DUAL FORM OF MALNUTRITION IN THE GAZA STRIP -PALESTINE TERRITORIES: PREVALENCE, ASSOCIATED DETERMINANTS AND WOMEN'S KNOWLEDGE AND PERCEPTION OF NUTRITION PRACTICES

By

RIMA R.R. EL KISHAWI

Thesis submitted in the fulfilment of the requirements for the degree of Doctor of Philosophy

2015

ACKNOWLEDGMENT

In the name of Allah, the Most Gracious and the Most Merciful

Thank You ALLAH for being beside me in each step and for giving me strength and ability to complete this study. I am sincerely grateful to my supervisor Professor Dr. Wan Abdul Manan Wan Muda, for his valuable guidance, support and invaluable advices throughout the duration of this study and the preparation of this thesis.

I whole heartedly appreciate the support from my co-supervisor Dr. Soo Kah Leng, and my field supervisor Professor Dr. Yehia Awad Abed for their keen supervision and valuable guidance.

I would like to thank Dr. Fouad Issawi the general director of primary health care in ministry of health, Dr. Randa El Khoudary the director of laboratories and blood bank in ministry of health, and Mr. Fouad Ahmed the director of central laboratory in ministry of health in Gaza Strip for their enthusiasm to help and support. I would like to express my thanks and appreciation to Dr. Adnan Al-Wahaidi Executive Director at Ard El-Insan Palestinian Benevolent Association in Gaza for Child Health and Nutrition for his encouragement and motivation. A special thanks to the laboratory medical technician in Ard El-Insan for his help to analysis the blood samples for the participants.

Collective and individual acknowledgements are owed to my colleagues in the central laboratory in ministry of health in Gaza Strip for their help and encouragement.

My sincere appreciations also go to PhD students in school of health science in USM universiti for their great guide, help, and support.

I am greatly indebted and appreciate to my beloved husband Fatih Hatip for his patient encouragement throughout the study. My deepest gratitude goes to all my family members for they have inspired and supported me in their own ways to finish my thesis: all my dearest brothers, sisters, nieces, and nephews. Special thanks for their motivation, support, encouragement, and for their love gave me forces to make this work. May Allah bless you all.

Finally, I would like to dedicate this thesis to the loving memory of my dear father and mother who passed away. They always believed in me, and they were very proud of my development as a person and my professional progress. I regret they didn't see the culmination of their dream.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CI	Confidence interval
CVD	Cardiovascular Disease
EBF	Exclusive Breastfeeding
EMR	Eastern Mediterranean Region
FAO	Food and Agriculture Organization of the United Nations
IDF	International Diabetic Federation
LMICs	Low-to-middle income countries
MET	Metabolic equivalent
MGRS	Multicentre Growth Reference Study
MOH	Ministry Of Health
NCDs	Non Communicable diseases
NCHS	National Center for Health Statistics
NGOs	Non-Governmental Organizations
NHANES	National Health and Nutrition Examination Survey
NIH	National Institutes of health
NIS	New Israel Shekel
OR	Odds Ratio
PCBS	Palestinian Central Bureau of Statistics
PEM	Protein- Energy Malnutrition
RDA	Recommended Dietary Allowances
ROC	Receiver Operating Characteristic

SES	Socioeconomic Status
UAE	United Arab Emirates
UNDP	United Nations Development Programme
UNICEF	The United Nations Children's Fund
UNRWA	United Nations Relief and Works Agency
WC	Waist Circumference
WHO	World Health Organization

MALPEMAKANAN BERGANDA DI SEMENANJUNG GAZA - PALESTIN: PREVALENS, PENENTU BERKAITAN, PENGETAHUAN DAN PERSEPSI WANITA TENTANG AMALAN PEMAKANAN

ABSTRAK

Di Semenanjung Gaza, berlaku peningkatan ketara obesiti dalam kalangan orang dewasa dan kurang berat badan dalam kalangan kanak-kanak prasekolah. Kewujudan penemuan ini membawa kepada hipotesis bahawa obesiti dan kurang berat badan boleh berlaku dalam sebuah keluarga dan ini membawa kepada malpemakanan berganda dalam sesebuah isi rumah. Tujuan utama penyelidikan ini adalah untuk memahami profil malpemakanan dalam golongan ibu dan kanak-kanak prasekolah berumur 2 – 5 tahun, serta menerangkan malpemakanan berganda (ibu berlebihan berat badan/ anak kurang berat badan) dalam isi rumah yang sama di Semenanjung Gaza. Secara spesifiknya, penyelidikan ini adalah untuk mengkaji faktor perkaitan dengan pasangan kanak-kanak kurang berat badan, dan ibu lebih berat badan, serta mengkaji persepsi dan pengetahuan pemakanan ibu. Kajian ini menggabungkan kaedah kuantitatif dan kualitatif. Dalam Fasa I, kajian keratan rentas mewakili data kuantitatif untuk menilai malpemakanan berganda dan faktor risiko berkaitan dalam kalangan ibu antara umur 18 hingga 50 tahun, dan kanak-kanak berumur 2 hingga 5 tahun. Bilangan peserta adalah seramai 357 isi rumah dari tiga lokasi geografi berbeza di Semenanjung Gaza, iaitu, kawasan Bandar El Remal, Kem Pelarian Jabalia, dan kawasan pedalaman Al Qarara. Data kajian telah dikumpul dengan menggunakan borang soal selidik berstruktur. Ketinggian dan berat badan bagi ibu dan anak diukur, Borang Soal Selidik Aktiviti Fizikal Antarabangsa (IPAQ) digunakan untuk mengukur

corak aktiviti fizikal ibu, Ingatan Diet 24-Jam digunakan untuk menilai pengambilan zat makanan pasangan ibu dan anak, dan kesemua 357 anak dan ibu bersetuju untuk diambil sampel darah bagi tujuan ujian biokimia. Dalam Fasa II, perbincangan kumpulan fokus telah dijalankan untuk mendalami pengetahuan dan persepsi pemakanan dalam kalangan 24 orang ibu dalam tiga kumpulan fokus dari tiga lokasi di Semenanjung Gaza. Keputusan daripada Kajian Fasa I mendapati kira-kira 59.7% kanak-kanak berumur 2-5 tahun mengalami anemia, 24.4% kurang berat badan (Z-score <-1), manakala lebih daripada separuh ibu (64.1%) adalah berlebihan berat badan atau obes. Prevalens malpemakanan berganda adalah 15.7%. Turutan kelahiran anak mempunyai perkaitan yang signifikan dengan malpemakanan berganda (OR_{adj}, 1.50, 95% CL (1.22, 1.82); p=<0.001). Kejadian malpemakanan berganda meningkat apabila ayah berpendidikan sederhana (OR_{adj}, 3.19, 95% CL (1.07, 9.5); p=0.036), atau rendah (OR_{adj}, 3.4, 95% CL (1.12, 10.37); p=0.031). Tambahan pula, kanak-kanak yang kurang selera makan cenderung untuk mengalami kekurangan berat badan dan juga berkait secara signifikan dengan malpemakanan berganda (OR_{adj}, 6.9, 95% CL (2.35, 20.24); p <0.001). Malpemakanan berganda meningkat dalam kalangan ibu yang mempunyai tahap pengetahuan pemakanan yang tinggi (OR_{adj}, 1.23, 95% CL (1.0, 1.52); p=<0.048). Malpemakanan berganda berkurangan dalam isi rumah berpendapatan bulanan rendah (OR_{adj}, 0.28, 95% CL (0.9, 0.88); p=0.030). Dari segi pengambilan zat makanan, pengambilan lemak oleh ibu menyumbang kepada obesiti dan ini berkait dengan malpemakanan berganda (OR_{adj}, 1.01, 95% CL (1.0, 1.02); p=0.016). Keputusan dalam bahagian II menyokong keputusan dalam bahagian I, iaitu golongan ibu dari Palestin mempunyai pengetahuan pemakanan yang baik, tetapi persepsi dan amalan pemakanan yang kurang bagus. Berpengetahuan tidak membawa kepada amalan sihat, dengan itu pengetahuan pemakanan dan sikap negatif golongan

ibu membawa kepada peningkatan malpemakanan dalam kalangan individu pada peringkat isi rumah. Faktor budaya dan perspektif yang kurang bagus banyak mempengaruhi amalan dan corak pemakanan. Penyelidikan ini meluaskan pemahaman dalam faktor kolerasi keluarga yang mempunyai anak kurang berat badan dan ibu berlebihan berat badan. Dalam kajian ini, masalah kanak-kanak kekurangan zat makanan masih wujud, di samping peningkatan kadar obesiti ibu dan juga malpemakanan dwibentuk. Program-program intevensi pemakanan perlu mengenal pasti kewujudan kedua-dua isu malpemakanan ekstrim ini pada peringkat isi rumah, dan menerapkannya ke dalam strategi-strategi bersasar agar masalah malpemakanan berganda dapat diuruskan dengan berkesan. Penemuan baru ini menyarankan program-program yang direka khas untuk kawasan-kawasan yang kekurangan sumber untuk menggalakkan amalan pemakanan sihat dan aktiviti fizikal berkala yang dapat menghindar dari masalah kanak-kanak kekurangan zat makanan dan obesiti orang dewasa.

DUAL FORM OF MALNUTRITION IN THE GAZA STRIP -PALESTINE TERRITORIES: PREVALENCE, ASSOCIATED DETERMINANTS AND WOMEN'S KNOWLEDGE AND PERCEPTION OF NUTRITION PRACTICES

ABSTRACT

In the Gaza Strip, obesity increased among adults and underweight among preschool children were prevalent. The coexistence of these findings led to the hypothesis that obesity and underweight can cluster within a household to emerge dual form of malnutrition in the same household. The main purpose of this study was to understand the profiles of malnutrition among mothers and children aged 2-5 years then in so doing, to address the dual form of malnutrition (overweight mother/underweight child) in the same household in the Gaza Strip. More specifically, to investigate the associated factors with child underweight, maternal overweight pairs, and explore the mothers' nutrition perception and knowledge. This study used quantitative and qualitative mixed methods design. Phase I, cross-sectional study represents a quantitative data set to assess dual form of malnutrition and its associated risk factors among mothers' childbearing aged 18–50 years, and children aged 2-5 years. Some 357 households from three different geographical locations in the Gaza Strip, namely, El Remal urban area, Jabalia refugee camp, and Al Qarara rural area participated in this study. Data were collected using structured questionnaire for face to face interviews. Height and weight for mothers and children were measured, International Physical Activity Questionnaire (IPAQ) was used to measure the physical activity pattern of mothers, 24-Hour recall was used to assess nutrients intake for mother-child

pairs, and all 357 children and mothers voluntarily provided blood samples for biochemical tests. In phase II, focus groups discussions were performed to explore mothers' nutrition knowledge and perception. Twenty four of surveyed overweight or obese mothers were recruited from the three locations in the Gaza Strip. Results from phase I study showed that, about 59.7% of children aged 2-5 years were anemic, 24.4% were underweight Z-score<-1.0, whereas more than half of mothers 64.1% were overweight or obese. The prevalence of dual form of malnutrition was 15.7%. Child birth order had significant association with dual form of malnutrition (OR_{adj}, 1.50, 95% CL (1.22, 1.82); p=<0.001). Household with dual form of malnutrition increased as father's educational decreased (medium or low level) (OR_{adj}, 3.19, 95% CL (1.07, 9.5); p=0.036), or (OR_{adj}, 3.40, 95% CL (1.12, 10.37); p=0.031), respectively. In addition, child with poor appetite was more likely to be underweight and also significantly associated with dual form of malnutrition (OR_{adj}, 6.9, 95% CL (2.35, 20.24); p<0.001). Dual form of malnutrition increased among mothers with high nutrition knowledge level (OR_{adj}, 1.23, 95% CL (1.0, 1.52); p=0.048). Dual form of malnutrition decreased in households with low monthly income (OR_{adj}, 0.28, 95% CL (0.09, 0.88); p=0.030).With regard to nutrient intake, mother's fat intake contributing to obesity was associated with the dual form of malnutrition (OR_{adj}, 1.01, 95% CL (1.0, 1.02); p=0.016). In part II, results supported the results of part I, that Palestinian mothers had good nutrition knowledge, but poor nutrition attitude and practice. Knowledge didn't convey to healthy practice, therefore, nutrition knowledge and the negative attitudes of mothers contributed in increasing malnutrition among individuals at household level. Cultural factors and mothers' poor perception have a powerful influence on feeding practices and eating patterns. This research broadens the understanding of the correlating factors of familial coexistence of underweight

children and overweight mothers. In this study, child undernutrition still exists, with increasing levels of maternal obesity as well as the dual burden of malnutrition. Nutrition intervention programs must recognise the coexistence of both extremes of malnutrition at household level, and incorporate this into their targeting strategies in order to manage the dual burden of malnutrition effectively. These new insights suggest programs specifically designed for resource-poor settings to promote healthy eating habits and regular physical activity that prevent both child undernutrition and the adult obesity.

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Infants and young children are the most vulnerable groups to malnutrition because of their different physiological requirements for growth and development (Blössner et al., 2005). During the past two decades, a significant public health threat from the growth of obesity globally was observed in numerous low- and middle-income countries. Obesity is considered one of the most widespread diseases (Prentice, 2006). It reduces the quality of life among individuals and serves as a risk factor in chronic diseases such as hypertension, diabetes mellitus, cardiovascular disease, and several types of cancers (World Health Organization [WHO], 1990).

According to UNICEF, approximately 129 million underweight children under 5 years old in the world are located in developing countries, which accounts for nearly one in four (United Nations Children's Fund [UNICEF] , 2009a). In many developing countries, the trend of overweight and obesity among adults is increasing at an alarming rate, and undernutrition remains prevalent in children (Popkin, 2001).

The development of nutrition transition, had led to change in the prevalence of undernutrition and obesity. In many developing countries nutritional, demographic, epidemiological, and socioeconomic transitions are existent and continuing undernutrition and escalating overnutrition. These conditions emerged new phenomena called double burden of communicable and non-communicable diseases

(Caballero, 2005). Previously these households have been called under/over nutrition, but recently this manifestation referred to "dual form of malnutrition", which defined as co-existence of one person is overweight and another is underweight in the same household (Doak, Adair, Bentley, Monteiro, & Popkin, 2005). There are different risk factors that associated with households experiencing dual form of malnutrition such as parental sociodemographic (including age, education, occupation, location) and for child (age, sex), food consumption for mother child pairs as dietary diversity consumed by individuals is considered to be key component of healthy diets. The attitudes of mothers to utilize available health resources in response to their children's sicknesses, is another factor that can contribute children's health and nutritional status. Evidence suggested that mothers' active health-care-seeking attitudes play an important role in children's wellbeing in developing countries (Suthutvoravut, 2006).

Palestinian community has been experiencing nutrition transition, where studies have shown non-communicable diseases such as (heart diseases, diabetes, hypertension, and cancer), and their risk factors sedentary lifestyle and high rates of obesity (Mikki, Abdul-Rahim, Awartani, & Holmboe-Ottesen, 2009). Increasing obesity among adults, and underweight was found high prevalence among preschool children, together these findings led to the hypothesis that obesity and underweight might cluster within household. Hence, these households' conditions referred to dual form of malnutrition warrant further attention, as both obese adult and underweight child contribute to the burden of poor health.

1.2 Context of the study

1.2.1 Demographic context

The Palestinian National Authority consists of two geographically separated areas, namely, the Gaza Strip and the West Bank (Appendix H). The Gaza Strip is a narrow band of land lying on the coast of the Mediterranean Sea, and it is bordered by Egypt and Israel (MOH, 2005a). The Gaza Strip is administratively divided into main five governorates, namely, Gaza North, Gaza City, Mid-Zone, Khan Younis, and Rafah (MOH, 2006). The total population of the Palestinian Territory in mid-2013 was 4.42 million, comprising 2.72 million in the West Bank and 1.70 million in the Gaza Strip. The Gaza Strip is considered one of the most densely populated places worldwide. Approximately, an area of less than 360 km^2 has population density of roughly 4,661 persons/km^2 (Palestinian Central Bureau of Statistics [PCBS], 2013). Palestinian refugees, who were forced out of their home lands that Israel occupied in 1948, accounted for 44.0% of the population; 29.3% in the West Bank and 67.7% in the Gaza Strip (PCBS, 2011).

According to the PCBS data in 2012, the natural growth of population is 3.5%, median age is 17.6 years, while life expectancy among male is 71.3 year, and for female is 74.1year. Palestinian society in the Gaza Strip is relatively young, about half of the population (43.7%)is under 15 years old, 25.2% of total population is women of child bearing age, and 16.4% of children is less than five years, while only 2.3% of the population is 65 years or older (MOH, 2013). These figures indicate that

population growth for several years will be increased because high rates of population, representing high past birth rates, will enter the reproductive years.

1.2.2 Socioeconomic context

Socioeconomic deterioration is associated with the increasing poverty level among Palestinians in the Gaza Strip as a result of the siege and the outside world isolation facilitated by the Government of Israel. The ongoing closure and restrictions imposed on the entry of raw materials that are necessary for production led to the economic deterioration in the Gaza Strip (Palestinian Center for Human Rights [PCHR], 2013). Cruel conditions resulted from the restrictions imposed on the border crossings, which affect the economic, social, and cultural rights of 1.7 million people in the Gaza Strip, as well as their basic needs.

In 2012, deterioration of socioeconomic conditions severely affected refugees and non-refugees in the Gaza Strip and, in turn, faced increased food insecurity levels. The level of food insecurity exceeded 44.0% of households in 2011 and increased to an alarming 57.0% in 2012. This suggests that households in the Gaza Strip were unable to expand their coping capacity and were directly affected by a range of deteriorating conditions. The disturbingly increased levels of food insecurity in the Gaza Strip can be clarified primarily by the prolonged blockade, which continues to prevent any meaningful recovery in the local productive economy (United Nations Relief and Works Agency [UNRWA], 2012).

Gaza Strip's economy is mainly dependent on external aid; and on the tunnel with Egypt after the war in 2008-2009. Israeli forces continue to limit the amount of goods that enter the Gaza Strip beginning in November 2007, and in 2012, they allowed the entry of goods in very limited quantities. The last six years of goods imported from Egypt via the tunnels failed to address the basic needs of the population in the Gaza Strip (PCHR, 2013).

Moreover, the Gaza Strip continues to receive an insufficient supply of electricity, which affects provision of services and daily activities. Service providers must continue to rely on backup generators to ensure electricity provision. The cuts in electricity supply presented many contrary effects, including those on the water supply for households. In the Gaza Strip, water quality is also an area of serious humanitarian concern (WHO, 2012a).

1.2.3 Health status and healthcare services

The leading causes of deaths in adults are similar to most developed countries, including heart disease, cancers, cardiovascular diseases, and diabetes, in addition there is a high prevalence of psychological trauma and related diseases (MOH, 2009). The health care provider in the Gaza Strip involves four main health providers, namely, the Ministry of Health (MOH), the non-governmental organizations (NGOs), the United Nations Relief and Work Agency (UNRWA), and the private for profit. The MOH has the responsibility of governorate, supervision, regulation, licensure and control for health care; its services are open to all Palestinians who have health insurance (MOH, 2009). It is considered the main provider of secondary and tertiary

health services; in addition it provides primary health care services (MOH, 2006). While, UNRWA health care system serves only refugees in the Gaza Strip, providing them primary healthcare free of charge (MOH, 2004).

1.3 Statement of the problem

Obesity is becoming an emerged problem in developing countries (Prentice, 2006). The prevalence of obesity and incidence of overweight among developing countries were highest in the Middle East and North Africa, which present specific implications for global disease burden and local health service capacity (Ella, Shehab, & Ismail, 2011). Obesity prevalence is higher in urban areas compared to rural areas in certain low- and middle-income countries as a result of better living conditions, access to energy diets, and less physical activity in the urban areas (Doak et al., 2005).

Recent shifts from the traditional foods to more 'westernized' diet structure indicated high rates of extreme malnutrition, increasing rates of obesity, and concurrently, increasing communicable vs. non-communicable diseases in developing countries around the world. These phenomena are known as nutrition and epidemiologic transitions (Popkin, 2001). The shift from a traditional to a western diet led to modifications in the nutritional population profile and sociodemographic, environmental, and cultural changes in a society (Monteiro, Conde, & Popkin, 2002). In several developing countries, nutritional, demographic, epidemiological, and socioeconomic transitions were observed, as well as the continuing undernutrition and escalating overnutrition. The new phenomena, known as the double burden of malnutrition emerged from these conditions (Doak et al., 2005). The dual form of

malnutrition (obese mother and underweight child) within a single household tends to become more prevalent among those in the low and middle-income sectors, owing to nutritional transition. The transition changes dietary patterns and lifestyles that increase the risk factors of overweight and obesity, whereas numerous risk factors affecting underweight remain an important public health concern (Jehn & Brewis, 2009).

Several studies have identified numerous factors associated with individuals, households, and communities, which may differentially affect obesity trends among adults and underweight children. The existence of both types of malnutrition in the same household manifested in the form of obese adults and underweight children, which dictated that common risk factors could underlie the two health problems (Doak et al., 2005).

Recent studies reported that Middle Eastern countries experiencing changes in diet and physical activity. Furthermore, Palestinian society changed their dietary structures and adopted a sedentary lifestyle (Mikki et al., 2009). In Palestine, malnutrition represents noticeably increasing health problems. This is particularly evident in the Gaza Strip because of the ongoing closure with reduced access to food, medical supplies, and safe drinking water. Loss of jobs and income resulted in the augmentation of nutritional disorders (Abdeljawad & Humeid, 2008). The poverty in the Gaza Strip has caused alarming proportions of young children who are victims of protein-energy malnutrition. This study was developed in the absence of baseline data regarding the dual form of malnutrition and the main associated risk factors, as in the

Gaza Strip most of studies have focused on underweight and overweight on the individual separately rather than at the household levels.

1.4 Significance of the study

Malnutrition presents a major challenge in Palestine. In 2003, results showed that more than half of preschool children had low energy intake, less than 80.0% of the Recommended Energy Allowances (MOH, 2005b). Parallel to malnourished children, studies have shown that obesity and nutrition-related chronic diseases are prevalent among Palestinian adults (Mikki et al., 2009). The findings of the Palestinian study showed high BMI levels among urban women and their rural counterparts. When adjusted to age, the prevalence of obese women (BMI $\geq$ 30 Kg/m^2) was 35.0% in rural citizens and 46.0% in their urban counterparts (Abdul-Rahim et al., 2003).

Refugee children tend to be more malnourished than non-refugee children in the Gaza Strip. This is attributed to overcrowded condition and poverty. In addition, children from rural areas were found to be malnourished, which was likely related to increased poverty and difficulties in accessing market (MOH, 2005b), where poverty was associated with food insecurity because members suffered from lack of access to sufficient food leading to hunger, malnutrition, and illnesses (Abdeen, Greenough, Shahin, & Tayback, 2003).

The dual form of malnutrition in the same household is an important concern, because an effective intervention program must be established that considers the coexistence of two individuals representing opposite types of malnutrition

(underweight and overweight) and sharing the same household environment. Simultaneously preventing communicable and non-communicable diseases may be enabled by determining the associated factors. The dual burden phenomenon profoundly complicates nutritional intervention, including that in the Gaza Strip, because this area depends on external aid. The majority of studies focus on under nutrition, such that interventions are likely to increase food availability on the entire household. This may lead to increased risk of overweight and obesity for other individuals in the household, who were overweight. By contrast, the intervention focused on reducing the energy density of the diet, and other members of the household, who are already underweight, may also be affected (Doak et al., 2005).

Thus, identifying the extent of the dual form of malnutrition is essential to intervene in underweight or obesity. The majority of studies in Palestine have focused on underweight and overweight on the individual rather than at the household levels. There were no previous studies conducted in Gaza Governorates on the pattern of the dual form of malnutrition or its determinants in the same households.

For effective intervention, acquiring information through the dual forms of malnutrition rates is urgently needed to identify the major determinants. Without knowing determinants of the underweight-overweight pairs at the same household and individual levels, planning successful nutrition intervention programs targeting this vulnerable group becomes difficult. In addition, this study explored the mother's level of nutrition knowledge and perception because the mother is vital in deciding the diets of family members, especially children.

1.5 Objectives

1.5.1 General objective

To assess malnutrition among overweight mothers and underweight children aged 2 to 5 years in the same household and to determine the dual form of malnutrition in the Gaza Strip.

1.5.2 Specific objectives

1-To assess the nutritional status of children aged 2-5 years.

2-To assess mothers' nutritional status.

3-To determine the prevalence of dual form of malnutrition in the same household, and its associated determinants (socio demographic, dietary intake, environmental factors, child health status, and maternal factors) that lead to dual form of malnutrition.

4-To examine the association between sociodemographic, nutrition knowledge, physical activity, sedentary lifestyle, and nutrients intake with maternal BMI.

5-To examine the association between sociodemographic, child's feeding practice, and nutrients intake with underweight children.

6-To assess mothers' nutrition knowledge and perception in food practice through conducting focus groups discussions.

1.6 Research questions

What is the extent of dual form of malnutrition in the same household in the Gaza Strip and what are the main associated determinants lead to it?

1.7 Research Hypothesis

Hypothesis 1

There is significant association between sociodemographic characteristics and developing dual form of malnutrition.

Hypothesis 2

There is significant association between mother's nutrition knowledge and the prevalence of dual form of malnutrition.

Hypothesis 3

There is significant association between physical activity and BMI level among mothers.

Hypothesis 4

There is significant relationship between household assistance and underweight children.

1.8 Conceptual framework

Numerous possible causes of malnutrition were categorized to three levels namely the basic level, the underling or intermediate, and the direct level. The following conceptual framework (Figure1.1) was adapted from the UNICEF conceptual framework of malnutrition (UNICEF, 1998), which included modified and hypothesized pathways of the dual form malnutrition at the household level. General directions of the association were involved, including socidemographic status, mother's care, environmental factors, nutrients intake, child health status and physical activity among mothers. This study excluded investigations of causal pathways involving households' food security, so these have not been included in order to simplify the model.

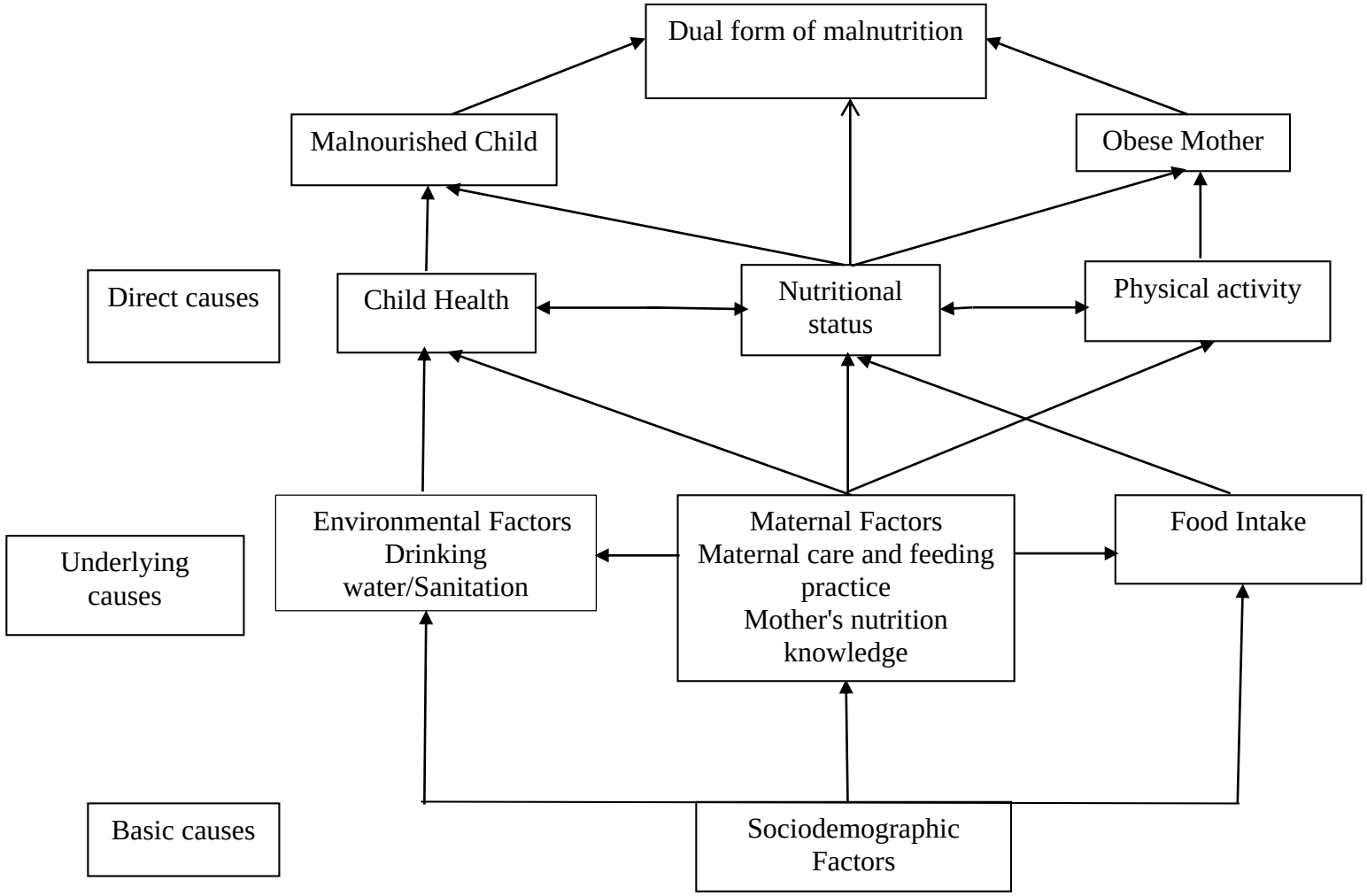

Figure 1.1 Conceptual frame work, possible interactions of different risk factors associated with malnutrition among under-five children and women in The Gaza Strip based on the UNICEF conceptual framework (1998)

The etiology of both opposites of malnutrition is complex, to understand of the importance of the various causes. The framework is used to understand various causes to help and facilitate the process of determining, analyzing, and deciding the suitable actions to resolve nutrition problems. Numerous possible causes of malnutrition are observed, namely the basic level, the underling or intermediate, and the direct level. The central direct cause of malnutrition is nutritional status can be dependent variable of determinants such as maternal factors and nutrients intake. Child health is affected by underlying factors at the household level (e.g., adequate mother's care, and appropriate health environment). In addition, the health status of child interacts to alter nutritional status, could be independently and through the cycle of malnutrition-infection. The nutrient intake and repeated diseases will lead to faltering growth regardless of the adequacy of nutrient intake. In this study, the physical activity level interacts with nutrition to define the daily energy balance of mothers. As increasing food intake of animal products has been related to obesity in developing countries, and physical activity can affect body weight over the longer term.

The underlying causes are various factors that manifest during dietary food intake, which includes quantitative adequacy to meet the recommended dietary allowance of macro- and micronutrients, which is the level of intake essential nutrients needed by all healthy individuals. The access and utilize of health care clinics and services such as immunization, adequate drinking water, and sanitation services were fundamental in preventing and treating child illnesses. Maternal factors include breastfeeding practice, mother's nutrition knowledge, and feeding practices of her children and herself.

The basic causes include sociodemographic factors, such as location: urban and high socioeconomic status, which were regularly connected to obesity and overweight, whereas rural and refugee camps continue to be underweight. Other factors may affect food availability at the individual level. These include household size, the level of education of parents, child care practices, employment status of parents, monthly income, and household assistance.

1.9 Operational Definitions

1-Household

Household was defined as a group under the same roof, and shared some forms of activities usually domestic activities (food production and consumption, sexual reproduction and child rearing), economy production activities (income earned occupation) and leisure activities.

2- Household Size

It refers to the number of persons residing in the household currently living in the household.

3-Child's birth order

The child's birth order is the position of child birth order regarding his/her siblings in the household.

4- Camp

It refers to any locality referred to as a refugee camp and administered by the United Nations Refugees and Work Agency in the Near East (UNRWA) (PCBS, 2008).

5-Refugee Status

Persons registered with United Nations and Works Agency (UNRWA) and having an UNRWA registration number are considered refugees regardless of whether their home is in a refugee camp.

6-Poverty household line

Poverty is defined in the Palestinian Territories, based on income for a family of two adults and four children; the poverty cut off is US$2 per person per day, and by using NIS 1400 for a family of six persons, given a currency exchange rate of NIS 3.9 per US dollar (United Nations Developing Program [UNDP], 2012).

7-Household assistance

UNRWA provides to refugees assistance/month could be cash or food such as stocks of rice (3kg), wheat flour (30kg), cooking oil (3liter), sugar (3kg) and powder milk (1 kg), others received money 40 NIS/ person.

8- Father/Mother education level

It includes those who didn't go to school, elementary or below (6 years of schooling or less), preparatory (completed 9 years of schooling), secondary (completed 12 years of schooling), intermediate college (Diploma), university, and master's degree/PhD. The normal age of entry in elementary school for Palestinians is 6 years (PCBS, 2007).

We coded this variable into elementary or below and preparatory (low level), secondary (intermediate level), and Diploma, university, and master's degree/PhD (high level).

9-Maternal employment status

It is defined as working mother for six months before the interview regardless of being employed or self-employed (e.g. haircut), we coded the variable into a binary variable: employment vs. housewife.

10-Father's job status

It is based on father's working regardless of being employed or self-employed; we coded the variable into a binary variable: working vs. not working.

11-Dual form of malnutrition

The child-mother pair is denoted as underweight child (Z score<-1) / overweight - obese mother (BMI ≥25.0 kg/m^2) (Khor & Sharif, 2003). (Doak, Adair, Monteiro, & Popkin, 2000).

12-Underweight child

A child he/she who has a weight for age Z– score (-2 SD < x < -1 SD of NCHS/CDC median for weight-for-age) will be considered mildly underweight, while significant underweight (moderate) (< -2 SD of NCHS/CDC median is based on the WHO reference population, and normal weight -1 SD < x < +2 SD of NCHS/CDC median for weight-for-age) (WHO, 1983).

13-Stunting

Stunting is low height for age, used as an indicator of chronic malnutrition. Classified in two categories; mild stunting (-2<x<-1SD of NCHS/CDC median for height-for-age) and significantly stunted (moderate) (<-2SD of NCHS/CDC median for height-for-age) (WHO, 1983).

14-Wasting

Wasting is used as an indicator of acute malnutrition or wasting comparing the weight of the child with the weight of the reference population for the same height. Weight for height reflects body proportion, or the harmony of growth, and is particularly sensitive to acute growth disturbances. Mildly wasted (-2<x<-1 of NCHS/CDC median for weight-for-height) and significantly wasted (moderate) (<-2SD of NCHS/CDC median for weight-for-height) (WHO, 1983).

15-Obesity

According to the WHO, an adult with BMI of 30.0 kg/m^2 or higher was considered to be obese (WHO, 2000).

16-Anemia

Anemia reflects a decrease in the oxygen carrying capacity of the blood due to a decrease in the mass of red blood cells or of haemoglobin in the blood (World English Dictionary, 2007). For preschool children, the widely accepted combination of mild, moderate, and severe anemia categories was commonly used, that ranged from (10.0 g/dl to 10.9 g/dl), (7.0 g/dl to 9.9 g/dl), and less than 7.0 g/dl, respectively (Kraemer & Zimmermann, 2007).

17- Exclusive Breast Feeding (EBF)

EBF is feeding infant up to six months just breast milk as the only source of food from his/her mother or nurse without any additional solid, semi-solid or liquid, except for vitamin or mineral drops, and medicines. After exact six months, liquid, semi-solid or solid foods should be introduced to infants (WHO 1991, 2008a).

18-Recommended Dietary Allowance (RDA)

The average daily dietary intake level of nutrient that is sufficient to meet the nutrient requirement of nearly all 97% healthy people in a particular life stage and age (McGuire & Beerman, 2007).

19-Estimated Energy Requirement (EER)

The average dietary energy intake required to maintain energy balance in healthy individuals based on age and sex (McGuire & Beerman, 2007).

20- Inadequate macro or micronutrients

Dietary intake of less than 70.0% of RDA defines inadequate macro or micronutrient (National Nutrition Monitoring Bureau [NNMB], 2006).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Malnutrition is clinically characterized as either undernutrition (macronutrients, and micronutrients deficiencies) or overnutrition (excess protein and calorie intake (UNICEF, 2006). Several factors can cause malnutrition. Irregular and insufficient consumption of nutritious foods across a person's life span, as well as severe or repeated infectious diseases that affect food digestion and absorption of nutrients may cause malnutrition. Insufficient diet and diseases are related to poor environmental conditions and inadequate health care (Blössner et al., 2005).

Malnutrition in the form of undernutrition is the most serious global health problem that increases morbidity and mortality (Müller & Krawinkel, 2005). Women in childbearing age and young children are the most vulnerable to malnutrition because of their different physiological requirements for growth and development (Blössner et al., 2005). Childhood malnutrition is a serious public health problem that contributes to growth retardation, iron deficiency anemia, poor academic performance, and development of psychosocial difficulties. Malnutrition, caused by undernutrition during childhood, can manifest as failure to attain growth potential (Khanam, Nghiem, & Rahman, 2011).

The global spread of obesity is another significant public health threat in low- and middle-income countries (Prentice, 2006). Over the past two decades, cases of overweight and obesity have dramatically increased worldwide. In developing countries, the burden of obesity has shifted from high socioeconomic groups to lower ones (Monteiro, Conde, Lu, & Popkin, 2004). Obesity is considered as one of the most widespread diseases that reduce the quality of life of individuals. Obesity is also a risk factor for chronic diseases, such as hypertension, diabetes mellitus, cardiovascular disease, and several types of cancers (WHO,1990).

2.2 Types of malnutrition

Macronutrients refer to carbohydrates, protein, and fat, which supply the body with calories. Micronutrients refer to vitamins and minerals. Malnutrition can be characterized by both overnutrition and undernutrition (Figure 2.1). The former is defined as excessive intake of energy and/or macronutrients. The latter has two major types; each one depends on nutrient deficiencies in the diet, duration of undernutrition, and age. The first and most important type is protein–energy malnutrition (PEM). The second type is micronutrient deficiency. Iron, iodine, vitamin A, and zinc are some of the most important micronutrients (Faber & Wenhold, 2007).

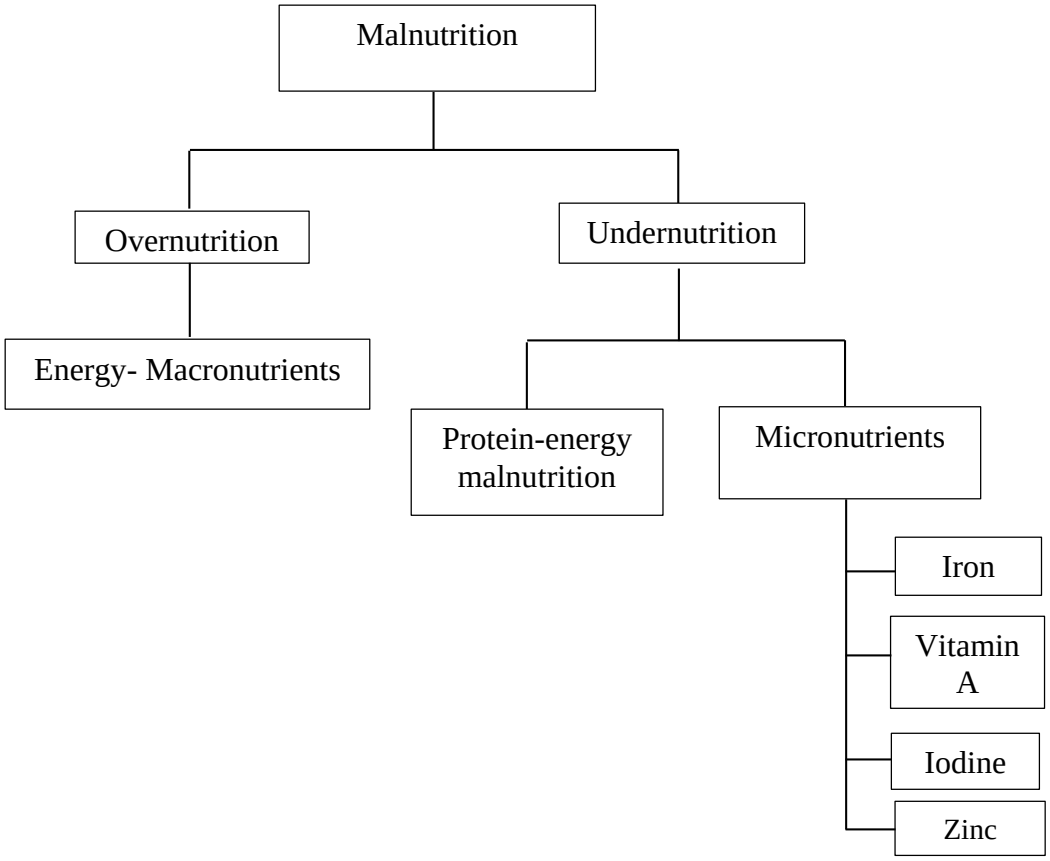

Figure 2.1 Classification of malnutrition (Source: Faber & Wenhold, 2007)

2.2.1 Protein Energy Malnutrition (PEM)

Macronutrient deficiencies can be classified according to the clinical syndrome of extreme PEM, namely, marasmus (a primary calorie deficit), kwashiorkor (inadequate protein intake), and marasmic kwashiorkor (both a calorie and protein deficit) (Prakash, 2006). Kwashiorkor is typically characterized by massive edema of the hand and feet, red or yellow hair, anorexia, rash, a large fatty liver, severe immune deficiency, and early death. The occurrence of edema results from reduced osmolarity in the blood caused by low serum albumin, increased cortisol, and decreased secretion of anti-diuretic hormones (Müller & Krawinkel, 2005). The distinction between the

two forms of PEM is based on the presence of edema (kwashiorkor) or absence of it (marasmus).

Marasmus, the more common syndrome, is characterized by loss of fat and muscle strength, decreased physical activity, and decreased basal energy metabolism, slow growth, weight loss, and absence of edema. Marasmus commonly occurs in children under five years old because children at this age have increased caloric requirements and risk of infection (Grover & Ee, 2009). Children with both marasmus and kwashiorkor experience stunted growth, concurrent gross wasting, and edema. They usually have hair and skin changes and an enlarged noticeable fatty liver (Prakash, 2006).

Undernutrition is the consequence of food insecurity, which results from poor quantity and quality of food, and severe repeated infections resulting in malabsorption or failure to utilize nutrients to preserve health can also contribute to undernutrition. Conditions that lead to undernutrition are related to the standard of living and availability of basic needs. Undernutrition is a condition that encompasses underweight (low weight for age), stunted (low height for age), wasted (low weight for height), and deficiencies of essential minerals and vitamins (micronutrient malnutrition)" (UNICEF, 2006).

-Underweight

Poor growth as a result of inadequate food and infections is the main cause of morbidity and mortality in infants and children worldwide. Up to 19.0% (110 million)

were estimated to be moderate or severe underweight, and 148 million were estimated to be mild underweight (Stevens et al., 2012). In 2011, an estimated 101 million children worldwide, under the age of five years old were underweight (Z-score<-2), which meant that approximately 16.0 % of children under five years old were underweight. The highest underweight prevalence 33.0% was reported in South Asia, followed by Sub-Saharan Africa 21.0%. Three countries in South Asia, namely, Bangladesh, India and Pakistan, accounted for half the total number of underweight children in the world, even though they these three countries were home to only 29.0% of the developing world's under-five population (United Nations Children's Fund, 2009a). The percentage of underweight children in 2011 was 36.0% less than in 1990 (UNICEF, 2013b). Between 1990 and 2012, underweight prevalence in preschool children declined from 25.0% to 15.0% worldwide, mainly due to the decline of underweight trend in China (UNICEF, 2012b). However, the prevalence of underweight was decreased since 1990, there are millions of children are still at risk.

In Kuala Lumpur, Malaysia results showed that the prevalence of underweight, (Z-score<-1) in preschool children was 44.5% (Sharif & Merlin, 2001). Another study in a rural area indicated that 15.7% of the children aged 1-6 years were underweight (Z-score<-1) (Khor & Sharif, 2003). While the results of the Third National Health and Morbidity Survey (NHMS III) in 2006 showed a 12.9% national prevalence of underweight Z-score<-2 among children under five years old, 10.5% were moderately underweight (Z-score-3.0≤ to<-2.0), and 2.4% were severely underweight (Z-score<-3). Nearly one in five underweight children was severely underweight (Khor et al., 2009).