



Enablers and barriers to prevent weight-regain post bariatric surgery – A qualitative enquiry

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ABSTRACT

Background: Weight-regain is commonly experienced after bariatric surgery. This qualitative enquiry aimed to explore participants' self-reported enablers and barriers to prevent future weight-regain post-surgery.

Methods: Eligible adults were recruited at 12-months post-bariatric-surgery at Counties Manukau, Auckland. Participants were invited to attend data collection at their 18-month group nutrition-education session, and to participate in a focus group at 21-months post-surgery. Thematic analysis was used to evaluate patient experiences.

Results: Participants (n = 28) were mostly female (73.2 %), New Zealand European (41.5 %), and had gastric sleeve surgery (92.3 %). Five key themes emerged from the analysis: *A Life Changing Health Journey* - participants experienced a decrease in obesity-related comorbidities and a subsequent decrease in medications. Weight change and food intolerances impacted quality of life. *Challenge of managing a New Healthy Lifestyle* - financial stress, buying healthier foods and social events were new challenges, often centred on food. *Changing Eating Behavior* - all participants struggled managing eating behaviors. *Mindset Changes* - post-surgery most participants had a positive mindset, increased confidence, and feelings of happiness. However, many struggled with mindset around weight and food. A need for *On-going Support* - most felt under-supported and expressed a need for longer, specific follow-up care.

Conclusion: Post-surgery group education sessions provided participants with increased support from both health professionals and peers on the same journey, to overcome struggles such as binge eating or identifying new coping strategies. Findings provide important insights into the challenges patients with bariatric surgery face and key learnings to develop specific supports for future care practices.

1. Introduction

A third (30.9 %) of New Zealand (NZ) adults have Body Mass Indices (BMIs) in the obese range (Morar, Vandevijvere, & Swinburn, 2021). Excess body fat is associated with adverse health outcomes, including type two diabetes mellitus (T2DM), cardiovascular disease, stroke, sleep apnoea, reproductive abnormalities, osteoarthritis, and several cancers, impacting both the individual and society (Morar et al., 2021). Bariatric surgery is an increasingly common treatment for severe obesity (Cummins, Overduin, & Foster-Schubert, 2004), using malabsorption and/or restrictive physiological changes (Sabench Pereferrer et al., 2017). It

poses many potential health benefits, including weight loss, reduced obesity-associated co-morbidities (e.g., diabetes, hypertension, etc.) and in some, complete resolution, reduced mortality, improved functional ability, and health-related quality of life (QOL) (Buchwald et al., 2004; Sabench Pereferrer et al., 2017; Welbourn et al., 2018). Approximately 35 % of patients experience weight-regain from two years post-surgery, which is physiologically and psychologically detrimental to patient outcomes (Baig, Priya, Mahawar, & Shah, 2019; Karmali et al., 2013). In some patients, weight regain may occur due to continuation or re-emergence of previous maladaptive eating behaviors (Lupoli et al., 2017; Pizato, Botelho, Gonçalves, Dutra, & de Carvalho, 2017).

Abbreviation list: BMI, body mass index; %EWL, percentage excess weight loss; GS, gastric sleeve; NZ, New Zealand; QOL, quality of life; T2DM, type 2 diabetes mellitus.

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Although binge eating may be eliminated by gastric restrictive procedures, the underlying behaviors may remain, subsequently impacting weight loss maintenance. People who report binge eating prior to surgery, may experience greater weight-regain than those that did not (Niego, Kofman, Weiss, & Geliebter, 2007).

Although long-term weight loss success post-surgery has been associated with attendance at clinical (particularly dietitian) appointments (Karmali et al., 2013; Masood et al., 2019), poor attendance is often a challenge (Vidal et al., 2014). Group appointments have however proven to be an effective strategy to prevent weight-regain, as attendees experienced an additional 8.4 % excess weight-loss (%EWL) compared to non-attendees (Orth, Madan, Taddeucci, Anderson, & Tichansky, 2008).

Middlemore Hospital, Counties Manukau in the south of Auckland, is the leading public hospital conducting bariatric surgical procedures in New Zealand; 1359 surgeries between 2010 and 2018 (Counties Manukau, 2019). Previous research conducted with patients who received bariatric surgery at this hospital reported a desire for more support from the bariatric service (Lauti, Stevenson, Hill, & MacCormick, 2016). In response, a Bariatric dietitian-led group nutrition-education programme at 18-months post-surgery was initiated as part of standard practice. Eating behavior advice was the main topic, including the difference between physical and emotional hunger, ways to overcome non-hungry eating, mindful eating, and developing healthy long-term habits, aiming to improve long-term successful health, well-being and weight-loss outcomes. The value and benefit of this expansion of the bariatric service has not been assessed, particularly the group approach that was used. Furthermore, as Counties Manukau serves one of the largest indigenous populations that include both Māori and Pacific patients, it was important to obtain qualitative data for the first time within a New Zealand cultural context. The aim of this qualitative study was to explore participants' self-reported nutrition and lifestyle-related enablers and barriers in achieving weight-loss maintenance post bariatric surgery and improve long-term health outcomes.

2. Methods

2.1. Participants and procedures

A potential pool of eligible participants ($n = 50$) was calculated based on the surgery rate (approximately 5–10 per month) within the recruitment time frame (± 8 months); there were 91 surgeries completed at Counties Manukau in the years 2018–2019, approximately 8 per month. Inclusion criteria: Counties Manukau patient with bariatric surgery 12 months prior, aged 18+ years. Participants were provided an information sheet regarding the study at their usual dietitian appointment 12-months post-surgery and recruited if consented. Participants were reassured that their participation (or not), would not impact their usual care.

Participants provided written consent prior to their dietitian-led nutrition-education session at 18-months post-surgery (standard practice for all bariatric patients in Counties Manukau service; this was their last dietitian appointment where they were discharged). During this session, participants completed a brief questionnaire that addressed nutrition and lifestyle-related barriers and enablers to weight maintenance following surgery. Participant responses to this questionnaire informed the content of the additional 21-month nutrition-education session that was added for the study participants.

At 21-months post-surgery, participants attended the nutrition education session, and were invited to consent to and join a focus group discussion that addressed the barriers and enablers to achieving weight loss maintenance. Six focus groups were conducted, with two to 10 participants, lasting 45–60 min each (December 2018 to August 2019). The first author conducted the education session and the focus groups with another co-author (bariatric dietitian) present to provide support as required. Authors prepared a focus group moderator guide to establish

whether participants found the additional session valuable, and to further explore participants' overall experiences of Bariatric surgery and their self-reported barriers and enablers to weight-regain or weight maintenance. Questions/statements were open-ended to allow for discussions, with prompts/hints to help guide the discussion as required. The moderator guide was piloted and adapted for understanding and completion within the allocated time frame. Attendees at each of the focus groups were presented the same series of questions.

Focus group responses were captured using an audio recorder for verbatim transcript-based analysis. The data were professionally transcribed by an independent company, checked by the first author, and uploaded to NVivo qualitative data analysis software; (QSR International Pty Ltd., version 12, 2018) for thematic analysis. Transcripts formed the basis of coding and classification of themes, using an approach of open coding of data units, followed by axial coding to form subcategories, and finally, selective coding to develop the themes that express the content. An integrated approach was used for code structure development to generate themes for this study, following the criteria for trustworthiness throughout (Bradley, Curry, & Devers, 2007). Using this approach retained the benefits of inductive reasoning (i.e. transcripts were read line-by-line), whilst also using the determined codes to ensure that all key factors were considered during the data analysis and interpretation process (Chenail, 2012). Identified codes and common themes, were explored, mapped, reviewed and discussed among authors to reach consensus. Alongside this process, direct quotes from the participants have been identified to contribute to the understanding of the data and to demonstrate specific themes.

This study was approved by the Massey University Human Ethics Committee: (Southern A, Application SOA 18/54), and the Counties Manukau research office (Research Registration Number: 821).

3. Results

3.1. Participant characteristics

Sixty-two participants consented to participate in the study at their 12-month follow-up appointment, of which sixteen did not attend the 18-month session, and five withdrew from the study prior to the 18-month session. As a result, 41 participants remained, of whom all agreed to attend the focus group sessions. A further 13 were lost to the follow-up at 21-months, therefore only 28 participated in the 21-month focus group sessions. Six focus groups were conducted (group 1; $n = 2$, group 2; $n = 10$, group 3; $n = 4$, group 4; $n = 7$, group 5; $n = 2$, group 6; $n = 3$). Most participants were female (73.2 %) and of NZ European ethnicity (41.5 %) (Table 1). Participants mean pre-surgery weight was 126.7 kg (ranging from 88.5 to 193 kg), with a mean body-mass index 42.9 kg/m². Most participants had gastric sleeve (GS) surgery (92.3 %).

3.2. Qualitative investigation of participant experiences through the bariatric programme

Five themes were identified through the qualitative thematic analyses from the six focus groups (Table 2).

3.2.1. Theme one – life changing health-related quality of life: “for me it has definitely been life changing in a positive way. My health has improved drastically”

This theme reflected participants' journeys throughout the bariatric surgery programme, including health improvements, weight outcomes and overall health-related QOL. Most participants ($n = 26$) reported improved health outcomes post-surgery, reducing the number of medications taken to manage obesity-related co-morbidities such as T2DM, sleep apnoea, high blood pressure and high cholesterol. All participants ($n = 28$) reported an increase in energy and improved functional ability, which meant spending more time with their children and/or grandchildren, returning to work, participating in physical activity (e.g.,

Table 1.
Participant characteristics (n = 28).

Variable	N (%) average	
Age (years)	28	49.7 ± 8.8
Sex		
Female	20 (71.4)	
Male	5 (17.9)	
Not specified	3 (10.7)	
Ethnicity		
NZ European	9 (32.1)	
NZ Māori	4 (14.3)	
Pacific	4 (14.3)	
Other	11 (39.3)	
Weight		
Pre-surgery weight (kg)		125.2 ± 28
Pre-surgery BMI (kg/m ²)		42.9 ± 13.5
Weight 12-months post-surgery		86.4 (77.5, 98.5) ^a
Weight 18-months post-surgery		87.4 (77.3, 99.1) ^a
Weight 21-months post-surgery		94.4 (77.9, 106.5) ^a
Type of surgery		
Gastric sleeve	26 (92.9)	
Revision from gastric band to gastric sleeve	2 (7.1)	
Other	0 (0)	
Surgical complications		
Post-surgical complications	5 (17.9)	

^a Values are number (percentage), mean ± standard deviation or median (25,75th percentile).

running, gym classes or walking), and doing household tasks e.g., gardening. Despite the many challenges experienced following surgery, participants all agreed the benefits outweighed the challenges.

“Instead of driving everywhere I can walk where I need to go, and I spend time with the grandkids so it's a much better lifestyle”.

Two subthemes (body weight and food related to quality of life) emerged as impacting participants' QOL. All groups reported that their accelerated weight-loss during the first-year post-surgery improved their QOL. However, several (n = 11) reported weight-regain starting to occur around the 21-months post-surgery mark, which was unexpected for them. Maintaining weight-loss was challenging mainly due to eating energy-dense foods and insufficient exercise. All feared weight-regain or “*returning to their old self*” and struggled to deal with the excess skin following weight-loss surgery, with decreased feelings of self-confidence.

“I lost over half my body weight”; “For me I knew I was big, but I didn't realise how big I was until now”;

“By the time I had surgery, I was 102. Two years on I now sit between 79 and 81. I thought maybe I'll get down to 75, but I'm 52 ... I'm thinking that might be a bit too much”;

“I'm carrying five kilograms of loose skin....I look in the mirror and I feel fatter now than I ever was when I was 140 kilograms”.

Food further impacted participants' QOL. Many (n = 12) experienced new post-surgical food intolerances, mainly eggs, water and meat, with consequential symptoms including nausea, vomiting, and reflux. This resulted in following strict diets in fear of having these symptoms. Nausea (and vomiting) was common with drinking water, eating new foods, or eating too fast, and alongside reduced gastric capacity, resulted in food avoidance, decreased fluid intake, dehydration, and constipation.

“I can't eat some things, I get nauseous..... Since my surgery I haven't eaten anything that has come in a plastic packet..... It's just the same food every single day”;

“You eat too fast because you have only got half an hour and then it comes back up”;

“Water. I just sit there and burp the whole time and experience pain”.

Foods with higher sugar and fat content were easier to eat, which increased the temptation for these types of foods.

“The unfortunate thing is the easy-to-eat foods are the ones that are bad for you like chocolate ice cream, because they dissolve in your mouth”.

Hunger feelings were controversial; some did not feel hunger, needing to remind themselves to eat, whilst others felt hunger, and often associated this with feelings of guilt.

“I got my head around the eating, and I don't really feel hungry, I don't really care what we have for dinner; food is not the big part of my life like it used to be”;

“The only thing I have struggled with is that I feel hungry. I can eat and I fill up very quickly but then an hour later mentally I am feeling like I am hungry”.

3.2.2. Theme two – the challenge of managing a new healthy lifestyle:

“*having the time and trying to adjust all the time.... the thing that's not healthy at the moment is trying to get the meals right and not snacking in between*”

Participants identified several challenges in managing their lifestyle post-surgery. Financial stress was a common barrier. Purchasing nutritious foods was deemed expensive; it was cheaper to feed their families with take-away foods as done pre-surgery. Other identified barriers were a lack of knowledge to make healthy food choices or deciding what to cook (n = 5), being influenced by food product advertisements e.g., chocolates at Easter, and time limitations in making good food decisions or doing physical activity.

“The prices of vegetables and that sort of thing. Everyone is telling you to eat healthy, but it is cheaper for us all to go and get a Mac-Donald's or a Burger King or something, whereas we would rather have cucumbers and tomatoes”;

Participation in social events was deemed a key barrier to following a healthy lifestyle, especially family-related gatherings. All participants noted an increased awareness of food being the centre of many social activities, work meetings, and cultural celebrations, and felt they were missing out due to the required eating habit changes.

“Culturally we celebrate and socialize. At family gatherings, it is all around the food”;

“I think it's just society in general. Even in work meetings and things, it is almost rude not to eat something, even if you are not hungry or you don't feel like it. It is odd to have food in front of you and sit there and not have anything”;

3.2.3. Theme three – challenges to changing eating behavior: “you can no longer suppress with the food anymore”

All participants struggled with problematic eating behaviors such as emotional and binge eating, excessive snacking, overeating or unconscious night snacking. These were often combined with feelings of no self-control at some point post-surgery. They identified emotional eating when feeling stressed, anxious, or depressed as a key reason for weight-regain. Although their ability to eat or binge on large volumes of food was physiologically reduced, the binge-eating mindset was still present, resulting in overeating the ‘wrong foods’ such as biscuits or chips. Two focus groups discussed caution and restrained or responsible eating in front of others as a new eating behavior, which was usually followed by binge-eating when alone to avoid feelings of shame and judgement from others.

“Binge now is like a little bag of chips and a biscuit because you can't get anything down. But, I mean, that mind-set is still there”;

“When I'm around people, I behave myself but as soon as that door shuts or I am on my own, it's like let me loose”.

Table 2
Qualitative analysis - theme development.

Focus group enquiry	Patient feedback - word codes	Sub-themes	Themes	Illustrative quotes
The bariatric journey	Improvements to health; reduced comorbidities Reduced medication Increased energy Increased functional ability Dizziness Food intolerances Dietary variety Dehydration Reduced hunger Nausea Weight gain Excess skin	Weight and quality of life Food and quality of life Improved health outcomes Adverse side effects.	1. Life changing health-related quality of life	"I should have done it earlier, for myself. I should have pushed the doctors a bit more to look at my options." "I am more active and my whole outlook is much more positive than it was. It has been a really amazing life changing opportunity." "The only downfall is that I still throw up with some foods, there are some things that I can't really eat." "It's hard to actually keep the weight off. I think it's some food choices as well. I know you maybe think it's good food, but sometimes it may be not the best."
Current lifestyle; barriers and enablers to following a healthy lifestyle	Time poor Financial stress Influenced by advertisements Boredom Family Culture Social life Societal influence Lack of knowledge Judgement Diet Optifast Avoidance of food types Exercise Behavior change Motivators Positive mindset Remembrance of old life Routine	Financial concerns Fear of judgement Lack of time Cultural and societal norms Motivation to make change	2. The challenge of managing a new healthy lifestyle.	"Everything we seemed to do was always around food or a meal or drinks. My mum struggles with that because she wants to go out for lunch and she is like I'll get a coffee and I'll get this and I'm like, I can only have one or the other. And she still can't get her head around that, you know? That I can't eat and drink at the same time." "I don't like telling people because the minute you say to them that I have had weight loss surgery, they go-oh. Couldn't stick to a thing and then you have gone to a surgeon. But they don't know the aftermath of that, of what you have to go through."
Eating behavior	Lack of self-control Sleep eating Binge eating Overeating Cautiously eating in front of people Changes to eating away from home Struggling with eating mindset Mind games Change of suppression of emotions Criticism towards others eating	Lack of self-control Disordered eating behaviors Newfound criticism of others eating behaviors	3. Challenges to changing eating behavior	"Yeah, I was really depressed for the first couple of weeks because I wasn't expecting such a dramatic change. You know, my mind thought I could eat more but I couldn't, and it was depressing." "And when you have that relationship with food and it's a transition, but I wasn't prepared. At the start, I didn't realise that I was going to feel that way and because food was such a social thing for me and lots of my life revolved around consuming food and sharing food ...all of a sudden, I felt isolated and so at the start I didn't expect that I didn't know that that was even going to be a thing."
Psychological challenges regarding the surgery	Still self-perceived fat Clothes shopping Health obsessed Increased confidence Scared of weight regain Mental struggles	Body dysmorphia Increased confidence and self esteem	4. Changes in mindset	"The mind games don't go away." "But it's the mental game of how I still see myself sort of thing and so I ask – do I look alright in this? And my husband and my kids are probably getting annoyed; you look fine. But do I look fat? No, you don't, how many times do we have to tell you?"
Support required long term	Social limitations Facebook Bariatric patients Support from watching others eat Cookbooks Lack of support	Health professional support Support from family and friends The impact of social media Resources	5. A need for ongoing support	"Just the mental help.....but for me I really was just... I felt like I was just dropped." "As I say I am most grateful and have no regrets or anything like that, but losing the weight is for me only a very small part of it and now I have flipped the page and now I have got other secondary problems that have come along with it, and they are not the best."
Group-based appointments/resources	Beneficial Increased support Decreased feelings of loneliness Shared ideas and recommendations	Togetherness Shared journeys	5. A need for ongoing support	"It was nice to know that someone else was going through the same kind of thing and to get ideas off other people you know that's really valuable."

One participant mentioned the use of mindful eating skills learnt from the 18-month group being an extremely helpful tool to control emotional eating and avoiding feelings of guilt after eating sweet treats.

3.2.4. Theme four – changes in mindset: “the mental game has been the biggest for me”

Changes to mind-set was experienced post-surgery, particularly an increased positive outlook on life, feelings of happiness and confidence about body image. Four focus groups reported a newfound enjoyment of clothes shopping as they could buy “normal clothes”.

“It really boosts you to be able to go into a normal clothes shop and buy clothes, that is just amazing”; “it feels really good, and it makes you feel so much better about yourself.

However, some participants (n = 6) reported a negative mindset post-surgery and an on-going struggle with their body image and/or weight; emotionally challenging.

“I am struggling mentally because I still see a fat blob. I still go and pick up size 14 and 16 and my daughter still says no you are a 10 or a 12. I am struggling big time with that”,

“There was nothing mentioned about struggling mentally. If mental issues come up, then maybe there is a protocol put in place throughout the journey to be able to see someone and talk to someone rather than end up where I am today”.

A newly found obsession with food and weight emerged in all focus groups. Many participants felt their life now revolved around food; obsessing about mealtimes and finding acceptable foods to eat. They also experienced new feelings of negative judgement towards what others ate, particularly food quantities.

“I found that I obsess about food, and I obsess about my weight”,

“I’ll watch them pile up their plates and think, you shouldn’t be eating all that”.

3.2.5. Theme five – a need for ongoing support: “when people regain, they don’t ask for help when they need it, and when they have asked for help it is there momentarily and then it’s gone, but I need it continually”

Most participants felt under-supported by the bariatric team, feeling as though once they had the surgery they were left to their own devices, expressing a need for longer follow-up care beyond 12 months. Most appointments were within the first-year post-surgery when weight loss was at its peak and discharged when they needed the most support. In hindsight, participants expressed a need for more education and support pre-surgery, regarding diet, psychological and mental support, and “just having regular check-ins”.

“I do still struggle with the lack of support because basically I have found that once you have had the surgery and you have gone through the three stages that were in the booklet it was like there you go - you are on your own”,

“... maybe a little bit of advice of what we do and don’t need to do before we go for the operation. Because I actually thought I was going to come out and look like Barbie”.

Most participants (n = 24) were members of bariatric Facebook support groups but had mixed views on the benefits. Positives were motivation to maintain weight. Negatives were the false medical information posted or the difficulty of seeing others’ success whilst struggling themselves. A key enabler identified was the importance of family/friend-based support - someone who believed in them. This improved motivation and perseverance to maintain weight outcomes. Many participants lost friends throughout their journeys due to lifestyle changes or judgement by others - “taking the easy way out”. Their small food intake and surgery became a subject of discussion at family/social gatherings, which led many to keep their surgery secret in fear of

judgement and criticism.

“I don’t believe in me at the moment, and I have got nobody else that does. So, I just do nothing”,

“Going out for dinner and people would say what’s wrong with it? And I was like, there’s nothing wrong. I just can’t eat it all, sorry. And because I am still big, they look at me like - yeah right!”.

The value of the 18-month group session was discussed in all six focus groups; every participant stated they found the group setting extremely helpful. Main reasons were a sense of not being alone and gaining a sense of understanding through other’s journeys, as well as valuable ideas on diet, mindset, or exercise from peers.

“I thought it was really good that you heard that people were struggling the same as you. That made you feel normal because you think it’s only you that’s scared of putting on the weight again or feels guilty...”.

4. Discussion

The purpose of this study was to evaluate the value of the addition of a nutrition group education session and to qualitatively explore patients’ perspectives on barriers and enablers to maintaining weight post-bariatric surgery.

4.1. Weight changes and discharge from care

Several participants (n = 11, 40 %) experienced weight-regain at 21-months post-surgery, however, all feared weight-regain. It is well known that with longer time post-surgery, the risk of weight-regain increases, particularly once major physiological and metabolic adaptations have occurred and extreme weight loss begins to plateau around 12-months (Odom et al., 2010). A study including 782 bariatric-surgery participants concluded that weight regain begins to occur two to five years post-surgery, with 50 % of participants experiencing a mean 8 % weight increase at 24-months post-surgery (from the lowest point at 18-months post-surgery) (Magro et al., 2008). Similarly, in this study, between 18 and 21-months, 19 (67 %) of the participants gained weight, with three (10.7 %) participants gaining ≥ 5 kg, a 5.5 % mean increase from 18-months post-surgery. The increasing trends in weight over this three-month period show concern for future weight regain in this participant group.

Similar to this study, previous studies reported discharge from care between 12 and 18-months post-surgery (Engström & Forsberg, 2011; Groven & Glenn, 2016; Jones, Cleator, & Yorke, 2016; Lauti et al., 2016). However, our data demonstrated a need for longer follow-up care, particularly right after discharge. The first-year post-surgery was experienced as the honeymoon period where weight loss was easy, but the most support was needed around the time of discharge when it became harder to maintain the weight-loss. Previous studies also reported that participants desired more care at this time, due to struggling to maintain weight and adhere to dietary advice (Jones et al., 2016; Lauti et al., 2016).

4.2. Changes to quality of life

In this study, participants highlighted reversal of T2DM, sleep apnoea, improved blood pressure and blood lipid profiles, resulting in decreased medication use, which improved overall health-related QOL. In turn, higher QOL was related to feelings of increased energy, improved functional ability and overall confidence. This is in line with evidence showing that obesity-associated co-morbidities negatively impact QOL (Le Foll, Lechaux, Rascle, & Cabagno, 2019; Major et al., 2015), and that bariatric surgery reduces these co-morbidities, particularly T2DM (27 % to 75 % for GS) (Wolfe, Kvach, & Eckel, 2016). All

participants in this study reported improved functional ability, for example walking further than previously, resulting in greater engagement in intentional daily physical activities such as going to the gym, running and walking, in turn improving QoL. [Ryder et al. \(2016\)](#) reported that the post-bariatric surgery experience significantly improved functional abilities leading to a trend towards increased physical activity levels ([Ryder et al., 2016](#)). Poor functional ability is a severe consequence of morbid obesity and may be experienced as forms of severe knee and back pain, leading to people becoming walker dependent, wheelchair bound, or bed ridden ([Ryder et al., 2016](#)). Hence, resolution of these symptoms significantly enhancing qualities of life.

4.3. Problematic eating behaviors

In this study, binge eating, emotional eating, and increased snacking behaviors were a common struggle among participants. Problematic and disordered eating behaviors such as binge eating are common among patients and contribute to long-term weight-regain post-bariatric surgery, and if present pre-surgery, should be considered an alert for poor weight loss outcomes long-term ([Conceição et al., 2014](#); [Matherne et al., 2015](#); [Mitchell et al., 2015](#); [Niego et al., 2007](#); [Tanofsky-Kraff et al., 2013](#)). An interesting observation in this study was that participants tended to snack (particularly more savoury snacks) more throughout the day (grazing) due to their inability to binge on large amounts of food because of the physiological restrictions from the surgery. Previous studies demonstrated patients often shift their eating behaviors from bingeing to grazing due to reduced stomach capacity post-bariatric surgery; 60 % becoming ‘grazers’ one-year post-surgery, and 94 % of pre-operative grazers continuing this behavior post-surgery, with consequences of weight gain ([Blacke, 2019](#); [Colles, Dixon, & O’Brien, 2008](#); [Conceição et al., 2014](#)).

Post-surgical food intolerances causing nausea and/or vomiting episodes were experienced in this study, as also previously reported ([Boerlage, van de Laar, Westerlaken, Gerdes, & Brandjes, 2017](#)). Intolerances created food phobias, fear of trying new foods and limiting dietary intakes to avoid symptoms, causing a very narrow, boring diet. They found it easier to eat non-nutritious foods (e.g., ice cream, chocolate) with fewer side-effects than bulky nutritious foods. However, eating less nutritious foods resulted in symptoms of discomfort (e.g., constipation and nausea), more energy-dense meals, and increased risk of weight gain. Many of our participants struggled with mind games regarding their eating behaviors and an increased sense of ‘responsible eating’ in front of others, due to an emerging new fear of judgement around food intake by others, thinking they had ‘failed surgery’. Participants thus reported hiding their consumption of less nutritious foods. These behaviors are commonly associated with weight-regain ([Colles et al., 2008](#)). However, the fear of weight (re)gain, weight stigmatization and resultant obsession about demonstrating good food choices is real among this patient group and has been clearly demonstrated in this study. Individuals who have undergone bariatric surgery have reported experiencing disordered eating cognitions and behaviors in previous qualitative investigations ([Watson, Riazi, & Ratcliffe, 2020](#)), suggesting that this is an important area for additional research. Clinicians should be attentive when advising on the necessary post-surgery dietary restrictions to assist and support patients to identify and legitimise these behaviors, thereby supporting their health and mental wellbeing following surgery ([Niego et al., 2007](#); [Watson et al. 2020](#)). Utilisation of mindful eating approaches in the nutrition education groups for patients in this study, was well-received and should remain a focus area.

4.4. Participant reported enablers and barriers to preventing future weight-regain

Two key enablers to prevent future weight-regain were identified in this study: regular physical activity and following a healthy diet. This aligns with previous research which reported that adherence to daily

physical activity, self-monitoring weight and following required dietary modifications (for example eating smaller regular meals, avoiding fast foods, limiting intake of non-nutritious foods and reducing fat intakes) were adequate strategies to prevent weight-regain ([Westerveld & Yang, 2016](#)). Support from health professionals, friends and family was a further strong enabler. Being surrounded by positive support was considered essential for success – participants needed others to believe in them to be able to believe in themselves. Previous research ([Conceição et al., 2020](#)) supports these findings, showing an association between increased social support and greater weight loss/maintenance outcomes post-surgery.

Barriers to a healthy lifestyle in this study were financial stress (nutritious food cost), time limitations (working hours), and the influence/expectations of society, cultural and social gatherings (being centred around food). Financial factors as a major barrier to preventing weight-regain have previously been reported ([Westerveld & Yang, 2016](#)). Non-disclosure of weight-loss method is a common barrier due to fear of judgement or criticism ([Graham, Hayes, Small, Mahawar, & Ling, 2017](#)), which was confirmed among participants in this study. However, all participants found the additional 21-month group education / discussion session valuable as it reduced loneliness through peer support and was a source of new meal ideas, coping strategies, and mindful eating advice from the dietitian. Further support either at pre-surgery or post-surgery appointments to desensitise the need for weight loss, and a greater focus on lifestyle changes such as nutrition and exercise, as identified by this study, is imperative. However, the challenge remains to change the general mindset of bariatric surgery being a weight-centric approach.

“That made you feel normal because you think it's only you that's scared of putting on the weight again or feels guilty and stuff like that. But to hear that everybody else did, it was just great”.

Support groups appear to be an integral component of weight-loss success following bariatric surgery. [Orth et al. \(2008\)](#) showed that support group attendees had improved weight-loss outcomes compared to non-attendees (55.5 % excess weight-loss, 47.1 % excess weight-loss respectively) ([Orth et al., 2008](#)). They recommended that support groups be led by either the surgeon, nurse practitioner or dietitian as an opportunity to continue patient education ([Orth et al., 2008](#)). Poor attendance to clinical appointments was identified as a problem among these patients ([Vidal et al., 2014](#)), therefore, designing appointments around patient-centred feedback is likely to result in increased attendance and adherence to guidelines.

The qualitative analysis was a strength of this research study as it produced a set of viable patient-centred recommendations to improve the bariatric programme at Counties Manukau. This has subsequently resulted in the addition of a psychologist into the post-bariatric surgery care team to support patient's mental health and wellbeing at Counties Manukau. Having continuity of care with an additional follow-up dietitian visit as part of their care was an additional strength. Not only did it strengthen relationships with participants and staff, but also among their peers. This provided a safe environment where participants felt they could openly share their opinions and journeys through the bariatric programme. The qualitative research design as well as the ethnic diversity allows for transferability of findings, particularly to other contexts, situations and population groups, especially in New Zealand.

A limitation of this research was the smaller sample size (overall 28 participants with 13 participants lost to follow up at 21-months post-surgery). This was firstly due to purposeful recruitment from the Counties Manukau bariatric service, living in areas characterized by higher levels of poverty may have contributed to the number of participants who did not attend the 21-month session, and those that withdrew from the study. However, the specificity of the study population, allowed for wider perspectives. The number of surgeries conducted during the study timeframe was another limitation, as we were unable to recruit the desired number of participants. Selection biases may be

present, where only participants who particularly benefit from group appointments agreed to take part in the study. Although no participants vocalised that they did not find the group setting beneficial when this was raised during focus group discussions, participants may not have felt safe to share for fear of criticism. Therefore, these results may not be reflective of all patients who under-go bariatric surgery. Finally, not having a control group was a limitation of this research as it would have been beneficial to compare outcomes from those who participated in the nutrition education group, to those who did not.

5. Conclusion

Weight-regain is a post-bariatric surgery problem with physiological and psychological implications for the individual. Bariatric surgery results in increased QOL initially, however, as post-surgical time increases, old behaviors can resurface, increasing the risk of weight-regain and adverse QOL. This study highlights factors which may contribute to weight-regain post-surgery and may be addressed with the addition of group education sessions to post-bariatric care. These sessions were perceived as an extremely valuable way of increasing patient support throughout their bariatric journey, providing effective education around diet, nutrition and eating behaviors (see [Appendix A](#)). However, understanding the reasons for weight-regain post-surgery is key to support patients and improve the true long-term benefits of bariatric surgery. Such support may help patients meet their weight-related and health outcomes.

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Appendix A. Recommendations

Recommendation	Proposed 'how to' ideas	Reasons
Meal plans	<ul style="list-style-type: none"> - Bariatric related meal plan after surgery - Cookbook with suggested recipes for bariatric patients 	<p><i>"But I think for me, I wanted ... I am better if someone tells me you should do it like this, rather than me focusing on trying to think what should I do."</i></p>
Addition of a psychologist	<ul style="list-style-type: none"> - Pre- and post-surgery to provide mental health support, especially one-year post-surgery when the weight regain begins to happen 	<p><i>"Definitely in my opinion there is not enough mental support, I am really struggling"</i></p>
Group appointments	<ul style="list-style-type: none"> - Utilise group appointments similar to cardiac rehabilitation groups, once per month. Half the session being a patient expert, half being a health care professional e.g., dietitian, surgeon, nurse. - Having allocated time for patients to be able to ask their own questions, which all others in the room will be able to learn from - Pre- and post-surgery groups with around 10 participants - Put emails out to patients prior to the group session asking what they are struggling with and then the health professional centres their part of the talk around this issue e.g., snacking 	<p><i>"I actually enjoyed the group session and hearing what other people were eating and they were struggling with maybe steaks and other people could eat bread and other people couldn't. It was quite interesting to realise that everybody was on a very different journey personally, but in some way it all kind of made sense as a group, what we were going through"</i></p> <p><i>"I prefer groups so that everyone can see what is happening with everyone else in the same boat."</i></p> <p><i>"Half the time – people don't want to go to places because someone is just sitting there talking"</i></p>
Mentoring from previous patients	<ul style="list-style-type: none"> - Use a previous patient who has been through the journey and can really say what it's like to mentor patients before surgery. - Two people to be able to talk too post bariatric surgery; one who had a great experience and one who had a negative experience. 	<p><i>"I think it would be really good to have a couple of people that have been through the surgery to speak to you at the beginning. I think that would be great if you had someone that had a really good time of it, like I have no problems or anything. I can't eat some stuff, but big deal. And then someone that's had a really awful time just so people know. Everybody's different and what you can expect, because some people think they're going to look like a supermodel and they're not going to have any excess skin or that and they're really disappointed, but they've got to be realistic"</i></p>
Increased number of appointments with the dietitian	<ul style="list-style-type: none"> - Patient-centred approach - Six-monthly follow ups for five years - Increased appointments/to support with diet progression stages 	<p><i>"You go to the dietitian and things like that but I found the dietitians weren't really hearing what I was saying. It was very broad information"</i></p> <p><i>"I would have liked really more help when I went in to go and see the dietitians as I progressed and was eating normally again... and it's quite difficult because when you're looking and speaking to a whole lot of other bariatric patients, every surgeon and doctors and things are different. Some insist you should be eating five meals a day. Some insist you should be eating three meals a day"</i></p>

(continued on next page)

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CRediT authorship contribution statement

Gypsy Bullen: Methodology, Investigation, Data curation, Formal analysis, Visualisation, Writing – Original draft, Review, Editing. **Deirdre Nielsen:** Conceptualisation, Methodology, Investigation, Supervision, Writing – Review & Editing. **Carol Wham:** Methodology, Supervision, Writing – Review & Editing. **Rozanne Kruger:** Conceptualisation, Funding acquisition, Methodology, Investigation, Formal analysis, Supervision, Writing – Review & Editing.

Declaration of competing interest

All other authors declare that they have no conflicts of interest.

Data availability

The authors do not have permission to share data.

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(continued)

Recommendation	Proposed 'how to' ideas	Reasons
Education around medications	- A detailed list of common medications which cause weight gain and increased appetite.	"That exact medication is the one that I found myself waking up and there were banana skins by my bed. I am single and I am by myself in my house, so there is nobody else. And I was like – okay. And then I went to the doctor and they said this is an effect of what your pills do"
Health professional monitored Bariatric Facebook group	- A group Facebook page for Bariatric patients to support each other - The page should be monitored by health professionals who can provide and monitor input to medical questions	"People are saying you can't do this and you can't do that; well, everybody is different and what you can tolerate and what you can't tolerate" "I found the Bariatric Facebook pages quite good to see, especially at the very beginning with people's progress and stuff. That really gave me something to aim for"
Emphasis on weight change rather than BMI	- Refraining from telling patients what BMI category they are in.	"Where you go and weigh yourself and there is a chart on the wall. I try not to weigh myself because it becomes an obsession. I can put on 5kg in a week, easy and lose it the next. I don't understand it and I don't try to. But I am still obese. And either that chart needs to come down or there needs to be more information around that chart because that's nasty. That's really nasty because I can't do any more than what I am doing. And whether it needs to be a BMI thing or ... I don't know. But yeah, I am still obese"
Workbook on how to deal with social situations	- A workbook on how to deal with eating in social situations / occasions - What to order when out at restaurants - 'Safe foods' to order if travelling overseas.	"lots of my life revolved around consuming food and sharing food and family gatherings and all of that. And all of a sudden I felt isolated and so at the start I didn't expect that. I didn't know that that was even going to be a thing" "A workbook, regardless of whether it's a cultural thing or whether it's just socialising. Just getting on with life afterwards in the social arena. How are you going to deal with that?"
Inpatient meal deliveries – specific meal codes	- Ensure only food suitable for post bariatric surgery is delivered - Increased education about what to do instantly after surgery	"I think it was mentioned at the last focus group about the meals straight after surgery. They brought out a huge meal and nobody told us that you were supposed to eat it all or what are we supposed to have straight after. It was quite a large tray of food"

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