Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.
MOTHERS' EARLY FEEDING PRACTICES AND THE ECOLOGICAL FACTORS THAT ARE ASSOCIATED WITH IRON INTAKE OF 9 – 11 MONTH OLD INFANTS IN SOLANA, CAGAYAN, PHILIPPINES

A thesis submitted in partial fulfilment of the requirements for the degree of

Master of Science in Nutritional Science

at Massey University
Palmerston North, New Zealand

Maria Gisela M. Lonzaga
2001
ABSTRACT

This study examines early infant feeding practices and the ecological factors that are associated with the diets of 9 – 11 month old infants. A face to face interview using a structured questionnaire was used to obtain the information from mothers of 120 infants in Solana, Cagayan, Philippines. Dietary information was obtained using a 24-hour dietary recall and a one week food diversity checklist. Ninety eight percent of the infants were breastfed but some mothers practiced early introduction of fluids and withholding nourishing foods from the infants. The infants’ mean iron intake was found to be inadequate in terms of the RDA, indicating a high risk of iron deficiency. Meat, poultry, and fish were provided in small amounts to the infants and not on a daily basis. Iron fortified foods were also not a significant source of iron. It was found that the infants’ food diversity was associated with the infants’ iron intake, the higher the food diversity scores of the infants, the higher their iron intake. Factors associated with the infants’ diet include maternal educational attainment, maternal attitude to variety of foods and child’s sex and age. Attendance at nutrition education activities was not associated with higher iron intake of the infants. Although maternal attendance at bench conferences was associated with higher maternal nutrition knowledge, attendance at bench conference was associated with low iron intake among infants. There was not a clear association between family monthly income and the infants’ diet. Maternal nutrition knowledge and the infants’ food diversity were found to mediate the relationship between infants’ iron intake and family and child’s characteristics and nutrition education activities.
ACKNOWLEDGEMENTS

I acknowledge and am deeply grateful to the New Zealand Government through the Ministry of Foreign Affairs and Trade for my New Zealand Official Development Assistance (NZODA) study award.

I am most grateful to the National Nutrition Council through Executive Director Elsa M. Bayani, Deputy Executive Director Maria Bernardita T. Flores and Deputy Executive Asuncion L. Macalalag for giving me the opportunity to take my post graduate study, and for the support and kind encouragement they provided throughout the duration of my study.

My deepest gratitude to my supervisor, Dr. Janet Weber, for her guidance and kind encouragement throughout my research, especially for her criticisms and patience in reading and correcting this report. Completion of this research is attributable to her help.

My sincere thanks to the Municipal Nutrition Committee of Solana, Cagayan through its Chairman, Mayor Rodrigo C. de Asis and its Municipal Nutrition Action Officer, Dr. Anastacia Taguba, the Barangay Nutrition Committees through the Barangay Officials for allowing me to undertake my research in their municipality. The Municipal and Barangay Nutrition Committees of Solana provided me the support and assistance, which made this research possible.

My gratitude to the mothers who participated in the pre-testing of my questionnaire and to the mothers who participated in the research. Without their cooperation this research would not have been possible.

My thanks to the Rural Health Unit’s staff, the Public Health Nurses, the Rural Health Midwives, the Barangay Nutrition Scholars and the Barangay Health Workers of
Solana for their assistance, particularly in the recruitment of the participants and providing information vital to my research.

I am also grateful to Dr. Duncan Hedderley for patiently assisting me with my statistics.

My sincere thanks to Mrs. Marilou R. Galang and Miss Eleanor M. Lanot for their help with my dietary analysis.

My special thanks also goes to:

Mrs. Elizabeth Reynolds who kindly and carefully edited the draft of the thesis.

Associate Professor Kathy Kitson for patiently editing my ethics application.

Mrs. Maria Lourdes A. Vega, Mrs. Arlene R. Reario, Mr. Benjamin C. Formento and their staff for the help they extended to me in times of need and everyone at the National Nutrition Council who in one way or another had generously extended their support and assistance to me.

Mrs. Magdalena J. Lara, Miss Lolita Carpio, Miss Rufina Soriano, Mrs. Marichu de Guzman, and Mr. Alfonso Rivera for providing the materials, data, and maps I needed for the study.

Mr. Charles Chua and the International Students' Office personnel for the support and kind assistance they extended in the entire duration of my study.

Mrs. Heather McClean, Mrs. Milagros Perez and Mrs. Rhodora Maestre for their support and kind encouragement.
My adjusting to life in New Zealand has been due to the support and help of a number of people: My sincere thanks goes to:

Father Raymond Soriano for his spiritual guidance.

The Carambas and Baker family, whose genuine concern and care made my stay in New Zealand enjoyable despite the homesickness and all the difficulties arising at times in the duration of my study.

My fellow Filipino students and friends, Carmi, Helen, Allan, Val, John, Raffy and family, Mayet and family, Elvie and family, Jerome and Jang, Roy and Bing, Ponchie, Mona, Rod, Erwin, Sumi, Asif, Natilene and Pyone who provided companionship, support and encouragement. I thank you all for the all the support and for the happy and special times that will not be forgotten.

I feel very lucky and privilege to have a supportive and loving family. My love and deepest gratitude to my father, mother, brother, sisters, brothers-in-law, sister-in-law, nephews, and nieces for loving and unselfishly caring for my son and for regularly sending me messages of love, support and encouragement for the whole duration of my stay in New Zealand.

My love and heartfelt thanks to my husband, Dandan and son, Keeno for their unending love and support. They have constantly encouraged and sustained me because they believe in me and knew that one day I would finished my studies.

Finally, to the heavenly Father, for the inspiration, guidance and compassion, my praise and thanksgiving.
# TABLE OF CONTENTS

| ABSTRACT | ii |
| ACKNOWLEDGEMENTS | iii |
| TABLE OF CONTENTS | vi |
| LIST OF FIGURES | xi |
| LIST OF TABLES | xii |
| CHAPTER 1 INTRODUCTION | 1 |
| 1.1 Background of the Study | 1 |
| 1.2 Purpose of the Study | 4 |
| 1.3 Objectives | 4 |
| 1.4 Scope and Delimitation | 5 |
| CHAPTER 2 CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE | 6 |
| 2.1 Conceptual Framework | 6 |
| 2.2 Literature Review | 9 |
| 2.2.1 Feeding Infants | 9 |
| 2.2.1.1 Feeding Recommendations and Guidelines | 9 |
| 2.2.1.2 Recommended Dietary Allowance | 11 |
| 2.2.1.3 Summary | 12 |
| 2.2.2 Iron Deficiency During Infancy | 13 |
| 2.2.2.1 The Risk of Iron Deficiency After 4 Months of Age | 13 |
| 2.2.2.2 Consequences of Iron Deficiency During Infancy | 14 |
| 2.2.2.3 Prevention, Control and Treatment of Iron Deficiency and Iron Deficiency Anemia | 15 |
| 2.2.2.3.1 Iron Supplementation | 16 |
| 2.2.2.3.2 Food Fortification with Iron | 17 |
| 2.2.2.3.3 Diet Diversification and Improvement Through Nutrition Education and Communication | 18 |
| 2.2.2.3.4 Epidemiologic Surveillance | 19 |
| 2.2.2.4 Summary | 19 |
| 2.2.3 Health and Nutrition Situation in Solana | 20 |
| 2.2.4 The Municipal Nutrition Action Plan of Solana | 21 |
| 2.2.4.1 Nutrition Education in Solana | 22 |
| 2.2.4.2 Diet/Food Diversity As A Nutrition Education Message | 24 |
| 2.2.4.3 Summary | 25 |
2.2.5 Influences on the Diet Quality, Intake and Nutritional Status of Young Children
2.2.5.1 Studies in Other Countries
2.2.5.1.1 The child
2.2.5.1.2 Household/Family Characteristics
2.2.5.1.2.1 Maternal Nutrition Knowledge
2.2.5.1.2.2 Maternal Attitude
2.2.5.1.2.3 Parental Education
2.2.5.1.2.4 Household/Family Size
2.2.5.1.2.5 Number of Siblings 0-6 Years Old
2.2.5.1.2.6 Household/Family Income
2.2.5.1.2.7 Family Food Expenditure
2.2.5.1.3 Participation in Nutrition Education Activities
2.2.5.2 Studies in the Philippines
2.2.5.2.1 The Child
2.2.5.2.2 Household/Family Characteristics
2.2.5.2.2.1 Maternal Nutrition Knowledge
2.2.5.2.2.2 Parental Education
2.2.5.2.2.3 Household/Family Size
2.2.5.2.2.4 Number of Siblings 0-6 Years Old
2.2.5.2.2.5 Household/Family Income
2.2.5.2.2.6 Family Food Expenditure
2.2.5.3 Summary
2.2.6 Dietary Assessment Methods
2.2.6.1 24-Hour Dietary Recall
2.2.6.2 Diet Record or Diary
2.2.6.3 Food Frequency
2.2.6.4 Diet History
2.2.6.5 Selected Issues Related to Dietary Assessment Methods
2.2.6.6 Summary
2.2.7 Diet/Food Diversity Score
2.2.7.1 Summary
2.2.8 Summary

CHAPTER 3 MATERIALS AND METHODS
3.1 Research Location
3.2 Sample Size
3.3 Sample Selection
3.4 Recruitment
3.5 Data Collection
3.5.1 Survey
3.5.2 Survey Questionnaire
3.6 Dietary Assessment Instruments
3.6.1 24-Hour Dietary Recall
3.6.2 Food Diversity Checklist
3.7 Ethical Considerations 66
3.8 Handling of Data 66
3.9 Data Analysis 67

CHAPTER 4 RESULTS 71

4.1 Response 72
4.2 Socio-demographic Characteristics of the Participants and
Index Child 72
4.2.1 Age of Infant 72
4.2.2 Sex of Infant 72
4.2.3 Birth Position Of Infant in the Family 72
4.2.4 Maternal Age 72
4.2.5 Maternal Educational Attainment 73
4.2.6 Family Monthly Income 73
4.2.7 Family Weekly Food Expenditure 73
4.2.8 Number of Household Members 73
4.2.9 Number of Siblings Below Six Years Old 73
4.3 Infant feeding Practices 75
4.3.1 Breastfeeding Practice 75
4.3.2 Provision of Supplementary Feeding 76
4.3.2.1 Provision of Drinks other than Breastmilk 76
4.3.2.2 Provision of “Solid” Foods 76
4.3.3 Foods Withheld from Infants 77
4.3.4 Foods Withheld from Infant When He/She is Sick 78
4.4 Participation in Nutrition Education Activities 79
4.5 Maternal Attitude to Variety of Foods, Meal Planning
and Preparation 80
4.6 Maternal Nutrition Knowledge 81
4.6.1 Family Characteristics and Nutrition Education Activities
Associated With Maternal Nutrition Knowledge 82
4.6.1.1 Family Characteristics 84
4.6.1.1.1 Maternal Educational Attainment 84
4.6.1.1.2 Number of Siblings Below Six Years Old 84
4.6.1.2 Participation at Nutrition Education Activities 85
4.6.1.2.1 Attendance at Bench Conferences 85
4.7 Infants’ Food Diversity 85
4.7.1 Family and Child’s Characteristics and Nutrition Activities
Associated with Infants’ Food Diversity 86
4.7.1.1 Family Characteristics 89
4.7.1.1.1 Family Monthly Income 89
4.7.1.1.2 Maternal Educational Attainment 89
4.7.1.1.3 Maternal Attitude to Variety of Foods 90
4.7.1.2 Child’s Characteristics 90
4.7.1.2.1 Sex 90
4.8 Iron Intake of 9 – 11 Month Old Infants 91
4.8.1 Infants’ Dietary Iron Intake 91
REFERENCES

APPENDICES

Appendix A  Excerpts from Nutrition Information and Education Materials
Appendix B  Map of the Philippines
Appendix C  Map of Philippine Provinces
Appendix D  Map of Cagayan
Appendix E  Map of Solana
Appendix F  Photos from Solana
Appendix G  Information Sheet
Appendix H  Consent Form
Appendix I  Structured Questionnaire
Appendix J  Letter of Research Approval from the Mayor of Solana
Appendix K  Letter of Research Approval from the Municipal Health Officer of Solana
Appendix L  Descriptive Tables
### LIST OF FIGURES

<table>
<thead>
<tr>
<th>FIGURES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Conceptual model</td>
</tr>
<tr>
<td>3.1</td>
<td>Diagram of sampling method performed</td>
</tr>
<tr>
<td>4.1</td>
<td>24-Hour Iron Intake of 9-11 month old infants</td>
</tr>
<tr>
<td>4.2</td>
<td>Iron sources of infants with low iron intake</td>
</tr>
<tr>
<td>4.3</td>
<td>Iron sources of infants with medium iron intake</td>
</tr>
<tr>
<td>4.4</td>
<td>Iron intakes of infants with high iron intake</td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>TABLES</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1</td>
<td>Socio-demographic characteristics of participants and index child</td>
</tr>
<tr>
<td>4.2</td>
<td>Duration of exclusively breastfeeding mothers</td>
</tr>
<tr>
<td>4.3</td>
<td>Foods withheld from infants</td>
</tr>
<tr>
<td>4.4</td>
<td>Foods withheld from sick infants</td>
</tr>
<tr>
<td>4.5</td>
<td>Mothers’ attendance at nutrition education activities</td>
</tr>
<tr>
<td>4.6</td>
<td>Factors mothers consider when planning meals</td>
</tr>
<tr>
<td>4.7</td>
<td>Importance to include variety of foods in planning meals</td>
</tr>
<tr>
<td>4.8</td>
<td>Importance of feeding children variety of foods everyday</td>
</tr>
<tr>
<td>4.9</td>
<td>Maternal nutrition knowledge test score</td>
</tr>
<tr>
<td>4.10</td>
<td>Association of family characteristics and nutrition education activities with maternal nutrition knowledge</td>
</tr>
<tr>
<td>4.11</td>
<td>Least square means of maternal nutrition knowledge scores for each maternal educational attainment category</td>
</tr>
<tr>
<td>4.12</td>
<td>Least square means of maternal nutrition knowledge scores for each number of siblings below six years old category</td>
</tr>
<tr>
<td>4.13</td>
<td>Infants’ food diversity scores</td>
</tr>
<tr>
<td>4.14</td>
<td>Association of family and child’s characteristics and nutrition education activities with infants’ food diversity</td>
</tr>
<tr>
<td>4.15</td>
<td>Least square means of infants’ food diversity scores for each income category</td>
</tr>
<tr>
<td>4.16</td>
<td>Least square means of infants’ food diversity scores for each maternal educational attainment category</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4.17</td>
<td>Association of family and child's characteristics and nutrition education activities with infants' iron intake</td>
</tr>
<tr>
<td>4.18</td>
<td>Least square means of infants' iron intake for each income category</td>
</tr>
<tr>
<td>4.19</td>
<td>Least square means of infants' iron intake for each infants' age group</td>
</tr>
<tr>
<td>4.20</td>
<td>Means of infants' iron intake for each infants' food diversity score tertiles</td>
</tr>
<tr>
<td>4.21</td>
<td>Mediating effect of maternal nutrition knowledge and infants' food diversity to the relationship of Family and child's characteristics and nutrition education activities with the infant's iron intake</td>
</tr>
</tbody>
</table>
CHAPTER ONE

INTRODUCTION

1.1 Background of the Study
Childhood malnutrition is a major public problem in the developing countries. It has serious effects on the growth and health of children. The death of children under 5 years of age accounts for one in every three deaths in the world (UNICEF, 1988). Protein energy malnutrition (PEM) affects one third of all the children under five in developing countries (UNICEF, 1995).

Aside from protein energy malnutrition, iron deficiency and iron deficiency anemia also have a great effect on the health status and development of children. Inadequate iron intake can reduce immunity and increase susceptibility to infectious diseases (Brock, 1995). Anemia in children, especially at infancy may also cause retarded physical and mental development (Stephenson, 1995). An association between iron deficiency and cognitive performance was seen in infants; anemic infants tend to score lower on mental and/or motor development tests compared to non-anemic infants (Andraca et al., 1997). Iron deficiency is recognised as the most prevalent deficiency world-wide (WHO, 1972) and children less than two years old are considered as one of the highest risk groups (INACG, 1979). Baynes and Bothwell (1990) cited that prevalence of iron deficiency is estimated at 30% of the world’s population, with highest prevalence in developing countries. One of the main causes of iron deficiency anemia in developing countries is poor availability of absorbable iron from the diet (Ohri-Vachaspati & Swindale, 1999).

Breastfeeding protects infants from iron deficiency for the first 6 months of life. Iron deficiency is uncommon in breastfed infants during their first 6 months (Owen et al., 1981; Duncan et al., 1985). Thereafter, infants become dependent upon dietary or supplemental iron to maintain adequate iron stores and to meet the requirements of
rapid growth and development. The emphasis of introducing iron rich foods at 4-6 months is very important (Wharton, 1989).

There are several factors that may influence nutrient intake including social, cultural and economic conditions. Poor people may not be able to buy adequate amounts of iron rich foods and parents of limited education may have the difficulty choosing an infant diet that contains sufficient amount of iron. Some studies show a positive correlation between dietary quality and total family income and between dietary quality and mothers education (Caliendo & Sanjur, 1978; Sanjur, LaChapell & Parker, 1973). Cronin et. al., (1982) also showed that other demographic factors such as age, race and religion significantly affect the selection of some foods and the frequency of their consumption.

Iron deficiency is a significant nutritional problem in the Philippines. A 1993 Nutrition Survey found infants aged 6 months to 1 year have the highest prevalence of iron deficiency anemia (Florentino, Villavieja & Molana, 1996). The 1993 survey found a prevalence of 49.2% in infants 6 months to less than 1 year, this is significantly less than the 70.4% iron deficiency anemia reported in 1987 (P<0.01). This 30.1% reduction was assumed by the National Nutrition Council (1998) to be attributed to the gradual improvement in the Philippine economy. The Council also reported that the supplementation of vitamin A during National Micronutrient Day may have helped improve the iron nutriture of preschoolers, as vitamin A is responsible for the integrity of tissues including mucosal tissues of the gastrointestinal tract where iron absorption takes place.

Despite this improvement iron deficiency anemia still occurs in every region of the country. The 1998 Fifth National (Philippines) Survey showed that anemia among children aged 6-months infants to 5 years old is highest in the Autonomous Region of Muslim Mindanao with a prevalence of 50.6% and lowest at the Northern Mindanao Region with a prevalence of 19.8% (FNRI, 1998).
Breastfeeding in the Philippines is not universal. However, rates of breastfeeding are improving. Zablan (1986) reported a decline in breastfeeding at birth from 87% in 1973 to 85% in 1978 and 83% in 1983. Improvement in these rates were seen in the 1993 and 1998 National (Philippine) Demographic and Health Survey where 82% in urban areas and 93% in rural areas were breastfeeding in 1993 and 83% in urban areas and 92% in rural areas were breastfeeding in 1998 (National Statistics Office, 1994 and 1998).

The duration of breastfeeding in the Philippines is erratic. Zablan (1986) reported a decline in the mean duration of breastfeeding from 12.3 months in 1993 to 11.4 months in 1978 to 9.6 months in 1983. The 1993 National (Philippine) Demographic and Health Survey reported an increased in mean duration of breastfeeding to 14.1 months but again this declined to 13 months in the 1998 National (Philippine) Demographic and Health Survey (National Statistics Office, 1998). The National (Philippine) Statistics Office (1994) stated that this duration is only a slightly shorter than Thailand (14.5) but much shorter than Indonesia (23.3).

Solana is a rural area. There is no information on the prevalence of iron deficiency among infants in the municipality. However, the Cagayan Valley Region, ranked second among all the regions in the country with the highest prevalence of anemia (48.8%) among children aged 6-months infants to 5 years old and Cagayan, where Solana is located ranked second among all the provinces of Cagayan Valley with the highest prevalence of anemia at 51.1% (FNRI, 1998). Therefore it is thought that the infants of Solana are at risk of iron deficiency.

The majority (83%) of women in Solana, Cagayan, Philippines initiate breastfeeding (Rural Health Unit, 1999). Statistics show that majority of women in Solana introduces supplementary foods at the recommended age (4-6 months), however, there is no information on what supplementary foods are given to infants. In particular there is no information as to whether the children are receiving foods which are rich sources of iron and what factors influence their diet quality.
One of the interventions aimed at improving nutritional status of the children in Solana is nutrition education, in which the importance of both diet diversity and including iron rich foods in the diet is explained. It is thought that mothers who attend nutrition education activities such as nutrition classes, individual health teachings, bench conferences and household teachings and learn the information will be more likely to provide iron rich diet to their children.

1.2 Purpose of the Study
The purpose of this study is to describe the early feeding practices and to examine the ecological factors that are associated with diet quality, particularly iron intake, of 9-11 month old infants in Solana, Cagayan, Philippines, so that appropriate nutrition interventions can be planned.

1.3 Objectives
A. To describe the early feeding practices of mothers with 9 – 11 month old infants in Solana, Cagayan, Philippines.

B. To examine the ecological factors that are associated with the diets of 9-11 month old infants in Solana, Cagayan, Philippines.

Specifically to answer the following questions:
1. What are the early feeding practices of mothers with 9 – 11 month old infants?

2. What is the level of iron in the diets of 9 -11 month old infants? Is iron provided in sufficient amounts so that the risk of iron deficiency is low?

3. What family and child’s characteristics and nutrition education activities are associated with infants’ food diversity?
4. What family and child's characteristics and nutrition education activities are associated with infants' iron intake?

5. Is maternal nutrition knowledge and infants' food diversity associated with iron intake of the infants?

6. Is the relationship of family and child's characteristics and nutrition education activities with the infants' iron intake mediated by maternal nutritional knowledge and infants' food diversity?

1.4 Scope and Delimitation

The study is confined to 9-11 month old infants in Solana, Cagayan, Philippines. The study will examine the early feeding practices of mothers and the ecological factors, particularly the family and child's characteristics and nutrition education activities that have associations with the infants' food diversity and iron intakes. It will also examine if the effects of these factors on the infants' iron intakes are being mediated by the mothers' nutrition knowledge and infants' food diversity.

This thesis contains 6 Chapters. Chapter 2 contains the conceptual framework and a review of the related literature with respect to infant feeding, iron deficiency among infants, and factors affecting diet quality, intake and nutritional status of young children and the dietary assessment methods. The municipal nutrition program of Solana will also be discussed in this chapter. Research methodology will be described in chapter 3. In chapter 4, research results will be outlined. Results will be discussed in chapter 5. The final chapter, that is chapter six, will outline the conclusions, recommendations and areas for future research.