Evaluation of the Health Education Process for European People with Type 2 Diabetes Mellitus

A thesis presented in partial fulfilment of the requirement for the degree of Master of Science in Nutrition Science

Massey University, Albany Campus,
New Zealand

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2006

Abstract

Evaluation of the Health Education Process of European People with Type 2 Diabetes Mellitus

Diabetes is a significant health problem in New Zealand. With a limited number of health professionals working in the area of diabetes it is essential that the educational and empowerment process is examined to ensure that the limited specialist resources are used effectively and efficiently with the best outcomes possible. For this to be achieved the holistic approach to education must be examined and evaluated. The aim of this research was to better understand the needs of European people between 45 – 65 years of age. The method used was a questionnaire to 50 female and 50 male subjects with type 2 diabetes randomly selected from patients seen by the researcher (a dietitian), within the Counties Manukau District Health Board geographical area. The results showed that most subjects were diagnosed between the age of 40 – 59 years, 64% had a relative with diabetes, 10% of females and 22% of males were overweight and 60% of females and 48% of males were obese. Group education was shown to be just as effective as individual therapy, with the preferred educators being specialist diabetes dietitians and nurses. Seventy two percent reported the best time for education was at diagnosis and 87% requested ongoing education. Once subjects knew their biochemical results 87% reduced their fat intake with 78% reducing saturated fat. The mean drop in HbA1c for females was 0.9mmol/l and males 1.4 mmol/l, with both being statistically significant. Level of self reported education bore no relationship to level of HbA1c achieved. Sixty two percent of those who had three years or less of secondary education, 30 % of those with three to five years secondary education, 52% with a technical or trade certificate, and 59% of those with a degree had reached a target HbA1c at follow-up. After diagnosis 45% reduced their alcohol intake. The most popular form of exercise was walking (46%), followed by gardening (28%). Fifty percent chose an exercise of moderate intensity and overweight subjects were more likely to exercise daily. The preferred medium for education was written pamphlets (86%) follow by books (60%). The conclusions reached were that most had changed to a healthy lifestyle since being diagnosed but vegetable intake was still much less than the New Zealand Guideline (2003). From the results it is hypothesised

that this diabetes population group, before diagnosis, had a higher intake of sweet drinks than the national average and this may have contributed to the development of the disease. Most were endeavouring to lose weight, improve biochemical indices and increase exercise. Both group and individual education were found to be equally effective as forums for education.

Acknowledgements

I would like to acknowledge the Whitiora diabetes service of Counties Manukau District Health Board for their support and encouragement.

Special thanks to Lesley Sanderson for her continuous support and for sharing her knowledge.

Thank you to the patients who were willing to be part of my research, without you this would not have been possible.

To Patsy Watson, my supervisor, for the endless hours spent guiding me through the process, keeping me focused, correcting my script and generally being there. With out her this would never have been completed.

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Chapter 1

Introduction

Diabetes is a significant health problem in New Zealand. Prevention is one of 13 population health objectives and the disease is one of three priority areas identified in the Ministry of Health's (2002 a) 2000 Health Strategy. The incidence of type 2 diabetes is increasing at an alarming rate with primary and secondary health care struggling to adequately educate those being diagnosed. There is a rapidly increasing number requiring amputations, dialysis and laser treatment for retinopathy; all complications associated with poor glycaemic control in people with diabetes. Twenty five percent of all admissions to Middlemore Hospital have diabetes as the cause of the admission or as a co-morbidity, thus the cost to the health budget is enormous and increasing.

With a limited number of health professionals working in the area of diabetes it is essential that the educational and empowerment process is examined to ensure the limited specialist resources are used effectively and efficiently with the best outcomes possible. For this to be achieved the holistic approach to education must be examined and evaluated.

The **aims and objectives** of this research are:

- To examine the preferred timing and location for lifestyle education.
- To determine the preferred health professional for lifestyle education.
- To explore the understanding of the importance of healthy eating and physical activity.
- To explore the understanding of the importance of achieving a weight within the healthy BMI range.
- To investigate the subjects perceived importance of biochemical indices of control.
- To assess subjects HbA1c control following education.
- To ascertain the preference for written, oral or visual material.
- To compare the effectiveness of group and individual education.

Chapter 2

Literature Review

2: 1 Definition of diabetes

The World Health Organisation (1999) defined diabetes mellitus 'as a metabolic disorder -

- of multiple aetiology
- characterised by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism
- resulting from defects in insulin secretion, insulin action or both.'

There are 3 main forms of diabetes mellitus-

Type One Diabetes

Type one diabetes is an autoimmune disease in which the insulin-producing pancreatic beta cells are destroyed. Typically it has a rapid symptomatic onset and although it is considered to be a disease of children and young adults aged less than 30 years of age it is increasingly being recognised in older people.

Type 2 Diabetes

Type 2 diabetes is much more common and has an insidious onset, as it is commonly asymptomatic for several years before being diagnosed. Type 2 diabetes results from insulin resistance with or without an insulin secretion defect. The incidence increases with age and usually presents in adults but is increasingly seen in children and adolescents. Population groups in New Zealand at increased risk of developing type 2 diabetes include Maori, Pacific peoples, Asians and people with a family history of diabetes. Obesity is the most important modifiable risk factor for type 2 diabetes (New Zealand Guideline (NZGG) 2003).

Diabetes in Pregnancy

Diabetes in pregnancy or gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. The definition

applies whether insulin or diet alone is used for treatment and whether or not the condition persists after pregnancy (American Diabetes Association (ADA) 2004). It is the most common metabolic complication of pregnancy. Pathophysiology of diabetes in pregnancy is that there is insufficient insulin to meet the considerable demands on the insulin secretory reserves in pregnancy (Hod 2002).

It is increasingly difficult to establish whether a patient has type 1 or type 2 diabetes. A protein on the surface of beta cells, glutamic acid decarboxylase antibody, is known to contribute to the destruction of beta cells, and is being used to enable a definitive diagnosis (Mahan et al 2000). However this test is thought to be accurate in only 90 % of cases so does not provide a definitive answer. Clinically latent autoimmune diabetes in adults may be indistinguishable from type 2 diabetes because it usually presents in an insidious way (Bell 2005). Patients can present with weight loss and rapid onset of symptoms yet can be managed on oral medication. This does not exclude type 1 as many people with type 1 diabetes have a honeymoon phase where the pancreas begins producing insulin again. This can be for just a short period of time but has been known to last one year (Mahan et al 2000).

Both Impaired Glucose Tolerance and Impaired Fasting Glucose refer to metabolic stages between glucose homeostasis and type 2 diabetes. Two randomised controlled trials have shown that prevention or delay of the onset of diabetes is possible through lifestyle intervention such as dietary changes and increased exercise (Pan et al 1997, Tuomilehto et al 2001).

2: 2 Diagnosis of Diabetes

Patients with newly diagnosed type 2 diabetes usually present with less than half normal pancreatic beta cell function and less than 60 % of normal insulin sensitivity. This demonstrates that the primary defects of type 2 diabetes are well established at the time of clinical diagnosis. Half of the patients in the United Kingdom Prospective Diabetes Study demonstrated some form of diabetic complication at the time of diagnosis suggesting that type 2 diabetes is typically diagnosed too late along the disease continuum (UKPDS 2003). Guidelines for the diagnosis of diabetes from the New Zealand Guideline Group (2003) Ministry of Health, Evidence-Based Best Practice Guideline Management of Type 2 Diabetes are as follows:

Patients with Symptoms of Diabetes

- a random venous plasma glucose result of greater than 11 mmol/l on two different days are diagnostic of diabetes
- and/or two fasting venous plasma glucose results $\geq$ 7 mmol/l on two different days are diagnostic of diabetes
- an oral glucose tolerance test is not required in the above situations.

Glucose Intolerance / Impaired Fasting Glucose

- a fasting venous plasma glucose of 6.1 to 6.9 mmol/l indicates impaired fasting glucose.
- an oral glucose tolerance test is recommended for people with a fasting venous plasma glucose of 5.5 to 6.0 mmol/l who are not of European ethnicity or who have a family history of diabetes, a past history of gestational diabetes or other features of the metabolic syndrome.

Oral Glucose Tolerance Test

The oral glucose tolerance test is generally used to diagnose diabetes when blood glucose levels are equivocal. When the diagnosis is clear from symptoms a diagnostic blood test is not necessary. The test should be preceded by an overnight fast of eight to fourteen hours, during which only water may be drunk. After collecting a fasting blood sample, the subjects drink 75g glucose. A blood sample is collected at one hour and 2 hours after the glucose load.

2: 3 Incidence

2: 3.1 Global Incidence

The International Diabetes Federation (1998) estimates that worldwide around 150 million adults have diabetes. Their Diabetes Atlas (2002) adds that type 2 diabetes constitutes about 85% to 95% of all diabetes in developed countries and accounts for an even higher percentage in developing countries. In the year 2000 it was estimated that about 4.6% of people aged between 20 – 79 had diabetes mellitus in all International Diabetes Federation member nations. The Western Pacific Region has the highest number of people with diabetes (approximately 44 million). However the prevalence rate of 3.6% is significantly lower than that in the North American (7.8%) and Eastern

Mediterranean and Middle East Regions (7.7%) (International Diabetes Federation 1998). The number of people with diabetes is expected to increase at an alarming rate in the coming decades. The International Diabetes Federation reports that in 1985 an estimated 30 million people worldwide had diabetes, and the figure is expected to rise to almost 300 million by the year 2025 (International Diabetes Federation 1998). The prevalence of diabetes is much higher in developed countries than in developing countries, but the developing world will be hit the hardest by the escalating diabetes epidemic in the future. The prevalence of adult diabetes in developing countries is expected to increase by 170% between 1995 and 2025 compared to a rise of 41% over the same period in the developed world. The causal agents of the projected increase are an ageing population, unhealthy diet, obesity and sedentary lifestyle (International Diabetes Federation 1998).

2: 3.2 Incidence in New Zealand

Several studies have sought to estimate the number of people with diabetes in New Zealand, but none have been definitive (Ministry of Health 2002, Diabetes 2000). The Ministry of Health (2003 a) National Health Survey (2002/2003) of people over the age of 15 years suggested a prevalence of people known to have diabetes as 3.1% in New Zealanders of European origin, 8.3% in Maori, 8.1% in Pacific Island people, and 4% in Asians and 'others'. The survey predicted that the number of people told by their doctor that they have diabetes that year would be 111,273. The number of people with undetected diabetes is not known, but a study showed 20% of 50 – 69 year olds in a Dunedin general practice (Ministry of Health 2002 Diabetes 2000). Dawson (2003) of the Ministry of Health reported 115,000 known cases of diabetes and it is estimated that a further 40 – 60,000 are undiagnosed. The mortality rate of people with diabetes in the 40 – 65 age range is 10 times higher than that of other New Zealanders.

There were 104,148 people with type 2 diabetes in New Zealand in the year 2000, of whom 24,362 were Maori (23%) 8,170 were Pacific Islanders (8%) and 71,615 (69%) were from other ethnic backgrounds. Of those with diabetes, 95% of Maori people and 89% of Europeans had type 2 diabetes. The estimated increase in incidence from 2003 to 2021 will be 117% for Pacific Island people, 97% for Maori and 47% for New Zealanders of European background. This will happen even without an increase in poor

diet, obesity and physical inactivity (Ministry of Health 2002 Diabetes 2000). The New Zealand guideline (2003) state that in 1996 European men aged between 25 – 89 years had a prevalence rate of diabetes of 3.1% (31,790 men) and estimated the number by 2011 will be up by 62% reaching 51,408. Women with diabetes in the same age group in 1996 made up 2.5% (28,707) of the population and the estimated number by 2011 will increase by 54% (44,105).

People who identify as European were chosen as the group to study for this research as there have been many studies that have looked at our Maori and Pacific Island community (Simmons 1996) but as far as the researcher can ascertain Europeans have never before been the focus of nutrition and diabetes research in New Zealand. The percentage of Maori and Pacific Island people with diabetes is much higher than in the European population, but because New Zealand is made up of 71.7% European (New Zealand Statistics 2001) there is a much greater number of Europeans with diabetes than the combined numbers from all other ethnic groups.

2: 4 Causes of Diabetes

2: 4.1 Fetal Origins Hypothesis

Small size at birth or in infancy is associated with an increased propensity to adverse health outcomes in adults, which includes increased risk of developing diabetes (as well as abnormal blood lipids, hypertension and death from ischaemic heart disease). Small body size or body shape at birth or subsequently, has been seen as a marker of poor fetal nutrition, which it is suggested results in fetal adaptations that programme future propensity to adult disease (Barker 1995, Rich-Edwards 1999).

This research was considered flawed by Lucas et al (1999) who believe there was misinterpretation and inappropriate analysis of growth data. Their belief was that size in early life is related to later health outcomes only after adjustment for current size. It is probably the change in size between these points (postnatal percentile crossing) rather than foetal biology that is implicated.

Anastasiou et al (1998) revealed a relationship between birth weight and risk of type 2 diabetes with a U shaped curve. Infants born at <1500g or >4500g have a 25% increased risk of developing diabetes. Intrauterine growth retardation and short stature are associated with an abnormal glucose tolerance. Innes et al (2002) concluded that a woman's own birth weight was strongly and inversely correlated to her risk of developing diabetes in pregnancy. The highest risk was associated with low and high birth weight.

2: 4.2 Diabetes during Pregnancy

There is increasing evidence that babies of mothers with diabetes experience in-utero beta cell exhaustion with post-mortem studies showing damaged islets cells in new-borns of diabetic mothers (Simmons 1997 b, Geremia 2004).

When body weight, length and head circumference were evaluated from birth through to 48 months, children of mothers with poor blood glucose control during pregnancy showed higher values for weight and the weight-height ratio in infancy compared to neonates of well-controlled mothers (Gerlini et al 1986). The American Diabetes Association (1999) reiterates this in its position statement saying that 'offspring of women with diabetes during pregnancy are at increased risk of obesity, glucose intolerance, and diabetes in later adolescence and young adulthood'. This has been backed up by research by Silverman et al (1991).

2: 4.3 Genetic Susceptibility

The risk for offspring of women with type 2 diabetes of eventually developing type 2 diabetes is about double the risk compared to the general population (ADA 1996). This could be due to insulin resistance as studies have demonstrated that insulin resistance is genetically inherited, thus the offspring of two diabetic parents and the first-degree relatives of diabetic subjects may manifest a defect in insulin-mediated glucose disposal. However, glucose tolerance remains normal in such individuals because fasting hyperinsulinaemia and a markedly elevated plasma insulin response to glucose feeding offset the defect in insulin action (DeFronzo 2003).

The 'thrifty phenotype' hypothesis states events such as malnutrition during fetal life

may cause diseases in adulthood. The malnourished fetus makes metabolic adaptations, which may become permanently programmed, persisting throughout life and causing disease later in life. Hales and Barker suggest that diseases such as cardiovascular disease, hypertension, obesity and hypercholesterolemia are related to reduced fetal growth as reflected by a reduced birth size and these are all associated with the metabolic syndrome and type 2 diabetes (Hales and Barker's et al 1991).

A Danish study of adoptees showed a strong relationship between body mass index or BMI, weight in kilograms divided by height in meters squared, of adoptees and their biological parents, with there being no relationship between the BMI of the adoptees and their adoptive parents (Stunkard et al 1986). A genetic contribution is also suggested by the very high concordance rates of the disease in monozygotic, genetically identical twins and apparently unaffected co-twins who have subclinical defects in insulin secretion (Williams et al 1998).

Although genetic susceptibility appears to play a powerful role in the occurrence of type 2 diabetes, the gene pool shifts quite slowly, thus the current epidemic is much more likely to reflect a marked change in lifestyle (Franz et al 2000). This became very evident for the Prima Indian tribe when they were relocated to a reservation. The gene pool did not change but there was a dramatic increase in obesity as a consequence of the reduced activity level and increase in energy dense foods such as deep fried takeaways (ADA 2000).

2: 4.4 Obesity and Inactivity

Obesity, particularly central or truncal obesity, is a major factor in insulin resistance and type 2 diabetes. Overweight and obesity alone accounts for more than 80% of diabetes in New Zealand (Ministry of Health Nutrition 2003 b). The American Diabetes Association (1998) data also revealed that 80% of type 2 diabetes is due to obesity and added that weight loss of as little as 5% results in a substantial improvement in health risk and glycaemic control. The New Zealand Guideline (2003) state that one third of the estimated increase in the number of people with diabetes in New Zealand is likely to be due to the increasing prevalence of obesity, a modifiable risk factor. The provisional results of the 2002/2003 New Zealand Health Survey reported the prevalence of overweight adults men as 57.1% and women 45.4% and the number of obese men as 16.5 % and women 19.1% (Ministry of Health 2003 a).

With the huge increase in childhood obesity there are more and more teenagers being diagnosed with type 2 diabetes. Reports on a recent study in Connecticut obesity clinic found that one in four children between the age of four and ten years were obese, and one in five adolescents between 11 – 18, were found to have impaired glucose tolerance. Four percent of the latter group had been diagnosed with type 2 diabetes (Lorder 2003).

The position of adiposity also influences propensity for diabetes with central adiposity (visceral fat) adding a much greater risk factor (60%) than peripherally distributed fat (Thomas 2001, Sunyer 1993, Folsom 1993). Men with a waist circumference of < 94 cm are at low risk, 94 – 102 cm at moderate risk and >102 cm are high risk. Women with a waist circumference of <80 cm have a low risk, 80 – 88 cm moderate risk and >88 cm high risk (ADA 1998). Jancin (2005) states that waist circumference is increasingly supplanting body mass index as the preferred indicator of obesity-related cardiovascular risk, both in research studies and clinical practice (Mann et al 2004). Dr Eckel of the American Heart Association Conference states that 'Waist circumference is a vital sign in my clinic, like blood pressure and pulse,' (Jancin 2005). Ministry of Health (1999 a) reported an increase of central obesity from 27.4% of the population in 1989 to 41.4% in 1997. Visceral fat is the first fat to be lost. Ten percent weight loss results in 50% visceral fat loss (Klein 2003 American Diabetes Association Conference Report).

Most weight loss programmes result in a slow weight loss but recidivism is common once the programme is terminated and weight regain can often be rapid (ADA 1998). Deliberate efforts to starve (or overfeed) are followed by a rapid return to the original weight, as it is thought that the latter constitutes a 'set point' that is amenable to physiological influences (Laquatra 2000).

Obesity is not always the result of gluttony as an excess of 100 kcal/day (1 slice of bread) results in a weight gain of 10 lbs (4.54 kg) a year and 100 lb (45.4 kg) in ten years (ADA 1998). Obesity is due to excess calorie intake compared to energy output.

'We can't under-eat enough to compensate for our under activity' Dawson (2003).

New Zealand Guideline (2003) used results from the Ministry of Health (1999 a) National Nutrition Survey, to predict that obesity prevalence will increase overall from

17% in 1996 to 29% in 2011. For every one percent absolute increase in the prevalence of obesity, it is estimated that an additional 2,300 people will develop diabetes. If we are going to reduce the burden of diabetes in New Zealand we must focus on prevention of obesity.

Many believe type 2 diabetes is substantially preventable (Ministry of Health (2002) Diabetes 2000, Dawson 2003) and that the risk of diabetes could be reduced 50 – 75% by controlling obesity (especially abdominal obesity) and 30 – 50% by increasing physical activity. Studies show that the relative risk of developing diabetes was 93 times higher in women who were overweight (BMI 33 – 34.9) compared with women of ideal weight (Ministry of Health (2002) Health Funding Authority). Overweight men with diabetes who intentionally lost 9kg or more reduced their risk of dying from diabetes by 36% (Ministry of Health 2002). Target weight for persons with diabetes should be based on a reasonable or healthy body weight – a weight an individual and health professional acknowledge as achievable (Franz 2003). The risk of developing diabetes was 30% lower in people who exercised vigorously at least once a week compared with sedentary men (Ministry of Health 2002).

Obesity also increases the risk of cardiovascular disease, a condition present in greater than 50% of people with type 2 diabetes at diagnosis. Eighty percent of people with diabetes die of coronary artery disease (National Diabetes Data Group 1995). The association is likely to be due, in part, to the adverse lipid profile including high concentrations of serum triglycerides and low density lipoprotein (LDL) cholesterol and low concentrations of serum high density lipoprotein (HDL) cholesterol.

The Diabetes Prevention Programme also encouraged lifestyle changes and found in people over 60 years this resulted in a risk reduction of 71%, whereas the medication Metformin alone only reduced risks by 31% (Franz et al 2002).

2: 4.5 Insulin Resistance

Many studies have reported impaired insulin-stimulated glucose uptake and deficient glucose-induced insulin secretion in healthy pre-diabetic individuals. Nielsen et al (2000) explored the pathophysiology behind type 2 diabetes in first-degree relatives of subjects and found first-degree relatives were insulin-resistant when compared with the

age, sex and BMI matched control group. Fasting rate of endogenous glucose production (2.40 ± 0.06 vs 2.37 ± 0.10 mg/kg lean body mass x min, p = ns) was similar in the first-degree relatives and controls respectively. Nielsen's data provided evidence that in first-degree relatives fasting gluconeogenesis and the ability of glucose *per se* to restrain endogenous glucose production are unaltered. Glucose effectiveness, assessed by a labelled glucose infusion technique, mimicking the systemic rate of appearance of glucose after the ingestion of 50g glucose, was similar in first-degree relatives and control subjects (Nielsen et al 2000).

Ralph De Fronzo (2003) divided Insulin Resistance into six types, depending of the site.

- **Basal State**: Insulin resistance resides at the level of the liver and is manifested by overproduction of glucose despite the presence of fasting hyperinsulinemia.
- **Insulin stimulated state**: Peripheral tissue, primarily muscle is the major site of insulin resistance.
- **β-cell level**: The major defect in insulin action are postreceptor in origin and include:- alteration in the signal-transduction system
  diminished glucose transport
  diminished glucose phosphorylation
  impaired conversion of glucose to glycogen
  glucose oxidation.
- **Adipocytes** have been implicated with day long elevated plasma free fatty acids levels which result from resistance to the antilipolytic effect of insulin. Chronically elevated plasma free fatty acid levels induce insulin resistance in muscles and liver and impair insulin secretion.
- **Gastrointestinal Tract:** Release of glucagon-like-peptide (GLP-1) (an incretin that is secreted by the L-cells of the small intestine) in response to an ingested meal/glucose load is deficient in type 2 diabetes and plays a major role in the development of impaired insulin secretion. It slows gastric emptying, lowers glucagon concentrations, stimulates proinsulin synthesis and increases insulin sensitivity.
- **Pancreatic α cells** are altered resulting in altered glucagon secretion. Fasting plasma glucagon levels are increased in diabetes and fail to decrease normally in response to an ingested glucose/ mixed meal.

Improved glycaemic control is more strongly related to improved insulin sensitivity than weight loss per se or loss of specific aspects of regional adiposity (Kelly et al 2004) however Franz et al (2002) reports that modest weight loss reduced insulin sensitivity and glycaemia in the short term. Biarnes et al (2005) research showed that Metformin also reduced insulin resistance.

2: 4.6 Amyloid Deposits

Amylin assists insulin in maintaining postprandial glucose homeostasis (Knowles et al 2002 b). Hyperamylinemia was found to accompany hyperinsulinemia and data suggests that hypersecretion of amylin could lead to conditions suitable for islet amyloid fibrinogenesis and this in turn could explain the increased risk of developing diabetes and obesity (Hoenig et al 2002). Histology of the islet cells of Langerhan show amyloid deposits that consist of islet amyloid polypeptides in 90% of people with type 2 diabetes (Leighton et al 1990). Yet there is a diminished release of the hormone amylin by the β-cells in first-degree relatives of subjects with type 2 diabetes. Amylin has been associated with insulin-resistance and this could be due to the loss of β-cells capacity due to the deposits (Knowles et al 2002 b).

2: 5 Education Strategies in the Treatments of Diabetes

Michael Fox founder of the Foundation for Parkinson's research said about coping with chronic disease.

'You can't beat it...
You can't deny it...
You deal with it.'

Treatment for diabetes depends on an appropriate education programme but Konrad Lorenz words should be kept in mind.

'Said does not mean heard
Heard does not mean understood
Understood does not mean accepted
Accepted does not mean practiced
Practiced does not mean forever.'

Statements that all those involved in education should keep in mind.

Appropriate and effective education of people with diabetes should improve quality of life, empower people with knowledge and the confidence to manage their diabetes and

reduce barriers to care. Outcomes that can be measured are glycosylated haemoglobin (HbA1c), lipids, blood pressure and BMI.

Glycosylated haemoglobin or HbA1c is a blood test performed in the laboratory on a whole blood sample. When a red blood cell forms in the bone marrow the glucose in the blood at the time is attached and remains with the red cell for its life span which is two to three months. When a blood sample is taken it has a combination or newly formed and older red blood cells. The HbA1c is a measure of an individual's average blood glucose over a period of the two to three months expressed as a percentage of total haemoglobin with glucose attached (Mahan et al 2000). This is a useful test when compared to home blood glucose monitoring as it indicates accuracy.

2: 5.1 Glycaemic Control

A systematic review of randomised trials (Norris 2001) showed that in most studies glycaemic control in both control and intervention study groups tended to have improved although there was a greater improvement in the intervention group in 14 studies. The percentage change in HbA1c ranged from – 26 to + four percent in the intervention groups and from –33 to + 15.5% in the control groups. Length of follow-up after completion of an intervention seemed to have a major effect on outcomes, and studies with a follow-up period of greater than six months tended to demonstrate greater effectiveness.

Results from the Diabetes Control and Complications trial (1993) and the United Kingdom Prospective Diabetes Study (1998 a & d) convincingly demonstrated the importance of glycaemic control in preventing the microvascular complications of diabetes. They showed an association between HbA1c and cardiovascular disease as being continuous, with each 1% reduction in HbA1c associated with a 21% reduction in the risk of diabetes-related deaths, 37% reduction in microvascular endpoints and a 14% risk reduction of myocardial infarction over 10 years. The New Zealand Guideline (2003) adds that good glycaemic control should be the key goal of treatment as this delays the onset and progression of diabetic microvascular and macrovascular disease. Tight glycaemic control reduces the risk of onset and progressive diabetic retinopathy and also reduces the risk of onset and progression of diabetic nephropathy (United Kingdom Prospective Diabetes Study 1998 d). The HbA1c level recommended in the

New Zealand Guideline is as close to physiological normal levels as possible, preferably less than seven percent. The lowest risk being in those with an average HbA1c <6% but the risk of hypoglycaemia must always be considered when determining an individuals target HbA1c, especially if they are treated with insulin. For people on Metformin and/or PPAR-γ agonists (glitazones), who have no risk of hypoglycaemia, the target HBA1c should be as low as possible. The target HBA1c that is achievable for people on insulin secretagogues (sulphonylureas) or insulin is likely to be higher because of the risk of hypoglycaemia.

The National Health and Nutrition Examination Survey (Harris 2001) showed that the frequency of self monitoring of blood glucose levels was not related to glycaemic control, however Jones (2003 b) study of patients who performed home blood glucose monitoring more frequently, did demonstrate significant reduction in HbA1c.

The target HBA1c for an individual should take into account:

- side effects of therapy, particularly severe hypoglycaemia
- other risk factors for diabetes complications, such as age, BMI, blood pressure
- presence of complications of diabetes, or co-morbidities
- individual choice
- psychosocial circumstances (NZGG 2003)
- pregnancy
- interfering factors eg sickle-cell haemoglobin and other haemoglobinopathies

In New Zealand blood glucose monitoring is well-established in clinical practice but there is still controversy as to its benefit. The New Zealand Guideline recommendations are based on those of the Royal College General Practitioners (UK) (McIntosh et al 2001). Internal locus of control is essential for the person with diabetes and regular blood glucose monitoring is the most effective method of encouraging this. (Tillotson et al 1996). The target range is < 7 mmol/l primeval and < 10 mmol/l post prandially (NZGG 2003).

The New Zealand Guideline (2003) assessed the usefulness of self-monitoring with the following conclusions:-

- Blood or urine testing as a stand-alone intervention does not appear to improve HBA1c, decrease body weight, reduce incidence of hypoglycaemia or improve health-related quality of life.

- There is no evidence that blood glucose monitoring is more effective than urine testing as part of an integrated self-care package in improving blood glucose control.
- Insulin doses can only be adjusted appropriately, and hypoglycaemia avoided, on the basis of self-monitoring blood glucose levels at different times of the day.

However the American Diabetes Association (2002 b) give another perspective stating that monitoring of glycaemic control as performed by patients and health care providers, is considered a cornerstone of diabetes care. The results of monitoring are used to assess the efficiency of therapy and to guide adjustments in nutrition therapy, exercise and medication. The optimal frequency of self-monitoring of blood glucose for patients with type 2 diabetes is not known, but should be sufficient to facilitate reaching goal blood glucose levels. When adding to, or modifying therapy, patients should test more often. Karter et al (2001) reiterates this at the conclusion of their cohort design study (considered to be more like a cross-sectional study by the New Zealand Guideline 2003) stating that more frequent self-monitoring of blood glucose levels was associated with clinically and statistically better glycaemic control in type 2 diabetes regardless of therapy.

At the 2005 American Diabetes Association scientific conference Hirsch stated that cell damage is more rapid with variability of blood glucose levels than when constantly elevated, thus home monitoring is essential as HbA1c only gives an average.

Hypoglycaemia

Hypoglycaemia is the state in which blood glucose levels drop below 4.0 mmol/l based on evidence that even very mild hypoglycaemia can reduce early warning symptoms and counterregulation (Fanelli et al 1993). It is one of the most common acute complications of diabetes and there is an increased risk as health professionals strive to achieve optimal glycaemic control (Johnston et al 2003). The UKPDS (1998 b) report stated that the rate of major hypoglycaemic episodes per year was 0.7% with conventional treatment, 1% with chlorpropamide, 1.4% with glibenclamide and 1.8% with insulin. Johnston et al (2003) refers to research by Jennings (1989) who found that 40 – 65 year old patients prescribed Metformin did not experience hypoglycaemia.

Self-monitoring of blood glucose is especially important for patients treated with insulin or sulphonylureas to enable them to monitor for, and prevent, asymptomatic

hypoglycaemia and hyperglycaemia. Research by Veitch et al (2004) found that hypoglycaemia in patients taking sulphonylureas may be refractory to intravenous glucose treatment with fatal consequences.

Diabetes New Zealand (2004 b) publication on hypoglycaemia state that hypoglycemia is more common if: meals are delayed or missed, there has been an increase in exercise without a decrease in medication or an increase in carbohydrate, alcohol is consumed without food, too much medication has been taken, or there has been significant weight loss. Research by Jennings (1989) referred to in Johnston (2002) adds that there was an increase risk with: increasing age, hepatic and renal disease, restricted food, intercurrent illness and the use of cocomitant medications e.g. ACE inhibitors.

Hypoglycaemia needs to be treated appropriately to prevent cognitive changes, rebound hyperglycaemia and weight gain. Ten grams of oral glucose can raise blood glucose levels 2.2 mmol/l over 30 min. Glucose levels begin to fall again 60 minutes after glucose is ingested therefore oral glucose must be followed by a carbohydrate containing food as a snack or part of a meal once the blood glucose level has risen above 4 mmol/l (Cryer et al 1994).

The treatment of hypoglycaemia requires the ingestion of glucose or carbohydrate containing food but the glycaemic response correlates better with the glucose content rather than the carbohydrate content (Franz et al 2002, Slama et al 1990). Mahan et al (2000) believes treatment should consist of 10–15 g carbohydrate however Franz recommends 15–20 g glucose as an effective treatment and adds that blood glucose may be only temporarily corrected with the initial response seen in 10–20 minutes. Franz believes glucose is the preferred treatment but adds that any form of carbohydrate that contains glucose may be used. Mahan recommends: three glucose tables, or half a glass of regular fruit juice or cordial, or tablespoon of jam, honey or sugar, or six large or eight small jelly beans. Brodows et al (1984) research reported that 20g glucose produced a greater rise in plasma glucose than 20g carbohydrate from orange juice or milk. Franz et al (2002) reports that adding protein has no beneficial effect and fat retards the acute glycaemic response.

The Auckland Diabetes Dietitians (2003) information sheet on hypoglycaemia treatment recommends; two to three BD Glucose tablets, three to four Vita tablets, three to four

Dextro energy tablets, one tablespoon of sugar or glucose powder in half a glass of water, half a glass of sweet cordial, fizzy drink (not diet) or Lucozade, half a glass of fruit juice, or six jelly beans (see Appendix 11).

Hyperglycaemia

Hyperglycaemia is the state in which blood glucose levels rise above nine mmol/l. Treatments depends on the level of hyperglycaemia and may include supplemental insulin or fluids. If less severe, extra fluid, exercise and extra vigilance with carbohydrate intake should see a return to more appropriate levels. Self-management guidelines recommend that the type of food eaten during the preceding meals should be checked to ascertain if that was the cause or if it was due to infection, stress or lack of medication (NZGG 2003, Diabetes Resource Manual 2004). Boswell King (1993) adds that with hyperglycaemia urine volume is increased due to osmotic diuresis and fluid requirement also increases.

Hyperglycaemia can be a result of hypoglycaemia followed by 'rebound' that is called the Somogyi effect. This phenomenon originates with the secretion of counterregulatory hormones that stimulate hepatic glucose production thus raising blood glucose levels. If rebound hyperglycaemia goes unrecognised and insulin doses are increased, a cycle of over insulinization may result (Mahan et al 2000). Untreated hyperglycaemia can have lasting effects on the patient's health with an increase in complications (Vincent et al 2005, Frantz et al 2005).

2: 5.2 Methods of Education

2: 5.2.1 Self- Management Education

Patient education is the cornerstone of diabetes self-management and is central to achieving improved out-comes of care (Mensing and Norris 2003). Widom et al (1994) adds that 'Diabetes education is not just part of the treatment, it is the treatment'.

The shift is away from the medical model, to more patient-centred educational goals and clinical management. This is particularly important in diabetes education where the person with diabetes, rather than the health care team, provides the majority of diabetes care. The learning process should also include others affected by diabetes such as family members, friends and others in the social support network (Calabretta 2002).

Programmes should be built on the philosophy of supporting individuals to achieve their own goals for diabetes management. This was exemplified in the Health District of Portsmouth, where goals were:

- to provide individuals with information regarding the cause, effects, and management of type 2 diabetes
- to enable newly diagnosed individuals to discuss and explore their experiences, frustrations, and successes in living with diabetes
- to ensure that those living with type 2 diabetes are aware of their specific health risk for developing the complications of diabetes
- to provide an expert forum for participants to discuss methods of reducing their identified risk factors
- to support individuals in developing their own diabetes management plan (Skinner et al 2003).

Daylong workshops were held resulting in significant changes in self-management behaviour and considerable reduction in HbA1c, total cholesterol and body mass index. Hill et al (2002) adds that long term monitoring and encouragement from the physician through clinic visits, group meetings, phone or email contact, can help to prolong the maintenance phase of weight loss thus ensuring better prospects for long term success. The experience of Counties Manukau District Health Board is that the long-term contact can be a diabetes nurse specialist, specialist dietitian or practice nurses. The American Diabetes Association (1998) recommend that contact with a registered dietitian should be at least twice a year to monitor metabolic parameters and assess the effectiveness of the nutritional therapy.

The researcher is a member of a team of Auckland diabetes dietitians that produce and up-date the diabetes diet sheets for all New Zealand in an attempt to provide as much relevant information as possible to empower people with diabetes. When a patient is educated on healthy eating it is essential that all the material is provided in a take home form that can be either written or visual as retention can be very limited.

Communication barriers can interfere with the dietitian providing effective education to patients. Low literacy skills are barriers that are often ignored and this can contribute to non-compliance and lead to reduced motivation (Doak et al 1997). In 1992 the National Working Group on Literacy and Health (1998) reported that one quarter of the United

States population had rudimentary reading skills and another 25% had limited reading skills and therefore it was difficult to have written communication with about half of the population. The National Literacy Survey in New Zealand (Walker et al 1997) revealed the literacy skills were similar to the United States levels. It is therefore very important that education through visual resources is available. The researcher developed a set of food photographs that can be used to explain portion size as well as healthy meal patterns to visual learners. Doek's research reports that the memory system in the brain favours visual storage so 'when a message is visualised we remember it better than if we just read or hear it'. The well known quote 'a picture is worth a thousand words' from Confucius is mentioned by Doak.

2: 5.2.2 Group Versus Individual Appointments for Education of People with Type 2 Diabetes

Human beings are social creatures who gather together for work and play. Thus, the emergence of groups as a health care delivery method is not surprising. Evidence suggests that groups may have an impact in making diabetes health services more accessible, and perhaps more effective. Group interaction appears to provide emotional support while lessening feelings of isolation and stigmatism that are associated with some chronic illnesses (Weinger et al 2003).

Elliot Joslin many years earlier also advocated group education saying:-

> **'We can only scratch one back at a time, but we can teach many patients together, and each is likely to teach another patient'** Barnett et al (1998).

Van der Ven (2003) believes that sharing the same medical condition provides people with ample common ground and comments that many aspects of care such as information and training in behavioural skills are just as easily and effectively addressed in a group as in an individual care format. The advantages of group over individual counselling include obtaining emotional support from people with similar experiences and being able to use the experiences of others. He adds that interventions with a short structured format seem to have a more beneficial effect than groups relying on disclosure and sharing of experiences only. To achieve behavioural change people need strategies and practice to translate new information into actual behaviour and to implement new behaviours in real life.

Education is 'practice and movement' – the practice of education is based on a set of theories, research findings and skills learned and practiced. The education of patients and teachers is constantly evolving (Redman 1997). Franz et al (2002) believes groups should be used as a first line approach to improve diabetes outcomes. But Mensing et al (2003) reports that there have been very few studies that directly compare group versus individual formats for delivering a specific intervention. In their meta-analysis Norris et al (2001) compared group and individual education in a narrative fashion and concluded that the literature on diabetes education was divided, although the effects may be more positive for group delivery of lifestyle programmes that focused on diet and physical activity.

2: 5.2.3 Preferred Educator

Educators must be flexible and well versed in planning for the uniqueness of each individual and acknowledge their dignity and autonomy (Funnell et al 2002). Educators must be skilled in using techniques and educational theories including motivational interviewing and empowerment techniques. They must be able to assess participants' readiness to learn, stages of change and learning style. Anderson et al (2000 a) reminds educators that there is no such thing as a 'one-size-fits–all' approach but instead all interventions must be tailored to, and instructional methods focused on, personal needs and instructor skill level. Support systems must be activated and instructional methods matched to readiness to learn. Educators that provide choices of behaviour change and practice sessions to familiarise learners with the new concepts such as carbohydrate counting, label reading and serving size should be available (Shintzky and Kub 2001).

The researcher is unaware of research into the preferred educator but a survey in a medical centre in South Auckland revealed that patients preferred education from the practice nurse rather than the doctor (Personal communication).

2: 5.2.4 Style of Education

Electronic presentations using fancy, rapid visual techniques may work well for younger, technologically savvy learners, but not so well for slower-learning older adults. Instructors need to be comfortable with a variety of multimedia and traditional delivery methods. Delivery options should be creative including discussions,

demonstrations, age specific games and visits to supermarkets (Norris et al 2001).

Zrebiec and Jacobson (2001) report on a web-based educational and emotional resource for patients with diabetes. A survey of 47,365 people mainly over 30 years of age revealed that nearly half of the users logged in more than three times and 79% rated participation as having a positive effect on their coping with diabetes. Barrera et al (2002) study of 160 women with a mean age of 59.3 ± 9.4 years supported this view.

Systematic review of randomised trials that measured changes in diabetic knowledge demonstrated improvement with education including follow-up of six to twelve months. A number of studies demonstrated that regular reinforcement or repetition of the intervention seemed to improve knowledge levels. Most studies that examined dietary changes were positive for self-reported changes including improvement in dietary carbohydrate and fat intake (Norris et al 2001).

Some studies show that adjustment of diet and physical activity in conjunction with self-monitoring of blood glucose improved control but in the Wing et al (1988) study there was no improvement in glycaemic control at one year. However Litzelman et al (1993) noted a decrease in serious foot lesions at one year after an intervention consisting of group education, with three follow-up visits, providing guidelines and chart reminders.

2: 5.3 Nutritional Strategies in the Treatment of Diabetes

2: 5.3.1 Healthy Eating in Practice

Regardless of all other treatments, food remains the fundamental cornerstone of treatment. Dawson (2003) endorsed a public health approach to healthy eating and healthy action as he believed prevention was better than cure. He emphasized the need to identify and motivate people at high risk to make lifestyle changes. Nutrition advice is an essential part of the intervention through one-on-one and /or small group education and follows-up.

Dietary Interventions recommended by the New Zealand Guideline (2003) include:

- A reduction in energy intake with weight loss as the primary objective for people who are overweight or obese.

- Reduction in the intake of food rich in saturated fatty acids, added sugar, and white flour bakery products.
- Progressive replacement of the above foods with vegetables, fruit, whole grains, high fibre products, and dried peas and beans (legumes).
- Increased consumption of fish.
- Inclusion of high fibre foods with a low to moderate glycaemic index at each meal.
- Distribution of carbohydrate foods evenly throughout the day.
- Avoidance of large volumes of carbohydrate-rich foods at any one meal.

Specific dietary information for people with diabetes and the metabolic syndrome includes advice about the saturated fatty acid content of foods and the quality of carbohydrate choices to encourage a high fibre intake. Everyone with type 2 diabetes and the metabolic syndrome should be offered a dietary review and tailored advice according to their readiness for change, energy requirements, profile of risk, prescribed medication, lifestyle and cultural choices.

2: 5.3.2 Lipids.

The New Zealand Guideline for the Assessment and Management of Cardiovascular Risk (2003) state that cardiovascular disease is the leading cause of death in New Zealand accounting for 40% of all deaths. While age-standardised mortality has halved over the past 30 years, the total number of deaths from cardiovascular disease has not changed because of the growing number of older people and at-risk individuals. Diabetes, elevated lipids and obesity are among the many established risk factors for cardiovascular disease (Schernthaner 1996). Prospective studies showed that morbidity and mortality from cardiovascular disease is two to five times higher in people with diabetes with approximately two-thirds of people with type 2 diabetes dying from cardiovascular disease (Haffner et al 1998). The case-fatality rate among those who have a cardiovascular event is higher in people with diabetes than in those without diabetes (Gu et al 1999).

The New Zealand Guideline recommend that dietary saturated fatty acids be kept to <7%, total fat <35%, and carbohydrate to 42 – 50% of total energy. Franz et al (2002) combines monounsaturated fat and carbohydrate and recommends that together they should provide ~60 – 70% of total energy intake with saturated fat making up less than

10%. A meta-analysis (Yu-Poth et al 1999) showed positive correlation between changes in dietary total and saturated fatty acids and changes in total, LDL, and HDL cholesterol. Adding exercise resulted in greater decreases in total and LDL cholesterol and triglycerides and prevented a decrease in HDL.

Diets high in cis-monounsaturated fatty acids and high in carbohydrate result in improvements in glucose tolerance compared with diets high in saturated fat (Yu-Poth et al 1999). Diets enriched with monounsaturated fat may also reduce insulin resistance (Parillo et al 1992). Metabolic study diets in which energy intake is maintained by being high in either carbohydrate or monounsaturated fat, lower plasma LDL cholesterol equivalently (Garg et al 1994).

Table 2:1 Target Biochemical Results Recommended.

	Total Cholesterol mmol/l	LDL mmol/l	HDL mmol/l	Triglyerides mmol/l
NZ Guideline	<4.0	<2.5	>1.0	<1.7

Source: New Zealand Guideline (2003)

The Cardioprotective Dietary Guideline (2003) recommend two to three servings of low fat or fat free milk, yoghurt or low fat cheeses, and margarine in place of butter with the reminder that quantity should be limited especially in those needing to lose weight. Franz et al (2002) reiterates decreasing intake of saturated fat and cholesterol and encourages low fat methods of cooking.

The Diabetes New Zealand (2004 a) Supermarket Guide (see Appendix 11) encourages choosing foods with less than 10g fat per 100g (exceptions are milk, yoghurt, and cereals). The Auckland Diabetes dietitians group produced a list of biscuits, and takeaways that fits this criteria as well as information on low fat methods of cooking (see Appendix 11).

Takeaways

Takeaways are very much part of the meal pattern within New Zealand with a high percentage eating takeaways once a week, and 38 % of men and 26% of women eating hot chips at least once a week (Ministry of Health 1999 a). With the increasing emphasis on monounsaturated fats replacing saturated fats many fast food outlets are now providing low fat options (Mann et al 2004). Kentucky Chicken has been the

slowest to respond but now provide chicken subs. Burger King and Nando's grill chicken for their burgers and provide salad in place of chips. Subway provides six low fat options for their sandwiches and has a salad option.

The National Heart Foundation initiated research into the correct temperature for the cooking of chips to minimise their fat content and offered training sessions for chefs. They also investigated which potatoes would absorb the least fat. These strategies have the potential to reduce the fat content of chips from 11.5% down to 10%. Some fish and chips outlets are now cooking in monounsaturated fat in an endeavor to appeal to their health conscious patrons.

The New Zealand Consumers Institute (August 2001) survey of the fat content of pies revealed that pies contain between 12.9g and 33.5g of fat. The consumption of 20 million pies per capita equated to the ingestion of 480 tons of fat in 1999. The Ministry of Health (1999 a) reported that 30% of men and 9% of women, within this study's age range ate sausage rolls or pies each week. This increased to 46% of males and 21% of females in the NZDep 96 quartile 1V areas.

2: 5.3.3 Carbohydrate

Glycaemic index

The glycaemic index concept originated in Australia with Brand-Miller and colleagues writing many books on the subject. New Zealand has also incorporated this concept for both weight loss, heart disease, type 2 diabetes and overall improved health. It is a measure of carbohydrate quantity and the extent to which the carbohydrate in different foods raise the blood glucose levels.

Inclusion of low-glycaemic index foods into the dietary pattern consistently lowers glycosylated protein levels by 0.43% and lowers LDL-Cholesterol and triglyceride levels in type 2 diabetes. These effects are enhanced when a low-glycaemic index diet is also high in dietary fibre (Mann et al 2004, NZGG 2003, Ludwig 2002, Willett 2000).

A meta-analysis (Brand-Miller et al 2003) of randomised controlled trials states that current dietary recommendations emphasise the quantity rather than the quality of carbohydrate, despite the fact that carbohydrate sources profoundly influence postprandial glycaemia. Sugars are not absorbed any more rapidly than starches

(Foster- Powell et al 2002, Franz et al 2002, Mann 2004). Several prospective observational studies found that the overall glycaemic index and glycaemic load of the diet, but not total carbohydrate content, are independently related to the risk of developing type 2 diabetes, cardiovascular disease and some cancers (Brand-Miller et al 2003). She acknowledges that not all studies are in agreement and that further research is needed. In the conclusion of Brand-Miller's meta analysis she notes that choosing low-glycaemic index foods instead of conventional or high- glycaemic index foods had a small but clinically useful effect on medium-term glycaemic control in patients with diabetes. The incremental benefits were similar to that offered by pharmacological agents that also target postprandial hyperglycaemia.

The United States has been much slower to take on the concept of glycaemic index with researchers elsewhere sharing their caution. Sheard et al (2004) states that the relationship between glycaemic index and glycaemic load and the development of type 2 diabetes remains unclear. Reaven (2000) agrees that any beneficial effects of low - glycaemic index diets on insulin resistance, and related cardiovascular risk factors, are small in comparison with reduced carbohydrate content of the diet and adds that it is too complicated to be practical.

However there is general agreement that the carbohydrate content of meals should be consistent, therefore the Auckland diabetes dietitians produced carbohydrate counting sheets (see Appendix 11). The New Zealand Guideline (2003) recommends whole grains, whole grain bread and high fibre breakfast cereals. The Auckland diabetes dietitians also produced handout sheets on glycaemic index, how to incorporate low glycaemic index foods into a healthy diet and a sheet of appropriate cereals for people with diabetes (see Appendix 11).

Fibre

The New Zealand Guideline (2003) recommend a high percentage of carbohydrate as intact foods with their naturally occurring dietary fibre providing >40 g dietary fibre daily or >7g fibre per 100g carbohydrate. The benefits ascribed to a high fibre diet are improved glycaemic indices, reduction in total and LDL-cholesterol and triglycerides (Chandalia et al 2000). However a meta-analysis by Brown et al (1999) indicated that while diets high in soluble fibre decreased LDL-cholesterol they had a small HDL-lowering effect and did not affect triglycerides. Other studies of healthy subjects and

those at risk of type 2 diabetes support the importance of including foods containing carbohydrate from whole grain, fruit and vegetables. Franz et al (2002) adds that large amounts of dietary fibre (~50 g per day) may have beneficial effects on glycaemia, insulinemia, and lipemia, however it is not known if such high levels of fibre intake can be maintained long-term. There is no reason to recommend an intake of fibre greater than that recommended for adults without diabetes. Soluble fibre is especially important as it dissolves in water and slows the passage of food but Franz warns that the increase should be no more than three to four grams a day to prevent bloating.

Epidemiological observations have associated intakes of three or more daily servings of whole grain foods with a 20 – 30% lower incidence of cardiovascular disease and type 2 diabetes (New Zealand Dietetic Association 2000). The position paper recommends the inclusion of three to four, or more servings of whole grain as part of the daily bread and cereal intake.

In Tuomilehto et al (2001) study 522 middle-aged over weight persons with impaired glucose tolerance were randomised to either an intervention group or control group. The intervention group received individual counselling aimed at reducing their weight by 5%, total intake of fat to <30 % of total energy, saturated fat intake to <10 % of total energy, increasing physical activity (moderate exercise 30 minutes a day), and intake of fibre to 15 g / 1000 kcal. The cumulative incidence of diabetes after four years was 11% in the intervention group and 23 % in the control group. During the trial, the risk of diabetes was reduced by 58% ($p = < 0.001$) in the intervention group. In those who achieved four out of five of the intervention goals, there were no new cases of diabetes and in both groups the incidence of diabetes decreased with increasing success at achieving the goals. The single most important predictor was fibre. Previous studies by Eriksson et al (1991), Pan et al (1997) and Schulze (2004 a) found similar results.

2: 5.3.4 Meat, Fish, Eggs, Dairy Products

The New Zealand Guideline (2003) recommend an increase in the consumption of fish especially the oily fish (two to three servings a week), a small serving of lean meat or skinned poultry a day and the inclusion of dried peas, beans and soy products in the diet. Franz et al (2002) recommends an intake of protein between 15 – 20% of total energy and two or more servings of fish per week to provide sufficient omega 3

polyunsaturated fatty acids. They also points out that ingestion of protein does not increase plasma glucose concentration even though it is just as potent a stimulant of insulin secretion as carbohydrate. However Franz does not recommend a high protein intake (and low in carbohydrate) as the long-term effects are unknown. They acknowledges that such diets may produce short-term weight loss and improved glycaemia, but it has not been established that the weight loss can be maintained in the long term plus there is the concern of the long term effect on the LDL cholesterol.

Moderate hyperglycaemia in obese patients may contribute to an increased turnover of protein in type 2 diabetes as there is an increase in whole-body nitrogen flux and a higher rate of protein synthesis and breakdown (Gougeon 1994).

2: 5.3.5 Vegetables and Fruit

The New Zealand cardioprotective guideline (2003) recommend three or four servings of vegetables a day with a variety of colours, especially green, orange and red, and suggest they be included at every meal. Fruit is also encouraged with the recommendation of three to four servings a day (but no more than one serving of fruit juice a day). The Ministry of Health (2003 b) states that 1600 deaths in New Zealand were due to inadequate fruit and vegetable intake. Gillman's (1996) study found reduced risk of myocardial infarction, cardiovascular disease, stroke and cancer when vegetables were included in a healthy meal pattern. Joshipura et al (1999) research on 75,596 women and 38,683 men resulted in data that supported a protective relationship between the consumption of fruit, vegetables, particularly cruciferous and green leafy vegetables, citrus fruit and juices and ischaemic stroke risk.

In the Ministry of Health (1999 a) National Nutrition Survey audit it was reported that 67% of New Zealanders ate three or more vegetables per day with potato being the most common. Forty six percent ate two or more fruit per day with banana the most common, and 14% were trying to eat more fruit. Provisional results of the Ministry of Health (2003 a) 2002/2003 New Zealand Health Survey reported two out of three adults ate the recommended three or more servings of vegetables each day and that just over half of all adults ate the recommended two or more servings of fruit a day. Puska (2003) reports that globally there has been a trend to reduce intake of fruit and vegetables, which is of concern. The American Diabetes Association position paper

(2003) and Franz et al (2002) stress the importance of including carbohydrate from fruit and vegetables. However both add that care must be taken to control the amount of carbohydrate eaten and include a similar amount at each meal in order to control blood glucose levels. Franz adds that there is no significant difference in glycaemic response if the total amount of carbohydrate is similar.

The Auckland Diabetes Dietitian's carbohydrate counting resource (2003) (see Appendix 11) gave subjects guidelines as to the carbohydrate content of fruit thus enabling them to include fruit within their carbohydrate allowance. Once subjects gained an understanding of the impact of fruit and carbohydrate containing vegetables on blood glucose levels they often found their glucose levels improved considerably (especially those fond of bananas). The Diabetes New Zealand basic food guide (see Appendix 11) emphasised the importance of vegetables low in carbohydrate and recommends half a plate at one to two meals a day. Vegetables play a major role in satiety for people trying to lose weight (Willett et al 2000).

2: 5.3.6 Non Alcoholic Drinks

People with diabetes are encouraged to have six to eight non alcoholic drinks a day with the recommendation to include water and limit sugar-sweetened drinks (New Zealand Guideline 2003). People with diabetes can consume artificially sweetened drinks. Franz et al (2002) states that nonnutritive sweeteners are safe when consumed within United States Food and Drug Administration guidelines. The Auckland diabetes dietitians have produced a sheet that lists the drinks that are appropriate for people with diabetes plus those to avoid (see Appendix 11).

2: 5.3.7 Alcohol

Rimm et al (1996) in a summary of ecological, control, and cohort studies, concluded that all alcoholic drinks are linked with lower risk of coronary heart disease, with the benefit being from the alcohol itself. The US Male Physicians, British Regional Heart, and the Health Professional Follow-up Study on alcohol all found that light to moderate alcohol intake was associated with a reduced risk of diabetes and protection against coronary artery disease (Puddey 2004). The lowest adjusted risk was associated with an average daily alcohol consumption of five to fifteen grams in women and fourteen to

twenty eight grams in men compared with no alcohol consumption (Valmadrid et al 1999). These levels support a recommendation that safe intakes for people with type 2 diabetes are the same or slightly lower than intakes recommended for people without diabetes. The US Department of Agriculture (2000) Dietary Guideline for Americans recommend no more than two drinks per day for adult men and no more than one drink per day for adult women.

Type 2 diabetic subjects that ingest moderate amounts of alcohol with food had no acute effects on blood glucose or insulin levels (Franz et al 1999) but exercise after drinking alcohol can lower blood glucose by up to 27% from baseline (Rasmussen et al 1999). Ingestion of light-to-moderate amounts of alcohol does not raise blood pressure but excessive chronic ingestion raises blood pressure and may be a risk factor for strokes (Franz et al 2002). The New Zealand Guideline (2003) suggest that people with diabetes may consume up to two to three standard drinks of alcohol at one time with a minimal effect on blood glucose. If exercise and consumption of alcohol are combined, there may be a lowering of blood glucose. All people with diabetes should be aware of the high energy value of alcohol and that excess consumption can lead to weight gain.

2: 5.3.8 Weight Loss

Obesity is by far the greatest risk factor in type 2 diabetes and cardiovascular disease. Even modest weight loss (5% - 10%) of body weight has been shown to decrease serum triglycerides and increase HDL-Cholesterol levels, thereby lowering the risk of cardiovascular disease (Dujovne et al 2001). Other plausible mechanisms that link obesity with cardiovascular disease include its adverse impact on hypertension, impaired glucose tolerance and type 2 diabetes (Paetel et al 2001). Reduction in calorie intake has an instant impact on insulin sensitivity, well before there is any weight loss (Klein 2003). Calorie reduction of 500 to 600 kcal/day generally leads to weight loss of 0.5kg per week and a 10% decrease in weight by six months (Klein 2001). Very low calorie diets (less than 800 kcal/d) are designed to produce rapid weight loss, but in randomised controlled trials, although a great weight loss was seen during the active phase of the study, by six to twelve months the advantage was variable (Pi-Sunyer et al 1998). However they have a place to play in the treatment of morbid obesity in patients who are unable to undergo elective surgery because of their weight (Pekkarinen et al 1997).

Powell et al (1994) found that when patients followed a 1,200 kcal/day diet the rate of weight loss and the reduction in the percentage of body fat did not differ significantly when dietary fat represented 10%, 20%, 30%, or 40% of the total calories.

2: 5.3.9 Label reading

In 1995 a treaty was signed between Australia and New Zealand to set up joint food authority known as ANZFA and in November 2000 ANZFA (now known as Food Standards Australia New Zealand) agreed upon food standards. As a consequence more comprehensive labeling requirements have been introduced to ensure that consumers have adequate information enabling them to make informed choices. The nutritional information panel must set out the energy, protein, total fat, saturated fat, carbohydrate, sugar and sodium content of the food, the number of servings of the food in the package, the quantity of the food in a serving and the unit quantity of the food. The label must list all the ingredients and compound ingredients used in the manufacture of the food (ANZFA Overview of Food Labeling 2001).

The guideline in the Diabetes New Zealand Shopping Guide (2004 a) (see Appendix 11) recommend the comparison of 100g of different products. When checking the fat the goal is less than 10 g of fat per 100 g and the fat should be predominately mono or polyunsaturated. With the emphasis now being on carbohydrate counting, the serving size should be checked and the amount of carbohydrate in that serving incorporated in the meal carbohydrate allowance recommended by a dietitian. When this is not possible the 100g column can again be checked with the recommendation that sugar should be less than 10 grams.

2: 5.4 Exercise

Exercise is known to effectively reduce blood glucose levels. Aerobic activity involves large muscle groups contracting repeatedly, rhythmically, and an increase in heart and breathing rates. To be effective, the activities need to be done for a sustained period of time (usually 15 minutes or more per session) at a low to moderate level of intensity on a regular basis (at least three times a week). Running, step aerobics, and walking, whether outdoors, on a treadmill or other machines are all effective. In contrast,

resistance training, is a high-intensity activity in which specific groups of muscles contract, while working against some form of external resistance. Unlike aerobic activity resistance training usually works one muscle group for short periods. Recent studies have shown that resistance training boosts energy, preserves youth, improves cardiovascular health, and helps metabolise fat and glucose. Aerobic training and resistance training each have their own advantages, however combining the two may give the best results (Braunstein 2003).

Exercise improves insulin sensitivity, can lower blood glucose and improves cardiovascular status (Pavlou et al 1989) but by itself has only a modest effect on weight. However it is useful as an adjunct to other weight loss strategies. Two hundred minutes per week is required to maintain weight loss, 150 minutes per week to stop weight gain, with < 150 minutes resulting in gradual weight gain over six months (Jakicic et al 1999). The New Zealand Guideline add to the list of benefits an increase in HDL-cholesterol, decreased LDL-cholesterol and systolic and diastolic blood pressure, in both men and women, who participate in more vigorous activity. The Nurses Health Study showed a reduction in cardiovascular risk occurred in women who exercised whether or not they were obese (Colditz 1997).

The New Zealand Guideline (2003) suggest everyone should aim to do a minimum of 30 minutes of moderate intensity physical activity on most days of the week. For people with time constraints, physical activity may be accumulated in bouts of eight to ten minutes (McArdle et al 1991). People who are already doing 30 minutes of moderate intensity physical activity per day should be encouraged to do physical activity of higher intensity, or for longer, to maximise the benefit of increasing their cardio-respiratory fitness.

A gradual introduction of low intensity physical activity should initially be recommended for sedentary people with diabetes and advice about exercise be individually tailored, diabetes-specific, and include implications for glucose management. To maximise adherence, exercise programmes should be accompanied by ongoing support. People may prefer home based exercise programmes, others community-based exercise programmes, such as at a marae or church (NZGG 2003). A Green prescription is often used especially the 'modified green prescription' which allow participants to experience a variety of activities without incurring a cost. Farquhar

(2003) suggests 'prescribe a dog' and encourages the use of pedometers with a recommendation of 10,000 steps a day.

People with pre-existing complications of diabetes should seek medical review before embarking on exercise programmes. Physical activity for people with diabetes and coronary heart disease should begin at a low intensity and gradually increase over several weeks. Vigorous activity is generally not encouraged in people with impaired ventricular function, severe coronary artery disease, recent myocardial infarction, significant ventricular arrhythmia's or stenotic valve disease (NZGG 2003).

Individualised advice on strategies to avoid hypoglycaemia when exercising must be given to people taking insulin including adjustment of carbohydrate intake, reduction of insulin dose, and choice of injection site. Advice on the spread of carbohydrate intake and/or a reduction of medication before planned exercise may be important for people with diabetes on oral therapies (especially those on sulphonylureas) (NZGG 2003).

2: 6 Medical Treatment of Type 2 Diabetes

2: 6.1 Non Insulin Medications

- Metformin is considered the first-line oral therapy in overweight/obese people (BMI >25.0). Metformin is a biguanide that prevents the liver from releasing excessive amounts of glucose and increases peripheral cell sensitivity. It is an excellent drug that does not cause hypoglycaemia or promote weight gain. However there are contraindications and guidelines for withdrawing metformin: serum creatinine higher than 0.15 mmol/l and during periods of suspected tissue hypoxia (Jones 2003 a, NZGG 2003).

- Insulin secretagogues stimulate the pancreas to produce more insulin. They can be considered as first-line therapy if metformin is not tolerated or contraindicated, or in people who are not overweight. Hypoglycaemia is a risk factor with these drugs. Fully subsidised insulin secretagogues in New Zealand are Glibenclamide, Gliclazide, Glipizide and Tolbutamide (NZGG 2003).

- Acarbose (available in New Zealand on special authority) is an α-glucosidase inhibitor which lowers blood glucose by competitively inhibiting specific enzymes involved in the digestion of complex carbohydrate.

- Glitazones (PPAR~γ agonists or thiazolidinediones) are a new class of oral glucose-lowering drugs include rosiglitazone and pioglitazone. The glitazones are insulin sensitising agents (NZGG 2003). Pioglitazone is funded in special circumstances by Pharmac. In randomised studies in patients with inadequately controlled insulin treated type 2 diabetes, both four and eight mg daily significantly improved glycaemic control (Raskin et al 2001). Treatment with eight mg rosiglitazone plus insulin resulted in a mean reduction from baseline in HBA1c of 1.2 % ($p = < 0.001$), despite a 12 % mean reduction of insulin dosage. The are countraindications for people with cardiac failure and can take up to six weeks for the full effect to be seen. Pioglitazone is an insulin sensitiser, which reduces insulin resistance by improving insulin action in skeletal muscle, adipose tissue and the liver and improves plasma triglyceride and HDL cholesterol levels. An advantage is that it does not have to be taken with meals.

- Incretins – a new drug released in the Unites States in June (Hirsch, 2005). Incretins increase the body's own Glucagon-Like Peptide 1(GLP-1), working by blocking Dipeptidyl Peptidase-4 the enzyme that would normally breaks down GLP-1 therefore raising the level of naturally produced GLP-1 and enhancing the effect of the body's own incretin hormone (Mentlein 2005).

2: 6.2 Insulin

The United Kingdom Prospective Diabetes Study showed that insulin therapy is not associated with any harmful cardiovascular effects and the beneficial effects of insulin treatment outweigh its theoretical risk (UKPDS 1999). Insulin should be offered to people with inadequate control on oral therapies. Tablet failure can occur at any stage but generally people with type 2 diabetes who survive the disease five to fifteen years will require an increasing amount of insulin if their blood glucose levels are to remain within normal limits (NZGG 2003).

- Intermediate Acting Insulin's have an onset of action approximately two hours after injection with a broad peak of four to twelve hours and a duration which can vary anywhere between 12 – 24 hours depending on the insulin and the individual. Often intermediate acting insulin's are the first line treatment after tablet failure. Protophane / Human Insulin Isophane Suspension (Humulin N) are both available on prescription in New Zealand.

- Penmix Insulin's are a mixture of the short and intermediate acting insulin and come in varying mixes. They are used more in the elderly who live ordered lives but are generally not appropriate for younger more active people.

- Regular acting insulin should be injected 30 minutes before a meal as its action does not peak for two to four hours and its duration is six to eight hours. If used for intramuscular injections or intravenous infusions its action is much faster. Actrapid and Humulin Insulin (Humulin R) are the regular acting insulin's available in New Zealand.

- Fast acting analogue insulin's commence action within 10 – 15 minutes of injection therefore can be taken just before or during a meal. Their half life is only four hours which allows a much more flexible lifestyle and there is less risk of hypoglycaemia. Novorapid and Humalog are fast acting insulin's.

- Insulin Glargine is a recombinant human insulin analogue produced by deoxyribonucleic acid (DNA) technology using a non-pathogenic strain of Escherichia coli. Two modifications of human insulin result in a stable molecule which is soluble in slightly acidic conditions (pH 4.0) and precipitates in the neutral pH of subcutaneous tissue. Because of these properties absorption of insulin glargine is delayed and the analogue provides a constant basal insulin supply without peaks in plasma insulin levels for approximately 24 hours, similar to that achieved by a continuous subcutaneous insulin infusion. It is given as a once-daily subcutaneous injection. Its benefit is that it provides basal control of glycaemia for approximately 24 hours without inducing peaks in plasma insulin levels therefore reduces possibility of hypoglycaemic episodes (McKeage et al 2001).

Levemir is the latest long acting insulin to come onto the market. Research has shown that only 2% is available at any one time as 98% is bound to albumin. There is only 27% variability of action compared to 68% variability with Protophane and it is weight neutral. Levemir is available in pre-filled FlexPens were as Glargine is usually given with a syringe. Pharmac funding is not available.

2: 6.3 Future Directions in Medications

Inhaled human insulin was used in a 12 week multicentre phase II study in the United States to determine whether preprandial inhaled insulin can be used as a substitute for preprandial insulin injections without loss of glycaemic control in insulin-treated type 2 diabetes. Twenty six patients with a mean aged 51 years (range 39 – 64), mean duration of diabetes 11 years (range 0.9 – 35), mean BMI 32 kg/m² (range 23 – 41), usually treated with two or three subcutaneous insulin injections daily, were randomised into two groups: the experimental group received inhaled recombinant insulin immediately before each meal plus Ultratard (a long acting human insulin) (Cefalu et al 2001). Cefalu et al compared the short-acting insulin delivery by shots versus insulin delivered by an experimental inhalation device and found that patient response varied the same amount i.e. insulin dose and action were as consistent and reliable as with the inhaled device. Other researchers found that inhaled insulin hit the blood stream sooner, started working faster, peaked at a higher level and hit its peak sooner. The effect in the same person at different times varied no more than the effects of injected insulin. The inhaled insulin was tolerated well and there was no difference in coughing or lung function test. Patients reported overall satisfaction, ease of use, and social comfort (Roberts 2005). The results demonstrate real progress in insulin therapy but more studies are needed, including real life conditions in which people use the inhaler at work and home.

Merck Sharp and Dohme have a new drug, MK 431 for people who are obese and/or have impaired fast blood glucose. In phase 11 trial there was an increase in insulin secretion and lower glucagon concentrations. Phase 111 is starting in 2005 in 22 counties including in New Zealand where there are studies about to commence at Middlemore and Greenlane Hospitals.

2: 7 Complications Associated with Type 2 Diabetes

The association between hyperglycaemia and microvascular complications (retinopathy, neuropathy, nephropathy) has long been recognised but the precise relationship between type 2 diabetes and/or associated conditions with cardiovascular events is still very much the subject of investigation. The recent INTERHEART case-control study reported a strong relationship between acute myocardial infarction, diabetes, lipids, smoking, hypertension, abdominal obesity and nutritional factors (Yusuf et al 2004). In the Steno-2 trial, a multiple risk factor intervention in patients with type 2 diabetes resulted in a >50% reduction in major cardiovascular outcomes over an eight year period confirming the impact of more intensive management of the disease (Gaede et al 2003). Regrettably, sub optimal adherence to lifestyle measures and medication remains a key impediment to the translation of current progress in knowledge and available means into clinical practice (Grant et al 2005).

The San Antonio Heart Study gave empirical evidence suggesting that complications where due to hyperinsulinemia rather than hyperglycaemia. There was also direct evidence that hyperinsulinemia could contribute to hyperlipidaemia and coronary heart disease thus macrovascular complications start during the prediabetic state (Haffner 2003). Lorder (2003) agreed that complications were often present at time of diagnosis and added that most had evidence of retinopathy, neuropathy and macrovascular disease within ten years of diagnosis.

There is increasing support for the concept that all patients with type 2 diabetes, with or without vascular disease, should be receiving lipid-lowering therapy. The recommendation based on the Heart Protection Study was that patients with diabetes and cardiovascular disease should receive lipid-lowering therapy, regardless of baseline LDL cholesterol, with optimal target of <70 mg/dl (1.8 mmol/l) (Grundy et al 2004).

The United Kingdom Prospective Diabetes Study (1998 b) emphasised the importance of normalising blood glucose levels with the lowest risk of complications being in those with HBA1c values in the normal range (<6.0%) (Stratton et al 2000). The UKPDS (1998 b) report that patients in the intensively treated group (fasting blood glucose below 6 mmol/l, or 4-7 mmol/l premeal in those taking insulin) reduced HbA1c by 11% over 10 years. This was associated with a 25% reduction in the risk of microvascular

endpoints and a 16% reduction in myocardial infarction. Although a difference in HbA1c between the two groups was maintained over the study period, the HbA1c increased progressively, highlighting the progressive nature of the disease.

Dr Sandy Dawson spoke at the New Zealand Dietetic Conference in September 2003 on the growing number of people with diabetes in New Zealand. He reiterated that 115,000 people were known to have diabetes with another 7,000 diagnosed per year. He emphasised that the complications associated with poorly controlled diabetes have a huge burden on health services within New Zealand and estimated that every year 500 people with diabetes require a lower limb amputation, 170 start renal dialysis and join the 570 already on dialysis, and 70 go blind (Dawson 2003).

2: 8 Strategies for Prevention of Type 2 Diabetes

Simmons (1997) recommended a population approach to diabetes prevention. He warns that if 'Left unchanged, an unfavourable environment continues to promote an increase in the number of people with abnormal glucose tolerance by making behavioural changes difficult to achieve and sustain'.

Prevention of obesity would reduce the incidence of type 2 diabetes by 80% (Simmons 1997). Swinburn et al (1999) believes that the 'obesogenicity' of the modern environments is fueling the obesity pandemic. They developed a framework known as ANGELO (Analysis Grid for Environments Linked to Obesity) which is a conceptual model designed to help understand the obesogenicity of environments and is a practical tool for prioritising environmental elements for research and intervention. The Diabetes Project Trust based in South Auckland is providing a Healthy Eating/Lifestyle programme for three schools in South Auckland as well as running 'Train the Trainer' programmes in primary care with the focus being diabetes prevention (Personal contact).

Counties Manukau District Health Board has more than 11,000 people diagnosed with Type 2 diabetes and estimates that there will be 900 people diagnosed this year. The total number with diabetes could triple over the next 20 years. The cost to the health system will be enormous, thus the decision was made to 'beat diabetes' and during 2004 and 2005 Counties Manukau District Health Board has been involved in developing a

diabetes strategic plan for the next five years. Planned actions and interventions were guided by the concept that a 'whole disease, whole family/whanau, whole society' approach was required to beat diabetes. The aim of this process is 'a systematic re-orientation of societal responsibility, community leadership and health sector capabilities towards preventing and managing chronic disease in general, and diabetes in particular' (Stephenson 2004). This concept is in congruence with the concepts expressed in the Ministry of Health (1999 b) ' Primary Prevention of Diabetes' report. 'Lets Beat Diabetes' was launched by the Minister of Health at the Telstra Stadium Manukau on the 25th May 2005.

Type 2 Diabetes is preventable in 80% of people therefore the focus must be increasing public awareness of risk factors, and educating the community about strategies for prevention. The focus needs to be healthy eating and active lifestyles, with a goal of reducing obesity particularly in children. With an ever-increasing number working in this area the author is optimistic that we can make a difference.

Chapter 3

Methods

3: 1 Ethics Application

Approval was first sought from Counties Manukau District Health Board with the researcher informed her manager of the proposed research, presenting the proposal to the manager of the diabetes service Dr Brandon Orr-Walker, and finally to the general manager of Counties Manakau District Health Board, Brad Healey for his approval. (see Appendix 1)

The Massey University ethical approval form (see Appendix 2) was completed and together with copies of the introduction, (see Appendix 3) patient information (see Appendix 4) informed consent forms (see Appendix 5) and the questionnaire (see Appendix 6) was mailed to the Massey ethical approval committee. Minor changes were suggested and once completed, approval was received. The Massey letter of approval is included as Appendix 7.

The third approval required was from the Auckland Ethical Committee with the researcher and her supervisor attending the committee meeting at which the research proposal was considered. Again minor changes to the wording of the information sheets and consent form were required. Once these changes were made, approval was given. It was suggested that the Maori Unit at Counties Manukau District Health Board be informed of the research. A copy of the ethical approval document and letter of approval is included. (see Appendix 8)

3: 2 Sample Selection

The average age at diagnosis for European men is 53.8 years, with a 10% lifetime risk of diabetes, and for European women 54.2 years with a lifetime risk of 8% (NZGG 2003). Therefore the age range of 45–65 years was chosen for this research to cover the

average age of diagnosis and allow a window of opportunity to examine the education process.

The probability method was used with stratified sampling. The stratum was a subset of the population who identified as European, shared the common characteristic of type 2 diabetes and had attended a clinic for dietary and lifestyle advice with the researcher within the previous six months. Random sampling was then used to select subjects.

People diagnosed with type 2 diabetes, who live within the boundaries covered by Counties Manukau District Health Board, receive their basic education from their general practitioner and practice nurses (primary care). If glycaemic and lipid goals are not reached patients are referred to Whitiora diabetes service at Counties Manukau District Health Board for secondary service intervention. The referrals generally come from general practitioners, specialist doctors and nurses at Middlemore Hospital or colleagues working within the diabetes service. Referrals are triaged by senior medical officers within the service. Those requiring dietetic intervention are triaged into group education or individual appointments. Schedulers, who book all appointments for the dietitians clinics, ring the patients who have been triaging as suitable for group education and asked if they are willing to attend the three, once a week, two-hour sessions. Those who agree to attend group sessions are sent information about the sessions held at the Manukau Super Clinic between six and eight pm.

Two weeks after the series of education encounters they are posted letters inviting them to come to the Manakau Super Clinic for individual appointments with the diabetes nurse specialist and dietitian (the researcher) who led the education sessions. This allows individual assessments and personalised education. Those who met the inclusion criteria and attended their follow-up appointments between February to May 2004 were invited to participate in the study. The researcher had no prior knowledge of the patients until they attended either their group or individual appointment.

Patients that were not considered suitable for group intervention or who were unwilling/unable to attend group sessions were allocated individual appointments. The researcher held clinics at the Counties Manukau outpatient facilities at Botany, Manukau and Otara. Clinics were also held in general practitioners surgeries with the researcher holding clinics in Waiuku, Pukekohe, Tuakau, Drury, Papakura and Otara.

At the first appointment a nutritional assessment was undertaken and appropriate educational provided. Follow-up appointments are negotiated frequently within two to three months and it was at this appointment between February and May that the patients, who met the research inclusion criteria, were asked if they willing to participate in the study. Patients willing to participate were given introduction and information sheets, and an informed consent form plus the questionnaire. They were asked to fill out the questionnaire and consent form and leave it with the personal assistant at the front desk thus avoiding bias due to the researcher seeing their responses. If unable to allow the extra time, a stamped addressed envelope was provided.

Further subjects were enlisted from clinics either at Counties Manukau District Health Board clinics or at general practitioners' surgeries who had attended appointments during the previous four months. Clinics bookings were analysed and those who met the selection criteria were phoned and asked if they were willing to participate. Information was sent out and again a stamped addressed envelope was provided. The researcher used the personal information management programmes of Microsoft XP to access the clinic list which provided only demographic details thus the researcher had no prior knowledge of the subjects progress.

Those who had not returned the questionnaires after three weeks had elapsed were phoned as a reminder. It was interesting that equal numbers of female and male agreed to participate.

Exclusion criteria

Patients were excluded who

- did not identify as European
- were outside the age range
- did not have a diagnosis of diabetes
- had type one diabetes.

3: 3 Methodology

3: 3.1 Design and Pretesting of the Questionnaire.

3: 3.1.1 Principles of Design

Questionnaires must be prepared with adequate consideration of the aspects of the questionnaire process separate from the instrument itself. Consideration must be given as to how the responses will be analysed. Questions should be relevant to the majority of the sample, or responders resent the time taken and feel their responses are unimportant if many of the questions are not applicable. This results in annoyance and frustration and causes non-return of questionnaires. It is important to define precisely the information desired and endeavour to write questions that will obtain this. Peripheral questions should be avoided. A preliminary version of the questionnaire should be given to a small but representative sample of potential responders and the group asked to fill out the questionnaire. Respondents should be asked to comment on the relevance of the questions and to critique the layout (Frary 1996).

The delineation of questions to be included in the questionnaire was based on the aims of the research. In preparing the questionnaire the researcher was very aware of research by Cotugna et al (2003) who reported one in five Americans are functionally illiterate and 50% of all adults read at or below the eighth grade level. A national literacy survey in New Zealand reported similar results (Walker et al 1997). Thus the focus was keeping it simple and using direct language. Sentences were kept short, a plain font used and the researcher was aware of the importance of white space.

StatPac Inc in their discussion on questionnaires state that a meta-analysis of studies revealed an aggregate increase in response rate of 7.7% when pre-notification information was sent. Pre-notification letters were thought to establish the legitimacy of the survey thereby contributing to the respondent's trust (www.statpac.com/surveys). The researcher used phone calls to provide information to prospective participants.

Disadvantages of questionnaires

Questionnaires are best used with literate people (Polar et al 1998). Therefore the inclusion of food photographs added bias to the results as the food photographs were

used for subjects with poor literacy skills (One respondent had her husband fill in the questionnaire).

The questionnaire design process proposed by Polar et al (1998) was used to develop the questionnaire, and self-administration of the questionnaire was chosen (after an explanation and discussion with the study participants). This method was chosen, as it would be less susceptible to interview bias and required less time on the part of the researcher. Polar adds that 'the way in which the questions are asked and the answers sought can have a major impact on the value of the information collected'.

3: 3.1.2 Development of the Questionnaire

Most questions chosen were closed response and multi choice, with occasional open ended questions being included in the desire to elicit more detailed information. Carefully designed closed response questions were used to try and avoid biased responses by restricting the range of answers and a choice of 'other' allowed a wider variety of individualised responses. This would assist in encoding of data and allow more powerful statistical methods (Polgar et al 1998). By determining prevalent categories in advance and asking responders to select from among those offered reduced risk of error. Some of the questions included were forced choice.

Use of jargon was avoided, as was bias and leading questions and care was taken to avoid double- barrelled ambiguous questions. Regardless there are always limitations to any method of questioning and structured questioning can result in respondents interpreting or understanding the questions in different ways, and issues relevant to respondents may not be captured (Depoy et al 1998). The questionnaire commenced with factual non-threatening questions followed by those that required personal opinion.

Consent was obtained to access medical records for anthropometric data, demographics, biochemical results and medical data such as medication and complications.

The questions were grouped into coherent categories that resulted in a logical flow. Categories included were:- timing and location of education, preferred education, biochemical results, activity level, alcohol, food groups, level of education, occupation and general background information.

Pre-testing of the Questionnaire

The questionnaire was then pretested by five patients with the following problems becoming evident.

- Patients found the Likert scale more difficult to understand and 'ticked' in the incorrect place.
- Difficulty in relating tick boxes to the question.
- The sheet to be used to record biochemical and anthropometric information obtained from medical records was filled in by subjects even though it was stated on the top of the sheet that it was not to be filled in.
- Coding columns filled in by the patient.

Changes implemented as a consequence of pre-testing were:

- The Likert scale was removed and the decision made to utilize the same scale throughout the questionnaire.
- An alphabetical letter was placed beside the boxes to be ticked.
- The demographic and biochemical results page was removed.
- The coding column headed at the top of each page was headed 'Researcher to complete this column' and highlighted.
- Modifications were made to the questions that were poorly answered thus endeavouring to simplify them and ambiguous questions removed or rewritten.
- The question concerning annul income was removed.
- An employment category of self-employed was added.

A copy of the questionnaire is included in Appendix 6.

3: 4 Data Collection, Analysis and Feedback

The questionnaires were either handed back to a personal care assistant at the time of the subjects appointment or mailed back to the researcher at Counties Manukau district health board. Additional anthropometric and biochemical data was abstracted from the subjects medical records on the Counties Manukau district health board Concerto computer programme as well as Medtech, Houstin and Next Generation programmes at the general practitioners clinics. Where biochemical results were not available the Diagnostic Medical Laboratory Limited were contacted for results.

Fasting venous blood was analysed using Roche/Hitachi modular protocol. The HbA1c, total cholesterol, HDL cholesterol and triglycerides levels were measured by Biorad Variant high performance liquid chromalography (HPLC) assay. Low density lipoprotein cholesterol levels was calculated using the Friedewald equation, except when the triglyceride level exceeds 4.5 mmol/l.

The anthropometric and medical data form is included as Appendix 9.

All data was first coded, if appropriate, then entered onto Excel spreadsheets with checks for outliers and information being double-checked. Auto filter was used to analyse the results. Where the questionnaire allowed multiple choices and a variety of combinations the data was manually analysed by the researcher. Data was analysed with auto filter according to gender, group or individual therapy, level of education, level of exercise and biochemical indices. Excels statistical programme was used to generate p values, standard deviations, means, and medians.

Once data was analysed a summary was prepared and mailed to the study participant who requested a synopsis. The participants also received a copy of their biochemical results at referral and follow-up, with their results being compared to the recommendations for people with diabetes. Where appropriate food intake was also commented upon and recommendations made. A copy of the participants' letter is included as Appendix 10.

Chapter 4

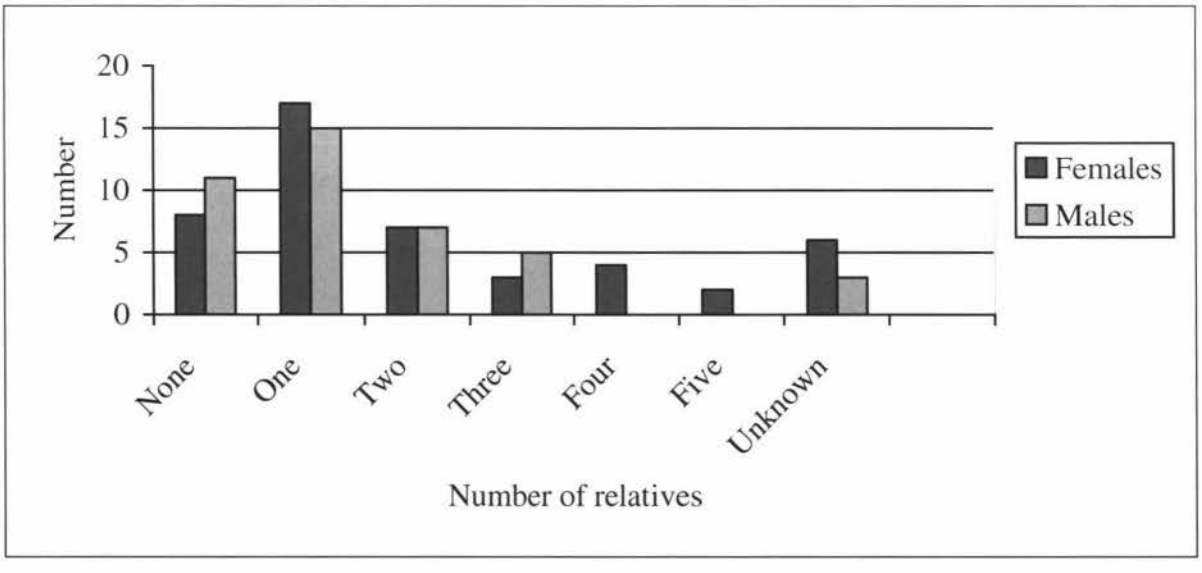
Results

4: 1 Demographics

The research population consisted of equal numbers of females' (50) and males (50). All subjects were of European origin. Table 4: 1 shows level of education, occupation and employment status of subjects. Most had less than three years secondary education, and participated in a wide variety of occupations, the greatest number being service workers. A high percentage of subjects were employed with only a few receiving benefits.

Almost half of all females and males had a first degree relative with diabetes. Figure 4: 1 shows that the majority of subjects had a family history of diabetes with up to five members of the family having been diagnosed.

Figure 4: 1 Number of Relatives with Diabetes
female n = 50 male n = 50



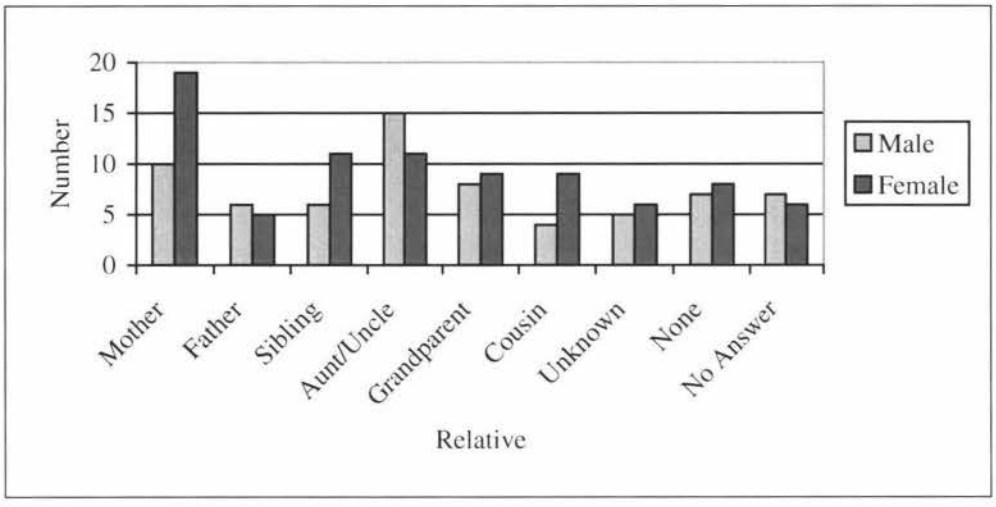
If the numbers of subjects reporting no known relatives with diabetes were combined with the number who 'did not know' if they had a relative, there were still 28% females and 28% males who did not have a known relative with diabetes.

Table 4:1 Demographics of Subjects by Sex and Experimental Group

	Total % n=100	Females Total % n = 50	Male Total % n = 50	Group Total % n = 56	Group Females % n = 27	Group Males % n = 29	Individual Total % n = 44	Individual Females % n = 23	Individual Males % n = 21
Highest level of education									
3 years or less secondary education	34	24 (48%)	10 (20%)	30.4%	11 (40.7%)	6 (20.7%)	38.6%	13 (56.5%)	4 (19%)
>3 years secondary education	23	13 (26%)	10 (20%)	23.2%	8 (29.6%)	5 (17.2%)	22.7%	5 (21.7%)	5 (23.8%)
Technical or trade certificate	23	4 (8%)	19 (38%)	25.0%	2 (7.4%)	12 (41.4%)	20.5%	2 (8.7%)	7 (33.3%)
Degree or higher qualification	17	6 (2%)	11 (22%)	17.9%	4 (4.8%)	6 (20.7%)	15.9%	2 (8.7%)	5 (23.8%)
No answer	3	3 (6%)	-	3.6%	2 (7.4%)	-	2.3%	1 (4.3%)	-
Occupation									
Legislators, senior officials, managers	3	-	3 (6%)	3.6%	-	2 (6.9%)	2.3%	-	1 (4.8%)
Professionals	16	3 (6%)	13 (26%)	19.6%	3 (11.1%)	8 (27.6%)	11.4%	-	5 (23.8%)
Technicians, associate professionals	11	7 (4%)	4 (8%)	10.7%	4 (14.8%)	2 (6.9%)	13.6%	3 (13%)	3 (14.3%)
Clerks	12	6 (2%)	6 (2%)	14.3%	5 (18.5%)	3 (10.3%)	6.8%	1 (4.3%)	2 (9.5%)
Service workers, shop/market workers	17	13 (26%)	4 (8%)	16.1%	6 (22.2%)	3 (10.3%)	18.2%	7 (30.4%)	1 (4.8%)
Skilled agricultural/fishery workers	1	-	1 (2%)	1.8%	-	1 (3.4%)	-	-	-
Craft and related trade workers	9	1 (2%)	8 (6%)	7.1%	-	4 (13.8%)	11.4%	1 (4.3%)	4 (19%)
Plant/machine operators/ assemblers	8	4 (8%)	4 (8%)	5.4%	1 (3.7%)	2 (6.9%)	11.4%	3 (13%)	2 (9.5%)
Elementary occupations	13	8 (6%)	5 (10%)	14.3%	5 (8.5%)	3 (10.3%)	11.4%	3 (13%)	2 (9.5%)
No answer	10	8 (6%)	2 (4%)	7.1%	3 (1.1%)	1 (3.4%)	13.6%	5 (21.7%)	1 (4.8%)
Employment status									
Employed full time	51	13 (26%)	38 (76%)	53.5%	7 (33.3%)	21 (72.4%)	47.7%	4 (17.4%)	17 (80.9%)
Employed part time	14	11 (22%)	3 (6%)	10.7%	6 (22.2%)	-	18.2%	5 (21.7%)	3 (14.3%)
Unemployed	2	2 (4%)	-	1.8%	1 (3.7%)	-	2.3%	1 (4.3%)	-
Full time homemaker	9	9 (8%)	-	5.4%	3 (1.1%)	-	13.6%	6 (26.1%)	-
Retired	12	6 (2%)	6 (2%)	12.5%	2 (7.4%)	5 (17.2%)	11.4%	4 (17.4%)	1 (4.8%)
Beneficiary	10	7 (4%)	3 (6%)	14.3%	5 (8.5%)	3 (10.3%)	4.5%	2 (8.7%)	-
Student	1	1 (2%)	-	0.0%	-	-	2.3%	1 (4.3%)	-
Did not answer	1	1 (2%)	-	1.8%	1 (3.7%)	-	-	-	-

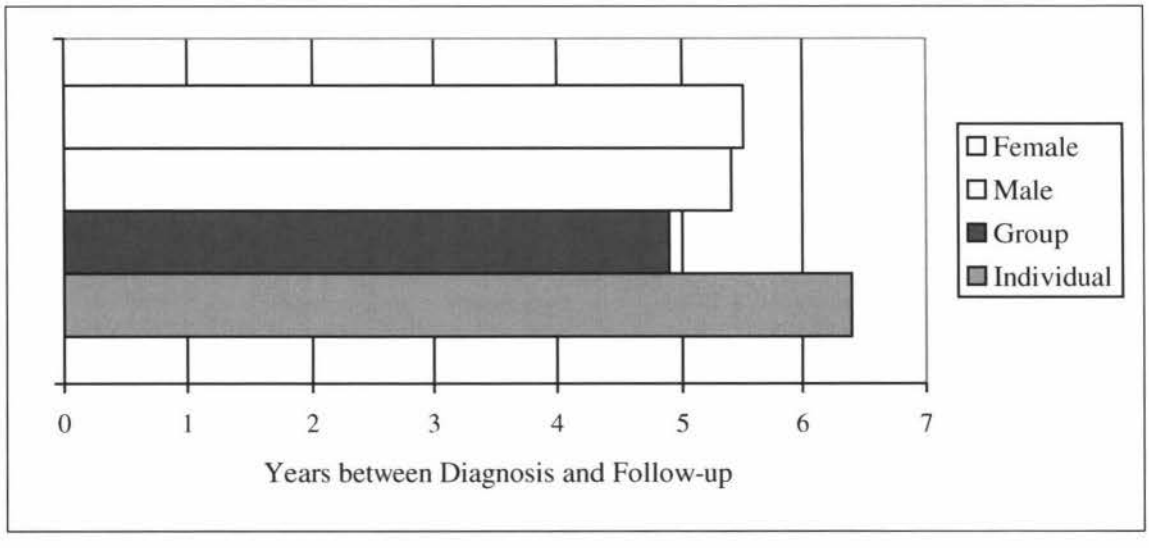
Figure 4:2 shows that women diagnosed with diabetes pass on a greater risk of developing diabetes to their off-spring than do men which is a significant difference (p= 0.015). Fifty seven percent of subjects reported having a first degree relative with diabetes.

Figure 4: 2 Relatives Diagnosed with Diabetes
females n = 50 males n = 50



Patient triaged to group style education generally had been diagnosed for a shorter time as the majority had been referred directly from Primary Care. Those seen individually had often been seen by the diabetes nurse specialist prior to being seen by the dietitian and have been diagnosed for a longer period of time as seen in Figure 4: 3.

Figure 4: 3 Years between Initial Diagnosis and Appointment with the Researcher
female n = 50 male n = 50, group n = 56 individual n = 44



4: 2 Anthropometrics

Figure 4: 4 shows the age range between 45 and 65years. The mean age for both females and males was 56.1 years. Those attending group education had a mean age of 56.3 years compared to those individually education who had a mean age of 56.0.

Figure 4: 4 Age of Subjects
female n = 50 male n = 50

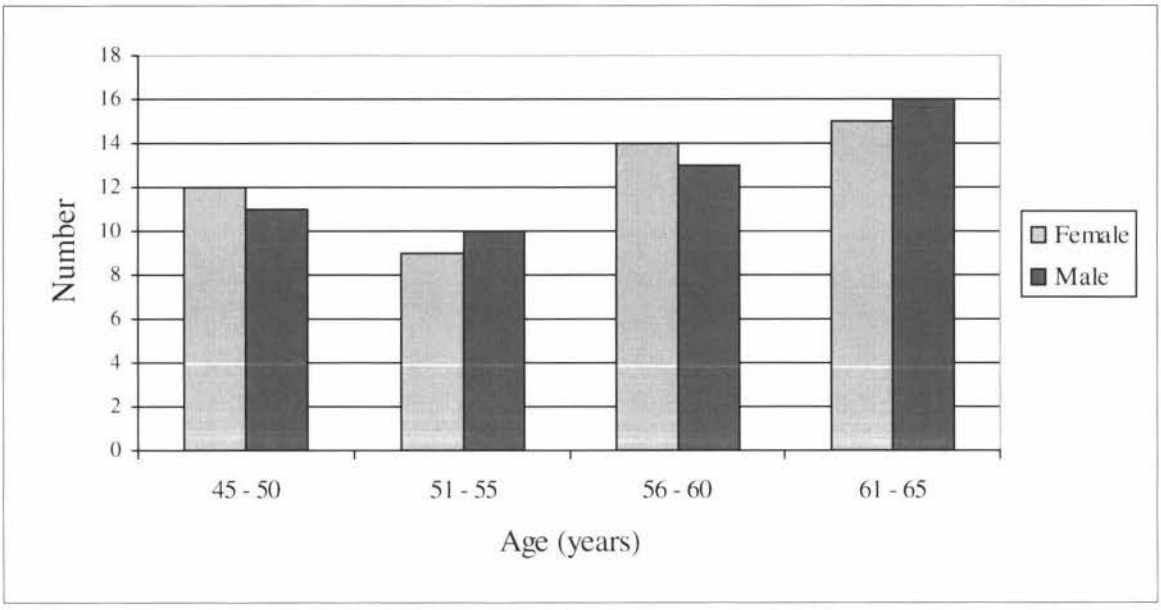
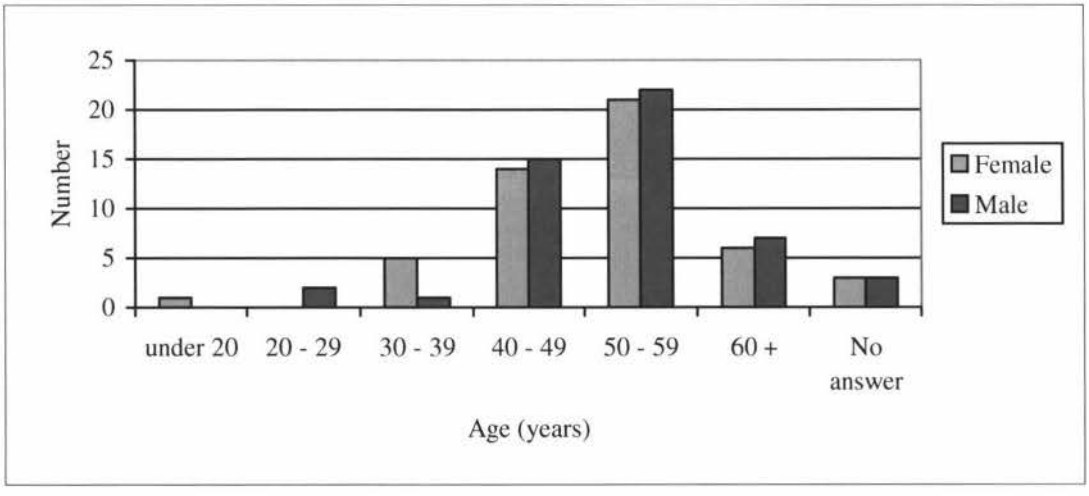


Table 4: 5 shows the age at which diabetes was diagnosed in the subjects. Most were diagnosed while in their 40s or 50s with only twelve females and eight males not within this age group.

Figure 4: 5 Age at Diagnosis of Diabetes
female n = 50 male n = 50



When subjects were referred to the diabetes service 4% of females were overweight and 60% obese, and 16% of males were overweight and 48% obese. This had changed at follow-up to 14% females overweight and 33 % obese, and 28% males overweight and 24% obese. There were 32% of females and 32 % males for whom there was no weight recorded at referral but at follow-up this number had dropped to 14% females and 20% of males but this was not statistically significant. Over all subjects there was a significant weight loss ($p = < 0.001$). Weight and BMI of subjects has been summarised in Table 4: 2. There was also a significant drop in BMI from referral to follow-up ($p= < 0.001$).

Table 4: 2 Weight and Body Mass Index of Subjects at Referral and Follow-Up

	Mean (SD)	Median	Lower Quartile	Upper Quartile	Minimum	Maximum
BMI females referral n = 50	37.9 (7.1)	37.3	33.3	41.0	20.9	51.9
BMI females follow-up n = 50	35.0 (6.9)	35.0	31.0	39.5	20.0	49.0
BMI males referral n = 50	34.0 (5.5)	32.8	30.2	35.7	22.6	62.0
BMI males follow-up n = 50	31.8 (4.8)	32.0	30.0	34.0	23.0	45.0
BMI group referral n = 56	37.5 (6.3)	35.8	32.9	40.6	25.7	62.0
BMI group follow-up n = 56	34.7 (5.7)	34.0	31.0	39.0	25.7	49.0
BMI individuals referral n = 44	31.9 (6.3)	32.0	27.8	36.1	20.9	42.6
BMI individuals follow-up n = 44	31.0 (6.5)	32.0	28.0	36.0	20.0	46.0
Weight females referral n = 50	99.7 (19.7)	98.0	90.6	112.0	58.0	150.0
Weight females follow-up n = 50	94.7 (20.6)	92.2	78.9	114.3	48.0	133.0
Weight males referral n = 50	104.6 (19.5)	100.7	92.2	117.8	72.0	158.0
Weight males follow-up n = 50	99.8 (16.0)	98.0	89.1	107.0	75.9	138.0
Weight group referral n = 56	101.4 (18.7)	100.0	93.7	113.8	74.0	158.0
Weight group follow-up n = 56	98.1 (18.0)	92.7	85.4	110.8	65.3	138.0
Weight individual referral n = 44	97.2 (20.7)	98.0	82.3	109.0	58.0	143.0
Weight individual follow-up n = 44	96.0 (19.5)	96.5	80.8	108.8	48.0	131.0

Table 4: 3 show the BMI of subjects who were happy with their weight at follow-up.

Table 4: 3 Subjects in each BMI Category Happy with their Weight at Follow Up.

	BMI 20 - 24	BMI 25 - 30	BMI >30	No weight recorded
Females n = 9	2	4	3	-
Males n = 15	2	4	5	4

Twenty-four subjects reported being happy with their weight. Although this does not take into account muscle mass it would be safe to estimate that the eight with a BMI of >30 kg/m² would be considered obese and at greater risk of developing diabetes. A male with a BMI of 24 kg/m² wanted to increase his weight.

4: 3 Biochemical Results

4: 3.1 Glycosylated Haemoglobin A1c (HbA1c)

Changes in HbA1c from referral to follow-up are summarised in Table 4: 4.

Table 4: 4 HbA1c in Subjects at Referral and Follow-Up
n = 100

HbA1c %	5 – 6.9 %	7 – 7.9 %	8 – 10 %	>10 %
Referral	26	23	27	13
Follow up	55	24	11	2

There was a significant drop in HbA1c from referral to follow-up (p= < 0.001 for males, p = < 0.001 for females). Table 4: 5 shows the HbA1c and BMI at follow-up and show subjects with a BMI of greater than 40 kg/m² can still have well controlled diabetes.

Table 4: 5 Comparison of HbA1c Percentage with BMI at Follow-Up
n = 100

BMI	HbA1c <7.0 %	HbA1c 7 – 7.9%	HbA1c 8 – 10%	HbA1c >10%
<25	1	3	1	-
25 – 30	11	5	2	1
31 – 40	28	9	6	-
>40	5	3	2	1

Table 4: 6 shows the comparison of subjects self reported level of education with their glycaemic control.

Table 4: 6 Comparison of Level of Education and HbA1c

HbA1c		<7.0%	7.0 – 7.9%	8 – 10%	> 10%
3 yrs or less of secondary education	n = 34	21 (62%)	8 (23%)	5 (15%)	-
>3 yrs secondary education	n = 23	7 (30%)	8 (35%)	3 (13%)	-
Technical or trade certificate	n = 23	12 (52%)	6 (26%)	3 (13%)	1 (4%)
Degree	n = 17	10 (59%)	4 (24%)	-	1 (6%)

4: 3.2 Lipids

Total Cholesterol

Males had the biggest drop in total cholesterol as seen in Table 4: 7. Both individual and group therapy subjects' mean total cholesterol dropped by 1.1mmol/l at follow-up as seen in Table 4: 8. This was highly significant drop with $p = < 0.001$. Both tables provide information on the median, quartiles, minimum and maximum levels and compare female with male and group with individual therapy.

High Density Lipoprotein (HDL)

Table 4: 7 shows that the mean for females was higher at both referral and follow-up than males but the difference did not reach statistical significance. The mean for both group and individual therapy was the same at referral but dropped at follow-up for group subjects only as seen in Table 4: 8. Both tables also provide information on the median, quartiles plus minimum and maximum levels and compare female with male and group therapy with individual.

Low Density Lipoprotein (LDL)

Females had higher LDL levels at referral and follow-up than males as seen in Table 4: 7. At referral LDL for group therapy subjects was lower than individual but the difference did not reach statistical significance. However the LDL was the same at follow-up as seen in Table 4: 8. Over all there was a statistically significant drop in LDL ($p= < 0.001$) and for males ($p= < 0.003$) and for females ($p= < 0.001$).

Table 4: 7 Biochemical Results of Subjects by Sex at Referral and Follow-Up

female n = 50 male n = 50

	Mean (SD) Females	Mean (SD) Males	Median Females	Median Males	Lower Quartile Females	Lower Quartile Males	Upper Quartile Females	Upper Quartile Males	Minimum Females	Minimum Males	Maximum Females	Maximum Males
HbA1c % referral	7.9 (1.5)	8.2 (1.9)	7.8	8.0	6.8	6.8	8.9	9.1	5.6	5.6	11.7	14
HbA1c % follow-up	7.0 (1.1)	6.8 (1.2)	6.9	6.8	6.2	6.1	7.8	7.4	5.4	5.2	9.3	10.3
Total cholesterol mmol/l referral	5.9 (1.1)	5.8 (2.0)	6.0	5.7	5.0	5.0	6.5	6.3	4	3.1	8.8	16.8
Total cholesterol mmol/l follow -up	4.9 (0.9)	4.6 (1.0)	4.9	4.5	4.1	4.1	5.4	5	3.7	3	7.4	8.3
HDL mmol/l referral	1.3 (0.3)	1.2 (0.3)	1.3	1.2	1.8	1.0	1.5	1.4	0.8	0.8	2.2	2.1
HDL mmol/l follow-up	1.3 (0.3)	1.2 (0.3)	1.2	1.2	1.1	1.1	1.4	1.3	0.8	0.8	1.9	2.5
LDL mmol/l referral	3.6 (1.0)	3.2 (0.9)	3.6	3.2	2.8	2.5	4.3	3.9	2.1	1.7	5.7	5
LDL mmol/l follow-up	2.8 (0.8)	2.6 (0.8)	2.6	2.6	2.2	2.1	3.4	3.0	1.7	0.9	4.7	5.7
Triglyceride mmol/l referral	2.2 (1.2)	3.7 (1.6)	1.8	2.4	1.4	1.3	2.9	3.8	0.6	0.6	6	5
Triglyceride mmol/l Follow-up	1.9 (1.0)	1.7 (0.8)	1.7	1.5	1.2	1.1	2.3	2.8	0.6	0.7	5.3	4.3

SD = standard devation

Table 4: 8 Biochemical Results by Therapy Group in Subjects at Referral and Follow-Up

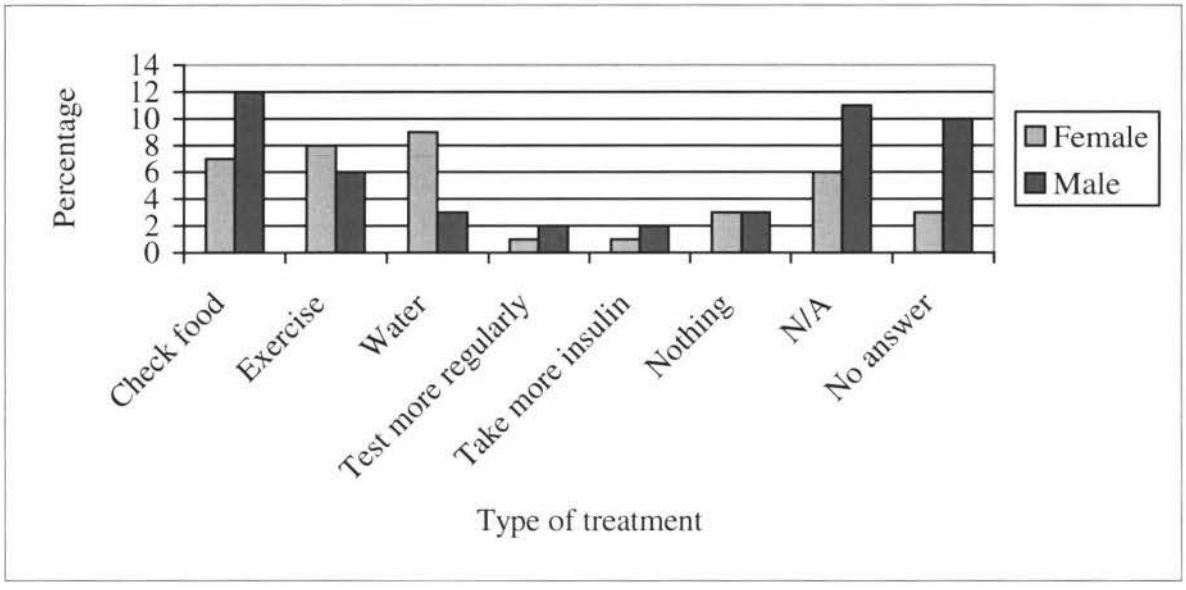
group n = 56 individual n = 44

	Mean (SD) Group	Mean (SD) Individuals	Median Group	Median Individual	Lower Quartile Group	Lower Quartile Individual	Upper Quartile Group	Upper Quartile Individual	Minimum Group	Minimum Individual	Maximum Group	Maximum Individual
HbA1c % referral	7.9 (1.7)	8.3 (1.7)	7.8	8.2	6.5	7.0	8.6	9.3	5.6	5.7	14	12.9
HbA1c % follow-up	6.7 (1.1)	7.2 (1.1)	6.6	7.1	6.0	6.5	7.3	7.7	5.2	5.5	10.3	10.2
Total cholesterol mmol/l referral	5.9 (1.9)	5.8 (1.0)	5.5	5.8	4.9	5.1	6.4	6.5	3.1	4.0	16.8	8.8
Total cholesterol mmol/l follow-up	4.8 (1.0)	4.7 (0.9)	4.7	4.5	4.2	4.1	5.3	5.1	3.0	3.6	7.4	8.3
HDL mmol/l referral	1.3 (0.3)	1.3 (0.3)	1.2	1.3	1.1	1.1	1.4	1.5	0.8	0.8	2.2	2.1
HDL mmol/l Follow-up	1.2 (0.3)	1.3 (0.2)	1.2	1.2	1.0	1.2	1.4	1.5	0.8	0.8	2.5	1.9
LDL mmol/l referral	3.4 (1.0)	3.5 (0.8)	3.4	3.5	2.6	3.0	4.0	3.9	1.7	2.2	5.7	5.4
LDL mmol/l Follow-up	2.7 (0.8)	2.7 (0.9)	2.8	2.4	2.2	2.1	3.3	2.9	0.9	1.3	4.7	5.7
Triglyceride mmol/l referral	3.6 (7.1)	2.3 (1.2)	2.0	1.8	1.4	1.3	3.6	3.0	0.5	0.7	5.0	6.2
Triglyceride mmol/l follow-up	1.9 (1.0)	1.6 (0.7)	1.7	1.5	1.3	1.0	2.6	2.3	0.6	0.6	5.3	2.9

Hyperglycaemia

Participants had a variety of ways of reacting to hyperglycaemia with the most popular being to check the food they had just eaten, followed by doing some exercise as seen in Figure 4: 11.

Figure 4: 1.1 Hyperglycaemia Treatments Chosen
females n =50 males n = 50



4: 5 Education

Very few subjects were told of their diagnosis of diabetes while in hospital as seen in Table 4: 10. Table 4: 10 also reports that initial education came from a variety of sources with by far the greatest number being educated by their general practitioner. When asked if this information met their needs only just over half were happy with the education they received. The preferred educator varied but generally the community diabetes nurse specialist and community diabetes dietitian were the preferred educator as seen in Table 4: 10.

Most felt education should be as soon as diagnosis was made and would like ongoing education with the largest number of the research participants preferring every three months although some preferred annual education as seen in Table 4: 11. Subjects generally preferred community clinics although about a third preferred clinics held in their general practitioners rooms as seen in Table 4: 11. Nearly half of the subjects preferred appointments during the daytime, although quite a number chose early evening as seen in Table 4: 11

Figure 4: 7 Number of Home Blood Glucose Tests per Day
females n = 50 males n = 50

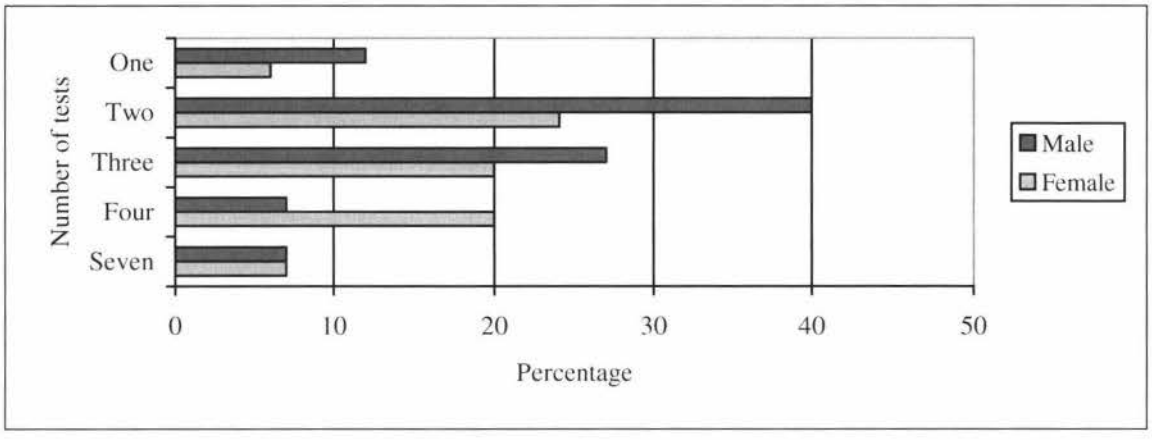
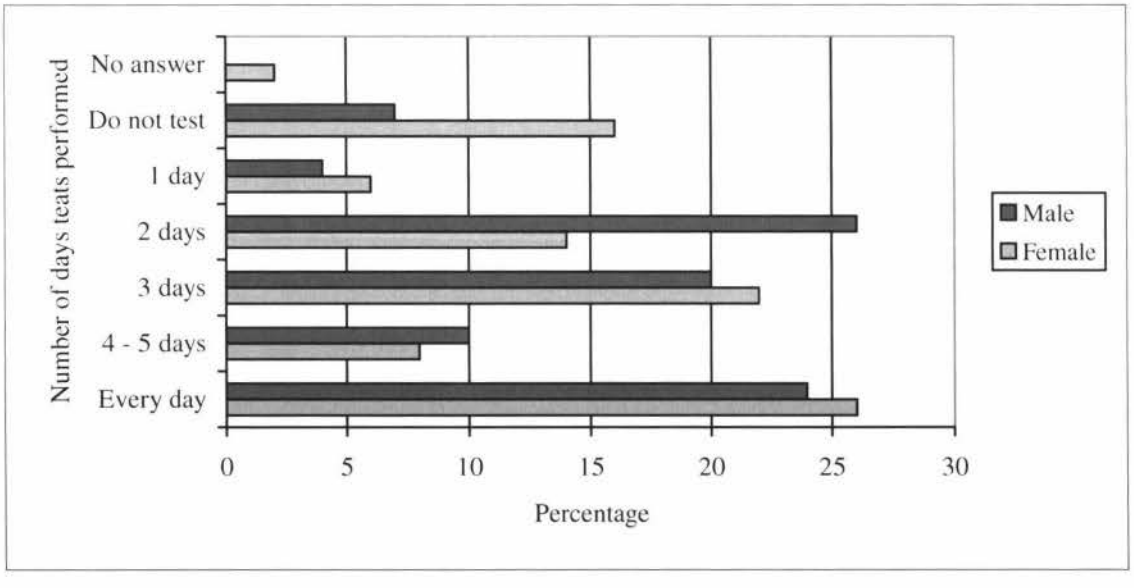


Figure 4: 8 shows that the number of days subjects' reported monitoring their blood glucose levels varied considerably.

Figure 4: 8 Number of Days per Week Home Blood Glucose Testing Performed
females n = 50 males n = 50



Timing of tests also varied greatly:

- 77% (37 females and 40 males) tested before breakfast
- 17% (8 females and 9 males) tested 2 hours after breakfast,
- 22 % (13 females and 9 males) tested before lunch,
- 10% (3 females and 7 males) tested 2 hours after lunch,
- 43 % (16 females and 27males) tested before dinner,

- 40% (22 females and 18 males) tested two hours after dinner
- 24% (14 females and 10 males) tested before bed.

The relationship between HbA1c and the number of blood tests is seen in Table 4: 9. Regular testing was shown to be no indicator of good control.

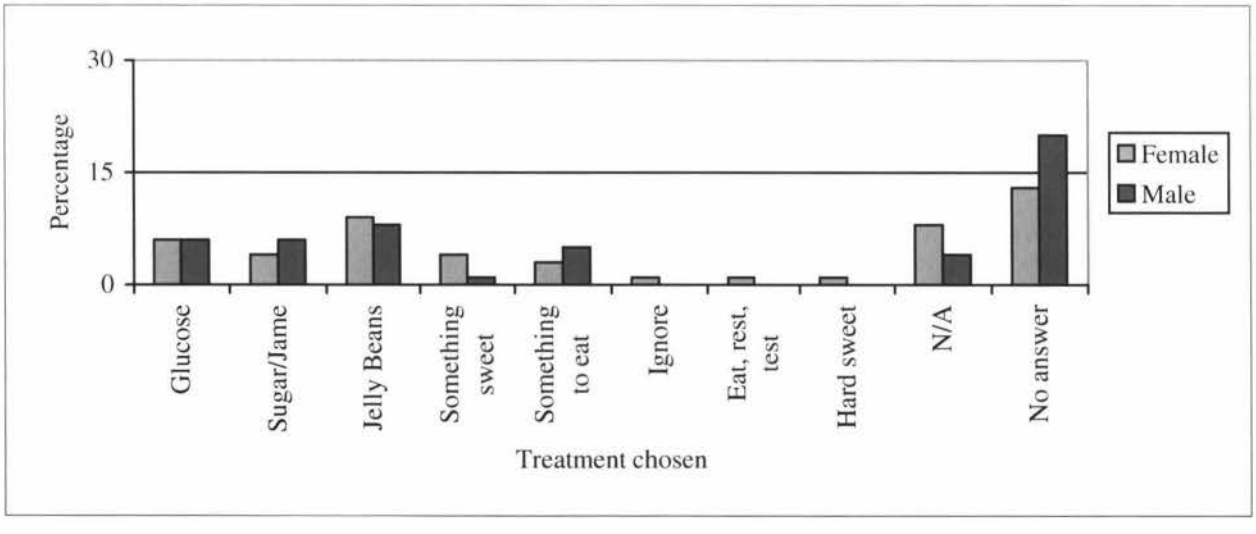
Table 4: 9 % HbA1c in Relationship to Number of Days Testing
n = 100

HbA1c	<7%	7 – 8%	8 - 9%	>10%
Every day	11	8	-	-
4-5 per week	5	2	1	1
3 x week	12	6	2	-
2 x week	13	4	2	-
1 x week	4	-	-	1
Occasionally	3	-	3	-
Did not test	6	4	-	-

4: 4.2 Hypoglycaemia

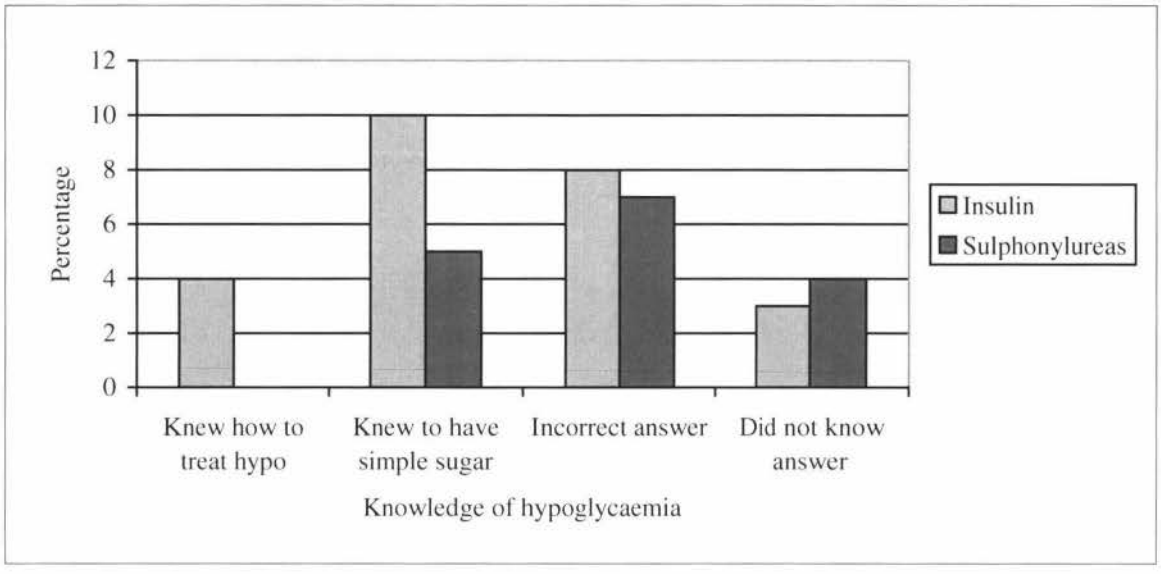
Treatments used by the subjects to treat hypoglycaemia varied greatly with the most popular being quickly absorbed simple sugars such as jellybeans and glucose as seen in Figure 4: 9.

Figure 4: 9 Hypoglycaemia Treatments
females n = 50 males n = 50



Research participants were divided into groups depending on their treatment modality thus the likely-hood of becoming hypoglycaemic. Figure 4: 10 shows that participants taking insulin were more likely to know the correct treatment.

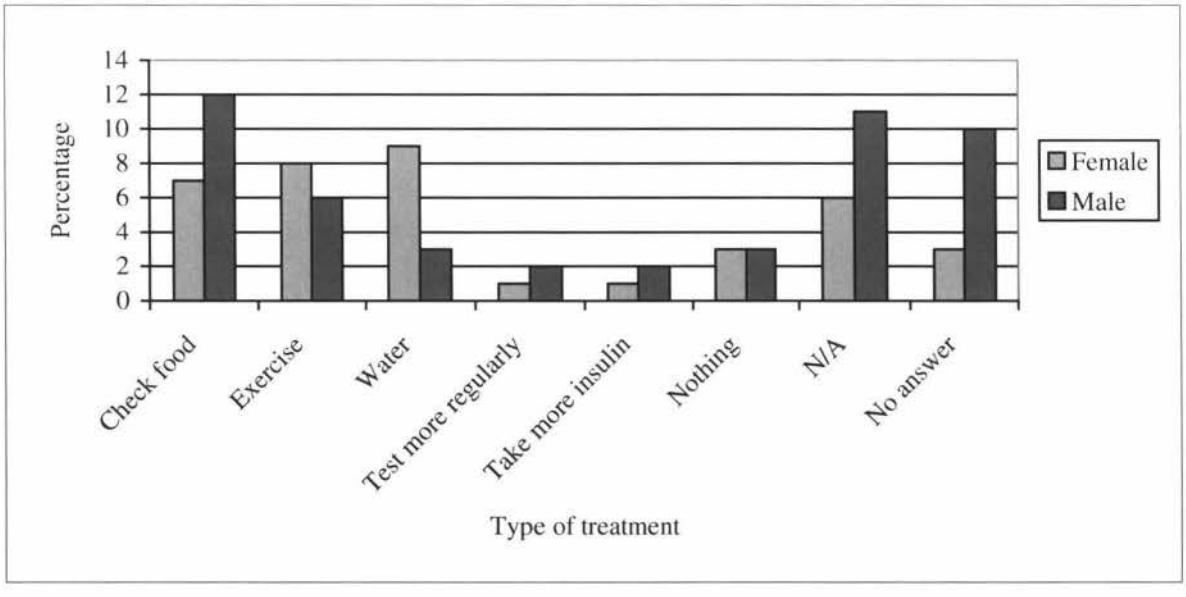
Figure 4: 10 Level of Knowledge of Hypoglycaemia Treatment: Comparing Differing Drug Treatment Modalities
females n = 50 males n = 50



4: 4.3 Hyperglycaemia

Participants had a variety of ways of reacting to hyperglycaemia with the most popular being to check the food they had just eaten, followed by doing some exercise as seen in Figure 4: 11.

Figure 4: 11 Hyperglycaemia Treatments Chosen
females n =50 males n = 50



4: 5 Education

Very few subjects were told of their diagnosis of diabetes while in hospital as seen in Table 4: 10. Table 4: 10 also reports that initial education came from a variety of sources with by far the greatest number being educated by their general practitioner. When asked if this information met their needs only just over half were happy with the education they received. The preferred educator varied but generally the community diabetes nurse specialist and community diabetes dietitian were the preferred educator as seen in Table 4: 10.

Most felt education should be as soon as diagnosis was made and would like ongoing education with the largest number of the research participants preferring every three months although some preferred it annually as seen in Table 4: 11. Subjects generally preferred community clinics although about a third preferred clinics held in their general practitioners rooms as seen in Table 4: 11. Nearly half of the subjects preferred appointments during the daytime, although quite a number chose early evening as seen in Table 4: 11.

Of the 56% of subjects who attended group education most preferred this form of education with an individual appointment later to personalise the education process as seen in Table 4: 12.

Type of Education

All subjects have an individual appointment. The group therapy subjects have three group sessions followed by an individual appointment but the individual therapy group receive all their initial education individually. When asked how the they would like to receive their education the majority felt that one to one oral discussions were helpful as seen in Table 4: 13.

Table 4: 14 shows that when the subjects were asked their preferred medium for receiving education the majority replied that it was the written form as pamphlets and the least popular were compact disks, the internet and food photographs. However all forms of education material were considered helpful by some of the subjects as seen in Table 4: 14.

Table 4: 10 Diagnosis and Education

	Total % n=100	Females Total % n = 50	Male Total % n = 50	Group Total % n = 56	Group Females % n = 27	Group Males % n = 29	Individual Total % n = 44	Individual Females % n = 23	Individual Males % n = 21
Diagnosis in hospital									
Yes	8	3 (6%)	5 (10%)	5.4%	1 (3.7%)	2 (6.9%)	11.4%	2 (8.7%)	3 (14.4%)
No	92	47 (97%)	40 (80%)	85.7%	26 (96.3%)	22 (75.9%)	89%	21 (91.3%)	18 (85.7%)
Who provided the initial education									
Doctor	64	28 (56%	36 (72%)	67.9%	17 (63%)	21 (72.4%)	59.1%	11 (47.8%)	15 (71.4%)
Nurse	9	6 (12%)	3 (6%)	3.6%	1 (3.7%)	1 (3.4%)	13.6%	5 (21.7%)	1 (4.8%)
Specialist diabetes nurse	9	6 (12%)	3 (6%)	3.6%	1 (3.7%)	1 (3.4%)	15.9%	5 (21.7%)	2 (9.5%)
Dietitian	2	1 (2%)	1 (2%)	3.6%	1 (3.7%)	1 (3.4%)	-	-	-
Doctor and nurse	5	4 (8%)	1 (2%)	8.9%	4 (14.8%)	1 (3.4%)	-	-	-
Specialist diabetes nurse / dietitian	3	-	3 (6%)	1.8%	-	1 (3.4%)	4.5%	-	2 (9.5%)
Doctor / specialist diabetes nurse	3	3 (6%)	-	1.8%	1 (3.7%)	-	4.5%	2 (8.7%)	-
Others	4	1 (2%)	3 (6%)	5.4%	1 (3.7%)	2 (6.9%)	2.3%	1 (4.3%)	-
Don't know	1	1 (2%)	-	1.8%	1 (3.7%)	-	4.5%	1 (4.3%)	1 (4.8%)
Did the information meet your needs									
Yes	55	30 (60%)	25 (50%)	51.8%	16 (59.3%)	13 (44.8%)	59.1%	14 (60.9%)	12 (57.1%)
No	43	18 (36%)	25 (50%)	48.2%	11 (40.7%)	16 (55.2%)	38.6%	8 (34.8%)	9 (42.9%)
Did not answer	2	-	-	-	-	-	-	-	-
On-going education preferred from									
Family doctor	7	4 (8%)	3 (6%)	5.4%	2 (7.4%)	1 (3.4%)	9.1%	2 (8.7%)	2 (9.5%)
Practice nurse	8	5 (19%)	3 (6%)	8.9%	4 (14.8%)	1 (3.4%)	6.8%	1 (4.3%)	2 (9.5%)
Community diabetes nurse specialist	57	27 (54%)	30 (60%)	60.7%	16 (59.3%)	18 (62.1%)	52.3%	11 (47.8%)	12 (57.1%)
Community diabetes dietitian	56	28 (56%)	28 (56%)	55.4%	17 (63%)	14 (48.3%)	56.8%	11 (47.8%)	14 (66.7%)
Private dietitian	2	2 (2%)	-	1.8%	1 (3.7%)	-	2.3%	1 (4.3%)	-
Support group	7	4 (8%)	3 (6%)	10.7%	4 (14.8%)	2 (6.9%)	2.3%	-	1 (4.8%)
Group education	3	1 (2%)	2 (4%)	1.8%	-	1 (3.4%)	4.5%	1 (4.3%)	1 (4.8%)
All of the above	1	1 (2%)	-	1.8%	1 (3.7%)	-	-	-	-
Did not answer	9	6 (12%)	3 (6%)	5.4%	3 (11.1%)	-	11.4%	3 (13%)	3 (14.3%)

Table 4: 11 Education

	Total % n=100	Females Total % n = 50	Male Total % n = 50	Group Total % n = 56	Group Females % n = 27	Group Males % n = 29	Individual Total % n = 44	Individual Females % n = 23	Individual Males % n = 21
Best time for education									
As soon as diagnosed	72	36 (72%)	36 (72%)	71.4%	20 (74.1%)	20 (69%)	72.7%	16 (69.6%)	16 (76.2%)
A week later	15	6 (12%)	9 (18%)	16.1%	3 (11.1%)	6 (20.7%)	13.6%	3 (13%)	3 (14.3%)
A month later	9	5 (10%)	4 (8%)	10.7%	3 (11.1%)	3 (10.3%)	6.8%	2 (8.7%)	1 (4.8%)
Did not answer	3	2 (2%)	1 (2%)	-	-	-	6.80%	2 (8.7%)	1 (4.8%)
Would you like regular education									
Yes	87	48 (96%)	39 (78%)	89.3%	27 (100%)	23 (79.3%)	84.1%	21 (91.3%)	16 (76.2%)
No	10	2 (4%)	8 (16%)	8.9%		5 (17.2%)	11.4%	2 (8.7%)	3 (14.3%)
Frequency of sessions									
Once a month	14	11 (22%)	3 (6%)	16.1%	7 (25.9%)	2 (6.9%)	11.4%	4 (17.4%)	1 (4.8%)
Every 3 months	39	21 (42%)	18 (36%)	32.1%	9 (33.3%)	9 (31%)	47.7%	12 (52.2%)	9 (42.9)
Annually	28	12 (24%)	16 (32%)	32.1%	9 (33.3%)	9 (31%)	22.7%	3 (13%)	7 (33.3%)
When requested	7	2 (2%)	5 (10%)	8.9%	2 (7.4%)	3 (10.3%)	4.5%	-	2 (9.5%)
Did not answer	9	3 (6%)	6 (12%)	7.1%	-	4 (13.8%)	11.4%	3 (13%)	2 (9.5%)
Time of day preferred									
Day time	47	25 (50%)	22 (44%)	33.9%	11 (40.7%)	8 (27.6%)	61.4%	14 (60.9%)	13 (61.9%)
Early evening	28	10 (20%)	18 (36%)	41.1%	8 (29.6%)	15 (51.7%)	11.4%	2 (8.7%)	3 (14.3%)
Don't mind	16	8 (16%)	8 (16%)	16.1%	5 (18.5%)	4 (13.8%)	15.9%	3 (13%)	4 (19%)
Other suggestions	2	2 (4%)	-	1.8%	1 (3.7%)	-	2.3%	1 (4.3%)	-
Did not answer	7	5 (10%)	2 (4%)	-	2 (7.4%)	1 (3.4%)	9.1%	3 (13%)	1 (4.8%)
Where would you prefer education to be held									
Family doctors rooms	36	20 (40%)	16 (32%)	19.6%	8 (29.6%)	3 (10.3%)	56.8%	13 (56.5%)	12 (57.1%)
Community clinics	60	28 (56%)	32 (64%)	78.6%	19 (70.4%)	25 (86.2%	36.4%	8 (34.8%)	8 (38.1%)
Did not answer	4	2 (4%)	2 (4%)	1.8%	-	1 (3.4%)	6.8%	2 (8.7%)	1 (4.8%)

Table 4: 12 Type of Education Preferred

Have you attended group education	Total % n = 100	Females n = 50	Males n = 50
Yes	56	27 (54%)	29 (58%)
No	44	23 (46%)	21 (42%)

If yes would you prefer education	Number	Females n = 27	Males n = 29
On your own	9	2 (7.4%)	7 (24%)
In a group	15	9 (33.3%)	6 (20.7)
Group followed by individual	27	15 (55.5%)	12 (41.3%)
Did not answer	5	1 (3.7%)	4 (13.7%)

Table 4: 13 Value of Individual Appointments for Initial Education

	Number	Very Helpful	Helpful	Some Use	Don't Know
Total %	100	72	18	2	1
Group total %	56	40	9	-	1
Group % females	27	21	3	-	-
Group % males	29	19	6	-	1
Individuals total %	44	32	9	2	-
Individual % females	23	16	5	2	-
Individual % males	21	16	4	-	-

Other ways to receive information suggested by subjects were magazines, meeting others with the condition, newsletters from people coping with diabetes, phone calls twice a week to reinforce and encourage until appropriate blood glucose control was obtained, and regular email (or mail) update of any new information.

When the self reported level of formal education was compared with the preferred medium for education some interesting patterns emerged. Table 4: 15 reveals that subjects with degrees found all methods of education helpful other than food photos. Those with a technical of trade certificate preferred written pamphlets, books and videos and those with >3 -5 years secondary education added television to their list of preferred mediums. Subjects with < 3 years or less of secondary education limited their preferred mediums to written pamphlets and books. Pamphlets were very popular with all groups.

Table 4: 14 Diabetes Education Material

	Written Pamphlet	Books	Video	Food Photo's	Internet	CD
VERY HELPFUL						
Total % n=100	**43%**	**22%**	**20%**	**16%**	**16%**	**15%**
Group total % n = 56	**26 (46.4%)**	**13 (23.2%)**	**15 (26.8%)**	**11 (19.6%)**	**10 (17.9%)**	**12 (21.4%)**
Group % female n = 27	13 (44.8%)	9 (31%)	9 (31%)	7 (24.1%)	5 (17.2%)	4 (13.8%)
Group % males n = 29	13 (48.1%)	4 (14.8%)	6 (22.2%)	4 (14.8%)	5 (18.5%)	8 (29.6%)
Individual total % n=44	**17 (38.6%)**	**9 (20.5%)**	**5 (11.4%)**	**5 (11.4%)**	**6 (13.6%)**	**3 (6.8%)**
Individual % females n = 23	10 (43.5%)	2 (8.7%)	2 (8.7%)	2 (8.7%)	2 (8.7%)	1 (4.3%)
Individual % males n = 21	7 (33.3%)	3 (14.3%)	3 (14.3%)	3 (14.3%)	4 (19%)	2 (9.5%)
HELPFUL						
Total % n=100	**43%**	**38%**	**26%**	**23%**	**25%**	**22%**
Group total % n = 56	**23 (41.1%)**	**20 (35.7%)**	**15 (26.8%)**	**13 (23.2%)**	**14 (25%)**	**10 (17.9%)**
Group % females n = 27	9 (31%)	6 (20.7%)	7 (24.1%)	7 (24.1%)	9 (31%)	8 (27.6%)
Group % males n = 29	14 (51.9%)	14 (51.9%)	8 (29.6%)	6 (22.2%)	5 (18.5%)	2 (7.4%)
Individual total % n =44	**20 (45.5%)**	**18 (40.9%)**	**11 (25%)**	**10 (22.7%)**	**11 (25%)**	**12 (27.3%)**
Individual % females n = 23	9 (39.1%)	8 (34.8%)	2 (8.7%)	5 (21.7%)	5 (21.7%)	5 (21.7%)
Individual % males n = 21	11 (52.4%)	10 (47.6%)	9 (42.9%)	1 (4.3%)	6 (28.6%)	7 (33.3%)
SOME USE						
Total % n=100	**5%**	**16%**	**9%**	**7%**	**10%**	**11%**
Group total % n = 56	**1 (1.8%)**	**8 (14.3%)**	**4 (7.1%)**	**5 (8.9%)**	**5 (8.9%)**	**5 (8.9%)**
Group % females n = 27	1 (3.4%)	2 (6.9%)	1 (3.4%)	1 (3.4%)	2 (6.9%)	2 (6.9%)
Group % males n = 29	-	3 (11.1%)	3 (11.1%)	4 (14.8%)	3 (11.1%)	3 (11.1%)
Individual total % n=44	**4 (9.1%)**	**8 (18.2%)**	**5 (11.4%)**	**2 (4.5%)**	**5 (11.4%)**	**6 (13.6%)**
Individual % females n = 23	1 (4.3%)	2 (8.7%)	2 (8.7%)	2 (8.7%)	-	-
Individual % males n = 21	3 (14.3%)	6 (28.6%)	3 (14.3%)	-	5 (23.8%)	6 (28.6%)
NO USE						
Total % n=100	**-**	**1%**	**8%**	**1%**	**20%**	**18%**
Group total % n = 56	**-**	**1 (1.8%)**	**3 (5.4%)**	**-**	**10 (17.9%)**	**8 (14.3%)**
Group % females n = 27	-	1 (3.4%)	1 (3.4%)	-	4 (13.8%)	3 (10.3%)
Group % males n = 29	-	-	2 (7.4%)	-	6 (22.2%)	5 (18.5%)
Individual total % n=44	-	-	**5 (11.4%)**	**1 (2.3%)**	**10 (22.7%)**	**10 (22.7%)**
Individual % females n = 23	-	-	5 (21.7%)		8 (34.8%)	9 (39.1%)
Individual % males n = 21	-	-	-	1 (4.8%)	2 (9.5%)	1 (4.8%)
DON'T KNOW						
Total % n=100	**1%**	**8%**	**16%**	**14%**	**10%**	**11%**
Group total % n = 56	**-**	**4 (7.1%)**	**7 (12.5%)**	**9 (16.1%)**	**6 (10.7%)**	**7 (12.5%)**
Group % females n = 27	-	2 (6.9%)	3 (10.3%)	5 (17.2%)	1 (3.4%)	4 (13.8%)
Group % males n = 29	-	2 (7.4%)	4 (14.8%)	4 (14.8%)	5 (18.5%)	3 (11.1%)
Individual total % n = 44	**1 (2.3%)**	**4 (9.1%)**	**9 (20.5%)**	**5 (11.4%)**	**4 (9.1%)**	**4 (9.1%)**
Individual % females n = 23	1 (4.3%)	2 (8.7%)	6 (26.1%)	4 (17.4%)	2 (8.7%)	2 (8.7%)
Individual % males n = 21	-	2 (9.5%)	3 (14.3%)	1 (4.8%)	2 (9.5%)	2 (9.5%)

Table 4:15 Comparison of the Level of Education with Preferred Medium for Education

	3 yrs or Less Secondary n = 34		>3 yrs Secondary n = 23		Technical/trade n = 23		Degree N = 17	
	Very Helpful	No Use/ Don't Know	Very Helpful	No Use/ Don't Know	Very Helpful	No Use/ Don't Know	Very Helpful	No Use/ Don't Know
Written pamphlets	28 (82%)	3 (9%)	19 (83%)	1 (4%)	22 (96%)	-	14 (82%)	1 (6%)
Books	17 (50%)	7 (21%)	14 (61%)	4 (17%)	15 (65%)	4 (17%)	11 (65%)	3 (13%)
TV	16 (47%)	7 (21%)	13 (52%)	3 (13%)	8 (35%)	7 (30%)	10 (59%)	3 (13%)
Video	10 (29%)	7 (21%)	13 (52%)	4 (17%)	12 (52%)	5 (22%)	10 (59%)	1 (6%)
CD	8 (24%)	12 (35%)	10 (43%)	5 (22%)	8 (35%)	9 (39%)	10 (59%)	2 (12%)
Internet	8 (24%)	12 (35%)	10 (43%)	6 (26%)	11 (48%)	8 (35%)	10 (59%)	3 (13%)
Photo's	13 (38%)	7 (21%)	10 (43%)	5 (22%)	7 (30%)	8 (35%)	6 (35%)	7 (41%)

Educational material was ranked from ' very helpful' to of 'no use'. The 'Basic Food Guide' and 'Carbohydrate Counting' were considered the most helpful with 'Breakfast Cereals' next. Many found the 'Cheese', 'Glycaemic Index' and 'Shopping Guide' very helpful. The least helpful were 'Biscuits' and 'Low Fat Takeaways'. A copy of each of these education sheets is found in Appendix 11. A summary of the study subjects ranking of the usefulness of the education sheets is shown in Tables 4: 16, 17, and 18.

Other information subjects thought would be helpful included:-

- Understanding the cause of diabetes and results of research.
- Planning meals that suit the whole family that are not expensive or time consuming to prepare.
- Meal suggestions for a week, especially lunch meals and cooking classes.
- Balancing food and insulin. Protein and insulin levels.
- More specific information on serving size. Not so much about what not to eat but what to eat.
- Nutritional requirements for endurance and athletic activities.
- How to cope with shift work.

Table 4: 16 Value of Education Sheets

		Basic Guide	Meal Plan	Glycaemic Index	CHO Counting	Low Fat Cooking
VERY HELPFUL						
Total %	**n=100**	**56%**	**41%**	**46%**	**56%**	**42%**
Group total %	**n = 56**	**39 (69.6%)**	**24 (42.9%)**	**29 (51.8%)**	**34 (60.7%)**	**28 (50.0%)**
Group % females	n = 27	18 (62.1%)	-	14 (48.3%)	15 (51.7%)	14 (48.3%)
Group % males	n = 29	21 (77.8%)	10 (37%)	15 (55.6%)	19 (70.4%)	14 (51.9%)
Individual total %	**n =44**	**17 (38.6%)**	**17 (38.6%)**	**17 (38.6%)**	**22 (50.0%)**	**14 (31.8%)**
Individual % females	n = 23	11 (47.8%)	9 (39.1%)	8 (34.8%)	11 (47.8%)	8 (34.8%)
Individual % males	n = 21	6 (28.6%)	8 (38.1%)	9 (42.9%)	11 (52.4%)	6 (28.6%)
HELPFUL						
Total %	**n=100**	**35%**	**44%**	**30%**	**33%**	**35%**
Group total %	**n = 56**	**12 (21.4%)**	**24 (42.9%)**	**18 (32.1%)**	**18 (32.1%)**	**17 (30.4%)**
Group % females	n = 27	6 (20.7%)	8 (27.6%)	9 (31%)	8 (27.6%)	9 (31%)
Group % males	n = 29	6 (22.2%)	16 (59.3%)	9 (33.3%)	10 (37%)	8 (29.6%)
Individual total %	**n =44**	**23 (52.3%)**	**20 (45.5%)**	**12 (27.3%)**	**15 (34.1%)**	**18 (40.9%)**
Individual % females	n = 23	9 (39.1%)	2 (8.7%)	4 (17.4%)	2 (8.7%)	9 (39.1%)
Individual % males	n = 21	14 (66.7%)	10 (47.6%)	8 (38.1%)	9 (42.9%)	9 (42.9%)
SOME USE						
Total %	**n=100**	**4%**	**4%**	**-**	**2%**	**5%**
Group total %	**n = 56**	**2 (3.6%)**	**2 (3.6%)**	**-**	**1 (1.8%)**	**2 (3.6%)**
Group % females	n = 27	2 (6.9%)	2 (6.9%)	-	1 (3.4%)	2 (6.9%)
Group % males	n = 29			-		
Individual total	**n =44**	**2 (4.5%)**	**2 (4.5%)**	**-**	**1 (2.3%)**	**3 (6.8%)**
Individual % females	n = 23	1 (4.3%)	1 (4.3%)	-	1 (4.3%)	1 (4.3%)
Individual % males	n = 21	1 (4.8%)	1 (4.8%)	-	-	2 (9.5%)
NO USE						
Total %	**n=100**	**-**	**-**	**3%**	**1%**	**2%**
Group total %	**n = 56**	**-**	**-**	**1 (1.8%)**	**-**	**1 (1.8%)**
Group % females	n = 27	-	-	1 (3.4%)	-	1 (3.4%)
Group % males	n = 29	-	-	-	-	-
Individual total %	**n =44**	**-**	**-**	**2 (4.5%)**	**-**	**1 (2.3%)**
Individual % females	n = 23	-	-	2 (8.7%)	-	-
Individual % males	n = 21	-	-	-	-	1 (4.8%)
DON'T KNOW						
Total %	**n=100**	**-**	**2%**	**8%**	**1%**	**2%**
Group total %	**n = 56**	**-**	**1 (1.8%)**	**3 (5.4%)**	**-**	**-**
Group % females	n = 27	-	1 (3.4%)	1 (3.4%)	-	-
Group % males	n = 29	-		2 (7.4%)	-	-
Individual total %	**n=44**	**-**	**1 (2.3%)**	**5 (11.4%)**	**1 (2.3%)**	**2 (4.5%)**
Individual % females	n = 23	-		4 (17.4%)	-	1 (4.3%)
Individual % males	n = 21	-	1 (4.8%)	1 (4.8%)	1 (4.8%)	1 (4.8%)

Table 4: 17 Value of Education Sheets

		Drinks	Breakfast Cereals	Biscuits	Cheese	Yoghurt
Total %	**n=100**	**45%**	**52%**	**37%**	**46%**	**33%**
Group total %	**n = 56**	**33 (58.9%)**	**35 (62.5%)**	**25 (44.6%)**	**30 (53.6%)**	**22 (39.3%)**
Group % females	n = 27	17 (58.6%)	16 (55.2%)	14 (48.3%)	14 (48.3%)	13 (44.8%)
Group % males	n = 29	16 (59.3%)	19 (70.4%)	11 (40.7%)	16 (59.3%)	9 (33.3%)
Individual total %	**n=44**	**11 (25%)**	**17 (38.6%)**	**12 (27.3%)**	**16 (36.4%)**	**11 (25%)**
Individual % females	n = 23	6 (26.1%)	10 (43.5%)	7 (30.4%)	11 (47.8%)	6 (26.1%)
Individual % males	n = 21	5 (23.8%)	7 (33.3%)	5 (23.8%)	5 (23.8%)	5 (23.8%)
HELPFUL						
Total %	**n=100**	**38%**	**37%**	**42%**	**43%**	**42%**
Group total %	**n = 56**	**16 (28.6%)**	**14 (25%)**	**21 (37.5%)**	**21 (37.5%)**	**20 (35.7%)**
Group % females	n = 27	7 (24.1%)	7 (24.1%)	9 (31%)	10 (34.5%)	9 (31%)
Group % males	n = 29	10 (37%)	7 (25.9%)	12 (44.4%)	11 (40.7%)	11 (40.7%)
Individual total %	**n =44**	**21 (47.7%)**	**23 (52.3%)**	**21 (47.7%)**	**22 (50%)**	**22 (50%)**
Individual % females	n = 23	12 (52.2%)	10 (43.5%)	10 (43.5%)	9 (39.1%)	10 (43.5%)
Individual % males	n = 21	9 (42.9%)	13 (61.9%)	11 (52.4%)	13 (61.9%)	12 (57.1%)
SOME USE						
Total %	**n=100**	**8%**	**4%**	**10%**	**3%**	**8%**
Group total %	**n = 56**	**2 (3.6%)**	**2 (3.6%)**	**4 (7.1%)**	**-**	**5 (8.9%)**
Group % females	n = 27	2 (6.9%)	2 (6.9%)	2 (6.9%)	-	4 (13.8%)
Group % males	n = 29	-	-	2 (7.4%)	-	1 (3.7%)
Individual total %	**n =44**	**6 (13.6%)**	**2 (4.5%)**	**6 (13.6%)**	**3 (6.8%)**	**3 (6.8%)**
Individual % females	n = 23	3 (13%)	1 (4.3%)	2 (8.7%)	2 (8.7%)	2 (8.7%)
Individual % males	n = 21	3 (14.3%)	1 (4.8%)	4 (19%)	1 (4.8%)	1 (4.8%)
NO USE						
Total %	**n=100**	**-**	**-**	**1%**	**2%**	-
Group total %	**n = 56**	**-**	**-**	**-**	**1 (1.8%)**	-
Group % females	n = 27	-	-	-	1 (3.4%)	-
Group % males	n = 29	-	-	-		-
Individual total %	**n =44**	-	-	-	**1 (2.3%)**	**-**
Individual % females	n = 23	-	-	-	-	-
Individual % males	n = 21	-	-	1 (4.8%)	1 (4.8%)	-
DON'T KNOW						
Total %	**n=100**	**1%**	**1%**	**2%**	**2%**	**1%**
Group total %	**n = 56**	-	**1 (1.8%)**	**1 (1.8%)**	**1 (1.8%)**	**-**
Group % females	n = 27	-	1 (3.4%)	1 (3.4%)	1 (3.4%)	-
Group % males	n = 29	-	-	-	1 (3.7%)	-
Individual total %	**n =44**	**1 (2.3%)**	**-**	**1 (2.3%)**	**1 (2.3%)**	**1 (2.3%)**
Individual % females	n = 23	-	-	1 (4.3%)	-	1 (4.3%)
Individual % males	n = 21	1 (4.8%)	-	-	1 (4.8%)	-

Table 4: 18 Value of Education Sheets

VERY HELPFUL		Exercise	Low Fat Takeaways	Shopping Guide
Total %	**n =100**	**37%**	**31%**	**46%**
Group total %	**n = 56**	**23 (41%)**	**21 (37.5%)**	**28 (50%)**
Group % females	n = 27	12 (41.4%)	11 (37.9%)	15 (51.7%)
Group % males	n = 29	11 (40.7%)	10 (37%)	13 (48.1%)
Individual total %	**n =44**	**14 (31.8%)**	**10 (22.7%)**	**18 (40.9%)**
Individual % females	n = 23	7 (30.4%)	5 (21.7%)	11 (47.8%)
Individual % males	n = 21	7 (33.3%)	5 (23.8%)	7 (33.3%)
HELPFUL				
Total %	**n=100**	**40%**	**33%**	**34%**
Group total %	**n = 56**	**22 (39.3%)**	**18 (32.1%)**	**16 (28.6%)**
Group % females	n = 27	9 (31%)	11 (37.9%)	7 (24.1%)
Group % males	n = 29	13 (48.1%)	7 (25.9%)	9 (33.3%)
Individual total %	**n =44**	**18 (40.9%)**	**15 (34.1%)**	**18 (40.9%)**
Individual % females	n = 23	7 (30.4%)	7 (30.4%)	7 (30.4%)
Individual % males	n = 21	11 (52.4%)	8 (38.1%)	11 (52.4%)
SOME USE				
Total %	**n=100**	**7%**	**11%**	**4%**
Group total %	**n = 56**	**4 (7.1%)**	**4 (7.1%)**	**3 (5.4%)**
Group % females	n = 27	3 (10.3%)	1 (3.4%)	2 (6.9%)
Group % males	n = 29	1 (3.7%)	3 (11.1%)	1 (3.7%)
Individual total %	**n =44**	**3 (6.8%)**	**7 (15.9%)**	**2 (4.5%)**
Individual % females	n = 23	2 (8.7%)	4 (17.4%)	1 (4.3%)
Individual % males	n = 21	1 (4.8%)	3 (14.3%)	1 (4.8%)
NO USE				
Total %	**n=100**	**2%**	**1%**	**1%**
Group total %	**n = 56**	**-**	**-**	**-**
Group % females	n = 27	-	-	-
Group % males	n = 29	-	-	-
Individual total %	**n = 44**	**2 (4.5%)**	**1 (2.3%)**	**1 (2.3%)**
Individual % females	n = 23	1 (4.3%)	1 (4.3%)	-
Individual % males	n = 21	1 (4.8%)	-	1 (4.8%)
DON'T KNOW				
Total %	**n=100**	**3%**	**4%**	**5%**
Group total %	**n = 56**	**1 (1.8%)**	**2 (3.6%)**	**4 (7.1%)**
Group % females	n= 27	-	2 (6.9%)	2 (6.9%)
Group % males	n= 29	1 (3.7%)	-	2 (7.4%)
Individual total %	**n= 44**	**2 (4.5%)**	**2 (4.5%)**	**1 (2.3%)**
Individual % females	n = 23	2 (8.7%)	2 (8.7%)	1 (4.3%)
Individual % males	n = 21	-	-	-

- How to stick to a healthy lifestyle.
- Information on the effect colds and flu have on diabetes.
- More about medication and how it works.
- Coeliac disease and its relationship with diabetes.

4:6 Food Choices made by Subjects

4: 6.1 Lipids

Table 4: 19 shows that the majority of subjects made changes once they were aware of their lipid profile and 2 % (males) reported that they already had acceptable levels.

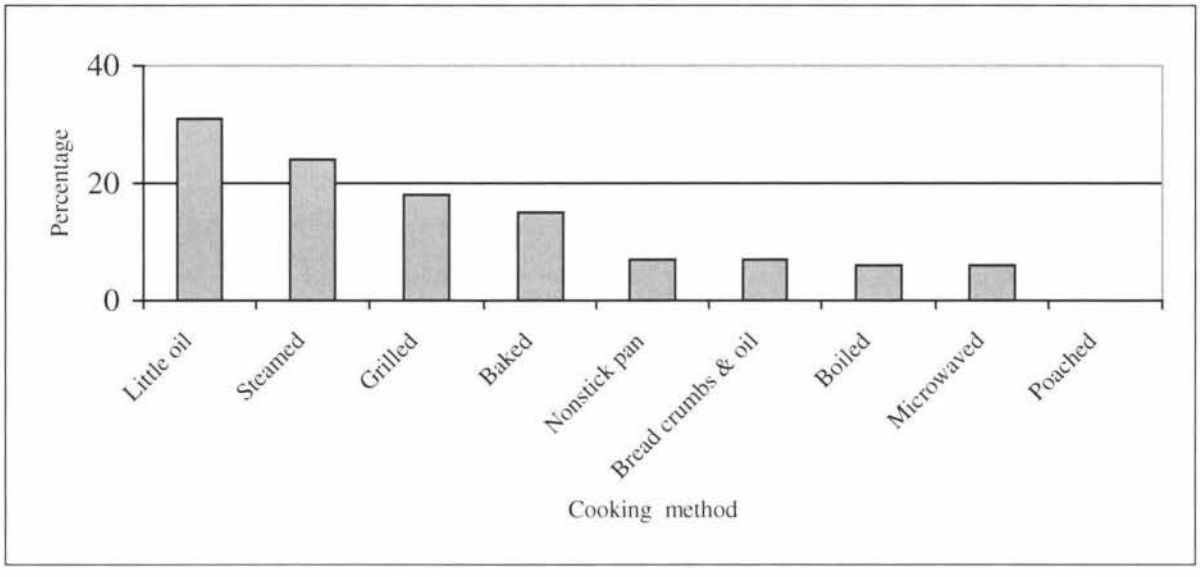
Table 4: 19 Changes made once Lipid Profile was Known

	Total % n = 100	Total Female n = 50	Total Male n = 50
Changes made once lipid profile known			
Yes	87	46 (92.0%)	41 (82.0%)
No	9	3 (6.0%)	6 (12.0%)
Cholesterol satisfactory	2	-	2 (4.0%)
Did not answer	2	1 (2.0%)	1 (2.0%)
Changes to polyunsaturated fat			
Increase	18	6 (12.0%)	12 (24.0%)
Decrease	55	30 (60.0%)	25 (50.0%)
Did not answer	27	14 (28.0%)	13 (26.0%)
Changed to monounsaturated fat			
Increase	9	4 (8.0%)	5 (10.0%)
Decrease	57	26 (52.0%)	31 (62.0%)
Did not answer	34	20 (40.0%)	14 (28.0%)
Changes to saturated fat			
Increase	-	-	-
Decrease	78	40 (80.0%)	38 (78.0%)
Did not answer	22	10 (20.0%)	12 (24.0%)

Methods used to cook fish

Figure 4: 12 show that the majority choose low fat methods of cooking most of the time.

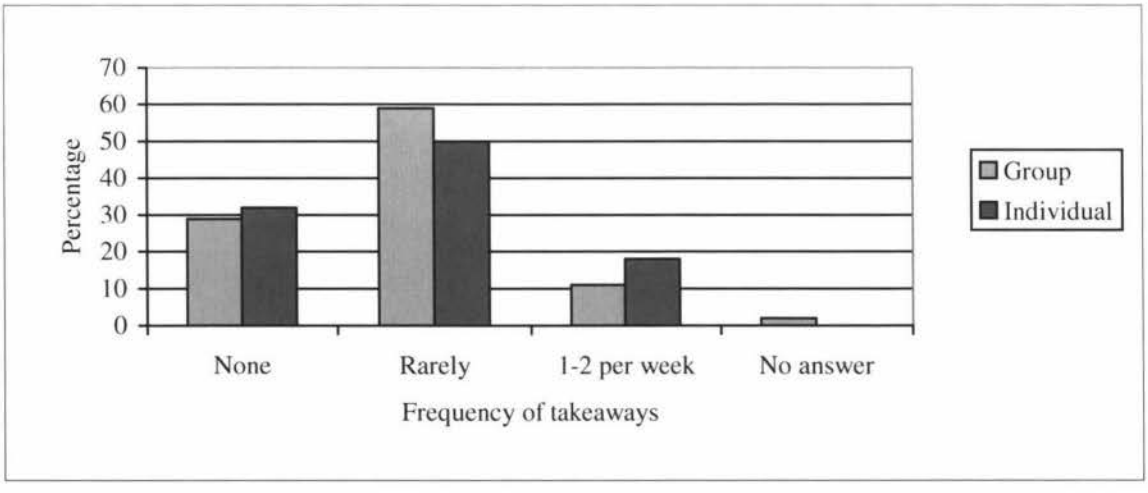
Figure 4: 12 Methods Used to Cook Fish



Takeaways

Figure 4: 13 shows that takeaways were avoided or eaten only rarely by subjects and there was not a significant difference between group and individually educated subjects.

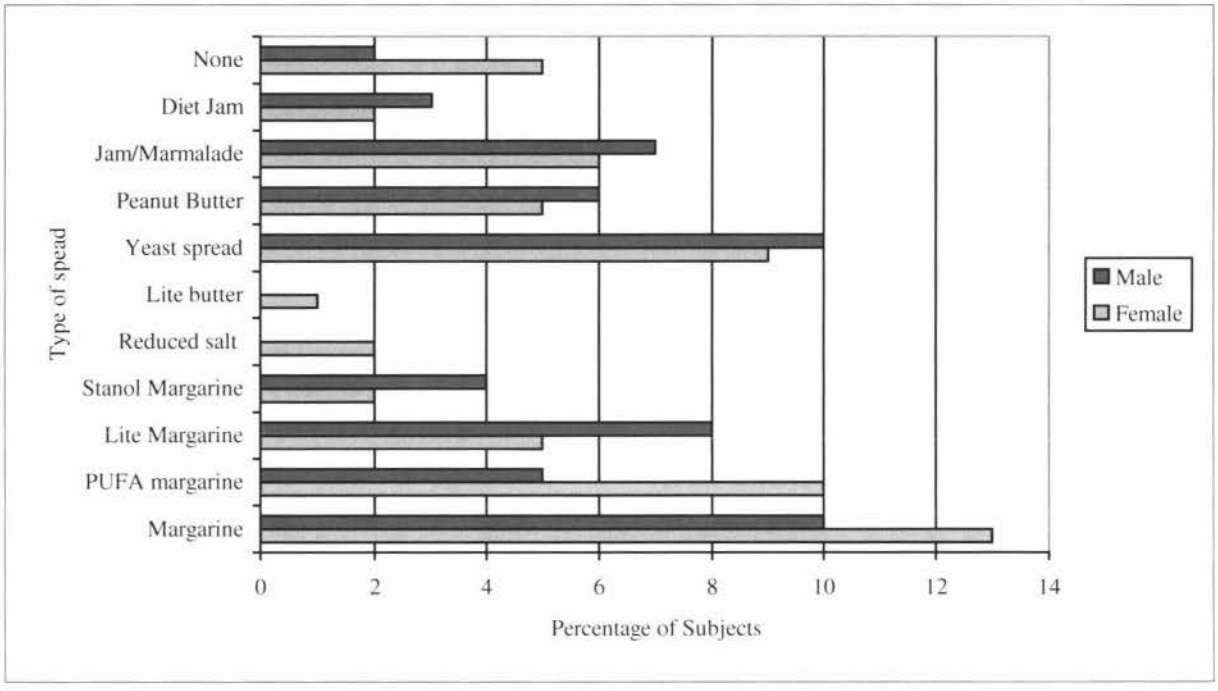
Figure 4:13 Frequency of Takeaway Consumption by Gender
female n = 50 male n = 50



Spreads

Figure 4: 14 shows the most common spreads used by subjects were margarine and yeast spreads.

Figure 4: 14 Type of Spreads Used
females n = 50 males n = 50



4: 6. 2 Carbohydrates

Cereals

Cereals were eaten by 81% of subjects with the majority choosing low-glycaemic index cereals at least some of the time as seen in Figure 4: 15. Figure 4: 16 shows that only one third ate cereal daily but the number who reported not to eating cereals varied slightly between questions as seen in Figures 4: 15 and Figure 4: 16.

Figure 4: 15 Type of Cereal Chosen
females n = 50, males 50

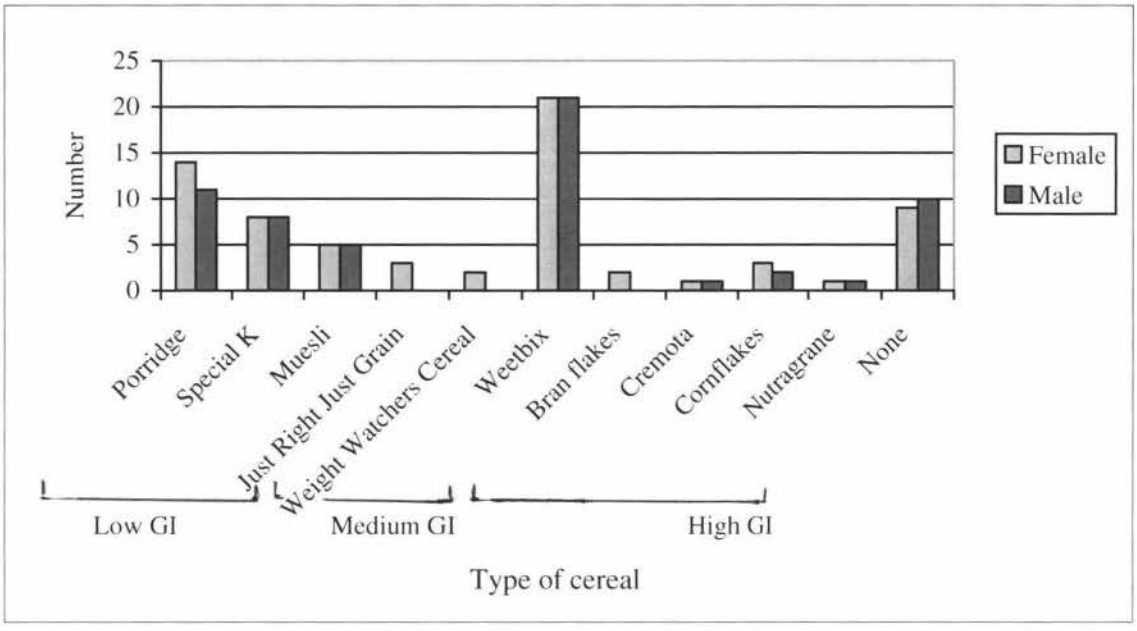
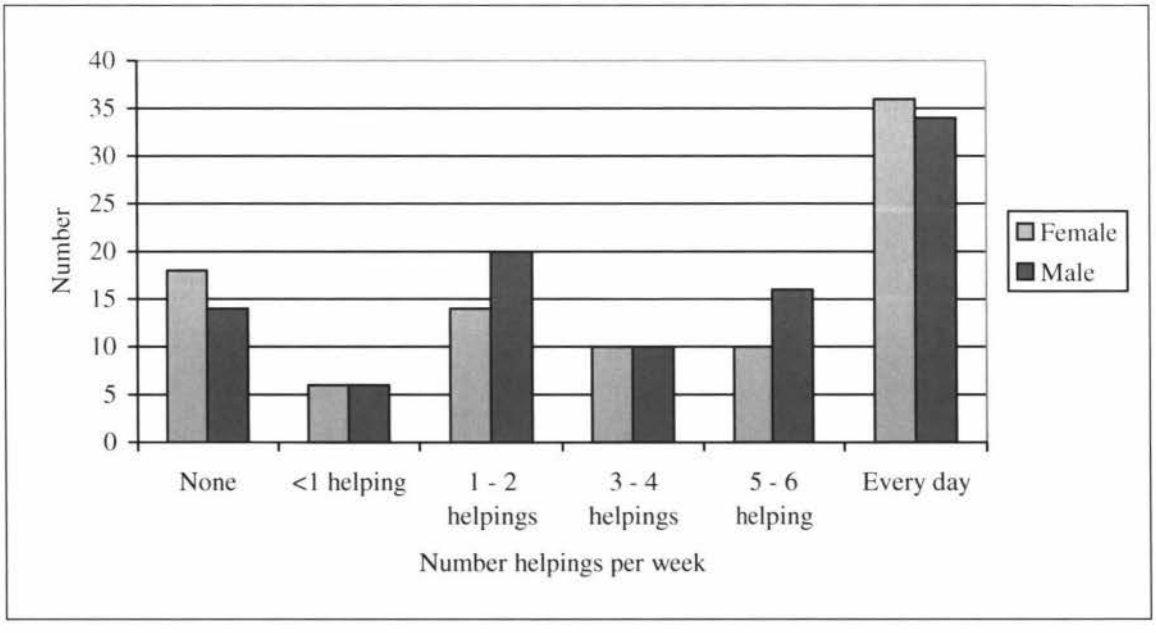


Figure 4: 16 Number of Helpings of Cereals Eaten by Subjects per Week
females n = 50 males n = 50



Bread

Bread was eaten by most of the subjects with 72% choosing whole grain, low-glycaemic index bread at least some of the time, 44% chose medium glycaemic index, and 10% chose high glycaemic index as seen Figure 4: 17. The amount eaten varied considerably as seen in Figure 4: 18.

Figure 4: 17 Type of Bread Chosen
females n = 50 males n = 50

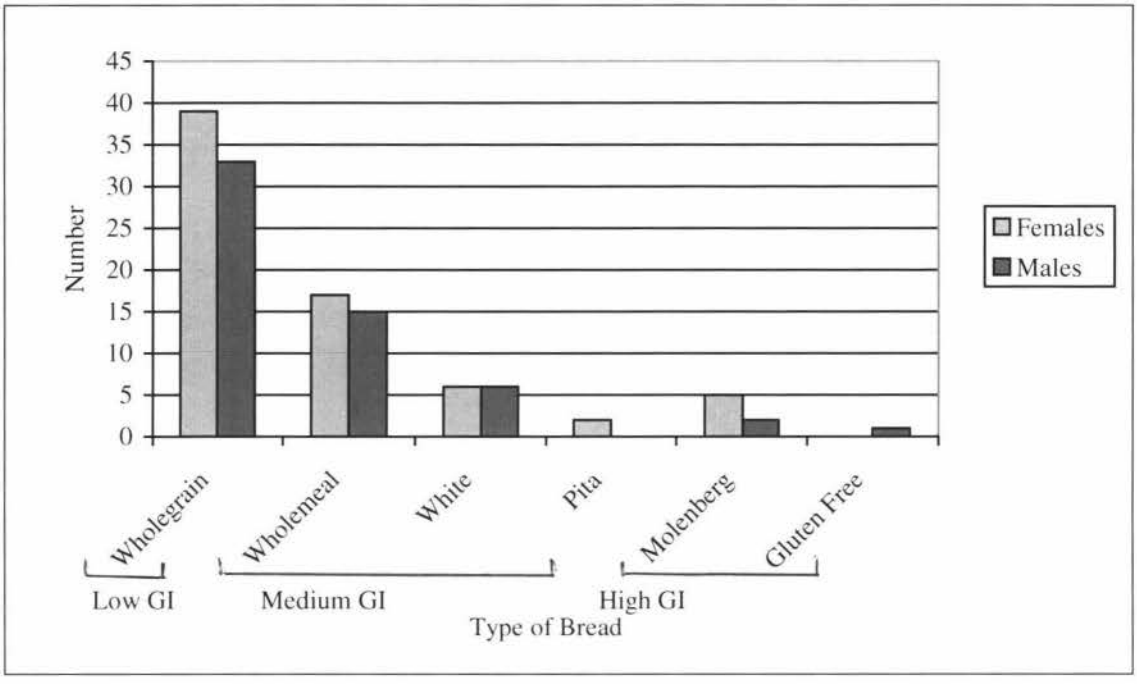
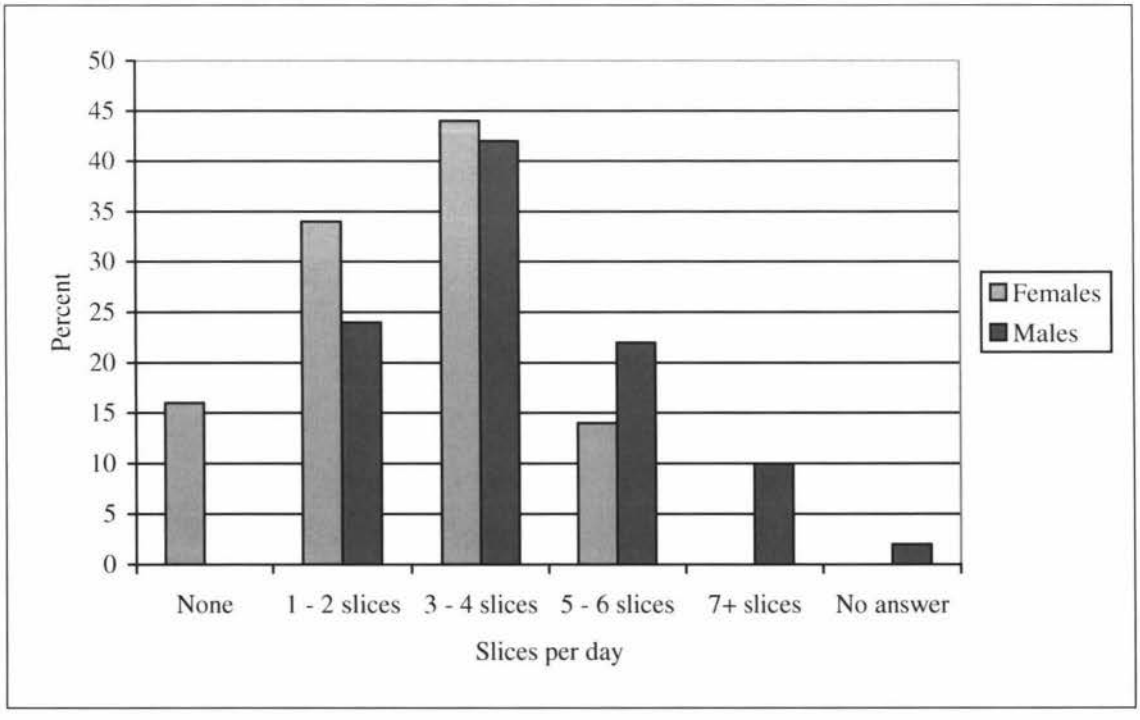


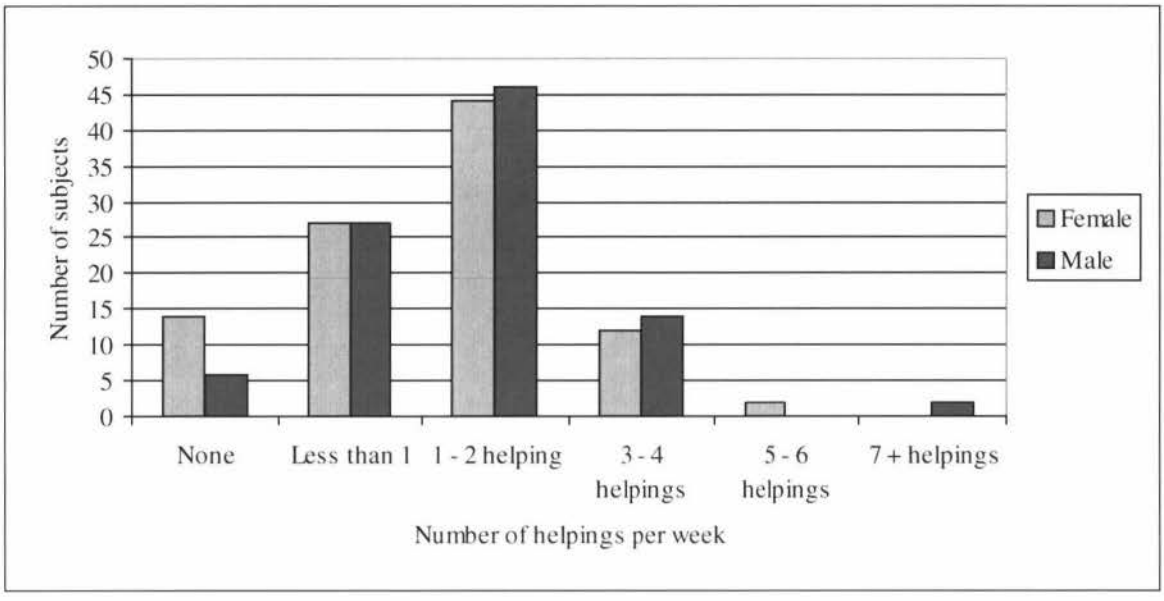
Figure 4: 18 Amount of Bread Subjects Ate per Day
females n = 50 males n = 50



Pasta and Rice

The amount of pasta/rice eaten by subjects varied greatly as seen in Figure 4: 19.

Figure 4: 19 Number of Helpings of Pasta and Rice Eaten by Subjects per Week
females n = 50 males n = 50



4: 6.3 Protein

Dairy Products

Dairy products were eaten by most subjects as seen in Figure 4: 20

Figure 4: 20 Number of Helpings of Dairy Products Eaten by Subjects per Day
females n = 50 males n = 50

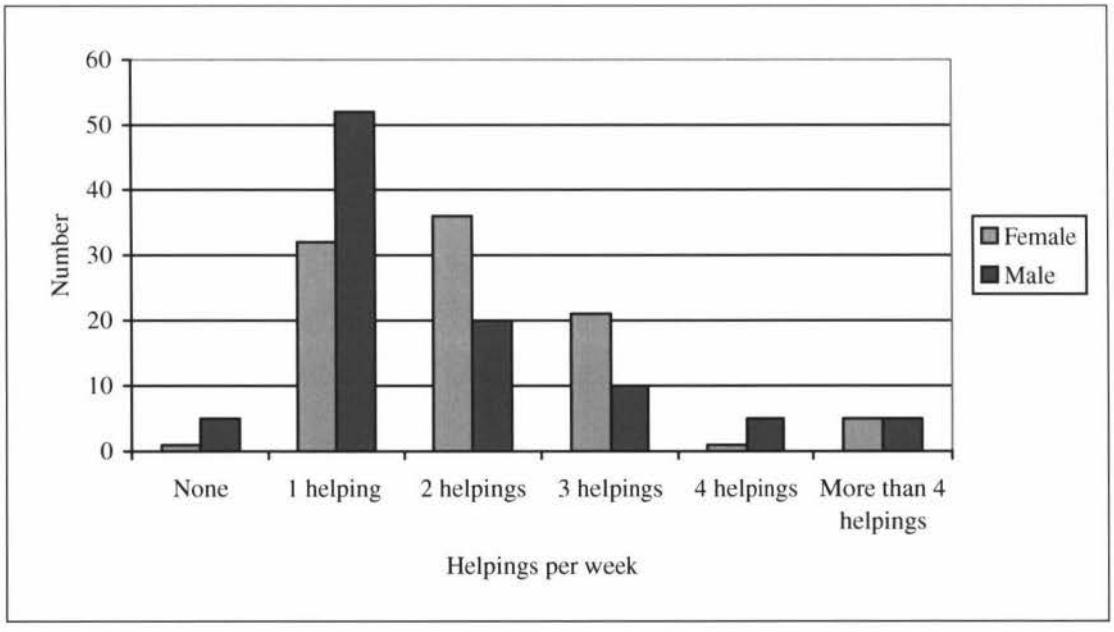
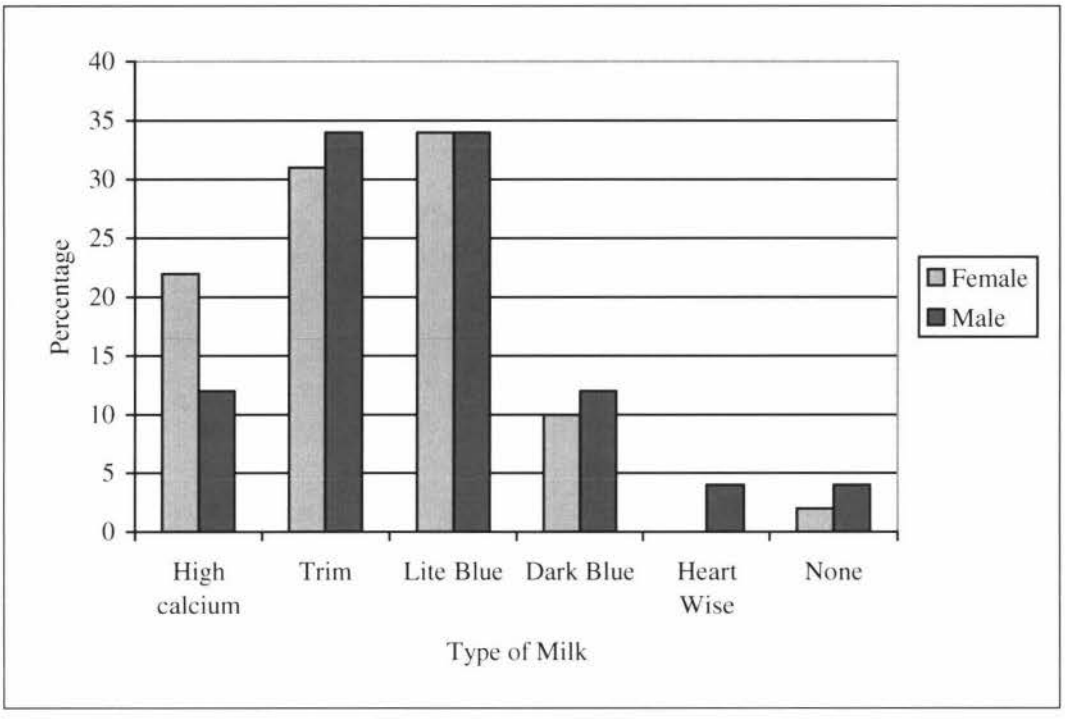


Figure 4: 21 shows that the majority choose fat reduced milk.

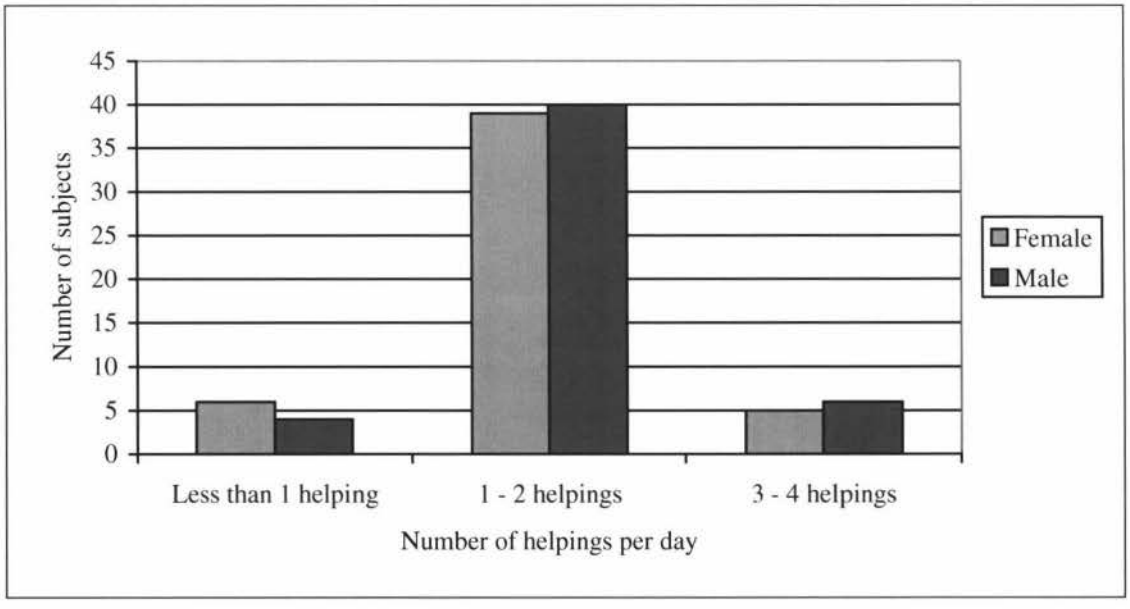
Figure 4: 21 Type of Milk Chosen
females n = 50 males n = 50



Meat, Fish, Chicken, Eggs

Protein intake varied with the majority having one to two helpings a day as seen in Figure 4: 22.

Figure 4: 22 Number of Helpings of Meat, Fish, Chicken and Eggs Eaten Per Day
females n = 50 males n = 50

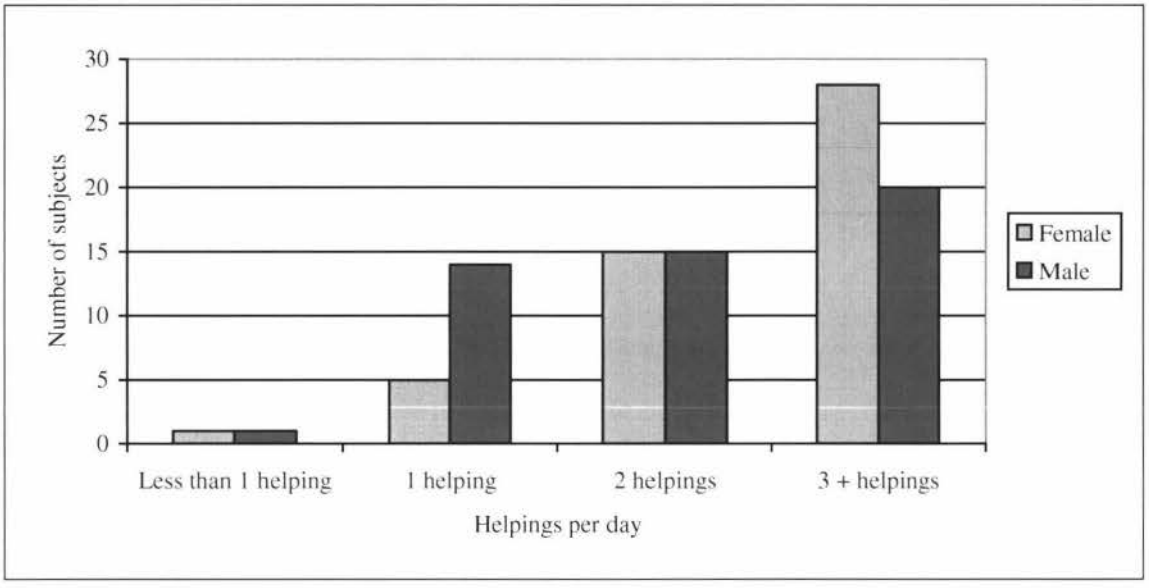


4: 6.4 Vegetables and Fruit

Vegetables

Vegetables were eaten routinely by all but two of the subjects, however the number of helpings a day varied as seen in Figure 4: 23.

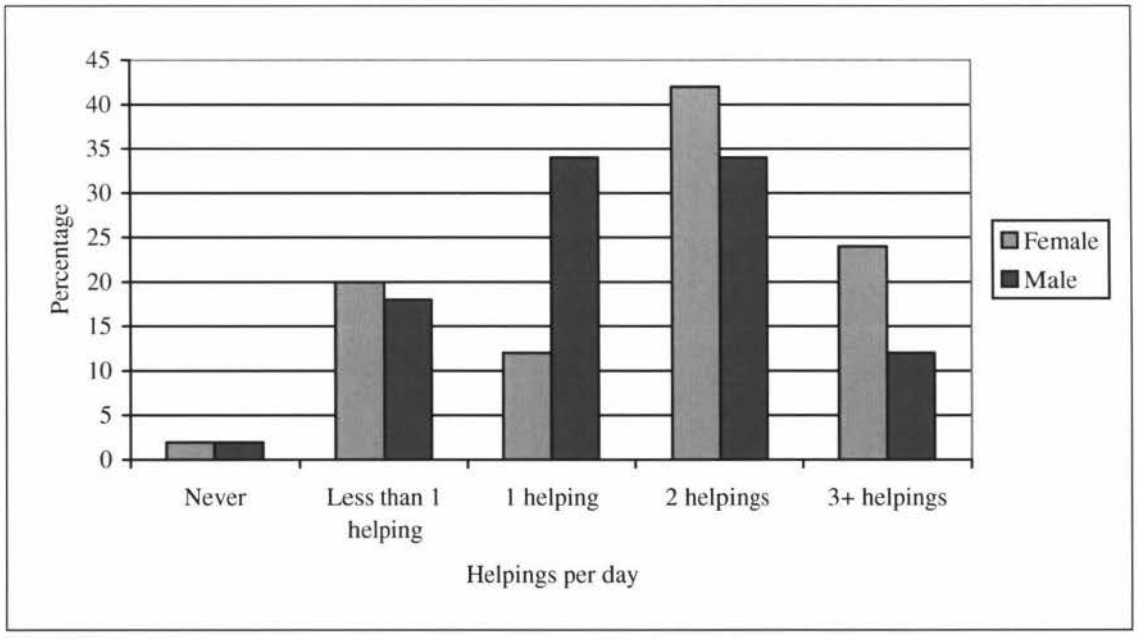
Figure 4: 23 Number of Helpings of Vegetables Eaten by Subjects per Day
females n = 50 males n = 50



Fruit

Practically all subjects ate fruit but the quantity varied greatly as seen in Figure 4: 24.

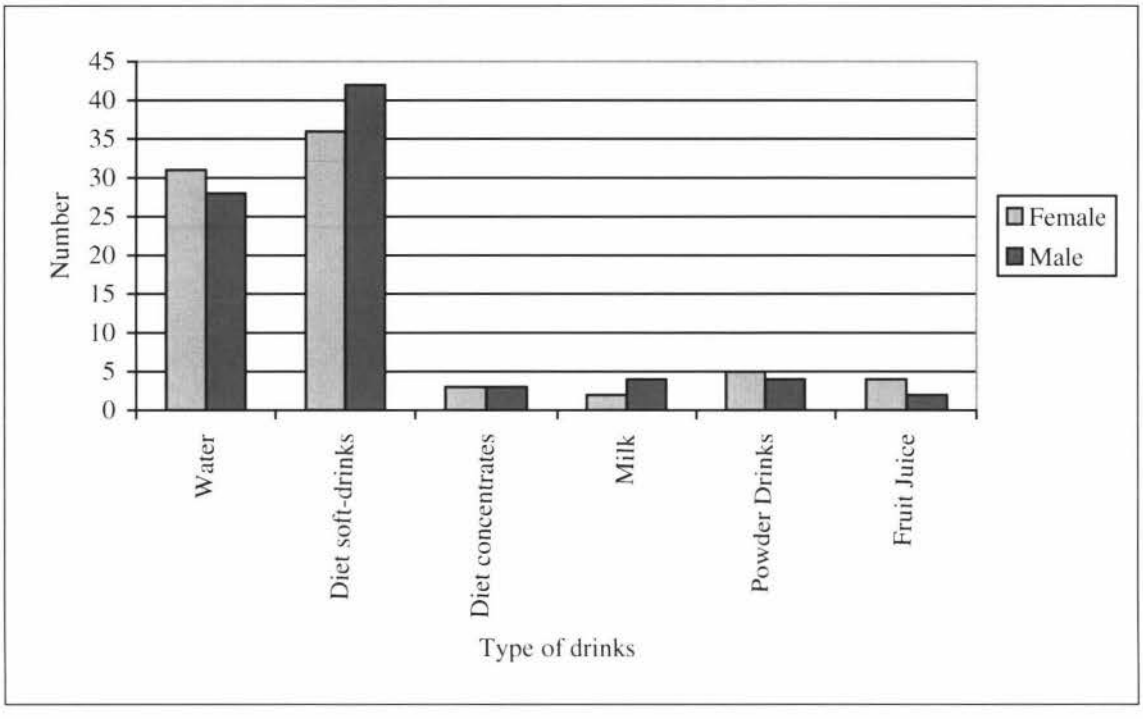
Figure 4: 24 Number of Helpings of Fruit Eaten by Subjects per Day
females n = 50 males n = 50



4: 6.5 Non Alcoholic Drinks

A wide variety of drinks were consumed by many of the subjects with diet fizzy drinks being the most popular followed by water as seen in Figure 4: 25.

Figure 4 :25 Types of Non-alcoholic Drinks Chosen by Subjects
females n = 50 males n = 50



4: 7 Alcohol

Table 4: 20 shows that alcohol was consumed by just over half the research subjects. Since being diagnosed with diabetes many had changed their alcohol consumption s seen in table 4: 20. Of those who had not made changes most drank very little alcohol prior to diagnosis. Only one male reported drinking more and commented that it was 'part of getting older'. Table 4: 21 shows that there were only a few who drank alcohol on a daily basis and the majority drank only occasionally. The most commonly drunk alcohol was wine with a similar number choosing beer and spirits as seen in Table 4: 21. The majority complied with the National Alcohol Guidelines with only a few drinking in excess as seen in Table 4: 21.

Table 4: 20 Life Style Changes - Changes in Alcohol Consumption since being Diagnosed

	Total % n=100	Females Total % n = 50	Male Total % n = 50	Group Total % n = 56	Group Females % n = 27	Group Males % n = 29	Individual Total % n = 44	Individual Females % n = 23	Individual Males % n = 21
Alcohol consumption									
Yes	68	26 (52%)	42 (84%)	69.6%	13 (48.1%)	26 (89.7%)	65.9%	13 (56.5%)	16 (76.2%)
No	31	23 (46%)	8 (16%)	30.4%	14 (51.9%)	3 (10.3%)	31.8%	9 (39.1%)	5 (23.8%)
Did not answer	1	1 (2%)	-	-	-	-	2.3%	1 (4.3%)	-
Changes to alcohol intake since diagnosis									
Yes	45	13 (26%)	32 (64%)	53.6%	11 (40.7%)	19 (65.5%)	34.1%	2 (8.7%)	13 (61.9%)
No	24	13 (26%)	11 (22%)	17.9%	4 (14.8%)	6 (20.7%)	31.8%	9 (39.1%)	5 (23.8%)
Do not drink	31	23 (46%)	8 (16%)	30.4%	14 (51.9%)	3 (10.3%)	31.8%	9 (39.1%)	5 (23.8%)
What changes have been made									
Don't drink	31	23 (46%)	8 (16%)	30.4%	14 (51.9%)	3 (10.3%)	31.8%	9 (39.1%)	5 (23.8%)
Stopped drinking	4	1 (2%)	3 (6%)	3.6%	1 (3.7%)	1 (3.4%)	4.5%	-	2 (9.5%)
Reduced	30	9 (18%)	21 (42%)	33.9%	8 (14.5%)	11 (37.9%)	25.0%	1 (4.3%)	10 (47.6%)
Same	6	2 (4%)	4 (8%)	1.8%	-	1 (3.4%)	11.4%	2 (8.7%)	3 (14.3%)
Same / very little	18	12 (24%)	6 (12%)	14.3%	4 (14.8%)	4 (13.8%)	22.7%	8 (34.8%)	2 (9.5%)
More	1	-	1 (2%)	-	-	-	2.3%	-	1 (4.8%)
Changed to low cal beer	2	1 (2%)	1 (2%)	3.6%	1 (3.7%)	1 (3.4%)	-	-	-
Changed from beer to spirits	3	-	3 (6%)	1.8%	-	3 (10.3%)	-	-	-
Less spirits	1	1 (2%)	-	-	-	-	2.3%	1 (4.3%)	-
Stopped drinking beer	2	-	2 (4%)	3.6%	2 (7.4%)	-	-	-	-
Did not answer	8	4 (8%)	4 (8%)	5.4%	2 (7.4%)	1 (3.4%)	11.4%	2 (8.7%)	3 (14.3%)

Table 4: 21 Life Style: Frequency and Type of Alcohol Drunk by Subjects

	Total % n=100	Females Total % n = 50	Male Total % n = 50	Group Total % n = 56	Group Females % n = 27	Group Males % n = 29	Individual Total % n = 44	Individual Females % n = 23	Individual Males % n = 21
Frequency									
Daily	9	1 (2%)	8 (16%)	7.1%	-	4 (13.8%)	11.4%	1 (4.3%)	4 (19%)
4 - 5 times a week	8	1 (2%)	7 (14%)	10.7%	1 (3.7%)	5 (17.2%)	4.5%	-	2 (9.5%)
2 - 3 times a week	17	7 (14%)	10 (20%)	16.1%	4 (14.8%)	5 (17.2%)	18.2%	3 (13%)	5 (23.8%)
Once a week	9	4 (8%)	5 (10%)	10.7%	2 (7.4%)	4 (13.8%)	6.8%	2 (8.7%)	1 (4.8%)
1 - 2 times a month	10	6 (12%)	4 (8%)	12.5%	4 (14.8%)	3 (10.3%)	6.8%	2 (8.7%)	1 (4.8%)
Less than once a month	16	8 (16%)	8 (16%)	14.3%	4 (14.8%)	4 (13.8%)	18.2%	4 (17.4%)	4 (19%)
Do not drink	28	21 (41%)	7 (14%)	26.9%	12 (44.4%)	3 (10.3%)	29.5%	9 (39.1%)	4 (19%)
Did not answer	3	2 (4%)	1 (2%)	1.8%	-	1 (3.4%)	4.5%	2 (8.7%)	-
Type of alcohol									
Beer	23	2 (4%)	21 (41%)	21.4%	1 (3.7%)	11 (37.9%)	25.0%	1 (4.3%)	10 (47.6%)
Wine	44	22 (44%)	22 (44%)	43.8%	11 (40.7%)	13 (44.8%)	43.2%	11 (47.8%)	8 (38.1%)
Spirits	20	8 (16%)	12 (24%)	19.6%	3 (11.1%)	8 (27.6%)	20.5%	5 (21.7%)	4 (19%)
Mixes	8	3 (6%)	5 (10%)	7.1%	2 (7.4%)	2 (6.9%)	9.1%	1 (4.3%)	3 (14.3%)
Do not drink	31	23 (46%)	8 (16%)	30.4%	14 (51.9%)	3 (10.3%)	31.8%	9 (39.1%)	5 (23.8%)
Did not answer	3	1 (2%)	2 (4%)	3.6%	-	2 (6.9%)	2.3%	1 (4.3%)	-
Quantity of alcohol									
1 glass	25	13 (26%)	12 (24%)	30.4%	9 (33.3%)	8 (27.6%)	18.2%	4 (17.4%)	4 (19%)
2 - 3 glasses	33	12 (24%)	21 (41%)	32.1%	4 (14.8%)	14 (48.3%)	34.1%	8 (34.8%)	7 (33.3%)
4 - 5 glasses	6	1 (2%)	5 (10%)	5.4%	1 (3.7%)	2 (6.9%)	6.8%	-	3 (14.3%)
4 - 6 cans	1	-	1 (2%)	-	-		2.3%	-	1 (4.8%)
1- 2 jugs	3	-	3 (6%)	1.8%	-	3 (10.3%)	4.5%	-	1 (4.8%)
Do not drink	31	23 (46%)	8 (16%)	30.4%	14 (51.9%)	3 (10.3%)	31.8%	9 (39.1%)	5 (23.8%)
Did not answer	3	2 (4%)	1 (2%)	1.8%	-	1 (3.4%)	4.6%	2 (8.7%)	-

4: 8 Food Labels

Figure 4: 26 show that the majority of subjects read food labels, checking the fat, carbohydrate and sugar content. Figure 4: 27 reports that the majority found label reading helpful.

Figure 4: 26 Macronutrients Checked on Food Labels by Subjects
females n = 50 males n = 50

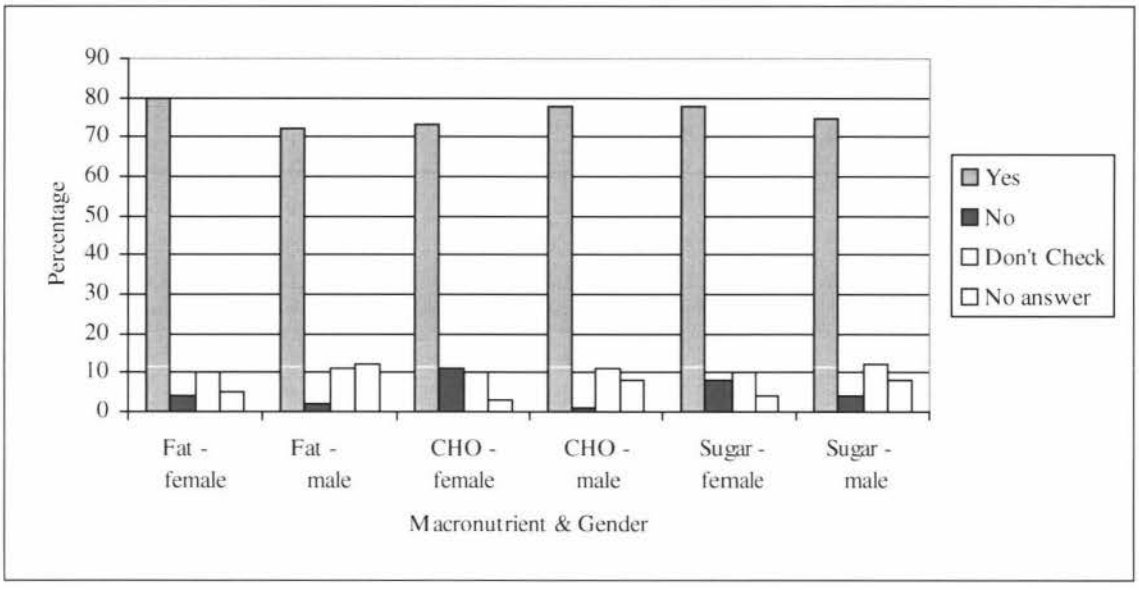
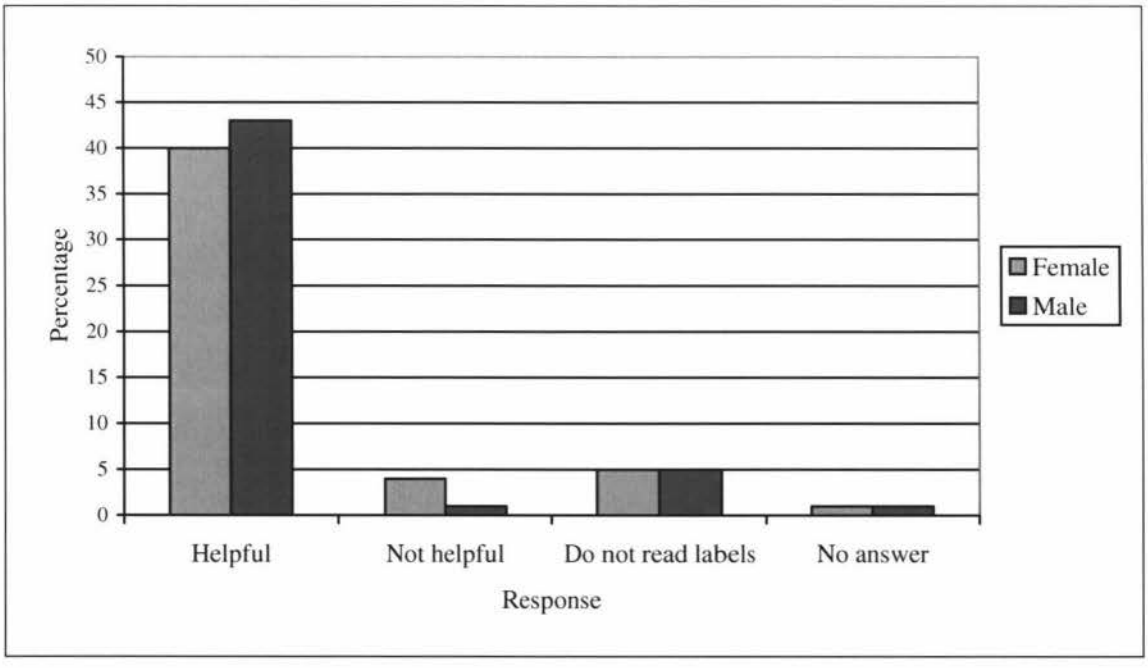


Figure 4: 27 Usefulness of Label Reading for Subjects
females n = 50 males n = 50



4: 9 Physical Activity

Research subjects reported a great variation in the number of times per week that they participate in physical activity. Males were more likely to undertake daily exercise, and the majority took part in some form of exercise three or more times a week. More females were likely to exercise only occasionally compared with men as seen in Figure 4: 28.

Figure 4: 28 Frequency of Exercise as Reported by Subjects
females n = 50 males n = 50

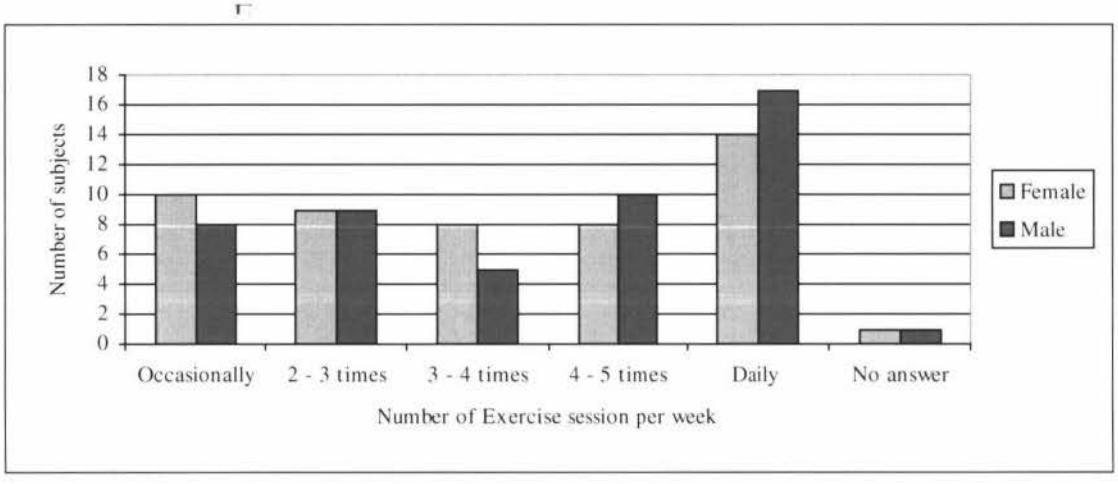
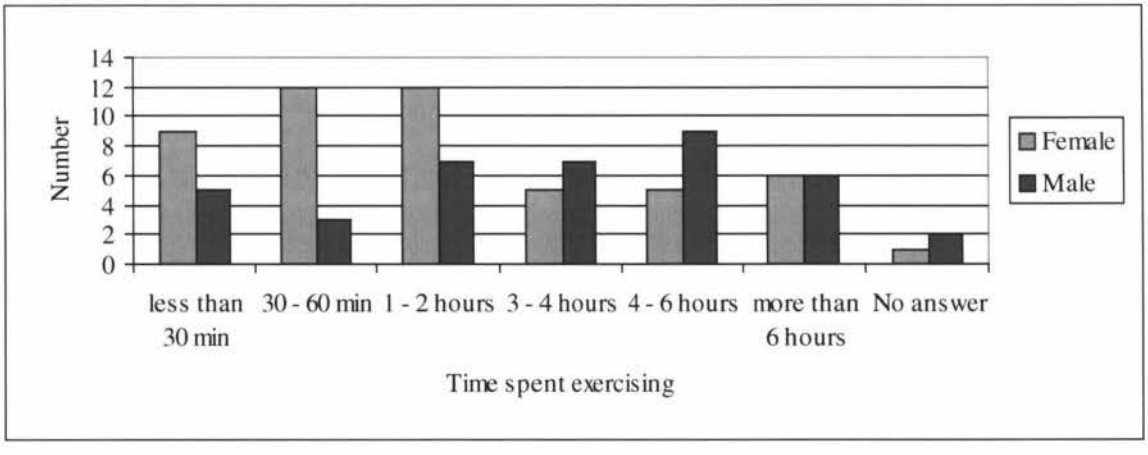


Figure 4: 29 reports the number of minutes spent in physical activity per week and reveals that approximately 50% exercised less than two hours a week.

Figure 4: 29 Time Spent in Exercise per Week
females n = 50 males n = 50



A question on changes made since becoming aware of lipid profile (question 24 p189) revealed 63% (32 females and 31 males) reported an increase in exercise. Only 4% (one female and three males) had decreased their level of exercise and 33 % (17 females and 16 males) did not answer the question.

Figure 4: 30 shows that walking was the most popular form of exercise.

Figure 4: 30 Type of Exercise Chosen
n = 100

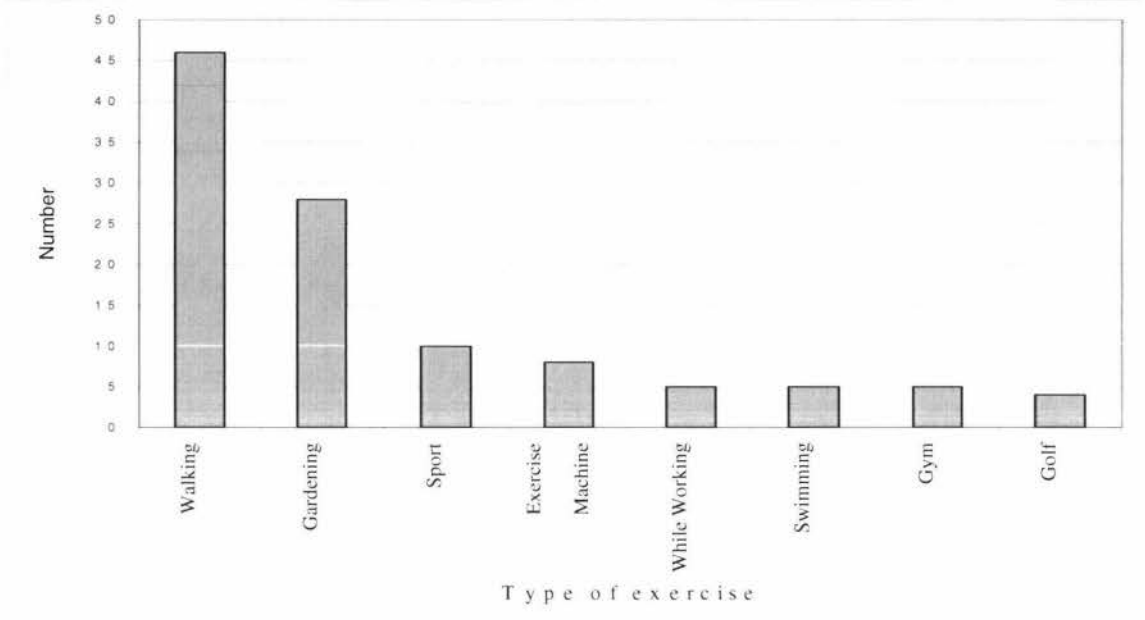
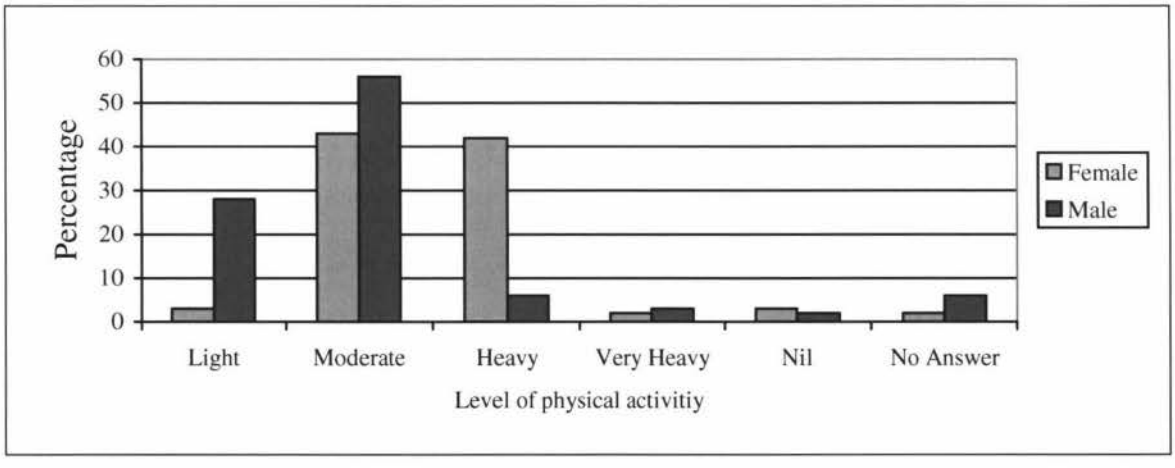


Figure 4: 31 shows that the level of physical activity varied considerably with the majority taking part in moderate intensity exercise but females were more likely to participate in an exercise that was considered heavy.

Figure 4: 31 Energy Level of Physical Activities Subjects Chose
Females n = 50 males n =50



Activities were classified according to their "metabolic equivalent" (MET) value that is the multiple of the resting metabolic rate for an exercise. Thus one MET is equivalent to the resting oxygen consumption for an average man or women. MET values increase with the intensity of exercise. For females; light exercise ranged between 1.2 – 2.7 METs and includes housework and slow walking; medium exercise 2.8 – 4.3 METs includes gardening, walking at moderate speed, dancing and child care; heavy exercise 4.4 – 5.9 METs includes mowing lawns, heavy gardening, stationary cycling and golf and very heavy exercise >6.0 METs (McArdle 1991). For males; light exercise ranged between 1.6 – 3.9 METs and includes walking and household activities; moderate exercise 4.0 – 5.9 METs includes mowing lawns, gardening, golf, cricket, stationary cycling; heavy exercise >6.0 METs includes carpentry, and very heavy >8.0 METs includes cycling, circuit training, sport and swimming.

A comparison between the frequency of exercise and biochemical indices and BMI is seen in Table 4: 22. There was no significant difference between any of these.

Table 4: 22 Frequency of Exercise compared with Mean Body Mass Index and Biochemical Indices
n = 100

	Exercise Daily n = 31	Exercise Occasionally n = 18
BMI	31.8	35.8
HbA1c %	7.1	7.1
HDL mmol/l	1.2	1.3
LDL mmol/l	2.9	2.6
Triglyceride mmol/l	1.7	1.6

Table 4: 23 shows a comparison between the amount of exercise and BMI and indicates that the overweight group exercise the most frequently.

Table 4: 23 Frequency of Exercise Compared with Body Mass Index at Follow up
n = 100

Frequency of Exercise	Obese n = 57 BMI >30	Overweight n = 21 BMI 25 – 30	Ideal Weight n = 5 BMI 18.5 - 25
Daily	23%	48%	20%
4 – 5 times a week	16%	29%	40%
3 – 4 times a week	14%	10%	20%
2 – 3 times a week	23%	10%	
Occasionally	21%	5%	20%

The frequency of exercise was compared to the self-reported level of education in Table 4: 24. It shows that 76% of those with degrees do exercise on 3 or more days of the week but the number drops to 66 % for those with a technical or trade certificate, to 57% for those with 3 years or less secondary education and still lower to 53% for those with three years or less of secondary education.

Table 4: 24 Frequency of Exercise Compared with Level of Education

Frequency of Exercise	3 years or Less of Secondary Education n = 34	>3 years Secondary Education n = 23	Technical or Trade Certificate n = 23	Degree n = 17
Daily	9 (26%)	6 (26%)	9 (39%)	5 (29%)
4 – 5 times a week	5 (15%)	3 (13%)	4 (18%)	5 (29%)
3 – 4 times a week	4 (12%)	4 (18%)	2 (9%)	3 (18%)
2 – 3 times a week	9 (26%)	6 (26%)	2 (9%)	1 (6%)
Occasionally	5 (15%)	4 (17%)	6 (25%)	2 (12%)

Subjects who spend three or more hours per week exercising are more likely to have a technical or trade certificate or a degree as seen in Table 4: 25.

Table 4: 25 Relationship of Time Spent in Exercise per Week with Level of Education

	3 years or Less of Secondary Education n = 34	>3 years Secondary Education n = 23	Technical or Trade Certificate n = 23	Degree n = 17
< 30 minutes	6 (18%)	2 (9%)	3 (13%)	2 (12%)
30 – 60 minutes	6 (18%)	5 (22%)	2 (9%)	2 (12%)
1 – 2 hours	6 (18%)	6 (26%)	4 (18%)	3 (18%)
3 – 4 hours	5 (15%)	1 (4%)	1 (4%)	4 (24%)
4 – 6 hours	2 (6%)	1 (4%)	6 (26%)	4 (24%)
> 6 hours	8 (24%)	8 (35%)	6 (26%)	1 (6%)

Table 4: 26 shows the weight category of those who exercised for 3 or more hours per week; 37% were obese, 76% overweight and 80% ideal weight. Whereas Table 4: 27 compares the frequency of exercise with changes in weight in obese subjects between referral and follow-up, (83% of follow-up weights and 68% of referral weights were

available). In obese subjects who exercised less then three hours a week, 27% gained weight, 59% lost and 13% remained the same.

Table 4: 26 Time Subjects Spent in Exercise per Week Compared with Body Mass Index at Follow Up
n= 100

Minutes	Obese n = 57 BMI >30	Overweight n = 21 BMI 25 – 30	Ideal Weight n = 5 BMI 18.5 – 25
<30 minutes	16%		20%
30 – 60 minutes	19%	10%	
1 – 2 hours	25%	14%	
3 – 4 hours	11%	5%	20%
4 - 6 hours	12%	28%	
> 6 hours	14%	43%	60%

Of those who did three or more hours of exercise a week, 12% gained weight, 68% lost weight and 20% remained the same.

Table 4: 27 Frequency of Exercise with Change in Weight of Obese Subjects Between Referral and Follow Up (BMI >30)

		Same Weight	Lost Weight	Gained Weight
Daily exercise	n =29	7%	17%	7%
4 – 5 times a week	n=18	11%	28%	6%
3 – 4 times a week	n=13	8%	53%	
2 – 3 times a week	n=18	17%	44%	11%
Occasional	n=10	10%	50%	40%

Table 4: 28 compares the frequency of exercise with changes in weight of overweight subjects. In overweight subjects who exercised less than three hours a week there were insufficient numbers to show a trend, but in those who exercised three or more hours a week 8% gained weight, 60% lost weight and 25% remained the same.

Table 4: 28 Frequency of Exercise with Change in Weight of Overweight Subjects Between Referral and Follow Up (BMI 25 – 30)

		Same Weight	Lost Weight	Gained Weight
Daily exercise	n=7	29%	71%	
4 – 5 times a week	n=6	16%	50%	16%
3 – 4 times a week	n=2		50%	
2 – 3 times a week	n=2		50%	50%
Occasional	n= 0			

4: 10 Health and Medication

4: 10.1 Complications

Figure 4: 32 shows that the most common complications were obesity, hypertension and hyperlipidaemia with similar numbers of each.

Figure 4: 32 Frequency of Complications Associated with Diabetes
females n = 50 males n = 50

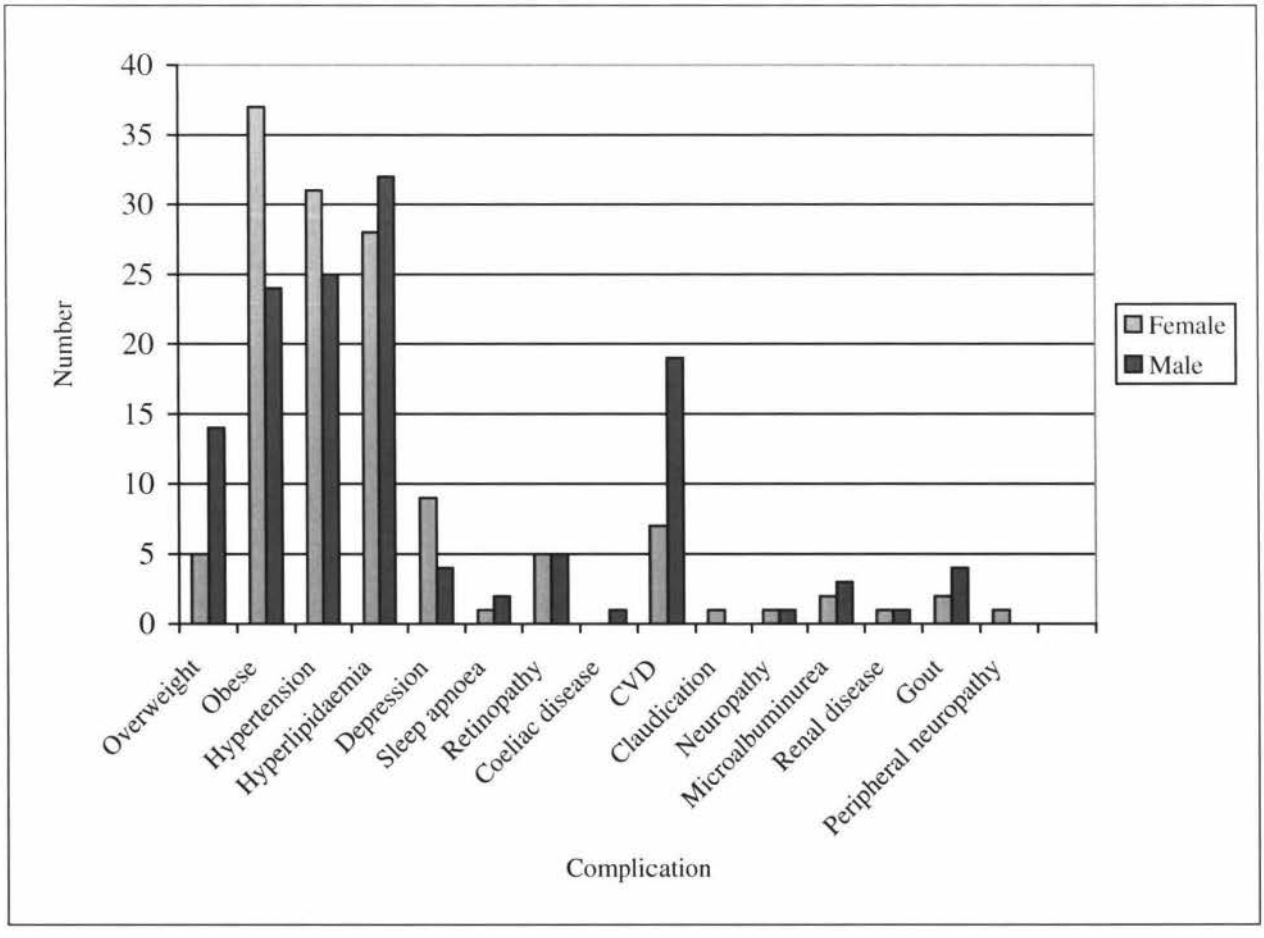


Table 4: 29 compares the years since subjects were diagnosed with diabetes, HbA1c at follow-up and the number of complications. It shows that subjects' who had been diagnosed since 2000 are much more likely to have an HbA1c within the target range and subjects diagnosed prior to 2000 an HbA1c >7.5%. There was less of a correlation between hypertension and the length of time since diagnosis. Subjects who had been diagnosed for more than two years were more likely to have dyslipidaemia, retinopathy, microalbuminurea and gout with the percentage increasing with the number of years since diagnosis. Depression was more common in those newly diagnosed, and obesity was a frequent complication in all groups.

4: 10.2 Medications

The mean number of medications per subject was 7.5, and Figure 4: 33 shows that only one subject was not taking medication for either diabetes, cholesterol, hypertension or depression. The number of different types of medications taken by the subjects is shown in Figure 4: 33. Table 4: 30 shows that 83% took oral medications to reduce blood glucose levels and 39% took insulin. Cholesterol lowering medication and anti-hypertensive medication were taken by 61%, a smaller percentage took Cartia (aspirin) with only a few taking antidepressants.

Figure 4: 33 Number of Medications Taken by Subjects
n = 100

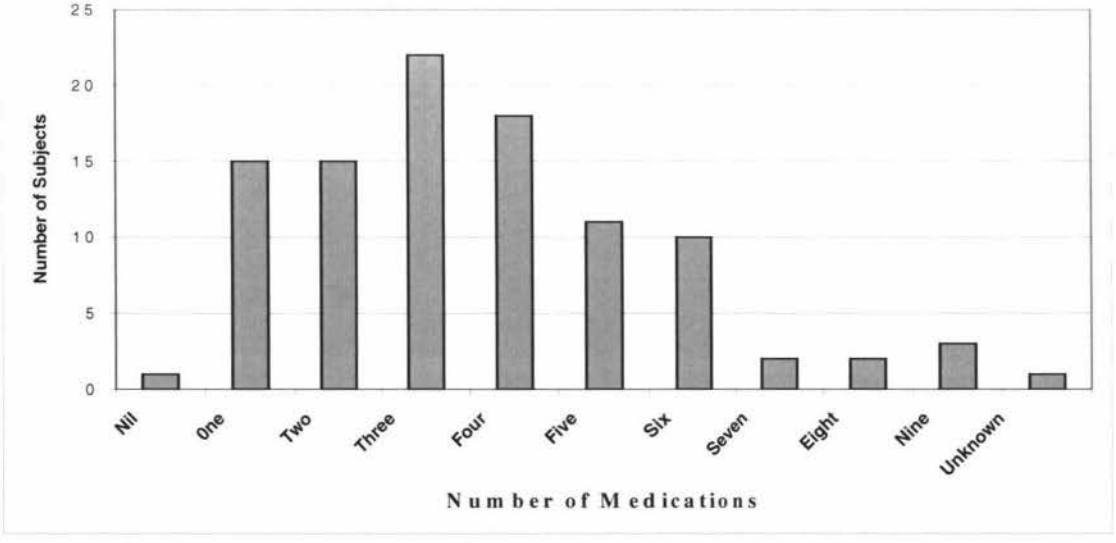


Table 4: 29 Comparison of Time since Diabetes Diagnosis, with % HbA1c and Number of Complications

	HbA1c			Complications							
Year of diagnosis	**< 7.0 %**	**>7.0 – < 7.5%**	**>7.5%**	**Hypertension**	**Dyslipidaemia**	**Depression**	**Obesity**	**Retinopathy**	**Micro-albuminuria**	**Gout**	**Nil**
2003 2004 n=42	31 (74%)	9 (21%)	2 (5%)	29 (69%)	23 (55%)	5 (11.9%)	22 (52%)	-	-	-	13 (31%)
2000 – 2002 n=20	15 (75%)	2 (10%)	3 (15%)	11 (55%)	13 (65%)	4 (20%)	14 (70%)	2 (10%)	1 (5%)	1 (5%)	1 (5%)
1996 –1999 n=10	2 (20%)	3 (30%)	5 (50%)	6 (60%)	8 (80%)	1 (10%)	6 (60%)	1 (10%)	-	2 (20%)	1 (10%)
1990 – 1995 n=11	3 (27%)	2 (18.%)	6 (54%)	4 (36%)	5 (45%)	1 (9%)	7 (64%)	1 (9%)	1 (9%)	1 (9%)	3 (28%)
< 1990 n=12	4 (33%)	2 (17%)	6 (50%)	11 (92%)	10 (83%)	2 (17%)	8 (67%)	6 (50%)	3 (25%)	2 (17%)	0

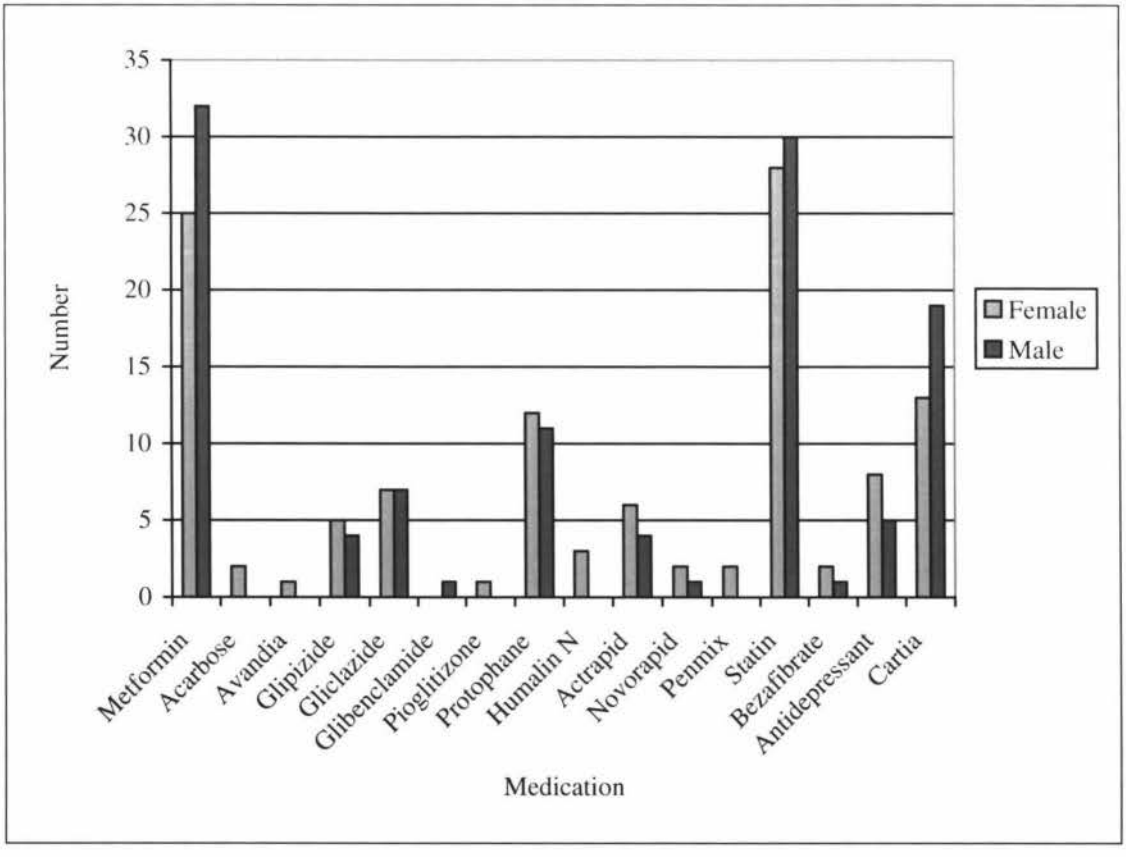
Table 4: 30 Comparison of Time since Diabetes Diagnosis, % HbA1c and Number of Medications.

	HbA1c			Medication							
Year of diagnosis	**< 7.0 %**	**>7.0 – < 7.5%**	**>7.5%**	**Biguanide (Metformin)**	**Sulphonylureas**	**Glitazon**	**Acarbose**	**Intermediate Insulin**	**Regular/ Fast Acting Insulin**	**Penmix Insulin**	**Nil**
2003 2004 n=42	31 (71%)	9 (21%)	2 (5%)	27 (64%)	7 (16.6%)	-	-	-	-	-	15 (36%)
2000 – 2002 n=20	15 (75%)	2 (10%)	3 (15%)	13 (65%)	4 (20%)	-	1 (5%)	4 (20%)	2 (10%)	1 (5%)	3 (30%)
1996 –1999 n=10	2 (20%)	3 (30%)	5 (50%)	4 (40%)	4 (40%)	1 (10%)	1 (10%)	4 (40%)	3 (30%)	1 (10%)	2 (20%)
1990 – 1995 n=11	3 (27%)	2 (18%)	6 (54%)	6 (54%)	6 (54%)	2 (18%)	-	8 (73%)	4 (33%)	-	-
< 1990 n=12	4 (33%)	2 (17%)	6 (50%)	7 (58%)	2 (17%)	1 (8%)	-	8 (67%)	4 (33%)	1 (8%)	-

4: 10.3 Comparison of the Relationship of Duration of Diabetes to % HbA1c, Complications and Medications

As seen in Table 4: 30 research subjects who had been diagnosed during the previous two years frequently had good control (HbA1c between 6–7 %) without diabetes medication or with Metformin only. Only a small number required sulphonylureas and no one took insulin. Subjects who had been diagnosed for between two and four years generally had well-controlled diabetes but were more likely to be taking sulphonylureas with added exogenous long and short acting insulin's. By the time subjects had been diagnosed for between five and eight years diabetes control had deteriorated with 80% having sub-optimal control at referral regardless of an increase in the number taking exogenous insulin. Many of those diagnosed for nine to fourteen years also had sub-optimal control and many more were requiring insulin. Similar results were seen in subjects who had been diagnosed prior to 1990.

Figure 4: 34 Type of Medications Taken
Female n = 50 male n = 50



Chapter 5

Discussion

5: 1 Demographics

5:1.1 Education

Females with 3 years or less of secondary education were over represented in both group and individually educated groups. The greatest difference was in those receiving group education where there were 16% more females with little formal education, compared to only 2% more in the individual education group. The difference was less pronounced in those having > 3 years secondary education. More males were in the technical, trade certificate, degree or higher qualification groups. The level of education did not appear to influence whether the subjects chose group or individual appointments. (see Table 4:1)

5:1.2 Employment Status

Sixty five percent of subjects were in employment (24 females and 41 males). Approximately equal numbers of subjects in employment attended group and individual appointments, however more employed part-time attended daytime individual appointments, probably due to a shorter working day allowing more flexibility. The two self-employed people attended group education sessions and this could be due to work demands. Table 5: 1 shows that there were fewer subjects in full employment than the national average but more in part-time positions. There was a similar number not in the work force and with 3 years or less of secondary education in the study as in the national average. However there was a much greater number of women in employment than found in Central Auckland where other research showed: 21% were in full employment (study 26%), 20 % part time (study 22%), and 53% not employed (study 16%) (Sanderson 2005). This could be partly due to only including Europeans in this study.

Table 5:1 Employment Status of Subjects Compare to the National Statistics
n = 100

	Full Time Employment	Part Time Employment	Not in Work Force	On a Benefit	3 years Secondary Schooling
***NZ 2001 Statistics**	75%	6%	33%	16%	33%
Study population	51%	14%	34%	10%	34%

Source: * New Zealand Census (2001)

5: 1.3 Family History of Diabetes

Sixty four percent of research subjects reported having a family member with type 2 diabetes, 29% a mother, 11% a father, 17% sibling, 17% a grandparent, and 13% a cousin. Another 15% reported no family history, but 8% did not know and 13% did not answer (Figure 4: 2), thus the percentage with a family member could have been even higher. Research on 2113 people in Italy who all had type 2 diabetes showed that 25.5% had a mother with diabetes, 6.5% a father and 21.2% another relative with diabetes (Bo et al 2000). The different cultural and ethnic mix in this latter study may account for the different results.

The Diabetes Foundation (2004) reported the risk of developing type 2 diabetes as seen in Table 5: 2.

Table 5: 2 Risk Factors in the Development of Type 2 Diabetes

	Age	Risk Factor
1 parent with diabetes	<50 years	1 in 7 (14%)
1 parent with diabetes	> 50 years	1 in 14 (7%)
Both parents with diabetes		1 in 2 (50%)
Identical twin with diabetes		3 in 4 (75%)

Source: Diabetes Foundation (2004)

Another study found that early onset of type 2 diabetes was associated with a parental history of diabetes and adds that obesity increased risk (Ng et al 2001). Shuldineret et al (2004) believes that the increased risk might be 'inherited susceptibility' and/or shared behaviours and environmental exposure including diet, tobacco use and

sedentary lifestyle. Certainly this study would confirm this with 64% having a relative with diabetes. Fifteen percent of subjects reported that they did not have a family history of diabetes, but this could be due to the relative having died or having not spoken of the diagnosis.

In this study 29% of subjects had a mother with diabetes, and as research has shown, this could be due to the an increased risk from women with diabetes passing on the genetic predisposition to the disease to their offspring, especially if they have been unable to control their blood glucose levels or/and had an excessive weight gain during pregnancy (Silverman et al 1995). The risk of the offspring developing diabetes is significantly higher when the mother has already been diagnosed with diabetes (Dabelea et al 2000, 2001, Pettitt et al 1988). There is also an added risk of obesity in offspring especially during the first 20 years of life and Dabelea adds that this could be confounded by genetic factors as women who develop diabetes when younger often have more diabetes susceptibility genes. Pettitt further showed a clear association between exposure to maternal diabetes in utero and an early diagnosis of diabetes in maturity onset diabetes of the young caused by mutations in the HNF-1 gene. There is no increased risk if the father has been diagnosed. It remains to be seen if a degree of glycaemic control can be achieved throughout pregnancy, whether that would decrease the degree and prevalence of obesity and type 2 diabetes in future generations (Dabelea et al 2000).

The high number of siblings with diabetes in this study (17%) could be a consequence of the same inter-uterine experience. Williams (2003) reports that if a sibling has diabetes, even in the absence of parental history, there is a five-fold increase risk of developing diabetes in pregnancy and 20 – 50 % would eventually develop diabetes. Pettitt (2000) at an American Diabetes Conference lecture the researcher attended reported that 10% of women who had gestational diabetes would develop diabetes with in 4 months with the number increasing by 10% each year until 50% had type 2 diabetes. Similar results were found in Hoffman et al (1998) research.

5: 2 Anthropometrics

5: 2.1 Age at Diagnosis

As subjects had all been diagnosed with type 2 diabetes and this is a disease where the prevalence increases with age, it could be expected that the number would increase with age (Narayan et al (2003). Thus it is not surprising that by 29 years of age only three had been diagnosed, and another six by 39 years. There were more females in the 30 – 39 year age group and this could be due to the increased risk of diabetes developing during pregnancy due to the body's increased demand for insulin and an increase in insulin resistance (Hod 2002). Although a high percentage of women who have had gestational diabetes no longer have diabetes after delivery, there are a few who still have either impaired glucose tolerance, impaired fasting glucose or type 2 diabetes. Up to 50% develop diabetes in the next five years (Bloomgarden 2000 quotes 47%) and this rises to 70 – 80% if there is significant weight gain (Ryan 2003). However Hod (2002) states that women who require insulin during pregnancy have a 50% risk of developing diabetes within 5 years but if dietary control alone is sufficient they have a 60% risk with in 10 – 15 years. There is also a 50% risk of diabetes in subsequent pregnancies. Bloomgarden puts the risk at 30 – 70%. Pallardo et al (1999) data suggest that regardless of obesity and severity of gestational diabetes, a beta-cell defect increases the risk of postpartum diabetes.

In this study diagnosis was commonly made between 40 – 59 years (72%) with only 13 % being diagnosed between 60 – 65 years. Research shows that the average adult has a significant chance of developing diabetes in their lifetime, approximately 32.8% for males and 38.5% for females with females having a higher risk at all ages. At the age of 60 years the level of risk decline to 18.9% for males and 22.4% for females (Narayan et al 2003). Similar to this study that shows that most were diagnosed during their 40 – 50's.

The New Zealand Guideline (2003) states that the mean age of diagnosis for European females was 54.2 years and males 53.8 years. In this research population the mean for females was 56.1 years and for males 55.8 years. The difference would be due to limiting the age range of the research population.

5: 2.2 Obesity

Obesity is known to be a risk factor for diabetes therefore it is not surprising that in the research population only 10% had a BMI within the healthy weight range at follow up. The Nurses Health Study reports that obesity increases the risk of diabetes 11.2 fold (Hu 2003). When BMI is above 33 - 34kg/m², the risk of diabetes is 93 fold higher in women compared to women of ideal weight (Ministry of Health 2002). The risk of diabetes following gestational diabetes increases two to three fold with a 6.8 kg weight gain and sixfold with a 15 kg weight gain during adult life (Bloomgarden 2000).

The concept of obesity as a risk factor is upheld by the findings of this research. Table 5: 3 shows that the research population was much heavier than the subjects who participated in the national nutrition survey. In this study the mean BMI at referral for females was 37.98 kg/m² and 34.02 kg/m².

Table 5: 3 Comparison of Percentage Overweight / Obese in Study Subjects in the New Zealand National Nutrition Survey
n = 100

	Overweight BMI 25 - 30		Obese BMI > 30	
	Female	**Male**	**Female**	**Male**
Research participants at referral	10%	22%	66%	48%
***National Nutrition Survey 1997**	38.9%	50%	21.7%	17.3

Source: * Ministry of Health (1999 a)

The mean BMI from the Ministry of Health (1999 a) National Nutrition Survey for Europeans over the age of 45 years for females was 26.9kg/m² and males 26.7kg/m². Thus the research population was considerably more overweight /obese however this is not surprising as all literature on type 2 diabetes states that obesity is one of the major risk factors.

As mentioned in 2: 8 future focus needs to be on prevention of diabetes therefore on obesity prevention and an increase in physical activity from the cradle to the grave. Bloomgarden (2004) quotes Cathy Nonas, director of the diabetes and obesity programmes at North General Hospital in New York City, who reiterates this view and emphasises that achieving a desirable weight through calorie restriction plus exercise is

the most important goal of intervention. She adds that it does not matter 'whether it's higher fat, whether it's lower 'carb', whether it's lower protein, they all seem to have a good effect where there's a weight loss'. The goal being to lose five to seven percent of body weight. Franz (2003) believes the goal should be to loose five to ten percent of body weight. Wadden (2005) adds that peak weight loss occurs within the first six months of treatment but that frequently there is weight regain of 30 – 35% within a year but regain plateaus after the first year. However after five years of follow-up as many as 50% of patients will have returned to baseline weight. Hill and Wyatt (2002) state that achieving and maintaining weight loss is more likely to be successful when there is a physician-patient partnership where the physician provides support and motivation for the patient's effort to initiate and maintain a healthy body weight. The researcher's experience also confirms that patients are more likely to lose weight if they have on going support and encouragement of a health professional.

5: 3 Biochemical Indices

5: 3.1 Glycosylated Haemoglobin A1c

The mean drop of HbA1c at follow up was 0.92% for females, 1.36% for males, 1.2% for group therapy and 1.1% for individually educated subjects. In all groups there was a significant drop in HbA1c ($p = < 0.001$). Campbell et al (1996) compared minimal group programme and individual programmes and also found a reduction HbA1c with no significant difference between the two. A randomised control trial compared the effectiveness of group education compared to individual education and also found glycaemic control improved in both groups with a slightly more marked reduction in the group setting (Rickheim et al 2002) and thus similar results to this study.

The United Kingdom Prospective Diabetes Study reported that a drop of 1% HbA1c reduces the risk of diabetes related end-points by 21%, heart failure by 16%, myocardial infarction by 14%, stroke by 12%, diabetes related death by 21%, all cause mortality by 14%, amputation by 43%, cataract extraction by 19% and microvascular disease by 37% (UKPDS 2000 b). Thus the drop in HbA1c seen in this study would have a huge impact on the health outcomes of these subjects. Table 5: 4 also shows the effect of improved glycaemic control on health outcomes in three studies.

Table 5: 4 Studies Showing Reduction in HbA1c Reduces Complications

	+ DCCT	* Kumamoto	# UKPDS
Drop in HbA1c	9 to 7%	9 to 7%	8 to 7%
Reduction in Retinopathy	63%	69%	17 – 21%
Reduction in Nephropathy	54%	70%	24 – 33%
Reduction in Neuropathy	60%	-	-
Reduction in Macrovascular disease	-	54%	16%

Source: +.Diabetes Control and Complications Trial Research Group. (1993). *New English Journal of Medicine*, 329, 977 - 986
*.Ohkubo et al (1995) *Diabetes Research & Clinical Practice*, 28, 103 – 117.
#.United Kingdom Prospective Diabetes Study Group. (1998 b) *Lancet*, 352, 837 – 853

In this study 55 % of subjects achieved an HbA1c of <7%, which compares with results of a Minnesota study of 345 people with diabetes, of similar age, where 56% achieved an HbA1c of <7% at 6 month follow-up (Bergenstal 2005). A study carried out in the United States to ascertain the quality of care of 1765 people with diabetes found only 34% achieved this level (Grant et al 2005).

Although a reduction in BMI is associated with an improved HbA1c Table 4: 5 shows that it is still possible to achieve good control when BMI is > 40 kg/m² and only 33% of those with a BMI of < 25 kg/m had well controlled diabetes at follow-up.

This research shows that the level of formal education is not an indicator of glycaemic control. Subjects who had reached target HbA1C (<7%) at follow-up consisted of 62% of those who had had three year or less of secondary education, only 30% of those with three to five years secondary education, 52% of those with a technical or trade certificate and 59% of those with a degree as seen in Table 4: 6. This could be a attributed to the considerable emphasis that is placed upon providing material at the appropriate literacy level at Counties Manukau.

In this study females mean weight loss at follow-up was 5 kg and males 4.8 kg but this did not reach statistical significance. However this weight loss was sufficient to greatly improve HbA1c (Table 4: 4) as 5% weight loss leads to a 0.6% reduction in HbA1c (UKPDS 1998 c) and also decreases fasting glucose, decreases hepatic glucose production and triglycerides and improves insulin sensitivity and secretion (JCEM 1993).

5: 3.2 Lipids

The New Zealand Guideline (2003) state that everyone with diabetes is classified as at high cardiovascular risk with morbidity and mortality from cardiovascular disease being two to five times higher than those without diabetes.

In this study there was a mean drop in total cholesterol of 1.0 mmol/l for females and 1.2 mmol/l for males at follow up, which would certainly contribute to a reduction in cardiovascular disease risk. The mean drop for group and individual therapy was the same 1.1 mmol/l. There was a significant drop in total cholesterol from referral to follow up ($p = < 0.001$) but the difference between female/males and group/individual education did not reach statistical significance. Mean high-density lipoprotein levels remained the same at follow up. The drop of low-density lipoprotein from referral to follow up was highly significant ($p = <0.001$) for both group and individual therapy groups. The mean at follow up for males was 2.6 mmol/L and for females 2.8 mmol/L a drop sufficient to greatly reduce the risk of cardiovascular disease for these subjects. This research showed that 40% achieved the goal of low density lipoprotein < 2.5mmol/l whereas research in the United States on 1765 patients with type 1 and 2 diabetes from a medical centre achieve 46% (Grant et al 2005). This difference could be a consequence of Grant's research population including people with Type 1 diabetes who are less likely to have metabolic changes that result in elevated lipids.

The triglyceride levels of subjects triaged to group education were considerably higher than those attending individual education (mean 3.6 mmol/l compared to 2.3 mmol/l). This could be a consequence of a number of the group therapy subjects having only recently been diagnosed and consequently their elevated HbA1c impacts on triglyceride levels. When insulin levels are low, lipoprotein lipase, which facilitates the transport of triglycerides into adipose tissue, is not activated therefore plasma triglycerides are elevated (Mahan 2000).

The recommendation for lipid profiles varies slightly between countries although < 1.7 mmol/l for triglycerides is the same for the countries shown in Table 5: 5.

Table 5: 5 Recommended Lipid Levels

	Total Cholesterol mmol/l	HDL Cholesterol Mmol/l	LDL Cholesterol mmol/l	Triglyceride mmol/l
+ New Zealand Guideline	< 4.0	>1.0	<2.5	<1.7
* European Guideline	<4.8	>1.1	<3.0	<1.7
# American Diabetes Association	<5.2	>1.1		<1.7

Table 5: 6 shows the slightly different guidelines for fat intakes in different countries.

Table 5: 6 Recommended Fat Intake

	Total Fat % Total Energy	Saturated Fat % Total Energy	Polyunsaturated % Total Energy	Monounsaturated % Total Energy
+New Zealand Guideline 2003	Up to 35%	<7%		>10%
* European Guideline	<35%	<10% < 8% may be beneficial	<10%	10 – 20 %
#American Diabetes Association	<30%	<10%	>10%	

Source: + New Zealand Guideine (2003) Best Practice Evidence-based Guideline Management of Type 2 Diabetes.

* Mann.J. (2004) European Association for the Study of Diabetes. *Nutrition, Metabolic and Cardiovascular Disease*

American Diabetes Association (2004). Nutrition Principles and Recommendations in Diabetes (position statement). *Diabetes Care*. 27 (Suppl. 1). 36 – 46.

5: 4 Self-Empowerment

Empowerment is defined as an educational process designed to help patients develop the knowledge, skills, attitudes, and degree of self-awareness necessary to effectively assume responsibility for their health-related decisions (Day 2000). As the patient provides 98% of diabetes care, the locus of control and decision-making in the daily treatment of diabetes should be the patients (Anderson 2002).

5: 4.1 Home Blood Glucose Monitoring

Self-empowerment is essential if patients are to achieve the recommended indices of control. Because our health care system is designed to deliver acute symptom driven care, it is poorly configured to effectively treat chronic diseases such as diabetes (Funnell et al 2004). Home blood glucose monitoring therefore is the most important

marker of control (Diabetes Forecast 2005). One of the aims of this research was to ascertain the subjects understanding of the importance of home blood glucose monitoring. The majority of subjects tested their blood glucose levels and all found the information helpful. The timing and frequency varied considerably and there was no relationship between the number of testing days and HbA1c control. Those testing daily were no more likely to have good control than those testing twice a week. Harris (2001) reported similar results as she found little relationship between frequency of testing and HbA1c levels. However she found that self -monitoring was more common in those whose HbA1c was increasing. When the results of testing were recorded health professionals found the information valuable when adjusting therapy, both drug and nutritional (Personal communication with Whitiora diabetes service). The Joslin Diabetes Centre (2005) concurs stating that the benefits of home blood glucose testing was that it provided a snap shot of blood glucose levels, essential when adjusting treatments and when diagnosing hypoglycaemia as the symptoms of sweats and feeling tired can be due to other conditions. Blood glucose testing also identifies hyperglycaemia in illness and as a consequence of stress. The American Diabetes Association (2000 b) and the United Kingdom Diabetes (2003) NICE health technology appraisal was also in favour of home blood glucose monitoring to enable people with diabetes to be actively involved in the management of the disease and comment that generally it results in greater understanding and motivation.

In this study the timing of home blood glucose testing varied considerably with pre breakfast being by far the most popular time followed by pre and two hours after dinner. Testing pre-prandially and at bed time on one or two days a week is recommended for people with stable type 2 diabetes, although for those with well controlled diabetes on diet alone or Metformin therapy a periodic HbA1c may be sufficient. If control is erratic or poor, testing before breakfast and two hours post-prandially more regularly may facilitate achieving enhanced glycaemic control. But unless the results are used to make behavioural, lifestyle or medication changes they are of little value (NZGG 2003).

Pharmac (2004) has changed the meters they will fund, to Accu-Check Advantage and Medisense Optium and strips for these meters are the only ones that will be subsidised as from 1 st April 2005. The maximum number of strips per prescription will be 50. Those who require extra strips will need another prescription. Both the New Zealand Guideline (2003) and the United Kingdom Position Paper 63 (2004) found that the cost

of blood glucose testing strips is greater than the cost of diabetes medication for people with type 2 diabetes thus both counties have decided to restrict the number of strips. It is also thought that many strips are wasted due to being over the expiry date.

5: 4.2 Hypoglycaemia

Hypoglycaemia was treated incorrectly by many of the subjects. Fourteen (58%) of the 24 subjects on insulin knew to have a simple sugar, but only four (17%) would follow up with a complex carbohydrate food. The results were even worse for the 16 subjects taking sulphonylureas as only five (32%) knew to take simple sugar and nobody knew both treatments. Although this was discussed at group education many of this population were not at risk of hypoglycaemia and thus would not have had personal experience of it. Ma et al (2005) comments that information not applicable at the time of education, is not always seen as high priority with respect to the patient's immediate circumstances e.g. how to manage a hypoglycaemic episode when well. Hypoglycaemia is a serious condition and one that all people commencing insulin and/or sulphonylureas would/should have had discussed. These results show that more emphasis should be place on education. The American Diabetes Association (1993) position paper states that because of an increased prevalence of macrovascular disease, older patients with type 2 diabetes may be more vulnerable to serious consequences of hypoglycaemia including fainting, seizures, falls, stroke, ischaemia, or sudden death. Their 2003 statement said that older patients with significant atherosclerosis might be vulnerable to permanent injury from hypoglycaemia. However Grodzicki et al (1997) states that risk of severe hypoglycaemia in type 2 diabetes is minimal and should not be used as an excuse for failing to achieve glycaemic goals. One reason that hypoglycaemia poses less of a threat in type 2 diabetes is that glucagon and epinephrine deficits are much less prominent.

Grodzicki (1997) adds that studies have reported that protein ingestion does not raise the circulating glucose concentration or raises it only modestly. A study comparing the effectiveness of a protein-enriched snack with that of a plain carbohydrate snack for the treatment of hypoglycaemia showed that the protein adds calories but does not prolong protection against subsequent hypoglycaemia. This is in keeping with current education at Counties Manukau where a low-glycaemic index carbohydrate snack is recommended.

Hypoglycaemia is more likely to occur when caloric intake is deficient, after severe or prolonged exercise, with alcohol ingestion, or when a combination of glucose-lowering drugs are used. Hypoglycaemia may be difficult to recognise in the elderly and in people who are taking beta-blockers (Grodzicki et al 1997).

5: 4.3 Hyperglycaemia

Hyperglycaemia not treated can lead to long-term complications therefore it is essential that people with type 2 diabetes take the condition seriously (NZGG 2003).

Causes are:-

- Excess carbohydrate intake. (This should be the first area examine yet was identified by only 18% of subjects)
- Forgetting medication or taking an incorrect dose.
- An infection. (Three percent of subjects suggested this)
- Sugary substance on the hands. (If there is an unexpected result it is suggested that patients wash their hands and retest)
- Outdated strips or strips that have been exposed to light can give incorrect readings. A new container of strips could be used to check results.
- Meter has not been calibrated to the strips

As a symptom of hyperglycaemia is dehydration, drinking extra water would be of value and 12% chose this. Exercise is known to reduce blood glucose levels and 14% of subjects suggested this as a method of reducing blood glucose levels (Diabetes Resource Manual 2004). The manual cautions people with diabetes that if blood glucose is >14 mmol/l fasting or >17 mmol/l random that exercise should not be taken. Thirty percent of subjects commented that it was not a problem for them or did not answer, and as 54% had an HbA1c <7% this could be correct.

5: 5 Education

Education is the key to achieving ideal control for people with type 2 diabetes thus this research looked at the process by examining where subjects were told of their diagnosis, who provided the education and who they would like to lead the education process. The majority were informed of their diagnosis by their general practitioner. Forty three percent reported that the information did not meet their needs and one commented that

the information was 'completely inadequate but the doctor gave me all they had'. Diabetes UK (2003) also reports that people generally felt under informed and unsupported in the first few days and weeks following diagnosis. In this study this was particularly so for those with type 2 diabetes seen in primary care. Another reported that there 'was not enough information and it was conflicting' and 'we must be given the same message- how to control diabetes'. Primary care must be empowered with appropriate information being made available and regular up-skilling of educators.

5: 5.1 Timing of Education

Timing of education was examined in this study. Two thirds of the research subjects wanting the information as soon as they were diagnosed, although one subject commented that it 'depends on the severity and how quickly action had to be taken'. Another suggested ' written information be given initially and a follow up appointment in one week'. One subject commented that 'too much information at one time was overwhelming'. Ma et al (2005) reports that people are more likely to learn about diabetes management at the time of diagnosis, or when they develop complications, rather than when they are well. Most of the research subjects wanted ongoing education however there was considerable variation in the frequency. One subject believed that the 'initial education should be weekly, reduced with increasing confidence and understanding until an annual review would be sufficient'. Another believed that 'diabetes education should begin in schools as part of health lessons'. The Diabetes Project Trust is doing just that with the focus being diabetes prevention and recognition of symptoms. This group has produced videos on diabetes prevention aimed at teenagers. (Personal communication). Subjects emphasised the 'need for people who know what they are talking about and who would listen and refer' with a reminder of 'the need for cautious education from magazines and the internet'.

5: 5.2 Preferred Educators

Subjects were asked to identify their preferred educators. Over half chose community diabetes nurse specialists and community dietitians. This result could be biased as all subjects would have had appointments with these health professionals during the previous months. Research by Rickheim et al (2002) demonstrated a 1.7% reduction in

HbA1c in the nurse-managed group compared to 0.6% reduction in the group followed by primary care physicians.

With the ever increasing number of people being diagnosed with type 2 diabetes the small number of specialists nurses and dietitians, part of the secondary health service, must rely more and more on primary care health professionals to educate people at time of diagnosis as well as those with well controlled diabetes. (South Auckland is focusing on up-skilling primary health professionals.) This allows specialist nurses and dietitians to focus on the more complex patients such as shift workers, those who have additional disease states eg gastroparesis and coeliac disease, or have developed complications.

The United Kingdom (2003) National Institute for Clinical Excellence recommends that education should be by both practise nurses and dietitians. Diabetes United Kingdom (2003) in their National Framework on Diabetes delivery strategy suggested giving advice and information through group structured education programmes. It was thought that practice nurses should lead these, as they are better educators and more adapt at helping patient understanding of the psychosocial aspects of care, than doctors.

5: 5.3 Group versus Individual Education

The International Standard Classifications of Occupations (1988) was used to stratify occupations. There were 52% of females and 44% of males who had low status occupations. Equal number of those working in the low status occupations chose to attend group education in the evening as chose individual appointment during the day. Those in the upper status occupations tended to choose the evening group sessions with fifteen females and fourteen males making this choice compared with four females and twelve males choosing the individual sessions held during the day. This could be due to the pressure of work and indicates the need to be flexible when establish education sessions.

Subjects mean drop of HbA1c from referral to follow-up (generally 3 months time frame) was 1.2% for group education (Rickheim et al 2002 reported 1.7% over 6 months) and 1.1% for individually educated subjects (Rickheim reported 0.6%) with both drops in HbA1c being highly significant ($p = < 0.001$).

The mean drop in LDL cholesterol was 0.55 mmol/l for group therapy subjects and

1.05 mmol/l for those educated individual, again both these were highly significant ($p = <0.001$). Once adequate control was achieved, many more of the group therapy subjects were discharged back to their general practitioner but generally a lesser number in the individual therapy group. This would be partly from the bias of type of patients triaged to group therapy. Once discharged the follow-up becomes a primary practice responsibility.

The United Kingdom National Institute for Clinical Excellence (2003) reports an improved BMI in those attending group education. This was also seen in this research where the mean drop in BMI from referral to follow-up for group therapy was 2.8 kg/m^2 (Rickheim reported 0.8 kg/m^2) compared to 0.9 kg/m^2 for individual therapy (Rickheim reported 1.5kg/m^2).

Of those attending group education only nine would have preferred individual appointments however there was bias as group subjects had already been asked if they would like to attend group sessions. A proportion of subjects attending individual sessions would not have been offered group sessions, as a language barrier or another compounding factor such as mental status, would have made them unsuitable.

Research by Trento et al (2003) examined the effectiveness of group education compared to one-on-one traditional education. Both groups had 56 participants and after three monthly interventions for four years, glycaemic control, blood pressure and LDL cholesterol was significantly lower in the patients participating in group than in the one-on-one care. The results of two studies are in keeping with the findings of this research. Rickheim et al (2002) study of 170 subjects compared diabetes education delivered in a group setting with an individual setting and found both equally effective at providing equivalent or slightly greater improvements in glycaemic control. The Norris (2002) meta-analysis also found no statistically significant difference in glycaemic control when comparing group versus individual delivery of education. The United Kingdom National Institute for Clinical Excellence (2003) states that education should be in groups unless the patient was considered unsuitable, a statement that the researcher would concur with.

Research by Fontbonne et al (2001) suggested that cognitive function declined in people with diabetes. However Trento et al (2004) findings were that diabetic adults were able

to acquire new knowledge and conscious behaviour, independent of schooling and age, if exposed to procedures and settings specifically tailored to their needs and characteristics through group education. In contrast patients having individual appointments experienced progressive deterioration in knowledge, problem solving ability and quality of life. Zrebiec (2003) believes that one of the primary advantages of groups are that people feel less alone, and group members learn from the insight and experience of others. Accepting information, advice or constructive criticism from others dealing with the same problem may be easier than from health care professionals. Prochaska et al (1995) when commenting on the transtheoretical model of change states that the group support concept serves to enhance the support system, which moves the patient from action to continued compliance. The researcher has also found that many subjects enjoy interactive group learning with other people with a similar chronic condition and are able to learn from each other and the interaction of the group.

Group education is considered a cost effective efficient method of educating and the emphasis needs to be in up-skilling and supporting primary care to run groups that provide appropriate consistent information. The Diabetes Projects Trust is doing just this in South Auckland and two dietitians have recently been appointed by Counties Manukau District Health Board to set up a programme of train the trainer, which will focus predominately on obesity prevention. The Diabetes Strategic Plan for Counties Manukau has identified a need to focus on 'population health' and states that there is a need for 14 dietitians to work in this area whereas at present there are 1.6 full time equivalents. In the past much of the information on healthy eating and diabetes was only available from dietitians but now with there being insufficient dietitians to educate the rapidly escalating number being diagnoses with type 2 diabetes, it is essential that information be available to the practice nurses and general practitioners with instruction as to how to get the message across.

5: 5.4 Time and Site of Education

The timing of clinics/group education revealed differing preferences with 28% preferring early evening. This included 44% of those in full time employment, 35% of self-employed and only 21% of those employed part time. This population is often required to attend regular appointments with health professionals thus it is not surprising that many would prefer appointments that do not impact on their

employment. The clinical implication of the responses to the question on timing of appointments is that clinics should be offered over a greater time period to accommodate patient preference.

Counties Manukau District Health Board is expanding clinics into primary care, which was the preferred setting for 36% of subjects, but 60% preferred community clinics. However there could be a bias with the a greater number attending community education skewing the results.

5: 5.5 Usefulness of Educational Material

The perceived usefulness of the nutritional education material varied considerable. Although group participants would have been offered all the nutritional sheets other than food photographs, many of those seen individually would have been educated using more simple methods thus biasing the results. Food preferences of subjects would have also influenced how useful they found the sheets rather than always indicating the standard of the information sheet, also adding bias. The education material found to be the most helpful was the Diabetes New Zealand Basic Food Guide and the Carbohydrate Counting Guide.

When combining the number who found the nutritional sheets 'very helpful' or 'helpful' the subjects preferences were: -

91%	the basic food guide (see Appendix 11).
80 – 89%	meal plan, carbohydrate counting, , drinks, breakfast cereals, and cheese (see Appendix 11) shopping guide (Diabetes NZ 2004 a).
70 – 80%	glycaemic index, low fat cooking, exercise, biscuits, yoghurt, (see Appendix 11).
64%	low fat takeaways (see Appendix 11).

5: 5.6 Education Medium

In this study, regardless of level of formal education, the preferred education medium was oral with one-to-one appointments, combined with written material. The researcher consistently finds a combination of oral discussion with written material is the most successful, as much of the information is new and under stress memory cannot be relied upon. Written material was preferred by ~82% of those with secondary education only

as well as those with a degree, but 96% of those with a technical trade preferred the written material. The next most popular medium across all levels of education was books with a response rate to their value only varying between 50 – 65%. The popularity of videos, and television was equal across all levels of education but videos were more popular with those with more formal education. Compact disks and the internet were less popular with subjects with three years or less secondary school education, with the trend being increased popularity with level of education, except for those with a technical trade. The latter certainly has a place in the education process, but should not be used in place of individualised educational programmes as all education must be tailored to the individual's culture, age, occupation, activity, and food preferences. Wilson et al (1993) compared group education, individual education and self-study and also found that group and individual were superior. Compact disks (CDs) may ensure instructional consistency, provision for the learner's mastery of content, provision of privacy, reduction in professional time spent presenting information and provision of accessibility when patient is ready to learn (Phillips 1999). The internet potential for use and access to information continues to grow rapidly but in this research only 37% felt it was either helpful or very helpful, which could correlate to the number with computers. Caution is essential to ensure that the site is based on scientific evidence.

Mullen et al (1985) performed a meta-analysis of education programmes for people with chronic conditions whose care included pharmacotherapy. Included were one-on-one education, group, written and other audio-visual materials and they found that the patients rating of the educational quality was the strongest predictor of knowledge. Perhaps the most important consideration is the patients' position on the cycle of change and ability to learn new concepts. Mullen adds that one-to-one consultations are the only way to ascertain the need for / and depth of education. The researcher experience concurs with this as all group patients are taught carbohydrate counting and label reading but sometimes at the individual appointment it become obvious that these concepts are too difficult and portion control is taught with the aid of food photographs.

Dietitians need to be mindful of the comment of one subject who wrote that 'too many sheets are confusing, better to give them out gradually'. Dietitians often see patients for one off appointments and try to provide a maximum of information. Ma et al (2005) reminds educators that prioritising patient education is strongly recommended as

patients are not always able to assimilate information when first diagnosed. Prioritising information reduces information overload and reduces jeopardy of missing key facts. Williams (2001) reminds educators that if primary care also has consistent appropriate information then education can be continual. This is the pathway being taken by Counties Manukau.

5: 6 Food Choices made by Subjects

5: 6.1 Lipids

5: 6. 1.1 Type of Fat Used

Result of this study revealed that subjects generally chose oil and only in small amounts. Bloomgarden (2004) comments that fatty acids have varying effects on insulin resistance, with animal studies revealing that muscle insulin sensitivity decreases with exposure to a variety of fatty acids; ω-3 fatty acids having the least effect and monounsaturated fatty acids having relatively favourable effects. There has also been a report that there is a positive correlation between trans fatty acids intake and diabetes risk (Colditz in Nurses Health Study 1997, Mann et al 2004 Lovejoy's et al 2002). Bloomgarden adds that fish oils higher in docosahexaenoic acid, such as salmon, have more beneficial effects on insulin sensitivity and a greater glycaemic effect amongst people with diabetes than do fish oils high in eicosapentaenoic acid found in tuna and mackerel. A question about fish consumption should have been included as the NZGG (2003) recommend two to three servings a week.

Lovejoy (1999) found that low-fat, high carbohydrate diets were associated with greater insulin sensitivity and postulated that saturated fat appeared to be associated with the greatest decrease in insulin sensitivity. The 'European Prospective Investigation into Cancer' in Norfolk (Harding et al (2001) showed that higher dietary fat predicted an increase in HbA1c levels in the normal population and the Health Professional' follow-up study (Cho et al 2001) commented that weight gain is the mediator of the adverse effects of dietary fat. However Noakes et al (2004) quoted a Cochrane Database systematic review of randomised controlled clinical trials of low-fat diets versus other weight reducing diets that concluded that low fat diets were no better than any calorie-restricted diets in achieving long term weight loss. Conversely Yu-Poth et al (1999)

showed that for every 1% decrease in dietary calories as total fat, there was a 0.3 kg decrease in body weight. Many studies have associated fat intake with the development of diabetes whether it be saturated or monounsaturated fat. The researcher's experience is that patients who restricted their total fat intake are more likely to lose weight and see evidence an improvement in lipid profile.

5: 6.1.2 Changes made by Subjects After they Knew their Lipid Profile

The majority of research subjects had made changes to their fat intake since knowing their lipid level. The majority appreciated the importance of lowering saturated fat intake with nobody reporting an increase intake. Twenty two percent did not answer the question about saturated fat and the number not answering increased for the questions about intake of mono and polyunsaturated fat. This indicated to the researcher that this question was not well worded and many subjects did not understand the terms used.

The New Zealand Guideline (2003) emphasised the importance of choosing appropriate types of monounsaturated and polyunsaturated fats and keeping saturated fat to <7% of total energy. This is a world-wide concept with the emphasis on reducing saturated fat and the only area in debate being the recommended energy intake from total fat as seen in Table 5: 6 (ADA 2001, Hegsted et al 1993, Schwab et al 2000).

In this study 92% of females and 82% of males had changed their intake of fat compared to the Ministry of Health (1999 a) National Nutrition Survey that reported that 76% of females and 84% males in a similar age group (45 – 64 years) thus indicating that the low fat healthy eating message is being heard.

A meta-analysis by Yu-Poth et al (1999) showed positive correlation between changes in dietary total fat and saturated fatty acids and changes in total, LDL and HDL cholesterol. Franz et al (2002) comments that reduced fat diets, when maintained long term, contribute to weight loss and lower LDL cholesterol. Three countries recommended lipid profile can be seen in Table 5: 5.

5: 6.3 Low Fat Methods of Cooking

Low fat methods of cooking were always emphasised when discussing healthy eating and the results of this study show that this message is being heard. Sixty percent of subjects were using low fat methods of cooking at least some of the time and most reported several different methods as seen in Table 5: 7. Those using oil used only small amounts. The number using high fat methods of cooking were considerable less in this study compared to the Ministry of Health (1999 a) National Nutrition Survey. Only 4% of this research population reported using fried or battered cook methods for fish compared to the National Nutritional Survey where these methods of cooking were chosen by 47% as seen in Table 5: 7.

Table 5: 7 Comparison of Fish Cooking Methods used by Subjects and New Zealand National Nutrition Survey Participants. (Expressed as a % of total subjects) (n = 100)

	Steamed/ Raw Baked /Grilled		Canned		Battered		Fried	
	F	M	F	M	F	M	F	M
+ NNS 1997 45 – 64 yrs	18 %	12 %	15 %	13 %	10 %	13%	11%	12%
Research Participants	38 %	22 %	1 %		1 %			3%

Note: F = female; M = male.
Source: Ministry of Health (1999 a)

5: 6.1.4 Takeaways

The New Zealand National Heart Foundation recommends that takeaways are avoided or eaten rarely especially if deep-fried. Lin et al (1999) report that generally meals cooked at home have a lower fat content. The Ministry of Health (1999 a) National Nutrition Survey only reports the consumption of hot chips and although this is quite different from the generic term 'takeaways' it gives some comparison of consumption with the participants in this study. Table 5: 8 shows that generally research subjects avoided takeaway foods.

Table 5: 8 Percentage of Subjects Eating Takeaways Compared to the Percentage Eating Hot Chips in the New Zealand National Nutrition Survey
Research: n = 100

	+ NNS 1997 45 – 64 yrs %	Research Participants %	Research Participants %
	(Hot Chips) 1/week	Takeaways 1 – 2 x per week	Takeaways Rarely
Females	26%	6 (12%)	30 (60%)
Males	38%	8 (16%)	25 (50%)

Source: + Ministry of Health (1999 a)

Similarly the comparison of takeaway intake between the Auckland Herald's Digipoll and the research subjects (Table 5: 9) shows that the study population ate considerably less (86% rarely or never ate takeaways) compared to 35.8% in the Herald's poll.

Table 5: 9 Comparison of the Percentage Eating Takeaways between the Herald Digipoll and Research Subjects
Research: n = 100, NZ Herald Digipoll n = 1000

Frequency	+ NZ Herald Digipoll %	Research participants %
None		30
Once a month or less/ rarely	35.8	55
More than once a month	17.6	
1 – 4 x week	42.7	14 (1 – 2x week)
Almost always	3.0	
Did not answer	0.8	1.0

Source: + New Zealand Herald 14th January (2005)

Choosing low fat food was emphasised at all diabetes teaching sessions, both group and individual, but those attending groups seem to encompassed the message to a greater extent, with an extra 8% rarely having takeaways, and 8% having takeaways less than one to two times a week.

5: 6.1.5 Spreads

The New Zealand Guideline (2003) recommend the use of monounsaturated and polyunsaturated margarine. The research subjects followed this recommendation with only one male (1%) eating butter compared to the New Zealand National Nutrition Survey (MOH 1999 a) that showed that 41% of females and 43% of males ate butter as seen in Table 5: 10. The majority used a variety of spreads therefore numbers are greater than 100.

Table 5: 10 Intake of Margarines / Butter of Subjects Compared to the New Zealand National Nutrition Survey (Expressed as a % of total subjects) (n = 100)

	Polyunsaturated Margarine %		Monounsaturated Margarine %		Low Salt Margarine %		Lite Margarine %		Butter %	
	F	M	F	M	F	M	F	M	F	M
+ NNS 1997 45 – 64 yrs	45	52	10	15	8	8	2	1	4	43
Research participants	10	13	5	10	2		9	8	1	

Note: F = female; M = male.
Source: + Ministry of Health (1999 a)

Study results in Figure 4: 14 show that many subjects were choosing lite/ salt reduced/plant sterol margarine thus taking up the healthy eating message. Surprisingly vegemite/ marmite intake (seen in Table 5: 11) was considerably less than the National Nutrition Survey but this could be due to an endeavour to reduce salt intake. Also surprising was the difference in intake of peanut butter (seen in Table 5: 11) and again the healthy eating message could be responsible, as the researcher's experience is that many patients understood that, peanut butter is a high fat food and must be limited.

The low sugar message has certainly had an impact with a dramatic drop in sweet spreads (seen in Table 5: 11) although the message from dietitians is that a thin scraping of jam/honey/marmalade on whole grain, low-glycaemic index bread is quite acceptable. Sucrose does not increase glycaemia to a greater extent than isocaloric amounts of starch (Franz et al 2002).

Table 5: 11 Spreads Eaten by the Subjects Compared to the New Zealand Nutrition Survey (Expressed as a % of total subjects) (n = 100)

	No Butter or Margarine %		Vegemite / Marmite %		Peanut Butter %		Jam Honey Marmalade %	
	F	M	F	M	F	M	F	M
+ NNS 1997 45 – 64 yrs			58	47	25	30	74	82
Research participants	5	2	9	10	5	6	4	5

Note: F = female; M = male
Source: + Ministry of Health (1999 a)

5: 6.2 Carbohydrate

Glycaemic index

Glycaemic index is a concept that has come to the fore in New Zealand and Australia, and more recently in the United States, for the treatment of people with type 2 diabetes. Liese (2003) stresses the need to dispel the myth that glycaemic index is a simple concept. The effect of a food of a given glycaemic index has three components, the glycaemic index, the number of servings ingested per day, and the quantity of carbohydrate ingested per serving, factors that can be summed up as glycaemic load.

In this study 95% of subjects who ate breakfast cereals, chose whole grain cereals with a low-glycaemic index, at least some of the time, and this could have contributed to improved glycaemic control. Franz (2003) reports that diets containing 50g fibre/day improved glycaemia and lipids. Equally pleasing was that 72% of those eating bread chose low-glycaemic index whole grain breads. Still it is important to keep in focus Brand Millers (2005) meta analysis which concluded with the statement that focused on quantity rather than glycaemic index as many people with diabetes find the low glycaemic index breads very expensive. The Ministry of Health (1999 a) National Nutrition Survey reported that 58% of females ate more than three slices of bread daily, the same percentage as in this study population. Seventy six percent of males ate more than three slices, which again is a similar percentage to this study (74%).

Pasta / Rice consumption varied considerably. Forty two percent of group subjects and 32% of those educated individually ate less than one helping a week. This could be a result of education given to group subjects on the importance of an even carbohydrate intake throughout the day and the need to have vegetables low in carbohydrate added to pasta/rice meals. Vegetables were recommended in order to expand pasta/rice meals thus reducing their carbohydrate content and energy density. Only 10.7% of group therapy subjects had three or more helpings a week compared to 25% of the individually educated group. The Ministry of Health (1999 a) National Nutrition Survey reported that 76% females and 73% male consumed at least one serving of rice or pasta a week compared to our research population where 58% of females and 66% of males consumed this amount.

5: 6.3 Protein Intake

Protein is an important component of healthy eating especially for people with type 2 diabetes as it is thought that moderate hyperglycaemia may contribute to its increased turnover (Henry 1994, Gougeon et al 1994). The American Diabetes Association recommend 15 – 20% of total energy as protein (Franz et al 2002) and the New Zealand Guideline (2003) 15 – 23%. Franz (2003) writes that the source of protein is not a concern with vegetarian diets easily meeting the protein needs. This study shows that the majority had a moderate intake, although 5% of females and 6% of males had a high intake (three to four helpings a day).

It is now known that protein does not increase plasma glucose concentrations (Gannon et al 2001). However Franz (2003) states that in persons with poorly controlled diabetes gluconeogenisis can occur rapidly and adversely affect glycaemic control. However a high protein intake puts considerable strain on the kidneys that are already at risk from diabetes (John Hopkins Diabetes White Paper 2002). Reddy et al (2002) add that a high protein intake also increases the risk of kidney stones, as there is an increased acid excretion and decrease in urinary citrate, which inhibits kidney stone formation by 25%. A chronic acid load also suppresses the function of osteoblasts and stimulates osteoclasts, which results in bone loss (Reddy et al 2002). High protein intakes are associated with elevated total cholesterol, LDL cholesterol and triglycerides and the American Heart Association (2001) warns that a high protein diet is associated with coronary heart disease, strokes, diabetes and some cancers. Baldwin (2004) adds that high protein diets add greater risk of hypoglycaemia for those on diabetes medication.

The 11% with a high protein intake could be following the low carbohydrate diet, a regime that is not recommended for people with diabetes. Carbohydrate foods contain nutrients that may reduce risk factors for coronary heart disease. They also contain nutrients such as fibre, linoleic acid, vitamin E, phyto-oestrogens and several phenolic acids with antioxidant properties (Noakes 2004). With low carbohydrate diets the initial weight loss is due to lower calories rather than the carbohydrate intake (Bravata et al 2003). They produce weight loss initially but evidence for the long-term benefits is lacking (Noakes 2004). Bloomgarden's article (2004) quotes research by John Miles who has shown evidence that an increase of amino acids results in a decrease in insulin-

mediated glucose uptake and a decrease in insulin-mediated suppression of hepatic glucose output. Thus high amino acids intake can exacerbate insulin resistance.

The majority of subjects ate dairy products with the low fat message being encapsulated in the type being chosen especially by those attending group therapy. Eighty seven percent of females and 80% males chose fat reduced milk. This compared very favourably to the Australian Institute of Health and Welfare (2004) that reported that overweight females and males (a similar population to this study) were more likely to consume skim or reduced fat milk but the number making that choice was much smaller with 19.7% females and 10.5%. As there is a high percentage of New Zealanders with osteoporosis it was pleasing to see that the majority included dairy products in their meal pattern. Reid et al (2003) report that in New Zealand 50% women and 33% of males over the age of 60 years develop osteoporosis with life time risk for women being 30 – 40% and men 13%.

5: 6.4 Vegetables and Fruit

5: 6.4.1 Vegetables

There is a significant difference between the number servings of vegetables eaten by the of adults in the Ministry of Health (1999 a) National Nutrition Survey and this study population as seen in Table 5:12. The number in this study eating the recommended three – four servings of vegetables a day was 56% females compared to 82% in the National Nutritional Survey and 40% of males compared to 74%. This could be due to a misunderstanding of what was considered a 'helping', the term used in the questionnaire. The majority of group-educated subjects had one – two helpings, but they were not asked to quantify the size of the helping.

Table 5: 12 Number of Servings of Vegetables Eaten by the Subjects Compared to the New Zealand National Nutrition Survey (Expressed as a % of total subjects) (n = 100)

	+ NNS1997 45 – 64 yrs %	Research %	+ NNS1997 45 – 64 yrs %	Research %
	<1 serv /day	<1 serv /day	>3 serv/day	>3 servs/day
Females	6	2	82	56
Males	10	2	74	40

Note: F = female; M = male.
Source: + Ministry of Health (1999 a)

Vegetables low in starch are emphasised when educating people with type 2 diabetes as they add fibre and bulk to meals (American Diabetes Association 2003) without increasing blood glucose levels and thus contribute to weight loss. With the majority of the research population needing weight loss this is where the emphasis would have been placed, thus the researcher would have expected a higher than average intake of vegetables. The World Health Organisation (2003) states that increasing vegetables can contribute to an overall reduction in energy intake. The Ministry of Health Burden of Disease (2003 b) emphasised the importance of vegetables and this is supported by a mounting number of research programmes that present evidence of the benefits of vegetables as a source of fibre, vitamins and antioxidants. This must be a focus of education at both the level of microintervention and macrointervention.

Could it be that obese people eat fewer vegetables than their slimmer counter parts and has this contributed to their weight gain? Research has frequently shown that people who eat vegetables are less likely to develop diabetes. Sargeant et al (2001) research with 9665 participants found intakes of five or more servings of fruit and vegetables was inversely associated with diabetes incidence particularly among women. Williams et al (1999) research with 1122 subjects between 40 – 64 years of age found that people who ate salad vegetables frequently all the year around, had a lower incidence of impaired glucose tolerance (13%) compared to those who ate less salad (17%). Only 1% of salad eaters developed type 2 diabetes compared to 6% of those eating less salad. However Lui et al (2004) research with 39,876 female health professionals found no inverse association between total intake of fruit and vegetables and risk of type 2 diabetes but a high intake of green leafy or dark yellow vegetables was associated with reduced risk. However research by Fung et al (2002) with men and Schulze et al (2004) with women found that fibre intake was associated with a reduction in the development of diabetes and greater insulin sensitivity. The EPIC-Norfolk Study found a significant inverse association between green leafy vegetables and HbA1c levels (Sargeant et al 2001). The researcher's experience is that at the time of diagnosis with type 2 diabetes many people have a very limited intake of vegetables, with many adding vegetables to their meals only two to three times a week.

5: 6.4.2 Fruit

The New Zealand Guideline (2003) recommend three to four servings of fruit a day. In this study 66% of females and 46% of males (48% of group and 65% of individually educated) ate two or more servings a day where as the Ministry of Health (1999 a) National Nutrition Survey reported 67% of females and 39% of males in the 45 – 64 age group had two + servings a day. Thus a similar number of females and 7% more males were having two + servings of fruit a day. During education sessions the inclusion of fruit is encouraged but subjects are cautioned that it needs to be included within their carbohydrate allowance.

Franz et al (2002) also emphasises the importance of foods containing carbohydrate, including fruit, and adds that the total amount of carbohydrate in meals or snacks is more important than the source or type. She states that fructose produced a reduction in postprandial glycaemia when it replaces sucrose or starch as a carbohydrate source. However she tempers this by saying that consumption of large amounts of fructose (15 – 20% of daily energy intake) has been shown to increase fasting blood glucose levels plus total and LDL cholesterol (Bantle et al 1993). Fruit, particularly bananas can be high in carbohydrate (30 g for a small bobby banana and 60g for a large one). The researchers personal experience is that people can eat two bananas at a time as a snack, and this can have a huge impact on blood glucose levels.

5: 6.5 Non Alcoholic Drinks

In this study drinks consumed varied considerably from the Ministry of Health (1999 a) National Nutrition Survey, with the study participants having a much lower consumption of water as seen in Table 5: 13. As obesity is frequently linked with the number of sweet drinks consumed perhaps this is one of the causes of increased obesity and therefore increased incidence of type 2 diabetes in the research population. Although this study shows that practically all the participants were choosing diet drinks the researcher purports that prior to the diagnosis of diabetes they were more likely to be drinking sweet drinks which research show is a risk factor for diabetes. Schulze et al (2004 b) research with 50,000 women revealed that those who drank one or more sugar sweetened beverages a day were 83% more at risk of developing diabetes compared to those who had one or less per month. They suggested that high-glycaemic index

beverages were absorbed quickly causing a sharp upward swing in blood glucose levels followed by raised insulin levels and the yo-yo effect taxes the body and could lead to diabetes. Ludwig et al (2001) add each additional serving of sugar sweetened drink children consume, results in an increase in body mass index and frequency of obesity. A drink containing less than 5g carbohydrate per serving is considered free (Franz 2003).

Table 5: 13 Non Alcoholic Drinks chosen by the Subjects Compared to the New Zealand National Nutrition Survey (Expressed as a % of total subjects) (n = 100)

	Water %		Fizzy %		Powder Drink %		Fruit Juice %		Cordials %	
	F	**M**	**F**	**M**	**F**	**M**	**F**	**M**	**F**	**M**
+ NNS 1997 45 – 64 yrs	86	76	21	24	8	10	23	20	2	5
Research Participnts	31	28	37 Diet	42 Diet	5 Diet	4 Diet	4	2	3 Diet	

Note: F = female; M = male.
Source: + Ministry of Health (1999 a)

5: 7 Alcohol Intake

On diagnosis with diabetes nearly half of the subjects made changes to their alcohol intake. One subjects commented 'I don't drink to get 'happy' any more – I'm happy without a drink'. Nearly half the female subjects did not drink alcohol (seen in Table 4: 20) and many only drank occasionally thus no change was required. The percentage reporting that they did not drink alcohol was highest among females (46%) compared to of males (16%). Only 2% of females and 16% of males drank more often than recommended with 36% of females and 34% of males drinking only once a week or less. The number of subjects drinking beer was considerably less than in the Ministry of Health (1999 a) National Nutrition Survey (1997) as seen in Table 5: 14. A number of males reported that they had reduced their beer intake, others had stopping drinking beer and others had changed to wine and spirits.

The same precautions apply regarding the use of alcohol as with the general population. Abstention from alcohol should be advised for women during pregnancy and for people with other medical problems such as pancreatitis, advanced neuropathy, and severe hypertriglyceridemia, as it can worsen these latter conditions.

Table 5: 14 Percentage of Subjects Drinking Alcohol Compared to the New Zealand National Nutrition Survey (Expressed as a % of total subjects) (n = 100)

	+ NNS1997 Females 45 – 64 yrs %	Research Females %	+ NNS 1997 Males 45 – 64 yrs %	Research Males %
Beer	6	4	72	41
Wine	67	44	17	44
Spirits	18	16	8	24

Research: females n = 50, males n = 50.
Source: + Ministry of Health (1999 a)

Alcohol can have both hypoglycaemic and hyperglycaemic effects in people with diabetes. These effects are determined by the amount of alcohol drunk, if consumed with or without food, and if use is chronic and excessive (Wheeler et al 2004). In studies with people with diabetes using moderate amounts of alcohol ingested with food, alcohol had no acute effect on blood glucose or insulin levels. Therefore, alcoholic beverages could be considered an addition to the regular food/meal plan for people with diabetes (Franz 2002). The American Diabetes Association recommend that if people with diabetes are not already drinking alcohol routinely, they should not start. If people with diabetes are drinking a moderate amount of alcohol daily, they should not increase the intake. Three or more drinks per day can cause deterioration in long- and short-term glucose metabolism. The American Diabetes Association adds that the type of alcoholic beverage does not matter. Bell (1996) adds that a moderate alcohol intake consumed with a meal has little effect on postprandial blood glucose levels but it provides energy and has the potential to increase triglyceride levels and blood pressure. Even moderate amounts of alcohol can enhance the glucose lowering action of exogenous insulin and certain oral glucose lowering agents (Arky et al 1968). Arky adds that alcohol appears to alter the phase of glucose recovery by interfering with hepatic gluconeogenesis. The hypoglycaemia induced by alcohol is not ameliorated by glucagon because it is caused by direct impairment of gluconeogenesis and is not associated with excessive insulin secretion.

This research shows the importance of including education on alcohol consumption in group and individual education programmes for people with type 2 diabetes and it was pleasing to see that most study subjects had encapsulated the message of moderation.

5: 8 Label reading

Regardless of the different teaching methods the majority of both group and individually educated subjects read the labels on food. It was surprising that the highest percentage checking labels were males in the individually educated group. The majority checked the fat, sugar and carbohydrate and practically all found the process helpful, which was a particularly pleasing result.

Label reading was emphasised as a self-empowerment tool for those able to understand the concept. Not all the individually educated subjects would have been taught full label reading but the majority would have had the fat content of the label discussed. All group educated subjects and some of the individual subjects would have also been taught to check the carbohydrate content per serving size of the packet/tin etc as this gives a more accurate indication of the impact on blood glucose level compared to focusing on the sugar content. As mentioned earlier sucrose does not rapidly increase glycaemia (Franz et al 2002, Rickard et al 2001, Malerbi et al 1996, Bantle et al 1993). However Franz comments that if sucrose is included in the meal, it must be substituted for another carbohydrate source. Franz (2003) emphasis the need to focus on total amount of carbohydrate rather than the source or type. The United States Food and Drug Administration (2004 a) and Kurtzweil (1995) provide guidelines for people reading food labels and emphasise the need to check serving size. Stehlin (2001) writes specifically for people with diabetes. Auslander et al (2002) also emphasised the importance of label reading.

Vermont University (Letourneau 2004) conducted a telephone survey to look at label reading and found that 5.1% never read a label, 9.6% rarely, 18.7% sometimes, and 34.8% most of the time. In this study 11 % did not check labels but there was a much higher number (between 72 – 80 %) that checked fat, carbohydrate and sugar as seen in Table 5: 15. In Letourneau's study the women read labels more frequently, which is in contrast to this research. In the Vermonter Poll those with a BMI greater than 26kg/m^2 read labels less, whereas in this research there was only a mean difference in BMI of 0.52 kg/m^2 between those reading labels and those not.

In Letourneau's study the average age of people reading labels was 51 years and those less likely to read labels were 48 years of age. Among the study subjects there was no

difference in age between those reading and not reading labels. Of interest was that the mean HbA1c of research label readers was 6.9% and non readers 7.5%, but the lipid profile of label readers was not as good as those who did not read labels. Perhaps elevated lipid levels encourage label reading.

Table 5:15 Comparison of the Vermonter Poll and the Research Results (Expressed as a % of total subjects)

	+ Vermonter Poll	Research
Checked Fat	50.5%	75.5%
Checked Carbohydrate	29%	75%
Checked Sugar	24%	77%

Vermonter Poll n = 646, Research n = 100.
Source: + Letourneau et al (2004) Vermonters and reading Food Labels.

5: 9 Physical Activity

A goal of the research was to explore the subjects understanding of the importance of physical activity. Generally the study subjects endeavoured to increase exercise, although a small percentage had decreased they activity. A compounding factor could have been deteriorating health. The New Zealand Guideline (2003) recommend a minimum of 30 minutes of moderate-intensity physical activity (3-6 MET's) on most days. The majority of female participants and a lesser number of males, achieved this level of exercise. Those attending individual appointments tended to participate in more intensive activities. Although the intensity generally met recommendations, the frequency fell short of recommendations with only 28% females and 34% of males reporting exercise daily. The length of time spent exercising fell well below the New Zealand Guidelines with 66% females and 30% of males participating in exercise for less than three hours a week. The 1999 – 2000 AusDiab study found that obese women participated in less physical activity than non-obese women (Cameron et al 2003) and similar results were seen in this study (Table 4: 23). Diabetes United Kingdom (2004) reminded their patients with deteriorating health, that armchair or stretching exercises help to control blood glucose levels, maintain fitness and mobility and this was also recommended during the education process in the study.

The Harvard Alumni Study (Sesso et al 2000) has shown that snack-tivity or accumulation of shorter sessions of physical activity is associated with the same

reduction in coronary risk as longer sessions. It has been suggested that multiple short bouts of exercise might improve adherence to exercise programmes (Fagard 2001). The New Zealand guideline (2003) recommend short bouts of eight to ten minutes. The researcher founds that sometimes people with diabetes find this form of exercise more acceptable.

Exercise is known to improve insulin sensitivity, lower blood glucose, and improve cardiovascular status but has only a modest effect on weight (Bouchard et al 2001). However in this research there was no improvement in HbA1c with exercise as seen in Table 4: 22 but those who exercised for more than three hours a week had the greatest weight loss as seen in Table 4: 26. Maggio et al (1997) adds that exercise is a useful adjunct to other weight loss strategies such as dietary fat reduction and is important in long-term maintenance of weight loss. This study shows that 88% of obese subjects who did three or more hours of exercise a week managed to either maintain their weight or lose weight. Of those who did less than three hours exercise a week, only 72% managed to maintain or lose weight as seen in Table 4: 26.

The greatest benefit from physical exercise is in diabetes prevention. The protective effect is greatest for people at high risk of developing diabetes and those with a family history (Hu et al 1999, Tuomilehto et al 2001, Knowler et al 2002 a).

5: 10 Health and Medication

Diabetes is a progressive disease with control becoming more difficult with increasing duration since diagnosis (UKPDS 1998 b, Trento et al 2004). Table 4: 8 shows that during the first two years after diagnosis 31% did not have any complications, and in Table 4: 9 36% did not require medication to control blood glucose levels. Those who had been diagnosed greater than 14 years all required medication and had complications resulting from their diabetes.

5: 10.1 Complications

As the major risk factor for type 2 diabetes is obesity it is not surprising that the most common complication/cause was obesity. Frequently associated with obesity/type 2 diabetes is hypertension and hyperlipidaemia and these four conditions are risk factors for cardiovascular disease, therefore these are also common complications as seen in Table 4: 32. Microalbuminuria is associated with elevated blood glucose levels (UKPDS 1998 b) thus this complication occurred more frequently with increasing years since diagnosis as seen in Table 4: 29. The United Kingdom perspective diabetes study (UKPDS 1998 b) reported a reduction in mean HbA1c from 7.9% to 7.0% was associated with an absolute risk reduction of developing microalbuminuria of 11% over 12 years. Duration and severity of diabetes is also related to retinopathy (Henricsson et al 1996, Porta et al 2001). The United Kingdom Perspective Diabetes Study (UKPDS 1998 b) report that between six and thirty nine percent of people with type 2 diabetes have retinopathy at diagnosis thought to be due to reduced insulin production over a period of 15 years prior to diagnosis. Regardless, of checking medical records of subjects who had been diagnosed for between nine and fourteen years, only one (9%) was diagnosed with retinopathy but this increased to 50% in those who had been diagnosed for more then 14 years as seen in Table 4: 29. Gout is also associated with diabetes due to failing renal function (Grodzicki et al 1997) and between five and twenty percent of subjects had gout as an added medical problem depending on length of time since diagnosis as seen in Table 4: 29.

District health boards are investing money and effort to support strategies that reduce risk and identify vulnerable people at an early stage in their disease. Primary health organisations now focus on disease prevention with the development of nurse-led disease management teams (Arcus 2004, Stephenson 2004).

5: 10.2 Medications

5: 10.2.1 Glycaemic Control

As glycaemic control deteriorates with time polypharmacy is almost inevitable (NZGG 2003). The UKPDS showed that less than 50% of patients who initially achieved an HbA1c of < 7% on sulfonylurea or metformin monotherapy still had an HbA1c < 7% three years later (Turner 1999). Added to this is tablet failure, a common problem that

can surface early in the development of the disease but may not occur for 10 years. Turner et al (1999) reports that about half of those who required one glucose-lowering drug required the addition of a second drug within three years of diagnosis and by nine years 75% required multiple therapies to achieve an average HbA1c of <7%. In this study 15% did not require glucose lowering medication during the first two years post diagnosis but by four years this number had dropped to 3% and after five years to 2%.

For 27% of subject diagnosed during the two years prior to the study Metformin was the drug of choice with only 7% requiring a sulphonylurea, but by two to four years post diagnosis the number on sulpnylureas had increased to 11% as well one taking Acarbose and 4% requiring an intermediate acting insulin, 2% requiring regular or fast acting insulin and 1% requiring penmix insulin. As diabetes is a progressive disease insulin therapy generally becomes necessary with the intermediate acting insulins frequently being the first line treatment. In this study 8% of subjects diagnosed for between five to nine years required long acting insulin 5% requiring regular/fast acting and 2% requiring penmix insulin.

The most common medications are oral hypoglycaemic agents with Metformin being the most frequently prescribed as it is a weight neutral drug and therefore often used for people with BMI >25kg/m^2 (Luna et al 2001, Diabetes Resource Manual 2004). As 78% of subjects fell within this category it is not surprising that it is taken by 64% of the newly diagnosed. Metformin is contra indicated for people with serum creatinine greater than or equal to 0.15mmol/l (NZGG 2003, Jones et al 2003 a). Thus it is surprising that the number in this study who were on Metformin did not reduce more rapidly. Sulphonylureas are used instead or as an additional medication for those struggling to control blood glucose levels (Luna et al 2001, UKPDS 1998 b).
Table 4: 30 shows that after five years the percentage taking Metformin dropped, but 58% of those diagnosed for greater than 14 years were taking it to assist with reducing insulin resistance, as an adjunct to insulin. Alpha glucosidase inhibitors are not funded in New Zealand thus the low rate of up take of this drug. Intermediate-acting insulins are generally the first exogenous insulins to be introduced with 20% of subjects diagnosed for between two and four years requiring this medication and the percentage rising with years since diagnosis. A similar pattern is seen with the short or rapid acting insulins given at meal times to control glycaemia. A small number of subjects had been prescribed penmix insulin but generally this is not considered an appropriate insulin for

this age group, and the researcher's experience is that ideal control is difficult to achieve as the mix of insulin is not always suitable especially for those with an active lifestyle plus it is not flexible. Pharmacological advances are occurring regularly but in New Zealand Pharmac is reluctant to fund many of the newer diabetes medications although acarbose is available under strict criteria and the eligibility criteria for Pioglitazone has just been relaxed. Insulin Glargine and Levemir, both long acting insulins, are not funded.

At referral 62% of subjects had LDL cholesterol levels greater than the recommended <2.5 mmol/l. To counter dyslipidaemia, statins were prescribed for 58% of subjects and combined with a change in saturated fat intake, the number with elevated LDL cholesterol at follow up dropped to 46%. There were still a large number of participants who did not attain the recommended LDL cholesterol levels and this could be due to too low a dose (40 mg is often required and even as high as 80mg/day, NZGG 2003), or participants not taking the medication regularly. LDL cholesterol levels rise with missed doses. Another cause of elevated levels can be poor glycaemic control. Occasionally fibrates are added to reduce triglyceride levels (NZGG 2003, British Heart Foundation Heart Protection Study 2003, Keech et al 2003, Haffner et al 1998, Goldberg et al 1998) and in this study 3% were prescribed a fibrate.

5: 10.2.2 Hypertension

Antihypertensive medication was taken by 61% of participants with 14% requiring two types of medication, 9% three types and 3% four different medications. Clinical trials demonstrate that most people with diabetes require multiple drug therapy to reach their target blood pressure. The United Kingdom Prospective Diabetes Study (1998 d) showed that more than half of the subjects required two or more drugs to reach their goal blood pressure (130/80), and 29% needed three or more medications to reach and maintain the target blood pressure after nine years. A finding up held by the SHEP Collaborative research group (Kostis et al 2005). Over the past two decades an emerging body of evidence, in mixed populations, suggests that fixed-dose combination therapy is more effective than commonly used mono-therapies in achieving target blood pressure goals (Bakris et al 2003).

People with type 2 diabetes are classified at higher cardiovascular risk, with approximately two thirds dying from cardiovascular disease (Haffner et al 1998). Blood pressure should be 130/80mm Hg but lower than this if people with diabetes have overt nephropathy or other renal disease (NZGG 2003). This is lower than for non-diabetics as elevated blood pressure leads to renal disease and cardiovascular disease, which are both part of the dysmetabolic syndrome (UKPDS 1998 b). Hypertension is 1.5 to 2 times more prevalent in people with diabetes. The epidemiological data clearly show that there are no natural thresholds under which the risk of microvascular and macrovascular complications in diabetes are fully prevented, but the risk increases steadily with rising levels of risk factors (Bakris 2000). The new analysis of the UKPDS data confirms this notion for both glycaemia and blood pressure with the association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 2000).

The Prospective Diabetes Study (UKPDS 1998 d) showed that each decrease of 10 mm Hg in mean systolic blood pressure was associated with a:-

15% reduction in risk for death related to diabetes,

11% reduction in risk for myocardial infarction,

13% reduction in risk for microvascular complications,

12% reduction in risk for any diabetes-related complication.

Kjeldsen et al (1998) in the Hypertension Optimal Treatment Study showed a 51% reduction in cardiovascular events in diabetic subjects.

5: 10.2.3 Depression

Depression is considered to be more common in people with diabetes. Talbot et al (2000) and Anderson (2000 b) state that people with depression are more likely to develop diabetes, and people with diabetes are twice as likely to be depressed. He adds that there is often an increase in depression as diabetic complications worsen, and deterioration in control as depression worsens. In this study Table 4: 29 shows similar results with a greater percentage of depression in those diagnosed for less than five years and more than 14 years. It is not know why people with diabetes are more prone to depression but it is thought that it could be due to stress, or from the metabolic effect on the brain (Ciechanowski et al 2000). Ciechanowski reports that depression is often undiagnosed and adds that psychotherapy and an anti-depressant can often have positive

effects on mood and glycaemic control. The type of medication chosen is important with Lustman et al (2000) recommending a serotonin reuptake inhibitor as being the most appropriate. Cognitive behavioral therapy and coping skill training are also useful in treating depression in people with diabetes (Peyrot 1999).

5: 10.2.4 Hypercoagulabilitiy

Hypercoagulabilitiy of blood platelets associated with the dysmetabolic syndrome adds a further risk factor. Aspirin (or another oral antiplatelet drug) is protective in most patient at increased risk of occlusive vascular events, including those with an acute myocardial infarction, ischaemic stroke, angina, cerebral ischaemia, peripheral arterial disease, or atrial fibrillation. Low dose aspirin (75-150 mg daily) is an effective anti-platelet regimen for long term use. However for most healthy individuals, for whom the risk of a vascular event is likely to be substantially less than 1% a year, daily aspirin may well be inappropriate (Antithrombotic Trialists' Collaboration 2002). Garcia Rodriguez et al (2001) adds that regular use of aspirin is associated with around a two-fold increase of gastrointestinal bleeding. However Sanmuganathan (2001) states that the cardiovascular benefits out weigh the harm in people with a 5-year cardiovascular risk greater than 15% but not for those with less than a 15% risk. Thirteen percent of subjects had been prescribed Cartia.

5: 11 Limitations of the Study

Study Design

The greatest limitation would be that the subjects were not matched when allocated to individual or group education. There were substantial anthropometric differences between the subjects in each group that could have biased the results. Length of time post diagnosis and differing biochemical results at referral would also have added bias. Because of these differences the groups could not be directly compared.

The inclusion of only one ethnic group definitely limited the value of the study and is a decision the researcher now regrets.

Recruitment of Subjects

It was planned to use only patients that attended clinics but due to a slower than expected recruitment process patients who had attended clinic during the past year were contacted by phone and asked if they were willing to take part in the study.

Questionnaire Construction

- Questions could have been more clearly and simply worded especially those relating to lipids. It appeared that the terms monounsaturated fat and polyunsaturated fat were not understood.

- The question on hypoglycaemia would have been of more value if the respondent had been asked 'has your blood sugar level ever gone low'? followed by the question ' If 'yes' what did you do' ?

- Similarly with hyperglycaemia. The first question should have been 'has your blood sugar level ever gone above 10 mmol/l'? followed by the question 'if 'yes' what did you do' ?

- The question on the number of minutes of exercise per week confused some subjects with the responses indicating subjects were reporting minutes per day rather than per week.

- The poor response to the number of servings of vegetables per day was a surprise as all subjects are encouraged to have ⅓ to ½ plate at at least one meal a day. An indication as to what was considered one serving eg half a cup, could have resulted in a more accurate assessment of the amount of vegetables consumed. The researcher wonders if subjects who's response was 'one or two serving per meal' had large servings, which would equate to four servings if ½ cup was a serving.

- The question about noodles, pasta and rice would have also provided more useful information if there had been some indication of serving size.

- The number of slices of bread a day, and servings of cereals a week, should have been tied in with the amounts in the National Nutrition Survey as this would have allowed for more accurate comparisons.

- Individual dairy products should each have been allocated a separate question to give some indication of the level of saturated fat intake and again a serving size indicated.

- A question about the removal of fat of meat and skin of chicken would have provided valuable information.

- As there is an increasing emphasis on oily fish, a question on frequency and type of fish consumed would have been valuable.

- Before asking subjects how useful they found the healthy eating information sheets there should have been a question asking which sheets they had received as part of their education process.

- Before asking about the usefulness of compact disks and the internet, subjects should have been asked if they had access to a computer. If the answer was 'yes' how would they rate the internet and compact disks as a style of education?

Results

- The answers to questions covering an analogous topic varied. An example is that subjects reported that they did not test their blood glucose levels but reported the number of times they tested. Other said they did not drink alcohol but indicated an amount of alcohol they consumed.

- Participants chose not to answer some questions thus biasing the results.

- As there was no way to verify information it is impossible to know if subjects are reporting accurately what they are doing or what they know they should be doing? Are they trying to please the researcher who gave the nutritional education?

- There was some difficulty in getting information on weight and biochemical results from participants seen in the community, as the researcher was reliant on general practitioners.

- There were differences in biochemical indicators at referral between group and individually educated subjects. Subjects who have uncontrolled diabetes with elevated HbA1c were much more likely to have a dramatic drop compared to newly diagnosed subjects whose HbA1c was already between six to seven percent.

Chapter 6

Conclusions

Diabetes in New Zealand has reached epidemic proportions with the Ministry of Health forecasting that there will be 167,000 diagnosed with type 2 diabetes by 2021 with many more being undiagnosed. 'Diabetes is a chronic condition that can lead to long term debilitating diseases .....However international research supports the view that there is potential to develop preventive strategies aimed at reducing the health complication for those with diabetes' and the impact on the publicly funded health care service. An effective diabetes service must focus on education, nutrition, exercise and self-monitoring of blood glucose (Price Waterhouse Coopers 2001). These are the areas examined in this study where the following conclusion have been reached.

To examine the preferred timing and location for lifestyle education.

- The frequency of on-going education varied considerably with options suggested being monthly (14%) three monthly being the post popular (39%) and annually also popular (28%).

- Although the greatest number of subjects preferred daytime appointments some (28%) preferred early evening. Evening clinics should be available to provide appointments for patients who are unable/unwilling to take time off work.

- Health professionals need to be aware of the number of appointments that people with diabetes are asked to attend and the reluctance of some patients to be continually requesting time away from their employment.

- The preferred site for clinics was in the community although not necessarily in the general practitioners rooms. Clinicians need to be mobile and see patients in their own surroundings.

To determine the preferred health professional for lifestyle education.

- Most of the subjects requested on-going education with the preferred educators being specialist dietitians and nurses. While this is appropriate for patients with co-morbidities or uncontrolled diabetes it is not appropriate for those with well controlled diabetes. This group of patients is the responsibility of primary care. Education, training and resources will be required if this is to be successful.

To explore the understanding of the importance of healthy eating and physical activity.

- Information on healthy food choices was generally being followed.
    - Most study participants chose low (54%) or medium (44%) glycaemic index cereals at least some of the time.
    - Most (72%) chose whole grain bread thus ensuring a low-glycaemic index meal.
    - The majority (88%) chose low fat milk ,which would contribute to the drop in LDL cholesterol.
    - The majority (79%) had the recommended one to two helpings of protein foods per day with only 10% having less than one helping. A few (11%) had three or four helpings a day which is not recommended for people with diabetes.

- Half (56%) achieved two + fruits a day but of concern was the number (21 %) who had less than one helping a day. Well below the recommended three to four servings.

- Forty eight achieved three + vegetables a day but of concern was the two who never ate vegetables and 19 who had only one serving a day far below the recommended intake of three to four servings (NZGG 2003).

- The majority (85%) never or rarely had takeaway foods thus had understood the low saturated fat message.

- Only one subject still ate butter the remainder chose mono or poly unsaturated fats, again endeavouring to follow the low fat message.

- Low fat methods of cooking were chosen by all but two subjects.

- The Ministry of Health (1999 a) National Nutrition Survey (1997) reported 76-86% of their respondents drank water but in this research population the numbers were much lower (31% females and 28% males) while a greater number (36% females and 42% males) choosing diet fizzy drinks. Obesity is frequently associated with the number of sweet drinks consumed thus if this research population was drinking sweet fizzy drink prior to diagnosis this could have contributed to their obesity and consequently diagnosis of type 2 diabetes.

- The education on label reading was a concept encompassed by most (86%) subjects with practically all checking the carbohydrate, sugar and fat content.

- The importance of physical activity was recognised by more than half the subjects.

  - More than half (63%) reported increasing exercise but regardless many (36%) fell short of the recommended 30 minutes most days of the week.

- For many (66% females and 30% males) the length of time spent exercising per week fell short of the recommendation of at least 150 minutes per week to maintain weight or 200 minutes for weight loss.

- Overweight subjects were more likely to exercise daily then those who were obese or ideal weight (48% over weight compared to 23% obese and 20% ideal weight).

- Overweight subjects were more likely to lose weight if they exercised daily (71% compared to 50%).

- Obese subjects who did not exercise were more likely to lose weight than those who exercised daily (50% compared to 17%).

- Health professionals need to stress the importance of regular activity, explaining the health benefits with out the emphasis on weight loss, and providing a wide variety of options especially with those with physical limitations.

- The mean HbA1c was 7.1% for all subjects regardless of whether they exercised daily or only occasionally.

To explore the understanding of the importance of achieving and maintaining a weight within the healthy weight range.

- Subjects perception of healthy weight was not always consistent with the recommended guidelines, as eight subjects with a BMI > 30 kg/m^2 and five with BMI between 26 – 29 kg/m^2 were happy with their weight. Two with a BMI of 25 kg/m^2 wanted to lose weight. Education of health professionals is required for a better understanding of what constitutes a healthy weight plus how to approach the subject of weight with their patients.

- Three quarters (75%) of research subjects reported that they wanted to lose weight therefore it can safely be assumed that they majority of these were aware of the benefits of weight loss.

- The Ministry of Health (1999 a) National Nutrition Survey mean BMI for Europeans of the same age range as this research population was 26.9 kg/m for females and 26.7 kg/m^2 for males. At referral this research populations mean BMI was 37.98kg/m^2 for females and 34.02kg/m^2 for males, confirming that type 2 diabetes is more common in people who are overweight/obese.

- A healthy weight does not equate to an HbA1c <7%. Twenty percent of those whose weight was in the ideal range achieve HbA1c of <7% and 61% of obese subjects this achieve target range. Therefore it is still possible to gain glycaemic control when obese.

To investigate the patients' perceived importance of biochemical indices of control.

- Once subjects' were made aware of their lipid results the majority (87%) endeavoured to make changes to their eating patterns. It is important that health professional's educate patients as to optimal levels and inform patients of their latest results.

- Subjects' response to the question on intake of saturated fat was that all had reduced intake but the response to the question on poly and monounsaturated intake seemed to indicate that many of the participants did not understand the terms.

- All who performed home blood glucose monitoring considered it valuable yet frequently this did not equate to well controlled diabetes. Just over half (58%) of subjects testing daily achieved an HbA1c <7%. Unless the result of the blood test is used to better understand self-management, and make appropriate changes, it serves little purpose.

- With only 10% of those at risk of hypoglycaemia understanding what constitutes an appropriate treatment, education is urgently required. All would have been educated about treatments but because there was no perceived relevance the information was not retained. It is important that health professionals remember that education is an on going process. For patients taking sulphonylureas and/or insulin this is a safety issue.

To assess participants HbA1c control following education.

- The percentage of participants achieving an HbA1c <7% more than doubled following pharmacological therapy and education (26% to 55%). Conversely at follow up there were only 2% with a HbA1c >10% compare to 13% at referral.

- Level of formal education bore no relationship to glycaemic control as more than half (62%) with three years or less of formal education achieved an HbA1c <7% compared to slightly less (59%) of those with a degree.

- Subjects educated in groups and individually all achieved a substantial drop in HbA1c, sufficient to reduce the risk of complications considerably

To ascertain the preference for written, oral or visual education material.

- The preferred medium for educational material was pamphlets (86%) with compact disks being the least popular (40%). With subjects having a widely varying level of education it is essential that patients are asked which medium they prefer and resources using the different mediums continue to be developed.

- The level of education had little impact on the number choosing written pamphlets for education. Those with three years or less of secondary education and those with degrees both preferred written material (82%).

- Compact disks and the Internet were the preferred medium for a quarter (24%) of those with three years or less of secondary education but over half (59%) of those with a degree preferred this medium.

- Education material must be available in a variety of mediums to cater for differing learning styles. When asked about food photographs (many would not have been given these) both those with three years or less of secondary education (38%) and those with a degree (35%) reported these as very helpful.

To investigate the effectiveness of group and individual education.

- Group and individual education sessions are both effective mediums for education. Of those subjects who attended group (56) only 9 (2 females and 7 males) would have preferred to be seen individually. More females (89%) preferred group or group followed by one-on-one education than males (62%).

- Thirty three percent felt they did not receive adequate accurate education at diagnosis. The emphasis must be on education and empowerment of primary care health professionals by providing them with more resources.

6: 1 Recommendations for Future Research

This research examines in some depth the preferred method of education and the outcomes for European people diagnosed with type 2 diabetes; a group under studied in research in New Zealand. A similar questionnaire adapted for other ethnic groups would make this research more valuable as preferred methods of education and outcomes could be compared thus ensuring the education process is culturally focused.

Also a questionnaire that included more of the questions used for the national nutrition survey would have provided a medium to compare the eating habits of people with diabetes with non diabetics.

Other areas that need more in-depth research would be:-

- Research investigating the quantitative intake of vegetable, follow by education on the importance of three to four servings a day.

- Research investigating the intake of fruit and its distribution throughout the day and again education on the importance of three to four servings a day.

- Investigate the type of drinks consumed by family members of people with diabetes as well as the people with diabetes, followed by education on the importance of avoiding sugar sweetened drinks as a strategy to reduce obesity.

- Monitoring of weight gain during pregnancy, especially for those at risk of, or who already have diabetes in pregnancy, as a strategy to reduce the risk of diabetes being passed on to the child.

- Investigation into the number of women who have had diabetes during pregnancy, who have had a repeat glucose tolerance test at six weeks postpartum. A system need to be place to ensure that the women have regular checks and receive appropriate education to ensure they have as near normal blood glucose levels as possible at time conception thus reducing the risk of foetal abnormalities.

- Work with primary care to develop a system where by people at risk of developing type 2 diabetes are monitored annually.

- Develop a recall system for people with diabetes that ensure regular checks even of those who are the frequent defaulters. Lateral thinking using innovative methods would need to be incorporated into this type of programme.

6: 1.1 Future Trends

Education Material

The researcher has already developed an educational resource for people with diabetes to be distributed by primary care providers. It is hoped that it will

become part of the resources endorsed by the diabetes strategic planning team of Counties Manukau.

It consists of: -

- 19 single sheets, of stand alone, nutrition information.
- basic information in eleven languages with the English translation.
- food photographs showing portion size and appropriate meals. The carbohydrate foods include foods from different cultures. (A resource developed to educate people who were illiterate but now used much more widely, especially for patients who are visual learners.)

The resource has been trialled with eleven primary care practices and is now ready for formatting and launch to primary care practices in Counties Manukau. The information included has been peer reviewed by dietitians working in the field of diabetes in the Auckland area (the researcher is a member of this team) and will be up-dated every three years to ensure material is based on the latest research and is evidence based. The purpose is to empower primary care to provide basic, accurate, consistent and culturally appropriate education on healthy eating to people with diabetes.

Prevention

Counties Manukau district health board has developed a five year diabetes strategic plan with the focus being 'lets beat diabetes'. Action and intervention are based on the approach that to beat diabetes it is essential to encapsulate the concept of 'whole disease, whole family/whanau, and whole society'. There are ten intervention areas that have been identified:- supporting community leadership through partnership, participation and protection, improving urban design and environment, long term social marketing, food industry accord, expanding the well child framework, a school accord, strengthened health promotion, improved self management, supporting primary cares focus on risk prevention and early identification and lastly improved service integration and care for advanced disease.

Risk prevention will be the focus of two newly appointed dietitians working for Counties Manukau district health board as they work with primary care to empower practice nurses and general practitioners to address obesity

prevention. The diabetes dietitans who work with the diabetes in pregnancy team of Counties Manukau are also researching the possibility of establishing group education for women who have had diabetes in pregnancy in the hope that reinforcing the healthy eating message may reduce the number diagnosed with diabetes.

Christchurch and Waikato are using Optifast, a very low calorie meal replacement, which is resulting in far greater weight loss than other medical obesity regimens and Counties Manukau dietitians are now investigating the possibility of a bulk buy which could be on sold to patients as this reduces the cost by $29 a week.

A 'Get Checked' programme has been established which allows an annual free check for people with diabetes to encourage an annual review. There is also Chronic Care Management that allows four free checks a year. As of July 2005, 5000 people in Counties Manukau have enrolled for the programme and 4600 have diabetes (Personal communication). All these initiatives are encouraging people with diabetes to receive appropriate care and reduce the risk of complications.

Educational material and treatment options must be continually updated as new insights become available as a result of continuing research.

WE CAN MAKE A DIFFERENCE

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Appendix 1

COUNTIES MANUKAU DISTRICT HEALTH BOARD
A Community Partnership

P.O. Box 93311
Otahuhu
Auckland 6
New Zealand

Phone 09 276-0000

15 January 2004

Clinical Board Co-ordinator
Third Floor, Room 304
Clinical Support Building
Middlemore Hospital
PB 93311
Otahuhu

Ms Lynnette Ferguson
18 Premila Drive
Pukekohe
South Auckland

Dear Lynette,

Thank you for the information you supplied the Clinical Board regarding your research proposal:

Pilot study to investigate the effectiveness of lifestyle in education in European people with Type 2 diabetes

I am pleased to inform you that the Clinical Board Executive has approved this research.

We wish you well in your project and require an update at the end of the year on how it is progressing. A copy of the progress report that is required by the Ethics Committee is sufficient, submitted to the Clinical Board Coordinator by January 2005.

Yours Sincerely,

Janine Rouse
Clinical Board Co-ordinator

Cc Brad Healey
Debbie Keys

Appendix 2

NATIONAL APPLICATION FORM FOR ETHICAL APPROVAL OF A RESEARCH PROJECT

PART I : BASIC INFORMATION

Protocol number and date received (for office use only)

1. Full project title

Pilot study to investigate amongst European people aged between 45 – 65, with Type 2 Diabetes, their preference for timing and method of life style education. How effective is Diabetes education in achieving improved clinical indicators and knowledge.

2. Short project title (lay title)

Pilot study to investigate the timing, method and effectiveness of education for people with diabetes.

3. Lead Principal Investigator's name and position

Lynnette Ferguson, diabetes specialist dietitian, Counties Manukau District Health Board

4. Address of lead Investigator

31 King Street	Work phone No.	09 358 0825 locator 8266
Waiuku	Emergency No.*	09 235 9312 (home)
South Auckland	Fax	09 235 9312
	E-mail	ferguson@ps.gen.nz

5. Lead investigator's qualifications and experience in past 5 years (relevant to proposed research)

Lynnette Ferguson NZRD, who has been working as a diabetes specialist dietitian at South Auckland Health (now Counties Manukau) since 1998, is conducting this study.
During this time she has been a member of the Diabetes Dietitans Special Interest, and NZ Society for the Study Diabetes (NZSSD), attending their conferences. She also been involved with the Diabetes Dietitians of Auckland who produce and distribute all diet sheets used in the education of people with diabetes through out NZ. She was co-ordinator of the rewrite of the Diabetes section of the dietitian's handbook and has shared with another dietitian the up-date of the nutrition section of the Post Graduate Health Professional Course through Waikato Polytechnic
Lynnette has also attended to 2 world conference on diabetes and is about to attend the American Diabetes Association conference in New Orleans. She just completed a postgraduate Certificate in Nutrition Science.

6. Co-investigators' name(s) and position(s) or, if multicentre, Principal Investigator at each site

A	Patsy Watson, supervisor of the above Masterate student
B	Programme Leader in Human Nutrition
C	Institute of Food, Nutrition and Human Health
D	

7. Address of co-investigator A

Massey University	Work phone No.	09 443 9755
Albany Campus	Emergency No.*	09 478 4817
Private Bag 102904	Fax	09 443 9640
Auckland	E-mail	pwatson@massey.ac.nz

8. Address of co-investigator B

	Work phone No.	
	Emergency No.*	
	Fax	
	E-mail	

9. Address of co-investigator C

	Work phone No.	
	Emergency No.*	
	Fax	
	E-mail	

10. Address of co-investigator D

	Work phone No.	
	Emergency No.*	
	Fax	
	E-mail	

(* option for Committee's information only)

11. Where this is supervised work

11.1 Supervisor's name	Patsy Watson
Position	Programme Leader in Human Health
Day time phone number	09 443 9755
11.2 Signature of supervisor (where relevant) Declaration: I take responsibility for all ethical aspects of the project	

12. List any other New Zealand Ethics Committees to which this project has been submitted and attach their letters of approval where available

13. I wish the protocol to be heard in a closed meeting

	Yes	✔	No

If the answer is yes, provide reason why you wish it to be heard in a closed meeting

14. Proposed starting date (dd/mm/yy)	10 August 2003
15. Proposed finishing date (dd/mm/yy)	10 August 2003
16. Duration of project (mm/yy)	12 months
17. Proposed final report date (mm/yy)	1st October 2004

PART II : PROJECT SUMMARY

1. Multicentre proposals

(Important: read the guidelines, Appendix 1)

1.1 Is this a multicentre study? **(if no, go to question 2)** ☐ Yes ☑ No

1.2 If yes, name the primary ethics committee for New Zealand

1.3 Has the protocol been submitted to any other ethics committees in New Zealand? (If **yes**, attach copies of relevant correspondence) ☐ Yes ☐ No

1.4 Who is the lead investigator or institution in New Zealand?

1.5 List the other New Zealand sites involved

1.6 Have the Principal Investigators from secondary sites agreed to participate? (attach copies of signed Part V Declaration for each site) ☐ Yes ☐ No

1.7 If the study is based overseas, which countries are involved?

2. Gene Studies

Does this research involve any gene or genetic studies? ☐ Yes ☑ No

If **yes**, complete section 16.

3. Scientific Assessment

Has this project been scientifically assessed by independent review? ☐ Yes ☑ No

If **yes**, by whom? (name and position)
A copy of the report should also be attached

If **no**, is it intended to have the project scientifically assessed, and by whom?

No

4. Data and Safety Monitoring Board (DSMB)

3.1 Is the trial being reviewed by a data and safety monitoring board? ☐ Yes ☑ No

If yes, who is the funder of the DSMB? ☐ Sponsor ☐ HRC

5. Summary

Give a brief summary of the study (not more than 200 words, in lay language)

Type 2 Diabetes has reached epidemic proportions in NZ. Most of the research being carried out has been with Maori and Pacific Island people thus I have chosen Europeans 45 – 64 years of age who have been diagnosed for at least 6 months and have already been seen by a dietitian. I have developed a pretested questionnaire which will be given to a random sample of 100 patients at Counties Manukau District Health Board at a follow up appointment with a dietitian over a period of 6 months. An information sheet and consent form will be sent prior to the appointment. The questionnaire is based on the concept that education is not a one off event but a continuous process. The results will give some insight as to the appropriate timing, site and style of education and is based on the concept that "Compliance is not a patients problem but a system problem". Appropriateness of education material will be examined and lifestyle changes, resulting from education will be investigated. The insight gained will be used to guide future planning for dietitian based education programs.

PART III : PROJECT DETAILS

SCIENTIFIC BASIS

1. Aims of Project

1.1 What is the hypothesis/research question(s)? (state briefly)

The research question is that people who have appropriate, effective education soon after diagnosis should have improved clinical outcomes and therefore reduced complications associated with diabetes.

1.2 What are the specific aims of the project?

- To examine the preferred timing and location for lifestyle education.
- To explore the preferred health professional for lifestyle education.
- To ascertain the preference for written oral or visual material.
- To investigate the patients perceived importance of biochemical indices of control.
- To explore the understanding of the importance of healthy eating and physical activity
- To survey food habits of people with diabetes.

2. Scientific Background of the Research

Describe the scientific basis of the project (300 words maximum). Where this space is inadequate, continue on a separate sheet of paper. *Do not* delete page breaks or renumber pages.

Europeans in NZ are facing a 39 % increase in prevalence of Type 2 Diabetes in the next 20 years (1) Thus Diabetes has been included in the Ministry of Health's thirteen health priorities for 2001. Diabetes is a chronic condition that can lead to long term debilitating disease such as blindness, lower limb amputation, heart disease, renal failure and early death. (2) However international research indicates that Type 2 Diabetes complications may be substantially preventable through changes in life style including exercise, and a healthy meal pattern. (3) If action is not taken to improve the level of service, its appropriateness, ease of access and availability the situation will worsen. (1)

"Diabetes education is not just part of the treatment, it is the treatment" (4) People with diabetes learn in a variety of mediums, written, oral and visual. Some prefer group education while others prefer individual appointments. There are many barriers to education that have been identified including inappropriate timing, site, time of day, level and frequency of education. The treatment gaols rely on the individual providing over 95% of their own care (5) therefore appropriate timely education is essential.

Diet and exercise are the cornerstone for treatment of Type 2 diabetes therefore as dietitians it is essential that information provide is individualised for each patient.

This pilot study will evaluate patients attitude to the education process, explore life style changes made as a consequence of education and resulting clinic outcomes. This research has not been previously carried out with this population group in New Zealand.

1. PriceWaterhouseCooper. Type 2 Diabetes Managing for Better Health Outcomes. April 2001
2. Fuller J, Shipley M, Rose G, The Whitehall Study 1980. Abbott W, Scragg R, Marbrook J, 1999: Simmonds D. 1996
3. UK Prospective Diabetes Study, UKPDS 34
4. Joslin Diabetes Mellitus 13th ed Joslin, Elliot Proctor 1869 – 1062. Editors Khan C R, Weir G C: Lea and Febiger, Philadelphia 1994
5. Travis T. Patient perceptions of factors that affect adherence to dietary regimes for diabetes mellitus. Diabetes Educator 26; 2: 272-279 2000

3. Participants

3.1 How many participants is it intended to recruit?	100 people with Type 2 Diabetes
3.2 How will potential participants be identified?	Randomly selected from patients attending the Dietetic Out Patient Diabetes Service of Counties Manukau District Health Board.
3.3 How will participants be recruited? (e.g. advertisements, notices)	A letter will be sent to each selected patient prior to their follow up visit to the clinic, including a brief description of the study (Information Sheet) and a consent form. Appendix i
3.3.1 Where will potential participants be approached? (e.g. outpatient clinic) If appropriate, describe by type (e.g. students)	Out Patient clinics of Counties Manukau District Health Board.
3.3.2 Who will make the initial approach to potential participants?	The principal investigator Lynnette Ferguson
3.3.3 Is there any special relationship between the participants and the researchers? e.g. doctor/patient, student/teacher	Dietitian / Patient Patients will have received education from the principal investigator in the previous 6 months and will be attending a routine follow up visit.

3.4 Briefly describe the inclusion/ exclusion criteria and include the relevant page number(s) of the protocol or investigator's brochure

Participants will have Type 2 Diabetes, be aged between 45 – 65 years and have already been seen by a dietitian from Counties Manukau District Health Board.

3.5 If randomisation is used, explain how this will be done

The computerised data base at Counties Manukau will be used to identify patient who fit the inclusion criteria until 100 patient have been selected and letters will be sent to these patient.

4. Study Design

4.1 Describe the study design. Where this space is inadequate, continue on a separate sheet of paper. *Do not* delete page breaks or renumber pages.

This pilot study is for a Masterate, to be completed in one year with no funding.
One hundred randomly selected consenting European patients between the age of 45 – 65, will be studied. This random selection will be made via computer from all patients that have visited the researcher in the past 6 months and received dietary and life style advice. Information sheets plus informed consent forms will be sent out prior to the appointment and the questionnaire given at the follow up appointment.

4.2 How many visits/admissions of participants will this project involve? Give also an estimate of total time involved for participants.

The patients will attend their usual 30 minute follow up visit for dietary and lifestyle advise and at the end of the visit the questionnaire will be given and the patient will fill it out in the waiting room and hand it to administration staff. This will take approximately 15 minutes.

4.3 Describe any methods for obtaining information. Attach questionnaires and interview guidelines.

The questionnaire is attached. Appendix ii
The data will be collected using standard methods.

- patients personal experience
- demographic
- Biochemical Results from laboratory
- Medication from medical records
- Complications from medical records

4.4 Who will carry out the research procedures?

The applicant.

4.5 Where will the research procedures take place?

At the Dietitian Out Patient Clinics of Counties Manukau District Health Board.

4.6 If blood, tissue or body fluid samples are to be obtained, state type, use, access to, frequency, number of samples, total volume, means of storage and labelling, length of proposed storage and method of disposal.

4.7 Will data or other information be stored for later use in a future study? ☐ Yes ☑ No

If yes, explain how

4.8 Will any samples go out of New Zealand? ☐ Yes ☑ No

If so where, and for what purpose?

5. Research Methods and Procedures

5.1 Is the method of analysis : ☑ quantitative ☐ or qualitative?

If the method of analysis is qualitative, go to question 5.2.

If the method of analysis is **wholly or partly quantitative**, complete the following :

5.1.1 Describe the statistical method that will be used

Data will be analysed using the Statistical Packages for Social Science (SPSS for Windows, version 10.0) Standard statistical methods will be used.

5.1.2 Has specialist statistical advice been obtained? ☐ Yes ☑ No

If **yes**, from whom?

(A brief statistical report should be included if appropriate)

5.1.3 Give a justification for the number of research participants proposed, using appropriate power calculations.

Not applicable in this pilot study.

5.1.4 What are the criteria for terminating the study?

None unless ill health or death befalls the applicant.

5.2 If the method of analysis is **wholly or partly qualitative**, specify the method. Why is this method appropriate? If interviews are to be used include the general areas around which they will be based. Copies of any questionnaires that will be used should be appended.

6. Risks and benefits

6.1 What are the benefits to research participants of taking part?

All participants will receive feedback on their individual results plus a brief summary of the research findings.

6.2 How do the research procedures differ from standard treatment procedures?

N/A

6.3 What are the physical or psychological risks, or side effects to participants or third parties? Describe what action will be taken to minimise any such risks or side effects.

There are no perceived risks.

6.4 What arrangements will be made for monitoring and detecting adverse outcomes?

There are no perceived adverse outcomes. However if during the course of the interview serious problem emerge, the investigator will listen attentively and request permission of the patient to refer them to the physician, health psychologist, diabetes nurse specialist, or podiatrist who are all part of the diabetes service.

6.5 Will any potential toxins, mutagens or teratogens be used? ☐ Yes ☑ No

If **yes**, specify and outline the justification for their use

6.6 Will any radiation or radioactive substances be used? ☐ Yes ☑ No

Note: If any form of radiation is being used please answer the following. If no, go to question 6.8

6.6.1 Under whose license is the radiation being used?

6.6.2 Has the National Radiation Laboratory (NRL) risk assessment been completed? ☐ Yes ☐ No

If **yes**, please enclose a copy of the risk assessment, and the contact name and phone number

If **no**, please explain why

6.7 What facilities/procedures and personnel are there for dealing with emergencies?

6.8 Will any drugs be administered for the purposes of this study? ☐ Yes ☑ No

If **yes** is SCOTT approval required? ☐ Yes ☐ No

Has SCOTT approval been given? (please attach) ☐ Yes ☐ No

7. Expected outcomes or impacts of research

7.1 What is the potential significance of this project for improved health care?

Diabetes is a chronic condition that can lead to long term debilitating disease such as blindness, lower limb amputation, heart disease, renal failure and early death However international research indicates that Type 2 Diabetes complications may be substantially preventable through changes in life style including exercise, and a healthy meal pattern. If action is not taken to improve the level of service, its appropriateness, ease of access and availability, the risk of complications will increase.

UK Prospective Diabetes Study reported that improved Blood Glucose and Lipid control and improved blood pressure reduced the risk of diabetes related complications by –

- 25% major diabetes eye disease
- 33% early kidney damage
- 33% less deaths
- 33% less strokes

Appropriate education, which empowers the patient to take control of their diabetes, will result in considerable improvement in biochemical indices and as a consequence improved long-term health of people with diabetes. This pilot will greatly improve dietitians understanding of the education process.

7.2 What is the potential significance of this project for the advancement of knowledge?

This study will provide insight into what is the most appropriate timing for the commencement of education, where patients prefer to have their education and the preferred frequency. It will also reveal which of the diet sheets are useful and those that need adapting to make them more user friendly. The preferred medium for education will become evident, as will the preference for group or individual appointments. Knowledge of patient's attitude to their biochemical results will assist in development of education programmes and an over view of food intake will reveal if the basic facts have been adequately explained and changes implemented.

In the long term it is hoped that an improved education programme can be developed which will lead to improved metabolic control and therefor a reduction in debilitating complications.

7.3 What steps will be taken to disseminate the research results?

The information obtained from the study will be analysed, and written up as a research report (thesis), presented as a conference paper, and if suitable written up as a paper for publication in a scientific journal. It will be also presented to the Diabetes and Dietitians teams working for Counties Manukau District Health Board and circulated to all dietitians working in diabetes in New Zealand through the Diabetes Special Interest Group newsletter.

Each participant will be given the opportunity to receive an outline of their individual results plus a brief summary of the research findings.

PART IV: BUDGET AND USE OF RESOURCES

8. Budget

8.1 How will the project be funded?

By the principal investigator.

8.2 Does the researcher, the host department or the host institution, have any financial interest in the outcome of this research? Please give details.

No

8.3 Will the researcher personally receive payment according to the number of participants recruited, or a lump sum payment, or any other benefit to conduct the study? If so, please specify:

No

8.4 What other research studies is the lead investigator currently involved with?

None

9. Resource Implications

9.1 Does the study involve the use of healthcare resources? [✔] Yes [ ] No

If **yes**, please specify:

The investigator's office and computer at Counties Manukau District Health Board's Out Patient Clinics
All time spent in this research will be in the investigators own time.

9.2 What effect will this use of resources have on waiting list times for patients ie., for diagnostic tests or for standard treatments?

None

10. Financial Costs and Payments to Participants

10.1 Will there be any financial cost to the participant? Give examples including travel.

No
The patients would be attending the clinic even if not taking part in the research.

10.2 Will the study drug/treatment continue to be available to the participant after the study ends? ☐ Yes ☐ No ☑ N/a

If **yes**, will there be a cost, and how will this be met?

10.3 Will any payments be made to participants or will they gain materially in other ways from participating in this project? ☐ Yes ☑ No

If **yes**, please supply details

11. Compensation for Harm Suffered by Participants

(refer to Appendix 3 of the Guidelines)

Is this a clinical trial under accident compensation legislation (see form guidelines) ☐ Yes ☑ No

If **yes**, please answer the following:

11.1 Is the trial being carried out principally for the benefit of a manufacturer or distributor of the drug or item in respect of which the trial is taking place? ☐ Yes ☐ No

(a) If the answer to 11.1 is **yes**, please complete **Statutory Declaration Form B** and answer questions 11.2, 11.3 and 11.4

(b) If the answer to 11.1 is **no** please complete **Statutory Declaration Form A**

11.2 What type of injury/adverse consequence resulting from participation in the trial has the manufacturer or distributor undertaken to cover? (please tick the appropriate box/es)

		Yes	No
a)	any injury (mental or physical)	☐	☐
b)	only serious or disabling injuries.	☐	☐
c)	only physical injuries	☐	☐
d)	only physical injuries resulting from the trial drug or item, but not from any other aspect of the trial	☐	☐
e)	physical and mental injury resulting from the trial drug or item, but not from any other aspect of the trial.	☐	☐
f)	any other qualification (explain)		

11.3 What type of compensation has manufacturer or distributor agreed to pay?

		Yes	No
a)	medical expenses	☐	☐
b)	pain and suffering	☐	☐
c)	loss of earnings	☐	☐
d)	loss of earning capacity	☐	☐
e)	loss of potential earnings	☐	☐
f)	any other financial loss or expenses	☐	☐
g)	funeral costs	☐	☐
h)	dependants' allowances	☐	☐

11.4 Exclusion clauses:

		Yes	No
a)	Has the manufacturer or distributor limited or excluded liability if the injury is attributable to the negligence of someone other than the manufacturer or distributor? (such as negligence by the investigator, research staff, the hospital or institution, or the participant).	☐	☐
b)	Has the manufacturer or distributor limited or excluded liability if the injury resulted from a deviation from the study protocol by someone other than the manufacturer or distributor?	☐	☐
c)	Is company liability limited in any other way? If yes, please specify	☐	☐

12. Information and Consent

Consent should be obtained in writing, unless there are good reasons to the contrary. If consent is not to be obtained in writing the justification should be given and the circumstances under which consent is obtained should be recorded. Attach a copy of the information sheet and consent form.

12.1 By whom, and how, will the project be explained to potential participants?	By the principal investigator.
12.2 When and where will the explanation be given?	A letter, information sheet and consent form will be posted to selected participants. Appendix i
12.3 Will a competent interpreter be available, if required?	N/A
12.4 How much time will be allowed for the potential participant to decide about taking part?	One week minimum
12.5 Will the participants be capable of giving consent themselves? - if not, complete Part VI	Yes
12.6 In what form (written, or oral) will consent be obtained? If oral consent only, state reasons.	Written (consent form attached appendix i)
12.7 Are participants in clinical trials to be provided with a card confirming their participation, medication and contact phone number of the principal investigator?	☐ Yes ☑ No

13. Confidentiality and Use of Results

13.1 How will data including audio and video tapes, be handled and stored to safeguard confidentiality (both during and after completion of the research project)?	All participants will be given a code number. A separate master file linking subject name and address to code number will be kept under lock and key, and stored in a separate location to the data. Code number will identify data collection forms and all data entered in the computer only.
13.2 What will be done with the raw data when the study is finished?	All data collection forms will be stored in locked filing cabinets in the nutrition research data storage room in the Institute of Food Nutrition and Human Health, Massey University, Albany Campus, which is locked and alarmed when no researcher is present.
13.3 How long will the data from the study be kept and who will be responsible for its safe keeping?	The data will be kept for 10 years by the applicant's supervisor (see above)
13.4 Who will have access to the raw data and/or clinical records during, or after, the study?	The applicant and her supervisor.
13.5 Describe any arrangements to make results available to participants, including whether they will be offered their audio tapes or videos.	No recordings will be made. Each participant will be given the opportunity receive an outline of their individual results plus a brief summary of the research findings in writing.
13.6 If recordings are made, will participants be offered the opportunity to edit the transcripts of the recordings?	☐ Yes ☐ No N/A
13.7 Is it intended to inform the participant's GP of individual results of the investigations, and their participation, if the participant consents?	☐ Yes ☑ No

If **no**, outline the reasons

Not relevant, as patient's GP will have copies of biochemical results and will take appropriate action if required. If the researcher has any concerns a routine letter will be sent outlining these concerns.

13.8 Will any restriction be placed on publication of results? ☐ Yes ☑ No

14. Treaty of Waitangi

14.1 Have you read the HRC booklet, "Guidelines for Researchers on Health Research involving Maori"? ☑ Yes ☐ No

14.2 Does the proposed research project impact on Maori people in any way? ☐ Yes ☑ No

14.3 Explain how the intended research process is consistent with the provisions of the Treaty of Waitangi

Although this research is directed towards European people this does not exclude Maori who may wish to participate. Participation will lead to improved diabetes care both by health professionals and by the person with diabetes as they are empowered by education.

14.4 Identify the group(s) with whom consultation has taken place, and attach evidence of their support

Manager of Counties Manukau District Health Board diabetes service - Debbie Keys

14.5 Describe the consultation process that has been undertaken **prior** to the project's development

Over the 5 years the researcher has worked for South Auckland Health she has worked closely with Maori Nurses giving "health eating for diabetes" talks supermarket tours as well having them attend the clinics. Consultation with Maori health workers is on going.

14.6 Describe any ongoing involvement the group consulted has in the project

There is a commitment to on going consultation as a routine component of the researcher's position.

14.7 Describe how information will be disseminated to participants and the group consulted at the end of the project

Each participant will be asked if they would like to receive an outline of their individual results and a brief summary of the research findings on their consent form. This will be sent out at the end of the research.

15. Other Issues

15.1 Are there any aspects of the research which might raise specific cultural issues? ☐ Yes ☑ No

If **yes**, please explain

15.1.1 What ethnic or cultural group(s) does your research involve? European

Describe what consultation has taken place with the group prior to the project's development

Over the last five years the researcher has consulted with health workers representing a widely diverse group of people. She has also attend and spoken at many patient support groups and Doctors surgeries as well as to health professionals including practise nurses and GP's. These experiences have all assisted with the consultative process through group discussion.

15.1.2 Identify the group(s) with whom consultation has taken place and attach evidence of their support

15.1.3 Describe any ongoing involvement the group consulted has in the project

The investigator will continue her employment with Counties Manukau District Health Board.

15.1.4 Describe how you intend to disseminate information to participants and the group consulted at the end of the project

Each participant will be asked if they would like to receive an outline of their individual results and a brief summary of the research findings on their consent form. This will be sent out at the end of the research.

Finding will be presented to the Counties Manukau Health Boards Diabetes and dietitians teams and distributed to other dietitians working in the same field through the Diabetes Dietitians Special Interest Group news letter.

The thesis will be available for any one interested and copies of the thesis will also be held at the Massey University Library.

16. Genetics Check List

16.1 Does the proposed research study involve use of products made by genetic modification, analyses of DNA or clinical genetics?
If it does not, proceed to question 17.

☐ Yes ☑ No

16.2 Have you read, and does your research comply with, the Guidelines "Ethical considerations relating to Research in Human Genetics? *Applicant responses to these questions may initiate a request from the Ethics Committee for more detailed information.*

☐ Yes ☐ No

16.3 Will the study involve administration of any products produced by genetic modification, other than licensed medicines?

☐ Yes ☐ No

If yes, has approval from GTAC been obtained?

☐ Yes ☐ No

If yes please describe.

16.4 Information on Samples :

16.4.1 Is tissue or body fluid samples for DNA analysis to be taken for :

(tick all boxes which apply)

a) immediate analysis ☐ Yes ☐ No
b) storage for future analyses ☐ Yes ☐ No
c) analyses outside New Zealand ☐ Yes ☐ No
d) analyses by individuals or organisations other than the study investigators ☐ Yes ☐ No

16.4.2 Describe processes for storage and disposal of samples taken for DNA analyses

16.4.3 Up to what point would withdrawal of the sample or the data at the request of the participant be possible?

16.5 Is personal and health information from individuals and DNA analysis to be linked? ☐ Yes ☐ No
If yes, please describe how confidentiality will be assured.

16.6 Are samples to be obtained from Maori? ☐ Yes ☐ No
If yes, please describe any relevant issues additional to Section 16.4.1

16.7 Will the study involve participant contact with a clinical geneticist? ☐ Yes ☐ No
If yes, please provide :
- the name of the clinical geneticist, and
- describe the purpose

16.8 Will provision be made where appropriate for genetic counselling? ☐ Yes ☐ No
If yes, please describe the process.

17. Ethical Issues

17.1 Describe and discuss any ethical issues arising from this project, other than those already dealt with in your answers?

None that we are aware of.

Thank you for your assistance in helping us assess your project fully

Please now complete:

- **the declarations (Part V)**
- **a drug administration form (if applicable)** **N/A**
- **Form A or B relating to accident compensation** **N/A**

PART V: DECLARATIONS

Full Project Title :

Pilot study to investigate the effectiveness of lifestyle education in European people with Type 2 Diabetes.

Short Project Title :

Pilot study to investigate the effectiveness of lifestyle education in European people with Type 2 Diabetes.

Declaration by Principal Investigator

The information supplied in this application is, to the best of my knowledge and belief, accurate. I have considered the ethical issues involved in this research and believe that I have adequately addressed them in this application. I understand that if the protocol for this research changes in any way I must inform the Ethics Committee.

NAME OF PRINCIPAL INVESTIGATOR (PLEASE PRINT): LYNNETTE FERGUSON

SIGNATURE OF PRINCIPAL INVESTIGATOR: L A Ferguson.

DATE: 29/9/03

A separate declaration will be required for each multi-centre site, signed by the principal investigator for that site.

2. Declaration by Head of Department in which the Principal Investigator is located or appropriate Dean or other Senior Manager

I have read the application and it is appropriate for this research to be conducted in this department I give my consent for the application to be forwarded to the Ethics Committee.

NAME AND DESIGNATION (PLEASE PRINT): Brenda Gill-Walker
Clinical Head Diabetes

SIGNATURE:

INSTITUTION: MASSEY UNIVERSITY ALBANY
Counties Manukau Health Board

DATE: 29/9/03

DESIGNATION: PROGRAMME LEADER IN HUMAN NUTRITION

- *Where the head of department is also one of the investigators, the head of department declaration must be signed by the appropriate Dean, or other senior manager.*
- *If the application is for a student project, the supervisor should sign here.*

3. Declaration by the General Manager of the Health Service in which the research is being undertaken (if applicable)

I have reviewed the proposal for cost, resources, and administrative aspects and issues regarding patient participation and staff involvement. The proposal has my approval subject to the consent of the Ethics Committee.

NAME OF GENERAL MANAGER (PLEASE PRINT): BRAD HEALEY

SIGNATURE:

INSTITUTION: COUNTIES MANUKAU DISTRICT HEALTH BOARD

DATE: 21/10/03

FORM A

DECLARATION OF ELIGIBILITY OF A CLINICAL TRIAL FOR CONSIDERATION OF COVERAGE UNDER ACCIDENT COMPENSATION LEGISLATION

Instructions: This form is to be completed and the statutory declaration signed by the applicant. It should be forwarded to the primary Ethics Committee together with the documents seeking ethical approval for the proposed study.

If the study is a multi-centre proposal, this form should only be sent to the primary committee.

The information provided must be sufficiently detailed to enable the Ethics Committee to be satisfied that the proposed research is not conducted principally for the benefit of the manufacturer or distributor of the medicine or item in respect of which the research is carried out.

The provision of this information will enable the ethics committee to be satisfied that participants in the clinical trial will be considered for coverage under accident compensation legislation, for injury caused as a result of their participation in the research.

DETAILS OF PROPOSED RESEARCH STUDY

Title of research project: Pilot study to investigate amongst European people aged between 45 – 65, with Type 2 Diabetes, their preference for timing and method of life style education. How effective is Diabetes education in achieving improved clinical indicators and knowledge.

- Name of Research Director/Investigator: Lynnette Ferguson
- Is the Investigator a Registered Health Professional ✓ Yes No
  tick or circle as appropriate
- Location/s of proposed study: Counties Manukau District Health Board Out Patient Diabetes Service
- State number of participants: 100
- Organisations providing support ($ or "in kind") for the direct and indirect costs of the research.
  Please provide names of organisations and the type of support provided.
  No monetary support has been provided.
- Relationship of proposed research to the pharmaceutical industry or other company involved in health research. Please describe the involvement of industry in your proposed research, and provide details of support to be received from them.
  There is no relationship with a pharmaceutical industry or company or with a company involved with health research.

STATUTORY DECLARATION:

I Lynnette Ferguson (name, of town/city) Auckland solemnly and sincerely declare that as director of the proposed research, the proposed study is not conducted principally for the benefit of the manufacturer or distributor of the medicine or item in respect of which the trial is carried out.

And I make this solemn declaration conscientiously believing the same to be true and by virtue of the Oaths and Declarations Act 1957.

Lynnette Ferguson — Name (please print)

Signature

23rd MAY 2003. — this day of

before me

Selvieh Keenan Lawrence — Name (please print)

Signature

A Justice of the Peace, or
A Solicitor of the High Court
or other person authorised to take a statutory declaration.
Warning: Please note that it is an offence under part VI subsection 111 the Crimes Act 1961 to make a false statutory declaration.

Note: Applicants conducting a research study which is conducted principally for the benefit of the manufacturer or distributor of the medicine or item in respect of which the trial is carried out should complete Form B.

Appendix 3

Massey University

INSTITUTE OF FOOD NUTRITION AND HUMAN HEALTH
ALBANY CAMPUS

To:.....

You are invited to take part in a study I am conducting through the Whitiora Diabetes Service of Counties Manukau District Health Board. However, like all invitations, you have the choice of accepting or declining.

I am interested to find out from you how you were educated about your diabetes, what method you would have preferred and what you found most helpful. This is part of my Master of Nutritional Science degree at Massey University.

Attached is an information sheet that outlines what will be involved.

Please read this information before making your decision. If you decide to take part in this study, please bring me the consent form when you come to your next appointment.

If you have any questions, please do not hesitate to contact me through the Whitiora Diabetes Service on 3580825 locator 8266. Leave a message and I will contact you as soon as possible.

Thank you for your time
Yours sincerely

Lynne Ferguson
Dietitian
Whitiora Diabetes Service
Middlemore Hospital

Massey University

INSTITUTE OF FOOD NUTRITION AND HUMAN HEALTH
ALBANY CAMPUS

Pilot study to investigate the effectiveness of lifestyle education for people who identify as European with Type 2 Diabetes

Participants information sheet

Researchers background:

You are invited to take part in a study being conducted by Lynne Ferguson for her MSc in Nutritional Science. Lynne is currently working as a dietitian at the Whitiora Diabetes Service. Her supervisor is Patsy Watson, a nutritionist and Programme Leader in Human Nutrition at Massey University, Albany Campus.

Study Outline:

The purpose of this study is to look at:

- The timing of your diabetes education.
- The methods used.
- Who provided the education?
- What education sheets did you find helpful?
- What is the impact of this education on your diabetes control?

Appropriate education is the key to you being able to take control of your diabetes and therefore achieve good blood glucose control, avoid complications and live a normal life. We would like to find out about your experiences when you found you had diabetes, and was the education you received right for you.

This study will help Lynne and other dietitians serve you better ensuring the information you receive is appropriate and timely.

What will be asked of you as a participant?

At your routine follow up visit to the diabetes service a 10 - 15 minute questionnaire will be given which asks where you initially received your education about diabetes, who provided that information, did you find the information helpful and what changes you have made as a consequence?

Version 6: 2 rd December 03

You will also be asked to give your consent to allow the researcher to access your medical files and record your –

- date of birth
- weight
- height
- year diabetes was diagnosed
- HBA1c
- Total cholesterol
- HDL level
- LDL level
- Triglycerides
- Diabetes related complications
- Medication prescribed

This data will be coded and used for statistical analysis only. Your name will not be used in the data records or analysis. The only people who will have access to your data are the researcher and her supervisor. All records will be kept in a locked and alarmed data storage room.

This information will be used to better understand the effectiveness and limitation of the education process that is used with people with diabetes.
At the completion of the study your General Practitioner will be informed of your individual results if you give your permission on the Consent Form.

What will you get out of taking part?

- Help and advice on how to manage your diabetes
- Referral to other diabetes specialists if necessary
- The knowledge that you are helping those yet to be diagnosed to receive appropriate education at an appropriate time and place.

Your rights:

Volunteers

- Receiving this information sheet you may decline to take part in this study
- Can withdraw from the study before the questionnaire is completed.
- Have the right to ask questions about the study at any time.
- Provide information on the understanding that their name will **not** be used.
- Will be given a summary of the findings of the study.

Confidentiality:

The results of this study will of course be CONFIDENTIAL. Anything a volunteer tells the researcher will be anonymous and remain confidential.

A code number will identify each volunteer when collecting and analysing all information. No names will be used. All data collected will be filed in a locked cabinet in a locked and alarmed room. A master list of the names, addresses and code numbers will be kept by the project supervisor under lock and key in a separate location. The analysis of the information will focus on the results for the group as a whole, not the individual.

Version 6: 2 rd December 03

Compensation

In the unlikely event of a physical injury as a result of your participation in this study, you may be covered by ACC under the Injury Prevention, Rehabilitation and Compensation Act. ACC cover is not automatic and your case will need to be assessed by ACC according to the provision of the 2002 Injury Prevention Rehabilitation and Compensation Act. If your claim is accepted by ACC, you still might not get any compensation. This depends on a number of factors such as whether you are an earner or non-earner. ACC usually provides only partial reimbursement of costs and expenses and there may be no lump sum compensation payable. There is no cover for mental injury unless it is a result of physical injury. If you have ACC cover, generally this will affect your right to sue the investigators.

If you have any questions about ACC, contact your nearest ACC office or the investigator.

Concerns

If you have any queries or concerns regarding your rights as a participant in this research you may wish to contact a Health and Disability Advocate,
Telephone 0800 555050.

Publication of Results

Results of this study will be written up as a thesis, and written up as a scientific paper.

Ethical Approval

This study has received ethical approval from the Auckland Ethics Committee.

The manager of Diabetes Service of Counties Manukau District Health Board has given permission for this study to be carried out.

Please feel free to contact the researcher if you have any questions about this study.

If you are willing in taking part in this study please complete the enclosed Consent Form and bring it with you to your next Clinic appointment.

Thank you.
Lynne Ferguson
Whitiora Diabetes Service
Middlemore Hospital
Private Bag 93311
Otahuhu
Auckland
Email: Lferguson@middlemore.co.nz

Appendix 5

Massey University

INSTITUTE OF FOOD NUTRITION AND HUMAN HEALTH
ALBANY CAMPUS

Pilot study to investigate the effectiveness of lifestyle education for people who identify as European with Type 2 Diabetes

Consent Form

If you are willing to take part in this study, please complete this consent form and bring it to your next visit to the dietitian.

- I have read and understood the purpose of the study.
- I have been given and read a written explanation of what is required of me.
- I agree to the researcher, Lynne Ferguson, accessing my medical notes for the purpose of this study
- I have had an opportunity to ask questions and to have them answered.
- I understand I have the right to withdraw from the study before the questionnaire has been completed and have the right to decline to answer any particular question.
- I agree to provide information to the researcher on the understanding that my name will not be used.
- I understand that my consent to take part does not alter my legal rights.
- I agree to take part as a subject in this study, under the conditions set out in the information sheet.
- I agree to my GP or other current provider being informed of my participation in this study /the results of my participation in this study. Yes / No

Please sign this Consent form prior to coming to clinic and have your signature witnessed.

Please turn over.

Subject:

_____ (Given name) _____ (Surname)

_____ (Signature) _____ (Date)

Witness:
In my opinion consent was given freely and with understanding.

_____ (Given name) _____ (Surname)

_____ (Signature) _____ (Date)

Thank you

Lynne Ferguson
Whitiora Diabetes Service
Middlemore Hospital
Private Bag 93311
Otahuhu
Auckland
Email: Lferguson@middlemore.co.nz

Appendix 6

Massey University

Institute of Food, Nutrition and Human Health
Albany Campus

Questionnaire

A study to investigate the effectiveness of life style education in European people with Type 2 Diabetes

Subject code number.....

Date of interview ...../...../.....

Please the box that best reflects your answer.

Timing and location of education	**Researcher to complete this columr**
1.To the best of your knowledge how many of your extended family have / had diabetes? *Please as many boxes as appropriate.* Yes No Don't know (a) mother (a) (b) father (b) (c) brother/sister (c) (d) uncle/aunt (d) (e) grandparent (e) (f) cousins (f) (g) don't know (g)	**1. Family Diabetes** Yes = 1 No = 2 DK = 3 (a) = (b) = (c) = (d) = (e) = (f) = (g) =
2. Were you told you had diabetes while in hospital? Yes No	**2. Where diagnosed** Yes = 1 No = 2
3. Did you receive your initial information about diabetes from: (a) a doctor (a) (b) a nurse (b) (c) a specialist diabetes nurse (c) (d) a dietitian (d) (e) others - please identify..... (f) don't know (a)	**3. Initial Education** (a) = 1 (b) = 2 (c) = 3 (d) = 4 ..... (f) = 9
4.Did this information meet your needs and answer your questions? Yes No	**4. meet your needs.** Yes = 1 No = 2

Preferred type of education.	Researcher to complete this column
5. Would you consider the best time to begin education sessions on how to control your diabetes to be:- (a) as soon as you find out you have diabetes (a) (b) a week after you have found out you have diabetes (b) (c) a month later (c) (d) other - write down suggestions .... (e) don't know (e)	**5. Best timing** (a) = 1 (b) = 2 (c) = 3 .... (e) = 9
6. Would you like to have regular education sessions? Yes No If 'no" go to question 9.	**6. Regular education** Yes = 1 No = 2
7. If you would like regular education sessions how frequent should these sessions be? (a) once a month (a) (b) every 3 months (b) (c) annually (c) (d) when you ask for an appointment (d) (e) don't know (e)	**7. Regularity of up-dates** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 9
8. Would you prefer your on-going education to be from your - (a) family doctor (a) (b) practice nurse (b) (c) community diabetes nurse specialist (c) (d) community diabetes dietitian (d) (e) private dietitian (e) (f) support group (f) (g) other - write down suggestions .... (h) don't know (h)	**8.Ongoing education** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6 .... (h) = 9
9. Have you attended group education sessions for people with diabetes? Yes No If "No" go to question 11.	**9. Group Education** Yes = 1 No = 2

10. If 'yes' would you prefer to receive education -		Researcher to complete this column 10. Type education
(a) on your own	(a)	(a) = 1
(b) in a group	(b)	(b) = 2
(c) in a group followed by an individual appointment	(c)	(c) = 3

11. What time of day would you prefer to have your appointment:		11. Time of day
(a) daytime	(a)	(a) = 1
(b) early evening	(b)	(b) = 2
(c) suggest a more suitable time		.....
.....		.....
(d) don't mind	(d)	(d) = 9

12.Where would you prefer to go for ongoing education sessions:		12.Preferred location
(a)To your family doctors rooms	(a)	(a) = 1
(b) To a community clinics like this	(b)	(b) = 2
(c) in home settings in your community	(c)	(c) = 3
(d) other - write down suggestions		.....
.....		.....

13.How helpful were the healthy eating information sheets? ***If you received the sheet, place the number in the box that best corresponds with your answer.*** 1= very helpful 2 = helpful 3 = don't know 4 = of some use 5 = of no use *eg if you thought it was helpful you would put 2*		13. Information Sheets
(a) basic meal plan (free food, foods to avoid)	(a)	(a) = 1
(b) meal plan	(b)	(b) = 2
(c) free drinks, drinks to avoid	(c)	(c) = 3
(d) breakfast cereals, best and avoid	(d)	(d) = 4
(e) biscuits to include	(e)	(e) = 5
(f) low fat cheeses	(f)	(f) = 6
(g) low fat artificially sweetened yoghurt	(g)	(g) = 7
(h) glycaemic index	(h)	(h) = 8
(I) carbobydrate counting	(I)	(i) = 9
(j) low fat cooking methods	(j)	(j) = 10
(k) low fat takeaways	(k)	(k) = 11
(l) shopping guide	(l)	(l) = 13
(m) exercise and diabetes	(m)	(m) = 14
(n) food photographys	(n)	(n) = 15
(o) others please state name		.....

14. Is there any other information about your food and life style that would be helpful?	**Researcher to complete this sectior**
Write down any suggestions.....	**14. Other information**
.....	.....

15. Diabetes information comes in a variety of styles. How helpful would you find each of the following?:		**15. Diabetes Information**	
(Write the number in the box that best corresponds with your answer.)			
1= very helpful 2= helpful 3= don't know 4= of some use 5= of no use			
eg if you thought it was helpful you would put	*2*		
(a) written pamphlets	(a)	(a)	= 1
(b) books	(b)	(b)	= 2
(c) one on one discussion	(c)	(c)	= 3
(d) takehome video	(d)	(d)	= 4
(e) take home food photos of health meals	(e)	(e)	= 5
(f) education on the internet	(f)	(f)	= 6
(g) computer CD	(g)	(g)	= 7
(h) TV programmes	(h)	(h)	= 8

16. Is there any other way you would have liked to receive information?	**16 Ways to receive information**
Write down any suggestions.....	.....

Blood Tests

17. Do you test your blood glucose (sugar) levels? Yes No	**17. Blood Glucose**
If 'No' go to question no 23	Yes = 1 No = 2

18. If you have answered 'yes' to blood glucose monitoring do you find it:	**18.Blood glucose monitoring**	
(Write the number in the box that best corresponds with your answer.)	very valuable	= 1
	valuable	= 2
1 = very valuable 2 = valuable 3 = don't know 4 = a waste of time	don't know	= 9
	a waste of time	= 4

		Researcher to complete this column
19. On how many days of the week do you test?		**19. Days test done**
(a) once	(a)	(a) = 1
(b) twice	(b)	(b) = 2
(c) three times	(c)	(c) = 3
(d) four or five times	(d)	(d) = 4
(e) every day	(e)	(e) = 5
(f) only occasionally	(f)	(f) = 6

20. At what times of day do you test?		**20. Times of test**
Please as many boxes as appropriate.		
(a) before breakfast	(a)	(a) = 1
(b) 2 hours after breakfast	(b)	(b) = 2
(c) before lunch	(c)	(c) = 3
(d) 2 hours after lunch	(d)	(d) = 4
(e) before dinner	(e)	(e) = 5
(f) 2 hours after dinner	(f)	(f) = 6
(g) before bed	(g)	(g) = 7
(h) other		(h).....

21 What do you do if your blood glucose (sugar) is low?	**21.Low blood glucose**
Write down what you do.....	.....
.....	.....
	.

22. What do you do if your blood glucose level is high?	**22.High blood glucose**
Write down what you do.....	.....

23. As a result of knowing your blood lipids (cholesterol) have you made any changes to your life style eg diet or activity level?	**23. Life style changes**
Yes No	Yes = 1
	No = 2
If 'No' go to question no 25	

24. If 'yes' have you:-		**24 Changes made**
Please the boxes that reflects the changes you have made.		
(a) changed your intake of polyunsaturated fats-	increased it	(a) increase = 1
	decrease it	(a) decrease = 2
(b) changed your intake of monounsaturated fat-	increased it	(b) increase = 3
	decreased it	(b) decrease = 4
(c) changed your intake of saturated fat-	increased it	(c) increase = 5
	decreased it	(c) decrease = 6
(d) changed your level of physical activity-	increased it	(d) increase = 7
	decreased it	(d) decrease = 8
(e) changed your alcohol intake-	increased it	(e) increase = 9
	decreased it	(e) decrease =10

Activity Level	**Researcher to complete this column**
25. Are you happy with your present weight? Yes No If 'yes' go to question no 27	**25. Present weight** Yes = 1 No = 2
26. If 'no' should you:- increase your weight decrease your weight	**26. Change in weight** increase = 1 decrease = 2
27. What are the physical activities that you are involved in- eg walking for exercise, gardening, bowls, golf, exercise machine etc ? Write down	**27. Physical Activities** ....
28. How frequently do you do some form of exercise. (a) occasionally (a) (b) 2 - 3 times a week (b) (c) 3 - 4 times a week (c) (d) 4 - 5 times a week (d) (e) daily (e) (f) other: Write down frequency	**28.Frequency of exercise** (a) = 1 (b) = 1 (c) = 2 (d) = 3 (e) = 4 (f) .....
29. During an average week how many minutes would you spend in physical activity? (a) less than 30 minutes (a) (b) 30 - 60 minutes (b) (c) 1 hour - 2 hours (c) (d) 3 hours - 4 hours (d) (e) 4 hours - 6 hours (e) (f) more than 6 hours (f)	**29. Time exercising** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6

Alcohol	Researcher to complete this column
30. Do you drink alcoholic beverages? Yes No If 'No" go to question no 36	**30. Alcohol** Yes = 1 No = 2
31. How often do you drink alcoholic beverages? (a) daily (a) (b) 4 - 5 times a week (b) (c) 2 - 3 times a week (c) (d) once a week (d) (e) 1 - 2 times a month (e) (f) less than once a month (f)	**31. Frequency of alcohol** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6
32. What type of alcoholic drink do you usually choose? (a) beer (a) (b) red wine (b) (c) white wine (c) (d) spirits (d) (e) mixes (e) (f) sherry (f) (g) other	**32 Type of beverages** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6 (g) ....
33. How much alcohol do you usually drink at one time? (a) 1 glass (a) (b) 2 - 3 glasses (b) (c) 4 - 5 glasses (c) (d) 4 - 6 cans (d) (e) 6 - 8 cans / stubbies (e) (f) 8 - 12 cans / stubbies (f) (g) 1 - 2 jugs (g) (h) more than 2 jugs (h) (I) other. Please write quantity.....	**33.Quantity of Alcohol** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6 (g) = 7 (h) = 8 (I) .....
34. Have you changed your alcohol consumption since you knew you had diabetes Yes No If 'no' go to question 36	**34 Change in Alcohol Consumption** Yes = 1 No = 2
35. If you have changed your alcohol consumption - in what way have you changed? Write down changes.....	**35. What changes** ....

Food Groups		Researcher to complete this column
36. How often do you eat fruit (fresh, frozen, canned, stewed)		**36. Servings fruit**
(a) never	(a)	(a) = 1
(b) less than 1 helping a day	(b)	(b) = 2
(c) 1 helping a day	(c)	(c) = 3
(d) 2 helpings a day	(d)	(d) = 4
(e) 3 or more helpings a day	(e)	(e) = 5
37. How many vegetables would you eat on an average per day? (raw, cooked, canned or frozen)		**37. How many vegetables**
(a) none	(a)	(a) = 1
(b) less than 1 helping a day	(b)	(b) = 2
(c) 1 helping a day	(c)	(c) = 3
(d) 2 helping a day	(d)	(d) = 4
(e) 3 helpings a day	(e)	(e) = 5
(f) more than 3 helpings a day	(f)	(f) = 6
38. How many helpings of noodles, pasta, or rice do you have in an average week?		**38. Servings Noodles pasta and rice**
(a) none	(a)	(a) = 1
(b) less than one helping a week	(b)	(b) = 2
(c) 1 - 2 helpings a week	(c)	(c) = 3
(d) 3 - 4 helpings a week	(d)	(d) = 4
(e) 5 - 6 helpings a week	(e)	(e) = 5
(f) more than 7 helpings a week	(f)	(f) = 6
39. How many helpings of breakfast cereal do you eat during an average week?		**39. Servings breakfast cereals**
(a) none	(a)	(a) = 1
(b) less than 1 helping a week	(b)	(b) = 2
(c) 1 - 2 helping a week	(c)	(c) = 3
(d) 3 - 4 helpings a week	(d)	(d) = 4
(e) 5 - 6 helpings a week	(e)	(e) = 5
(f) every day	(f)	(f) = 6
40. What type of breakfast cereal do you usually buy?		**40.Type of cereal**
Write down.....		.....
.....		.....
		.....
		.....

		Researcher to complete this column
41 How many slices of bread do you eat during an average day? (slices, rolls, pita, panini)		**41. Servings of bread**
(a) none	(a)	(a) = 1
(b) 1 - 2 slices a day	(b)	(b) = 2
(c) 3 - 4 slices a day	(c)	(c) = 3
(d) 5 - 6 slices a day	(d)	(d) = 4
(e) greater than 7 slices a day	(e)	(e) = 5

42. What type of bread do you usually buy?	**42 Type of bread**
Write down.....	.....
.....	.....
	.....
	.....

43. What type of spread do you put on your bread?	**43 Spread on bread**
Write down.....	.....
.....	.....
	.....
	.....

44. How many helpings of milk products would you have on an average day? (milk, yoghurt, dairy food, ice cream, cheese)		**44. Servings dairy products**
(a) none	(a)	(a) = 1
(b) 1 helping a day	(b)	(b) = 2
(c) 2 helpings a day	(c)	(c) = 3
(d) 3 helpings a day	(d)	(d) = 4
(e) 4 helpings a day	(e)	(e) = 5
(f) more than 4 helpings a day	(f)	(f) = 6

45. What is the colour of the cap of the milk that you use?	**45.Type of milk**
Write down.....	.....
.....	.....
	.....
	.....

46. How many helpings of protein foods would you eat on an average day? (meat, chicken, fish, seafood, eggs, dried beans, nuts, lentils)		**46. Servings of proteir**
(a) less than 1 helping a day	(a)	(a) = 1
(b) 1 - 2 helpings a day	(b)	(b) = 2
(c) 3 - 4 helpings a day	(c)	(c) = 3

	Researcher to complete this column
47. How many meals of takeaways would you eat during an average week? (KFC, fish and chips, McDonalds) (a) none (a) (b) rarely (b) (c) 1 - 2 helpings a week (c) (d) 3 - 4 helpings a week (d) (e) 5 - 6 helpings a week (e) (f) every day (f) (g) twice a day most days (g)	**47. Servings of Takeaways** (a) = 1 (b) = 2 (c) = 3 (d) = 4 (e) = 5 (f) = 6 (g) = 7
48. How would you usually cook fish? Write down.....	**48. Cooking of fish** ....
49. What type of cold drinks do you usually drink? Write down.....	**49. Type cold drinks** ....
50. Do you read the nutritional labels of foods? Yes No If No go to question 47	**50. Reading labels** Yes = 1 No = 2
51. When reading the label do you? Yes No (a) Check the amount of fat (a) Check the amount of sugar (a) Check the amount of carbohydrate	**51 What part of label** Yes =1 No = 2 (a) (b) (c)
52. Does reading labels help you to choose what to eat? Yes No	**52. Does it help** Yes = 1 No = 2

General Background Information		Researcher to complete this column
53. Are you currently -		**53 Employment status**
(a) employed full time	(a)	(a) = 1
(b) employed part time	(b)	(b) = 2
(c) self employed	(c)	(c) = 3
(d) unemployed	(d)	(d) = 4
(e) full time homemaker	(e)	(e) = 5
(f) retired	(f)	(f) = 6
(g) beneficiary	(g)	(g) = 7
(h) student	(h)	(h) = 8

54.What is / was your occupation?	**54. Occupation**
.....	.....
	.....

55. What is your highest level of education?		**55. Level of education**
(a) 3 years or less secondary education	(a)	(a) = 1
(b) greater than 3 years secondary education	(b)	(b) = 2
(c) Technical or trade certificate	(c)	(c) = 3
(f) Degree or higher qualifications	(d)	(d) = 4

Thank you for participating in my study.

Appendix 7

Massey University
AUCKLAND

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24 October 2003

Lynnette Ferguson
C/o Patsy Watson
Institute of Food Nutrition and Human Health
Massey University
Albany

Dear Lynnette

HUMAN ETHICS APPROVAL APPLICATION – MUAHEC 03/040
"Pilot Study to investigate the Effectiveness of Lifestyle Education in European People with Type 2 Diabetes

Thank you for your application. It has been fully considered, and approved by the Massey University, Albany Campus, Human Ethics Committee to proceed to the Health and Disability Ethics Committee, Auckland.

Could you please forward to us a copy of the letter of response from HDEC, once that committee has considered your application?

If you make any significant departure from the Application as approved then you should return this project to the Human Ethics Committee, Albany Campus, for further consideration and approval.

Yours sincerely

Professor Brian Murphy
Chairperson,
Human Ethics Committee
Albany Campus

CC Patsy Watson
Institute of Food Nutrition and Human Health

Please include the reference no. and study title in all correspondence/telephone calls.

Auckland Ethics Committees

Private Bag 92522
Wellesley Street
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Delivery Address:
C/O Ministry of Health
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650 Great South Road, Penrose
Phone (09) 580 9105
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Committee X Email: pat_chainey@moh.govt.nz
Committee Y Email: yvonne_erixon@moh.govt.nz

15 December 2003.

Appendix 8

Ms Lynnette Ferguson
18 Premila Drive
Pukekohe
South Auckland

AKX/03/11/297 **Pilot study to investigate the effectiveness of lifestyle education in European people with Type 2 diabetes: PIS/Cons V#6, 2/12/03.**

Thank you for your amendments, received 15 December 2003.

The above study has been given ethical approval by Auckland Ethics Committee X.

Certification
It is certified as not being conducted principally for the benefit of the manufacturer and may be considered for coverage under ACC.

Accreditation
This Committee is accredited by the Health Research Council and is constituted and operates in accordance with the Operational Standard for Ethics Committees, March 2002.

It should be noted that Ethics Committee approval does not imply any resource commitment or administrative facilitation by any healthcare provider, within whose facility the research is to be carried out. Where applicable, authority for this must be obtained separately from the appropriate manager within the organisation.

Progress Reports
The study is approved until 10 May 2004. Should you wish to extend the study, please advise the Ethics Committee.
A final report is also required at the conclusion of the study.

Amendments
All amendments to the study must be advised to the Committee prior to their implementation, except the case where immediate implementation is required for reasons of safety. In such cases tl Committee must be notified as soon as possible of the change.

Yours sincerely,

Pat Chainey
Administrator, Committee X

Cc: South Auckland Health

Appendix 9

Anthropometric and Medical Data

A study to investigate the effectiveness of life style education in European people with Type 2 Diabetes

Subject code number.....

Male

Female

Male = 1
Female = 2

Date of Birth

Weight

Height

BMI

Year Diabetes was diagnosed

	at referral	at FU
HBA1c		
Total Cholesterol		
HDL		
LDL		
Ratio		
Triglycerides		

Complications

a.....

b.....

c.....

d.....

e.....

f.....

Medication

a..... ..... b.....

c..... ..... d .....

e..... f.....

g..... h.....

i..... j.....

Appendix 10

Dear

Thank you for participating in my research project. I looked at the education process for people with Type 2 diabetes and it has given me a much better understanding of peoples preferences and as a consequence of information gained I will be able to improve the dietetic service to people with diabetes within Counties Manukau District Health Board.

Generally I was delighted with the results that showed:-

72 % chose whole grain bread
90% of those having cereals chose low glycaemic index cereals
84% chose fat reduce milk
30% did not have takeaways and 55% had them only rarely

The one area I was concerned about was the number of servings of vegetables with 2% having less than one helping a day, 19% one helping a day, and 30% two helpings a day. Only 49% had the recommended 3 -4 servings a day. A serving is considered ½ cup cooked vegetables or 1 cup raw e.g. salad.

Vegetables are a rich source of vitamins, minerals, fibre and antioxidants which are all required to keep us healthy thus I encourage those of you not having your 3–4 servings a day to increase the quantity either as salads or cooked vegetables.

Your responses to the diet information sheets showed that most were of value and some gave suggestions of further information sheets that could be developed.

Knowledge of Lipid (fat) levels motivated 87% of you to change the food you eat and as a consequence the total cholesterol dropped by an average of 1.1 mmol/l.

The HbA1c results also dropped between average of 1.1% for females and 1.2% for males which would have resulted in a considerable reduction in risk of complication. This was partly a result of weight loss as the average weight loss was 5kg with one gentleman loosing 50kg.

Remember that physical activity is the corner stone to improved control. Many (63%) have increased their level of exercise since being diagnosed. Half of participants meet the recommendation for exercise of 4–5 times a week for 30 minutes.

Alcohol was consumed by 68% of participants with most reducing the amount since being diagnosed. Only 10% drank more than the recommended 2 glasses for women and 3 glasses for men at any one time.

Your biochemistry results show that:-

	At Referral	At Follow up	Recommended
HbA1c			6 – 7 %
Weight			
Total Cholesterol			less than 4.0 mmol/l
HDL (good fat)			greater than 1.0 mmol/l
LDL (bad fat)			less than 2.5 mmol\l
Triglycerides			Less then 1.7 mmol\l

Your food intake compared to the national recommendations

	Your Intake	Recommendations
Fruit		3 – 4 servings a day
Vegetables		3 – 4 servings a day
Protein Foods		1 – 2 servings a day
Type of drink		Sugar free
Milk		Low fat
Spreads		Margarine
Takeaways		Rarely
Cereals		Whole grain
Bread		Whole grain

Further dietary changes that you might like to consider:-

Again thank you for your participation in the research.

Lynne Ferguson
Specialist Diabetes Dietitian
Whitiora Diabetes Service
Counties Manukau District Health Board.

South Auckland HEALTH
A Community Partnership

Nutrition Services Middlemore Hospital

Sample Menu

Breakfast

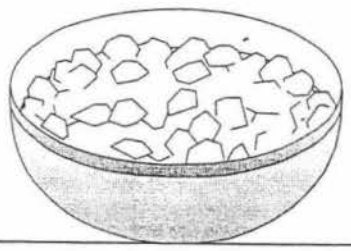
Time:.....

½ cups porridge and reduced fat milk, **or**

Weetbix and fruit and reduced fat milk **or**

oast, wholegrain, 2-3 medium slices with scraping of margarine,

r 1 cup of rice with vegetables



Lunch

Time:.....

*Choose **1 serving** of these foods –*

ean meat, fish, chicken, egg, cheese

*Choose **1 serving** of these foods -*

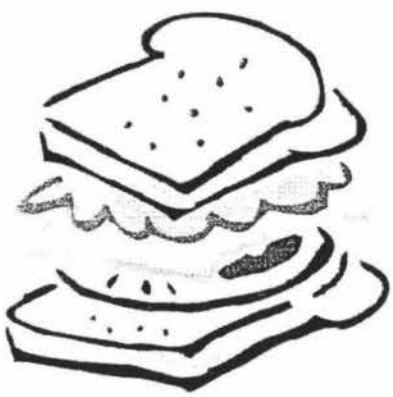
medium pieces of potato, kumara or taro, **or**

cup rice, noodles or pasta, **or**

-2 chapati or roti, **or**

-3 medium slices wholegrain bread, **or**

small green bananas



- Eat plenty of salad or anytime vegetables
- Soup or fruit – 1 serving

Dinner

Time:.....

*Choose **1 serving** of these foods –*

ean meat, fish, chicken, egg, cheese

*Choose **1 serving** of these foods –*

medium pieces of potato, kumara or taro, **or**

cup rice, noodles or pasta, **or**

-2 chapati or roti, **or**

-3 medium slices wholegrain bread, **or**

small green bananas

- Eat plenty of salad or anytime vegetables
- Dessert – raw fruit or stewed fruit or tinned unsweetened fruit

Supper

Time:.....

*Choose **1 or 2** of these foods –*

– 2 crackers, 2 plain biscuits, 1 medium slice wholegrain bread, 1 raw fruit, 1 cup reduced fat milk or yoghurt

Benefits of low G.I. foods

- More stable blood glucose levels, 'evens out' highs and lows.
- May help with weight control; you often eat less food and feel full for a longer time.
- Improves blood fat (lipids) levels.

Putting G.I. into practice

- The most important change:
  Use a low G.I. bread and a low G.I. cereal
- Include at least one low G.I. food at each meal.
- Keep foods 'whole', *for example:*
  Wholegrain rather than wholemeal or white bread.
  Whole fruit rather than fruit juice.
  Raw and unpeeled fruit and vegetables where possible or just lightly cooked.

The combination of a low G.I. food with a high G.I. food within a meal can result in an overall moderate G.I. of that meal.

If your present eating pattern includes very few low G.I. foods, try to introduce these slowly and monitor the effects on your blood glucose levels.

N.B : * Registered Brand Names

Remember

The G.I. is a tool, which can help predict how a food will affect blood glucose levels.

Many factors affect the G.I. factor:

- Processing, preparation and cooking methods
- Type of starch
- Protein and fat content
- Fibre content

The G.I. cannot be predicted by reading an ingredient label or the sugar content. It requires individual testing of individual foods. Testing of a wider variety of foods is on-going.

It is important to see a Dietitian regularly for more up-to-date information.

Not all foods with a low G.I. are 'healthy' food choices

Choose foods low in fat and sugar, high in fibre

Further reading:

'The New Glucose Revolution' - The Low Glycaemic Index Solution for Optimal Health
'The Pocket Guide for people with Diabetes', By Prof Jennie Brand-Miller, Kaye Foster-Powell, Assoc. Prof Stephen Colagiuri

Website: www.glycemicindex.com

auckland region dietitians

Carbohydrate Superstars

- Carbohydrate foods help to balance our blood glucose levels.
- Carbohydrate foods must be eaten at each meal.
- **Some carbohydrate foods are more 'slowly digested'** and give a **slow increase in blood glucose levels.**

  These are called:

  Low G.I. foods
  or
  Low glycaemic index foods

- Carbohydrate foods that are quickly digested have a **high G.I.** and will give a **greater increase** in **blood glucose levels**.
- Carbohydrate foods can be grouped into:

  Low, Medium or High G.I.

Low G.I.
or
low glycaemic index foods help to keep your blood glucose levels more even over the day

Low G.I. (55 and less)

Slow increase in blood glucose levels

Bread
Heavier wholegrain, mixed grain, oatbran breads e.g.: Burgen*, Holsom's* 9 Grain
Heavier fruit breads e.g.: Burgen*
Pumpernickel, sourdough – wheat, rye, stoneground wholemeal

Cereals
All-Bran*, Rice Bran, Rolled Oats, Special K*, Sanitarium* Lite Muesli

Crackers/Biscuits/Muesli Bars
Arnott's* Vita-Weat, Snack Right* Fruit Slice, Sanitarium* Fruity Bix Bars

Grains/Legumes
Barley, burghul/bulger, buckwheat, semolina. Beans – baked beans, chickpeas, haricot beans, kidney beans, soya beans Dahl, lentils, split peas

Pasta/Rice
Pasta – white, wholemeal,
2 Minute Noodles, vermicelli
Rice noodles – fresh, salmon sushi

Dairy Products
Milk, soya milk, yoghurt, low fat icecream

Fruit
Apples, banana, cherries, grapefruit, grapes, kiwifruit, strawberries, oranges, peaches, pears, plums
Dried - apricots, prunes, apple

Vegetables
Corn, green banana, taro, yams

Medium G.I. (56 - 69)

Medium increase in blood glucose levels

Bread
White, wholemeal bread
Pita, chapatti, roti
Crumpets

Cereals
Instant Porridge, Just Right* Original/Grains, Sustain*, Vita-Brits*, Weet-Bix*

Crackers/Biscuits
Ryvita*, Arnott's* Milk Arrowroot, Arnott's* Shredded Wheatmeal

Grains/Legumes
Cornmeal, couscous, millet

Pasta/Rice
Rice – Basmati, Doongara, Uncle Ben's* parboiled, Aborio
Udon noodles, rice vermicelli

Dairy Products
Icecream – regular fat

Fruit
Apricots, kiwifruit, mango, pawpaw, pineapple, rockmelon
Dried - figs, raisins, sultanas

Vegetables
Potato-new

High G.I. (70 - 100)

Greater increase in blood glucose levels

Bread
Fibre-white, French, Gluten Free, Lebanese and Molenberg* breads
Bagels, English muffins, scones

Cereals
Branflakes, Cornflakes, Chex*, Coco Pops*, Puffed Wheat, Rice Bubbles, Shredded Wheat, Sultana Bran*

Crackers/Biscuits
Arnott's* Water Crackers, Kavli*, Real Foods* Corn Thins, Sao Crackers, Griffin's* Golden Fruit

Grains/Legumes
Broad beans
Popcorn

Pasta/Rice
Brown, Jasmine and white rice
Corn and rice pasta
Tinned spaghetti

Fruit
Watermelon
Dried - dates

Vegetables
Kumara, parsnip, potato – old, tapioca

Carbohydrate Foods

Note the following mean: Individual foods in **bold print** - lower glycaemic (low GI) food choices
- Estimated
N/A – Not available

	Quantity	Carbohydrate
Cereals		
Oatbran, 60g	**½ cup**	**30g**
Porridge made with milk, 260g	**1 cup**	**30g**
Porridge, made with water, 260g	**1 cup**	**20g**
Rolled Oats, raw, 45g	**½ cup**	**25g**
Kelloggs		
All-Bran, 30g	**½ cup**	**20g**
Just Right, Just Grains, 45g	1 cup	35g
Just Right, Original, 45g	¾ cup	30g
Miniwheats, 30g	15 biscuits	20g
Special K, 30g	**1 cup**	**20g**
Sustain, 30g	½ cup	25g
Wheat Biscuits, 30g	2 biscuits	20g
Sanitarium		
Bran Flakes, 30g	½ cup	20g
Fruity Bix and Nuts, 45g	15 biscuits	30g
Hi-Bran Weet-Bix, 30g	2 biscuits	20g
Lite Bix, 30g	2 biscuits	20g
Light n'Tasty, 30g	½ cup	20g
Oat Bran Weet-Bix, 40g	2 biscuits	25g
Unsweetened, Untoasted Muesli, 50g	**½ cup**	**30g**
Weight Watchers		
Breakfast Cereal, 30g	½ cup	20g
Low Fat Muesli, 30g	½ cup	20g
GP		
Vita-Brits, 30g	2 biscuits	20g
Post		
Shredded Wheat, 25g	1 biscuit	20g
Hubbards		
Thank Goodness, 30g	½ cup	20g
Healtheries		
Wheat Free / Gluten Free Muesli, 50g	1/2 cup	30g

	Quantity	CHO
Breads		
Wholegrain/ Wholemeal, 38g, average	**1 slice**	**15g**
Burgen		
Mixed Fruit Loaf, 39g	**1 slice**	**15g**
Mixed Grain, 38g	**1 slice**	**16g**
Oatbran and Honey, 38g	**1 slice**	**15g**
Soy and Linseed, 35g	**1 slice**	**16g**
Sunflower and Barley, 38g	**1 slice**	**14g**
Freyers		
Golden Sourdough, 42g	1 slice	19g
Light Rye, 42g	1 slice	20g
Mixed Grain, 42g	1 slice	19g
Oatmeal Grain. 42g	1 slice	19g
Soy and Linseed, 42g	1 slice	17g
Wholemeal Grain, 42g	1 slice	18g
Ploughmans		
Country Grain with Honey, 38g	1 slice	17g
Dark Soft Rye, 38g	1 slice	16g
Light Malted Rye, 38g	1 slice	19g
Quality Bakers		
Fibre White, Sandwich, 28 g	1 slice	14 g
Fibre White, Toast, 37 g	1 slice	18 g
Cheese / Spicy Fruit Muffins, 65g	1	28g
English Muffin Splits,65g	1	28g
Hot Cakes, 55g	1	24g
Hot Dog Roll, 70g	1	35g
Hamburger Bun, 70g	1	36g
Italian Roll, 60g	1	30g
Panini, plain and flavoured, 90g	1	44g
Alfresco Pita Bread		
Large Pita, 105g	1	51g
Wheatmeal, 90g	1	41g
Plain, 90g	1	45g
Mini, 40g	1	20g
Alfresco Plain Wraps		
Large Wraps, 110g	1	59g
Vogels		
Mixed Fruit Bread, 42g	1 slice	21g
Mixed Grain and Toasted Sesame, 34g	1 slice	13g
Original Mixed Grain, Sandwich, 36g	1 slice	15g
Original Mixed Grain, Very Thin, 29g	1 slice	12g
Original Mixed Grain Toast, 44g	1 slice	18g
Pumpkin Seed with Mixed Grain, 34g	1 slice	14g
Soy and Linseed, 34g	1 slice	12g
Sundried Tomato and Basil, 34g	1 slice	16g
Sunflower and Barley, 42g	1 slice	16g

	Quantity	Carbohydrate
Bread		
Wholegrain/ Wholemeal, 38g, average	**1 slice**	**15g**
Quality Bakers		
Cheese / Spicy Fruit Muffins, 65g	1	30g
English Muffin Splits,65g	1	30g
Hot Cakes, 55g	1	20g
Hot Dog Roll, 70g	1	35g
Hamburger Bun, 70g	1	35g
Italian Roll, 60g	1	30g
Panini, plain and flavoured, 90g	1	40g
Alfresco Pita Bread		
Large Pita, 105g	1	50g
Wheatmeal, 90g	1	40g
Plain, 90g	1	45g
Mini, 40g	1	20g
Alfresco Plain Wraps		
Large Wraps, 110g	1	60g
Speciality Baked Breads / Breads		
Abels Real Bagels of Chicago		
Natural, 90g	1	50g
Bakers Delight		
Cape Seed Loaf,small, 45g	1 slice	20g
Lekkerbrot Loaf, small, 30g	1 slice	10g
Pan Di Casa, 50g	1 slice	25g
Apricot Delight Loaf, 30g	1 thin slice	15g
Bread Roll		
wholemeal, 70g	1 roll	30g
wholegrain, 79g	1 roll	40g
Chapatti / Roti		
# Thin, 20cm, 35g	1	20g
Crumpets		
Round, 50g	1	20g
Square, 80g	1	30g
Focaccia, 1/8 of 23cm round, 50g	1	20g
Hot Cross Bun, 68g	1	30g

	Quantity	Carbohydrate
Jabal		
# Lebanese, small, 60g	1	25g
# Lebanese, medium, 80g	1	30g
# Pita bread, medium, 90g	1	60g
Lebanese Bread		
white, 85g	1	40g
Naan Bread, 100g	1 slice	40g
New York Bagels		
Mini, 35g	1	20g
Plain and flavoured, 115g	1	55g
Old El Paso		
Taco Shells, Jumbo, 19g	1	10g
Burrita Tortillas, 40g	1	20g
Pancake, plain, 15cm, 36g	1	10g
Persian Bread		
Naan,60g	1 slice	35g
Pita Bread		
mini, 40g	1	15g
plain, 84g	1 pocket	30g
wholemeal, 67g	1 pocket	25g

Crispbreads / Crackers

Arnotts		
Original Water Crackers, 5g	2	10g
Salada,Large, 11.6g	1	10g
Vita Wheat, 11.6g	2	10g
Healtheries		
Popcorn Snacks, 10g	8	10g
Rice Wafers, 14.5g	1	10g
Hutchinsons		
Rice Crackers, 15g	8	10g
Huntley and Palmer		
95% Fat Free, Original, 17.4g	2	10g
Litebread, 12.5g	2	10g

	Quantity	Carbohydrate
Kavli, 15g	3	10g
Real Foods		
Corn Thins, 11.6g	2	10g
Ryvita, 11g	1	10g

Sweet Biscuits

Arnott's		
Full o'Fruit, 12.5g	1	10g
Gingernuts, 9g	1	10g
Malt 'o' Milk Biscuits, 14g	2	10g
Marie Biscuits, 11g	2	10g
Milk Arrowroot, 14.4g	2	10g
Shredded Wheatmeal,17g	2	10g
Griffin's		
Fruit Fingers, 12.8g	1	10g
Gingernuts, 12.9g	1	10g
Golden Fruit, 9.3g	1	10g
Malt, 15g	2	10g

Muesli Bars

Flemings		
Chewy Yoghurt Topps, 33g	1	20g
Muesli Bars, 31.3g	1	20g
Foodtown		
Muesli Bars, 36g	1	20g
Mother Earth		
Mini Bars, 25 g	1	20g
Pams / No Frills		
Fruit Cereal Bars, 40g	1	30g
Sanitarium		
Fruity Bix Bars, 25g	**1**	**20g**
Uncle Tobys		
Fruit Break Bites, 97% Fat Free, 25g	1	20g
Fruit For Yonks, 21g	1	20g
Fruit Twists, 97% Fat Free, 37.5g	1	20g
Real Fruit Bars, 97% Fat Free, 20g	1	20g
Real Fruit Breaks, 45g	1	30g
Roll-Ups, 15.6g	1	10g
Wholemeal Fruit Breaks, 45 g	1	30g
Weight Watchers		
Fruit Cereal Bars, 40g	1	30g

Rice / Pasta / Noodles

	Quantity	Carbohydrate
Rice		
# rice, boiled, 145g, average	1 cup	50g
Basmati rice, uncooked, 100g	**½ cup**	**80g**
Basmati, boiled, 145g	**1 cup**	**50g**
Uncle Ben's		
Boil In Bag, 125g	**1 bag**	**90g**
Pasta		
plain, uncooked, 100g	**1 cup**	**74g**
# plain, dried, cooked, 140g, average	**1 cup**	**40g**
egg, cooked, 200g	**1 cup**	**50g**
Noodles		
egg, boiled, 169g	**1 cup**	**20g**
Fantastic		
98% Fat Free Noodles, prepared	**1 pottle**	**50g**
Maggi		
Instant 2 Minute Noodles, prepared	**1 'cake'**	**50g**
Trident		
97% Fat Free, 5 Minute Noodles, 160g	**1 'cake'**	**40g**
Rice Stick Noodles, 160g, boiled	1 cup	64g
Udon Noodles, 160g, boiled	1 cup	40g

Soups

Average / Thick Soup, 260g	1 cup	20g

Beans / Legumes

Craigs		
Four Bean Mix, canned, drained, 100g	**1/2 cup**	**20g**
Taco Beans, 420g	**1 tin**	**80g**
Watties		
Baked Beans, 150g	**½ cup**	**35g**
Baked Beans Lite, 425g	**1 tin**	**80g**
Baked Beans, 300g	**1 tin**	**70g**
Chilli Beans, 420g	**1 tin**	**85g**
Spaghetti, in Tomato Sauce, 220g	1 tin	35g
Spaghetti, in Tomato Sauce,110g	½ cup	20g
Weight Watchers		
Baked Beans, 130g	**1 small tin**	**20g**

Fruit

	Quantity	Carbohydrate
Apple, raw, 130g	**1 medium**	**15g**
stewed, 90g	**½ cup**	**10g**
Apricots, raw, 54g	1 medium	5g
stewed,unsweetened,130g	½ cup	10g
dried, 35g	**10 halves**	**20g**
Banana, raw, 128g	**1 small**	**30g**
Blackberries, raw, 123g	1 cup	10g
frozen, 160g	1 cup	10g
Blackcurrants, frozen, unswt., 59g	½ cup	5g
Blueberry, frozen, unswt., 164g	1 cup	20g
Boysenberries, raw, 133g	1 cup	10g
frozen, unswt., 140g	1 cup	10g
Cherries, eating, raw, 67g	**10**	**10g**
Currants, dried, 77g	½ cup	50g
Dates, dried, 83g	10	60g
chopped, 94g	½ cup	60g
Dried Fruit		
Mixed,155g	1 cup	110g
Feijoas, raw, 30g	1	2g
Figs		
dried, 105g	½ cup	60g
dried, 16g	1	10g
Grapefruit, 236g	**1**	**10g**
Grapes, black, raw, 54g	**10**	**10g**
Kiwifruit, raw, 100g	**1**	**10g**
Loganberries, raw, 156g	1 cup	5g
Mandarins, raw, 60g	1	5g
Mangoes, raw, 203g	**1**	**30g**
raw, 176g	**1 cup slices**	**30g**

Fruit *continued*

	Quantity	Carbohydrate
Melons		
Cantaloupe, raw, 100g		5g
raw, 172g	1 cup diced	10g
Honeydew, raw, 100g		10g
raw,172g	1 cup, diced	20g
Rock, raw, 100g		5g
raw,168g	1 cup, diced	10g
Watermelon, raw, 213g, (2.5cm 25.5cm 12cm)	1 slice	10g
Nashi Pear, raw, 130g	1 small	10g
Nectarine, raw, 143g	**1 medium**	**10g**
Oranges, raw, 128g	**1 small**	**10g**
Papaya, raw, 100g	1/4 fruit	10g
Passionfruit, raw, 18g	1 medium	1g
Peaches, raw, 138g	**1small**	**10g**
canned / natural juice 130g	**½ cup**	**10g**
dried, 61g	**½ cup**	**30g**
Pears, raw, 148g	**1 medium**	**20g**
Persimmon, raw, 75g	1small	10g
Pineapple, raw, 110g	1 slice	10g
Plums, raw, 49g	**1small**	**10g**
stewed, w/o sugar, 132g	**½ cup**	**10g**
Prunes, dried, 84g	**10**	**40g**
stewed, w/o sugar, 112g	**½ cup**	**30g**
Raisins, dried, 77g	½ cup	50g
15g	1tbsp	10g
Raspberries, raw, 136g	1 cup	10g
Rhubarb, stewed, 265g	1 cup	3g
Strawberries, raw, 28g	5	2g
raw,158g	1 cup	10g
Sultanas, dried, 76g	½ cup	60g
15g	1 tbsp	10g
Tamarillo, raw, 60g	1small	2g
Tangelo, raw, 90g	1small	10g

Vegetables

	Quantity	Carbohydrate
Corn, sweet, kernels, boiled, drained, 173g	**1 cup**	**30g**
Corn on Cob, 275g	**1, 16cm cob**	**60g**
Broad Beans, 170g	1 cup	15g
Green Banana, cooking, boiled, 140g	**1 small**	**40g**
Kumara, boiled, 157g	1 small	30g
Parsnip, flesh, boiled, drained, 160g	1	20g
Potato, 200g	1 medium	40g
Potato, 300g	1 large	60g
Mashed Potato, boiled, mashed, 210g	1 cup	30g
Taro, common, baked, 155g	**1 medium**	**40g**
Yam, cooked, cubed, 70g	**½ cup**	**20g**
Mc Cains		
Superfries, straight	12	25g
Crunchy Potato Wedges	12	25g
Watties		
Hash Brown, 60g	1	20g
Super Sweet Corn Cobs, 125g	**1 cob**	**20g**

Tinned Vegetables

Watties		
Cream Style Corn, No Added Sugar, 140g	½ cup	16g
Creamed Corn, 140g	½ cup	21g

	Quantity	Carbohydrate
Yoghurt		
De Winkles		
Acidophillus Fruit Flav., 150g	1 pottle	30g
Easi Yo		
Reduced Fat/Natural, 200g	¾ cup	10g
Fresh n' Fruity		
Fresh n' Fruity De Lite, 150g	1 pottle	10g
Fresh n' Fruity, 150g	1 pottle	30g
Ski		
Fruit Flavoured Yoghurt, 150g	1 pottle	20g
Slimmers Choice		
Natural, Unswt.,150g	1 pottle	10g
Yoplait		
Silhouette, Diet Lite,150g	1 pottle	10g
Fruit Yoghurt, 150g	1 pottle	20g
Natural Swt, Yoghurt, 150g	1 pottle	20g
Weight Watchers		
Natural, Unswt., Low Fat,125 mls	1 pottle	10g
Dairy Food		
Swiss Maid, 150g	1 pottle	30g
Ice-cream		
Easi Yo		
Goodies Ice-cream, 100mls	2 sm. i/c scoops	10g
Talley's		
Guilt Free Dairy Dessert, 100mls	2 sm. i/c scoops	20g
Tip Top		
Lighten Up Ice-cream, 100 mls	2 sm. i/c scoops	15g
Weight Watchers		
Sweet Celebrations, 145mls	1 pottle	20g

	Quantity	Carbohydrate
Fast Foods		
Hot Chips, 250g	1 medium serve	60g
Meat Pie, 172g	1	30g
McDonald's		
McD Regular Burger, 98g	1	30g
Big Mac Burger, 204g	1	40g
McFeast Burger, 206g	1	35g
Potato Fries, 112g	1 medium serve	40g
Pizza Hut		
Supreme Regular, thick crust, 416g	1 pizza	100g
Supreme Regular, thin crust, 346g	1 pizza	90g
Sausage Roll, 100g	1 medium	30g
Snack Foods		
Corn Chips, 50g	1 sm pkt.	30g
Potato Chips, 50g	1 sm pkt.	30g
Popcorn, plain, 16g	2 cups	10g
Café Style Food		
Falafel, vegetarian, 5cm	1 ball	6g
Fish Cake, baked, 76g	1	15g
Fish Pie, 220g	1 cup	26g
Kebab, # pita bread, hummus, salad, chicken	1 small	45g
Lasagne, beef, mince, 3cm x 5cm, 310g	1	25g
Macaroni, cheese, 258g	1 cup	30g
Papadom, fried, 6g	1	1g
Potato Salad, 238g	1 cup	33g
Quiche Lorraine, ¼ pie, 22.5cm diam., 263g	1	35g
Rice Salad, 244g	1 cup	46g
Shepherds Pie, $^1/_8$ pie, 23cm diam.,115g	1 serve	9g
Steak and Kidney Pie, 7cm x 7 cm x 3cm, 136g	1 serve	20g
Sushi, 100g	2	15g
Tabbouleh, Salad, 169g	1 cup	20g

	Quantity	Carbohydrate
Milk		
Low Fat / Fat Reduced, 180mls	**1 glass**	**10g**
Fresh n' Fruity		
Smoothies, 300mls	1 bottle	30g
Sanitarium		
So Good Lite, 260mls	**1 cup**	**20g**
Trident		
Coconut Milk, Lite, 400ml	1 can	10g
Coconut Cream, Lite, 400ml	1 can	5g
Mayonnaise / Salad Dressings / Sauces		
ETA		
Lite and Free Mayonnaise, 25g	1 tbsp	5g
Reduced fat Salad Dressing, 25g	1 tbsp	5g
Gravy, dried, low fat, prepared with water, 260g	1 cup	6g
Pasta Sauce, tomato based, commercial, heated, 258g	1 cup	24g
Tomato Sauce, 15g	1 tbsp	1g
White Sauce, homemade, 14.7g	1 tbsp	2g
Fruit Juices		
McCoy		
Fruit Juice, No Added Sugar, 250mls	1 glass	20g
Tomato Juice, 250mls	1 glass	10g
Just Juice		
Orange and Apple,	1 glass	25g
Coffee		
Cafe, latte, 200mls	1 cup	10g

	Quantity	Carbohydrate
Cakes / Baked Products		
Banana Cake,9.5cm x 6.5cm x 2.5cm, 85g	1	40g
Chocolate Cake, standard, 100g	1	40g
Fruit Cake		
plain, 7.5cm x 5cm x 1.5cm, 45g	1	30g
iced, 7.5cm x 5cm x 1.5cm , 45g	1	30g
Muffin, 80g	1 medium	30g
Scone, 50g	1 medium	20g
Desserts		
Aunt Betty's Healthy De-Lites		
Apple and Wild Berry, 100g	1	50g
Watties		
Creamed Rice, 99% Fat Free, 220g	1 sm. tin	40g
Apple Crumble, baked, 235g	1 cup	80g
Bread and Butter Pudding, baked, 250g	1 cup	40g
Christmas Pudding, 264g	1 cup	134g
Pastry		
Filo, ready- rolled,21g	2 sheets	15g
Flaky, 8cm x 8cm x 0.5cm, 34g	1 sheet	15g
Puff, ready- rolled, 125g	1 sheet	51g
Rice Pudding, homemade, 250g	1 cup	45g
Sponge Pudding, fruit, steamed, $^1/_6$ pudd., 90g	1 serve	40g
Trifle, 180g	1 cup	40g
Confectionary		
Chocolate, fancy, filled, 5g	1	5g
Fruit Gums, 2g	1	2g
Mintie,7g	1	6g
Mars Bar, 60g	1 bar	40g
'Pastilles',5g	1	3g
Kit Kat,12g	1 finger	7g
Crunchie Bar,53g	1 bar	35g

Miscellaneous

	Quantity	Carbohydrate
Breadcrumbs, commercial, 180g	1 cup	60g
fresh, wholemeal, 180g	1 cup	70g
Flour		
Cornflour, 7.5g	1 tbsp	10g
Plain flour, 25g	1 tbsp	20g
130g	1 cup	85g
Wholemeal flour, 134g	1cup	80g
Golden Syrup, 20g	1 tbsp	15g
Sugar, 218g	1 cup	227g
15g	1 tbsp	15g
5g	1 tsp	5g
Honey, 21g	1 tbsp	20g
Jam, 20g	1 tbsp	15g
Tomato Chutney, 16g	1 tbsp	5g
Jarrah Hot Chocolate,11.5g	1 sachet	10g
Horlicks, 7.4g	1tbsp	5g
Milo, 8g	1 tbsp	5g
Ovaltine, 6.4g	1 tbsp	5g

References

The Concise New Zealand Food Composition Tables
The New Zealand Institute for Crop and Food Research Ltd.

Disclaimer

The New Zealand Institute for Crop and Food Research Limited has exercised reasonable skill, care and diligence in the work described in this report, but shall not be liable for the commercial performance of any products or for any losses arising from the use of the information contained herein.

Food Works Computer Data Base

Common Standard Measures of New Zealand Foods
Lyn Gillanders, Dietitian, Auckland Hospital, Gregory Milligan, Nutritionist, D.S.I.R., Palmerston North

Family Circle
The Fat, Fibre and Carbohydrate Counter

Food Labels

auckland region dietitians

April 2003 – April 2006

Fat

- Only a small amount of fat is needed for good health.
- All fats are high in energy (kilojoules/kilocalories).
- For a healthy heart it is important to reduce total fat to:
  - control weight gain
  - control blood cholesterol levels
  - reduce the risk of heart disease
- Some types of fat are better for your heart than others, e.g.: mono/polyunsaturated fats.

Remember

Too much of any type of fat can be bad for your health - use fats in small amounts

Where is fat found?

• Fat you can see

Fat in and around meat, skin on chicken
Butter, margarine, oil
Cream , sour cream, cream cheese
Lard, dripping, suet, Chefade, Kremalta

• Fat that is hidden

Whole milk, cheese, icecream
Processed meats - sausages,
luncheon sausage, salami
Fried foods, crumbed and battered food
High fat, deep fried, takeaways
Pastry, quiche, croissants, pies
Mayonnaise, salad dressings, some gravies and sauce
Desserts

Snack Foods

Chocolate, muesli bars
Cakes, biscuits, muffins
Potato/corn chips, dips, pate

Other †

Avocado, nuts seeds, olives
Peanut Butter

Types of fat

Saturated fat - use very little

Fats from:

Animal sources	Fat in and around meat and chicken Full fat dairy products, butter, cream, sour cream Lard, dripping, suet, Chefade*.
Hardened vegetable oils	Kremalta
Tropical vegetable oils	Coconut oil, coconut cream Palm kernel oil

What do they do?

- Increase blood cholesterol
- Increase risk of heart disease

Polyunsaturated fat - limit if overweight

Fats from:

Vegetable sources	Corn, soybean and safflower oil and margarines made with these oils
Seeds/nuts	
Fish	Fish oils

What do they do?

- Help lower blood cholesterol

Monounsaturated fat - limit if overweight

Fats from:

Vegetables sources	Canola, olive, rapeseed and peanut oil Margarines made from canola and olive oils
Nuts	All nuts, (except walnuts), peanut butter
Fruit	Avocado, olives

What do they do?

- Lower blood cholesterol
- Protect against heart disease

Remember

- **Use 'heart friendly' fats - 'monounsaturated' and 'polyunsaturated' fats instead of 'saturated' fats.**
- **Include small amounts of these fats as part of a low fat healthy eating pattern.**

N.B.: †Foods high in 'heart friendly' fats - monunsaturated and polyunsaturated fats.

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How to keep your fat intake low

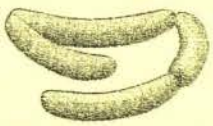
- **Trim visible fat from meat and remove skin from chicken before cooking.**

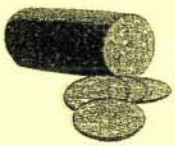
- **Limit the use of high fat processed meats and meat products:**

Sausages, luncheon sausage, salami

Tinned corned beef, fatty bacon

Pies and pastries





- **Try substituting meat on some days with lower fat choices:**

Fish

Pasta

Legumes - dried beans, peas, split peas, lentils

Vegetables

- **Use lower fat cooking methods:**

- ✧ Use non stick pans and cook with little or no fat or oil.
- ✧ Bake, steam, poach or boil.
- ✧ Dry stir fry or use a little stock or brush the pan with oil.
- ✧ Grill or barbeque trimmed meat – try marinating with low fat yoghurt, herbs and spices.
- ✧ Bake fish fillets or kebabs in foil or baking paper, use lemon juice, stock or wine and herbs to season.
- ✧ Roast meat on a rack so the fat drip away.
- ✧ Dry roast vegetables, by spraying with a little oil before cooking.
- ✧ Let homemade soups, casseroles and meat dishes cool, until the fat settles on the top. Remove the fat before adding vegetables.
- ✧ Extend meat dishes by adding dried beans and lentils.

- **Use low fat dairy products:**

Fat reduced milk

Low fat, unsweetened or 'lite' yoghurt

Low fat cheese – cottage cheese, ricotta, quark, low fat cheese slices

- **Use a thin spread of margarine or reduced fat spread.**

- **Replace high fat sauces/dressings with low fat choices:**

  'Lite', low fat or no fat salad dressings and mayonnaise

  Tomato/ vegetable sauces instead of creamy/ cheese sauces

  Grainy mustard/ herb or balsamic vinegars and a dash of olive oil

- **Always include lots of 'free' vegetables with meals:**

  Cabbage, carrots, cauliflower, green beans, broccoli, silverbeet etc.

  Add salad vegetables to sandwiches

- **Choose healthy snack foods:**

  Use wholegrain, low fat crackers

  Fresh fruit

  Low fat yoghurts

  Wholegrain bread and other low fat snack foods.

- **Keep foods high in sugar and fat for special occasions:**

  Cakes, biscuits, muffins, scones

  Chocolate

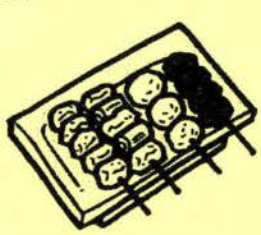
  Icecream and desserts

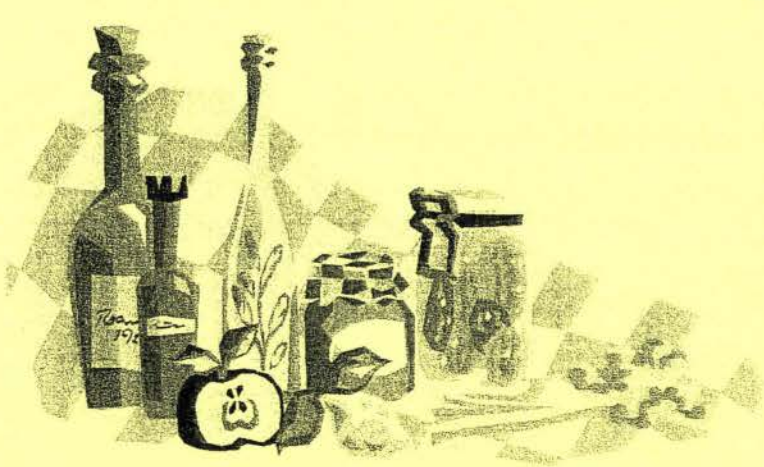
- **Limit high fat takeaways foods to once a month treat:**

  Choose takeaways that are not deep fried:

  Chinese, Indian, Japanese, Middle Eastern

  Hamburgers, Kebabs, Subway Sandwiches, Baked Potato





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What can I drink?

Remember

Water is the best fluid:
- **it's quick**
- **cheap**
  and satisfies your thirst

Keep a jug of water in the refrigerator for all the family.

If you would like some flavoured drinks for a change, the following list will help. Many of these are made with an artificial sweetener Splenda* (955), Nutrasweet* (951).

Suitable drinks for you to use:

Cordial Concentrates / Ready to Drink – minimal carbohydrate

- Diet Soda Stream☒ – a soda flavoured soft drink base
- Sanitarium* Waterplus
- Thriftee*☒

Ready to Drink - small amounts of carbohydrate Less than 5g per 200 ml

- Baker Hall* Original Low Calorie Fruit Drinks
- Bundaberg* Diet Gingerbeer
- Mizone* Sportswater
- Ocean Spray* Lifestyle Cranberry Classic, No Added Sugar
- Powerade* Light
- Sunraysia* Diet Cran

Allow 1 – 2 drinks per day. Discuss this with your Dietitian.
Check the nutritional information label carefully.

Powders

- Diet Refresh*
- Weight Watchers* Low Calorie Drink

Fizzy Drinks

- 'Diet' or 'Low Calorie', e.g. Diet Lemonade, Diet Gingerale
- Crystal Clear Sparkling Spring Water

Zero
Sweet as L + P
Fanta Lite
Golden Circle Diet

Avoid

Drinks that contain sugar (sucrose), glucose, fructose, honey. Check labels carefully.

- Ordinary fizzy drinks, ordinary cordials, flavoured mineral water
- Ordinary Raro*, Vitafresh* - including Vitafresh* Sugar Free
- Energy drinks, sports drinks, Red Bull*, Pirana*, Lift Plus*, G Force*, Ikon* etc.

Remember

- Labels with 'no added sugar' may be high in natural sugars.
- Discuss the use of fruit juice and sports drinks with your Dietitian.

N.B.: * Registered Brand Names

☒The products contain **Cyclamate** (952) and **Saccharin** (954) sweetener – there is a recommended safe daily allowance. Please see Table 1. **These products are not recommended for use during pregnancy.**

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Breakfast Cereals

Start the day the cereal way!

Cereals are a convenient food for breakfast and provide many nutrients.

Guidelines for choosing breakfast cereals

Look for: **Fibre - more than 6 grams per 100g**
Sugar - less than 15 grams per 100g
Fat - less than 5 grams per 100g

Consider

- **The Glycaemic Index (GI):** In the **Best Choice** box, low GI cereals are highlighted in **bold print** and the other cereals are medium GI. These low GI cereals help give a slower increase in blood glucose levels.
- **Serving size:** Recommended serving sizes on cereal labels can give a wide variation in carbohydrate intake. Check your serving size with your Dietitian.

Best Choice

Low / medium GI cereals

All-Bran*
Just Right / Just Grains*
Miniwheats*
Oatbran
Porridge / Rolled Oats / Wholegrain Oats
Sanitarium* Lite Muesli
Shredded Wheat*
Special K*
Sustain*
Unsweetened Untoasted Muesli
Vita-Brits*
Weet-Bix* / Hi Bran / Oat Bran

Low fibre

Good Choice

Low sugar / low fat / high fibre

Bran Bix*
Bran Flakes*
Budge* Breakfast Biscuits
First Choice* Light Cereal
Kornies*
Lowan* Flakey Medley
Weight Watchers* Low Fat Muesli

Low sugar, fat and fibre

For those requiring low fibre cereals

Blueberry Morning*
Cornflakes*
Puffed Corn, Millet, Rice
Rice Bubbles*
Rice Chex*
Rice Krispies*

Remember

- Cereals very low in fat may be high in sugar
- Toasted cereals are high in fat

N.B.: * Registered Brand Names

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Biscuits

A guide to some of the biscuits presently available

Guidelines for choosing biscuits

Look for: **Crackers / Crispbreads**

- **Fat** - **less than 10 g per 100g**
- **Fibre** - **more than 6 g per 100g**
- **Salt** - **less than 600 mg sodium**

Plain Biscuits

- **Fat** - **less than 15 g per 100 g**

Crackers

Arnott's*	Original Watercrackers (3) Salada Original/ Multigrain/Wholemeal Δ (1½ large) **Vita-Weat Crispbread** Δ (3)
Aulsebrook's*/Lees*	Cabin Bread (1)
All Brands	Rice Crackers (12)
Healtheries*	Rice Wafer (2) and Thins (3) (Pizza/bacon - higher in fat)
Huntley & Palmers*	Low Fat Crackers (3) Premium Watercrackers (6)
Kavli* Δ (3)	
Provita* Δ (3)	
Real Foods*	Corn Thins - Original / Multigrain (2)/ Soy and Linseed (3)
Rice de Lites*	Natural/ Cheese & Bacon (3)
Ryvita* Δ	Crispbread - Original/ Country Grain Dark/Whole Rye/ Sesame (2)

What to put on a cracker? Enjoy a low fat topping:

Avocado-thin spread	Tomato/cucumber/gherkin	Hummus-low fat
'Lite' cream cheese- thin spread	Cottage cheese / relish	Pickle/Chutney
Peanut butter - thin spread	Marmite/vegemite	Salsa

Plain biscuits

Arnott's*	Full o' Fruit (2) Gingernuts (2) Malt o' Milk (3) Marie Biscuits (2) Shredded Wheatmeal (3) **Snack Right Fruit Slice** (1)
Griffin's*	Berry / Apricot Fruit Fingers (2) Gingernut Bears (4) Gingernuts (1) Golden Fruit (2) Milk Arrowroot (3)

Remember

- Eat a variety of snacks, not just plain biscuits all the time.
- Enjoy a fresh fruit, a 'lite' low fat yoghurt or a slice of Burgen* Mixed Fruit Loaf as a healthy snack choice.
- Some crackers are high in salt as well as fat e.g. cheese crackers
- Sugar free' biscuits may not be suitable - *discuss this with your dietitian.*

N.B.: * Registered Brand Name Δ High Fibre **Bold – Low G.I.** (Figures) - 15 g carbohydrate

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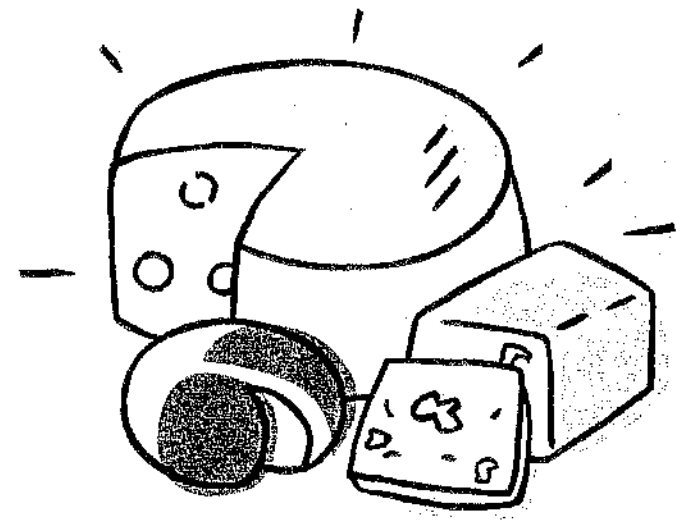
Say Cheese!



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Tips on using cheese

1. Low fat soft white cheeses such as cottage, ricotta and quark mix well with foods like salmon or tuna blended with herbs, tomato or chilli paste to make a delicious spread. They also mix well with yoghurt, lemon juice and a pinch of sugar to make a lemon cream which makes a nice topping on fruit for dessert.

2. Mozzarella is the best cheese for melting.

3. Grated cheese goes further than sliced cheese. It can be kept in the freezer.

4. To enhance flavour, use a little parmesan mixed with a lower fat milder cheese.

5. Use mustard / spices / worcester sauce to bring out the flavour.

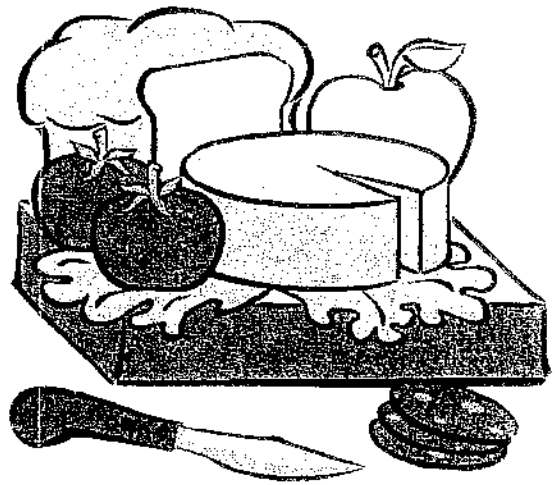
Fat and Sodium in Cheese

Cheeses are listed in groups of low, medium or high fat. A varied selection of cheeses are listed in groups of low, medium or high fat. Where possible, cheeses have been marked low, medium or high in sodium. This information is not available for all cheeses. It is best to use low / medium fat cheeses that are also low / medium in sodium. Strong flavoured cheeses like parmesan are often high in fat and sodium and are best used in small amounts to enhance flavour.

N.B.: * **Low Sodium** + Medium sodium # High sodium

Very High Fat Cheeses *Fat more than 41g per 100 g*

Ferndale	+ Double Cream Brie / Camembert
Bouton D'or	Puhoi Blue / Crème Fraiche Marscapone
Kapiti	Kahurangi / Kikiorangi
Galaxy / Mainland	Creamy Blue



Low Fat Cheeses *Fat 0 – 15 g per 100 g*

Can be used daily

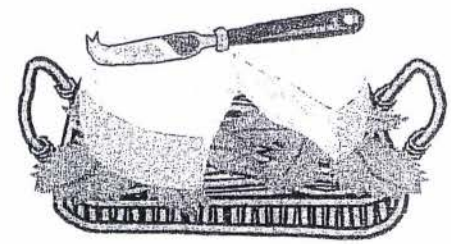
* **All Brands**	**Cottage , may contain chives / pineapple**
* **All Brands**	**Ricotta**
All Brands	Quark / Quarg
# Bega	Super Slim Slices
Bouton D'or	Chives and Onion Cheeseboard Classique Blue Brie

Medium or Reduced Fat Cheeses *Fat 16 – 30 g per 100 g*

Meadow Fresh	* **Lite Cream Cheese**
Chesdale	# Singles, light and trim
Country Goodness	+ Light cream cheese
All Brands	* **Mozzarella**
All Brands	# Feta
All Brands	+ Edam
All Brands	+ Gouda
Royal Tasman	Fresh Camembert
Bouton D'or	Camembert / Brie
Mainland	+ Lite
Bega	+ So Right
Ferndale	+ Pyrenees
	+ St Paulin
	+ Raclette
	* **Emmentaler**
Kraft	Grated Parmesan

High Fat Cheeses *Fat 31 – 40 g per 100 g*

Mainland	Egmont
Royal Tasman	+ Brie de Luxe
	+ Double Cream Cheese
Ornelle	+ Double Cream Cheese
Kapiti	Aukai / Raumati
	Creamy Harvati / Herb and Garlic
All Brands	+ Colby
All Brands	Cheddar, mild, tasty, port wine
	Reserve tasty, Gold Reserve Mature
Galaxy	Epicure



Yoghurt

Guidelines

Look for:

Fat - less than 2g per 100g
Sugar - less than 10g per 100g

Remember

- There are a wide variety of yoghurts on the market. Most of these are low in fat and provide an excellent source of protein and calcium.
- Yoghurt is a low glycaemic index food (low G.I.) - it is 'slowly digested' giving a more gradual rise in blood glucose levels.

Natural Yoghurts

- When choosing natural yoghurts with no added sugar or sweetener, add more flavour, with the addition of your own fruit - fresh or frozen.

Examples:

DeWinkel*, Low Fat Acidophilus, Plain
Biofarm Organic*, Low Fat, Natural
Weight Watchers*, Natural Yoghurt
Naturalea*, Acidophilus Plain, Unswt.
Slimmers Choice*, Unswt. Plain
Yoplait*, Trim Acidophilus

Artificially Sweetened Yoghurts

- These yoghurts are lower in sugar because they contain an artificial sweetener.
- They are also low in fat.

Examples:

Fresh 'n' Fruity* Lite
Yoplait* Silhouette Diet Lite
Slimmers Choice*
Weight Watchers*

Fruit Flavoured Yoghurts

- These yoghurts have added sugar but are usually lower in sugar and fat compared to 'dairy' foods.
- The sugar content in fruit flavoured yoghurts may be greater than 15g per 100g – allow for this in your food plan.

Examples:

Fresh and Fruity* Yoghurt
Yoplait* Fruit Yoghurt, Lite
Ski* Fruit Flavoured Yoghurt
De Winkle* Yoghurt

Homemade Yoghurts

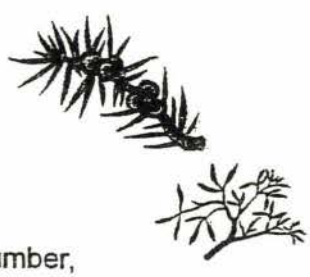
- Look for packet mixes that are low in fat.
- A small amount of sugar or an artificial sweetener can be added to those that are unsweetened.

Examples:

Easi Yo* - Base and Culture, Low fat, Natural or Flavoured, Slimmers
Hansells* Yog it - Base and Culture, Non Fat, Natural Yoghurt Acidophillus Mix Natural or Flavoured

Cooking with Yoghurt

Yoghurt can be used in a variety of ways to add more flavour and interest to your meals - here are a few suggestions to try.



Yoghurt / Herbs / Garlic

Mix low fat, plain unsweetened yoghurt with a little crushed garlic and add a variety of your favourite fresh or dried herbs - basil, dill, marjoram, mint, oregano, parsley, tarragon or rosemary.

Serve as a dressing with salads or cooked vegetables, e.g. asparagus, cucumber, cauliflower, mushrooms, peas, pumpkin or tomato.

Variations:
Try adding dry or wholegrain mustard, lemon juice, herb or red wine vinegars to give a different flavour to the dressing.

Baked Potato / Yoghurt

Mix low fat, plain yoghurt with finely chopped spring onion.
Serve over a baked potato.

Lemon Cream

250g Ricotta cheese
150g pottle low fat, natural yoghurt
Finely grated rind of 1 lemon
2 teaspoons of brown sugar

Mix Ricotta, yoghurt, lemon rind and sugar.
Chill and serve with chopped fresh fruit or berries.

Serves 4 1 Serve = 5g Carbohydrate *This is a good alternative to cream.*

N.B.: * Registered Brand Names

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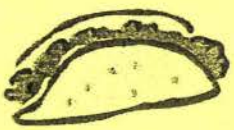
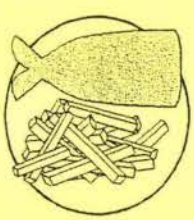
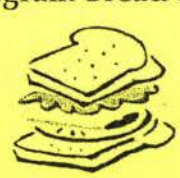
Takeaways – what choices to make!

HIGH FAT TAKEAWAYS	LOWER FAT TAKEAWAYS
 **KFC** 2 KFC Chicken thighs and medium French Fries  **16 teaspoons fat** *40g carbohydrate*	Chicken Fillet Burger  **3 teaspoons fat** 40*g carbohydrate*
 **McDONALD'S BIG MAC** One Big Mac and medium Fries **13 teaspoons fat** *80g carbohydrate*	**McDONALD'S SALAD BURGER**  **2 teaspoons fat** *40g carbohydrate* Smoked Chicken and Salad + croutons **3 teaspoons fat** *10g carbohydrate* Garden Salad + croutons **1 teaspoons fat** *10g carbohydrate*
 **FISH AND CHIPS** One piece of Fried Fish in Batter and a scoop of chips **12 teaspoons fat** 60*g carbohydrate*	**GRILLED FISH** Ask for grilled fish, or take the batter off and prepare oven baked chips at home.  **1 teaspoons fat** *30g carbohydrate*
 **MEAT PIE OR SAUSAGE ROLL** One Meat Pie or Sauasge Roll **8 teaspoons fat** *30g carbohydrate*	**WHOLEGRAIN SANDWICH/ BREAD ROLL** 1 filled wholegrain Bread Roll or 1 Sandwich  **2 teaspoons fat** *30g carbohydrate*
 **WENDYS** One Classic Burger with medium Fries **7 teaspoons fat** *90g carbohydrate*	**WENDYS** **Fat** *Carbohydrate* Grilled Chicken Salad 2 tsp 10g Deluxe Garden Salad 1 tsp 10g Taco Salad 5 tsp 30g Hot Stuffed Potato 5 tsp 80g

HIGH FAT TAKEAWAYS	LOWER FAT TAKEAWAYS
 **CHINESE** Spring Rolls Won Tons Fried Rice Fried Noodles Battered fish or Pork Fried Chicken Wings	**CHINESE** Steamed rice - 1 cup <u>PLUS</u>  - Chicken with vegetables - Beef with vegetables - Fish with vegetables **4 teaspoon fat** *40g carbohydrate* Chow Mein 1 cup **3 – 5 teaspoons fat** *20g carbohydrate* Chop Suey 1 cup **3 teaspoons fat** *15g carbohydrate*
 **INDIAN** Fried Rice Vegetable Pakora Butter Chicken Other cream based curries	**INDIAN** Steamed rice - 1 cup no fat *40g carbohydrate* or Naan Bread *45g carbohydrate* <u>PLUS</u> Meat or chicken dishes cooked in a savoury sauce without butter or cream.
 **MEDITERRANEAN** Lasagne with chips Nachos with mince, cheese and sour cream Creamy pasta dishes	**MEDITERRANEAN**  Donor kebab –with meat, chicken, falafel or chickpea patty, hummus, grated carrot and lettuce served in pita bread. Avoid extra egg, cheese, bacon and restrict mayonnaise. **3 teaspoon fat** *50g carbohydrate*

OTHER GREAT CHOICES FOR A TAKEAWAY OR QUICK MEAL

Nandos	- Pita Bread without mayo	**1 teaspoon fat**	*35g carbohydrate*
	Grilled Chicken Salad without dressing	**½ teaspoon fat**	*10g carbohydrate*
	Chicken Burger	**2 teaspoons fat**	*45g carbohydrate*
Sushi	- 6 pack	**1 teaspoon fat**	*35g carbohydrate*
Panini	- with meat/chicken and salad	**3 teaspoons fat**	*40g carbohydrate*
Subway Sandwich (6 inch)	- have low fat fillings with lots of salad	**1 teaspoons fat**	*45g carbohydrate*
BBQ - **Rotisserie Chicken**, salad, 1 wholegrain bread roll		**2 teaspoons fat**	*20g carbohydrate*

OR **enjoy a low fat frozen meal** from the supermarket.

Remember

- Aim for less than 10 grams of fat per 100 grams
- Check label for carbohydrate content
- Does the carbohydrate content fit with your recommended allowance?

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Lets get Fitt

F is for Frequency

For fitness - exercise 3 - 4 times a week

For weight loss - daily

I is for Intensity

Remember, your activity should make you puff not gasp!

T is for Time

Start with 10 - 15 minutes and build up slowly to 30 minutes.

Walk slowly at the end for 5 minutes to cool down.

T is for Type

Do something you enjoy!

Remember

- You may benefit from checking your blood glucose levels before and after exercise.
- If you are taking certain medication or insulin know how to treat a 'hypo' i.e. a low blood glucose level.
- It is important to warm up before exercise; this prevents aches and pains.
- Wear comfortable shoes.
- Check your feet regularly to ensure no discolouring or damage has occurred.
- Carry identification indication that you have diabetes and if you are on medication.

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Physical Activity and Type 2 Diabetes

We prescribe you:

____ minutes of

Physical activity

____ a week

Why Exercise?

Exercise helps to:

- Lower your blood glucose levels
- Assist with weight loss
- Improve blood cholesterol levels
- Lower high blood pressure
- Give you more energy
- Make you feel good

Before you start!

Consider the following:

- If you have had health problems in the past, discuss with your doctor what activity is safe to do.
- You may need to adjust diabetes medication or insulin prior to intense exercise.
- Current level of fitness.
- Would you be better supported in a group?
- Consider other medical problems such as painful legs, arthritis, asthma etc. Try other activities that make you more comfortable like arm chair exercise.

Food and fluid requirements

Food recommendations

Your Dietitian will give you an individual tailored meal plan to meet your physical activity needs.

If you are having low blood glucose levels before, during or after activity, try to eat a low fat, carbohydrate snack about 1 hour prior, during or after exercise.

Healthy food snacks

- Wholegrain bread
- Low fat, 'lite' or 'diet' unsweetened yoghurt
- Raw fruit
- Low fat, wholegrain crackers or biscuits

Fluid recommendations

6 - 8 cups (1.5 - 2 litres per day)
Water is best

Activities

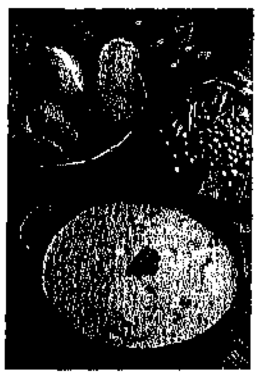
You need to 'puff' but not 'gasp'!

'Build' activity into your day

- Park your car further away, e.g: from the office, when shopping
- Get off the bus one stop earlier
- Use the stairs - not the lift!
- Walk the dog
- Walk down to the dairy to get the paper each morning
- Walk around your house X number of times
- Gardening
- Swimming, water walking, water aerobics

Eating Tips...

- Have 3 meals of similar size each day.
- Include wholegrain breads, cereals, vegetables and fruit daily. Use dried beans, split peas or lentils often.
- Use only a scraping of margarine or peanut butter on bread, or try low fat spreads.
- Cook without fat – steam, boil, bake, microwave, grill – or stir fry in water, stock or a wipe or spray of oil.
- If you use coconut cream use only a little, and dilute with water or low fat milk.
- Use very little salt in cooking and avoid it at the table.
- Fill up on vegetables from the 'Eat Freely' list.
- Alcohol can affect the control of your diabetes. It is high in calories. Discuss with your dietitian or doctor.
- If overweight, aim to lose weight slowly.
- Physical activity is very important. Aim for 30 minutes per day. Walking is a great activity.



Important!

Eating at regular times is especially important if you are taking tablets or insulin for your diabetes.

Sample Meal Outline...

Breakfast

1 fruit, raw or unsweetened, and/or yoghurt
and/or breakfast cereal/porridge and/or
wholegrain bread/toast with a scraping of
margarine or peanut butter, Vegemite, Marmite,
tomato or 'Lite' spread
Tea or Coffee (no sugar)

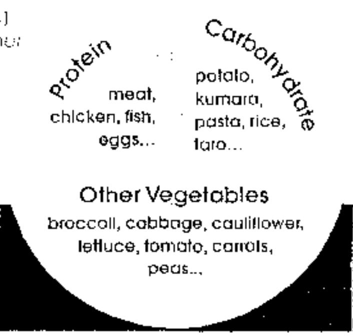
Lunch

Soup (optional)
Vegetables from 'Eat Freely' list
Wholegrain bread, rolls or crispbread or a choice
from carbohydrate list
Scraping of margarine or low fat spread
Lean meat or fish or egg or chicken or
low fat cheese or dried beans – small serving
and/or yoghurt
1 fruit, raw or unsweetened
Tea or coffee (no sugar)

Evening meal

Soup (optional)
Lean meat or fish or chicken – small serving
(no fat, crumbs, or batter)
Potato or kumara or rice or pasta
or noodles or roti or chapatti or green banana
(cooking) or taro
average serving
Selection of other
vegetables
1 fruit raw or
unsweetened
Tea or coffee
(no sugar)

As a guide for your evening meal, use this plate model:



Between Meals...

Water, tea, coffee or low calorie drinks

If required, choose a small snack such as:
2 crispbread or 2 crackers or
1 fruit or 1 yoghurt or
1 small glass of milk
or 1 thin slice of bread

The need for snacks will depend on weight, medication and individual diabetes goals. If you are unsure, consult your dietitian.

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www.diabetes.org.nz

For other DNZ publications, contact:
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Other brochures and booklets available:

- It's Time to Shed Some Light on Type 2 Diabetes
- Living With Diabetes and Insulin
- Diabetes New Zealand Supermarket Shopping Guide
- Testing Your Blood Glucose
- Diabetes and Physical Activity
- Walking for Health, A Guide to Using Pedometers
- Diabetes and Driving
- Diabetes and Your Kidneys
- Diabetes and Your Eyes
- Diabetes and Your Feet
- Diabetes and Pregnancy
- Pre-Diabetes

January 2005

A BASIC GUIDE TO FOOD

DIABETES NEW ZEALAND

Eat Freely...

Free foods add variety without raising blood glucose levels. Choose a selection of vegetables daily - eat plenty

For example:

- Asparagus
- Beetroot
- Broccoli
- Brussel sprouts
- Butter beans
- Cabbage
- Carrot
- Cauliflower
- Celery
- Choko
- Cucumber
- Egg plant
- Green beans
- Kamo kamo
- Leeks
- Lettuce
- Marrow
- Mushroom
- Onion
- Parsley
- Peas
- Peppers
- Puha
- Pumpkin
- Radish
- Silverbeet
- Snowpeas
- Spinach
- Spring onion
- Swede
- Taro leaves
- Tomato
- Watercress
- Zucchini

Eat Regularly...

Carbohydrate (starchy foods)

Have a similar amount at each meal to keep blood glucose levels even. Eating too much will raise your blood glucose levels. Select wholemeal or wholegrain products, eg oat, rye, barley or wheatbran

- Bread, bread rolls
- Pita bread, crackers
- Crispbreads, muffins
- Scones, cabin bread
- Roti, chapatti
- Dried beans, baked beans, split peas, lentils
- Rice, noodles, pasta, spaghetti
- Kumara, potato, corn, parsnip
- Yam, breadfruit, taro, tapioca
- Green banana (cooking)
- Porridge, breakfast cereal (low sugar)
- Fruit - raw, stewed or canned (without sugar or syrup)

For balanced and healthy eating, also include...

Protein foods

Choose a small serving at 1 or 2 meals per day

- Meat, with fat cut off, chicken without skin
- Fish & seafood, egg
- Dried beans, split peas, lentils (eg, baked beans, bean salad)

Low fat dairy products

Choose 2-3 servings per day

- Milk or soya milk
- Yoghurt (unsweetened or 'Diet'/'Lite')
- Cottage cheese,
  other low fat cheese

Fats

Use in small amounts.

- Margarine, peanut butter
- Oil - eg olive, canola, peanut, soya
- Nuts (dry roasted)
- Avocado

Limit...

Too much sugar

Foods with too much sugar add extra carbohydrate to your diet and raise blood glucose levels

Sugar - all types

- Jam, marmalade, honey
- Treacle, golden syrup
- Lollies, chocolate, carob
- Sweetened condensed milk
- Sweetened fruit
- Jelly, ice cream
- Puddings & desserts
- Cakes & biscuits
- Muesli bars
- Cordials
- Powdered fruit drinks
- Iced tea drinks
- Some flavoured coffee & milk
- Fizzy drinks, flavoured mineral water
- Fruit juice (including 'no added sugar' varieties)
- Energy drinks

Too much fat

Too much saturated fat increases the risk of heart disease. Too much fat increases energy intake and contributes to weight gain

- Deep fried foods and fatty snacks
- Fatty meat, eg salami, sausage, canned corned beef
- Saveloys, luncheon sausage, fatty bacon
- Pies, pastries, croissants
- High fat biscuits, crackers and cakes
- High fat savourles, eg sausage rolls
- Potato chips
- Cream, coconut cream, cream cheese, sour cream
- Mayonnaise, salad dressing
- Dripping, lard, suet, Chefade, Kremelta, butter
- High fat takeaways

Add variety to your diet with...

- Herbs, spices, garlic
- Marmite/Vegemite
- Low calorie or 'Lite' salad dressing
- Artificial sweeteners
- 'Diet' jelly
- Vinegar
- Worcester sauce
- Soy sauce, tomato sauce or paste
- Lemon, rhubarb

What to drink?

Aim for 6-8 cups of liquid per day

- Water
- Tea, coffee
- Clear soup
- 'Diet' or low calorie drinks or soda water

This is a basic guide to the sort of foods people with diabetes should include in their diet.

There is a lot more to learn about healthy eating. Contact a dietitian for more advice on your own personal eating plan.