An-Najah National University

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Prevalence of Micronutrient Deficiencies and their Association with Sociodemographic Factors, Dietary Practices and Micronutrient Supplementation amongst Lactating Women: Findings from the Palestinian Micronutrients Survey

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Dedication

First of all, I am deeply grateful to Allah who helped me in completing my project successfully

Days passed from my life and I started it with a step ... and here I am today reaping the fruits of the years of years in which my goal was clear ... and I strive every day to achieve it and reach it no matter how difficult it was...

Today I stand before you ... and here I arrived with a flame of knowledge in my hand ... and I will take great care of it so that it does not go out ... and I thank God first and foremost for having helped me and helped me in that

Then I would like to thank the tender heart ... those who were beside me in all the past stages ... who relished suffering ... and a candle was burning to illuminate my path...

To my beloved mom

And to the one who taught me to stand ... and how to start the thousand miles by step ... to my right hand ... to the one who taught me to ascend with his eyes watching me ... my father ... to those who held my hand and taught me a letter ... a letter ...

Then, special thanks to my Supervises Dr Mohammad Altamimi and Dr Jihad Abdallah, thank you for your direction to make this thesis complete successfully. To my brothers and sisters, to my friends.

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Thanks to Allah for supporting me with determination throughout the preparation of this work.

Great thanks to my university

"An-Najah National University "

My high appreciation to my supervisor:

Dr. Mohammad Altamimi

who helped and supported me with advice.

الاقرار

انا الموقعة ادناه مقدمة الرسالة التي تحمل العنوان:

Prevalence of Micronutrient Deficiencies and their Association with Sociodemographic Factors, Dietary Practices and Micronutrient Supplementation Amongst Lactating Women: Findings from the Palestinian Micronutrients Survey

أقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص، باستثناء ما تمت الاشارة إليه حيثما ورد، وأن هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أي درجة علمية أو بحث لدى أية مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's Name: **اسم الطالبة: ريم دغلس**

Signature: **التوقيع:**

Date: **التاريخ: 8/4/2021**

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List of Abbreviation

VIT	Vitamin
RI	Recommendation intake
NS	not significant
DK	don't Know
PMS	Palestinian Micronutrient survey
ANC	Antenatal care
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organization
MOH	Ministry of Health
NHMRC	National Health , Medical and Research Council
NCD	Non-Communicable Diseases
VAD	Vitamin A Deficiency
CDC	The Centres for Diseases Control and prevention
FFQ	Food Frequency Questionnaire
SPSS	Statistical Package for Social Sciences

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Abstract

Breastfeeding women in Palestine suffer from various nutritional problems as a result of multiple reasons. The most important are poverty, lack of health awareness, community traditions, and the blockade imposed by the Israeli occupation on the Gaza Strip. Such situation has created a shortage of minerals and vitamins in the lactating women and their infants; such as vitamin D, vitamin A, calcium, iron, and B12. Therefore, this study aimed to determine the nutritional status and comorbidities of micronutrients deficiencies amongst lactating mothers in the Palestinian population. The study was based on the survey (PMS) made by the Palestinian Ministry of health. This, survey has been prepared to provide an evidence-based source of information on the presented aspects of the nutrition situation in the State of Palestine, for increased donor funding in nutritional aspects, towards informed discussions among policy makers, development partners and other stakeholders. Also, this survey provides an extensive evaluation and documentation of important aspects of the nutrition and health status in Palestine. A representative cross-sectional study on micronutrient status

(Micronutrient Profile), prevalence and causes of anaemia, coverage and use of micronutrient supplements, flour fortification and salt iodization, and salt intake was carried out among lactating mothers (18-48 years). The percentage of women who suffer from anaemia was 20.2% in the West bank and 35.3% in Gaza.

This study showed that there was significant association ($P < 0.05$) between micronutrient deficiency and the type of community, there the values for Zinc ($P= 0.04$), Iron ($P=0.0001$), Vit A($P=0.0001$) and D (P 0.0001).

Percentage of lactating women suffering from zinc deficiency, 88.8% in the West Bank and 92.7% in Gaza. While the percentage of lactating women suffering from vitamin A deficiency was 33% in the West Bank and 92.7% in Gaza. The percentage of lactating women suffering from iron deficiency in the West Bank was 2.7% and in Gaza was 19.5%. Finally, Vitamin D deficiency was 36% in West bank and 24% in Gaza.

The results have shown that age was significantly associated with Vitamin A deficiency ($P = 0.002$), but no significant association was found with Zinc, Iron and Vit D ($P > 0.05$).

Nutritional status has not shown a relationship with micronutrients deficiency in iron, zinc, vitamin A and D, however, there was a significant relationship between chocolate intake and zinc ($P = .035$) and intake of red meats and iron ($P = .032$).

The current study has concluded that although many factors may play a role in anaemia and other comorbidities, there were few factors clearly associated with such conditions. Vitamin A and Zn were the most associated with prevalence of iron deficiency. With high level of deficiency of both micronutrients, proper policies and regulations should be warranted. This study recommends improving the antenatal care (ANC) services, promoting awareness about healthy diet by increasing the consumption of vitamin A and C rich fruits and vegetables. Moreover, it is highly recommended to adopt the traditional household practices such as fresh cooking, legume soaking, dairy fermenting and cereal sprouting to reduce the phytate content of the cereals and legumes consumed by the majority of the study participants.

Chapter One

Background of the Study

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Background of the Study

1.1 Research Overview:

Breastfeeding women in Palestine suffer from various nutritional problems because of many factors including poverty, lack of health awareness, some traditional practices and level of education. Such factors, negatively, affect the life and health of breastfeeding women and their children (Elmadfa, et al .2014).

Mothers and babies in Palestine, particularly Gaza Strip, are facing serious health and nutrition challenges as a result of the protracted political and humanitarian crisis. About 25% of pregnant women in the State of Palestine are at risk of dying at childbirth. In Gaza, 14,000 women annually are at high risk, with 23% of births being born prematurely. About 25% of pregnant women also have anaemia. (Multiple Indicator Cluster Survey, 2014) (Palestinian Central Bureau of Statistics year, UNICEF (2015). Despite the decrease in the maternal mortality rate to 20 per 100,000 live births, one out of every four pregnant women is considered to be at high risk and requires specialized health care during pregnancy (1 out 4 cases annually). On average about 22 children die for every 1,000 live births) Gaza: 24 deaths per 1,000 live births; West Bank: 20 deaths per 1,000 live births).

The practice of breast-feeding is declining all over the world, especially in urban areas. Most women can breastfeed as recommended if given the support they need to overcome barriers associated with breast-feeding

(UNICEF, 2014). Therefore, increasing breastfeeding rate in our modern life is becoming a huge challenge as it is largely influenced by the increase in the percentage of workingwomen who are deprived from breastfeeding their children naturally or even spending enough time with them.

Lactating women always need support and encouragement from the surrounding people. To breastfeed sufficiently, women with no or little experience need additional support. (Kronborg, et al 2007). Women with previous breastfeeding experience are more likely to breastfeed than those who never had any experience (Mclnnes, et al, 2001).

According to (Chaudhry et al, 2018) the prevalence of vitamin D and A deficiency in Palestine is relatively high in comparison with neighbouring countries. Due to the complex economic and political situation in Palestine, it is crucial to examine the risk factors for these micronutrient deficiencies. While absorption of supplements is high, few babies and mothers receive the full diet, and there are large differences in deficiency levels in different areas of the state (Kronborg, et al 2007). Health service delivery pathways may be essential in ensuring absorption of supplements and reducing deficiency levels.

A study by (Segura et al., 2016) confirmed that breast milk is the best food for newborns and infants. The nutritional stocks of a breastfeeding woman may be somewhat depleted as a result of pregnancy and blood loss during childbirth. Breastfeeding increases nutritional needs, mainly due to the loss of nutrients, first through colostrum and then through breast milk. It is recommended to increase the intake of certain nutrients or to use certain supplements in lactating women to meet milk production requirements and to protect the infant from nutrient deficiency (Segura et al., 2016). To have a good nutritional status, a nursing woman must increase the intake of protein, fat and carbohydrates. Human breast milk has a fairly stable formula, and it is only selectively affected by the mother's diet. The fat content in breast milk varies somewhat. The contents of carbohydrates, protein, fats, calcium and iron do not change much, even if the mother is deficient in these elements in her diet. A mother whose diet is low in thiamine and vitamins A and D, produces less of these in her milk (Segura et al., 2016).

As a result, introducing a micronutrient supplementation system during lactation must be based on adequate information on the prevalence of micronutrient deficiencies, their adverse effects and the potential for reversing these through supplementation.

Lactating mother should increase her fluid, caloric, and protein intake. Therefore, the demand for both energy and nutrients increases during lactation. On the other hand, lactating women need an adequate nutrition to enable them not only to keep their health well, but also to feed their children sufficiently. It is well documented that micronutrients deficiency affects growth, cognition and reproductive performance of lactating women (Segura et al., 2016).

The nutritional status of breastfeeding women in Palestine was reported to be under the healthy level. (Segura et al., 2016). Breastfeeding women suffer from deficiencies of vitamins and the minerals that are crucial to maintain lactation and feeding the infants adequately.

This research examines the micronutrient status of minerals, amino acids, vitamins and their concentrations in lactating women in the West Bank and Gaza. Moreover, the study will shed the light on confounders that may cause nutritional deficiencies.

1.2 The main Objective of Study:

The main aim of the study is to determine the prevalence of micronutrient deficiencies and comorbidities amongst lactating women in West bank and Gaza strip.

The specific objectives of this study are:

1 To report the various levels of minerals (Iron and Zinc) and vitamins (Vit A and Vit D) of lactating women.

2 To identify socio-demographic variables that associate with anaemia and micronutrients deficiency in lactating women.

3 To examine the association between food intake of meat, fruits and vegetables, bread, fast foods, tea and coffee with anaemia prevalence in lactating mothers.

4 To evaluate the relationship of physical activities, smoking and dieting with micronutrients deficiency in lactating women.

1.3 Statements of the problem and rationale of the study:

Breastfeeding women in Palestine suffer from various nutritional problems as a result of multiple reasons including poverty, lack of health awareness, community culture, and the blockade imposed by the Israeli occupation on the Gaza Strip. Such situation has created a shortage of minerals and vitamins in lactating women and their infants; such as vitamin D, vitamin A, calcium, iron, and B12.

This study will address the nutritional status of lactating women and discuss the nutritional status and comorbidities of micronutrients deficiencies amongst lactating mothers in the Palestinian population.

1.4 Significance of the study

The current study deals with the nutritional status and comorbidities of micronutrients deficiencies amongst lactating mothers in the Palestinian population.

First, it provides evidence to support the concept about existence of problem in the nutritional status and micronutrients deficiencies amongst lactating mothers in the Palestinian population.

Second, it deals with confounders such as mothers age, employment, mothers and husband’s education, type of province and type of community that interfere with lactating women health status.

Moreover, this study may pave the road for other researchers to investigate further factors and health status of subgroups of lactating women.

Chapter Two

Introduction and Literature Review

Chapter Two

Introduction and Literature Review

Despite the great importance of breastfeeding for the mother and the child, some issues cause problems for the mother, such as stress, fatigue, mastitis, anaemia and micronutrient deficiency.

The lactating mother is prone to anaemia and micronutrients deficiency due to fulfilment of the child's nutritional needs during pregnancy and lactation. In addition to other factors such as socio-demographic factors, nutritional and health status.

2.1. Anaemia amongst lactating women:

Anaemia, as a nutritional common disorder, is affecting one-third of the global population (Alemayehu, 2017). Anaemia is the drop in the haemoglobin concentration of the peripheral blood below the normal range expected for age and sex of an individual (Mahlknecht & Kaiser 2010). It is manifested by a condition in which the number of red blood cells or their oxygen carrying capacity is insufficient to meet physiologic needs. Lactating mothers are more susceptible because of maternal iron depletion during lactation, blood loss during childbirth and inadequate nutrient intake (McLean et al., 2009).

Expenses of maternal stores will determine the milk quality, productive and reproductive capacity as well as anaemia prevalence.

Multiple contributing factors are affecting maternal stores of nutrients including socio-economic, nutrition and health status (Bhanbhro et al., 2020).

2.2 Factors associated with anaemia in lactating women:

2.2.1 Socio-economic and demographic factors:

Anaemia in lactating women is associated with individual and community socio-economic levels. Cultural, social, and political factors play a major role in determining behaviour and type of anaemia disorder amongst lactating women (Canicali Primo et al.,2016). Results from previous research revealed that maternal age, educational status, maternal occupation, and place of residence were associated with anaemia amongst lactating mothers (Liyew &Teshale, 2020).

The age at childbearing is considered the risky age of iron deficiency and anaemia due to blood loss from menstruation and eating a diet poor in iron content. It was reported that more than half of pregnant women have any kind of anaemia (Ayensu et al., 2020) and more than half of anaemic lactating mothers have anaemia before or during pregnancy (Feleke & Feleke, 2018).

Pregnancy was found to be highest during the ages between 25-30 years. Of this group of age, 72.6% was found to comply with WHO recommendations with regard to breastfeeding. Such group of age was found to be more susceptible to anaemia than other groups (Prakash et al., 2015; Al Ketbi et al., 2018).

Association of lactating mother's education with anaemia was reported in several studies. The level of lactating mother education makes mothers able to search relevant information about optimal nutrition and more likely to have supplements that help to decrease the probability of incidence of anaemia (Skafida, 2009). Education of lactating women has an influence on behaviours, life style and it plays important role of gaining multiple skills related to lactation especially if the mother has encountered any difficulties (Mickenset al., 2009). In Ethiopia, a study about the effect of level of lactating women's education and prevalence of anaemia has found a significant increase in the incidence of anaemia amongst non-educated lactating women (Lakew et al., 2015). On the other hand, the husband of a lactating woman may provide support and consultations; therefore, educated husbands have direct and indirect effects on the decisions of their spouses especially in breastfeeding and how to follow up the ideal treatment in case of anaemia(WHO, 2010). Lactating mothers with husbands who had attended primary education were 21% less likely to have anaemia than those who had husbands with no education (Lakew et al., 2015).

With regard to occupation, many studies have pointed out that anaemia was higher amongst unemployed women than women with jobs (Gautam et al., 2019). In this context, lactating women who had been working had lower odds values of having anaemia. Working mothers may be earning money and have an extra income than their counterparts, therefore, women who have work can access and purchase more food items, including meat, fish, and poultry which lead to increased diversity of diet. Diet diversity improves micronutrients intake such as iron (Sadeghian et al., 2013). Also, it was reported that lower wealth quintiles of lactating mothers had greater odds of having anaemia than those in higher wealth quintiles. Studies have shown that lower socio-economic status pregnant and lactating women were at risk of iron deficiency anaemia (Lover et al., 2014).

A research has shown that lactating women who already have healthy life style and doing exercises such as walking, swimming, biking, or jogging can help them to have stronger muscles, a healthier heart, and more energy (Hu& Lin, 2012). Exercise helps spur the growth of more red blood cells which may reduce anaemia (Banfi et al., 2011).Training stimulates erythropoiesis to increase the O_2-transport capacity, and increase red cell mass as well as plasma volume, resulting in increased blood volume.The newly formed cells also have an improved deformability which facilitates muscle blood flow. Training also increases red blood cells, which further enhances O_2 release from Hb (Connes et al., 2007). However, strenuous exercise may increase blood loss in gastrointestinal tract that is lost daily. Blood loss leads to iron deficiency anaemia which comes from either nutritional deficiencies or blood loss or both (Mairbäurl, 2013).

Many studies have documented the significant relationship between smoking and anaemia amongst lactating women (Paterson& Morgan, 1980). The studies have confirmed that haemoglobin level is significantly higher in smokers than non-smoker lactating women (Shah et al., 2012).

Smoking affects blood parameters such as haemoglobin concentration due to exposure to carbon monoxide. Carbon monoxide binds to haemoglobin, which leads to form carboxyhaemoglobin and that, is considered as inactive form of haemoglobin. This form of haemoglobin has no oxygen carrying capacity. Also, carboxyhaemoglobin reduces ability of haemoglobin to deliver oxygen to the tissue (Milman & Pedersen, 2009).

Nicotine inhibits iron uptake. The diverse effect of nicotine depends on temperature and concentration. Studies have shown that 15mM concentration of nicotine has led to inhibited transferrin endocytosis by 40%, while uptake of iron was decreased by nearly 60%. The mechanism of nicotine depends on iron blocking uptake. It acts as a weak base inhibiting iron release from transferrin, and inhibiting exocytosis with a resultant block of endocytosis. However, the concentrations required to exert an effect are too high to implicate inhibition of iron transport in the effects of smoking on lactating women (McArdle & Tysoe, 1988).

Developing countries are suffering of serious nutritional problems, which influenced human health, social and economic development (Lakew et al., 2015). Non- uniform distribution of anaemia across countries or regions of the world was reported. However, the gap of prevalence of anaemia amongst lactating women between developed and developing countries was reported to be huge. For instance, only 14% of lactating women with anaemia in developed countries compared to 51%in the developing countries. In the developing regions, the highest prevalence was in Central and West Africa, followed by South Asia (Balarajan et al., 2011)

Consequently, the maternal deaths due to anaemia were reported to be the highest in developing countries (Balarajan et al., 2011; McLean et al., 2009; WHO, 2008, 2011). Similarly, in 2005-2006, the percentage of anaemia amongst lactating women in India has increased from 60% to 70% (Kalaivani, 2009; McLean et al., 2009; Toteja et al., 2006).

The common consequences of conflict and long-term socio-economic hardship are malnutrition and food insecurity (Khader et al., 2009). Occupied Palestinian territories have emerged problems in this regard for many years. In 2002, nutrition assessment of the West bank and Gaza strip has shown that Palestine- Israel escalation led to deterioration of the household economies, interfered with food availability and accessibility and raised the probability of a significant problem of undernutrition (Yip, 1994). Palestinian refugees (in the West bank or Gaza) were reported to be the highest affected group due to poor availability of dietary iron. Pregnant or lactating women and children were disproportionally affected (Dunbar, 1984).

The prevalence of anaemia estimated amongst Palestinian refugee women, was 67.4% in the Gaza Strip and 47.6% in the West Bank in 1990. However, the rates had decreased to 44.7% in Gaza Strip and 35.5%in the West Bank in 1999 (Madi, 2001).

The overall prevalence of anaemia amongst rural women is higher than urban women. Minander (2009) and his group found that the burden of anaemia in rural areas was 91.3%, while it decreased to 86% amongst urban lactating women in India. The women in rural areas follow traditional habits and dietary practices (Kaur & Kochar, 2009). Moreover, the early marriage age in rural areas has a major influence on increasing the rate of anaemia. However, in the urban areas the position of women has rapidly changed with the spread of education and social life (Argento et al., 2008). On the other hand, in the Bedouin communities, women have higher fertility rate and more children. An increased number of pregnancies may increase the probability of becoming iron deficient (Treister-Goltzman et al., 2015).

2.2.2 Nutritional factors

Nutritional status of lactating women determines their current health issues. Dietary history, food intake, and life style play the main role on health stability. In this context, diversity of diet gives the body adequate quantities of micronutrients such as iron, zinc, and different type of vitamins (Popkin et al., 2020).

Lactating women need special nutritional care. Breastfeeding increases nutritional demands to meet the requirements of both mother and baby. In the first six months, lactating women need additional 500 kcal and 400 kcal during the next six months. This can be achieved by eating more usual balanced diet. For example, 6-8 extra bread slices can meet that need. On average, 100 ml of milk gives 70kcal of energy (Linkage, 2004; Prentice et al., 1994).

Protein intake is important during lactating time. Casein is the main protein in milk. It provides the baby with calcium and phosphate. Also, it forms a curd in baby’s stomach to enhance efficient nutrition. Consuming one egg or 25g of cheese or 175 ml of milk may meet the additional requirements of protein during lactation. Moreover, multi nutrients such as vitamin A, C and E, Zinc, B_{12}, iodine, iron and calcium are reflected on breast milk composition. Milk or milk product, leafy vegetables, fresh fruit, chocolate and fish are a few of healthy items that should be taken to have enough stores of nutrients for both mother and baby (Food and Nutrition Board, Institute of Medicine, 2002).

Globally, maternal undernutrition is a serious problem. The iron, zinc, vitamin A and iodine are the common micronutrient deficiencies amongst lactating women. Malnutrition amongst lactating women is aggravated in developing countries such as Palestine because of the increased level of poverty, food insecurity, lack of appropriate feeding practise, and heavy burden of infectious illness (Lander et al., 2019).

There are significant effects of nutrition during lactating time on increasing the burden of anaemia amongst lactating women. Although, the anaemia can be associated with nutritional deficiencies of vitamin A, vitamin B_{12}, vitamin $B_9$and zinc, iron deficiency is still the most common cause of anaemia (Siddiqui et al., 2017).

2.2.3 Micronutrients

Nutrient content in breast milk is associated with baby growth, such as Zinc and phosphorus. Lack of some micronutrients; specifically, those classified as Group I (thiamine, riboflavin, vitamin B-6, vitamin B-12, choline, retinol, vitamin A, vitamin D, selenium, and iodine) micronutrients through lactation in mothers could result in low concentrations in their breast milk and subsequent infant deficiency (Allen, 2012)

The poor micronutrient condition of infants is usually attributed to the replacement of some breast milk with –poor liquids and foods, low birth-weight and/or preterm delivery resulting in poor infant stores at birth, and/or infant morbidity. During lactation nutrients are classified into 2 groups: Group I nutrients (thiamine, riboflavin, vitamin B-6, vitamin B-12, choline, retinol, vitamin A, vitamin D, selenium, and iodine) and Group II nutrients (folate, calcium, iron, copper, and zinc) (Allen, 2012).

Maternal supplementation containing nutrients from Group I can increase breast milk concentrations and improve infant condition. Group I nutrients are of high concerns in the general health nutrition, since their secretion into milk is rapid and significant due to maternal depletion. Concentration of Group II nutrients in breast milk is relatively not affected by maternal intake or status; so when intake is less than the amount produced in milk, the mother gradually becomes more depleted and maternal supplementation benefits her more than the infant (Allen, 2012).

2.2.3.1 Micronutrients status and anaemia amongst lactating mothers

Deficiencies of iron, zinc, vitamin A and vitamin D are prevalent worldwide. Micronutrient deficiencies are major problem in developing countries. These deficiencies are affecting on vulnerable groups such as lactating women (Dijkhuizen et al., 2001).

Iron is one of the most important minerals that serve several functions. It's carrying oxygen through the body as a part of red blood cells. Two types of iron are consumed by human; haem iron from animal sources and non-haem iron from plant sources. According to the American National Institutes of Health (NIH), meat, sea food and poultry are rich sources of iron. Also, spinach, lentils, rice, mushroom and dark chocolate are rich plant sources of iron (non-haem) (Abbaspour et al., 2014). Haem iron has higher bioavailability than non-haem iron. The bioavailability of iron is 14% to 18% from diets include meat and seafood, and 5% to 12% from vegetarian diets (Faleiros et al., 2016).

In developing countries, wheat is the staple food crop displacing traditional foods (Glahn et al., 1998). The wheat grain is a single-seeded fruit, called a caryopsis. It contains a small embryo, which forms the new plant on germination, and a large storage tissue (the endosperm), which comprises mainly starch (a source of energy) and protein. These tissues are surrounded by protective layers derived from the seed coat (testa) and fruit coat (pericarp)(Balk et al., 2019). Iron and zinc, together with other minerals, are concentrated in the embryo and in the outer layer of endosperm cells, called the aleurone. In recent decades, increase interest in vegetarian diets because of the proposed health benefits associated with plant-based diets, together with concerns over sustainability and affords ability. Cereals, and in particular wheat and bread, are among the most widely consumed staple foods and are of global importance to human nutrition ((Hurrell & Egli, 2010). Different strategies have been employed in order to increase bioavailable iron in wheat products, including supplementation, food fortification, bio fortification (via plant agronomy, breeding or genetic engineering) and changing dietary habits through consumer education (Abbaspour et al., 2014, Zimmermann and Hurrell, 2007). Additionally, in order to counteract the negative effect of phytate, the use of exogenous phytase enzymes and different bread (white, brown) making processes have been explored (Baye et al., 2015, Brune et al., 1992, Lopez et al., 2001, Sanz-Penella et al., 2009). In particular, the use of lactic acid bacteria in sourdough bread production has shown a significant degradation of IP6. Present studies are suggesting many modifications in the processes of fermentation and baking (i.e., temperature, leavening time and microorganism strain) which may improve iron bioavailability (Rodriguez-Ramiro et al., 2017).

Coffee and tea inhibit iron absorption. Many studies have indicated the negative association between coffee and tea intake and anaemia amongst lactating women. Drinking coffee and tea affects iron bioavailability and due to its potency as an inhibitor of absorption is likely to aggravate anaemia at times of increased physiological need or when dietary iron intake is limited(McClure et al., 2014). Coffee is known to contain tannin, which can potentially interfere with iron absorption (Kumera, 2018). Probiotic bacteria are used to for production of fermented dairy products. The use of probiotic bacteria has the potential to replenish the natural intestinal flora of the body. These bacteria competitively inhibit the growth and colonization of pathogenic bacteria. Many studies show the effect of fermented milk on improvement of lactose digestion and avoidance of symptoms of intolerance in lactose malabsorption. Fermented milks are nutritionally similar to unfermented milk, except that some of lactose is broken down to glucose and galactose. Fermented milks represent an excellent source of nutrients such as calcium, protein, phosphorus and riboflavin. During the fermentation of milk, lactic acid and other organic acids are produced and these increase the absorption of iron. If fermented milk is consumed at mealtimes, these acids are likely to have a positive effect on the absorption of iron from other foods (Branca & Rossi, 2002).

Careful attention should be considered to balance iron levels amongst lactating women. During lactation period, the requirements of total iron are increased. As a rule, the losses of iron occur due to bleeding at delivery. After delivery, the amount of iron in the increased red cell mass, is made available for the mother, so it is considered a positive iron balance in the lactation period. Iron absorption significantly reduced during the first few months after delivery. In lactating women, the daily iron requirements consist of basal iron losses (0.8mg/day) and iron losses in breast milk, about 0.3 mg/day (Hallberg, 1992).

Zinc is an essential mineral that found in some foods. Red meat and poultry are the major sources of zinc. Legumes, cereal and whole grain-bread contain phytates which bind with zinc and inhibit its absorption. Bioavailability of zinc from animal foods is higher than grains and plant foods (SandstroÈm, 2001).

Zinc deficiency is one of the most public health problems. The strategy of fortification or supplementation is used to improve Zn status in the population. Low zinc diets are usually also poor in iron, vitamin B_{12}, vitamin A, and other micronutrients, due to lack of animal protein foods which may lead to anaemia (Olivares et al., 2012).

Negative association between zinc availability and iron absorption was reported. Studies have shown that the potential negative interactions between these two micronutrients due to a competitive binding to specific transport protein; DMT1 (divalent metal iron transporter-1) and Zip14 (an intestinal zinc transporter) transporter. On the other hand, deficiency of zinc gives rise to iron deficiency anaemia, tissue and cellular iron accumulation. Also, there is positive association of zinc serum levels with haemoglobin and markers of iron status. A pervious study has demonstrated that zinc helps to modulate iron transporter expression and iron regulatory proteins. Iron deficiency anaemia may occur because of decrease of zinc element, which is found in the structure of enzymes that coordinate or catalyst iron metabolism (Kondaiah et al., 2019).

During lactating period, the requirements of zinc increased but the capacity of zinc metabolism changed (Soliman et al., 2019). Physiologic adjustments in metabolism of zinc are possible during lactating period such as changing in distribution of zinc, increased zinc absorption, reduced endogenous zinc losses, and changes in the exchangeable zinc pools kinetics. Many studies have shown that lactating women need about 2 to 4 mg daily additional dietary zinc to meet the requirements (Abdelhaleim et al., 2019; Donangelo & King, 2012).

Vitamin deficiencies are reconsidered as major public health problem in 60-75 countries worldwide. Vitamin A is a fat-soluble vitamin that is naturally present in many foods. Plant sources are rich in vitamin A such as vegetables. Vitamin A deficiency caused global prevalence of anaemia. Lactating women are at high risk of vitamin A deficiency anaemia (Gilbert, 2013). Many nutritional surveys have documented the close association between vitamin A deficiency and anaemia. Vitamin A deficiency effects on incidence of anaemia via modulation of haematopoiesis, by enhancement of immunity to infectious diseases and, hence, the anaemia of infection, and through the modulation of iron metabolism (Semba & Bloem, 2002).

Vitamin D is found in Fish, eggs and cereals (Lee et al., 2015). Vitamin D deficiency is associated with anaemia. Anaemia due to inflammation is caused by vitamin D deficiency (Kartal & Kartal, 2015). The mechanism underlying this association involves the reduction of pro-inflammatory cytokines by vitamin D as well as the direct suppression of hepcidin mRNA transcription. There is also evidence that vitamin D may be protective against anaemia by supporting erythropoiesis. Other calciotropic hormones, fibroblast growth factor 23 (FGF-23) and parathyroid hormone (PTH) have also been found to be involved in iron homeostasis and erythropoiesis. Vitamin D, through its down-regulatory effects on inflammatory cytokines and hepcidin may favourably impact anaemia, particularly anaemia of inflammation (Smith & Tangpricha, 2015).

Vitamin E is a name for a group of fat-soluble compounds with antioxidant properties. Vegetables, nuts and fortified cereal have significant amount of vitamin E (Oski & Barness, 1968).

Vitamin E deficiency is related to haemolytic anaemia. Haemolytic anaemia causes fragile red blood cells. Vitamin E protects the red blood cell membrane from oxidative damage (Ramakrishnan et al., 2003). Many studies have shown that the deficiency of vitamin E is quite rare. Preliminary studies have reported that large amounts (typically 800 IU per day) of vitamin E improve haemolytic anaemia caused by a genetic deficiency of the enzyme glucose-6-phosphate dehydrogenase (G6PD) and anaemia caused by kidney dialysis. Lactating mothers may need to supplement their dietary intake of vitamin E to achieve the recommended daily allowance of 19 mg (Allen, 2005; Oski & Barness, 1968; Levonorgestrel et al., 2006).

Vitamin B_{12} deficiency anaemia is a condition in which the body does not have enough healthy red blood cells, due to a lack (deficiency) of vitamin B_{12}(Duggan et al., 2014). Vitamin $B_{12}$is needed to make red blood cells (Allen, 2002).

Folic acid, also called folate, is another important B vitamin in the aetiology of anaemia. Anaemia caused by a lack of vitamin B_{12} or lacks of folate is megaloblastic anaemia. With these types of anaemia, the red blood cells don’t develop normally. The red blood cells become enlarged andovalin shape, unlike healthy red blood cells. This causes the bone marrow to make fewer red blood cells. In some cases, the red blood cells die sooner than normal (Haidar, 2010).

Chapter Three

Research Methods

Chapter Three

Research Methods

3.1 Data sources and study design:

This research is based on data obtained from the Palestinian micronutrients survey (PMS) that has been launched in (2013) for lactating mothers in the West Bank and Gaza (Appendix 1). The Palestinian MOH decided together with UNICEF, with the scientific cooperation of the University of Vienna, to conduct a representative cross-sectional study on the micronutrient status, prevalence and causes of nutritional anaemia ,Because there are a number of other micronutrients It has an effect on blood formation and its insufficient intake can contribute to the development anaemia, and the increase in the number of breastfeeding women with anemia in Palestine.All collected data were made public in 2013 and the current research has extracted the data concerning the micronutrients status of lactating women. Data collection, settings, participants, instruments and biochemical tests were fully described by PMS (2013).

In this study, nutritional status and comorbidities of micronutrients deficiencies amongst lactating mothers in the Palestinian population have been described.

The study focused on some factors such as socio-demographic factors and nutritional status that may have association with anaemia and micronutrient deficiency (Iron, Zinc, Vit A and Vit D). Based on the literature review of previous studies, some of these factors were the most important in influencing anaemia and micronutrient deficiencies, hence, were selected. In addition to socio-demographic factors, the study investigated whether there was a relationship between anaemia and the nutritional status of a nursing woman, whether she followed a specific diet during the period of breastfeeding. Also, the research investigated the association between anaemia and some eating habits of the nursing mother (eating brown bread, grains, vegetables and fresh fruits, drinking tea and coffee, eating chocolate and eating dairy products).

As for association of nutritional status with the prevalence of micronutrient deficiency among lactating mothers, the study showed the relationship of the nutrient to a specific type of food and the frequency it was consumed (per day or week).

Zinc deficiency was studied in relation to eating legumes, red meat, eggs and dairy products, and eating chocolate as well. Regarding iron deficiency, the relationship was studied with drinking tea and coffee, and eating cereals, eggs, red meat and fish.

As for vitamin A and D, the study focused on the relationship of vitamin A deficiency with intake of fresh vegetables, and the relationship of vitamin D deficiency to drinking tea and eating eggs.

Many influencing factors are interrelated and difficult to be addressed in the current study.

3.2 Data collection and questionnaire:

The study questionnaire has been designed and carried out by the General Directorate for primary health care and public health and nutrition department (Palestinian MOH) with support of the UNICEF (Elmadfa, et al., 2014).

One thousand and two hundred FFQ questionnaires were distributed to understand the underlying causes of anaemia and other malnutrition diseases that might have long-term impacts amongst lactating mothers in the west bank and Gaza strip. The randomly selected lactating mothers were given questionnaires in a certain day of the week and have been given enough time to fill the forms.

The questionnaire consisted of 2 parts; the first part included socio-demographic data while the second part covered the nutritional status, and micronutrients tests.

All participants were cooperative and have been assured about confidentiality of their information and that their answers were highly respected. All filled questionnaires were collected, examined for missing data then prepared for analysis.

3.3 Study population:

The chosen population has consisted of the lactating mothers in different cities in Palestine including cities, villages, camps and Bedouin communities in the West Bank and Gaza strip.

Clusters with 15 individuals each covered the population groups in the different districts of the provinces. Sample size was (N=1200) equally divided between West Bank and the Gaza Strip.

3.4 Instrument:

The study has used a questionnaire that has been developed after a pilot survey of previous studies conducted by the General Directorate for primary health care and public health and the nutrition department.

The questionnaire has been designed to be short that may take 5 to10 minuets to be filled. Simple and clear Arabic language was used. The questionnaire, as shown in the appendix 1, consisted of the following parts:

A. **Questions regarding the socio-demographic status have covered the following sections;** residence, type of community, lactating mother educational attainment and employment, husband educational attainment and employment, and age of lactating mother.
B. **Questions regarding nutritional status and lifestyle have covered the following sections;** drinking tea, coffee, Brown bread, red meat, fresh fruit and vegetables, follow a diet during lactation, taking nutritional supplements during last pregnancy, BMI, smoking status and physical activity.

3.5 Laboratory Assessment Methods:

Haematological parameters used for the assessment of anaemia prevalence and severity and characterization of form of anaemia, were haemoglobin (Hb), red blood cell count (RBC), haematocrit (Hct), erythrocyte mean corpuscular volume (MCV), erythrocyte mean corpuscular haemoglobin (MCH) and erythrocyte mean corpuscular haemoglobin concentration (MCHC).The iron (ferritin), vitamin D and zinc levels were tested by testing the blood serum by using the CIMA method for ferritin, vitamin D, and the method Colorimetric test with 5-Brom –PAPS for Zinc As for vitamin A, the plasma was analyzed using a method VPLC UV detection (Elmadfa, et al., 2014) .

In the PMS anaemia prevalence was assessed based on the haemoglobin thresholds for anaemia diagnosis published by the World Health Organization (WHO, 2011). Haemoglobin thresholds for anaemia diagnosis were; ≥ 12 is considered no anaemia, 11-11.9 mild anaemia ,8-10.9 moderate anaemia, < 8 severe anaemia (WHO, 2011).

The indicators of ferritin, zinc, vitamin A and vitamin D status were proportional to the references >15 ng/ml, >10.5 mmol/ L, 0.7mmol/L and 25nmol/L, respectively. If the ferritin <15ng/ml is considered depleted, as for the zin, <11.5mmol/L is considered deficient, 11.5-13mmol/L is considered low, 13-23mmol/L is considered elevated.

Vit A<0.7mmol/L is considered deficient, <1.05mmol/L is considered low, >1.05mmol/L is considered sufficient.

Vit D <25nmol/L is considered deficient, <50 nmol/l is considered low, >50nmol/L is considered sufficient (Elmadfa, et al., 2014).

3.6 Anthropometric characteristics of the study population:

Body weight and height were measured using the SECA 8744 scale and the SECA 217 scale, respectively (SECA, Hamburg, Germany). All laboratory assessments and measurements were carried out under the Palestine Micronutrients Survey project 2013 (Elmadfa, et al., 2014). Body weight and height were used to calculate the BMI as; weight in kg divided by squared height. The categories were divided according to the WHO as; BMI from 16-18.5 is considered underweight, from 18.5-25 is considered normal weight, from 25-30 overweight and more than 30 is considered obese.

3.7 Food intake and dietary records:

The food consumed by lactating women in the period of data collection was self-reported in the corresponding FFQ questionnaire. Frequency of consumption of bread, starch (rice, pasta, and potato), fresh fruits, fresh vegetables and salads. Legumes, animal products (dairy products, eggs, fish, meat and poultry), desserts, fast foods, coffee and tea was recorded.

3.8 Smoking and physical activity:

The data about smoking included whether a lactating woman is smoking /was smoking or not, and the number of cigarettes per day.

For physical activity, the data was about whether a lactating woman has exercised after childbirth, and how often.

3.9 Data analysis:

Descriptive analysis was performed and descriptive measures (means, frequencies, percentages, etc.) were obtained for studied variables.

Fisher Exact test was used to test association between categorical variables (anaemia and Micronutrient deficiency) with (socio-demographic factors, participants' characteristics, micronutrients supplementations, and nutritional status). Significance was declared at the 0.05 level ($P < 0.05$). All analyses were carried out using SPSS software, V20.0.

Chapter Four
Results

Chapter Four

Results

4.1 Socio-demographic characteristics of the study participants:

Distribution of the study sample based on studied socio-demographic factors is shown in Table 1. Half of the sample were from the West Bank and the other half were from Gaza. About 45% lived in the city, 28.8% lived in villages, 24% lived in refugee camps, and 1.8% were from Bedouin communities. About 5% were less than 20-year-old, 64.4% were between 20 and 30 years old, and 30.2% were above the age of 30 years. Only 9.2% of lactating mothers had employment, 65.8% had high-school education or less, and 72.6% had husbands with high-school education or less.

Table 1: Distribution of the study sample based on their socio-demographic factors.

Socio-demographic factors	N	%
Type of province	1200	100.0
West Bank	600	50.0
Gaza	600	50.0
Type of community	1200	100.0
City	545	45.4
Village	345	28.8
Camp	288	24.0
Bedouin	22	1.8
Age (years)	1192	100.0
Less than 20	64	5.4
20-30	768	64.4
More than 30	360	30.2
Employment	1200	100.0
Yes	110	9.2

No	1090	90.8
Mother education	1200	100.0
High school or less	789	65.8
Diploma	96	8
BA	306	25.5
High education	9	0.7
Husband education	1095	100.0
High school or less	795	72.6
Diploma	60	5.5
BA	208	19.0
High education	32	2.9

4.2 Association between anaemia status and socio-demographic factors:

Table 2 shows the prevalence of anaemia according to Participants' characteristics and socio-demographic factors. There were significant differences ($P < 0.0001$) in prevalence of anaemia between mothers according to province (the West Bank or Gaza). Prevalence of anaemia in Gaza was more than that in the West Bank. Also, there was significant ($P < 0.01$) difference between women living in cities with those living either in camps, villages or in Bedouins communities. While there was no significant difference in anaemia level with regard to other factors such as age of lactating women, employment, education and husband's education ($P > 0.05$).

Table 2: Association between socio-demographic factors and prevalence of anaemia amongst lactating mothers.

Socio-demographic factors	N	Anaemia					P value
		Over all	Non Anaemic		Anaemic		
			N	%	N	%	
Type of province	1200						0.0001
West Bank		600	479	79.8	121	20.2	
Gaza		600	388	64.7	212	35.3	
Type of community	1173						
City		542	379	69.5	166	30.5	0.01
Village		344	271	78.6	74	21.4	
Camp		283	200	69.4	88	30.6	
Bedouin		22	17	77.3	5	22.7	
Age (years)	1200						
Less than 20		136	105	77.2	31	22.8	0 .398
20-30		704	505	71.7	199	28,3	
More than 30		360	257	71.4	103	28.6	
Employment	1200						
Yes		110	77	70	33	30	0.32
No		1090	790	72.5	300	27.5	
Mother education	1200						
High school or less		789	565	47.1	224	18.7	0.927
Diploma		96	71	5.9	25	2.1	
Bachelor		306	224	18.7	82	6.8	
High education		9	7	.6	2	.2	
Husband education	1195						
High school or less		779	552	70.9	227	29.1	0.35
Diploma		79	63	79.7	16	20.3	
Bachelor		206	150	72.8	56	27.2	
High education		31	21	67.7	10	32.3	

4.3 Association of dieting, food intake and BMI status with prevalence of anaemia amongst lactating mothers:

There were no significant associations ($P > 0.05$) between mothers' dietary behaviour and food intake of chocolate, legumes, red meat, cereals, corn flakes, eggs, fish, fresh vegetables, coffee and tea with anaemia. However, there was a significant difference (P < 0.05) between mothers who consumed dairy products and mothers who didn't consume such products (Table 3). Also, there was no significant difference in the level of anaemia between mothers according to their BMI categories (P > 0.05).

Table 3: Association of dieting, food intake and BMI status with prevalence of anaemia amongst lactating mothers

Nutritional factor	N	Anaemia					P value
		Overall	Non-Anaemic		Anaemic		
			N	%	N	%	
Dieting	1178						0.139
Yes		129	103	79.8	26	20.2	
No		1049	751	71.6	298	28.4	
Brown bread	1185						0.013
Didn't eat		951	666	56.2	285	24.1	
Once a day		35	28	2.4	7	.6	
More than once a day		199	158	13.3	41	3.5	
Cereals / Corn flakes	1195						0.501
Didn't eat		1101	797	72.4	304	27.6	
Once a week		94	65	69.1	29	30.9	
Fresh fruits	1198						0.755
Didn't eat		22	16	72.7	6	27.3	
Once a week		1139	821	72.1	318	27.9	
More than once a week		37	29	78.4	8	21.6	
Fresh vegetables	1197						0.693
Didn't eat		15	12	80	3	20	
Once a week		1135	816	71.9	319	28.1	
More than once a week		47	36	76.6	11	23.4	
Drinking Tea	1200						0.875
Yes		944	683	72.4	261	27.6	
No		256	184	71.9	72	28.1	

Chocolate	1195						
Didn't eat		175	128	73.1	47	26.9	0.448
Once a week		1000	722	72.2	278	27.8	
More than once a week		20	12	60	8	40	
Coffee	1180						
Didn't drink		672	493	73.4	179	26.6	0.378
Once a week		434	310	71.4	124	28.6	
More than once a week		74	53	71.6	21	28.4	
Fast Food	1196						
Didn't eat		610	447	73.3	163	26.7	0.378
Once a week		586	416	71	170	29	
Dairy products	1199						
Didn't consume		68	43	63.2	25	36.8	0.029
Once a week		137	93	67.9	44	32.1	
More than once a week		994	730	73.4	264	26.6	
BMI status	757						
Under Weight		21	15	71.4	6	28.6	0.247
Normal		443	321	74	113	26	
Over Weight		278	183	69.8	79	30.2	
Obese		15	7	46.7	8	53.3	

4.4 Association between supplementation status and prevalence of anaemia amongst lactating mothers:

The majority of the lactating women in the study have taken types of supplementation during the last pregnancy (92.5%). However, there was no significant difference in the level of anaemia between mothers according to micronutrients supplementation with vitamins B12, D and E ($P > 0.05$), while, significant differences were found in other micronutrients supplementation including Zinc, Vit A and Iron ($P < 0.05$) as shown in Table 4.

Table 4: Association of micronutrient supplementation and micronutrient status with the prevalence of anaemia amongst lactating mothers.

	N	Anaemia prevalence					P value
		Overall	Non-Anaemic		Anaemic		
			N	%	N	%	
Have you taken Nutritional supplements during your last pregnancy?	1200						0.811
Yes		1110	801	72.2	309	27.8	
No		90	66	73.3	24	26.7	
Have you taken folic acid pills prior to your last pregnancy	1200						0.263
Yes		300	227	75.7	73	24.3	
No		896	637	71.1	259	28.9	
Didn't remember		4	3	75	1	25	
After giving birth, have you received a vitamin A capsule in the clinic?	668						0.148
Yes		391	262	67	129	33	
No		265	187	70.6	78	29.4	
Don't know		12	11	91.7	1	8.3	
Folate profile	1195						0.073
Low		238	161	67.6	77	32.4	
Normal		957	703	73.5	254	26.5	
B12 profile	1194						0.122
Low		243	166	68.3	77	31.7	
Normal		951	697	73.3	254	26.7	
Vitamin A profile	1094						0.003
Low		298	198	66.4	100	33.6	
Normal		751	567	75.5	184	24.5	
Vitamin D profile	133						1.000
Low		131	90	61.2	41	37.8	
Normal		2	2	100	0	0	
Iron Profile	1195						0.0001
Deficient		133	43	32.3	90	67.7	
Normal		1062	820	77.2	242	22.8	
Zinc profile	1195						0.010
Low		1084	770	71	314	29	
Normal		107	90	84.1	17	15.9	
Elevated		4	3	75	1	25	

4.5 Association of socio-demographic factors and some of participant characterizations with prevalence of micronutrients deficiency amongst lactating mothers.

There were significant differences ($P < 0.05$) between mothers living in the West bank and Gaza. Zinc, Iron and Vit D deficiency in Gaza was a little more than of that in the West bank, unlike Vit A deficiency, as it was slightly more in the West bank (Table 5). Also, there were no significant ($P > 0.05$) differences in Zinc and Vit D deficiency according to type of community, however, there was a significant difference ($P < 0.05$) between types of community in Iron and Vit A deficiencies. With regard to age, only Vit A deficiency was significantly different ($P < 0.05$) amongst lactating mothers.

Finally, practicing of physical activity or smoking were not associated with micronutrient deficiency amongst lactating women ($P > 0.05$).

Table 5: Association of socio-demographic factors and some of participant characterizations with the prevalence of micronutrient deficiency amongst lactating mothers.

			Zinc level						**P value**	**N**	**Iron profile**					**P value**
			Low		**Normal**		**Elevated**					**Low**		**Normal**		
	N	**Overall**	**N**	**%**	**N**	**%**	**N**	**%**			**Overall**	**N**	**%**	**N**	**%**	
Type of province	1195									1195						
West Bank		596	529	88.8	64	10.7	3	0.5			596	16	2.7	580	97.3	
Gaza		599	555	92.7	43	7.2	1	0.2	0.04		599	117	19.5	482	80.5	0.0001
Type of community	1195									1195						
City		544	494	90.8	48	8.8	2	0.4			544	72	13.2	472	86.8	
Village		345	309	89.6	34	9.9	2	0.6			345	22	6.4	323	93.6	
Camp		284	259	91.2	25	8.8	0	0			284	38	13.4	246	86.6	
Bedouin		22	22	100	0	0	0	0	0. 635		22	1	4.5	21	95.5	0.004
Age (years)	1195									1195						
Less than 20		136	120	88.2	15	11	1	0.8			136	16	11.8	120	88.2	
20-30		702	630	89.7	70	9.9	2	0.2			702	80	11.4	622	88.6	
More than 30		357	334	93.6	22	6.2	1	0.2	0.116		357	37	10.4	320	89.6	0.846
Do you currently smoke cigarettes or hookah?	1195															
Yes		23	21	91.3	2	8.7	0	0								
No		1172	1063	90.7	105	9	4	0.3	1.0							

	Vitamin A Profile						P Value	Vitamin D Profile								P Value
			LOW		Normal					Deficient		Low		Normal		
	N	**Overall**	N	%	N	%		N	**Overall**	N	%	N	%	N	%	
Type of province	1049							150								
West Bank		562	186	33.1	376	66.9			75	27	36	46	61.3	2	2.3	
Gaza		487	112	92.7	375	7.2	0.0001		75	18	24	57	76	0	0	0.0001
Type of community	1049							169								
City		468	146	31.2	322	68.8			64	20	31.2	43	67.2	1	1.6	
Village		319	82	25.7	237	74.3			39	12	30.8	26	66.7	1	2.6	
Camp		243	69	28.4	174	71.6			44	13	29.5	31	70.5	0	0	
Bedouin		19	1	5.3	18	94.1	0.041		22	0	0	3	100	0	0	0.908
Age (years)	1049							150								
Less than 20		118	30	25.4	88	74.6			18	5	27.8	12	66.7	1	5.6	
20-30		607	197	32.5	410	67.5			90	32	35.6	57	63.3	1	1.1	
More than 30		324	71	21.9	253	78.1	0.002		42	8	19	34	81	0	0	0.124
Physical exercises after delivery.								150								
Yes									47	15	31.9	32	68.1	0	0	
No									103	30	29.1	71	68.9	2	12	0.934

4.6 Association of nutritional status with prevalence of micronutrients deficiency amongst lactating mothers

4.6.1. Zinc

There were no significant differences (P > 0.05) in Zn level between mothers according to dietary intake of legumes, red meat**,** eggs, and dairy product (Table 6). However, there was a significant difference between mothers who consumed chocolate and mothers who haven’t consumed such an item (P< 0.05).

Table 6: Association of type and food frequency with Zn levels amongst lactating mothers.

			Zinc level						
	N		Low		Normal		Elevated		P value
		Overall	N	%	N	%	N	%	0.770
Legumes	1194								
Didn’t eat		82	76	92.7	6	7.3	0	0	
Once a weak		1112	1007	90.6	101	9.1	4	0.4	
Red Meat	1188								0. 436
Didn’t eat		118	108	91.5	9	7.6	1	0.8	
Once a week		1069	969	90.6	97	9.1	3	0.3	
More than once a week		1	1	100	0	0	0	0	
Eggs	1193								0. 665
Didn’t eat		77	68	88.3	9	11.7	0	0	
Once a weak		1113	1011	90.8	98	8.8	4	0.4	
More than once a week		3	3	100	0	0	0	0	
Dairy products	1194								0. 949
Didn’t eat		68	62	91.2	6	8.8	0	0	
Once a week		1116	1012	90.7	100	9	4	0.3	
More than once a week		10	9	90	1	10	0	0	

Chocolate	1190								0.035
Didn't eat		174	165	94.8	9	5.2	0	0	
Once a weak		996	897	90.1	96	9.6	3	0.3	
More than once a week		20	17	85	2	10	1	5	

4.6.2. Iron

According to results in Table 7, there were no significant differences in iron level (P > 0.05) between mothers according to their intake of tea, coffee, cereals/corn flakes**,** eggs and fish. However, consumption of red meat has shown significant differences (P < 0.5) between mothers in their iron level.

Table 7: Association of type and food frequency on Iron levels amongst lactating mothers.

		Iron profile					**P value**
	N		**Deficient**		**Normal**		
Do you drink tea?	**1195**	**Overall**	**N**	**%**	**N**	**%**	
Yes		939	104	30.8	835	69.2	0.909
No		256	29	11.3	227	88.7	
Cups of tea	939						0.487
Didn't drink		13	4	31	9	69	
Once a week		884	248	28.1	636	71.9	
More than once a week		42	15	35.7	27	64.3	
Do you drink Coffee?	1175						0. 508
Didn't drink		670	79	11.8	591	88.2	
Once a week		432	42	9.7	390	90.3	
More than once a week		73	9	12.3	64	87.7	
Cereals / corn flakes	1190						0. 393
Didn't eat		1096	125	11.4	971	88.6	
Once a week		94	8	8.5	86	91.5	
Eggs	1193						0. 347
Didn't eat		77	9	11.7	68	88.3	
Once a week		1113	123	11.1	990	88.9	
More than once a week		3	1	33.3	2	66.7	

Red meat	1187						0. 032
Didn't eat		118	18	15.3	100	84.7	
Once a week		1069	114	10.7	955	89.3	
More than once a week		1	1	100	0	0	
Fish	1194						0.135
Didn't eat		93	6	6.5	87	93.5	
Once a week		1101	127	11.5	974	88.5	

4.6.3. Vit A

There was no significant difference between mothers in their Vit A level due to consumption of fresh vegetables (P > 0.05) as shown in Table 8.

Table 8: Association of fresh vegetable consumption and frequency with vitamin A levels amongst lactating mothers.

		Vitamin A level					**P value**
	N	**Over all**	**Low**		**Normal**		
			N	**%**	**N**	**%**	
Fresh vegetables	1046						0. 487
Didn't eat		13	4	30.8	9	69.2	
Once a week		991	278	28.1	713	71.9	
More than once a week		42	15	35.7	27	64.3	

4.6.4 Vit D

There was no significant difference between mothers in their Vit D level due to consumption of tea and eggs (P > 0.05) as shown in Table 8.

Table 8: Association of tea drinking and egg consumption with vitamin D levels amongst lactating mothers.

		Vitamin D level							**P value**
	N	**Overall**	**Deficient**		**Low**		**Normal**		
			N	**%**	**N**	**%**	**N**	**%**	
Do you drink tea?	150								0.425
Yes		120	33	27.5	85	70.8	2	1.7	
No		30	12	40	18	60	0	0	
Eggs	150								0. 541
Didn't eat		8	4	50	4	50	0	0	
Once a week		141	41	29.1	98	69.5	2	1.4	
More than once a week		1	0	0	1	100	0	0	

Chapter Five
Discussion

Chapter Five

Discussion

This study aimed to determine the prevalence of micronutrient deficiencies amongst lactating women in Palestine and investigate their association with socio-demographic factors, dietary practices and micronutrient supplementation based on analysis of data from the Palestinian Micronutrients Survey. Similar to previous studies amongst lactating women in some regions of Palestine, the major group of age was 25-35 years.

5.1 Association of socioeconomic factors with prevalence of anaemia:

This study has determined the prevalence of anaemia amongst lactating mothers living in cities, villages, camps and Bedouin communities in the West Bank and Gaza. The overall prevalence of anaemia (30.6%) has highlighted that anaemia is still a severe public health problem in villages and Bedouin areas (22.7%) (Tesfaye et al., 2020). In Gaza, many socioeconomic factors may relate to anaemia risk including increased number of social cases such as widows, orphans, the elderly, and prisoners because of the successive "Israeli" incursions on the Gaza strip. Also, many families were forced to internally be displaced and be refugees because of increased insecurity and destruction of their houses. Moreover, rural populations were the most heavily affected by tightened road closures; increased number of poor and unemployed individuals (Mikki et al., 2011).

The research has investigated the relationship between age, work, lactating mother's education and husband's educational level with anaemia levels. The groups of age (<20, 20-30, >30 years) had no significant differences as the percentages of incidence of anaemia were very close (77.2%, 71.7%, 71.4 %, respectively). Mother's work and education, and husband's education also had no effect on the prevalence of anaemia. This is contrary to a study in Ethiopia concerning the effect of the level of education on prevalence of anaemia which found significant differences in the incidence of anaemia based on educational level of lactating women (Lakew et al., 2015). Another study has shown that husband's low-level of education was related to a high risk of anaemia amongst Iranian women (Nikzad et al., 2018). Palestinian women are amongst the most educated people in the Middle East. More than 90% have access to literacy and go to primary school (Lydia Cardwell, 2018). In general, Palestinian girls consistently outscore their male peers in the Secondary (Tawhiji) exam and have higher university enrolment rates. Compared to the situation of women in Yemen, Egypt, and Afghanistan, the thriving of women's education in Palestine may explain one of the most important factors that has affected the prevalence of diseases among Palestinian women especially anaemia through awareness and knowledge to enhance their life style and avoid risk of anaemia. Also, many studies showed that women who had been working had lower odds values of having anaemia due to ability to earn money, extra income, and ability to access and purchase food items (Gautam et al., 2019; Sadeghian et al., 2013). However, job opportunities of Palestinian women are limited (Cuberes & Teignier, 2016).A striking feature of the labour market is the significantly higher rate of unemployment amongst skilled women (47 percent) relative to skilled men (18 percent) (López-Anuarbe et al., 2016). Compared to developed countries the job opportunities of women are enhanced with a good pay. Labour force participation rate for women aged 25-54 is 63% compared to 94% for men. In 2018 women's global labour force participation rate is even lower at 48.5 % with 26.5 percentage points below that of men (Grimshaw& Rubery, 2015).

5.2 Association of nutritional status with prevalence of anaemia amongst lactating mothers

No doubt, diet quality is highly reflected in the micronutrient's status of the lactating women. The current study has focused on certain and most frequent consumed foods in the Palestinian community. To address the problem of anaemia, the study has analysed the connection between anaemia and dieting, food intake of certain items and BMI, in order to find a direct effect of these factors on the anaemia prevalence. Moreover, the study has analysed the effect of some micronutrient levels on the prevalence of anaemia. As mentioned before, micronutrients are interconnected. For example, vitamin A deficiency affects iron repletion. The current study has shown that vit A deficiency amongst lactating women can be a reason for anaemia. It is more likely that a vit A deficient lactating mother will be anaemic due to iron deficiency. Previous studies have reported similar results in the correlation of vitamin A deficiency with iron deficiency as both of them increase anaemia risk (Zhao et al., 2014).

Direct connections between dieting and food types with risk of anaemia were not found in this study. This is similar to the findings of Virginia & Fenty (2017). The current findings have shown significant association between dairy products intake and decreased anaemia risk ($p<0.05$). In Palestine, consumption of fermented dairy products is higher than raw milk or cheese. Lactic acid bacteria are used for the production of fermented dairy products. The use of such bacteria has the potential to replenish the natural intestinal flora of the body which in turn are responsible for some B vitamins production. Moreover, fermented milk represents an excellent source of nutrients such as calcium, protein, phosphorus and riboflavin. During the fermentation of milk, lactic acid and other organic acids are produced and these enhance the absorption of iron (Branca & Rossi, 2002).

Cereals, in particular wheat and bread, are amongst the most widely consumed staple foods and are of global importance to human nutrition (Balk et al., 2019). The current study has demonstrated that brown bread intake has significantly contributed to anaemia prevention ($P < 0.05$). Iron and zinc, together with other minerals, are concentrated in the embryo of wheat grain. Different strategies have been employed in order to increase bioavailable iron in cereal products with limited success, including supplementation, food fortification, biofortification (via plant agronomy, breeding or genetic engineering) and changing dietary habits through consumer education.

Additionally, in order to counteract the negative effect of phytate, the use of exogenous phytase enzymes and different bread making processes have been explored (Hurrell & Egli, 2010). In particular, the use of lactic acid bacteria in dough bread production has shown a significant degradation of IP6, which is the main iron chelator in cereals and bread which reduce iron bioavailability during the intestinal transit. On other hand, many studies show that modifications in the processes of fermentation and baking (i.e., temperature, leavening time and microorganism strain) employed to improve iron bioavailability (Rodriguez-Ramiro et al., 2017).

A study conducted by Patterson et al., (2001) has shown that the flesh of animal foods such as beef, lamb, poultry and fish are rich in dietary protein, iron, iodine, zinc, Vitamin B_{12} and omega-3 fatty acids. The study also determined that the recommended intake of meat can enhance iron status thus indicating the very important role of dietary intervention for the treatment of iron deficiency anaemia (Gilsing et al., 2013). Other research in developed countries has shown that higher consumption of animal flesh foods results in better iron status for adults (Sharma et al.,2013). However, another study has shown that dietary modification to include greater quantities of animal flesh foods had no impact on iron status and anaemia (Asakura et al., 2009).

Another study has shown that the main inhibitors of non-heam iron absorption are calcium, phytates in high fibre foods and phenolic compounds from tea and coffee (Patterson & Blumfeild, 2009). Many studies have indicated the negative association between coffee and tea intake and anaemia amongst lactating women. Drinking coffee and tea affects iron bioavailability and due to its potency as an inhibitor of absorption is likely to aggravate anaemia at times of increased physiological need or when dietary iron intake is limited (McClure et al., 2014). Coffee is known to contain tannin, which can potentially interfere with iron absorption (Kumera, 2018).

Body mass index (BMI) has measured maternal nutrition status. Many studies found a significant association between BMI and anaemia.

A study showed that anaemia prevalence of 21.7% among Nigerians pregnant and lactating women and younger age groups was no significant association with the socio-demographic characteristics. Amongst the subjects 3.7% were underweight, while 37.6% had excess weight (overweight, obese and morbidly obese). Except in the underweight subjects, where anaemia was not observed, no significant difference was found in the prevalence of anaemia among other BMI groups (Ugwuja et al., 2015). This can be explained by the nature of the sample and the distribution of participants over the BMI different groups. The current study has shown a trend of increasing percent of anaemia with increasing BMI; however, no significant association was found ($P > 0.05$).

Although, lactating mothers are at risk of macronutrient deficiencies due to malnutrition (Gebremedhin & Enquselassie, 2011), a study, in Iran, has found that BMI wasn't directly associated with risk of anaemia amongst lactating women (Salam et al., 2016).

5.3 Association of micronutrients supplementation and micronutrient profile with prevalence of anaemia

Micronutrient deficiency and anaemia remain as major health concerns for lactating mothers. Many countries apply programmes to supplement lactating women with micronutrients in order to prevent deficiencies complications. During the period of lactation, mothers are susceptible to anaemia because of maternal iron depletion and blood loss during childbirth. The current study has demonstrated that Zinc and Iron deficiencies have significantly contributed to anaemia ($P < 0.05$). In the developing countries, Iron deficiency co-exist with other trace elements deficiencies such as Zinc. Zinc works as a catalyst in iron metabolism in the activity of alpha-aminolevulinic acid dehydratase enzyme, which plays a role in haem synthesis (Gürgöze et al., 2006).

On the other hand, Vitamin A appears to be involved in the pathogenesis of anaemia. Present study has found that there was an association between vitamin A deficiency and anaemia ($P < 0.05$). This can be explained by the diverse biological mechanisms of Vit A such as the enhancement of growth and differentiation of erythrocyte progenitor cells, potentiation of immunity to infection, reduction of the infection of anaemia, and mobilisation of iron stores from tissues (Frislli et al., 2020). Similarly, Balarajan et al., (2011) and West et al., (2007) have confirmed the role of vitamin A deficiency in the aetiology of anaemia. In addition, Vitamin A deficiency may cause anaemia through indirect effects, such as increasing risk of iron deficiency (Nguyen, et al., 2015). It happened by decreasing iron absorption, or increased risk and severity of infections . Another study has shown that the prevalence of vitamin A deficiency in Africa and South Asia, particularly in young children and pregnant women, was highly associated with anaemia (Stevens et al. 2015).

The prevalence of Zinc deficiency in the lactating mother showed meaningful difference, and that was due to mothers increasing requirement of Zinc. Without a proper nutritional supplement, mothers fall in the state of Zinc deficiency. In this study, Zinc deficiency has aggravated the anaemia risk. On the other hand, Iron supplementation has increased the zinc deficiency as well; this is probably due to the effect of iron in prevention of intestinal Zinc absorption. In this study, supplementation with Vitamin D, E, folic acid and folate has no significant effect on anaemia prevalence. Several studies have shown a positive association between high folate, folic acid status and anaemia risk (Morris et al., 2007), while some countries have shown limited improvement.

Vitamin D has a relationship with anaemia in various healthy and diseased populations. Recent studies found that the association may differ between race and ethnic groups and is likely specific to anaemia due to inflammation. Many evidences have shown that vitamin D may be protective against anaemia by supporting erythropoiesis. Other calciotropic hormones, fibroblast growth factor 23 (FGF-23) and parathyroid hormone (PTH) have also been found to be involved in iron homeostasis and erythropoiesis (Smith et al., 2015). However, supplementing women didn't improve their anaemia status, may be due to physiological factors, dose level and adherence to supplementation programme.

5.4 Association of socio-demographic factors with prevalence of micronutrients deficiency amongst lactating mothers:

This study has shown significant differences in Zinc profile between province (Gaza vs. West Bank) ($P<0.05$). While the type of community hasn't shown similar trends ($P>0.05$) as depicted in Table 5. Moreover, Table 4 has shown that characterisations of lactating mother such as age and smoking have no significant effect on zinc deficiency ($P>0.05$). A study has shown that the percent of Zinc deficiency in smokers was higher than that in non-smokers. Another study has shown that abnormally high level of oxidative stress among smoker was associated with Zinc deficiency (Mohammad et al., 2010)

Iron deficiency is one of anaemia conditions. Haemoglobin level (Hb) detects iron deficiency (Zimmermann et al., 2008). Rural areas have increasing prevalence of anaemia as shown in some international studies. Living place distribution in Palestine has significant effect on iron profile ($P<0.05$) while such profile wasn't affected significantly by mother's age ($P>0.05$). Generally, different types of community represent the economic status and the ability of access to adequate medical examinations while it may be difficult in the case of women reside in villages and Bedouins to examine Hb level frequently. A study by Alvarez-Uria, et al., (2014) conducted in India has shown an increasing prevalence of anaemia in rural areas. Another study by Baliga et al., (2014) in Karnataka Village also, has shown that ¾ of the study subjects had anaemia. Studies on the number of anaemia cases in rural areas of Indonesia also have shown similar trends (Chparro et al., 2019).

The area distribution in Palestine has significant effect on vitamin A profile ($P< 0.05$). Moreover, type of communities has relation with appearance of lack of vitamin A intake ($P< 0.05$). Diverse lifestyle among communities contributes hugely to types of vitamins ingested by individuals taking into consideration, foods that have high content of vitamin A. As mentioned before, vitamin A deficiency influences haemoglobin metabolism that may lead to iron deficiency, which is considered the main cause of anaemia (Semb & Bloom, 2002).

Interestingly, Bedouin community has the lowest percentage of vitamin A deficiency compared with city communities. Bedouin community depends on healthy life style and rich foods. The most foods consumed in such community are meat, milk, and whole grains which have high content of Vitamin A (Abu- Saad et al.,2001). These days village and camp communities are close to the city lifestyle including food types intake. Fast food has occupied large place in city's food consumption which misses the important nutritional values (Wertheim & Raneri, 2019). Mother's age group has significant effect on vitamin A profile ($P < 0.05$). Mothers Group 20-30 years age, has indicated a 32.5% suffering of vitamin A deficiency.

However, vitamin A supplement after delivery hasn’t shown significant differences on mother’s profile of vitamin A ($P > 0.05$). This can be explained by the variable level of adherence to supplement intake, social barriers and awareness about the importance of supplements.

One billion people worldwide have vitamin D deficiency or in sufficiency as shown in some estimates (Tangohet al., 2018). Many factors influence the risk of impaired vitamin D status in terms of photosynthesis and bioavailability of vitamin D. (Bahrami et al., 2018) previously has shown that in Palestine (West Bank and Gaza), there was association between dwelling-place and vitamin D deficiency (Chaudhry et al., 2018). Similarly, this study has shown that there was significant relationship between living-place and vitamin D in lactating mother ($P<0.05$). Food style in Palestine is close to Mediterranean diet which rich in a number of foods that contain vitamin D especially fish in Gaza (UN Food and Agriculture Organization,2019) however, in the West Bank as green spaces planted with leafy vegetables and fruits may provide minor sources of vitamin D. A Turkish study has approved that place of residence has an effect on vitamin D deficiency (Gür et al., 2014). The effect of place of residence and lifestyle on vitamin D deficiency were also found to be effective when comparing the eastern and western parts of Turkey (Tangoh et al,2018).

Furthermore, many studies have mentioned that clothing style, duration to sun exposure, time of exposure, consuming fish, and vitamin D supplements will affect vitamin D deficiency across the place of residence (Gür et al., 2014).

On the other hand, a study was conducted in Bangladesh has shown that vitamin D synthesis was decreased with increased air pollution in different areas. Pollution may interfere with UVB radiation reaching the skin (Baileyet al., 2012). Air pollution is a major problem in many industrial cities.

Previously, a study has shown that the geographical topography of place of residence would affect the vitamin D level with coastal area to have the increased levels compared to high altitudes areas (Oliver et al., 1999)

Different groups of ages of lactating mothers have shown no differences in Vitamin D level (P>0.05). Moreover, physical life after delivery hasn't contributed to improve vitamin D profile. Several studies reported that vitamin D improved by physical outdoor activities. Vitamin D in turns, contributes to decreasing knee pain, lowering of inflammation and metabolic risk factors and increasing muscle strength (Manoy, et al., 2017). In contrast, another previous study reported no significant positive effect of vitamin D on physical life (Jin et al., 2016).

5.5 Association of nutritional status with prevalence of micronutrients deficiency in lactating mothers

Macronutrients (fat, protein, carbohydrates) deliver energy and important compounds to the entire body composition. Micronutrients are needed to keep this process of continuous construction and re-construction, running. Consequently, the requirements for micronutrients will differ depending on the individual needs which are related to the different metabolic conditions within the life cycle. Type of consumed food contributes to micronutrient availability. Certain foods are rich sources of important micronutrient such as red meat, egg, legumes, dairy products, fish, fresh vegetables, and cereal. In this research, consumption of different types of food has affected the nutritional status as reported by others (Hanz & Jana, 2018)

The current study has shown that consumption of legumes, red meat, eggs, dairy products didn’t have an effect on Zinc profile ($P>0.05$). However, only chocolate has a significant effect on Zinc profile ($P<0.05$). Previous study has confirmed that chocolate is good source of Zinc. Average Zinc content in chocolate and cocoa was 22.3 mg/kg (range 10.2-52.3) which is about the same level in meat and sausages, based on fresh weight (Kruszewski & Obiedzinski, 2018). Another study has assessed trace metal contents in chocolate samples by Atomic Absorption Spectrometry has shown the quantified zinc and iron concentrations are highest in cacao-based chocolate compared to milk and sugar –based chocolates. Teams from the Federal University of Santa Maria in Brazil deemed chocolate as an extremely rich source of many essential minerals and it said that cocoa is the best natural food source for Fe and Zn (11.9 mg and 3.3 mg /100 gm dark chocolate, respectively) hence contributes to a healthy diet (Rehman& Husnain, 2012). Bioavailability of such minerals was attributed to many factors including the manipulation and processing of cacao beans to chocolate.

Vitamin A is one of the most important nutrients for normal vision, the immune system, and reproduction. Vitamin A also helps the heart, lungs, kidneys, and other organs work properly(Semba & Bloom 2002). Different sources of food provide vitamin A or its precursor such as fresh and leafy vegetables. In this research, consumption of fresh vegetables didn't have a significant effect on vitamin A profile ($P>0.05$). Many studies defined that certain types of vegetables contain vitamin A such as spinach, carrot and sweet potato. Fresh vegetables that contain vitamin A are seasonal which cause to fluctuant of vitamin A stores from these sources (Gillbert, 2013). Steady state of fresh fruits and vegetables all year around is suggested to maintain good level of vitamin A in the serum.

This study has demonstrated that red meat consumption has a significant effect on iron profile compared to egg, cereal, fish, tea and coffee consumption which didn't have high relationship with iron profile as shown in Table 6.

Many studies have shown that egg is an important source of vitamin D. Recent research found an average serve of eggs (2 x 60g eggs) contains 8.2mcg of vitamin D(Browning & Cowiesn, 2014). Table 8 has shown that no relationship was found between vitamin D profile and egg consumption. However, recent research has revealed that eggs contain 82% of daily requirement of vitamin D (Barnkob et al., 2020). Latest Australian research confirmed that eggs are one of the highest natural sources of vitamin D. Furthermore, eggs were found to help to keep vitamin D levels high to reduce the risk of variable diseases (Schmid & Walther, 2013).

Coffee and tea consumption was hypothesised to interact with variants of vitamin D-receptor polymorphisms, but limited evidence exists. Current evidence, however, has related caffeine intake to calcium metabolism. It has been demonstrated that caffeine has negatively influenced calcium balance by reducing renal re-absorption of calcium, and possibly by reducing intestinal calcium absorption efficiency. High caffeine intake may involve considerable renal and intestinal calcium loss (Latif, 2013). In this study, no clear effect of coffee and tea intake on vitamin D and iron profile ($P > 0.05$) was found.

Chapter Six

Conclusion and recommendations

Chapter Six

Conclusion and Recommendations

In general, nutritional status of the lactating women in the study has been shown to be at risk due to different factors. Anaemia, micronutrients deficiency and obesity were some of the comorbidities that were prevalent amongst the Palestinian lactating women. Although, difference between anaemic and non-anaemic women was obvious in the type of residency (Gaza vs. the West bank) other socio-demographic variables were not significant. Similar trends were found with regard to micronutrient deficiencies.

On the other hand, nutritional status, BMI and dietary intake showed no significant connection with anaemia apart from negative association with dairy products.

Iron deficiency was found to be the main reason for anaemia. There was a negative association, though not significant, between iron profile and sources of Zn, while, vitamin A source was positively associated with iron profile. Supplements with vitamins A and D didn’t show improvement in the sample with regard to vitamin A and D deficiencies, hence, with anaemia. Furthermore, lifestyle including dieting, smoking and physical activity were not associated with anaemias levels.

The main recommendations of this study are:

1. The need for a sustained health and nutrition education to the lactating mothers.
2. Families and communities and health care providers should promote healthier food intake, proper dietary practices and dietary diversification during lactation time in order to improve their health and nutritional outcomes.
3. Efforts should be made to improve the health care services for proper follow ups and well-informed mothers.
4. More attention should be paid to support lactating mothers in rural areas, in particular those with special nutritional requirements and or having their first baby.
5. Finally, further research is required to address the barriers against the transfer of health and nutrition education into action as well as to assess the dietary adequacy of the lactating mothers in the study areas.

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Appendix

Appendix (1): Questionnaire for Lactating Mothers

State of Palestine **Ministry of Health**	**General Directorate for Primary Health Care and Public Health** **Nutrition Department**	
A01 Questionnaire No: L☐☐☐☐☐		

Palestinian Micronutrient Survey 2013 With Support From UNICEF

Survey Questionnaire for Lactating Mothers
This Questionnaire is for Research Purposes Only. All Information Herein is Confidential.

Welcome the lactating mother and tell her that we, in the Ministry of Health (MOH) in cooperation with UNICEF, are conducting a survey on the nutritional status of lactating mothers, aiming to assess the nutritional status and micronutrient (vitamins and minerals) deficiency among lactating mothers. Explain that you will ask her certain questions and will take a small blood specimen from her to test her haemoglobin and vitamins and minerals in her blood. Explain that all information she may disclose will be kept completely confidential and accessible only for the survey team, and that by participating in this survey she will contribute to the development of health plans to improve the health of lactating mothers in Palestine.
Your participation in this survey is voluntary and you can decide whether to participate or not.

A02	Consent to participate	1Yes	2 No	☐
B Personal Data				
B01	Province	1 West Bank	2 Gaza Strip	☐
B02	District	01 Jenin 10 Tulkarm 20 Qalqiliya 25 Salfit 15 Nablus 05 Tubas 35 Jericho & Al - Aghwar 30 Ramallah & Al-Bireh 40 Jerusalem	45 Bethlehem 50 Hebron 51 SouthHebron 55 North Gaza 60 Gaza 65 Deir El-Balah 70 Khan Yunis 75 Rafah	☐ ☐
B03	Community			
B04	Type of community	1 City 2 Village	3 Camp 4 Bedouin community	☐
B05	Health centre code	☐☐☐☐☐☐☐☐		
B06	Health centre name			
B07	Supervising body	1 MOH 2 UNRWA	3 NGO	☐
C The Researcher				
C01	Researcher name			/
C02	Researcher number	/		☐ ☐
C03	Date of interview	☐☐/☐☐2013/		
/	/	Signature		
D Lactating Mother data				
D01	Name of lactating mother			

D02	Age of lactating mother in years		☐☐
D03	Telephone number (if possible)		
D04	Lactating mother educational attainment	1 Illiterate 2 Elementarylevel 3 Preparatorylevel 4 Secondarylevel 5 Vocationaleducation 6 Diploma 7 BA 8 Postgraduate	☐
D05	Does the lactating mother work outside home?	1 Yes 2 No, go to D07	☐
D06	If yes, specify type of work	1 Public sector employee 2 Private sector employee 3 NGO sector employee 4. INGO employee 5 Self-employed 6 Temporary employment	☐
D07	Husband educational attainment	1 Illiterate 2 Elementary level 3 Preparatorylevel 4 Secondarylevel 5 Vocationaleducation 6 Diploma 7 BA 8 Postgraduate 9 N/A, go toD10	☐
D08	Does the husband work?	1 Yes 2 No, go to D10	☐
D09	If yes, specify type of work	1 Public sector employee 2 Private sector employee 3 NGO sector employee 4. INGO employee 5 Self-employed 6 Temporary employment	☐
D10	Number of household members (persons living in the house, eating and drinking together in the last week)	/	☐☐
D11	Number of children under five	/	☐
D12	Last child's date of birth (day / month / year)	/	☐☐/☐☐/☐☐☐☐
D13	Last child sex	1 Male 2 Female	☐
D14	Do you know what foods increase your breast milk supply?	1 Yes 2 No, go to D16	☐
D15	If yes, which of the following foods increases your breast milk supply?	1 Halva with Tahini 2 Vegetables 3 Meat and eggs 4Milk 5Nuts 6 Black cumin 7 Dates 8 Fruits 9 Fenugreek 10 Fluids 11 Others	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
D16	Do you drink tea	1 Yes 2 No, go to D20	☐
D17	If yes, how many cups of tea do you drink per day?	**D1701** With sugar ☐☐ cups **D1702** Without sugar ☐☐ cups, go to D19	

D18	If you drink tea with sugar, how many spoons in one cup?	Number of spoons	☐
D19	If you drink tea, when do you drink it in relation to meals?	1 With themeal 2 Immediately after the meal 3 Two hours or more after the meal 4 I don't drinktea	☐
D20	If you drink coffee, when do you drink it in relation to meals?	1 With themeal 2 Immediately after the meal 3 Two hours or more after the meal 4 I don't drinkcoffee	☐
D21	Have you heard about the iodized salt?	1 Yes 2 No, go to D23	☐
D22	Where did you first hear about the iodized salt? (Do not read choices)	1 Radio 2 TV 3 Newspapers 4 Educationalsessions 5 Educationalleaflets 6 The physician 7 The nurse 8 Friends 9 Nutritionist 10 Healtheducator	☐
D23	Have you heard about the fortified flour?	1 Yes 2 No, go to D25	☐
D24	Where did you firsthear about the fortifiedflour? (Do not read choices)	1 Radio 2 TV 3 Newspapers 4 Educationalsessions 5 Educationalleaflets 6 The physician 7 The nurse 8 Friends 9 Nutritionist 10 Healtheducator	☐
D25	Do you follow any diet during lactation?	1 Yes 2 No	☐

E01 General Micronutrient Supplements Data			
E0101	Have you taken nutritional supplements during your last pregnancy?	1 Yes 2 No, go toE0107 3 Don't remember, go toE0107	☐
E0102	If yes, name them:	1 Folic acidpills 2 Iron and folic acid pills 3 Calcium pills 4 Othervitamins	☐ ☐ ☐ ☐
E0103	Who was the first to prescribe nutritional supplements to you?	1 Physician 2 Nurse 3 Healthworker 4 Myself 5 Nutritionist 6 Friend 7 Relative 8 Pharmacist	☐
E0104	Have you received instructions on how to use these supplements?	I Yes 2 No, go to E0106 3 Don't remember, go to E0106	☐
E0105	If yes, which source was the most to stress the use of supplements?	1 Physician 2 Nurse 3 Healthworker 4 Myself 5 Nutritionist 6 Friend 7 Relative 8 Pharmacist	☐
E0106	Have you complied with taking the required quantity of supplements?	1 Yes 2 No 3 Don't remember	☐
E0107	Was your last pregnancy with (name) a planned one?	1 Yes 2 No, go to E0201	☐

E0108	If yes, did you visit a physician before becoming pregnant?	1 Yes 2 No	☐
E02 Folic acid pills			
E0201	Have you taken folic acid pills prior to your last pregnancy?	1 Yes 2 No, go toE0301 3 Don't remember, go toE0301	☐
E0202	Have you complied with taking the prescribed folic acid?	1 Yes, go to E0301 2 No 3 Don't remember, go to E0301	☐
E0203	If no, why haven't you complied with taking the folic acid?	1 Was not prescribed by physician 2 Caused me health problems 3 Kept forgetting 4 Didn't feel it is important 5 Other	☐
E03 Folic acid and iron pills			
E0301	Have you taken folic acid and iron pills during your last pregnancy?	1 Yes 2 No, go to E0303 3 DK, go toE0303	☐
E0302	If yes, for what duration have you taken iron and folic acid pills during your last pregnancy?	Number of months	☐ ☐
E0303	Have you taken folic acid and iron pills after delivery?	1 Yes 2 No, go to E0310 3 DK, go toE0310	☐
E0304	If yes, for what duration have you taken iron and folic acid pills after delivery?	Number of months	☐ ☐
E0305	How many times have you taken the iron and folic acid pills after delivery?	1 Once a day 2 Twice a day 3 Three times a day 4 Once a week 5 Twice aweek 6 Three times a week 7 Once a month 8 Twice a month 9 Notregularly 10 Don't remember	☐
E0306	If you have not been taking iron and folic acid pills regularly after delivery, what is the main reason? (Select only one answer)	1 Tastes bad 2 I kept forgetting 3 Causes health problems 4 Didn't know why it is important for my health 5 Don't remember	☐
E0307	Who was the first to prescribe iron and folic acid pills to you after delivery?	1 Physician 2 Nurse 3 Healthworker 4 Myself 5 Nutritionist 6 Friend 7 Relative 8 Pharmacist	☐
E0308	Have you received instructions on how to use iron and folic acid pills after delivery?	1 Yes 2 No, go to E0310	☐
E0309	If yes, which source was the most to stress the need to take iron and folic acid pills after delivery?	1 Physician 2 Nurse 3 Healthworker 4 Myself 5 Nutritionist 6 Friend 7 Relative 8 Pharmacist	☐
E0310	Do you know why it is important to take iron and folic acid pills?	1 Yes 2 No, go to E0312	☐

E0311	If yes, tell me why is it important to take iron and folic acid pills? (Do not read choices, check all what she mentions)	1 Reduces the risk of anaemia during pregnancy and after delivery 2 Enhances and maintains iron reserves in the body of pregnant and lactatingwomen 3 Preserves the health of the foetus 4Other	☐ ☐ ☐ ☐
E0312	Do you know which foods are rich in iron?	1 Yes 2 No, go to E0314	☐
E0313	If yes, which of the following foods are a rich source of iron?	1 Green leafy vegetables 2 Legumes 3 Egg yolk 4 Liver 5 Molasses 6 Driedfruits 7 Meats 8 Dairyproducts 9 Other	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E0314	Do you know which foods increase iron absorption?	1 Yes 2 No, go to E0316	☐
E0315	If yes, which of the following foods increase iron absorption?	1 Foods rich in vitamin C, such as oranges and lemon 2 Fruit and vegetablejuice 3 Dairyproducts 4 Meats 5 Pickles 6 Coffee and tea 7DK	☐ ☐ ☐ ☐ ☐ ☐

E0316	Where do you get the iron and folic acid pills from?					
	Health provider	Yes			No	
		Available always	Available sometimes	Not available		
E03161	MOH	1	2	3	4	☐
E03162	UNRWA	1	2	3	4	☐
E03163	NGOs	1	2	3	4	☐
E03164	Private	1	2	3	4	☐
E03165	Medical missions	1	2	3	4	☐

E04 Vitamin A capsules
For lactating women attending UNRWA clinics

E0401	After giving birth to (name) have you received a vitamin A capsule in the clinic?	1 Yes 2 No 3 DK	☐
E0402	Do you know the importance of vitamin A?	1 Yes 2 No, go to F01	☐
E0403	If yes, tell me why vitamin A is important:	1 Preserves the skin and delays ageing symptoms 2 Enhances immunity 3 Improves sight and prevents night blindness	☐☐ ☐

F Health Education Data for the Lactating Mother			
F01	Have you received health education during your last pregnancy on good nutrition for lactating mothers?	1 Yes 2 No 3 DK	☐
F02	Have you received health education during your last pregnancy on preparation for breastfeeding?	1 Yes 2 No 3 DK	☐
F03	Have you received health education during your last pregnancy on exclusive breastfeeding?	1 Yes 2 No 3 DK	☐
F04	Have you received health education on complementary feeding for (name)?	1 Yes 2 No 3 DK	☐

G Lactating Mother's Health Status Data				
G01	During the past three months, have you been diagnosed with or received treatment for any of the following diseases?	1 Cardiovascular diseases 2 Diabetes 3 Hypertension 4 Anaemia	5 Cancer 6 Osteoporosis 7 I do not have any disease 8 Other	☐ ☐ ☐☐ ☐ ☐

H Lactating Mother's Smoking Data			
H01	Do you currently smoke cigarettes or hookah?	1 Yes 2 No, go to H04	☐
H02	If yes: (For less than one cigarette or hookah – record 0)	**H0201** Number of cigarettes per week	☐☐
		H0202 Number of hookah per week	☐☐
H03	For how long have you been smoking?	☐☐months☐☐years	
H04	Have you smoked before?	1 Yes 2 No, go to I01	☐
H05	If yes: (For less than one cigarette or hookah – record 0)	**H0501** Number of cigarettes per week	☐☐
		H0502 Number of hookah per week	☐☐
H06	When did you quit smoking?	**H0601** Number of months	☐☐
		H0602 Number of years	☐☐

I Lactating Mother's Physical Exercise Data				
I01	Have you practiced physical exercises after delivery?	1 Yes	2 No, go to J0101	☐
I02	If yes, how often have you practiced physical exercises?	1 Daily 2 1-3 times perweek 3 4-6 times perweek	4 Once permonth 5 1-3 times per month	☐

J01 Data on Frequency of Lactating Mother's Intake of Foods

This section addresses the consumption of various foods as stated in the following table as per your eating pattern.

Please, observe the following instructions when filling in the table:

7. Circle the cell that reflects the quantity of food/drinkconsumption.
8. Circle one cell only, which is the nearest to the level ofconsumption.
9. If not sure what the right answer is, the best option is not answer thequestion.

Code	Food	Didn't eat	1-3 times per month	Once per week	2-3 times per week	4-6 times per week	Once a day	Twice a day	3 times or more per day	/
J0101	Rice or pasta	1	2	3	4	5	7	7	8	☐
J0102	Potatoes	1	2	3	4	5	7	7	8	☐
J0103	Cereals / corn flakes	1	2	3	4	5	7	7	8	☐
J0104	Brown bread	1	2	3	4	5	7	7	8	☐
J0105	White bread	1	2	3	4	5	7	7	8	☐
J0106	Burghul	1	2	3	4	5	7	7	8	☐
J0107	Red meat	1	2	3	4	5	7	7	8	☐
J0108	Chicken	1	2	3	4	5	7	7	8	☐
J0109	Fish	1	2	3	4	5	7	7	8	☐
J0110	Sausage	1	2	3	4	5	7	7	8	☐
J0111	Eggs (any form)	1	2	3	4	5	7	7	8	☐
J0112	Milk or drinks with milk	1	2	3	4	5	7	7	8	☐
J0113	Dairy products: yoghurt, labneh, cheese	1	2	3	4	5	7	7	8	☐
J0114	Butter or margarine	1	2	3	4	5	7	7	8	☐
J0115	Fresh fruits	1	2	3	4	5	7	7	8	☐
J0116	Dried fruits	1	2	3	4	5	7	7	8	☐
J0117	Fresh vegetable s	1	2	3	4	5	7	7	8	☐
J0118	Soups	1	2	3	4	5	7	7	8	☐
J0119	Salads	1	2	3	4	5	7	7	8	☐
J0120	Legumes (lentils, beans, etc.)	1	2	3	4	5	7	7	8	☐
J0121	Nuts	1	2	3	4	5	7	7	8	☐
J0122	Water	1	2	3	4	5	7	7	8	☐
J0123	Bottled water, soda water	1	2	3	4	5	7	7	8	☐
J0124	Herbal drinks (anise, tisane)	1	2	3	4	5	7	7	8	☐
J0125	Chips	1	2	3	4	5	7	7	8	☐

Code	Food	Didn't eat	1-3 times per month	Once per week	2-3 times per week	4-6 times per week	Once a day	Twice a day	3 times or more per day	/
J0126	Soft drinks	1	2	3	4	5	7	7	8	☐
J0127	Energy drinks	1	2	3	4	5	7	7	8	☐
J0128	Fresh vegetable juice	1	2	3	4	5	7	7	8	☐
J0129	Fresh fruit juice	1	2	3	4	5	7	7	8	☐
J0130	Commercial juice	1	2	3	4	5	7	7	8	☐
J0131	Cakes and sweets	1	2	3	4	5	7	7	8	☐
J0132	Chocolate	1	2	3	4	5	7	7	8	☐
J0133	Fast food	1	2	3	4	5	7	7	8	☐
J0134	Tea with Sugar	1	2	3	4	5	7	7	8	☐
J0135	Tea without sugar	1	2	3	4	5	7	7	8	☐
J0136	Coffee	1	2	3	4	5	7	7	8	☐

K Breastfeeding Data				
K01	Have you ever breastfed (name)?	1 Yes	2 No, go to L01	☐
K02	How long after delivery did you start breastfeeding (name)?	1 Immediately 2 After one hour 3 After two hours 4 After three hours	5 In the first day 6 In the second day 7 In the firstweek 8 Don't remember /DK	☐
K03	Are you still breastfeeding (name)?	1 Yes	2 No, go to K06	☐
K04	Do you plan to continue breastfeeding (name)?	1 Yes 2 No	3 DK	☐
K05	If yes, specify for how long you expect to continue:	Number of months		☐☐

K06 For lactating mothers whose babies are less than 6 months of age
I would like to ask you about fluids that (name) may have taken yesterday during day or night. I am interested to know if (name) has taken such drinks even as part of other foods:

K0601	Has (name) taken pure water yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0602	Has (name) taken baby formula yesterday during day or night?	1 Yes	2 No, go to K0606	3 Don't remember, go to K0606	☐
K0603	How many times did (name) take baby formula?	Times			☐☐

K0604	Has (name) taken milk – canned, powdered, dried, or fresh animal milk, yesterday during day or night?	1 Yes	2 No, go to K0606	3 Don't remember, go to K0606	☐
K0605	How many times did (name) take canned, powdered, dried, or fresh animal milk?	Times			☐ ☐
K0606	Has (name) taken fruit juice or cocktail yesterday during day ornight?	1 Yes	2 No	3 Don't remember	☐
K0607	Has (name) taken soups yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0608	Has (name) taken vitamin or mineral supplements or any medicines yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0609	Has (name) taken oral dehydration solution yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0610	Has (name) taken any other fluids yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0611	Has (name) taken yoghurt yesterday during day or night?	1 Yes	2 No, go to K0613	3 Don't remember, go to K0613	☐
K0612	How many times did (name) take yoghurt yesterday during day or night?	Times			☐ ☐
K0613	Has (name) eaten porridge yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐
K0614	Has (name) eaten solid or semisolid (soft) foods yesterday during day or night?	1 Yes	2 No, go to K0616	3 Don't remember, go to K0616	☐
K0615	How many times did (name) eat solid or semisolid (soft) foods yesterday during day or night?	Times			☐ ☐
K0616	Has (name) taken anything in a bottle with teat yesterday during day or night?	1 Yes	2 No	3 Don't remember	☐

L Lab Tests (draw vein blood)					
L01	Lab technician drawing blood				
L02	Lab technician code		/		☐ ☐
L03	Did you have fever today or during the past week?	1 Yes	2 No	3 DK	☐
L04	Was the blood drawn?	1 Yes, completely 2 Yes, but incompletely		3 No, Blood draw was notsuccessful 4 No, sherefused	☐

M Lactating Mother's Anthropometric Data			
M01	Weight before pregnancy (kg)	/	☐☐ ☐.☐
M02	Weight gain during last pregnancy (kg)	/	☐☐. ☐
M03	Current weight (kg)	/	☐☐ ☐.☐
M04	Height (cm)	/	☐☐ ☐.☐ ☐
M05	Person taking measurements	/	/
M06	Number of person taking measurements		☐☐

N Comments by Field Researcher	
____________________ ____________________ __________	
N01	Date: ☐☐/ ☐☐/ ☐☐☐☐
N02	Field researcher number: ☐☐
	Field researcher name and signature:

O Comments by Team Leade	
____________________ ____________________ __________	
O01	Date: ☐☐/☐☐/ ☐☐☐☐
O02	Team leader number: ☐☐
	Team leader name and signature:

P Comments by Desk Reviewer	
____________________ ____________________ __________	
P01	Date: ☐☐/☐☐/ ☐☐☐☐
P02	Desk reviewer number: ☐☐
	Desk reviewer name and signature:

Q Data Enterer	
Q01	Date: ☐☐/☐☐/ ☐☐☐☐
Q02	Data enterer number: ☐☐
	Data enterer name and signature:

J01 Data on frequency of child's intake of foods

This section addresses the consumption of various foods as stated in the following table as per your child's feeding pattern.

Please, observe the following instructions when filling in the table:

10. Circle the cell that reflects the quantity of food/drinkconsumption.
11. Circle one cell only, which is the nearest to the level ofconsumption.
12. If not sure what the right answer is, the best option is not answer thequestion.

Code	Food	Several times per day	Once every day	4-6 times / week	2-3 times / week	Once per week	Sometimes	Never	Child's age (in months) when first consumed this food	/
J0101	Carrots	1	2	3	4	5	6	7	☐☐	☐
J0102	Potatoes	1	2	3	4	5	6	7	☐☐	☐
J0103	Spinach	1	2	3	4	5	6	7	☐☐	☐
J0104	Peas, beans	1	2	3	4	5	6	7	☐☐	☐
J0105	Cauliflower	1	2	3	4	5	6	7	☐☐	☐
J0106	Zucchini	1	2	3	4	5	6	7	☐☐	☐
J0107	Okra	1	2	3	4	5	6	7	☐☐	☐
J0108	Apple	1	2	3	4	5	6	7	☐☐	☐
J0109	Banana	1	2	3	4	5	6	7	☐☐	☐
J0110	Pears	1	2	3	4	5	6	7	☐☐	☐
J0111	Citruses	1	2	3	4	5	6	7	☐☐	☐
J0112	Peach	1	2	3	4	5	6	7	☐☐	☐
J0113	Strawberry	1	2	3	4	5	6	7	☐☐	☐
J0114	Rice	1	2	3	4	5	6	7	☐☐	☐
J0115	Pasta	1	2	3	4	5	6	7	☐☐	☐
J0116	Cereals / corn flakes	1	2	3	4	5	6	7	☐☐	☐
J0117	Bread	1	2	3	4	5	6	7	☐☐	☐
J0118	Breadcrumbs	1	2	3	4	5	6	7	☐☐	☐
J0119	Pastries	1	2	3	4	5	6	7	☐☐	☐
J0120	Cow milk	1	2	3	4	5	6	7	☐☐	☐
J0121	Flavouredmilk	1	2	3	4	5	6	7	☐☐	☐
J0122	Yoghurt	1	2	3	4	5	6	7	☐☐	☐
J0123	Labneh	1	2	3	4	5	6	7	☐☐	☐
J0124	Pudding	1	2	3	4	5	6	7	☐☐	☐
J0125	Meat	1	2	3	4	5	6	7	☐☐	☐
J0126	Chicken	1	2	3	4	5	6	7	☐☐	☐

Code	Food	Several times per day	Once every day	4-6 times / week	2-3 times / week	Once per week	Sometimes	Never	Child's age (in months) when first consumed this food	/
J0127	Fish	1	2	3	4	5	6	7	☐☐	☐
J0128	Baby teas	1	2	3	4	5	6	7	☐☐	☐
J0129	Tea with sugar	1	2	3	4	5	6	7	☐☐	☐
J0130	Tea without sugar	1	2	3	4	5	6	7	☐☐	☐
J0131	Tea with breadcrumbs	1	2	3	4	5	6	7	☐☐	☐
J0132	Tap water	1	2	3	4	5	6	7	☐☐	☐
J0133	Bottled water	1	2	3	4	5	6	7	☐☐	☐
J0134	Fruit juice	1	2	3	4	5	6	7	☐☐	☐
J0135	Commercial juice	1	2	3	4	5	6	7	☐☐	☐
J0136	Soft drinks	1	2	3	4	5	6	7	☐☐	☐

J02	Who is the person that usually decides the type of food and drink your child takes?	1 Me (the mother) 2 The father 3 Grandparent	4 Babysitter 5 Nursery 6 Siblings	☐

K Comments by Field Researcher
____ ____ _____________________________
K01 Date: ☐☐/ ☐☐/ ☐☐☐☐
K02 Field researcher number: ☐☐
Field researcher name and signature:

L Comments by Team Leader	
____ ____ _____________________________	
L01	Date: ☐☐/☐☐/ ☐☐☐☐
L02	Team leader number: ☐☐
	Team leader name and signature:

M Comments by Desk Reviewer	
____ ____ _____________________________	
M01	Date: ☐☐/☐☐/ ☐☐☐☐
M02	Desk reviewer number: ☐☐
	Desk reviewer name and signature:

N Data Enterer	
N01	Date: ☐☐/☐☐/ ☐☐☐☐
N02	Data enterer number: ☐☐
	Data enterer name and signature:

جامعة النجاح الوطنية

كلية الدراسات العليا

انتشار نقص العناصر الدقيقة وعلاقته بالعوامل الاجتماعية والممارسات التغذوية ومكملات العناصر الدقيقة بين النساء المرضعات: مخرجات المسح الفلسطيني للعناصر الدقيقة

إعداد

ريم دغلس

إشراف

د محمد التميمي

د جهاد عبدالله

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في التغذية وتكنولوجيا الغذاء بكلية الدراسات العليا في جامعة النجاح الوطنية، نابلس.

2021

انتشار نقص العناصر الدقيقة وعلاقته بالعوامل الاجتماعية والممارسات التغذوية ومكملات العناصر الدقيقة بين النساء المرضعات: مخرجات المسح الفلسطيني للعناصر الدقيقة

إعداد

ريم دغلس

إشراف

د محمد التميمي

د جهاد عبدالله

الملخص

تعاني النساء المرضعات في فلسطين من العديد من المشاكل الصحية المتعلقة بالتغذية بسبب العديد من العوامل. أهمها الفقر، وقلة الوعي الصحي، والتقاليد المجتمعية، والحصار المفروض من الاحتلال الإسرائيلي على قطاع غزة. أدت هذه الظروف إلى نقص في المعادن والفيتامينات على حساب الأمهات المرضعات وأطفالهن، مثل نقص فيتامين د، وفيتامين أ، والكالسيوم، والحديد، وفيتامين ب 12.لذلك، فإن الهدف من هذه الدراسة هو تحديد الحالة التغذوية والأمراض المصاحبة لنقص المكملات الغذائية لدى الأمهات الفلسطينيات المرضعات. بنيت الدراسة على المسح الاستقصائي (PMS) الذي أجرته وزارة الصحة الفلسطينية ليكون مصدرا للمعلومات قائما على الأدلة المعروضة للوضع الغذائي في دولة فلسطين، وكذلك لزيادة الدعم في الجانب الغذائي في فلسطين والمضي نحو مناقشات مستنيرة بين صانعي السياسات، والشركاء في التنمية، وغيرهم من أصحاب المصالح. كما ويمنح هذا المسح الاستقصائي تقييما وتوثيقا شاملا لجوانب مهمة متعقلة بالحالة التغذوية والصحية في فلسطين.

هذا وأجريت دراسة مقطعية تمثيلية على حالة المغذيات الدقيقة (توصيف المغذيات الدقيقة)، ومسببات الأنيميا ومدى انتشار فقر الدم، ونسبة تناول الدقيق المدعم بالمكملات الغذائية الدقيقة، وكمية استهلاك الملح المدعم باليود بين الأمهات المرضعات من عمر (18 سنة حتى 48 سنة)، وكانت نسبة النساء المرضعات اللاتي يعانين فقر الدم 20.2% في الضفة الغربية و 35.3% في قطاع غزة.

أظهرت هذه الدراسة وجود علاقة بين نقص المغذيات الدقيقة ونوع المجتمع، حيث بلغت نسبة المرضعات المصابات بنقص الزنك، 88.8٪ في الضفة الغربية و 92.7٪ في غزة. في حين بلغت نسبة المرضعات اللاتي يعانين من نقص فيتامين أ 33٪ في الضفة الغربية و92.7٪ في غزة. وبلغت نسبة المرضعات اللواتي يعانين من نقص الحديد في الضفة الغربية 2.7٪ وفي غزة 19.5٪. وأخيراً بلغ نقص فيتامين (د) 36٪ في الضفة الغربية و 24٪ في غزة.

أظهرت النتيجة أن العمر مرتبط بشكل كبير بنقص فيتامين أ ($P = 0.002$).

لم تظهر الحالة التغذوية علاقة بنقص المغذيات الدقيقة في الحديد والزنك وفيتامين أ ود، ومع ذلك فقد ثبت أن هناك علاقة بين الشوكولاتة والزنك ($P = 0.035$) ومنتجات الألبان والحديد.

خلصت الدراسة الحالية إلى أنه على الرغم من أن العديد من العوامل قد تلعب دورًا في فقر الدم والأمراض المصاحبة الأخرى، إلا أن هناك القليل من العوامل المرتبطة بوضوح بمثل هذه الحالات. كان فيتامين (أ) والزنك (Zn) هما الأكثر تأثيراً في انتشار نقص الحديد. مع ارتفاع مستوى النقص في كل من المغذيات الدقيقة، ينبغي ضمان السياسات واللوائح المناسبة.

توصي هذه الدراسة بتحسين خدمات رعاية ما قبل الولادة (ANC)، وتعزيز الوعي حول أهمية اتباع نظام غذائي صحي، وزيادة استهلاك الخضار والفواكه الغنية بفيتامينات أ وج. بالإضافة إلى ذلك، فإن اتباع الممارسات المنزلية التقليدية مثل طهي المنتجات الطازجة، ونقع البقوليات، وتخمير الألبان، وإنبات الحبوب أمر في غاية الأهمية لتقليل محتوى الفيتامينات للحبوب والبقوليات التي يستهلكها غالبية المشتركين في الدراسة.