Deanship of Graduate Studies
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Risk Factors of Stunting among Children under the Age of Five in Gaza Governorates

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Risk Factors of Stunting among Children under the Age of Five in Gaza Governorates

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Thesis Approval

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Dedication

To my beloved father, the greatest man I have in my life, my idol, the source of power and support to me during my whole life

To my precious mom, who her praying was the secret of my success, to the biggest heart with the most loving care

To my lovely brothers and sisters

Maysaa Sadi Al belbiesi

Declaration

I certify that this thesis submitted for the degree of Master, is the result of my own research, except where otherwise acknowledged, and this study (or any part of the same) has not been submitted for a higher degree to any other university or institution.

Signed:

Maysaa Sadi Al belbiesi

25/5/2018

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With respect,

Maysaa Sadi Al belbiesi

Abstract

Stunting has been identified as one of the major proximal risk factors for poor physical, mental development, educational performance and economic productivity .It's considered as one of the health problems as the prevalence of stunting among children under the age of five in Gaza Strip is 7.1%.

This case control study was carried out to identify the risk factors of stunting among children under the age of five in Gaza governorates.A total random sample of 450 childrenas cases and controls who were matched at age and sex with ratio (one case: one control) was taken from three health providers which are: five of the primary health care facilities of Ministry of Health, three health facilities of The Middle East Council of Churches Department of Service for Palestinian Refugees and two centers of Ard El Insan Palestinian Benevolent Association. Data was collected via interviewer-administrated questionnaire with the one of the parents; the response rate was 95%.

The male participation was 57.3% and the female participation was 42.7%, and the participation from the first year was 10.2%, the second year 35.1%, the third year 27.6%, the fourth year 15.6% and the fifth year participation was 11.6%

The multivariate analysis revealed that risk factors for stunting related to the child health were short length at birth P value .0001,suffering from chronic diseases P value .011, suffering from diarrheal disease P value.000*, admission to hospital because of diarrhea P value .003*, early starting weaning at the first month P value .0001*, frequency of complementary feedingless than 4 times P value .002* and consumption of milk less than three times per week P value .002*. Regarding the mother health: not having preconception care services P value .000*, having complication during the pregnancy P value .012*, andabnormal increase of the mother weight P value.010*. The socioeconomic factors related to stunting that were: first degree of consanguinity P value .001*, living in a refugee's camp P value .006* and low income (less than 1000 NIS per month) was statistically significant P value .000*. The environmental risk factors were: washing hand sometimes before meals P value .001*, living in house the ceiling wasasbestos P value .001*, living in house with poor ventilation P value .028* and exposure to pesticide was statistically significant P value .0001*.*

The study concludes that there are several factors leading to stunting among the children under the age of five, and in order to decrease the prevalence of stunting, the interventions should be at multilevel including child and mother health as well as the socioeconomic status and the surrounding environment.

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List of abbreviations:

AEI: Ard El Insan Palestinian Benevolent Association

AIDS:Acquired Immunodeficiency Syndrome

BMI: Body Mass Index

CI: Confidence Interval

CS: Cesarean Section

ECI: Equalized Crowding Index

GS: Gaza Strip

H//A: Height/Length-for-Age

Hb: Hemoglobin

HIV: Human Immunodeficiency Virus

IMF: International Monetary Fund

IUGR: Intra Uterine Growth Restriction

IVF: In Vitro Fertilization

LAZ: Length for Age Z score

LWB: Low birth weight

MOH: Ministry Of Health

NECC: Near East Council of Churches

NGO: Non-Governmental Organization

OR adj: Adjusted Odds Ratio

OR c: Crude Odds Ratio

PCBS: Palestinian Central Bureau of Statistics

PCC: Preconception care

PHC: Primary Health Care

SD: Standard Deviation

SPSS: Statistical Package for Social Science

UNICIF: United Nations Children's Emergency Fund.

UNRWA: United Nations Relief and Work Agency for Palestine Refugees in the Near East

WB: West Bank

WHO: World Health Organization

Chapter1

Introduction

1.1 Background

Malnutrition problems continue to be a major health burden in developing countries. It is globally the most important risk factor for illness and death, with hundreds of millions of pregnant women and young children particularly affected(Müller and Krawinkel, 2005).It's importance that the malnutrition is determinant of mortality and morbidity in young children worldwide and especially at developing countries. It is associated with 50 percent of all deaths in children under five years of age(Goday et al, 2017).

In monitoring growth of children there are three most commonly used anthropometric indices to assess their growth status that included weight-for-height (Wasting), height-for-age (Stunting) and weight-for-age (Underweight)(WHO, 2017b). Linear growth faltering occurs when a child is not growing in length or height in accordance with his potential. A child is considered to be stunted when his/her length/height-for-age (H//A) falls below −2 standard deviations (SDs)of the World Health Organization (WHO) child growth standard median(Onis, 2006).

Childhood stunting is the best overall indicator of children's well-being and an accurate reflection of social and political inequalities. About 155 million children globally are stunted, resulting from not enough food, a vitamin- and mineral-poor diet, inadequate child care and disease. As growth slows down, brain development lags and stunted children learn poorly(WHO, 2017a). Stunting rates among children are highest in Africa and Asia. In Eastern Africa 37% were affected as of 2016 and 34% in Southern Asia (ibid).Stunting is a major health problem in children under the age of five years in many low and middle

income countries around the world. Stunting could lead to impaired physical development and have a long-term effect on cognitive development, educational performance and economic productivity in adulthood and on maternal reproductive outcomes(Akombi et al, 2017).

There is a global agreement on a critical window—from conception through the first 2 years of life (0–23 months)—within which 70% of stunting occurs. This linear growth deficit continues to deteriorate till the age of five due to sustained exposure to unpleasant environmentally modifiable factors related to feeding, infections and psychosocial care. The continued decline in linear growth observed in the first 5 years of life may cause severe irreversible physical and neurocognitive damage that accompanies stunted growth and pose a major threat to human development(Leroy et al, 2014).

1.2 Problem statement

In Palestine, stunting among children under the age of five is considered as one of the health problems that facing the health community in the Gaza Strip (GS)as the prevalence of stunting among children under the age of five in Palestine is 7.4%, in the Gaza Strip 7.1% of children under the age of five are stunted and 7.7 % in West Bank(WB)(PCBS, 2014). Stunting is considered as reflection of the political inequalities and circumstances in GS. Most of the Palestinian studies concerned with the incidence and prevalence of stunting among the children and few studies concerned with the main risk factors that are leading to stunting, because of that the researcher would like to identify the risk factors of stunting in this age group. As it's necessary to detect the determinants and risk factors of stunting among children under the age of five in Gaza governorates, in order to help in reducing the incidence of the problem and avoiding the resulted health problems from stunting.

1.3 Justification

Efforts to combat hunger and malnutrition have advanced significantly since 2000. Ending hunger, food insecurity and malnutrition for all, however, will require continued and focused efforts, especially in Asia and Africa. More investments in agriculture, including government spending and aid, are needed to increase capacity for agricultural productivity(Council, 2016).

Globally, the stunting rate fell from 33 per cent in 2000 to 23 per cent in 2016. Southern Asia and sub-Saharan Africa accounted for three quarters of all stunted children that year (ibid).

The stunting problem became a public health issue; a study of the main risk factors of the stunting in children at preschool stage is highly needed.As it has severe short-term and long-term health and functional consequences, including poor cognition and educational performance, low adult wages and lost productivity. There is consensus regarding its definition and a robust standard to define normal human growth that is applicable everywhere(Onis and Branca, 2016).

There is agreement on a critical window – from conception through the first 2 years of life – within which linear growth is most sensitive to environmentally modifiable factors related to feeding, infections and psychosocial care. Also, it is a cross-cutting problem calling for a multisectorial response. Action to reduce stunting requires improvements in food and nutrition security, education, WASH (water, sanitation and hygiene interventions), health, poverty reduction and the status of women(Onis and Branca, 2016).

The stunting problem is irreversible problem but can be prevented by improving the nutrition status of the child in the first 1000 days. Stunting problem often begins in the

utero due to maternal malnutrition and continues to the first two years of life due in part to inadequate hygiene and infant and young child feeding practices, and reflects a failure to reach one's genetic potential for height(Golden, 2009).

The major concern of stunting problem is having short and long term effects on child health as well as has economic effects on health services. These effects including: increasing the mortality and morbidity among children and developmental delays that can significantly and adversely impact a person's ability to learn (both during and after the years in school), thereby limiting their ability to reach their full potential. It is associated with impaired socio-emotional, motor, and cognitive development (Gardner et al, 1999). A stunted child may have altered socio-emotional behaviors, including increased apathy, negative affect (e.g., crying and fussiness), and reduced activity, play, and interest in exploring their environment (ibid).

This lack of interest in exploring their surroundings and negative behaviors often reduces the level of stimulation children receive from their interactions with the environment and their caregiver, further impeding their development(Yousafzai et al, 2013).

Stunting is associated with poor performance on cognitive tests, including deficits in literacy, numeracy, reasoning, and vocabulary, among others(Grantham and Baker, 2005). It is also associated with lower overall school achievement, and stunted children are more likely to be older at school enrollment, repeat grades, be absent from school, drop out of school, and fail at least one grade(Grantham et al, 2007). Losses in learning are not only related to fewer overall years in school and therefore lost learning potential, but once children are actually in school they have a reduced capacity to learn, meaning they learn less per school year (ibid).

This loss in learning among stunted children has a direct impact on their income-earning potential in the future; it was estimated that every additional year of schooling increases adult yearly income by 9 percent (ibid).Among females, shorter adult stature has important implications for pregnancy outcomes. Maternal stunting (<145 cm) is a consistent risk factor for prenatal mortality(Lawn et al, 2005), likely due to an increased risk of obstructed labor and asphyxia at birth. Briefly, the short term effects of stunting are: increasing the mortality and morbidity, delay in cognitive, motor and language development and increase health expenditure as increasing the chances of stunted child getting sick. The long term effects including: decrease in stature and exposed to obesity and associated co morbidities, decrease in the productive health, decrease in school performance and decrease in work capacity and productivity(Stewart et al, 2013).

1.4 The overall aim

To identify the risk factors and determinants associated with stunting among the children under age of five in the Gaza Strip (GS).

1.5 Objectives

• To study the association between stunting and child and mother health and nutrition status.

• To explore the relationship between stunting and the socioeconomic status of the child's family.

• To identify the parental risk factors of stunting.

• To identify the environmental circumstances that could increase the chances of being stunted.

• To suggest recommendations that may help in decreasing the prevalence of stunting based on the results of the study.

1.6 Context of study

1.6.1 Demographic characteristics of Gaza governorates

The Gaza Strip is a small Area of Palestine on the eastern coast of the Mediterranean Sea in the southern area of Palestine, with estimated population 1.94 million. The population of children under the age of five is about 316,663. The Gaza Strip is divided into five governorates: North Gaza, Gaza City, Mid Zone, Khanynis and Rafah (PCBS, 2017). Population of Palestine is generally high at 800/Km2, particularly in Gaza Strip it is 5,154 persons/km2 compared to a lower population density in the West Bank of 519 persons/km2 at mid-2016(PCBS, 2016).The total fertility rate in 2015 was 4.06(Courbage .Y, 2016)

1.6.2 The socio economic situation

After a decade of near isolation, an escalating humanitarian crisis looms over Gaza. Since 2007, Gaza has experienced near constant closure of its borders, and economic and political relationships with the West Bank have been curtailed. An analysis suggests that political uncertainty and conflict contributed to a virtual collapse in Gaza's productive capacity, severely impairing infrastructure and the provision of basic services (power, clean water, medical assistance). With the widening gap between per capita income in Gaza and the West Bank, soaring youth unemployment, and diminished personal savings, Gaza have few remaining economic buffers(IMF, 2018).

Years of conflict and blockade have left 80 per cent of the population dependent on international assistance. The economy and its capacity to create jobs have been devastated, resulting in the impoverishment and de-development of a highly skilled and well-educated

society. The average unemployment rate is well over 41 per cent – one of the highest in the world, according to the World Bank. The number of Palestine refugees relying on UNRWA for food aid has increased from fewer than 80,000 in 2000 to almost one million today (UNRWA, 2016).

The average housing density in Palestine was 1.7 persons per room. The averagefor the West Bank was 1.6 compared with 1.9 persons per room in Gaza Strip.1.1% of households in Palestine lived in a villa, 44.6% lived ina house, and 53.7% lived in an apartment.People who live under poverty in Gaza Strip is about 38.8% and people who live under deep poverty about 21.1% in 2011 (PCBS, 2016).

1.6.3 Health care system

The health system in Gaza is composed of primary, secondary and tertiary care services. The main health care providers are the Ministry of Health (MOH), UNRWA, NGO's, and the private for-profit service providers sector. With such multitude of service providers there are numerous challenges in providing a well-coordinated, standardized health service provision during normal times and frictions are deemed to exacerbate during emergencies(WHO, 2014).

MOH is the main health care provider in the governorates; it provides PHC, secondary and tertiary services for the whole population. It purchase advanced medical services through referring patients to the neighboring countries and other private and NGO health care facilities. It has been seriously affected by the financial crisis being experienced by the Palestinian Authority. In particular, there have been reductions in the numbers of patients being referred outside the occupied Palestinian territory for specialized treatment and there have been growing and substantial shortages of medicines and disposables(WHO, 2013).

UNRWA provides health-care services to the vast majority of the over 1.2 million Palestine refugees in Gaza Strip through 22 medical centers, providing primary health care(PHC) and purchasing secondary and tertiary health care services (UNRWA, 2016).

1.6.4 Water, Sanitation and Hygiene status in GS

The Gaza Strip is facing immense challenges related to water, sanitation and hygiene (WASH), which pose significant health risks to its 1.8 million residents and constrain socioeconomic development. Groundwater from the coastal aquifer is the only water resource available in the Gaza Strip(UNICEF, 2017b). The water supply in the Gaza Strip is estimated at 90 l/c/d, below acceptable water quantity standards of 100 l/c/d recommended by the World Health Organization (WHO). Furthermore, the absence of sufficient wastewater treatment facilities results in approximately 35 MCM/year of untreated/partially treated wastewater discharged into the sea along the Gaza coast. The deteriorated WASH situation has been compounded by nine years of blockade and three consecutive destructive wars. The consequences of the last armed conflict in 2014 are still affecting the WASH sector in direct and indirect ways by limiting the capacity to develop and deliver basic needs and services to people living in the Gaza Strip (ibid).

Fifty days of continuous attacks caused massive destruction, devastation and displacement. Extensive damage to water and wastewater facilities reported by the Coastal Municipalities Water Utilities (MWU) and the Palestinian Water Authority (PWA) has received a preliminary estimate of around US$ 34 million. The reconstruction process is going slowly (ibid).

1.6.5 Child health care services

The primary health care facilities of MOH provides child health services for children under the age of five as preventive and curative services including immunizations, child examination and assessment, lab tests and giving supplements and drugs. Also MOH provides secondary and tertiary health care services through specialized hospitals for children (MOH, 2016).

UNRWA provides care for children across the phases of the life cycle, with specific interventions to meet the health needs of newborns, infants under 1 year of children, children under 5 years of age and school-age children. Both preventive and curative care is provided, with a special emphasis on prevention. Services include newborn assessment, well-baby care, periodic physical examinations, immunization, growth monitoring and nutritional surveillance, micronutrient supplementation, preventive oral health, school health services and care of sick children, including referral for specialist care.Growth and nutritional status of children under 5 is monitored at regular intervals through UNRWA health services. Breastfeeding is promoted and mothers are counseled on infant and child nutrition, including the appropriate use of complementary feeding and micronutrient supplements. A new electronic growth monitoring system, based on the revised WHO growth monitoring standards, was introduced in pilot health centers during 2011. The system documents the four main growth and nutrition-related problems among children under 5: underweight, wasting, stunting and obesity(UNRWA, 2016).

Other health providers like NGOs also provide health services for child, one of them is Ard El Insan Palestinian Benevolent Association (AEI) which provides prevention and treatment services for common childhood diseases, supporting and encouraging community participation of the poor group in the development process, networking and

cooperation with international institutions in the field of nutrition and general health of the child, contribute to the achievement of food security at the individual and family levels and developing the capacities of workers in the field of common childhood diseases and community development.The Middle East Council of Churches Department of Service for Palestinian Refugees (NECC) also aims to provide primary health services in poor crowded areas that lackin health services, enhancing the public and environmental health in these areas, it covers the main health services for child and mother health as well as the psychosocial support programs and health problems related to malnutrition.

1.7 Operational definitions

1.7.1Preterm birth: Preterm is defined as babies born alive before 37 weeks of pregnancy are completed (WHO, 2017c).

1.7.2 Low birth weight (LBW): Low birth weight has been defined by the World Health Organization (WHO) as weight at birth of less than 2,500 grams(Wardlaw, 2004).

1.7.3 Chronic Diarrhea: Chronic diarrhea is defined as loose stools that last for at least four weeks. This usually means three or more loose stools per day (Lamont and Friedman, 2016)

1.7.4 Complementary food: The transition from exclusive breastfeeding to family foods, referred to as complementary feeding, typically covers the period from 6 to 24 months of age, and is a very vulnerable period (WHO, 2005)

1.7.5Anemia: Anemia is a condition in which the number of red blood cells and consequently their oxygen-carrying capacity is insufficient to meet the body's physiologic needs (WHO, 2010).The normal hemoglobin concentration for children is above 11 g/dl, anemia is divided into three types according to decrease in Hb concentration: mild anemia

10-10.9 g/dl, moderate anemia 7-9.9 g/dl and severe anemia which the Hb is less 7 g/dl(WHO, 2015)

1.8 Study Layout

The study consists mainly of five chapters: introduction, conceptual framework and literature review, methodology, results and discussion, conclusion and recommendation.

The first chapter presented general introduction to the study, where a brief background regarding the subject of the study was provided. The researcher illustrated the problem statement, justification for conducting the study, the general goal and specific objectives, research questions, definition of terms and context of the study. The second chapter included two parts; conceptual framework where the researcher provided a schematic diagram of the conceptual framework of the study, and the second part presented the literature review related to the study topic and variables. In depth detailed theoretical inquiry including previous studies were presented to enrich the study. The third chapter described methodology including study design, population, sample, instruments, pilot study including validity and reliability of study instruments, ethical considerations and statistical procedures.

The fourth chapter presented the study results and discussion. The researcher presented the results in form of figures and tables that make it easy for the reader to understand and make comments. The results were discussed in relation to available previous studies that directly related to the topic of this study and its objectives.

Finally, in the fifth chapter, the researcher presented conclusion, recommendations and suggestions for further research that related to the study results and open a horizon for other researchers to work on this conception and its effect on our work environment.

Chapter 2

Conceptual framework and literature review

This chapter summarizes the arguments and related studies to the main study concept which is the identification of the main risk factors and determinants of stunting among children under the age of five in Gaza Strip. This is described after introducing the conceptual framework of this study.

2.1 Conceptual framework

According to the literature review, the main risk factors associated with stunting among the children under the age of five that are studied in this research as drawn in the conceptual frameworkinclude: Figure (2.1)

Child health related risk factors: The childhood undernutrition may have its origins in the foetal period, ideally during pregnancy, with interventions known to reduce fetal growth retardation and preterm birth that causing the malnutrition problems in the first two years of life including stunting (Christian et al, 2013). Boys are more vulnerable to be stunted than girls(Kandala et al, 2011). On average low body weight (LBW) babies have six times or even more risk to become stunted compared to their respective counterparts (Hien and Kam, 2008). Poor complementary feeding has been identified as a risk factor associated directly with stunting (Bhutta et al, 2013). Exclusive breastfeeding of infants under 6 months is associated with higher mean length for age Z score (LAZ) (Kuchenbecker et al, 2015).Inadequacies in micronutrient nutrition may arise from low dietary diversity, limited or no intake of animal source foods and high anti-nutrient content like flavonoids is group of anti-nutrients found in “healthy” sources, including tea, coffee and certain other whole

plant foods.(Stewart et al, 2013). Poor absorption of nutrients due to parasites or intestinal infection or the combination of these factors are considered the most common immediate causes of poor growth among children in developing countries (Allen and Gillespie, 2001). One of the significant independent risk factors for stunting are: age, anemia and moderate and heavy Trichuris and Ascaris co-infection that cause diarrhea (Casapía et al, 2006).

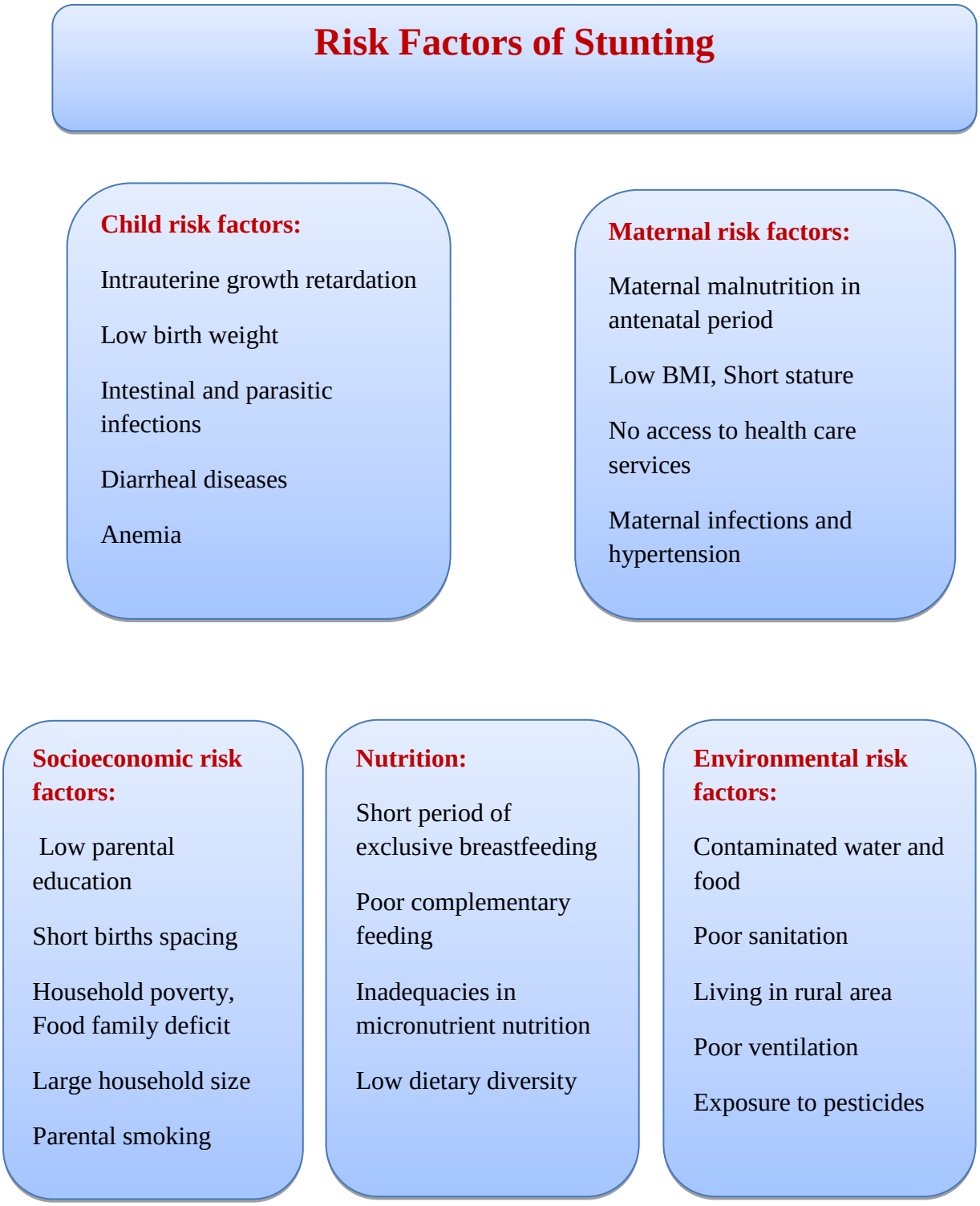
Maternal risk factors:Adolescent pregnancy interferes with nutrient availability to the fetus due to the competing demands of ongoing maternal growth (Prakash et al, 2011). Periconceptional conditions including the pre-pregnancy nutritional status of the mother, as well as her energy and nutrient intake, influence the early processes of growth and development (Gluckman and Pinal, 2003). Maternal depression in the prenatal and postnatal periods predicts poorer growth and higher risk of stunting(Rahman et al, 2004).Maternal education is a strong predictor of child stunting with some minimal attenuation of the association by other factors at maternal, household and community level (Abuya et al, 2012). Children whose mothers had Body Mass Index (BMIs) less than 18.5 were more likely to be stunted (Chirande et al, 2015). Maternal age, stature, education and access to health care are important determinants of the child's health status (ibid).Maternal infection related to malaria, helminthes, HIV/AIDS and other conditions may lead to intra uterine growth retardation and later stunted growth in the infant (Luxemburger et al, 2001). Hypertension during pregnancy may also lead to adverse nutrition outcomes for the offspring (Thangaratinam et al, 2012).Stunting associated with short maternal height, younger maternal age, smoking, illicit drug use and clinically suspected intrauterine growth restriction (Victora et al, 2015).

Socioeconomic risk factors : In families having more than three children, the children were on average four or even more times are more likely to be underweight, stunted and wasted compared to those having less than three children (Hien and Kam, 2008). Short

birth spacing increases the risk for depleted maternal reserves in subsequent pregnancies, with negative consequences for both mother and child (Dewey and Cohen, 2007). Low caregiver education shows a strong and consistent relationship with poor child nutrition outcomes, and likely drives other caring practices associated with stunted development and growth (Imdad et al, 2011).Dietary intake may be affected by caregiver neglect or absence.Household poverty may lead to food insecurity (Hong, 2007).Bigger household size and a higher number of children younger than five years old were associated with stunting (Rannan-Eliya et al, 2013).

Environmental risk factors: It has been found that rural children have a higher risk to become stunting compared to urban children (Hien and Kam, 2008).Environmental risk factors for stunting consisted of kitchen without ventilation and children exposed to pesticide (Paudel et al, 2013). Household-level hygiene practices such as hand washing, safe water source and storage, and sanitation conditions affect the risk of diarrhea and other morbidities interfering with growth (Fink et al, 2011). Food preparation techniques such as inadequate cleaning or cooking time can also increase the risk of contamination (Khlangwiset et al, 2011).

Figure (2.1) Conceptual framework



2.2 Literature review

2.2.1 Importance of nutrition in the first 1000 days

It is now well established that nutrition during the first 1000 days of life (starting from pregnancy until the second birthday is crucial for a child's survival and development).Deprived fetal development and low birth weight have been associated with increased risk of coronary heart diseases, diabetes, hypertension and stroke(Rakotomanana, 2016).

Nutritional stress during intrauterine life is one of the factors that has been suggested to trigger such changes, on the other hand, several nutrients have been shown to have multiple impacts on a child's neurodevelopment, and thus to influence the child's psychosocial abilities as well as academic performance. Specifically, deficits in protein, iron, zinc, copper or choline during pregnancy will affect the infant's brain size, as well as cognitive and motor development. Fetal nutrition is then critical for a child's development and will determine his/her abilities as an adult. Additionally, over the past decades the World Health Organization (WHO) has emphasized the importance of infant feeding during the first two years of life, as it will have a direct influence on the nutritional status of the child, then on health and survival (Rakotomanana, 2016).

Exclusive breastfeeding of infants from birth through initial 6 months using breast milk (the ideal food during this period) is important for optimal health, growth, and development. As infants grow and become more active following the first 6 months of life, breast milk alone falls short of providing the full nutritional requirements – where the gap keeps expanding with the increasing age of the infants and young children. Complementary feeding plays critical role in bridging these gaps(Abeshu et al, 2016).

The target age range for complementary feeding is between the age of 6 and 23 months (with continued breastfeeding), where most infants reach a general and neurological stage of development (chewing, swallowing, digestion, and excretion) that enables them to be fed other foods rather than breast milk(Monte and Giugliani, 2004).

2.2.2 Malnutrition

Malnutrition refers to deficiencies, excesses or imbalances in a person's intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is 'under nutrition' which includes stunting (low height/ length for age), wasting (low weight for height/length), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). The other is overweight, obesity and diet-related non communicable diseases (such as heart disease, stroke, diabetes and cancer (WHO, 2016).

Nearly half of all deaths in children under 5 are attributable to under nutrition. This translates into the unnecessary loss of about 3 million young lives a year. Under nutrition puts children at greater risk of dying from common infections, increases the frequency and severity of such infections, and contributes to delayed recovery. In addition, the interaction between under nutrition and infection can create a potentially lethal cycle of worsening illness and deteriorating nutritional status. Poor nutrition in the first 1,000 days of a child's life can also lead to stunted growth, which is irreversible and associated with impaired cognitive ability and reduced school and work performance(UNICEF, 2017a).

Malnutrition, the result of a lack of essential nutrients, resulting in poorer health, may be caused by a number of conditions or circumstances. In many developing countries long-term (chronic) malnutrition is widespread - simply because people do not have enough food to eat(Nordqvist, 2016).

In the poorer nations malnutrition is commonly caused by: Food shortages: In these developing nations food shortages are mainly caused by a lack of technology needed for higher yields found in modern agriculture, such as nitrogen fertilizers, pesticides and irrigation. Food shortages are a significant cause of malnutrition in many parts of the world. Food prices and food distribution: It is ironic that approximately 80% of malnourished children live in developing nations that actually produce food surpluses (Food and Agriculture Organization). Some leading economists say that famine is closely linked to high food prices and problems with food distribution. Lack of breastfeeding: The lack of breastfeeding, especially in the developing world, leads to malnutrition in infants and children. In some parts of the world mothers still believe that bottle feeding is better for the child (Nordqvist, 2016).

2.2.3 Stunting

Stunting is identified by assessing a child's length or height (recumbent length for children less than 2 years old and standing height for children age 2 years or older) and interpreting the measurements by comparing them with an acceptable set of standard values. There is international agreement that children are stunted if their length/height is below −2 SDs from the WHO Child Growth Standards median for the same age and sex. Similarly, children are considered severely stunted if their length/height is below −3 SDs from the WHO Child Growth Standards median for the same age and sex(Onis and Branca, 2016).

In 2015, 23.2 percent of children under age 5 worldwide had stunted growth. Between 1990 and 2015, stunting prevalence globally declined from 39.6 percent to 23.2 percent, and the number of children affected fell from 255 million to 156 million. In 2015, just two out of every four stunted children lived in South Asia and one in three in sub-Saharan Africa(UNICEF, 2017a).In Palestine 7.4% of children under the age of five are stunted, in

Gaza Strip 7.1% of children under the age of five are stunted and in West Bank 7.7 % of the children under the age of five are stunted(PCBS, 2014).

2.2.4 Risk factors of stunting:

In an effort to better understand the underlying causes of stunting; several studies have been done in various countries, in attempt to define the determinants of child undernutrition.

2.2.4.1 Maternal risk factors: Stunting often begins very early in life, typically in utero, and generally continues during the first two post-natal years. Most of the decline in length-for-age occurs during the complementary feeding period, between 6 and 24 months of age(Dewey and Huffman, 2009),Periconceptional conditions including the pre-pregnancy nutritional status of the mother, as well as her energy and nutrient intake, influence the early processes of growth and development(Gluckman and Pinal, 2003). Maternal depression in the prenatal and postnatal periods predicts poorer growth and higher risk of diarrhea in sample of infants,and the relative risks for stunting were 4.4 at 6 months of age and 2.5 at 12 months of age(Rahman et al, 2004).Mother education is a crucial determinant of child malnutrition. It has been found that mother education has a linear association with child's stunting. The highest prevalence of stunting was found among the mothers with no schooling and followed by mothers with primary education(Kandala et al, 2011).Maternal education is a strong predictor of child stunting with some minimal attenuation of the association by other factors at maternal, household and community level (Abuya et al, 2012), Maternal education had an indirect effect on stunting largely through socio-economic status and the antenatal environment (Casale et al, 2018). Poor maternal nutritional status at conception and undernutrition in utero(Allen and Gillespie, 2001). Children whose mothers had BMIs less than 18.5 were more likely to be stunted (Chirande

et al, 2015).The high levels of maternal and paternal education were both associated with protective caregiving behaviors. Both maternal and paternal education is strong determinants of child stunting (Walker et al, 2007). Mother's age at child's birth was a significant predictor of stunting: infants aged 0-23 months whose mothers gave birth for the first time at an age younger than 20 were more likely to be stunted,thus, maternal age, stature, education and access to health care are important determinants of the child's health status(Chirande et al, 2015). Maternal infection related to malaria, helminthes, HIV/AIDS and other conditions may lead to IUGR and later stunted growth in the infant(Luxemburger et al, 2001).Adolescent pregnancy interferes with nutrient availability to the fetus due to the competing demands of ongoing maternal growth(Prakash et al, 2011).Hypertension during pregnancy may also lead to adverse nutrition outcomes for the offspring(Thangaratinam et al, 2012).Mothers with a BMI less than 18.5 were more likely to have children with severely stunted growth than mothers whose BMI is greater than 25(Akombi et al, 2017).Stunting associated with short maternal height, younger maternal age, smoking, illicit drug use and clinically suspected intrauterine growth restriction(Victora et al, 2015).

2.2.4.2 Child risk factors: The childhood undernutrition may have its origins in the foetal period, suggesting a need to intervene early, ideally during pregnancy, with interventions known to reduce fetal growth retardation and preterm birth that are causing the malnutrition problems in the first two years of life including stunting (Christian et al, 2013). Sex is an important determinant for childhood undernutrition. Boys are more vulnerable to be stunted than girls (Altare et al, 2016; Kandala et al, 2011). The most consistent significant risk factors for stunting and severe stunting among children aged 0–59 months are: sex of child (male), mother's perceived birth size (small and average), and children who were reported to having diarrhea(Akombi et al, 2017).

Low birth weight (LBW) leads children to all forms of undernutrition like underweight, stunting and wasting. On average LBW babies have six times or even more risk to become underweight, stunted and wasted compared to their respective counterparts (Hien and Kam, 2008).A higher prevalence of stunting is found among under five children who are deprived from colostrum (Kumar et al, 2006). The 6–24 months age period is important because as the child is introduced to foods other than breast milk and becomes increasingly more independent and mobile, the environmental factors influencing growth and development multiply, so poor complementary feeding has been identified as a risk factor associated directly with stunting(Bhutta et al, 2013).

Exclusive breastfeeding of infants under 6 months is associated with higher mean Length for Age Z score (LAZ) (Kuchenbecker et al, 2015).Duration of exclusive breastfeeding is an important determinant of child nutritional status. Children of mothers who were exclusively breastfeeding their infants for less than six months, had a higher risk on being stunted compared to the children whose duration of exclusive breastfeeding is up to six months (Hien and Kam, 2008).

Infant feeding practices is a strong determinant of stunting among the under-five year children. Studies have shown that the proportion of stunted children is significantly lower whose mothers initiated breastfeeding within six hours of birth(Kumar et al, 2006). A poor quality food is one of determinants negatively impacting infant and young child growth. Inadequacies in micronutrient nutrition may arise from low dietary diversity, limited or no intake of animal source foods, and high anti-nutrient content such as phytates and polyphenols in the plant-based diets of many poor populations. Another factor is the inadequate practices. These include infrequent feeding; excessively dilute feeds with low energy density, inadequate feeding during illness, providing insufficient quantities of food and non-responsive feeding(Stewart et al, 2013).

Inappropriate or inadequate breastfeeding, delayed and inadequate complementary feeding, poor absorption of nutrients due to parasites or intestinal infection or the combination of these factors are considered the most common immediate causes of poor growth among children in developing countries(Allen and Gillespie, 2001).

Babies that were perceived to be small at time of birth are more prone to being severely stunted than large babies. Children that had a recent episode of diarrhea were more likely to have severely stunted growth than children who had not. Children from the poorest households were more likely to be severely stunted than children from richest households(Akombi et al, 2017).

One of the significant independent risk factors for stunting are:age, anemia and moderate and heavy Trichuris and Ascaris co-infection that cause diarrhea (Casapía et al, 2006).Another study demonstrated that children experiencing diarrhea during the two weeks before the survey have a higher risk for being underweight, stunted and wasted(Hien and Kam, 2008). Diarrheal disease, respiratory illnesses, malaria, fever and helminthes infection are known determinants acting variously through inflammation and nutrient diversion, sequestration or loss (Hall et al, 2008). Checkley et al. have estimated that 25% of the burden of stunting could be attributed to five or more episodes of diarrhea occurring prior to the age of 2 years(Checkley et al, 2008).

2.2.4.3 Socioeconomic risk factors: The bi-directional pathway between poverty and undernutrition is well known. Disparities in stunting prevalence by wealth strata reflect this relationship(Black et al, 2013). In families having more than three children, the children were on average four or even more times are more likely to be underweight, stunted, wasted compared to those having less than three children (Hien and Kam, 2008).

Short birth spacing increases the risk for depleted maternal reserves in subsequent pregnancies, with negative consequences for both mother and child (Dewey and Cohen, 2007).Low caregiver education shows a strong and consistent relationship with poor child nutrition outcomes, and likely drives other caring practices associated with stunted development and growth (Imdad et al, 2011). Children born to educated fathers were less likely to be stunted when compared with children born to uneducated fathers. Also, children who were born to educated mothers and breastfed were less likely to be severely stunted when compared with children who were born to uneducated mothers and not breastfed(Akombi et al, 2017).

Dietary intake may be affected by caregiver neglect or absence. Inadequate child stimulation and activity can interact with poor nutrition to impede development through multiple pathways. Household poverty may lead to food insecurity(Hong, 2007).One of the most recognizable determinants of stunting and underweight in general is household wealth(Rakotomanana, 2016).Bigger household size and a higher number of children younger than five years old were associated with lower H/A(Rannan-Eliya et al, 2013).Children living in households with eight to ten and five to seven family members were more likely to be stunted than those living in households with two to four family members. Similarly, children living in households with three under-five children were more likely to develop stunting than those living in households with one under-five child(Fikadu et al, 2014).

2.2.4.4 Environmental risk factors: Environmental determinants of infection, inflammation and undernutrition are important underlying factors contributing to unhealthy growth and development. Contaminated water and poor sanitation have been estimated to cause 5.4 billion cases of diarrhea and 1.6 million deaths per year (Hutton et al, 2004). It has been found that rural and mountainous children have a higher risk to become

undernourished for all three forms of anthropometric indices (underweight, stunting and wasting) compared to urban children(Hien and Kam, 2008).

Environmental risk factors for stunting consisted of kitchen without ventilation and children exposed to pesticide(Paudel et al, 2013). Food and water safety, relates primarily to the infection pathway to stunted growth, but may also contribute through inorganic contaminants and environmental pollutants(Weisstaub and Uauy, 2012). Household-level hygiene practices such as hand washing, safe water source and storage, and sanitation conditions affect the risk of diarrhea and other morbidities interfering with growth(Fink et al, 2011).Food preparation techniques such as inadequate cleaning or cooking time can also increase the risk of contamination. Recently there has been renewed interest in the role of mycotoxins, such as aflatoxin, in child growth faltering (Khlangwiset et al, 2011).

Environmental contamination is of direct import for infants and toddlers learning to feed themselves. Contamination of floors and the ground surrounding the house are particularly important to young children exploring their environments through crawling, early walking and by putting objects in their mouths. Proper disposal of feces, removal of animal waste and hand hygiene are all critical during this sensitive age period. Insufficient access to safe water may serve as an important barrier to appropriate hygiene practices and safe preparation of complementary foods(Stewart et al, 2013).

In considering the environment broadly, other factors such as population density degree of urbanization and climate change are also important contextual factors that may contribute to worsening rates of malnutrition(Spears, 2013).

2.2.5 Stunting outcome

There is growing evidence of the connections between slow growth in height early in life and impaired health and educational and economic performance later in life. Recent

research findings indicate that stunting can have long-term effects on cognitive development, school achievement, economic productivity in adulthood and maternal reproductive outcomes(Dewey and Begum, 2011). Evidence shows that the period from pregnancy through the first 2 years of life is a critical window of opportunity for the prevention of malnutrition, as after a child's second birthday it becomes increasingly difficult to reverse growth faltering and prevent stunting . Stunting is a marker for both chronic malnutrition and consequently poor child development outcomes. Children who are stunted are at an increased risk for repeated infections and are more likely to die from diarrhea, pneumonia, and measles, and may be at an increased risk in adulthood for chronic diseases such as cardiovascular disease.

In addition, childhood stunting is associated with developmental delays that can significantly and adversely impact a person's ability to learn (both during and after the years in school), thereby limiting their ability to reach their full potential. It is associated with impaired socio-emotional, motor, and cognitive development. A stunted child may have altered socio-emotional behaviors, including increased apathy, negative affect (e.g., crying and fussiness), and reduced activity, play, and interest in exploring their environment. This lack of interest in exploring their surroundings and negative behaviors often reduces the level of stimulation children receive from their interactions with the environment and their caregiver, further impeding their development.

Stunting is associated with poor performance on cognitive tests, including deficits in literacy, numeracy, reasoning, and vocabulary, among others. It is also associated with lower overall school achievement, and stunted children are more likely to be older at school enrollment, repeat grades, be absent from school, drop out of school, and fail at least one grade(Oot et al, 2016).

2.2.6 Health policies to decrease the prevalence of stunting

Action can be taken across multiple areas to reduce rates of stunting.

- First, improving optimal breastfeeding practices is the key to ensuring a child's healthy growth and development. Early initiation and exclusive breastfeeding for six months provides protection against gastrointestinal infections, which can lead to severe nutrient depletion and therefore stunting.
- Second, among the most effective interventions for preventing stunting during the complementary feeding period is improving the quality of children's diet. Evidence suggests that greater dietary diversity and the consumption of foods from animal sources are associated with improved linear growth. Promote consumption of healthy, diversified diets, including high-quality, nutrient-rich foods in the complementary feeding period (6–23 months). Improve micronutrient intake through food fortification, including of complementary foods, and use of supplements when and where needed. Foster safe food-storage and handling practices, to avoid infections from microbial contamination and mycotoxins.
- Thirdly, because stunting results from several household, environmental, socioeconomic and cultural factors, reduction of stunting requires that direct nutrition interventions are integrated and implemented in tandem with nutrition-sensitive interventions. For example, prevention of infections requires household practices such as hand-washing with soap, the success of which depends on behavior change to adopt the practice (culture), the availability of safe water (water supply), and the affordability of soap (socioeconomic status). Similarly, the

availability of high-quality foods (food supply) and affordability of nutrient-rich foods(socioeconomic status) will affect a family's ability to provide a healthy diet and prevent child stunting.

- Finally, at the program level, specific contextual factors should be taken into account in order to determine the right mix of nutrition-specific and nutrition-sensitive interventions that are most likely to succeed. Important contextual factors include the magnitude of the stunting burden, household wealth, complexity of food value chains and systems' capacity for service delivery. Integrate nutrition in health-promotion strategies and strengthen service-delivery capacity in primary health systems and community-based care forprevention of stunting and acute malnutrition, supported by social protection programs where feasible. Promote a holistic view of malnutrition through the understanding that stunting, wasting and micronutrient deficiencies can occur in the same child, family and community, and ensure services for undernutrition are implemented in a more cohesive fashion(WHO, 2014).

Chapter 3

Methodology

This chapter provides comprehensive details of all aspects of the research methodology. It explains the study design and the method, the tool of data collection, period of the study and analysis. In addition, the study population, the population sample as well as the sample frame. Finally, the ethical issues were considered and the limitation of the study as well.

3.1Study design:

The design of this study is analytic case control study. This study design is used to compare two populations: the first population which has the outcome of interest (cases) with another population doesn't have the outcome (controls); both populationswere matched by specific criteria. It is an appropriate design to study the risk factors of stunting among the children under the age of five in GS, it require less time and less cost. The data has been collected via administrated questionnaire with the parents or the caregiver of both cases and controls.

The cases were the children who are stunted which means their length/ height to age (H//A) was under the normal which was divided into three groups in this study: mild stunting that H//A falls below -1 SD, moderate stunting which the H//A falls below -2 SD and severe stunting which the H//A falls below -3 SD.

The sources of the cases collection were from the three health providers: NECC with 120 cases, AEI with 82 cases and from MOH PHC facilities 23 case.

The controls were the children that have normal H//A and matched with specific criteria with the cases (the age and gender) and had specific ratio for comparison (one control for each case). The sources of collection the controls were the NECC with 96 controls and the MOH PHC with 129 controls.

3.2 Study population

The study includedtwo populations: the first population is the children under the age of five who are visiting the facilities of primary health care facilities for growth assessment whether in MOH PHC facilities and inCouncil of Churches Department of Service for Palestinian Refugees health facilities. Cases and controls were taken from this population. There were 143 cases and 225 controls from this population.

And the second population was taken as cases from the children under the age of five who are visiting Ard El Insan Palestinian Benevolent Association health centers for malnutrition problems. Only cases were taken from AEI. There were 82 case of stunting.

3.3 Study settings

The researcher has selected five MOH PHC facilities randomly of each governorateand the NGOs that concern about children developmental and malnutrition problems: two centers ofArd El Insan Palestinian Benevolent Association in Gaza and Khanyounis city and three centers of the Middle East Council of Churches Department of Services for Palestinian Refugees in Gaza and Rafah.

3.4 Study period

The study took 13 months in execution; it started in January, 2017 and completed by March 2018. This study was initially proposed in May, 2017. The research proposal has been submitted to and defended in the front of the Al Quds University-School of public

health assigned committee in May 2017. At its development, the research proposal described the entire process and provided information and designs of the data collection and data analysis methods and tools. Upon the approval, the researcher prepared the required tool of his study. The researcher has consulted a group of five experts at the arbitration stage before the finalization of the tool. The arbitration stage lasted for four weeks including refining of tool in the light of reviewers and the academic supervisor's feedback. In October 2017, the tool was ready to go for data collection. Piloting took place between 14 and 26 of October 2017. Actual data collection started on 11 November through 15 February 2018. Data analysis consumed one week. The final draft of the thesis was delivered at the first of April 2018.

3.5 Sampling

The researcher has collected data from 225 case of children with stunting and from 225 children without stunting problem as controls (one case: one controls), the matching criteria were the age and gender of the children. The researcher used the epi info programversion 7 to calculate the sample size annex 1. This is a series of tools designed to help public health professionals conduct outbreak investigations, manage surveillance databases, and perform statistical analyses. The software enables epidemiologists and other public health and medical professionals to create questionnaire, customize the data entry process, and enter and analyze data, the confidence intervals (CI) was 95% and the power 80%.

Simple random sampling technique was used to choose the five MOH PHC facilities and non-probability sampling was used to choose two NGOs (also five centers).The matching criteria between cases and controls were the age and gender. The cases were taken from the both NGOs and the MOH PHC facilities, controls were taken from MOH PHC facilities

and from Council of Churches Department of Service for Palestinian Refugees health facilities.

The cases were 225 cases: 120 cases from NECC, 23 cases from MOH and 82 cases from AEI, while the controls were 225: 96 cases from NECC and 129 cases from MOH PHC facilities.

Table 3.1: Distribution of cases and controls among the three health facilities

Institution	Cases n=225 n (%)	Controls n=225 n (%)
Middle East Council of Churches Department of Services	120 (53.3)	96 (42.7)
MOH	23(10.2)	129 (57.3)
Ard El Insan Palestinian Benevolent Association	82(36.4)	

3.6 Eligibility criteria

3.6.1 Inclusion criteria

Children under the age of three who are visiting the MOH PHC facilities for growth assessment services as cases and children under the age of five visiting the MOH PHC facilities without the stunting problem as controls, children under the age of five who are visiting the centers of the Council of Churches Department of Service for Palestinian Refugees health facilities for assessment as cases and controls, and children under the age of five who are visiting Ard El Insan Palestinian Benevolent Association health facilities for malnutrition problems.

3.6.2 Exclusion criteria

Children under the age of five with severe existing disease like cancer or cerebral palsy that can cause major growth delay.

3.7 Study tools and instruments

To assess the height/length status to age H/A, the researcher used the Z-Score for cases and controls (for boys and girls) annex(3).The researcher did not take the measurements but was supervising the taking of measurements and recording them on Z score sheets.

The H//A was divided into four groups: Normal H//A which were the controls, Mild stunting which H//A below -1 SD, Moderate stunting which H//A below -2SD and Severe stunting which H//A below -3 SD.

This study had an interviewer-administrated questionnaire with parents or the care giver of the children; the main items of the questionnaire were about: annex (4)

- The first part of the questionnaire was about the general information, demographic variables as age, gender, description of the participant whether case or control, the institution and anthropometric measurements of children including height, weight and the last hemoglobin measurement if available or in the last three months. As well as the degrees of stunting for cases. Also information related to the respondents to the questionnaire.
- The second segment is about the general medical history of the mother of the child whether she has suffered from any disease now or during the pregnancy period. Furthermore, some items about the health care services pre and post natal period were added.
- The third segment is about the medical history of the child including the early neonatal period, anthropometric measurements at birth, the immunization coverage

and the intake if iron and vitamin supplements. The second group of items of this segment is about the health status of the children including chronic disease and diarrheal disease as well as history of any hospital admission for any disease and for diarrheal diseases. The items from 30 to 41 are about the nutrition status since birth including items about the breast feeding and the complementary foods and the frequency of weekly food intake.

- The fourth segment is about the socioeconomic status of the family including questions about the parent's age and education, the income and the residency, family size and measuring crowding index annex (5).
- Last segment of the questionnaire is about the surrounding environmental circumstances including items about the water availability and hygiene, type of house, presence of animal near or at home and living in agricultural land and exposure to pesticides.

3.8 Data collection

After the examining the validity of the questionnaire by the experts and after conducting the pilot study, the researcher collected all requireddata by using the interviewer-administrated questionnaire with parent of childrenaccording to the inclusion and exclusion criteria, it lasted for three months, each month represented the third of the sample. The researcher started the data collection at the three health facilities of Council of Churches Department of Service for Palestinian Refugees, two centers in Gaza city and one center at Rafah city for 6 weeks. The second four week of the data collection was in the two health centers of Ard El Insan Palestinian Benevolent Association in Gaza city and in Khanyounis city. The third part of the data collection took parts at the five PHC facilities of MOH in the five governorates. Time allocation for each questionnaire ranged between 15-20 minutes. Privacy was maintained during gathering and filling of the questionnaires.

The researcher collected the data at first day by collecting the cases and prepares the list for their controls; the second day was the collection of the controls and new cases and this was in NECC. In AEI the collection was only for cases. In MOH PHC facilities the collection was mainly for controls of the cases and few new cases. At the end of the day the researcher review some data at the medical files of cases and controls.

3.9 Data entry and analysis

The researcher used Statistical Package for Social Science (SPSS) program version 20 for data entry and analysis. The analysis was carried out at both descriptive and inferential levels. The descriptive data gives mean and standard deviation (SD) for continuous variables and frequencies for both continuous and categorical variables of the study. The inferential analysis was done by using statistical tests such as Chi-squarewhich was used to measure the association between the stunting and the categorical variables, simple logistic regression and multiple logistic regression tests.Logistic regression is used to describe data and to explain the relationship between one dependent binary variable and one or more nominal, ordinal, interval or ratio-level independent variables.

Statistical significance was set at $P<0.05$ and 95% confidence intervals (CI). Crude Odds Ratio (ORc) was resulted from the simple logistic regression and the Adjusted Odds ratio (OR adj) was resulted through the analysis by using the multiple logistic regression.

3.10 Scientific rigor

3.10.1 Validity of the questionnaire:

The questionnaire was evaluated by five experts in public health field and in pediatric nutrition through assessing all the components and the context of the instrument, to ensure that it is highly valid and relevance and their comments were taken in consideration, the

questionnaire was formatted in order to ensure face and content validity, this including appealing layout, and logical sequences of questions and clarity of instructions.

3.10.2 Reliability of the questionnaire

The data entry was in the same day of data collection would allow possible interventions to check the data quality or to re-fill the questionnaire when required.Re-entry of 5% of the data after finishing their entry helps assure correct entry procedure and decrease entry errors.

3.11 Pilot study

A pilot study of 22 cases and 22 controls was done to develop and test adequacy of the research questionnaire and check the feasibility of the study. Modifications of questionnaire were done as appropriate.

3.12 Ethical consideration

In order to lunch this study, the proposal was submitted to Al Quds University-School of public health research committee for discussion and academic approval. Additionally the Modified International Code of Ethics Principles (1975), known as the Declaration of Helsinki, which is adopted by the World Medical Assembly,was followed and an official letter of approval to conduct the research was obtained from the Helsinki Committee Annex (6). An administrative approval was obtained from the medicaldirector of MOH and the directors of the two NGOs. In accordance with the Principles of the Helsinki Ethical Declaration, every respondent to the interviewed questionnaire in the study received a complete explanation of the research purposes, program, and confidentiality. It was an optional participation. Verbal consent was obtained from the respondentsof the participated children in the study. To increase the responses credibility, the researcher maintained

adherence to the Ethical Code Principles, through providing and maintaining anonymity and confidentiality. The researcher assumed that other ethical rights were protected through respect for people and respect for truth.

3.13 Limitation of the study

The study faced some limitations such as; the study excluded the children who are visiting UNRWA PHC facilities due to the policies of the organization which doesn't allow research in the medical field anymore.

The data was depending on the mother memory which may result in recall bias.

Chapter 4

Results &Discussion

4.1 Introduction

This chapter presents the results of the statistical analysis of the data and the interpretation of these results. Including the descriptive statistics that includes: the distribution of the study population including cases and controls according to demographic variables, anthropometric measurements at the time of data collection and at birth, mother health related variables, child health and nutrition related variables, the socioeconomic variables and the distribution of the population according to the environmental circumstances. Also includes the inferential statistics of the data that includes: the associations between stunting and the child health, maternal health, socioeconomic status and environmental circumstance. And the last part is summary for the significant risk factors of stunting among children under the age of five in GS.

4.2 Demographic characteristics

Descriptive analysis represents the demographic characteristics of the children including the gender distribution, geographic distribution and distribution according to five age groups from the first month to 59 months of life.

Table (4.1) shows a total sample of 450 children aged 0–59 months were included in the study as 225 cases and 225 controls. Male participation was 57.3% with 129 cases and 129 control and female participation was 42.7% with 96 cases and 96 controls.

It was revealed that more than half of the stunted children were boys 52.7% and the rest were girls (El Kishawi et al, 2017).The gender and the age of the participants were the

matching criteria between the cases and controls, so the differences should not be statistically significant.

Table (4.1): Distribution of participants by demographic related data

Variables		Case n(%)	Control n(%)
Gender	Male	129 (57.3)	129 (57.3)
	Female	96 (42.7)	96 (42.7)
Age	1-12 months	23 (10.2)	23 (10.2)
	12-24 months	79 (35.1)	79 (35.1)
	24-36 months	62 (27.6)	62 (27.6)
	36-48 months	35 (15.6)	35 (15.6)
	48-60 months	26 (11.6)	26 (11.6)

n= number of participants

The ages varied from one to 59 months old. The participation of the first year (1-12 month) was 10.2%; the second year (12-24 months) participation was 35.1%, the third year (24-36 months) participation was 27.6%, the fourth year (36-48 months) had 15.6% of the sample and the fifth year (48-60 months) participated with 11.6 % of the total sample as shown in figure (4.2).

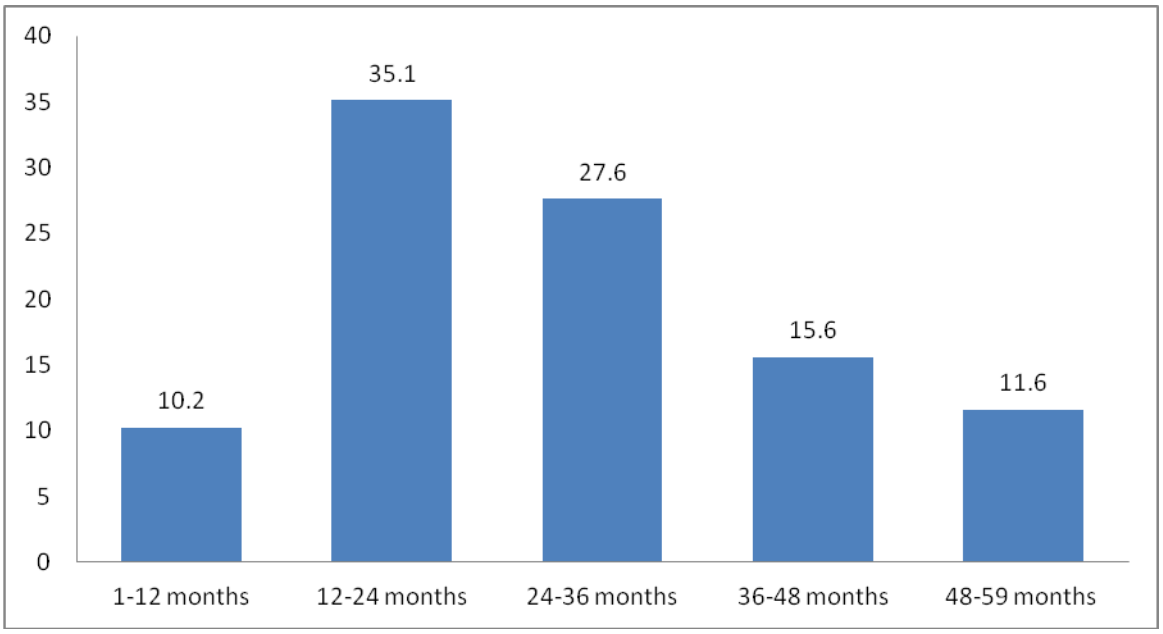


Figure (4.1): Distribution of participants by age

The sample has been collected from three institutions: the first one is the Middle East Council of Churches Department of Serviceswhich has three medical centers in Gaza and in Rafah with participation 48% of the sample, also five centers of MOH PHC facilities with 33.8% of the sample and 18.2% of the sample was from the two centers of Ard El Insan Palestinian Benevolent Association. Most of the respondents to the questionnaires were the mothers.

4.3 Anthropometric measurements at the time of the data collection: this part compromises descriptive analysis of anthropometric measurements of the participating children.

The length of the cases of the age group 1-12 months was ranged from 62 to 75 cm with mean 67.8 cm and SD 3.4 but the length of their controls was ranging from62 to 76 cm with mean 73.3 cm and SD 3.2. The second age group that starts from 12-24 months, its cases length was ranged from 67 to 86 cm with mean 75.1cm and SD 3.8 and the length of their controls was ranged from 76 to 92 cm with mean 84.9 and SD 3.09. The height of the

cases of the age group 24-36 months was ranged from 77 to 94 cm with mean 85cm and SD 3.08 and the height of their controls was ranged from 85 to 98 cm with mean 93.6 cm and SD 2.8. The height of the cases of the fourth age group 36-48 months was ranged from 80 to 100 cm with mean 91.2 cm and SD 5.3 and the height of their controls was ranged from 88 to 106 cm with mean 101cm and SD 3.3.The last age group 48-59 month; the length of its cases was ranged from 84 to 108 cm with mean 98.4cm and SD 5.3 and the length of their controls was ranged from 101 to 112 cm with mean 107 cm and SD 2.8.

The cases were divided into three groups according to the severity of the stunting as mild<-1 SD, moderate<-2 SD and severe stunting <-3 SD. The mild cases were 102 cases with 45.3% of all cases. The moderate cases were 74 with 32.9% and the severe cases were 49 with 21.8% of all cases. El-Kishawi (2015) revealed that almost 60% of the stunting cases were mild stunting.

The normal hemoglobin concentrationfor children is above 11 g/dl, anemia is divided into three types according to decrease in Hb concentration: mild anemia 10-10.9 g/dl, moderate anemia 7-9.9 g/dl and severe anemia which the Hb is less 7 g/dl(WHO, 2015).The hemoglobin (Hb) percentage was measured either within the same day of data collection or within the last visit only if it was in the last three months. The total number of the children who had Hb measuring is 405 children, 209 of them are the cases and 196 controls.

Children with normal Hb concentration were 68% of the study population, 49.8 % of the cases and 88.8% of the controls. The most common form of anemia was the mild anemia which its prevalence was 30.6% among cases and 11.2% among controls, where the moderate anemia was among 19.6% of cases.It was revealed that the overall prevalence of anemia was 59.7% among preschool children in the Gaza Strip, 46.5% and 13.5% of which are mild and moderate, respectively(El Kishawi et al, 2015).

Concerning the micronutrients intake, about 31% of all the children are taking iron supplements, 42% of the cases are taking iron and 20% of the controls are taking iron supplements. Of the entire sample, only 7.1% are taking multivitamins supplements.

The rate of mild and moderate anemia was almost 50% among cases and 11.2 % among controls but these differences was not statistically significant (P value 0.997), according to the Palestinian Micronutrient Survey, the children aged 6 to 59 months with mild anemia was found in 11–25%, and moderate anemia in 6-8%, whereas boys were more affected than girls and children in the Gaza Strip more affected than those in the West Bank(I. Elmadfa, 2014).Also children who were receiving multivitamins for micronutrient deficiencies or iron supplements for anemia had no statistically significant relationship with stunting (p value >0.05).

Table (4.2): Association between stunting and micronutrients deficiency and supplements

Variable		Case n (%)	Control n (%)	Crude OR (95%CI)	P Value*
Hb Conc. n =405	Normal	104 (49.8)	174 (88.8)	0.205 (.120,.353)	0.997
	Mild	64 (30.6)	22 (11.2)		
	Moderate	41 (19.6)			
Taking multivitamins	Yes	21 (9.3)	11 (4.9)	0.499 (0.235,1.062)	0.071
	No	204 (90.7)	214 (95.1)		
Taking iron supplements	Yes	95 (42.2)	45 (20.4)	0.352 (0.231,0.534)	0.073
	No	130 (57.8)	179 (79.6)		

P Value* < 0.05

It was revealed that anemic children were at higher risk for stunting with odds ratio 1.3 more than non-anemic children (Xiaoliang et al, 2009).

Taking multivitamins was close to be statistically significant related to stunting, as the children suffering from micronutrients deficiencies may develop stunting in the future as they had malnutrition problems.

4.4 Mother Health

4.4.1Common diseases related to mother

Chronic diseases are considered the greatest public health concern globally, and contributor to a large burden of disease in developed world, and increasing rapidly in developing countries as well as Palestine(Mosleh, 2016). In this study 25 mothers of the children are suffering from chronic diseases, nineteen mothers are of cases and the other six are mothers of controls. The most prevalent disease is hypertension followed by diabetes and asthma.

There are many associations between the mother health and the stunting of the children, presence of chronic diseases among mothers was in association with stunting among children with statistically significant relationship (P value 0.011*) with OR 3.367 which means having a chronic disease increases the chances of having stunted children three times more than the mothers without chronic diseases, but there was no significant relation with specific disease. Chronic diseases of the mother can lead to malnutrition problems during the antenatal period and during the first two years of life of the child.

4.4.2Association between stunting among children and the mother health

As shown in table (4.3), about 32.4% of mothers of cases had Preconception Care (PCC) and 52.4% of mothers of controls had PCC services for the child of the study, the mother

who had not these services were 57.6% of case's mother and 47.6% of control's mothers, which means that there is association between the not having PCC services and increasing the stunting rates among children with statistically significant relationship (P value 0.001*) and OR 2.29, it means that not having PCC services can increase the likelihood of having stunted child two times more than the mothers taking the PCC services.

During the PCC the women knows more about the child health and nutrition in the first two years as well as the nutrition of mother during the pregnancy, also have knowledge about the importance of family planning and spacing between births. Also during the PCC services, there is assessment of the maternal general health that could reflect the nutrition status and the deficiencies in micronutrients; this assessment allows the mothers to improve the health status before the pregnancy.

Almost of the mothers had antenatal follow up ranging from two to eight antenatal visits with median four visits per pregnancy period. Also almost of the mothers the post natal care with median one visit per the pregnancy period. The antenatal and post natal care took place in four mail health provider the UNRWA PHC facilities with 42.9%, MOH PHC facilities with 33.8 %, NGOs 17.3, private doctors 1.6% and 4.2% were visiting two centers. Almost all the mothers had ante natal follow up mainly in PHC facilities so there was no significant relation between stunting and the follow up and also there was no significance between stunting and the place of follow up (P value>0.05). There is high coverage of maternal services through the main health providers in GS and there is high awareness to the antenatal services. This high coverage of antenatal services among all the health providers in the GS did not make any significant differences between the mothers of cases and the mothers of controls.

This frequency of antenatal follow up which was ranging from two to eight visits with mean four visits per the pregnancy period, it was not statistically significant with stunting

among children with (P value > .05). Also almost 99% of the mothers had one or two post natal follow up among the PHC facilities, these services are the same for all women so there was no statistically significant relationship.

Another variable of study was the using of family planning method at the time of data collection; almost half of the mothers were using one method of family planning and the other half were not among mothers of both cases and controls so there was no significant relationship between using family planning method and stunting.

Of the entire sample mother's there are only three cases with In Vitro Fertilization (IVF) pregnancy and the rest were had normal pregnancy. According to mode of delivery a 48 of the mothers had Cesarean Section (CS) delivery (11%), 16% of the case's mothers experience CS delivery and 5% of the control's mothers experience CS delivery,these differences were statistically significant with stunting with (P value 0.001*) and OR 3.38.

The CS delivery can increase the chances of stunting among children 3 times more than the normal vaginal delivery. Cesarean section was found in association with stunting among preschool children in many studies (Akombi et al, 2017).

Of all the participant's mothers there was 9%of them had complication during the pregnancy mostly are anemia and hypertension.The occurrence of complication during the pregnancy was 16.4% among case's mothers and it was statistically significant increasing the chances of having a stunted child (P value 0.001*) with OR 10.8. But there was no statistically relationship with specific disease. Having complication during the pregnancy increases the chance of the undernutrition of the mother leading to IUGR.

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Table (4.3):Association between stunting among children and the mother health

Variable		Case n (%)	Control n (%)	Crude OR (95%CI)	χ2 (df)	P Value*
Mother's disease	Yes	19 (18.4)	6 (2.7)	3.367 (1.319,8.595)	7.158 (1)	0.011*
	No	206 (91.6)	219 (97.3)			
The disease	Diabetes	4 (21.1)	0 (0.0)	0.561 (0.273,1.155)	11.842 (5)	0.117
	Hypertension	7 (36.8)	0 (0.0)			
	Heart Diseases	1 (5.3)	0 (0.0)			
	Asthma	4 (21.1)	6 (100.0)			
	Epilepsy	1 (5.3)	0 (0.0)			
	Hepatitis	2 (10.5)	0 (0.0)			
PCC	Yes	73 (32.4)	118 (52.4)	2.296 (1.556,3.366)	18.421 (1)	0.001*
	No	152 (57.6)	107 (47.6)			
Place of Follow up	UNRWA	103 (46.0)	90 (40.0)	0.933 (0.778,1.120)	3.379 (4)	0.456
	MOH	68 (30.4)	84 (37.3)			
	NGOs	41 (18.3)	37 (16.4)			
	Private	4 (1.8)	3 (1.3)			
	Two centers	8 (3.6)	11 (4.9)			
Family planning method	Yes	96 (42.7)	126 (56.0)	1.710 (1.178,2.483)	8.001 (1)	0.076
	No	129 (57.3)	99 (44.0)			
Type of Labor	Normal	189 (84.0)	213 (94.7)	3.381 (1.709,6.687)	13.433 (1)	0.001*
	CS	36 (16.0)	12 (5.3)			
Complication during pregnancy	Yes	37 (16.4)	4 (1.8)	10.874 (3.806,31.066)	29.224 (1)	0.001*
	No	188 (83.6)	221 (98.2)			
Mother weight during pregnancy	Normal Increase	191 (84.9)	222 (98.7)	8.136 (2.390,27.699)	28.827 (2)	0.001*
	Abnormal Increase	21 (9.3)	3 (1.3)			
	weight loss	13 (5.8)	0 (0.0)			

χ2 (df): chi square with degrees of freedom

The participants of the mothers were asked about their weight during the pregnancy, of them 91.8% had normal increase of weight, but 5.3% had abnormal increase of weight and 2.9% of them had weight loss during the pregnancy period. There was a statistically significant relationship between abnormal increasing of weight and having stunted children (P value .001*) with OR 8.1. By asking the mothers who had abnormal increase in weight about the reason of increase weight, the most answers were because of gestational hypertension and edema not because of nutrition causes

4.5 Child health and nutrition.

4.5.1Association between stunting and child health.

As shown in table (4.4), Of the all births 91.6% are full term births, 2.7% of births are preterm births and 5.8% are post term births,the distribution of study population according to the gestational age was divided into full term birth among 92% of cases and 91% of controls, preterm delivery was among 5% of cases and post term delivery was among 3.1% of cases and 8.4% of controls, preterm children were more likely to be stunted with statistically significant relationship (P value 0.023) with OR 10.894, which means that preterm delivery increases the chances of being stunted ten times more than the full term deliveries. It's logically accepted those preterm babies who have less weight and height at birth than the babies who born at full term or post term. As well as the cause of preterm delivery could be because of maternal chronic disease than can also cause malnutrition of the mother and the infant. Post term delivery had negative statistically significant relationship with stunting (P value 0.026) with OR 0.35 which means the post term delivery decrease the chances of being stunted with 70% less than the full term delivery.

Most of the children had normal body weightranging from 2.5 to 4 Kilograms (Kg) at birth with 96.8 % and only 3.2% of them were underweight (less than 2.5 Kg) at birth, but 20%

of the participants had short stature at birth , 36.9 % of the entire cases were short at birth and only 2.2% of all controls were stunted.Also children born underweight were more likely to be stunted with statistically significant relationship (P value0.011). According to findings of analysis which indicates that children born with low birth weight had 2.5-fold higher odds (Aguayo et al, 2016).

Table (4.4): Association between child health and stunting

Variables		Case n(%)	Controls n(%)	Crude OR (95%CI)	χ2 (df)	p Value*
Gestational Age	Full term	207 (92.0)	205 (91.1)	10.894 (1.394,85.148)	13.882 (2)	
	Preterm	11 (4.9)	1 (0.4)			0.023*
	Post term	7 (3.1)	19 (8.4)	0.365 (0.150,0.887)		0.026*
Weight at Birth	Normal Weight	204 (94.0)	221 (99.5)	14.083 (0.085,0.412)	10.910 (1)	0.011*
	Underweight	13 (6.0)	1 (0.5)			
Height at Birth	Normal	142 (63.1)	220 (97.8)	25.718 (10.179,64.98)	85.943 (1)	0.057
	Short	83 (36.9)	5 (2.2)			
Suffering from chronic disease	Yes	42 (18.7)	4 (1.8)	12.680 (4.463,36.024)	34.966 (1)	0.001*
	No	1853 (81.3)	221 (98.2)			
Admission to hospital	Yes	38 (16.9)	8 (3.6)	5.512 (2.509,12.110)	21.793 (1)	0.001*
	No	187 (83.1)	217 (96.4)			

It was also revealed in study that the highest risk of stunting was among preterm babies and babies who were small for gestational age (Sania et al, 2015). Children who were born with underweight may have poor nutrition during the intrauterine life causing them intrauterine growth retardation.

By asking the mothers to describe the general health of the children since birth, almost 70% of the children are having good health, but 27.8% of the children are having poor health status and 1.8% of them have a very poor health conditions. Of the cases 46.2% are described as having a poor health conditions and 3% described as having a very poor health conditions.According to immunization status, almost all of the children had completed their vaccines or still taking the vaccines at its appointments.

Regarding the presence of diseases, there was 10% of the children having disease, the most prevalent disease are the asthma, urinary tract infections and gastrointestinal problems (GI).There was a statistically significant relationship between suffering from chronic diseases and stunting (P value 0.001*) with OR 12.6. This means child suffering from chronic diseases has twelve times more chances than children don't suffer from chronic diseases. But there was not statistically significant relationship between stunting and specific chronic disease.

Also participants were asked about the history of hospital admission; about 11% of the children had hospital admission mainly due to upper respiratory tract infection and asthma. There was statistically significant relationship between admission to hospital and stunting among the children under five (P value 0.001*) with OR 5.5.

4.5.2 Association between stunting and diarrheal diseases.

As shown in table (4.5) the overall percentage of diarrhea diseases among children was 44.2%, the prevalence of diarrheal diseases among cases was 59.1% while it was 29.3% among the controls, these differences between cases and controls were statistically significant strong risk factor of stunting among the children (P value 0.001*) with OR 3.4. The diarrheal diseases among children can increase the chances of stunting three times more. The most type of diarrhea disease was the watery diarrhea with 93.2% among cases

and 95.5% among controls and 7% was bloody diarrhea among cases but these differences were not statistically significant (P value 0.644).. It was revealed that prevalence of diarrhea among children between the three and five years old in Gaza Strip was 59.2 (Al Laham et al, 2015).

The frequency of diarrhea was less than three times per year among 60.2% of the affected cases and 98.5% of the affected controls and the frequency of diarrhea was three times and more per year in 39.8% of the affected cases and 1.5% of the affected controls.Frequency of diarrhea per year was divided into two groups, suffering from three times or more per year of diarrhea was statistically significant related to stunting (P value 0.001).

Table (4.5): Association between stunting and diarrheal diseases

Variables		Case n (%)	Control n (%)	Crude OR (95%CI)	χ2 (df)	p Value*
Diarrheal Disease	Yes	133 (59.1)	66 (29.3)	3.483 (2.355,5.150)	4.42 (1)	0.001*
Type of diarrheal disease	Watery diarrhea	124 (93.2)	63 (95.5)	1.267 (0.465,3.451)	0.509 (2)	0.644
	Bloody diarrhea	7 (5.3)	2 (3.0)			
	Persistent diarrhea	2 (1.5)	1 (1.5)			
Hospital admission due to diarrheal disease		67 (29.8)	4 (1.8)	23.429 (8.370,65.578)	66.374 (1)	0.001*
Times of admission due diarrhea	One	52 (77.6)	2 (50.0)	0.288 (0.037,2.224)	1.580 (1)	0.233
	Two and more	15 (22.4)	2 (50.0)			
Frequency of diarrhea per year	Less than 3 times	80 (60.2)	65 (98.5)	43.063 (5.797,319.86)	32.784 (1)	0.001*
	3 times and more	53 (39.8)	1 (1.5)			

Admission to hospital due to diarrheal disease was among 15.8 % of all children, most of them are cases. Admission to hospital due to diarrheal disease was among 29% of cases but it was low rate of hospital admission among the controls which makes a statistically significant relationship with stunting with (P value 0.001) with high OR.

These finding are similar to findings among research from another countries which revealed that diarrheal diseases and helminthes infection are known determinants acting variously through inflammation and nutrient diversion, sequestration or loss (Hall et al, 2008). Checkley et al. have estimated that 25% of the burden of stunting could be attributed to five or more episodes of diarrhea occurring prior to the age of 2 years (Checkley et al, 2008).

4.5.3 Breast feeding and feeding practices and frequencies.

Almost all of the participants of the study were breastfed and about 54% of the children had exclusive breastfeeding for six months and more, 42.7% of the cases had exclusive breastfeeding for six months and more. At the time of the data collection there were 9% of the cases and controls on breastfeeding. It was revealed that the rate of exclusive breastfeeding was 44.6% (Radi et al, 2013). Also it was revealed that the rate of exclusive breastfeeding is increasing in the last years which was 66.9% (Huwwer, 2015). This high percentage of exclusive breastfeeding was as described by the mothers.

And about 46% of the children had exclusive breastfeeding for less than six months and start weaning before the six months mainly at the second month of life. There wasn't statistically significant relationship between the short periods of exclusive breast and the stunting among the children (P value >0.05).

By asking about the weaning, the researcher meant starting introducing foods other than breast feeding not the complete weaning as it means stopping the breastfeeding.

The most cause of starting weaning early was that the breastfeeding was inconvenient also the rejection of breastfeeding by the children. The completely weaning period was ranging from the first to the thirty months with mean nine months. The early starting of weaning and introducing fluids at the first month of life was related to stunting with strong statistically significant relationship (P value 0.001) with OR 5.3. This means that early starting of weaning at the first month increases the chances of being stunted five times more than children have weaned after the sixth month. But the age of completely weaning and stopping of breastfeeding wasn't in relationship with stunting (P value > .005).

The most commonly fluids initially introduced to the children were the infant formula for about 53.3% of the children followed by the animal milk for 12.7% of the children.There was strong positive and statistically significant relationship between introducing animal milk for weaning and stunting (P value 0.000) with OR 8.7, which means using the animal milk as the first food of weaning increases the likelihood of being stunted 8 times more.

And there was negative relationship between introducing yogurt for weaning and stunting and it was statistically significant relationship (P value 0.01) and OR 0.25, but the other food of starting weaning were not statistically significant related to stunting.

For the participants who are with age less than 24 months, the frequency of complementary feedings was less than four times per day for 57.9% and frequency of four times and more for 42.1%. And 76.2% of the cases of the same age group had less than 4 times of complementary feeding per day. There was statistically significant relationship (P value 0.001*) between number of meals and stunting, the less the frequency the more association with stunting. This frequency increases the chances of being stunted almost five times more than the children take more than four meals per day as the OR is 4.8.

Table (4.6) Association between stunting and feeding practices

Variables		Case n (%)	Control n (%)	Crude OR (95%CI)	χ2 (df)	p Value*
Exclusive breast feeding for 6 months	Yes	96 (42.7)	147 (65.3)	2.532 (1.730,3.707)	23.269 (1)	0.677
	No	129 (57.3)	78 (34.7)			
Start of weaning	One	44 (19.6)	11 (4.9)	5.333 (2.396,11.871)	29.090 (4)	0.000*
	Two	56 (24.9)	49 (21.9)	1.524 (0.843,2.755)		0.163
	3-5	28 (12.4)	23 (10.3)	1.623 (0.796,3.310)		0.183
	Six	64 (28.4)	97 (43.3)	0.880 (0.507,1.526)		0.648
	Above 6	33 (14.7)	44 (19.6)			
Complete weaning	7 and less	73 (36.0)	40 (19.6)	1.314 (0.641,2.695)	18.311 (3)	0.456
	8 to 10	42 (20.7)	67 (32.8)	0.451 (0.220,0.926)		0.06
	11 to 12	63 (31.0)	79 (38.7)	0.574 (0.288,1.145)		0.115
	More 12	35 (12.3)	18 (8.8)			
First food of weaning	Infant Formula	119 (53.4)	122 (54.2)	0.528 (0.279,0.999)	61.964 (6)	
	Fruits	17 (7.6)	33 (14.7)			0.050
	Vegetable	4 (1.8)	11 (4.9)	0.373 (0.115,1.203)		0.099
	Carbs	24 (10.8)	23 (10.2)	1.070 (0.573,1.999)		0.833
	Yogurt	6 (2.7)	30 (13.3)	0.205 (0.082,0.510)		0.01*
	Animal Milk	51 (22.9)	6 (2.7)	8.714 (3.604,21.068)		0.000*
What the child eat in a typical day	As other	84 (68.3)	125 (99.2)	58.036 (7.822,430.59)	44.113 (1)	0.001*
	Eat less	39 (31.7)	1 (0.8)			
How many meals the child has daily	Twice	37 (30.3)	1 (0.8)	125 (15.639,1002)	51.357 (2)	0.001*
	Three	72 (59.0)	80 (64.0)	3.046 (1.519,6.109)		0.002*
	Four times	13 (10.7)	44 (35.2)			
How many meals of complementary food the child has	less 4times	77 (76.2)	40 (39.6)	4.8 (2.665,8.98)	27.807 (1)	0.001*
	4 times and more	24 (23.8)	61 (60.4)			

The older children had meals ranging between two to five meals per day with mean three meals per day, 59% of the cases had three meals per day and 64% of the controls had three meals per day. Having two or three meals per day was considered as statistically risk factors of stunting among children (P value 0.002*).

4.5.4 Food frequency of the children.

As shown in table (4.7) the carbohydrates food intake (Porridge, bread, rice, noodles, or other foods made from grains) was three times and more per week for 65.8% of cases and 69.3% of controls, while 32.4% of cases and 29.3% of controls had less than three meals of carbohydrates per week. These findings were not statistically different (P value 0.454). The data attained by El-Mahalawi (2010) demonstrated that no significance between carbohydrate and stunting among children under the age of three (El-Mahalawi, 2010)

The findings show that vegetables (roots and green vegetables)were fed three times and more per week for 74.2 % of the cases and 79.1 % of controls, and less than three times per week for 24.9 % of cases and 20% of controls. Concerning the consumption of root and green vegetables, there was no statistically significant difference between cases and controls (P value 0.214). The data in Huwwer (2015) study showed also no significant differences between malnutrition and vegetables intake (Huwwer, 2015).

Furthermore the blood based food like liver and kidney were fed less than three times per week for 25.3% of cases and 39.1% of controls, but it was never fed for 74.7% of cases and 60.9% of controls. Huwwer (2015) showed that liver and blood based organs were never fed for 75.5% of the children in preschool period (ibid).There was not statistically significant relationship between stunting and consumption of blood based food consumption (P value 0.072).

Meats intake (beef, lamb, goat, chicken, or duck or other birds) was less than three times per week for 50.2% of the cases and 75.1% of controls. But these differences weren't statistically significant.

The findings show that eggs were fed three times and more per week for 14.7% of the cases and 22.6% of the controls, and fed less than three times per week 82.2% of cases and 74.7% of controls. Consumption of eggs for less than three times per week was associated with reduced risk of stunting with statistically significant relationship (P value 0.032*) with OR 0.58.

Sea foods were fed less than three times per week for 36.4% of cases and 48.3% of the controls, and were never fed for 63.6% of cases and 50.7% of controls. There was not statistically significant relationship (p value >0.05) between consumption of sea foods and stunting.

The dairy products (Milk, cheese and yogurt) were fed three times and more per week for 56% of cases and 74% of controls, and less than three times per week for 40.4% of cases and 24.4% of controls. It was found in this study that consumption of milk and dairy products less than three times per week had strong positive and statistically significant relationship with stunting among children under five (P value 0.001*). This frequency of consumption increases the chances of stunting more and half times of stunting as the odd ratio was 1.4.

Regarding the oil food was fed three times and more per week for 15.6% of cases and 15.1% of controls, and less than three times per week for 68.8% of cases and 48.4% of controls. Consumption of oily foods wasn't statistically significant related to stunting of children.

Table (4.7): Distribution of the study population by food intake frequency

Food	Frequency	Case	Control	Crude OR (95%CI)	χ2 (df)	P Value*
Bread, rice, noodles, or other foods made from grains	≥ 3 times/ week	148 (65.8)	156 (69.3)	.858(.574,1.282)	.706 (2)	0.454
	< 3 times /week	73 (32.4)	66 (29.3)	.712(.157,3.233)		
	Never	4 (1.8)	3 (1.3)			0.659
Pumpkin, carrots, or potatoes, green vegetables	≥ 3 times/ week	167 (74.2)	178 (79.1)	.754(.483,1.177)	1.54 (2)	0.214
	< 3 times /week	56 (24.9)	45 (20.0)	.938(.131,6.736)		
	Never	2 (.9)	2 (.9)			0.949
Liver, kidney, heart	< 3 times /week	57 (25.3)	88 (39.1)	.528(.353,.790)	9.778 (1)	0.072
	Never	168(74.7)	137 (60.9)			
Any meat, such as beef, lamb, goat, chicken, or duck or other birds	< 3 times /week	113 (50.2)	169 (75.1)	.334 (.224,.499)	29.787 (1)	0.75
	Never	112 (49.8)	56 (24.9)			
Eggs	≥ 3 times/ week	33 (14.7)	51 (22.6)	.588(.362,.954)	4.753 (1)	0.032*
	< 3 times /week	185 (82.2)	168 (74.7)	.555(.171,1.796)		
	Never	7 (3.1)	6 (2.7)			0.325
Fresh or dried fish, shellfish, or seafood	< 3 times /week	82 (36.4)	111 (48.3)			1.000
	Never	143 (63.6)	114 (50.7)			1.000
Milk, cheese, yogurt, or other milk products	≥ 3 times/ week	126 (56.0)	168 (74.7)	1.453(1.302,1.681)	20.319 (2)	0.000*
	< 3 times /week	91 (40.4)	55 (24.4)	.094(.012,.759)		
	Never	8 (3.6)	2 (.9)			0.088
Any oil, fats, or butter, or foods made with any of these	≥ 3 times/ week	35 (15.6)	34 (15.1)	.724(.425,1.232)	26.910 (2)	0.234
	< 3 times /week	155 (68.8)	109 (48.4)	2.412(1.303,4.465)		
	Never	35 (15.6)	82 (36.4)			0.574
Any sugary foods such as chocolates, sweets, candies, pastries, cakes	≥ 3 times/ week	46 (20.4)	49 (21.8)	.924(.576,1.483)	.120 (2)	0.743
	< 3 times /week	125 (55.6)	123 (54.7)	.921(.530,1.601)		
	Never	54 (24.0)	53 (23.6)			0.772

Finally the sugar food intake was three times and more per week for 20.4% of cases and 21.8% of controls, and less than three times for 55.6% of cases and 54.7% of controls. Also frequency of consumption was not statistically significant with stunting.

From the food intake and consumption we can conclude that the main predictor of stunting here was the consumption of milk less than three times per week with positive strong relationship.

4.6 Socioeconomic status.

4.6.1 Association between stunting and socioeconomic variables

As shown in table (4.8) which illustrates some of the social variables that related to the family size, birth order and degree of consanguinity.

The children who were first born among cases with 12% and among controls with 14.7%, while the children order between 2^{nd} and 4^{th} was among 63.3% of cases and among 68% of the controls and the child order 5^{th} and more was 24.4% of cases and 16.9% of controls. The relationship between birth order and stunting was not statistically significant relationship (P value >.05).

Regarding the family size, it was varying from 2 to 11 with mean 5.5.The family size can be divided into four groups: four and less members with 34.4% of the total population, five family members with 18.8%, six family members with 26% and seven members and more with 20.6% of the total population families. The four groups were almost the same in cases and controls families so there was not statistically significant relationship between the stunting and family size. These findings were inconsistent with findings of other studies of other countries which found that children living in households with eight to ten and five to seven family members were more likely to be stunted than those living in households with two to four family members(Fikadu et al, 2014).

The degrees of consanguinity were divided to three groups: 1st degree which constitutes 27.6% of the total parents, 2nd degree with 24.2% and the third group with no relation was the highest with 48.2% of the total parents. The 1st degree of consanguinity among case's families is high with 35.1% while in control's families is 20%.Parents with first degree of consanguinity were associated with having stunted children, as there was strong positive and statistically significant relationship between the first degree of consanguinity and the stunting (P value .001*) with OR 2.41, which means the first degree or consanguinity between parents increases the likelihood of having stunted children two times more than parents of second degree of consanguinity and parents without blood relation. The significant relation between stunting and consanguinity of parents was also found in previous study in GS (El Kishawi et al, 2017).

This is important point as the first degree of consanguinity can lead to many problems among the offspring like the inherited diseases and increase the chances of undernutrition problems including stunting as it was found in the study.

There was 23.1% of the cases had another stunted family member. There was statistically relationship between stunting and having stunted brother or sister (P value 0.00*).

Number of children under the age of five was ranging from one member to three children; families with one child under five were 18.2%, families with two children underthe age of five were 65.1% and families with three children were 16.7%. There were no statistically significant differences between cases of stunting and their controls (P value >0.05). It was revealed in some studies that having three children under the age of five is a risk factor of stunting (Fikadu et al, 2014).

Table (4.8): Association between socioeconomic variables and stunting

Variables		Case n (%)	Control n (%)	ORc (95%CI)	χ2 (df)	P Value
Birth order	First born	27 (12)	33 (14.7)	.875 (.501,1.529)	4.723 (3)	0.640
	2nd – 4th	143 (63.3)	153 (68)			
	≥ 5th	55 (24.4)	38 (16.9)	.565 (.294,1.089)		0.088
Family size	4 and less	58 (25.8)	71 (31.6)	1.280 (0.746,2.195)	3.180 (3)	0.370
	Five	46 (20.4)	44 (19.6)			
	Six	58 (25.8)	61 (27.1)	1.164 (0.706,1.918)		0.551
	Seven and more	63 (28.0)	49 (21.8)	1.574 (0.945,2.620)		0.081
Degree of consanguinity	1st degree	79 (35.1)	45 (20.1)	2.411 (1.530,3.801)	14.681 (2)	0.000*
	2nd degree	55 (24.4)	54 (24.1)	1.399 (0.881,2.222)		0.155
	No Relation	91 (40.4)	125 (55.8)			
Another stunted brother	Yes	52 (23.1)	2 (0.9)	33.514 (8.051,139.515)	52.609 (1)	0.000*
	NO	173 (76.9)	223 (99.1)			
N of child U5	One	42 (18.7)	40 (17.8)	0.987 (0.722,1.350)	0.093 (2)	0.936
	Two	145 (64.4)	148 (65.8)			
	Three	38 (16.9)	37 (16.4)			

4.6.2 Association between parental factors and stunting

By asking the mothers about their height and the father's height, the answers were mostly descriptive as normal, tall and short without numeric description so it wasn't statistically significant relationship with stunting.

The age of marriage for mothers was divided into two groups: before the 20 years old and after 20 years old, 40% of case's mothers married before 20 and 32.1% of control's mothers married before 20 years. While the father's age of marriage was divided into two groups: before the 25 years old and after the 25, 49.3% of case's fathers married before 25 and 48.7% of the control's fathers married before the age of 25.

The age of the mothers was divided into three groups, the majority of them between 25-30 years with 73.8% of the total population's mothers, the age group less than 25 years was 11.8% of the total and the last age group above the 35 was 14.4% of the population. These differences in age groups weren't statistically significant with stunting.

Regarding the educational level of the mothers the majority was the secondary level with 47.6% of case's mothers and 47.1% of control's mothers followed by the preparatory school. The mean years of education for women was 12.3 years (Huwwer, 2015). Also the majority of fathers had secondary school education followed by the university education. The education of level for mother wasn't have any significant relation with stunting (P value >0.05), but the preparatory and secondary level of education for fathers was in statistically significant relationship to stunting (P value 0.004).

As shown in table (4.8) most of mothers are unemployed with 96.4% of the total population, but the fathers 68.4% of them are employed with 58.7% of the case's fathers and 78.2% of the control's fathers. Most of mothers of cases weren't having a job but 6.2% of mothers of controls had a job, these differences had statistically significant relationship between mother's employment and stunting among children (P value 0.009). Also unemployment among fathers was statistically significant with stunting of children (P value 0.001).

Table (4.9) Association between parental factors and stunting

Variables		Case n (%)	Control n (%)	ORc (95%CI)	χ2 (df)	P Value
Mother age	25 and less	34 (15.1)	19 (8.4)	0.412 (0.217,0.781)	8.841 (3)	0.32
	26 -30 years	70 (31.1)	95 (42.2)			
	31 - 35 years	85 (37.8)	82 (36.4)	0.579 (0.306,1.097)		0.094
	More than 35	36 (16.0)	29 (12.9)	0.694 (0.329,1.461)		0.336
Mother education	Primary school	17 (7.6)	13 (5.8)	1.551 (0.677,3.551)	1.299 (3)	0.299
	Preparatory	58 (25.8)	55 (24.4)	1.251 (0.723,2.164)		0.424
	Secondary school	107 (47.6)	106 (47.1)	1.197 (0.736,1.948)		0.468
	Bachelor	43 (19.1)	51 (22.6)			
Father education	Uneducated	1 (0.4)	1 (0.4)	1.756 (0.107,28.827)	14.668 (4)	0.693
	Primary school	18 (8.0)	7 (3.1)	4.516 (1.740,11.718)		0.07
	Preparatory	39 (17.3)	33 (14.7)	2.075 (1.137,3.788)		0.017*
	Secondary	126(56.0)	112 (49.8)	1.976 (1.247,3.130)		0.004*
	Bachelor	41 (18.2)	72 (32.0)			
Maternal working status	Employed	2 (0.9)	14 (6.2)	7.398 (1.661,32.941)	9.332 (1)	0.009*
	Un employed	223 (99.1)	211 (93.8)			
Father's working status	Employed	132 (58.7)	176 (78.2)	2.531 (1.674,3.825)	19.920 (1)	0.001*
	Un employed	93 (41.3)	49 (21.8)			
Father smoking	Yes	97 (43.3)	68 (30.2)	1.763 (1196,2600)	8.264 (1)	0.004*
	No	127 (56.7)	157 (69.8)			

Regarding the smoking of the parents, father smoking was positive among 43.3% of cases and 30% of controls. Smoking father at home was found to be statistically significant with stunting.

The predictors and the risk factors were the preparatory and the secondary education of the father with OR 2 which means it increases the chances two times more, the parental unemployment also was increasing the odds of having stunted children and the father smoking can increase the likelihood of having stunted children twice more the nonsmoking father.

4.6.3 Association between stunting and residency

The highest participation was from Gaza city with 38.4% of the sample as it the largest city of GS with the highest population as well as four of the ten visited health centers are from Gaza city, followed by Khanyounis city with 20.9% of the participation, the middle governorate had 16.9% of the sample, Rafah city participated with 14% and the least is the North Gaza with 10% of the sample. This distribution is almost similar to the population size but with decreases the participation from the North Governorate because the other governorates have two participated centers and more and there was only one participated center in North Gaza. These differences of distribution weren't statistically significant with stunting among children (P value 0.120).

The place of residency was divided into three types: city, camp and rural area. Families of cases who were living in city is about 45.3%, families of cases who were living in camp is 41.3% and the other 13% of these families were living in rural area. While the families of controls, who were living in city was about 72%, 22% were living in a camp and about of 4% were living in rural area. Living in refugee's camp has strong positive and statistically significant relationship with stunting (P value 0.000) with OR 2.8 which means living in

camp is predictor of stunting with increasing the chanced almost three times more than children living in city. Also living in rural area was statistically significant with stunting (P value 0.017) with OR 5.9. This means living in rural area increases the chances of having stunted child six times more than children living in city. Living in rural areas was found in relationship with stunting in most of the world wide studies (Hien and Kam, 2008).

Crowding indexes are generally quantitative measures based on a calculation that involves number of people in a dwelling and the dwelling size, or a proxy for size such as the number of rooms or bedrooms. Quantitative measures range from simple counts of people and rooms, to more sophisticated models that also take into account household composition and demographic information. The quantitative measure that used in this study is the Equalized Crowding Index (ECI) (Goodyear et al, 2012): Annex (5). According to the ECI, a value greater than 1 indicates a household is crowded. In this study almost of the participant's houses are crowded. The ECI is ranging from 1 to 7.5 with mean 2.7.

Regarding the crowding index measurement, the results were crowded among almost all the study population so there was no specific relationship between ECI and stunting. Families with only one bedroom had more chances of having stunted children with statistically significant relationship (P value 0.040) with OR 1.95, which means that living at home with only one bedroom increases the chances of having stunted children two times more. This significant relationship indicates that overcrowding is one of the main predictors of stunting.

Table (4.10) Association between stunting and residency

Variables		Case n (%)	Control n (%)	ORc (95%CI)	χ2 (df)	P Value*
Governorate	North Gaza	15 (6.7)	29 (12.9)	1.126 (0.970,1.309)	8.433 (4)	0.120
	Gaza	92 (40.9)	81 (36.0)			
	Middle	33 (14.7)	43 (19.1)			
	Khanyounis	48 (21.3)	46 (20.4)			
	Rafah	37 (16.4)	26 (11.6)			
Type of residency	City	102 (45.3)	162 (72.0)	2.896 (1.899,4.416)	34.385 (3)	0.000*
	Camp	93 (41.3)	51 (22.7)			
	Rural	30 (13)	12(4)	5.956 (1.923,18.445)		0.017*
Bed rooms number	One	54 (24.0)	30 (13.3)	1.950 (1.032,3.683)	8.493 (2)	0.040*
	Two	135 (60.0)	156 (69.3)			
	Three and more	36 (16.0)	39 (17.3)	0.938 (0.564,1.558)		0.803
Crowding index	One	0	2 (.4)			1.000
	More than one	225	223			

4.6.4 Association between stunting and income

Regarding the income, it was divided into three groups: less than 1000 NIS which was among 47.3% of the total population (64.4% of cases families and 30.2% of controls families), the second group was from 1000 to 1500 NIS which was the income of 35.8% (24% of the cases families and 47.6% of the controls families) and the last group that the income more than 1500 NIS was 16.9% of the total population families. The expenses were the same as income or less in only 34% of the total population (17.8% among the

families of cases and 44.4% of the families of controls) while there was increase in the expenses from 100 to 500 NIS among 64.9% of the total population (69.8 among families of cases and 47.1% among the families of controls) and there was a group had expenses more the income with more than 500 NIS which was among 11.6% of the total families (12.4% among the families of cases and 8.1% among the families of controls). The income group of less than 1000 NIS was through 64% of the cases families and it was statistically significant with stunting (p value 0.019). Other groups of income were not having significant relationship with stunting. It was revealed that low monthly income was considered as a risk factor for malnutrition problems(El Kishawi et al, 2016) according to Radi et al (2013), the prevalence of stunting was greater among the children from household below the poverty line (Radi et al, 2013).Having income less than 1000 NIS per month is one the predictor of stunting with OR 4, increasing the chances of stunting four times more than children in families with higher income.

By measuring the differences between income and expenses, there was group of people had enough income 31% of the total families, another group had more expenses than the income ranging between 100 and 500 NIS and the last group was have more than 500 NIS differences, there was a strong positive relationship between the more expenses and the stunting of children (P value 0.000).The families who had expenses more than the income increases the chances of having stunted children three times more than the other families with higher income and less expenses.

Almost half of the families took a food or money aid. Either from UNRWA, Ministry of Social affair or another institutions, about 65.8% of the families of cases took a food or cash aid.

In this study it was there was positive strong relationship between stunting and food assistance for families (P value 0.000) with OR 2.9 which means the family who takes support and aid having three times chances more of having stunted children, in Huwwer study, it was revealed that malnutrition prevalence was highest among families receive food aid (Huwwer, 2015). This strong relationship because the people receiving food aid had income problems and lie below poverty line. There was no statistically significant relationship between stunting and special organization for food support.

Table (4.11) Association between stunting and financial issues

Variables		Case n (%)	Control n (%)	ORc (95%CI)	χ2 (df)	P Value*
Income	1000 and less	145 (64.4)	68 (30.2)	4.101 (2.355,7.140)	52.862 (2)	0.001*
	1001 to 1499	54 (24.0)	107 (47.6)	0.971 (0.546,1.726)		0.919
	1500 and more	26 (11.6)	50 (22.2)			
Expenses	As income or less	40 (17.8)	100 (44.4)	3.703 (2.381,5.760)	37.327 (2)	0.001*
	100 -500 increase	157 (69.8)	106 (47.1)			
	More than 500	28 (12.4)	19 (8.1)	3.684 (1.851,7.333)		0.001*
Aid	Yes	148 (65.8)	89 (39.7)	2.91 (1.986, 4.280)	30.554 (1)	0.001*
	No	77 (34.2)	135 (60.3)			

4.7 Association between stunting among children and environment factors

Regarding the water safety and hygiene practices, almost all of the study population (cases and controls) had the same water source which was the water venders with small population of the families had protected well as source of drinking water, but only 4% of

the total population boils the water for drinking, these variables weren't statistically significant related to stunting (P value > 0.05).

Regarding washing hands before meals , there was 31.9% of the cases are always wash their hands before meals, 56% of cases sometimes wash their hands and 11.4% of cases never wash their hands before meals. On the other hand 63.4% of the controls always wash their hands before meals, 25 % of controls sometimes wash their hand and 11.4% of controls are never washing their hand before meals.As mentioned above 56.7% of the cases were sometimes washing their hand before meals and this habit was in strong and statistically significant relation with stunting (P value 0.001) with OR 4.4. This means that washing hands sometimes increases the odds of stunting among the children by four times more.

Concerning the living conditions, 53.8% of cases were living in houses ceiling's wasasbestos and 44% of cases were living in houses covered with concrete while the rest 2% of cases were living in mixed houses of asbestos and concrete. But 26.2% of controls were living in houses covered by asbestos and 73.8% of them were living in houses made of concrete. Living in house covered by asbestoses was found to have statistically significant relationship with stunting (P value 0.001) with OR 3.3.And this means that stunting's chances increases by three times more in living in houses has ceiling of asbestos.

Houses with good ventilation were of 51.1% of cases and 78.8% of controls. These differences made the homes without good ventilation is statistically significant related to stunting of children (P value 0.001) with odds ratio 3.5 more chances of having stunted children.

And 49.3% of the cases had exposure to pesticides and 15.1% of controls were exposed to pesticides. As we mentioned early that living in rural area increase the chances of children

to be stunted, also exposure to pesticide was related to stunting with positive and statistically significant relationship (P value 0.001) with OR 1.18.

Table (4.12) Association between stunting and environmental circumstances

Variable		Case n (%)	Control n (%)	ORc (95%CI)	χ2 (df)	P Value*
Boiling water	Yes	5 (2.2)	6 (2.7)	0.830 (0.249,2.758)	0.093 (1)	0.760
	No	220 (97.8)	219 (97.3)			
Washing hands	Always	67 (31.9)	128 (63.4)	4.458 (2.867,6.932)	46.165 (2)	0.001*
	Sometimes	119 (56.7)	51 (25.2)			
	Almost Never	24 (11.4)	23 (11.4)	1.994 (1.047,3.795)		0.442
Type of ceiling	Concrete	99 (44.0)	162 (72.0)	3.356 (2.251,5.003)	36.674 (2)	0.001*
	Asbestos	121 (53.8)	59 (26.2)			
	Mixed	5 (2.2)	4 (1.8)	2.045 (0.536,7.799)		0.295
Animals inside the house	Yes	40 (17.8)	18 (8.0)	2.486 (1.378,4.488)	9.580 (1)	0.003*
	No	185 (82.2)	207 (92.0)			
Good ventilation	Yes	115 (51.1)	177 (78.7)	3.527 (2.335,5.327)	37 .49 (1)	0.001*
	No	110 (48.9)	48 (21.3)			
Exposure to pesticides	Yes	111 (49.3)	34 (15.1)	1.183 (1.117,1.286)	60.329 (1)	0.001*
	No	114 (50.7)	191 (84.9)			

The families who were raising animals inside their homes were about 17.8% of cases and 8% of control's families. Also there was statistically significant relationship between stunting and raising animals at home (P value 0.003) with OR 2.4.

Regarding the type of latrine, 45.8% of the cases and 44.9% of the controls were using the diapers, while 34.2% of the cases and 47.6% of the cases were using the European or Western Water Closet, 17.3% of cases and 3% of controls were using the Squatting Pan and 2.7% of cases and 6.2% of controls were using the kid's toilet. Almost all the houses were linked to the municipality sewage system

4.8 Summary of the risk factors of stunting among children

The final multivariate analysis was performed by using the multiple logistic regressions to identify the relationship between the findings and stunting as total models.

The significant risk factors of stunting that related to child health as shown in table (4.13) were: length at birth was statistically significant with stunting P value .000 (OR adj10.488 59%CI (2.800,39.287)), suffering from chronic diseases P value .011* (OR adj 7.497 95%CI (1.580,35.574)) suffering from diarrheal disease P value.000* (OR adj 2.047 95%CI(1.880,3436)) , admission to hospital because of diarrhea P value .003* (OR adj 10.22095%CI(2.188,47.734)), early starting weaning at the first month P value .000* (OR adj 1.47495%CI (1.282,1.694)), frequency of complementary feeding less than 4 times P value .002* (OR adj 95%CI3.043 (1.517,6.105)) and consumption of milk less than three times per week P value .002* (OR adj 1.291 95%CI(1.099,1.517)).

Table (4.13) Child health related risk factors of stunting

Variables	Simple logistic regression	Binary logistic regression

	Crude OR (95%CI)	P Value*	Adjusted OR (95% CI)	P Value*
Preterm delivery	10.894 (1.394,85.148)	.023*	1.673 (.391, 7.158)	0.488
Small weight	14.083 (0.085,0.412)	.011*	2.064 (.156,27.272)	0.582
Short length	25.718 (10.179,64.98)	.057	10.488 (2.800,39.287)	0.001*
Suffering from any disease	12.680 (4.463,36.024)	.001*	7.497(1.580,35.574)	0.011*
Suffering from diarrheal disease	3.483 (2.355,5.150)	.001*	2.047 (1.880,3436)	0.001*
Frequency of diarrhea 2	43.063(5.797,319.868)	.001*		0.997
Admission to hospital	5.512 (2.509,12.110)	.001*	1.144(.267,4.907)	0.856
Admission to the hospital due to diarrhea	23.429 (8.370,65.578)	.001*	10.220(2.188,47.734)	0.003*
Start of weaning 1	5.333 (2.396,11.871)	.001*	1.474 (1.282,1.694)	0.001*
First food of weaning 6	8.714 (3.604,21.068)	.000*	.503 (.410,.617)	0.962
Eggs 2	.588(.362,.954)	.032*	1.166 (.903,1.505)	0.239
Milk, cheese, yogurt, or other milk products	1.453(1.302,1.681)	.000*	1.291 (1.099,1.517)	0.002*
How many meals the child has daily2	125 (15.639,1002.8)	0.001*	1.067(.849,1.341)	0.580
How many meals of complementary food the child has 1	4.8 (2.665,8.982)	0.001*	3.043 (1.517,6.105)	0.002*

Table (4.14) concludes the risk factors of stunting that related to the mother health that includes: not having preconception care services P value .000* (OR adj 2.07295% CI (1.386, 3.097)), having complication during the pregnancy P value .012* (ORadj4.372

95%CI (1.385.13.802)), and the mother weightP value.010 (OR adj 4.644 95%CI (1.446, 14.912)).

Table (4.14): Mother related risk factors of stunting

Variables	Simple logistic regression		Binary logistic regression	
	Crude OR (95%CI)	P Value*	Adjusted OR (95% CI)	P Value*
Mother's disease	3.367(1.319,8.595)	.011*	.590 (.202,1.727)	0.336
PCC	2.296 (1.556,3.366)	.001*	2.072 (1.386,3.097)	0.001*
Type of Labor	3.381 (1.709,6.687)	.000*	1.494 (.684,3.263)	0.314
Complication pregnancy	10.874 (3.806,31.066)	.001*	4.372 (1.385.13.802)	0.012*
Mother weight pregnancy	8.136 (2.390,27.699)	.001*	4.644 (1.446,14.912)	0.010*

Table (4.15) shows the socioeconomic factors related to stunting that includes:first degree of consanguinity P value .001* (OR adj 1.633 95%CI (1.483, 1.830)), living in a refugee's camp and in a farm P value .006* (OR adj 1.633 95%CI (1.483, 1.830)) and low income was statistically significant P value .000* (OR adj .465 95%CI (.314,.688)).

Table (4.15): Socioeconomic risk factors of stunting

Variables	Simple logistic regression		Binary logistic regression	
	Crude OR (95%CI)	P Value*	Adjusted OR (95% CI)	P Value*
Father education	2.075 (1.137,3.788)	.017*	1.190 (.877,1.614)	0.264

Maternal working status	7.398 (1.661,32.941	.009*	6.151 (.896,42.218)	0.065
Father's working status	2.531 (1.674,3.825)	.001*	1.313 (.758,2.273)	0.331
Father smoking	1.763 (1196,2600)	.004*	.945 (.750,1.191)	0.633
Degree of consanguinity 1	2.411 (1.530,3.801)	.000*	1.633 (1.483,1.830)	0.001*
Another stunted brother	33.514 (8.051,139.515)	.000*	.033 (.007,.149)	0.064
Type of residency	2.896 (1.899,4.416)	.000*	1.533 (1.133,2.073)	0.006*
Bed rooms no	1.950 (1.032,3.683)	.040*	.821 (.560, 1.203)	0.311
Income	4.101 (2.355,7.140)	.000*	.465 (.314,.688)	0.001*
Expenses	3.703 (2.381,5.760)	.000*	1.000(.630,1.588)	0.999
Aid	2.91 (1.986, 4.280)	.000*	1.551 (1.332,1.916)	0.022*

Table (4.16) shows that the environmental risk factors that are: washing hand before meals P value .001* (OR adj 1.752 95%CI (1.259, 2.437)), living in house its ceiling was made of asbestoses P value .001* (OR adj 2.122 95%CI (1.380, 3.260)) , living in house with poor ventilation P value .028* (OR adj 1.759 95%CI (1.064, 2.910)) and exposure to pesticide was statistically significant P value .000 (OR adj 95%CI 1.859 (1.111,3.109)).

Table (4.16): Environmental risk factors of stunting

Variables	**Simple logistic regression**		**Binary logistic regression**	
	Crude OR (95%CI)	**P Value***	**Adjusted OR (95% CI)**	**P Value***
Washing hands	4.458 (2.867,6.932)	.000*	1.752 (1.259 ,2.437)	0.001*

Type of ceiling	3.356 (2.251,5.003)	.001*	2.122 (1.380, 3.260)	0.001*
Animals inside the house	2.486 (1.378,4.488)	.003*	.492 (.185 ,1.306)	0.154
Home ventilation	1.183 (1.117,1.286)	.001*	1.759 (1.064,2.910)	0.028*
Exposure to pesticides	3.527 (2.335,5.327)	.001*	1.859 (1.111,3.109)	0.001*

Table (4.17): Statistically significant findings in the study

Variables	**Simple logistic regression**		**Binary logistic regression**	
	Crude OR (95%CI)	**P Value***	**Adjusted OR (95% CI)**	**P Value***
Length at Birth	25.718(10.179,64.9)	.057	10.488(2.800,39.28	0.001*

Suffering from any disease	12.680 (4.463,36.024)	.001*	7.497(1.580,35.574)	0.011*
Suffering from diarrheal disease	3.483 (2.355,5.150)	.001*	2.047 (1.880,3436)	0.001*
Admission to hospital due to diarrhea	23.429 (8.370,65.578)	.001*	10.220(2.188,47.734)	0.003*
Start of weaning	5.333 (2.396,11.871)	.001*	1.474 (1.282,1.694)	0.001*
Milk products	1.453(1.302,1.681)	.000*	1.291 (1.099,1.517)	0.002*
Complementary food1	4.8 (2.665,8.982)	0.001*	3.043 (1.517,6.105)	0.002*
PCC	2.296 (1.556,3.366)	.001*	2.072 (1.386,3.097)	0.001*
Complication during pregnancy	10.874 (3.806,31.066)	.001*	4.372 (1.385.13.802)	0.012*
Degree of consanguinity 1	2.411 (1.530,3.801)	.000*	1.633 (1.483,1.830)	0.001*
Residency	2.896 (1.899,4.416)	.000*	1.533 (1.133,2.073)	0.006*
Income	4.101 (2.355,7.140)	.000*	1.465 (1.314,1.688)	0.001*
Aid	2.91 (1.986, 4.280)	.000*	1.551 (1.332,1.916)	.022*
Washing hands	4.458 (2.867,6.932)	.000*	1.752 (1.259 ,2.437)	0.001*
Type of ceiling	3.356 (2.251,5.003)	.001*	2.122 (1.380, 3.260)	0.001*
Home ventilation	1.183 (1.117,1.286)	.001*	1.759 (1.064,2.910)	0.028*
Exposure to pesticides	3.527 (2.335,5.327)	.001*	1.859 (1.111,3.109)	0.001*

Chapter 5

Conclusion and Recommendation

5.1 Conclusion

Stunting is considered as a major public health problem worldwide as it's associated with short and long term effects as well as increase the morbidity and mortality among children under the age of five. There is increased international attention as result of greater awareness of the significance of stunting as a major public health problem as it affects

large numbers of children globally, has severe short-term and long-term health and functional consequences; it is a cross-cutting problem calling for a multi sectorial response.

This case control study was carried out in order to identify the risk factors of stunting among children under the age of five in Gaza governorates; the study identified multiple risk factors related to child health, mother health, parental factors, socioeconomic factors and environmental factors. The sample was taken from the five governorates, from PHC facilities of MOH and the two NGOs.

In this study the researcher investigated at first the relationship between the stunting and the child related factors including health risk factors and nutrition risk factors, it was found that length at birth is associated with stunting, suffering from any chronic disease was statistically significant with stunting but there was no significance with specific disease, suffering from diarrheal disease was also found to be in strong positive relationship with stunting, admission to hospital because of the diarrheal disease was one of the child health risk factors but the type of the diarrheal disease wasn't associated with stunting as well as the frequency .

Early starting of weaning was significantly associated withstunting;frequency of giving the child in his first two years of life a complementary feeding less than four times per day was associated with stunting, consumption of milk products less than three times per week was significantly associated with stunting, but the frequency of consumption other food types was not statistically associated with stunting among children.It was found that there was not significant between stunting and anemia, also receiving multivitamins or iron supplements wasn't associated with stunting. And time of completely weaning wasn't statistically significant to stunting.

Regarding the mother health: it was found that those mothers who didn't had a preconception care services were associated with stunting among children with statistically significant relationship and those mothers who had a complication during the pregnancy also found to be as a risk factor of stunting among children also the mother's weight at pregnancy was associated with stunting of children. Most of the mothers had antenatal and post natal health services because of that there was not significant relationship between these services and stunting of children, also there was not association between stunting and special affection of chronic diseases.

According to the socioeconomic factors; it was found that parents with first degree of consanguinity were significantly associated with more chances of having stunted children, having income less than 1000 NIS per month was having strong positive relationship with stunting and families who were taking food aid were in statistically significant relationship with stunting among children. Also living in a refugee's camp or in a farm land was statistically significant with stunting. The parent's education and age were not statistically associated with stunting as well as the parent's employment status.

Regarding the environmental factors; washing hand sometimes was statistically associated with stunting, living in a house covered by asbestos was statistically related to stunting,houses with poor ventilation were found to be in positive relationship with stunting, and exposure to pesticides was associated with stunting. Water source was the same for study population so there were no differences between cases and controls, presence of animals near or inside the house wasn't statistically significant with stunting.

5.2 Recommendations

The results of this study show that there were several factors significantly associated with stunting among children under the age of five; based on these findings the researcher proposes the following recommendations:

- Improvement of the preconception health services to include more population, as well as improving the quality of the services through providing the health education programs for both parents about the child nutrition from the pregnancy period until completing the second year of life.
- Advice for the exclusive breast feeding for the first six months and advice about the weaning period and the introduced foods for weaning, also counseling the mothers about the safe and nutritious complementary food as well as the appropriate amounts.
- Options for improving diets during the first 1000 days include dietary diversification and increased intake of nutrient-rich foods, improved complementary feeding practices, micronutrient supplements and fortified foods or products specifically designed for these target groups.
- Advice about the family planning methods and importance of spacing between births.
- Prevention of diarrhea by advising the mothers for hygiene practices and correct handling with foods.
- The socioeconomic risk factors could be improved by creation of employment opportunities to increase the income and through improvement of the quality of the food aids; alsohealth educational programs should be applied before marriage among couples to raise awareness about the risk of consanguinity marriage on childhood health status.

- Increased maternal and paternal education levels to increase the knowledge about the nutrient-dense diets, which are required for preventing undernutrition.
- Advise the parents to stop smoking or smokes away from the children as it have effect child health.
- An attempt to decrease the environmental risk factors through decrease the direct exposure to pesticides and interventions that promote hand washing among children. As well as advise the mothers to boil the water to prevent the children from diarrheal diseases. Giving health education about the importance of the good ventilation of the houses.

5.3 Recommendation for further research

- Conduct similar study at community level not only at clinic level including the kindergartens to study more population and more differentiations.
- Each group of the studied risk factors could be conducted in separate research in more and wider details.
- Conduct research using more controls to case ratio and without using the mild cases
- Conduct more comprehensive study that includes a qualitative part, case studies or interventional measurements.

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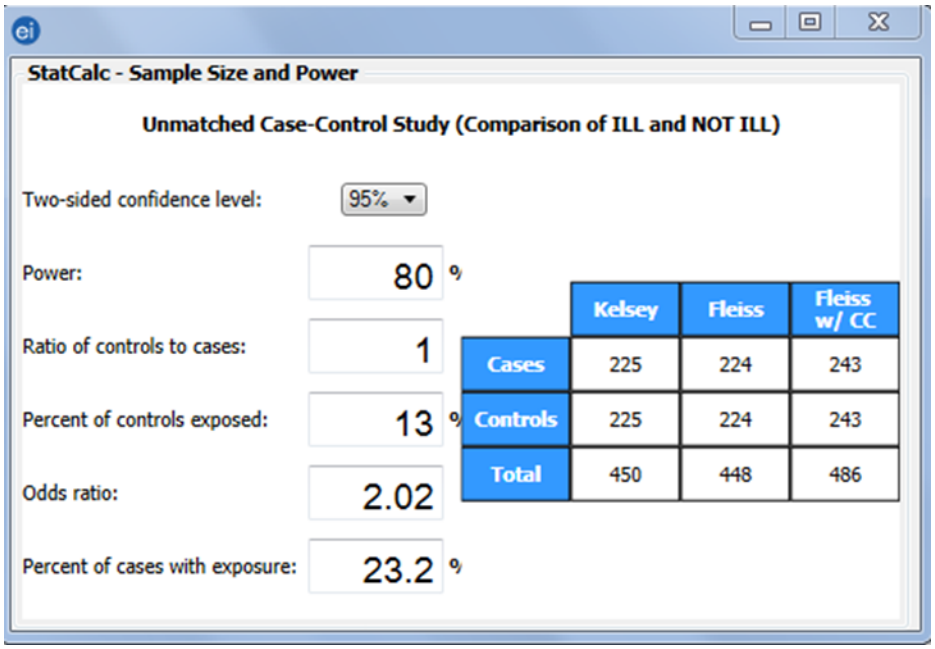
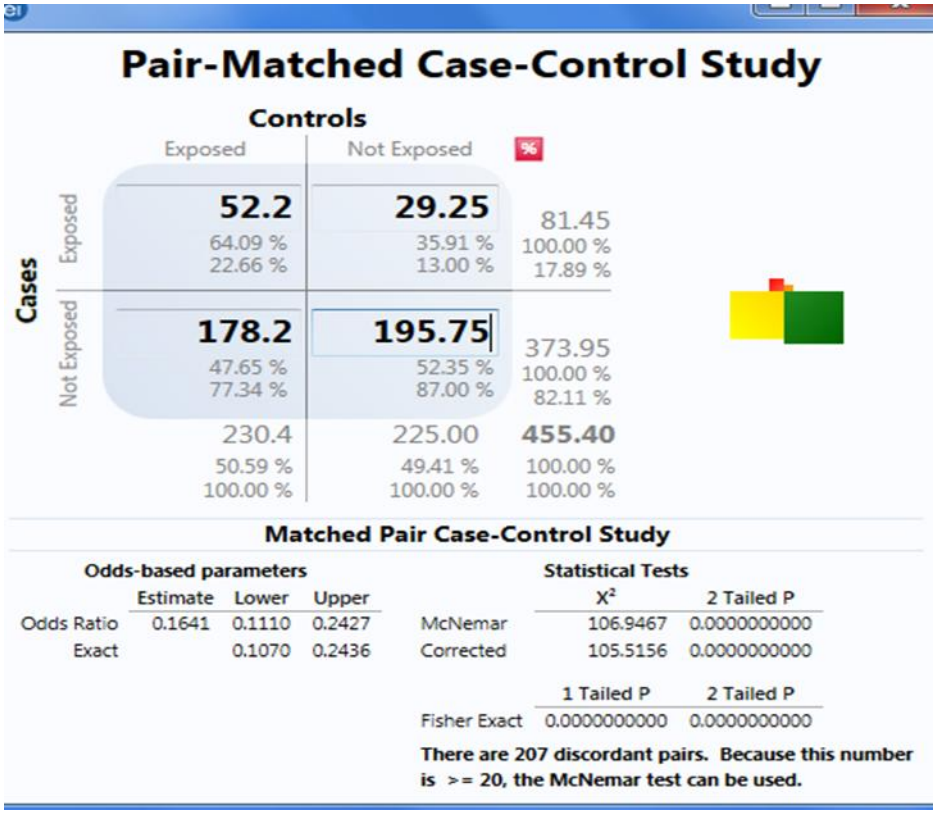
Annex (1): Describe the sample size calculation method by using the epi info program

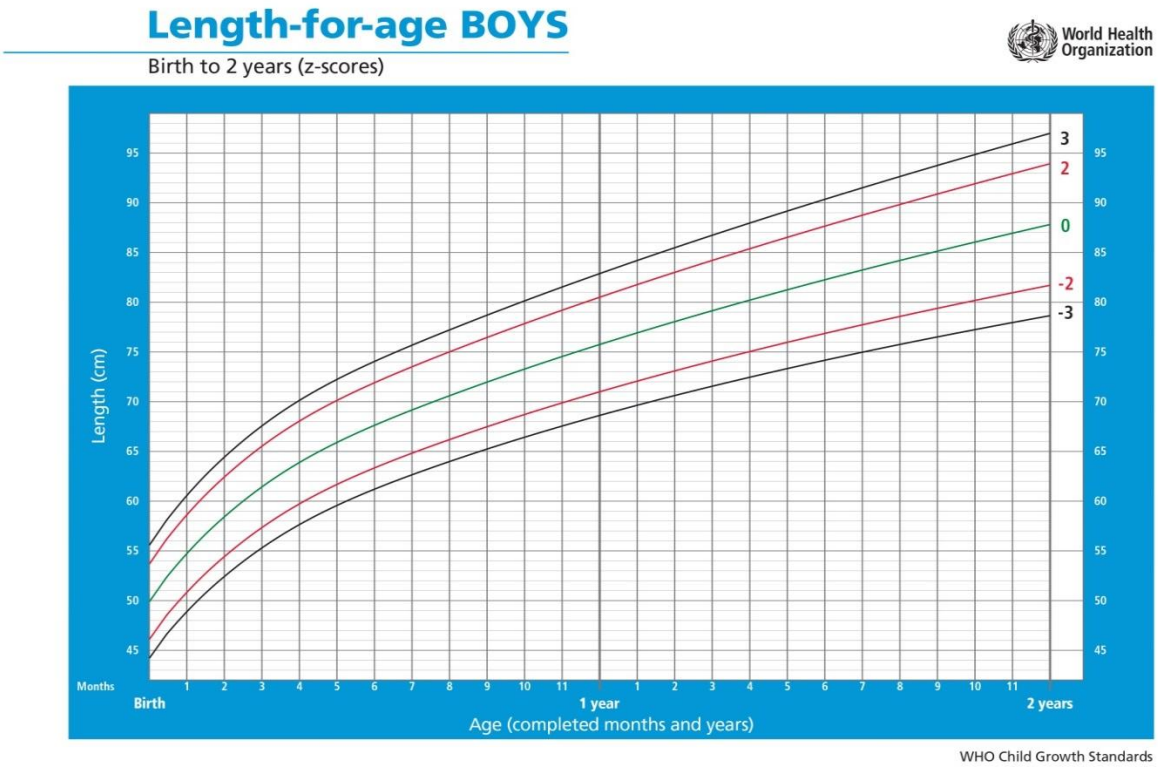


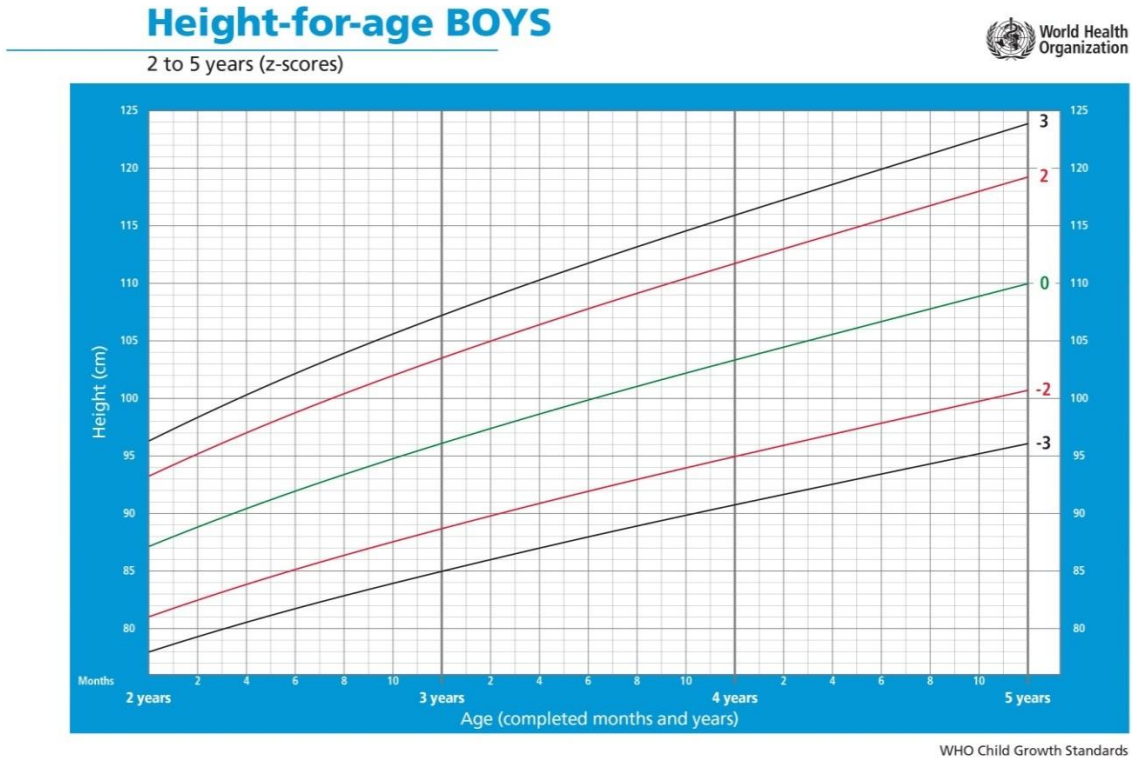


Annex (2): List of arbitrators

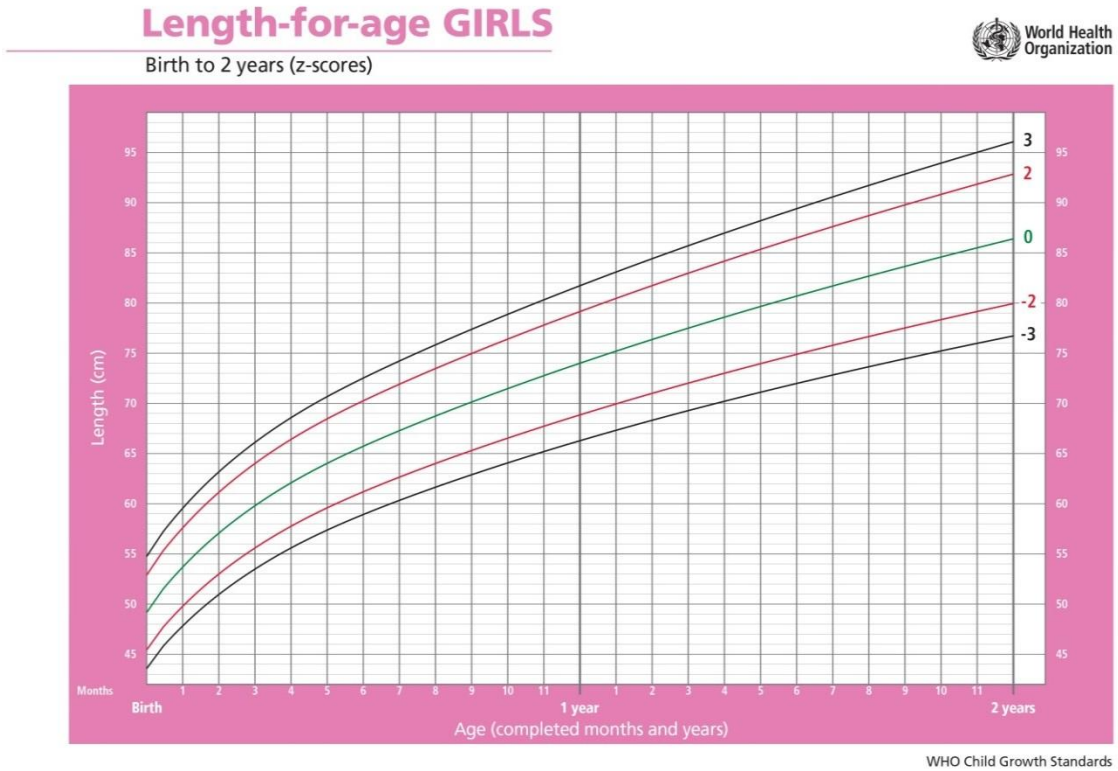
	Name
1-	Dr-Yehia Abed
2-	Dr- Basam Abu Hamed
3-	Dr- Adnan Al Wahaidi
4-	Dr- Shereen Abed
5_	Dr- FawazMazyak

Annex (3): Z-score for boys.





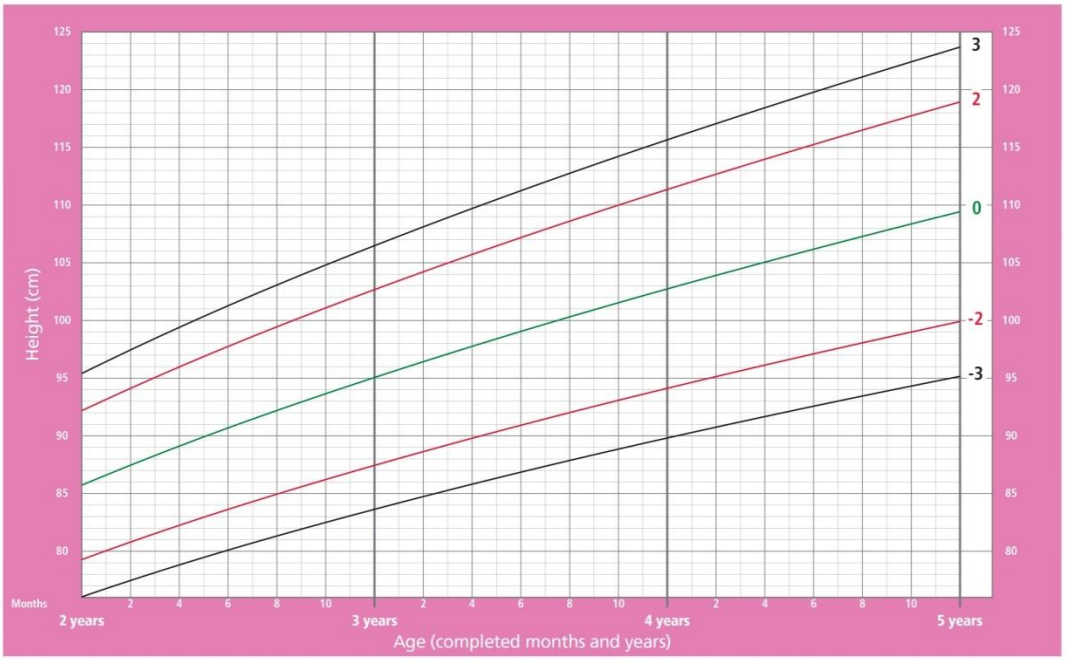
Z-score for girls.



Height-for-age GIRLS

2 to 5 years (z-scores)

World Health Organization



WHO Child Growth Standards

Annex (4): Study questionnaire

Dear participant

I am Maysaa ALbelbeisi, collecting data for a research study about risk factors of stunting among children under the age of five in Gaza Governorates;this questionnaire is part of a study conducted by me as a requirement for master degree in Public Health at Al Quds University. The findings and conclusion of this study will help in improving our children health. The interview will be for about 30 minutes. Confidentiality will be provided and maintained and you don't need to tell the child name. This study is self-funded and findings will be used only for the research purpose.

Thanks a lot for your participation

Serial number ……	Date of interview / /
Participant description	Case 1 Control 2

Demographic criteria	
ID	
Child age Birth date	……. Years / /
Sex	Male Female

Relationship of the respondent to the child	
Age of the respondent	
Level of education of the respondent	Not finished 1 Primary school 2 Secondary school 3 High school 4 Graduate studies/university 5 Post Graduate 6
Name of the institution	

Anthropometric measurements	
Height/ length	…….. cm ……..... percentile
Weight	……Kg
Stunting as diagnosed	Severe<-3SD Moderate <-2SD Mild <-1SD

Mother health				
Q1	Does the mother have any chronic disease? If yes, what is the disease?	Yes 1 Diabetes mellitus Hypertension Heart disease Asthma Epilepsy Specify:	No 2	 1 2 3 4 5 6
Q 2	Did the mother receive preconception care?	Yes No		1 2
Q 3	Did the mother have medical follow up during pregnancy?	Yes No		1 2
Q 4	Where was the follow up?	At UNRWA PHC At MOH PHC At NGO Two centers Specify:		1 2 3 4 5
Q5	How many times the mother has antenatal follow up?			
Q6	Does the mother receive a post natal follow up?	Yes No		1 2
Q7	If yes; How many times she received a post natal follow up?			
Q8	Is the mother having a family planning method now?	Yes No		1 2
Q 9	Type of pregnancy	Normal pregnancy IVF		1 2
Q10	Type of labor	Normal labor CS Assisted vaginal		1 2 3
Q 11	Was there any complication during pregnancy?	Yes 1 No 2 Gestational hypertension Gestational diabetes Chronic urinary tract infection Enteric infection Bleeding disorders Specify:		 1 2 3 4 5 6

Q 12	Mother weight during pregnancy	Normal Overweight Underweight	1 2 3
Child Health			
Q 13	Gestational age	Full term Pre term Post term	1 2 3
Q 14	Weight at birth		
Q15	Length at birth		
Q 16	How would you describe the child's health?	Healthy Poor health Very poor healthy	1 2 3
Q17	Immunization status	Complete Incomplete	1 2
Q18	Did the child receive multivitamins?	Yes No	1 2
Q19	Did the child receive iron supplements?	Yes No	1 2
Q20	Did the child suffer from any disease?	Yes No	1 2
Q21	If yes, describe the disease	Congenital anomalies Respiratory infections Enteric infections and diarrhea Anemia Gastrointestinal diseases Disability Urinary tract infection Epilepsy Malabsorption problem Specify:	1 2 3 4 5 6 7 8 9 10
Q 22	When did the child start to suffer from the disease?		
Q 23	Did the child suffer from diarrheal disease?	Yes No	1 2
Q24	If yes : what was type of diarrheal disease	Watery diarrhea Bloody diarrhea Persistent diarrhea	1 2 3
Q25	Frequency of diarrhea	Less than three per year Greater than three per year	1 2

Q26	Did the child have ever admitted to hospital?	Yes No	1 2
Q27	What is the cause of hospital admission		
Q28	Did the child have admitted to the hospital due to diarrhea?	Yes No	1 2
Q29	If yes; how many times?		
Q 30	Was the child breast fed?	Yes No	1 2
Q31	Did the child have exclusive breast feeding for 6 months?	Yes No	1 2
Q32	Are you currently breastfeeding the child?	Yes No	1 2
Q33	How many times the child had breast feeding per day?		
Q34	When did your child start weaning?		
Q35	How old was the child when breastfeeding was stopped? Completely weaning		
Q 36	How weaning carried out?	Infant formula Animal milk Fruits Vegetables Carbohydrates Yogurt Water Specify :	1 2 3 4 5 6 7
Q37	In case that the breast feeding was stopped before 6 month. Identify the cause	Child did not want breast milk anymore Breast feeding was inconvenient The mother had problems with the breast feeding Specify:	1 2 3 4
Q38	What the child eat in a typical day?		
Q39	How many meals the child has daily?		
Q40	How many meals of complementary food the child has? For less than 24 months	Less than 4 times 4 times and more	1 2

Q41	How many times the children eat the following food items per week?	1	2	3	4	5 and more	Never
Q41-1	Porridge, bread, rice, noodles, or other foods made from grains						
Q41-2	Pumpkin, carrots, or sweet potatoes that are yellow or orange						
Q41-3	Liver, kidney, heart, or other organ meats or blood based food						
Q41-4	Any meat, such as beef, lamb, goat, chicken, or duck or other birds						
Q41-5	Eggs						
Q41-6	Fresh or dried fish, shellfish, or seafood						
Q41-7	Milk, cheese, yogurt, or other milk products						
Q41-8	Any oil, fats, or butter, or foods made with any of these						
Q41-9	Any sugary foods such as chocolates, sweets, candies, pastries, cakes, or Biscuits						

Socio economic status				
Q42	Father's age		Mother's age	
Q43	Father's height		Mother's height	
Q44	Father’s age at marriage		Mother’s age at marriage	
Q 45	consanguinity		1st degree 2nd degree No relation	1 2 3
Q46	Is there other stunted family members?		Yes No	1 2
Q47	If yes, how many			
Q 48	Family size			
Q49	Birth orderof the child			
Q50	Does the parents smoke?		Yes, both Father only Mother only No one	1 2 3 4

Q51	Where they smoke?		
Q52	Mother's level of education	Not educated Primary school Secondary school High school Graduate studies/university Post graduate	1 2 3 4 5 6
Q53	Father's level of education	Not educated Primary school Secondary school High school Graduate studies/university Post graduate	1 2 3 4 5 6
Q54	Mother's job	Employed Not employed	1 2
Q55	Father's job	Employed Not employed	1 2
Q56	What was the household's total monthly income?	…….. NIS	
Q57	What was the household's expenditure last month?	……NIS	
Q58	How many people are supported by the total household income?		
Q59	Number of child at home under the age of five		
Q60	Place of residency	City Camp At the border area In farm Specify	1 2 3 4 5
Q 61	In which governorate?	North Gaza Gaza City Middle Governorate Khanyounis City Rafah City	1 2 3 4 5
Q62	Does the family take any support?	Yes No	1 2

Q63	If yes, from where	UNRWA aids Social affairs specify	1 2 3

Crowding index			
Q 64	Number of bedrooms		
Q 65	Number of children under the age of 10		
Q 66	Number of other people aged 10 and above		
Q 67	Number of couples		

Environmental factors			
Q68	What is the main source of drinking water for the Household?	Public tap Private tap Protected well Open well in yard Purchased bottle water Tank(water's vendors) Filtered water Specify	1 2 3 4 5 6 7 8
Q69	Do you boil or treat the children's drinking water in any way?	Yes No	1 2
Q70	How do you store the household drinking water?	In clean open container In clean closed container Specify	1 2 3
Q71	Do you wash the children's hands before meals?	Always Sometimes Almost never Never	1 2 3 4
Q72	What is the type of ceiling?	A house covered of asbestos A house covered of concrete Specify	1 2 3
Q73	Do you have animals near the house?	Yes No	1 2
Q74	Do you have animals live inside the house?	Yes No	1 2
Q75	Is the home good ventilated?	Yes No	1 2

Q76	Is the child having direct exposure with pesticides?	Yes No	1 2
Q 77	What type of latrine does the child use?	Squatting Pan Kid's toilet European or Western Water Closet Diapers	1 2 3 4
Q 78	What is the type of the sewage system in the house?	Cesspools Pump Stations Septic tank	1 2 3

أخيالكريم \ أختيالكريمة

أنا الباحثة : ميساء سعدي البلبيسي, أقوم بإجراء دراسة لمعرفة عوامل الخطر اللي تؤدي لمرض التقزم لدى الأطفال دون سن الخامسة في محافظات غزة , وذلك استكمالا لمتطلبات الحصول على درجة الماجستير في جامعة القدس / كلية الصحة العامة.

وعليهفقدتمإعدادهذاالاستبيانبهدفجمعالبيانات , إذيضمهذاالاستبيان ستة أقسام رئيسية : القسم الأول يحتوي على المعلومات الشخصية و الديموا غرفية للطفل, والقسم التاني يحتوي على القياساتالأنثروبومترية المطلوبةوالقسم الثالث يحتوي على اسئلة تخص صحة الأم , القسم الرابع يحتوي على أسئلة خاص بصحة الطفل , القسم الخامس يصف الحالة الاجتماعية والاقتصادية , بينما القسم السادس يتناول الظروف البيبئية المحيطة بالطفل.

راجينمنكمالإجابةعلىبنودهذاالاستبيانبدقةعاليةوموضوعيةوصدقحيثإنالوقتاللازملتعبئةهذا الاستبيانلايتعدىنصفساعةمنوقتكمالثمين،معالعلمأنكافةالمعلوماتستعاملبسريةتامةدونالإشارةإلي شخصكمالكريموسيتماستخدامهافقطلأغراضالبحثالعلميوذلكلهدفالتحسينوالتطويرواخذالقراراتالمبنية علىالحقائق.

شاكرينلكمحسنتعاونكم

الرقم التسلسلي	تاريخ المقابلة / /	
وصف حالة المشارك	حالة تحكم	1 2
المعاييرالديموغرافية		
رقم الهوية		
عمر الطفل تاريخ الميلاد	..... سنة / /	
النوع	ذكر أنثى	1 2
علاقةالمجيبللطفل		
عمر المجيب		
مستوىالتعليمللمجيب	غير متعلم المرحلةالابتدائية المرحلةالاعدادية المرحلةالثانوية	1 2 3

	بكالوريوس دراساتعليا	4 5 6
اسم المؤسسة		

القياساتالأنثروبومترية	
الطول	..... سم ..... نسبة
الوزن	.....كجم
فحص الدم	
حالة المريض	حاد متوسط خفيف

صحة الأم				
س 1	هلتعانيالأممنأيأمراضمزمنة؟ اذا نعم , من ماذا تعاني الأم ؟	نعم 1 مرضالسكري مرضالضغط أمراضفيالقلب أزمةصدرية صرع أمراضأخرى:.....	لا 2	 1 2 3 4 5 6
س2	هلتلقتالأمخدمةرعايةماقبلالحمل؟	نعم لا		1 2
س 3	هل تلقت الأم رعاية ومتابعة خلال الحمل ؟	نعم لا		1 2
س4	أين تلقت الأم خدمة متابعة الحمل؟	عيادات الرعاية الأولية في وكالة الغوث عيادات الرعاية الأولية في الحكومة في مؤسساست غير حكومية في أماكن أخرى:.....		1 2 3 4
س5	كم عدد زيارات الأم لخدمة متابعة الحمل؟			
س6	هل تلقت الأم خدمة رعاية مابعد الولادة ؟	نعم لا		1 2
س7	إذا نعم, كم مرة تلقت هذه الخدمة ؟			
س8	هل الأم تستخدم وسيلة منع حاليا ؟	نعم لا		1 2
س 9	نوع الحمل	طبيعي تلقيح		1 2
س 10	طريقة الولادة	طبيعي قيصري ولادة مع مساعدة		1 2 3
س 11	هل كان هناك مضاعفات خلال الولادة ؟	نعم 1	لا	

	اذا نعم . ماهي ؟	ارتفاعضغطالدمالحملي سكريالحمل التهابالمسالكالبوليةالمزمنة العدوىالمعوية اضطراباتالنزيف أمراض اخرى :.....	2	1 2 3 4 5 6
س 12	وزن المرأة خلال الحمل	طبيعي زيادة في الوزن نقص في الوزن		1 2 3
صحة الطفل				
س 13	فترة الحمل	ولادة كاملة ولادة قبل الأوان ولادة بعد الأوان		1 2 3
س 14	الوزن عند الميلاد			
س 15	الطول عند الميلاد			
س 16	كيف تصف صحة الطفل ؟	حالة صحية جيدة حالة صحية سيئة حالة صحية سيئة جدا		1 2 3
س 17	حالة التطعيمات	كاملة ناقصة		1 2
س 18	هل يتناول الطفل فيتامينات ؟	نعم لا		1 2
س 19	هل يتناول الطفل الحديد ؟	نعم لا		1 2
س 20	هل يعاني الطفل من أي أمراض؟	نعم لا		1 2
س 21	اذا نعم, ماهو المرض ؟	التشوهاتالخلقية التهاباتالجهازالتنفسي الالتهاباتالمعويةوالإسهال فقردم أمراضالجهازالهضمي إعاقة التهابالمسالكالبولية صرع مشكلةسوءالامتصاص أمراض آخرى:.....		1 2 3 4 5 6 7 8 9 10
س 22	من متى بدأ المريض يعاني من المرض ؟			
س 23	هل يعاني الطفل من مرض الاسهال ؟	نعم لا		1 2
س 24	اذا نعم, ماهي نوع الاسهال ؟	الإسهالالمائي إسهالدموي الإسهالالمستمر لاكثر من 14 يوم		1 2 3
س 25	تكرار الاسهال	أقل من 3 مرات بالسنة 3 مرات وأكثر بالسنة		1 2
س 26	هلدخلالطفلإلىالمشفى؟	نعم		1

		لا	2
س 27	اذا نعم, ماذا كان السبب ؟		
س 28	هل دخل الطفل المشفى بسبب الاسهال ؟	نعم لا	1 2
س 29	اذا نعم. كم مرة ؟		
س 30	هل كان الطفل يرضع طبيعي ؟	نعم لا	1 2
س 31	هلالطفلمارسالرضاعةالطبيعيةالحصريةلمدة 6 أشهر؟	نعم لا	1 2
س 32	هل حاليا الطفل يرضع طبيعي ؟	نعم لا	1 2
س 33	كم مرة كان يرضع الطفل طبيعي ؟		
س 34	متى بدأ الطفل بالفطام ؟ إدخال الطعام غير الحليب		
س 35	كمكانعمرالطفلعندإيقافالرضاعةالطبيعية؟ بشكل كامل		
س 36	كيف بدأ الفطام ؟	حليب أطفال حليب الحيوان ثمار خضروات الكربوهيدرات زبادي ماء حدد:	1 2 3 4 5 6 7
س 37	فيحالةتوقفالرضاعةالطبيعيةقبل 6 أشهر. حددالسبب	لميكنالطفليريدحليبالأمبعدالآن كانالرضاعةالطبيعيةغيركافية كان للأممشاكلمعالرضاعةالطبيعية أسباب اخرى.	1 2 3 4
س 38	ماذا يتناول الطفل في اليوم العادي ؟	نفس اكل الاطفال بالبيت أقل أكتر	1 2 3
س 39	كم وجبة يتناول الطفل باليوم ؟		
س 40	كمعددوجباتالطعامالتكميليللطفل؟ للاقل من 24 شهر	أقل من 4 4 وأكثر	1 2

س 41	كممرةيأكلالأطفالالموادالغذائيةالتاليةفيالأسبوع؟	1	2	3	4	5 و اكثر	أبدا
41-1	العصيدة،الخبز،الأرز،المعكرونة،أوغيرهامنالأطعمةالمصنوعةمنالحبوب						
41-2	اليقطين،والجزر ،أوالبطاطاوأنواعها						

3-41	الكبد،الكلى أوالقلب وغيرها من اعضاء						
4-41	أياللحوم،مثللحمالبقروالضأنوالماعزوالدجاج،أوالبطأوالطيورالأخرى						
5-41	البيض						
6-41	الأسماكالطازجةأوالمجففة،المحار،أوالمأكولاتالبحرية						
7-41	الحليب،الجبن،الزبادي،أوغيرهامنمنتجاتالحليب						
8-41	أيزيتأودهونأوزبدة،أوأطعمةمصنوعةمنأيمنهذه						
9-41	أيالأطعمةالسكريةمثلالشوكولاتةوالحلوياتوالحلوياتوالمعجناتوالكعك،أو بسكويت						

الوضعالاجتماعيوالاقتصادي			
س 42	عمر الأب	عمر الأم.....	
س 43	طول الأب	طول الأم	
س 44	عمر الاب عند الزواج	عمر الام عند الزواج	
س 45	درجة القرابة	من الدرجة الاولى من الدرجة التانية لا صلة	1 2 3
س 46	هل هناك اطفال يعانون نفس المشكلة ؟	نعم لا	1 2
س 47	أذا نعم , كم عددهم ؟		
س48	عدد أفراد الأسرة		
س 49	ترتيب الطفل داخل الاسرة		
س 50	هليدخنالوالدان؟	نعمكلاهما الأبفقط الأمفقط لاأحد	1 2 3 4
س 51	اذا نعم . أين يدخن ؟		
س 52	مستوىتعليمالأم	غيرمتعلم المرحلةالابتدائية المرحلةالاعدادية المرحلةالثانوية بكالوريوس دراساتعليا	1 2 3 4 5 6

س 53	مستوىتعليمالأب	غيرمتعلم المرحلةالابتدائية المرحلةالاعدادية المرحلةالثانوية بكالوريوس دراساتعليا	1 2 3 4 5 6
س 54	وظيفةالأم	تعمل لا تعمل اخرى:.....	1 2 3
س55	وظيفة الأب	يعمل لايعمل أخرى :.....	1 2 3
س56	ماهوالدخلالشهريالإجماليللأسرة؟	..... بالشيكل	
س 57	ماهينفقاتالأسرةفيالشهرالعادي؟	..... بالشيكل	
س 58	ماهوعددالأشخاصالمدعومينبإجماليدخلالأسرة؟		
س59	عددالأطفالفيالمنزلدونسنالخامسة		
س 60	مكانالإقامة	مدينة معسكر فيالمنطقةالحدودية فيمزرعة اخرى:....	1 2 3 4 5
س 61	فيأيمحافظة؟	شمال غزة مدينة غزة المحافظة الوسطى مدينة خانيونس مدينة رفح	1 2 3 4 5
س 62	هلتأخذالأسرةأيدعمغذائي؟	نعم لا	1 2
س 63	أذا نعم. من أي مؤسسة ؟	وكالة الغوث الشئون الاجتماعية غير ذلك:.....	1 2 3

Crowding index مؤشر الازدحام			
س 64	عدد غرف النوم		
س65	عدد الاطفال دون سن العاشرة		
س66	عدد الاشخاص الذينتبلغأعمارهم 10 سنواتفمافوق		
س67	عدد الأزواج		

عواملبيئية			
س 68	ماهوالمصدرالرئيسيلمياهالشربللبيت ؟	الصنبورالعام الصنبورالخاص بئر محمي بئرمفتوحفيالفناء زجاجات المياه المعدنية بائعو المياه مياهمصفاة الفلتر أخرى:.....	1 2 3 4 5 6 7 8
س 69	هلتغليأوتعالجمياهالشربللأطفالبأيشكلمنالأشكال؟	نعم لا	1 2
س 70	كيفتخزنمياهالشربالمنزلية؟	فيحاويةمفتوحةنظيفة فيحاويةمغلقةنظيفة اخرى :.....	1 2 3
س 71	هلتغسلأيديالأطفالقبلالوجبات؟	دائما بعضالأحيان علىالاغلبلا أبدا	1 2 3 4
س 72	ماهونوع سقف المنزل؟	بيتمسقوفمنالأسبستوس منزلمسقوفمنالخرسانة اخرى:.....	1 2 3
س 73	هلليكحيواناتبالقربمنالمنزل؟	نعم لا	1 2
س 74	هلليكحيواناتتعيشداخلالمنزل؟	نعم لا	1 2
س 75	هلتهويةالمنزلجيدة؟	نعم لا	1 2
س 76	هليتعرضالطفلمباشرةلمبيداتالآفات؟	نعم لا	1 2
س 77	مانوعالمرحاضالذييستخدمهالطفل؟	مرحاض القرفصاء مرحاض الطفل مرحاض الكرسي اخرى	1 2 3 4
س78	ماهونوعنظامالصرفالصحيفيالمنزل؟	البالوعات محطاتالضخ خزانللصرفالصحي	1 2 3

Annex (5): Crowding Index formula.

Equals:((0.5*number of children under 10) +(number of couples) +(all other people aged 10 and over)) /(number of bedrooms available)

Annex (6): An official letter of approval from the Helsinki Committee in the Gaza Strip

المجلس الفلسطيني للبحث الصحي
Palestinian Health Research Council
تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار
Developing the Palestinian health system through institutionalizing the use of information in decision making

Helsinki Committee
For Ethical Approval

Date: 2017/08/07 **Number:** PHRC/HC/243/17

Name: MAYSAA S. ALBELBEISE **الاسم:**

We would like to inform you that the committee had discussed the proposal of your study about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Risk factors of stunting among children under the age of five in Gaza Governorates

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/243/17 in its meeting on 2017/08/07

و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

Signature

Member **Member**

07 8 17

Chairman

18/8/2017

Genral Conditions:-
1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed.

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين
شارع النصر - مفترق العيون

ملخص الدراسة

لا تزال مشاكل سوء التغذية تشكل عبئا صحيا رئيسيا في البلدان النامية حيثتعد من عواملا لخطر الأكثر أهمية على مستوى العالم المسببة للأمراض والوفاة ،حيث تتأثر بهذه المشكلة مئات الملايين من النساء الحوامل والأطفال الصغار على وجه الخصوص. وترتبط مشكلة سوء التغذية ب 50% من الوفيات من الأطفال دون سن الخامسة.

إن التقزم في مرحلة الطفولة هو أفضل مؤشر عام ل صحة الأطفال وانعكاس دقيق لأوجه عدم المساواة الاجتماعية والسياسية. حيث يعاني حوالي 155 مليون طفل من التقزم على مستوى العالم ، بسبب عدم كفاية الغذاء ، وقلة النظام الغذائي المعتمد على الفيتامينات والمعادن ، وعدم كفاية رعاية الأطفال والأمراض ، معدلات التقزم بين الأطفال هي الأعلى في أفريقيا وآسيا.

يعتبر التقزم كواحد من العوامل الرئيسية المسببة في ضعف التطور العقلي والجسدي وكذلك يسبب مشاكل في القدرة على الدراسة والتحصيل العلمي ، أيضا يسبب مشاكل في القدرة الإنجابية والخصوبة ، والتقزم أيضا آحدى عوامل اللي تؤدي الي ضعف في الانتاج والاقتصاد . مرض التقزم يحدث غالبا خلال الألف يوم الأول من الحياة ويستمر حتى عمر الخمس سنوات.

يعتبر التقزم من المشكلات الرئيسية الي تواجه قطاع الصحة في محافظات غزة حيث أن معدل انتشار التقزم بين الأطفال دون سن الخامسة هو 7.1% من الأطفال. معظم الدراسات الفلسطينية تهتم بنسب حدوث وانتشار المشكلة ولكن قليل من الدراسات التي تهتم بعوامل الخطر المسببة للتقزم عند الأطفال دون سن الخامسة في فلسطين وخاصة في قطاع غزة.

وقد اجريت هذه الدراسة بغرض عام رئيسي وهو تحديد أهم عوامل الخطر المسببة لمرض التقزم بين الأطفال دون سن الخامسة في قطاع غزة. والأهداف الرئيسية لهذه الدراسة هي تحديد العوامل المتعلقة بصحة وتغذية الطفل والأم والعوامل الناتجة من الوضع الاقتصادي والاجتماعي لعائلة الطفل وكذلك العوامل الأبوية والظروف البيئية المحيطة بالطفل وقد تؤدي للتقزم. وكذلك لوضع بعض التوصيات التي قد تساعد على تقليل نسبة الإصابة بالتقزم.

كانت العينة الإجماليةلهذه الدراسة عبارة عن 450 مشارك من الحالات المصابة بالتقزم والضوابط لهذه الحالات حيث كانت الصفات المتطابقة بينهم هي الجنس والعمر بمعدل ضابط واحد لكل حالة , وقد أخذت هذه العينة من ثلاثة مقدمين للخدمة الصحية بغزة وهم : خمس مرافق الرعاية الصحية الأولية التابعة لوزارة الصحة الفلسطينية في الخمس محافظات، وثلاثة مرافق صحية تابعة لاتحاد الكنائس في الشرق الأوسط ومركزين لجمعية أرض الإنسان الخيرية الفلسطينية . تم جمع البيانات من خلال الاستبيان الذي يديره القائمون على المقابلة مع أحد الوالدين ؛ كان معدل الاستجابة للاستبيان 95%

شمل الاستبيان على اسئلة عامة عن طول ووزن الطفل وقت اجراء الدراسة وكذلك نسبة الهيموجلوبين في الدم اذا كان متوفر . أول جزء كان يشمل اسئلة عن صحة الام حاليا وخلال الحمل ، تاني جزء عن صحة الطفل وتغذيته من يوم الولادة حتى يوم جمع البيانات ، والجزئ الثالث يشمل اسئلة عن الوضع الاقتصادي والاجتماعي لعائلة الطفل و اخر جزء كان يشمل اسئلة حول الظروف البيئية المحيطة بالطفل.

كانت نسبة الذكور المشاركين 57.3% ونسبة الإناث المشاركات 42.7%, وكانت المشاركة حسب الفئات العمرية حيث ان نسة المشاركة من الأطفال في السن الأولى كانت 10.2%، وعمر السنتين 35.1%، وعمر الثلاث سنوات كانت مشاركته 27.6%/ وعلى عمر الاربع سنوات كانت 15.6% ومشاركة الاطفال في سن الخامسة 11.6% من العينة الكلية.

من خلال التحليل متعدد المتغيرات للبيانات تبين أن أهم عوامل الخطر المسببة للتقزم بين الأطفال دون سن الخامسة والمتعلقة بصحة الطفل وتغذيته هي: الطول عند الولادة ، الإصابة بمرض مزمن, الإصابة بمرض الإسهال، والدخول إلى المستشفى بسبب الإسهال، وبدء الفطام للطفل مبكرا على عمر الشهر الواحد ،وتناول الغذاء التكميلي أقل من أربعة مرات باليوم، وأيضا تناول منجات الألبان أقل من ثلاث مرات بالأسبوع يؤدي للتقزم بين الأطفال دون سن الخامسة.

فيما يخص العوامل المتعلقة بصحة الأم التي قد تؤدي للتقزم بين الأطفال وهي: أهمها كانت عدم حصول الأم على خدمات رعاية ماقبل الحمل ، كذلك حدوث مضاعفات خلال الحمل و وزن الأم خلال الحمل.

وأيضا كانت درجة القرابة الأولى بين الوالدين من أهم العوامل الإجتماعية والإقتصادية اللمسببة لمرض التقزم وكذلك مكان الإقامة في مخيمات للاجئين و ينتشر التقزم أكثر خلال الأسر ذات الدخل المنخفض. بالنسبة للعوامل البيئية المسببة للتقزم بين الأطفال كانت تشمل عدم غسل الأيدي قبل الأكل و العيش في بيت مغطى بمادة الاسبست ، وعدم وجود تهوية جيدة بالبيت ، والتعرض المباشر للمبيدات الحشرية .

بعض المقترحات لتقليل مشكلة التقزم كانت من خلال الخدمات الصحية المقدمة قبل الحمل والتي من خلالها يتم اعطاء محاضرات توعوية عن أهمية التغذية للطفل والأم منذ الاخصاب. كذلك أهمية استخدام وسائل تنظيم الأسرة لكي ينال كل طفل حاجاته الاساسية بدون نقصان. تعليم الأمهات كيفية معالجة أمراض الاسهال والحفاظ على نظافة الاطفال وكيفية التعامل من الاكل والشراب المقدم للطفل. النصيحة بالرضاعة الطبيعية لأول ستة شهور وأهمية الغذاء التكميلي وعدد الوجبات اللازم اعطائها .منع الاطفال من التعرض المباشر مع المبيدات الحشرية وكذلك غسل اليدين قبل الطعام.

وملخص هذه الدراسة أن هناك عدة عوامل تؤدي إلى التقزم بين الأطفال دون سن الخامسة في قطاع غزة متعلقة بصحة الطفل وصحة الأم والوضع الاجتماعي والاقتصادي والظروف البيئية المحيطة بالطفل ، ومن أجل تقليل معدل التقزم بين الأطفال ، ينبغي أن تكون التدخلات على مستويات متعددة بما في ذلك صحة وتغذية الطفل والأم وكذلك الوضع الاجتماعي الاقتصادي والبيئة المحيطة.