**Deanship of Graduate Studies**
**Al-Quds University**

# The Effect of Adequacy of Ante-natal Care on Birth Weight in Gaza Governorates

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**M. Sc. Thesis**

**Jerusalem- Palestine**

**1440 / 2018**

# The Effect of Adequacy of Ante-natal Care on Birth Weight in Gaza Governorates

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A Thesis Submitted in Partial Fulfillment of Requirements for the Degree of Master of Maternal and Child Health (MCH) Nursing /faculty of health professions
Al-Quds University

**1440 / 2018**

Al-Quds University
Deanship of Graduate Studies
MCH Program / Nursing Department

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## Dedication

This work is dedicated to my father who did everything easy for me, my mother who is a model of great strength and love and praying for me every time.

My husband, my sons whose support, encouragement, and love made this endeavor possible.

## Declaration

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

**Signed**

**Maryam Shaath**

**Date: / / 2018**

## Acknowledgment

First of all, praise to Allah, the lord of the world, and peace and blessings of Allah be upon the noblest of all Prophets and messengers, our prophet Mohammed, all thanks for Allah who granted me the help and capability to complete this thesis.

I would like to express my sincere thanks and gratitude to my academic advisor Dr. Hamza. Abed El-Jawad and my academic supervisor Dr. Mazen abu Qamar, for their guidance and support. Also, thanks is extended to the academic and administrative staff of Al-Quds University, for their encouragement and support during studying. My huge thanks to my father, my mother, my husband, my sons and daughters, my brothers, and my sisters; thank you very much for your pray and support.

Special thanks to all labor words and special care baby units stuff in governmental hospitals at Gaza Strip.

Deep thank to the team of data collection who made this study reality.

Last but not least, I would like to express my gratefulness to my friends for their support and encouragement and I hope this work could be helpful for the practice and for anyone concerned.

**Maryam Shaath**

**December, 2018**

## Abstract

Antenatal care plays an important role in the prevention of low birth weight (LBW). Timely and accurate antenatal care is believed to be an important factor in preventing pregnancy complications. This study aimed to assess the effect of adequacy of ante-natal care on birth weight in Gaza Governorates. The study adopted case-control design on 138 mothers (69 cases from babies those who have low birth weight, and 69 of those who have normal baby weight) taken by convenient sampling method from Nasser medical complex and Shifa medical complex. The researcher used a questionnaire as a tool for data collection. Different statistical procedures were used for data analysis including percentages, mean, Chi-square, fisher exact test, multiple and simple logistic regression. Logistic regression analysis was used to predict the probability that the infant would have low birth weight. Variables with $p < 0.25$ which applied to all mothers in this study and which have statistical significance association with birth weight were selected as predictors. They were: eclampsia, still birth, abortion, mothers' work, and medications during pregnancy, history of obstetric risks, abruptio placenta, para, gestational diabetes mellitus, specialist, adequacy of received services, and place of ANC, chronic health problems, family size, and physician as a health care provider. Adequacy of received services had an effect on birth weight and there was a difference between case and control, but this difference did not reach to a significant association (p-value = .08) The study results revealed that the mothers who have eclampsia during pregnancy have increased the odds to deliver babies with low birth weight The study results revealed that the mothers who had eclampsia were more likely to get baby with low birth weight five times than the mothers had not the case. Mothers who had previous abortion more than one time were more likely to get baby with low birth weight two times and half than the mothers never have abortion. Employed Mothers were at higher risk to get low birth weight three times and half than unemployed mothers. The study concluded that the adequacy of antenatal care have a positive effect on birth weight, but not crucial effect as other factors played this role of effect such as abortion, eclampsia, and maternal occupation. The researcher recommends conducting preventing and treatment measures for the mothers who have abortion and eclampsia. Further studies are needed in future to include and detect other factors related to prenatal care which may have effect on birth weight

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## List of Abbreviations

| | |
|---|---|
| ANC | Antenatal Care |
| LBW | Low Birth Weight |
| MOH | Ministry of Health |
| PHC | Primary Health Care |
| UNICEF | The United Nations International Children's Emergency Fund |
| UNRWA | United Nation Relief and Work Agency |
| WHO | World Health Organization |
| NGOs | Non-Governmental Organization |
| LMICs | Low and Middle Income Countries |
| PNCC | Prenatal Care Coordination |
| SPSS | Statistical Package for the Social Sciences |
| PHCs | Palestinian Health Care System. |
| EBCOG | European Board and College of Obstetrics and Gynecology |
| APNCU | Adequacy of Prenatal Care Utilization Index |

# Chapter One

## 1.1 Introduction

Antenatal care has an important influence on giving women a positive pregnancy experience and reducing the risk of stillbirths and pregnancy complications (WHO, 2018), it is defined as a care that is given to mothers and their fetus during pregnancy (Abdal Qader et al., 2012). Periodic antenatal care visits and check-ups during pregnancy are important for maternal and child health. Antenatal care promote health during pregnancy through counseling and educational activities; screen, identify and referral of women with risk factors (Tuladhar & Dhakal, 2011).

Globally, while 86 percent of pregnant women access antenatal care with a skilled health personnel at least once, only three in five (60 per cent) receive at least four antenatal visits. In regions with the highest rates of maternal mortality, such as sub-Saharan Africa and South Asia, even fewer women received at least four antenatal visits (52 per cent and 46 per cent, respectively) (Unicef, 2016).

There are many aspects of antenatal care that need to be emphasized to ensure good delivery outcome. Some of the important outcomes are low birth weight and pre-term birth. There is a study in developing countries that has shown positive effects of antenatal care on perinatal outcomes, such as reduced rates of pre-term birth, low birth weight and also perinatal death (Tuladhar & Dhakal, 2011). The antenatal period clearly presents opportunities for reaching pregnant women with a number of interventions that may be vital to their health and well-being, since the putative benefits of antenatal care to babies include increased growth, reduced risk of infection and increased survival (Campbell & Graham, 2006).

Antenatal care is among the most important tools available to health care providers especially nurses to detect modifiable obstetric risk factors (infections, micronutrients deficiencies, metabolic and placental diseases) that may impact on optimal fetal development, and final birth weight. The world health organization (WHO) recommends a minimum of four antenatal checking and follow up of data collected. Also, visits for a woman with a normal pregnancy (WHO, 2016). Technically, adequate antenatal care visits was defined as four antenatal care visits, inadequate antenatal as 1-3 visits irrespective of the place and timing of antenatal care visits (Tuladhar & Dhakal, 2011). The adequacy of ANC is measured by three dimensions: number of visits, timing of initiation of care and inclusion of all recommended components of care (WHO, 2004). Although there have been several modifications to the content of antenatal care since its inception, it was just recently that questions about its effectiveness started coming to public awareness.

### 1.2 Research problem

Globally, more than 20 million infants worldwide (15.5% of all live born infants) are born each year with low birth weight (LBW), 95.6% of them in developing countries, that the overall prevalence of low birth weight is 15.9% (Mahumud et al., 2017). Moreover, the prevalence of LBW is higher in developing countries, the infants who are born with the problems of low birth weight have been widely associated with an increased risk for delayed development, physical disabilities and reduced life expectancy; the child's disability imposes a substantial burden on the affected child, family and community, impaired cognitive development, and the advent of chronic diseases in later life (Wehby et al., 2009). Further, LBW has recently been shown to be related to lower education and wealth (Victora et al., 2008).

According to the researcher's opinion, the association between antenatal care and LBW was not well established in Palestine. Most of the research on this topic is conducted in developed nations, and the results from research conducted in developed countries are not necessarily applicable to less developed countries like Palestine especially in Gaza Strip. On the other hand, there are a lot of studies which established the adequacy of antenatal care but the characteristics of an ideal antenatal care and its association with LBW is still a matter of debate, and in developed countries it is clear that ineffective practices are still part of the antenatal agenda (Rondon et al., 2015).

Developing countries usually follow guidelines based on research conducted in developed countries. Although each developing country has its own characteristics, the importance of antenatal care in these countries seems to be underestimated; visits tend to be irregular and pregnant women do not tend to initiate antenatal care opportunely, nor do they comply with health recommendations (WHO, 2011). According to the United Nations International Children's Emergency Fund (UNICEF), only half of all women worldwide receive an adequate antenatal care, and most of these women receiving adequate antenatal care are in the developed world (UNICEF, 2015).

To the best of researchers' knowledge and based on what has been studied and researched, the information on the characteristics of antenatal care leading to satisfactory obstetric outcomes in developing countries is insufficient and this issue is very important to be studied in Gaza Strip since there is no one take this issue into consideration.

### 1.3 Justification of the study

Antenatal care is generally thought to be an effective method of improving outcomes in pregnant women and their babies, although many antenatal care practices have not been subject to rigorous evaluation in Gaza Governorates. Previous studies found that the

adequacy and continuity of antenatal care had beneficial effects on a range of measures of maternal and wellbeing, but none of these interventions was found to have a statistically significant effect on pregnancy outcome and infant's morbidity and mortality (Tuladhar & Dhakal, 2011; Rumbold & Cunningham, 2008). . The issue which has not been revealed yet in developing countries and its positive pregnancy outcomes, including a reduced risk of low birth weight (Yakoob et al., 2009). According to the researcher's opinion, , there is no consensus about the effect of adequacy of antenatal care on birth outcomes since the studies among developing countries have been scarce because of the lack of reliable data on birth outcomes.

So, this study was conducted to assess the adequacy of antenatal care and its effect on birth weight .Moreover, this study highlighted the importance of the number and timing of antenatal care visits since it has its effect on the adequacy of antenatal care itself because it provides an excellent opportunity to deliver education regarding the danger signs and symptoms during pregnancy, delivery and the postpartum period and, this what has been studied in the study of Ochako et al. (2011) who concluded that the early initiation of antenatal care visits and attendance at four or more visits were associated with higher infant birth weights and lower infant mortality rates. Also, because of the limited results in the previous studies, this study came to widen the scope in the evaluation of the effect of antenatal care on low birth weight in order to establish the broad effectiveness of its effect in Gaza Strip.

### 1.4 Main aim of the study

The main aim of this study is to assess the effect of adequacy of antenatal care on birth weight in Gaza Governorates.

## 1.5 Objectives of the study

1. To identify the current status of the adequacy of antenatal care provided in UNRWA and governmental primary health care centres in Gaza Strip
2. To recognize the effect of adequacy of initiation of ANC on LBW in Gaza Strip.
3. To determine the effect of adequacy of received services of ANC on LBW in Gaza Strip.
4. To identify the association between the demographic factors and LBW in Gaza Strip.
5. To formulate recommendations for the policy makers to encourage utilizing antenatal care services at ministry of health and UNRWA.

## 1.6 Research questions

**The main question of this study is to what extend that adequacy of ANC affects the pregnancy outcome (LBW) in Gaza strip.**

1. What is the current status of the adequacy of antenatal care provided in UNARWA and governmental primary health care centres in Gaza Strip?
2. Is there a significant association between the adequacy of initiation of ANC and LBW in Gaza Strip?
3. Is there a significant association between the adequacy of received services of ANC and LBW in Gaza Strip?
4. What are the factors that have a significant association with low birth weight in Gaza Strip?
5. What are recommendations can formulated to policy makers to encourage utilizing antenatal care services at ministry of health and UNRWA?

## 1.7 Context of the Study

### 1.7.1 Demographic context

The Palestinian territories consist of two politically separated areas (West Bank and Gaza Strip). Gaza strip is a narrow zone of land bounded of the south by Egypt, on the west by the Mediterranean Sea, and on the east and north by the occupied territories in 1948. Gaza strip is very crowded place with 46 kilometers long and 5 –12 kilo-meters wide and with a total area of 365 $km^2$.

### 1.7.2 Gaza strip

Gaza Strip is administratively divided into five governorates: North, Gaza, Mid-zone, Khanyounis and Rafah. It consists of four cities, fourteen villages and eight refugees' camps (PCBS) (Palestinian Central Bureau of Statistics, 2016).

Based on the results of the 2017 Population, Housing and Establishment Census, the population of the Gaza Strip for the same year 1.90 million people, including 963 thousand males and 936 thousand females. Population density is 5, 204 inhabitants per sq. km2. and a fertility rate of 4.5% (PCBS, 2017). Gaza Strip has an extremely high population growth rate of over 3.3%, and as a result some 44.2% of the population is under the age of 15 (PCBS, 2016).

#### 1.7.3 Palestinian Health Care System

The Palestinian Health Care System (PHCS) is consists of four major providers: Ministry of Health (MOH), United Nation Relief and Work Agency (UNRWA), Non-Governmental Organizations (NGOs) and for profit private sector. The main provider MOH is operating 25 hospitals and 453 PHC facilities, 394 in WB and 59 in GS (MOH, 2015). Another main component UNRWA is operating 51 PHC facilities (MOH, 2015).

Palestinian people especially for children and other vulnerable groups through MOH, UNRWA, non-governmental and private centers. PHC centers try to offer accessible and affordable health

#### 1.7.3.1 Primary health care center

Primary health care (PHC) is a major component of Palestinian health care system. PHC provides preventive, promotional, curative and rehabilitative health care to all Palestinian people especially for children and other vulnerable groups through MOH, UNRWA, non-governmental and private centers. PHC centers try to offer accessible and affordable health services for all Palestinians regardless of geographical locations. According to MOH policy, PHC centers classified from level I to level IV according to health services they provide. At the end of 2015, the total number of PHC centers in the GS were 54 centers guided by MOH, 20 centers guided by UNRWA and many other centers guided by NGOs (PCBS, 2016).

## 1.8 Operational Definitions

### 1.8.1 Antenatal care

In this study, the researcher defined antenatal care as the care given to the mothers and their fetus through periodic antenatal care visits and check-ups during pregnancy.

### 1.8.2 Adequacy of antenatal care

In this study adequacy of antenatal care defined as the antenatal care which meets the adequacy of prenatal care utilization index (APNCU) which include the: 1) Adequacy of initiation of antenatal care (month of initial antenatal care visit, number of visits, and gestational age), and 2) Adequacy of received services (underwent at least seven of the eight recommended procedures during visits).In this study the researcher adopted definition of (Beeckman et al., 2012).

### 1.8.3 Adequacy of initiation of antenatal care

Which describes the adequacy of when antenatal care of (initial visit) began during pregnancy, so the earlier the antenatal begin the better delivery outcome.

### 1.8.4 Adequacy of received services during visits

Which describes the adequacy of received antenatal services during the time of beginning antenatal until delivery.

### 1.8.5 Low birth weight

Low birth weight (LBW) is defined by the World Health Organization (WHO) as weight at birth less than 2500 g (5.5 lb.), regardless of gestational age. In this study, the baby is considered LBW according to medical file Dx. < 2500g.

## 1.9 Boundaries of the study

**1. Conceptual boundary**: assess the effect of adequacy of antenatal care on low birth weight.

**2. Setting boundary**: the study was done on governmental hospitals of the Gaza strip, namely: Nasser Medical Complex, and Al-Shifa Medical Complex.

**3. Temporal boundary**: the whole study proposed to be applied in the period between Sep, 2017 till May, 2018.

**4. Population boundary**: mothers of low birth weight babies and normal birth weight who's presented at special care babies units and post-natal departments of Nasser Medical Complex, and Al-Shifa Medical Complex.

# Chapter Two

# Conceptual Framework and Literature Reviews

## 2.1 Background of the study

Antenatal care refers to the health care provided to an expectant mother throughout the period of pregnancy (Gajate-Garrido, 2013). Antenatal care should involve the provision of appropriate advice on health matters such as nutrition, hygiene, newborn care and safer sex, identification of expectant women at risk of experiencing pregnancy complications through appropriate screening and diagnosis, and either the treatment of identified pre-existing illnesses and conditions or, where treatment is not available at the particular health facility, referral to an appropriate health facility that can deal with the identified conditions (Awiti, 2014). Antenatal care can benefit both expectant mothers and their fetuses through identification of expectant mothers at risk of delivering infants with low–birth weight, preterm babies or experiencing complications during delivery and providing appropriate psychosocial, nutritional, and medical interventions aimed at reducing such risks.

The World Health Organization (WHO) recommends a minimum of four antenatal care visits at particular intervals, to the doctors or nurses, for expectant women in developing countries (WHO, 2014). There is also a recommended timing for each visit. For example, it is recommended that the first antenatal care visit should be made within the first 16 weeks of pregnancy while the third visit should be made at 32 weeks of pregnancy, and there are further detailed recommendations on what should be done at each visit (Awiti, 2014). It has been shown that the recommendations of WHO regarding antenatal care use in developing countries are appropriate (Gajate-Garrido, 2013).

Moreover, the findings of Titi Mand El Sharif (2013) have emphasised the need for antenatal and postnatal services specifically for these high-risk disorders and the associated

complications, here findings revealed that the Palestinian Ministry of health clinics do not have a written protocol or guidance to help care providers in managing or screening; hence the protocols are needed for antenatal and postnatal care of pregnancy disorders and the associated outcomes in mothers and infants (Titi Mand El Sharif, 2013).

## 2.2 Conceptual Framework of the Study

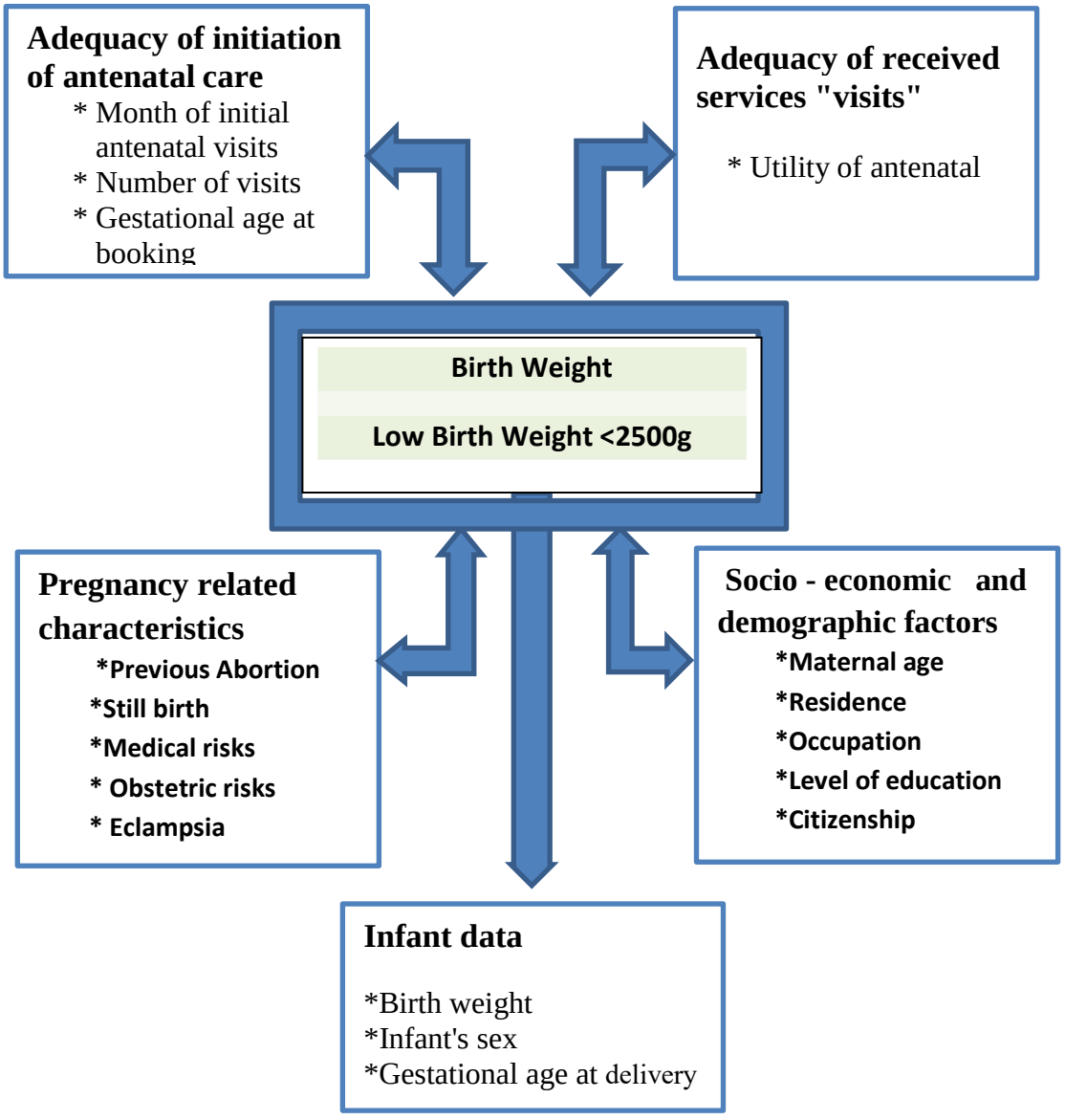


**Figure 2.1 Conceptual Framework**

## 2.3 Antenatal care

Antenatal care is defined as the routine care of pregnant women provided between conception and the onset of labour. Antenatal care is an opportunity to provide care for prevention and management of existing and potential causes of maternal and newborn mortality and morbidity. The new WHO antenatal care model recommends that the first antenatal care visit takes place within the first trimester (ie, gestational age of <12 weeks) and an additional seven visits are recommended (WHO, 2016).

During check-ups, pregnant women receive medical information over maternal physiological changes in pregnancy, biological changes, and antenatal nutrition including antenatal vitamins. Recommendations on management and healthy lifestyle changes are also made during regular check-ups. The availability of routine antenatal care, including antenatal screening and diagnosis, has played a part in reducing the frequency of maternal death, miscarriages, birth defects, low birth weight, neonatal infections and other preventable health problems.

The World Health Organization (WHO) reported that in 2015 around 830 women died every day from problems in pregnancy and childbirth. Only 5 lived in high-income countries. The rest lived in low-income countries (World Health Organization, 2017). A study examined the differences in early and low-weight birth deliveries between local and immigrant women and saw the difference caused by antenatal care received. The study, between 1997 and 2008, looked at 21,708 women giving birth in a region of Spain. The results indicated that very low birth weight (VLBW) were much more common for immigrants than locals (Castello et al., 2012). The study showed the importance of antenatal care and how universal antenatal care would help people of all origins get proper care before pregnancy/birth (Castello et al., 2012).

The WHO recommends that pregnant women should all receive four antenatal visits to spot and treat problems and give immunizations. Although antenatal care is important to improve the health of mother and baby, many women do not receive four visits (Moller et al., 2017). There are many ways of changing health systems to help women access antenatal care, such as new health policies, educating health workers and health service reorganisation. Community interventions to help people change their behaviour can also play a part. Examples of interventions are media campaigns reaching many people, enabling communities to take control of their own health, informative-education-communication interventions and financial incentives (Souza et al., 2014).

A review looking at these interventions found that one intervention helps improve the number of women receiving antenatal care. However interventions used together may reduce baby deaths in pregnancy and early life, lower numbers of low birth weight babies born and improve numbers of women receiving antenatal care (Souza et al., 2014).

### 2.3.1 Initial Visit

The timing of initiation of the first antenatal care visit is paramount for ensuring optimal care and health outcomes for women and children. Globally, there has been a change in the pattern and type of obstetric outcomes, as a greater proportion of deaths and morbidities are related to complications of pre-existing medical conditions, namely indirect conditions, in a phenomenon described as the obstetric transition (Souza et al., 2014). An early antenatal care visit gives the opportunity to provide screening and tests that are most effective early in the pregnancy (i.e., correct assessment of gestational age to allow for accurate treatment of preterm labor, screening for genetic and congenital disorders, provision of folic acid supplementation to reduce the risk of neural tube defects, and screening and treatment for iron deficiency anemia and sexually transmitted infections).

Additionally, the visit can potentially capture non-communicable diseases such as diabetes and provide guidance on modifiable lifestyle risks such as smoking, alcohol consumption, drug abuse, obesity, malnutrition, and occupational exposures (European Board and College of Obstetrics and Gynecology "EBCOG" Scientific Committee, 2015). All these conditions can be detected and treated if early, timely, and high-quality antenatal care is provided, but beyond the content the antenatal care services need to be available, accessible, and acceptable (Zolotor and Carlough, 2014).

A comfortable environment, open communication, and the nurse's attitude will help put the woman at ease during the initial antenatal visit. The first visit is often quite lengthy. A complete history is recorded to identify factors that may negatively affect the pregnancy and a physical examination is performed (White et al., 2011).

### 2.3.2 Physical examination

The physical examination begins with measuring the client's height and weight and vital signs. A head-to-toe examination is performed by the health care provider. Special attention is given to the assessment of the heart, lungs, pelvis, breasts, and nipples. The pelvic examination is performed last. The external genitalia are examined for scars, lesions, or infection. A Pap smear for cervical cancer and a specimen of cervical mucous for gonorrhoea are usually obtained. A bimanual examination is performed to determine uterine changes and pelvic size to estimate adequacy of the pelvic opening for delivery (White et al., 2011).

Pelvic size is estimated by the examiner during the manual examination. The diagonal conjugate (distance from the lower border of the pubic symphysis to the sacral promontory) is an estimation of the pelvic inlet by calculating obstetric (true) conjugate. It is generally 11.5 cm. The anteroposterior diameter (9.5 to 11.5 cm), measured from the

lower border of the pubic symphysis to the tip of the sacrum, is an estimate of the pelvic outlet (White et al., 2011).

### 2.3.3 Screening tests

During the first visit, screening tests are performed to determine the mother's health and to have baseline data with which to compare subsequent test results. Tests may vary for a specific client but generally include complete blood count, haemoglobin, blood type, Rh factor, urinalysis, blood glucose and other tests (Zauderer, 2009).

A review looking into women keeping their own case notes shows they have more risk of having a caesarean section. 25% of women reported their hospital notes were lost in hospital though none of the women forgot to take their own notes to any appointments (Brown et al., 2014). Physical examinations generally include: collection of (mother's) medical history, checking (mother's) blood pressure, mother's) height and weight, pelvic exam, Doppler fetal heart rate monitoring, (mother's) blood and urine tests, discussion with caregiver (Carberry et al., 2014). A review looking into which of these charts detected small babies found that there is no good quality research to show which is best (Carberry et al., 2014). More research is needed before the customized growth charts are recommended because they cost more money and take more time for the health care workers to make (Carberry et al., 2014)

Early scans mean that multiple pregnancies can be detected at an early stage of pregnancy and also gives more accurate due dates so that less women are induced who do not need to be (Nabhan and Aflaifel, 2015). Levels of feedback from the ultrasound can differ. High feedback is when the parents can see the screen and are given a detailed description of what they can see. Low feedback is when the findings are discussed at the end and the parents are given a picture of the ultrasound. The different ways of giving feedback affect

how much the parents worry and the mother's health behaviour although there is not enough evidence to make clear conclusions. In a small study, mothers receiving high feedback were more likely to stop smoking and drinking alcohol however the quality of the study is low and more research is needed to say for certain which type of feedback is better (Nabhan and Aflaifel, 2015).

### 2.3.4 Return visits

Return visits for an uncomplicated pregnancy generally are: 1) Every 4 weeks for the first 28 weeks, 2) Every 2 weeks during weeks 29 to 36 and 3) Every week, after 36 weeks, until birth of infant (White et al., 2011).

## 2.4 Nurses' role during antenatal care

Nurses play a key role in providing a high quality of maternal services throughout the antenatal period and childbirth that contribute to reduce maternal and perinatal death (Zauderer, 2009). Trinh and colleagues (2007) stated that antenatal care provider such as a nurse has a great impact on the quality of care. Nurses should have moral, ethical and professional responsibility to provide care to pregnant women (White et al., 2011). They are responsible for care giving, providing up-to date health education and listening to clients' suggestions about the services which women need (Kritcharoen et al., 2005). To identify those needs, the nursing process is the accepted framework used for assessing, analysing, planning, implementing and evaluating nursing care (Zauderer, 2009). Nurses can take complete health history, perform physical examinations, order and interpret laboratory investigations, and provide primary care for health maintenance and promotion. Based on this framework, nurses‟ role in antenatal care is: (1) assessment, (2) analysis, (3) planning, (4) implementation and (5) evaluation (White et al., 2011).

## 2.5 The effect of antenatal care

There is evidence that women from low income regions receive less than adequate antenatal care. Inadequate antenatal care has been found to increase the risk of having a low birth weight infant by one and one-half (Schillaci et al., 2010). A study conducted by Russell et al. (2007) revealed a total of 4.6 million infants were hospitalized in the United States during 2001, of these 4.6 million infants, 384200 of them were hospitalized because of premature birth and/or low birth weight. This total accounted for only 8% of all infants hospitalized, however, it accounted for 47% of the healthcare costs of all infants hospitalized, which totalled 5.8 billion dollars in 2001 alone (Russell et al., 2007). Not only is premature birth the leading cause of infant mortality and childhood morbidity, but premature birth is also associated with neurodevelopmental disorders (Russell et al., 2007).

There is also a link between preterm birth and low birth weight with lifelong chronic health problems such as hypertension and dyslipidaemia (Schillaci et al., 2010). The investigators suggested that by preventing preterm birth, major cost savings could ensue. In order to prevent preterm birth, one intervention recommended by the investigators was prevention strategies that are provided during antenatal care, which includes education about smoking cessation, infection prevention, and screening for women who have previously given birth preterm (Russell et al., 2007). Cogan et al. (2012) conducted a study to determine whether or not maternal characteristics and antenatal care pattern had an effect on the number of well child visits after delivery. The investigators found that women who received intense, adequate, or intermediate levels of antenatal care had also taken their children to better child visits. This study suggested an association between adequate antenatal care and a child's wellbeing by reducing childhood morbidity and mortality, which affects a child's health throughout their lives (Cogan et al., 2012).

## 2.6 Birth weight

The birth weight of an infant is the first weight recorded after birth, ideally measured within the first hours after birth, before significant postnatal weight loss has occurred. Low birth weight (LBW) is defined as a birth weight of less than 2500 g (up to and including 2499 g), as the World Health Organization (Cutland et al., 2017). This definition of LBW has been in existence for many decades. In 1976, the 29th World Health Assembly agreed on the currently used definition. Prior to this, the definition of LBW was '2500 g or less'. Low birth weight is further categorized into very low birth weight (VLBW, <1500 g) and extremely low birth weight (ELBW, <1000 g). Low birth weight is a result of preterm birth (PTB, short gestation <37 completed weeks), intrauterine growth restriction (IUGR, also known as fetal growth restriction), or both (Cutland et al., 2017).

The term low birth weight refers to an absolute weight of <2500 g regardless of gestational age. Small for gestational age (SGA) refers to newborns whose birth weight is less than the 10th percentile for gestational age. This report will focus specifically on birth weight <2500 g (Quinn et al., 2016).

### 2.6.1 Epidemiology of low birth weight

Globally, it is estimated that 15–20% of all births, or >20 million newborns annually, are low birth weight infants. Low- and middle-income countries account for a disproportionate burden of LBW; over 95% of the world's LBW infants are born in LMICs. There are marked global and regional variations in LBW rates. An estimated 6% of infants are born LBW in East Asia and the Pacific, 13% in Sub-Saharan Africa, and up to 28% in South Asia (WHO, 2014). Up to half of all LBW infants are born in south Asia. High-income regions report lower LBW rates, including 6.9% from UK. Of concern is the estimated

increase in LBW rates in certain middle-income countries such as Oman, where the LBW rate went from 4% in 1980 to 8.1% in 2000 (Islam, 2015).

In the Gaza Strip, low birth weight was reported as7.37%. Six antenatal factors were associated with an increased likelihood of low birth weight after adjustment for principal confounding variables, namely lower perception of the quality of given antenatal care, consanguinity (first cousin marriage), medical complaints of anemia, pregnancy-induced hypertension, maternal reporting of vaginal bleeding, and periodontal diseases (Abu Salah, 2018).

One of the major challenges in monitoring the incidence of LBW is that more than half of infants in the LMICs are not weighed. Population-based survey data often rely on modeled estimates, with statistical methods to adjust for underreporting and misreporting of birth weight. In the context of vaccine safety monitoring, accurate ascertainment of birth weight in LMICs will continue to require attention and investment to improve accuracy and reporting of this important health indicator (Cutland et al., 2017).

Previous studies show that there is association between antenatal care and both and low birth weight. Qader et al. (2012) conducted a cross-sectional study to show the association between antenatal care and birth weight in Iraq showed that the percentage of low birth weight babies was 21.3% and concluded that antenatal care of the pregnant mothers is one of the important risk factors contributing to low birth weight babies. Another study conducted by of Awiti et al. (2014) to investigate the effect of adequate use of antenatal care on birth weight in Kenya. The results indicated that adequate use of antenatal care increases birth weight, holding other factors constant. The researchers further observe that

the single–level model overstates the effect of antenatal care on birth weight. The results imply that infant health can be improved by using antenatal care adequately.

Moreover, the study of Van Dijk et al. (2011) to measure the impact of antenatal care coordination (PNCC) on healthy birth outcomes. The study concluded that the use of PNCC is an effective strategy for preventing adverse birth outcomes. On the other hand, Fonseca et al. (2014) concluded that there was an association between inadequate number of ANC visits, laboratory studies and exams, and increased risk of LBW new-borns.

On the other hand, a study of Ahmed et al. (2012) to assess low birth weight and its relationship with antenatal care among women in Pakistan, in which the main outcome measure was infants born with low birth weight LBW (<2.5kg). The study results showed that there was a significant association between the occurrence of low birth weight and maternal education, paternal education, and paternal occupation. Mothers who received antenatal care were more likely to deliver normal weight babies compared to those who did not. Women with more than four antenatal visits were six times as likely to deliver normal weight babies. The study suggested proper strategies for antenatal care to increase the awareness among women living in remote locations.

A study of Dubey et al. (2015) to identify the maternal determinants associated with LBW of babies at Hospital Kishanganj, showed that 34% of newborns were found to be low birth weight in the study. Statistically significant association was found between low birth weight of babies and mother's age, religion, literacy of mother and regular ANC check-up during pregnancy. The study concluded and suggested various maternal factors influence the birth weight of newborn babies and by improving antenatal care services both in coverage and quality we can reduce infant mortality in country.

Additionally, Balsa and Triunfo (2015) conducted a cross-sectional to examine the effectiveness of antenatal care on low-income women's birth outcomes, he revealed that adequate use of antenatal care, as defined by early initiation and at least 9 visits, decreases the probability of low birth weight by 6 percentage points, and increases birth weight by 149 grams.

# Chapter Three

# Methodology

## 3.1 Introduction

This section illustrates the important issues related to how the study was be conducted. It presents the study design, study setting, study population, sample size and sampling process, inclusion criteria for cases**,** inclusion criteria for controls, exclusion criteria, instrument of the study, data collection, validity and reliability, pilot study, statistical analysis and statistical methods. Finally, it presents the limitations of the study, administrative and ethical consideration and period of the study.

## 3.2 Study design

This study adopted a retrospective, case-control study design. This design allowed the researcher to identify the effect of adequacy of antenatal care on birth weight. This design was selected, because it is relatively simple, requires few subjects and is logistically easy and less expensive.

## 3.3 Study setting

This study was carried out at the main governmental hospitals which have neonatal intensive care units and post-natal units namely, Nasser Medical Complex, and Al-Shifa Medical Complex.

## 3.4 Study population

Regarding babies who have low birth weight, the target population was consisted of two groups, the first group was cases were from the babies who have low birth weight, and the other group were controls, while the controls are the babies who have birth weight 2500

gram or more in the post-natal rooms . Individual matching by maternal age, gender of baby and medical risks during pregnancy have been applied by selection of one control for each case.

### 3.5 Sample size and sampling process

Since it is expected to have some difficulties during collecting the sample required, the sample of this study was non-probability convenient sampling method into main hospitals of Gaza Strip. The sample was calculated by using Epi-info software V. 3.0.43, based on literature review and consultation with experts in the field of study at ($\alpha$= 0.05, power= 0.8). Sample size include 138 eligible mothers having infants which was divided equally into two groups; case group consisted of 69 mothers having LBW infants. Controls group consisted of 69 mothers having healthy infants.

### 3.6 Controlling for confounder variables

To avoid any errors in the results, some of the variables that have been controlled by a method of matching such as: 1) maternal age, 2) infant's gender and 3) medical risks during pregnancy.

### 3.7 Inclusion criteria for cases

- Infant with birth weight of less than 2500g.
- Admitted during the period of data collection
- Mothers who have had antenatal care visits in governmental and/or UNRWA primary health care centres and have delivered infants with birth weight of less than 2500g
- Mothers who are interested to participate in this study

### 3.8 Inclusion criteria for controls

- Normal weight infants (2500g – 4000g)
- Mothers who are interested to participate in this study

### 3.9 Exclusion criteria

- Infants who have congenital defects
- Mothers who have chronic medical conditions

### 3.10 Instrument of the study

A structured interviewing questionnaire was used in this study. The questionnaire was developed by the researcher based on previous studies and adopted by (Beeckman et al., 2012) and with consultation of experts in the ante-natal care and maternal and child health. The questionnaire was submitted to panel of experts and knowledge of the topic to make suggestions and judgment about the adequacy of the instrument, last draft of questionnaire establish after revision by experts notifications and advises. Some questionnaire was distributed to the cases and controls. The questionnaire was designed in English language and it was revised by experts in the field. The questionnaire was using closed ended questions and a categorical scale.

The questionnaire consisted of three sections:

- The first section of the questionnaire represented mother and infant socio-demographic factors such as maternal age, residence, educational level, etc.
- The second section represented information regarding pregnancy related characteristics and adequacy of antenatal care utilization index such as gravida, para, abortion, number of visits, received services, etc.
- The third section of the questionnaire represented questions regarding the infant data such as birth weight, gestational age, etc.

### 3.11 Data collection

Data was collected from the mothers of babies during admission to neonatal intensive care unit and from post-natal room after delivery after being identified as eligible by inclusion criteria. The researcher has been invited the mothers individually to participate in the study. After obtaining written consent, full explanation were done to the questions by the researcher Time estimation for filling each questionnaire is about 20 minutes.

### 3.12 Validity and Reliability

#### 3.12.1 Face and content validity

Validity determines whether the research truly measures that which it was intended to measure (Golafshani. 2003). In general, validity is an indication of how sound the research is. More specifically, validity applies to both the design and the methods of the research. In this study, the researcher used content validity. Content validity is defined as ″the extent to which a test reflects the variable it seeks to measure" (Holm and Liewehyn 1986). It is conducted before data collection by the help of experts to ensure relevancy, clarity and completeness. Content validity is a subjective estimates of measurement based on judgment rather than statistical analysis. In order to validate the instrument used, the designed questionnaire with a covering letter, title and objectives of the study were sent to six experts from different backgrounds including researchers, public health experts in environment field. The experts were asked to estimate the relevance, clarity and completeness of each item; some questions modified with the help of the supervisor if requested. To increase the validity in this research, the following was also done; systemic checking and follow up of data collected. Also, data cleaning and checking were done.

### 3.12.2 Reliability

Reliability refers to whether or not you get the same answer by using an instrument to measure something more than once. In simple terms, research reliability is the degree to which research method produces stable and consistent result. A specific measure is considered to be reliable if its application on the same object of measurement number of times produces the same results.

### 3.13 Pilot study

Pilot study was conducted on 26 subjects (10% of sample size) before the start of actual data collection, 13 cases and 13 controls, in order to provide feedback about the questionnaire and ensure validity and reliability of questionnaire.

### 3.14 Statistical analysis

To achieve the goal of the study, the researcher used the statistical package for the Social Science (SPSS version 22) for analysing the data.

### 3.15 Statistical methods

1. Descriptive statistics such as frequencies and percentages and cross tabulation.
2. Bivariate analysis was used using person's chi-square, [1] Fisher's Exact Test and other statistical tests to show if there is statistical significant associations between antenatal care use index and (birth weight).
3. Multivariate analysis was used using binary logistic regression to determine which antenatal care use index affect the probability of an outcome (birth weight), the results presented with beta coefficients, adjusted odds ratio with 95% CI and repetitive p-value.

### 3.16 Administrative and Ethical Considerations

The researcher was committed to all ethical considerations required to conduct a research, ethical approval was obtained from (Al-Quds University) and Helsinki committee to carry out the study **(Annex1)** Also, an approval letter was obtained from ministry of health in the Gaza strip to visit the hospitals **(Annex2)**. Informed consent **(Annex3)** was obtained from the mothers to fill up the questionnaire **(Annex4).**

### 3.17 Period of the study

The study was conducted during the period from January 2018 to July 2018.

### 3.18 Limitations of the Study

Limited sample was expected to be a limitation in this study. Other confounding variables other than what have been mentioned above; may affect the results.

# Chapter Four

## 4.1 Results

### 4.2 Introduction

This chapter clarifies the results of statistical analysis of the data, including descriptive analysis that presents the socio-demographic characteristics of the study sample and answers to the study questions. The researcher used simple statistics including frequencies, means and percentages, Chi square test, also advanced statistical procedures were used such as multiple regression.

### 4.3 Distribution of Study Participants According to the Type of Subject, Maternal Age and Area of Residence

**Table 4.1: Distribution of Study Participants According to the Type of Subject, Maternal Age and Area of Residence**

| Variable | | Cases N (%) | Control N (%) | Total N (%) |
|---|---|---|---|---|
| **Type of subject** | | 69 (50.0) | 69 (50.0) | 138 (100.0) |
| **Maternal age** | Below 30 years | 44 (50.0) | 44 (50.0) | 88 (63.8) |
| | 30 years and above | 25 (50.0) | 25 (50.0) | 50 (36.2) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |
| **Medical risks during pregnancy** | Yes | 10 (14.5) | 10 (14.5) | 20 (14.5) |
| | No | 59 (85.5) | 59 (85.5) | 118 (85.5) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |
| **Infant's sex** | Male | 32 (46.4) | 30 (43.5) | 62 (44.9) |
| | Female | 37 (53.6) | 39 (56.5) | 76 (55.1) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |
| **Residence** | Camp | 13 (13.8) | 13 (13.8) | 26 (18.8) |
| | City | 43 (62.3) | 47 (68.1) | 90 (65.2) |
| | Village | 13 (18.8) | 9 (13.0) | 22 (15.9) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |

Table 4.1 shows the distribution of study participants according to the type of subject, maternal age and area of residence. The table shows that the study participants consisted of 138 women, 69 (50%) were cases and 69 (50%) were controls. As shown in the above table, matching was done between mothers' ages, infant's sex and their medical risks during pregnancy. The table shows that 13 (13.8%) of the cases are living in the camps with the same percentages among controls. Also, 43 (62.3%) of the cases and 47 (68.1%) of the controls are living in the cities, while 13 (18.8%) of the cases and 9 (13.0%) of the controls are living in the villages.

### 4.4 Distribution of Study Participants According to the Status of work, Mothers' citizenship, and Level of Income

**Table 4.2: Distribution of Study Participants According to the Status of work, Mothers' citizenship, and Level of Income**

| Variable | | Cases N (%) | Control N (%) | Total N (%) |
|---|---|---|---|---|
| **Status of work** | Working | 2 (2.9%) | 10 (14.5) | 12 (8.7) |
| | Not working | 67 (97.1) | 59 (85.5) | 126 (91.3) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |
| **Citizenship** | Refugee | 40 (85.0) | 43 (62.3) | 83 (60.1) |
| | Not Refugee | 29 (42.0) | 26 (37.7) | 55 (39.9) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |
| **Level of income** | Below 1000 Shekel | 38 (55.1) | 41 (59.4) | 79 (57.2) |
| | 1000 – 1500 Shekel | 22 (33.9) | 21 (30.4) | 43 (31.2) |
| | More than 1500 Shekel | 9 (13.0) | 7 (10.1) | 16 (11.6) |
| | **Total** | 69 (100.0) | 69 (100.0) | 138 (100.0) |

Table 4.2 shows that only 2 (2.9%) of the cases have working mothers compared to 10 (14.5%) of the controls. Also, the table shows that 40 (85.0%) of the cases are refugees compared to 43 (62.3%) of the controls. Moreover, the table shows that 38 (55.1%) of the cases have families with average income level below 1000 Shekel compared to 41 (59.4%) of the controls. On the other hand, 22 (33.9%) of the cases have families with average income level between 1000 – 1500 Shekel, compared to 21 (30.4%) of the controls.

### 4.5 Distribution of Study Participants According to the Education of Mothers

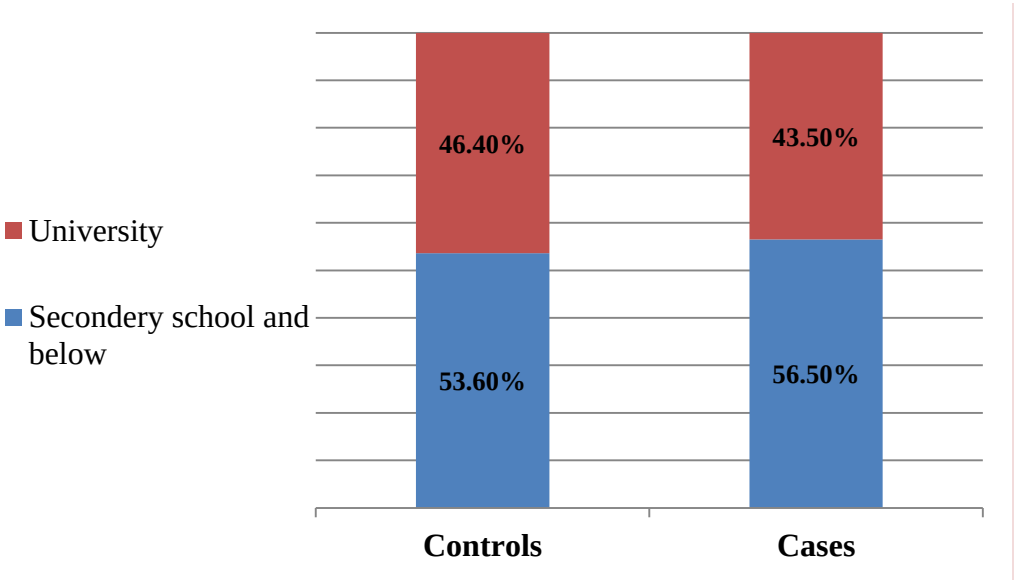


**Figure 4.1: Distribution of Study Participants According to the Education of mothers**

Figure 4.1 shows the distribution of study participants according to the education of mothers. The figure shows that 56.5% of the cases have mothers with secondary school or below, while 43.5% of them have mothers with University degree.

### 4.6 Distribution of Study Participants According to the Place of ANC

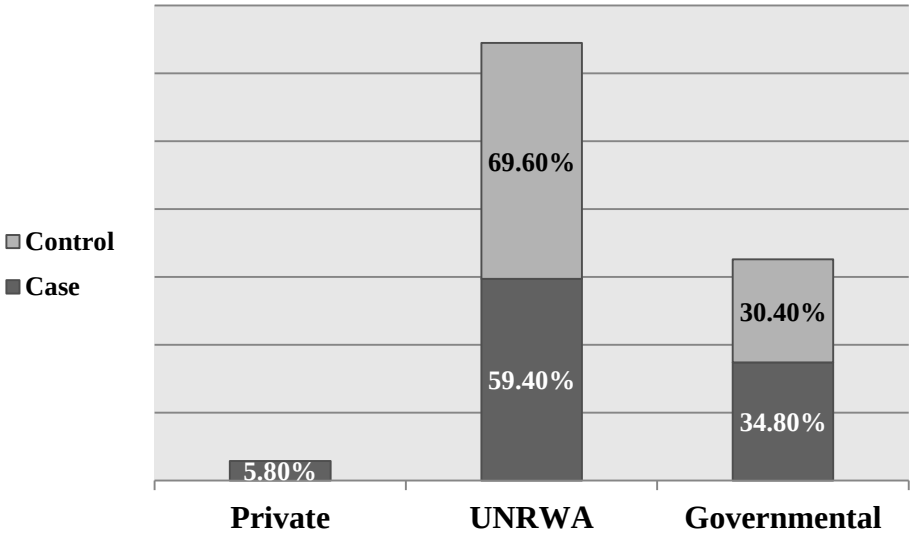


**Figure 4.2: Distribution of Study Participants According to the Place of ANC**

Figure 4.2 shows that more than half (59.4%) of the mothers with low birth weight babies in this study have had their antenatal care follow up in UNRWA health care centers, 34.8% of them have had their antenatal care follow up in the governmental health care centers, while only 5.8% of them were in private health care centers

### 4.7 Distribution of Study Participants According to the Hospitals they stay

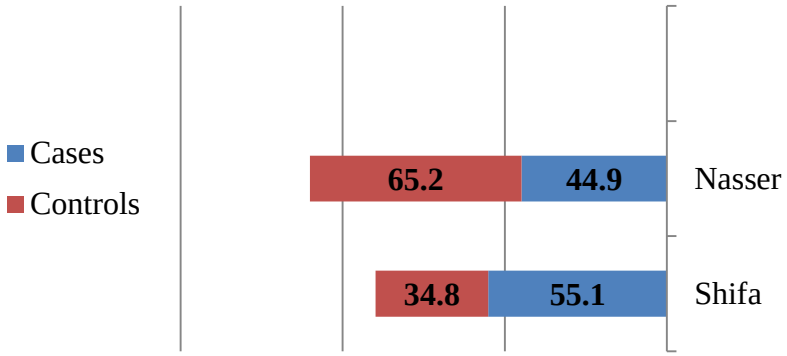


**Figure 4.3: Distribution of Study Participants According to the Hospitals they stay**

Figure 4.3 showed that 55.1% of the cases were collected from Shifa medical complex and 44.9% were collected from Nasser medical complex. Also, the figure shows that 65.2% of controls were collected from Nasser medical complex, while 34.8% were collected from Shifa medical complex

### 4.8 The Status of Adequacy of Antenatal Care in the Gaza Strip

**Table 4.3: Adequacy of Antenatal care in the Gaza Strip**

| Variable | | Frequency | % |
|---|---|---|---|
| **Initiation of ANC visits** | Adequate ≥12weeks | 75 | 54.3 |
| | Inadequate <12weeks | 63 | 45.7 |
| **Number of visits** | Adequate ≥ 4 visits | 130 | 94.2 |
| | Inadequate < 4 visits | 8 | 5.8 |
| **Adequacy of received services "Utility"** | Adequate | 135 | 97.8 |
| | Inadequate | 3 | 2.2 |
| **Gestational age at booking** | < 17 weeks | 115 | 83.3 |
| | ≥ 17 weeks | 23 | 16.7 |

Table 4.3 shows that 54.3% of the women have adequate initiation of antenatal care visits, while 45.7% do not. Also, 94.2% of the women in this study have adequate number of visits to the antenatal care sites. Moreover, the table shows that 97.8% of the women in this study have adequate number of received services "utility" in the antenatal care settings, and 83.3% of them have early booking for antenatal care visits (at ≤ 17 weeks).

### 4.9 Pregnancy-Related Characteristics and Birth Weight

**Table 4.4: Association between Para, Previous Abortion, Stillbirth and Birth Weight**

| Variable | | Cases N (%) | Control N (%) | χ2 (df) | P value |
|---|---|---|---|---|---|
| **Para** | Primi para | 22 (31.9) | 12 (17.4) | 3.903 (1) | 0.048 |
| | Multi para | 47 (68.1) | 57 (82.6) | | |
| **Previous Abortion** | Never | 5 (7.2) | 18 (26.1) | 8.861 (2) | 0.012 |
| | Once | 14 (20.3) | 12 (17.4) | | |
| | More than one | 50 (72.5) | 9 (56.5) | | |
| **Still birth** | Never | 58 (84.1) | 68 (98.6) | 9.127 (1) | 0.003[1] |
| | Yes | 11 (15.9) | 1 (1.4) | | |

[1] Fisher's Exact Test

Table 4.4 shows that there is a statistical significant association between birth weight and number of deliveries "para" ($p<0.05$). The table also shows that there is a statistical significant association between birth weight and number of abortions ($p<0.05$). Moreover, the table also shows that there is a statistical significant association between birth weight and number of stillbirths.

### Pregnancy-Related Characteristics and Birth Weight (Continued)

**Table 4.5: Association between Birth Weight, and Place of ANC, History of Obstetric Risk, and Medications during Pregnancy**

| Variable | | Cases N (%) | Control N (%) | χ2 (df) | P value |
|---|---|---|---|---|---|
| **History of obstetric risks** | Yes | 37 (53.6) | 25 (36.2) | 4.217 (1) | 0.040 |
| | No | 32 (46.4) | 44 (63.8) | | |
| **Medications during pregnancy** | Yes | 57 (83.8) | 46 (66.7) | 5.403 (1) | 0.020 |
| | No | 11 (16.2) | 23 (33.3) | | |

Table 4.5 shows that there is a statistical significant association between birth weight and mothers' history of obstetric risks ($p<0.05$). The table also shows that there is a statistical significant association between birth weight and medications taken during pregnancy ($p<0.05$). Also, there is no statistical significant association between birth weight and mothers' medical risks during pregnancy.

**Pregnancy-Related Characteristics and Birth Weight (Continued)**

**Table 4.6: Association between Birth Weight, and Complications during Pregnancy and Chronic Health Problems**

| Variable | | Cases N (%) | Control N (%) | $\chi 2$ (df) | P value |
|---|---|---|---|---|---|
| **Anemia** | Yes | 20 (29.0) | 20 (29.0) | 0.000 (1) | 1.000 |
| | No | 49 (71.0) | 49 (71.0) | | |
| **Eclampsia** | Yes | 18 (26.1) | 3 (4.3) | 12.637 (1) | <0.001[1] |
| | No | 51 (73.9) | 66 (95.7) | | |
| **Gestational DM** | Yes | 6 (8.7) | 1 (1.4) | 3.762 (1) | 0.052[1] |
| | No | 63 (91.3) | 68 (98.6) | | |
| **Abruptio placenta** | Yes | 4 (5.9) | 0 (0.0) | 4.121 (1) | 0.042[1] |
| | No | 64 (94.1) | 68 (100.0) | | |
| **Placenta previa** | Yes | 2 (2.9) | 2 (2.9) | 0.000 | 1.000[1] |
| | No | 67 (97.1) | 67 (97.1) | | |

[1] Fisher's Exact Test

Table 4.6 shows that there is a statistical significant association between birth weight and eclampsia ($p<0.05$). The table also shows that there is a statistical significant association between birth weight and abruptio placenta ($p<0.05$). On the other hand, there is no statistical significant association between birth weight and mothers' complications (anemia, gestational DM, and placenta previa).

### 4.10 Association between Birth Weight, and Type of Antenatal Care Provider

**Table 4.7: Association between Birth Weight, and Type of Antenatal Care Provider**

| Variable | | Cases N (%) | Control N (%) | χ2 (df) | P value |
|---|---|---|---|---|---|
| **Specialist** | Yes | 66 (95.7) | 69 (100.0) | 3.067 (1) | 0.080[1] |
| | No | 3 (4.3) | 0 (0.0) | | |
| **Nurse** | Yes | 63 (45.6) | 65 (47.1) | 0.402 (1) | 0.534 |
| | No | 75 (54.4) | 73 (52.8) | | |

[1] Fisher's Exact Test

Table 4.7 shows that there is no statistical significant association between birth weight and the type of antenatal care provider such as specialists and nurses, ($p>0.05$).

### 4.11 Birth weight and Adequacy of ANC

**Table 4.8: Association between Birth weight and Adequacy of ANC**

| Variable | | Cases N (%) | Control N (%) | χ2 (df) | P value |
|---|---|---|---|---|---|
| **Initiation of ANC visits** | Inadequate <12weeks | 33 (47.8) | 30 (43.5) | 0.263 (1) | 0.608 |
| | Adequate ≥12weeks | 36 (52.2) | 39 (56.5) | | |
| **Number of visits** | Inadequate < 4 visits | 5 (7.2) | 3 (4.3) | 0.531 (1) | 0.466 |
| | Adequate ≥ 4 visits | 64 (92.8) | 66 (95.7) | | |
| **Adequacy of received services " Utility "** | Yes | 3 (4.3) | 0 (0.0) | 3.067 (1) | 0.080[1] |
| | No | 66 (95.7) | 69 (100.0) | | |
| **Gestational age at booking** | < 17 weeks | 59 (86.8) | 56 (81.2) | 0.470 (1) | 0.493 |
| | ≥ 17 weeks | 10 (14.5) | 13 (18.8) | | |

[1] Fisher's Exact Test

Table 4.8 shows that there is no statistical significant association between birth weight and initiation of ANC visits, number of visits, adequacy of received services, gestational age at first visit "booking" (p>0.05).

### 4.12 Birth weight and Demographic Factors of the Participants

**Table 4.9: Association between Birth weight and Demographic Factors of the Participants**

| Variable | | Cases N (%) | Control N (%) | χ2 (df) | P value |
|---|---|---|---|---|---|
| **Place of residence** | Camp | 13 (13.8) | 13 (13.8) | 0.905 (2) | 0.636 |
| | City | 43 (62.3) | 47 (68.1) | | |
| | Village | 13 (18.8) | 9 (13.0) | | |
| **Mothers' education** | ≤ Secondary | 39 (56.5) | 37 (53.6) | 0.117 (1) | 0.732 |
| | University | 30 (43.5) | 32 (46.4) | | |
| **Mothers' work** | Working | 2 (2.9%) | 10 (14.5) | 5.841 (1) | 0.016[1] |
| | Not working | 67 (97.1) | 59 (85.5) | | |
| **Fathers' work** | Working | 51 (73.9) | 50 (72.5) | 0.037 (1) | 0.848 |
| | Not working | 18 (26.1) | 19 (27.5) | | |
| **Citizenship** | Refugee | 40 (85.0) | 43 (62.3) | 0.272 (1) | 0.602 |
| | Not Refugee | 29 (42.0) | 26 (37.7) | | |

[1] Fisher's Exact Test

Table 4.9 shows that there is a statistical significant association between birth weight and mothers' working status (p<0.25). On the other hand, there is no statistical significant association between birth weight and place of residence, mothers' education, fathers' work, and citizenship (p>0.05).

**Birth weight and Demographic Factors of the Mothers (Continued)**

**Table 4.10: Association between Birth Weight and Demographic Factors of the Mothers (Continued)**

| Variable | | Cases N (%) | Control N (%) | $\chi 2$ (df) | P value |
|---|---|---|---|---|---|
| **Degree of Kinship** | 1st Degree | 15 (21.7) | 12 (17.6) | 2.784 (3) | 0.426 |
| | 2nd Degree | 12 (17.4) | 9 (13.2) | | |
| | 3rd Degree | 11 (15.9) | 7 (10.3) | | |
| | 4th Degree | 31 (44.9) | 40 958.8) | | |
| **Level of income** | Below 1000 Shekel | 8 (55.1) | 41 (59.4) | 0.387 (2) | 0.824 |
| | 1000 – 1500 Shekel | 22 (33.9) | 21 (30.4) | | |
| | > 1500 Shekel | 9 (13.0) | 7 (10.1) | | |
| **Family size** | Below 5 | 35 (50.7) | 27 (39.1) | 1.874 (1) | 0.171 |
| | 5 and more | 34 (49.3) | 42 (60.9) | | |

Table 4.10 shows that there is no statistical significant association between birth weight and degree of kinship, level of income, and family size ($p>0.05$).

### 4.13 Multivariate Analysis of the Determinants of Low Birth Weight (ANC Adequacy, Socioeconomic and Demographic and Pregnancy Related Characters)

**Table 4.11: Multivariate Analysis of the Determinants of Low Birth Weight (Final Model)**

| Variables | B | Error | Wald | df | P value | Adjusted OR |
|---|---|---|---|---|---|---|
| Medications | | | | | | |
| No | | | | | | |
| Yes | .862 | .485 | 3.166 | 1 | .075 | 2.369 |
| Previous Abortion | | | 7.784 | 2 | .020 | |
| Never | | | | | | |
| Once | .077 | .504 | .023 | 1 | .879 | 1.080 |
| More than one | 1.713 | .635 | 7.272 | 1 | .007 | 2.534 |
| Still birth | | | | | | |
| Never | | | | | | |
| Yes | -1.828 | 1.109 | 2.718 | 1 | .099 | .161 |
| Maternal occupation | | | | | | |
| Unemployed | | | | | | |
| Employed | -1.910 | .919 | 4.319 | 1 | .038 | 3.510 |
| History of obstetric risks | | | | | | |
| Never | | | | | | |
| Yes | .195 | .434 | .201 | 1 | .654 | 1.215 |
| Utility ANC service | | | | | | |
| Adequate | | | | | | |
| Inadequate | 1.556 | 1.329 | 1.371 | 1 | .242 | 4.740 |
| Eclampsia | | | | | | |
| No | | | | | | |
| Yes | 1.641 | .747 | 4.826 | 1 | .028 | 5.163 |

P < 0.05 indicates a significant association
Adjusted OR: All variables were entered in one model with adjustment for other factors

Logistic regression analysis was employed to predict the probability that the infant would have low birth weight. All variables with p value < 0.05 in bivariate analysis and the utility of ANC services (0.08) were entered in the above model to adjust and control the effect of

these variables on each other (confound factors). So factors with P value < .05 have statistical significance association with birth weight were selected as predictors.

The model showed that all the factors that were risk for low birth weight in bivariate analysis (eclampsia, abortion, Maternal occupation, medications during pregnancy, history of obstetric risks, utility of ANC services, and still birth) had not a significant association with LBW, except abortion, maternal occupation and eclampsia (p-value = .020, .038, and .028, respectively).

Our findings also demonstrate that the mothers who had eclampsia were more likely to get baby with low birth weight five times than the mothers had not the case. Mothers who had previous abortion more than one time were more likely to get baby with low birth weight two times and half than the mothers never have abortion.

Employed Mothers were at higher risk to get low birth weight three times and half than unemployed mothers.

Model fitness was checked by Hosmer Lemeshow goodness-of-fit test, classification table and area under ROC (Receiving operating characteristics) curve. The null hypothesis for Hosmer Lemeshow goodness-of-fit test of the model is fit, the *p* value is 0.994 which is not significant, therefore the model is fit. Also the classification table by SPSS showed that 72.1% of cases are predicted correctly whether they had low birth weight or not (70% or above is considered a good model) (Norsa'adah, B. (2011). None of the interaction are significant, co linearity between the two variables was checked by linear regression as the variance inflation factor (VIF) for each independent variable was 1.027(less than 10 which is considered acceptable).

None of the interactions are significant, co linearity between the two variables was checked by linear regression as the variance inflation factor (VIF) for each independent variable was 1.027(less than 10 which is considered acceptable)

## 4.14 Discussion

The main aim of this study was to assess the effect of adequacy of ante-natal care on birth weight in Gaza strip. In this section, the researcher made comparison between the present study results and previous research studies. Moreover, the researcher conducted critical discussion of the study results based on her point of view and experience.

- **Adequacy of Ante-natal care in the Gaza Strip**

The results revealed that 54.3% of the women have adequate initiation of ante-natal care visits, while 45.7% do not. Also, 94.2% of the women in this study have adequate number of visits to the ante-natal care sites, and 97.8% of the women in this study have adequate number of received services in the ante-natal care settings, and 83.3% of them have early booking for ante-natal care visits (at ≤ 17 weeks). If we have a look in the current result, we will see that the APNCU index is adequate, this could be attributed to the fact that nearly half of the mothers in the current study are educated, meaning that the education make the woman have more attention of their health and pregnancy status.

These results are non-consistent with the results of study of Joshi et al. (2014) which revealed that 50.0% of the study participants had adequate antenatal visits. The study of Beekman revealed that the women did not receive the minimal recommended content and timing of care. This could be attributed to the differences in the sample of the current study and previous studies; also it could be attributed to the nature of health services which are provided in the area of those studies.

- **The Effect of Adequacy of Ante-natal Care and Other Factors on Birth Weight**

The results of bivariate analysis revealed that there is no statistical significant association between birth weight and initiation of ANC visits, number of visits, adequacy of received services, gestational age at first visit "booking" ($p>0.05$). Some factors associated with birth weight. These factors were tested using Chi-square test and Fisher's Exact Test and the factors include para, abortion, still birth, history of obstetric risks, medications during pregnancy, anemia, eclampsia, and abruptio placenta. All of these factors have statistical significant association with birth weight before conducting multiple logistic regressions.

Also, there is no statistical significant association between birth weight and mothers' medical risks, site of ante-natal care during pregnancy, and mothers' complications (anemia, gestational DM, and placenta previa). Moreover, there is no statistical significant association between birth weight and initiation of ANC visits, number of visits, adequacy of received services, and gestational age at first visit, place of residence, mothers' education, fathers' work, and citizenship. These results are not consistent with the results of Balsa and Triunfo (2015) which revealed that adequate use of Antenatal care, as defined by early initiation and at least 9 visits, decreases the probability of low birth weight by 6 percentage points and increases birth weight by 149 grams.

On the other hand, some of the above mentioned results are consistent with the results of Dubey et al. (2015) which revealed that the statistically significant association was found between low birth weight of babies and mother's age, religion, literacy of mother and regular ANC check-up during pregnancy.

Moreover, these results are not consistent with the results of Pinzon-Rondon et al. (2015) which revealed that the quality of prenatal care, number of prenatal visits, and first prenatal

visits during pregnancy, were associated with LBW even after controlling for all the studied variables.

Additionally, the above mentioned results are not consistent with the results of Awiti et al. (2014) which revealed that infant health can be improved by using prenatal care adequately. More importantly, the results of the present study are not consistent with the results of Onwuhafua et al. (2016) which revealed that the prevalence of anemia was high (56.7%) among the un booked but lowest (9.5%) with moderate attendees.

- **The Effect of Adequacy of Ante-natal Care on Birth Weight: The Final Model**

Most of the above mentioned factors were chosen to be included within the model, these factors include: eclampsia, still birth, abortion, mothers' work, medications during pregnancy, history of obstetric risks, abruptio placenta, para, gestational DM, specialist, adequacy of received services, site of ANC, chronic health problems, family size, and physician as a health care provider.

The present study results revealed that the mothers who had eclampsia were more likely to get baby with low birth weight five times than the mothers had not the case. Mothers who had previous abortion more than one time were more likely to get baby with low birth weight two times and half than the mothers never have abortion.

Employed Mothers were at higher risk to get low birth weight three times and half than unemployed mothers.

The above mentioned results which are mentioned in the model proved that the antenatal care does not affect the birth weight as an outcome. This could be attributed to the fact that the majority of study sample in the current study have adequate antenatal care including its initiation of care, number of visits, adequacy of received services, and gestational age at

booking, that's why all of these factors would not have effect on birth weight. Also, the number of mothers who do not have adequate antenatal care index is little compared to those who have adequate index.

These results are non-consistent with the results of Qader et al. (2012) which revealed that the antenatal care of the pregnant mothers is one of the important risk factors contributing to low birth weight babies. Also, the study of Awiti et al. (2014) revealed that adequate use of antenatal care increases birth weight, they revealed also that the health of infants can be improved by using antenatal care adequately.

Moreover, the of Van Dijk et al. (2011) revealed that the use of antenatal care index is an effective strategy for preventing adverse birth outcomes, and this what has been supported by the study of Fonseca et al. (2014) which showed that there was an association between inadequate number of ANC visits, laboratory studies and exams, and increased risk of low birth weight among new-borns. Additionally, these results are non-consistent with the results of Ahmed et al. (2012) which showed that there was a relationship between low birth weight and antenatal care, maternal education, paternal education, and paternal occupation among women in Pakistan; the factors which are not revealed as factors in the current study. On the other hand, these results are consistent with the results of Spracklen et al. (2014) which revealed that gestational hypertension has an effect on birth weight in which the women who developed preeclampsia delivered infants that were significantly smaller than infants of women who did not develop preeclampsia and non-smoking women, respectively.

More importantly, the results of the current study are consistent with the results of Carl et al. (2011) which revealed that preeclampsia is a significant risk factor in the development of IUGR and low birth weight, and to that end, an infant at 38–40 weeks with a weight of

1,250 grams has a significantly greater mortality risk than one born of similar weight at 32 weeks.

Additionally, the study of society for maternal-fetal medicine (2015) revealed that preeclampsia and parity, was found a significant predictor for low birth weight. While the result of this current study is not consistent with the result of Xiong and Fraser (2004) which showed that the differences in mean birthweight between women with pre-eclampsia and women with normal blood pressure were not statistically significant. More importantly, the results of the current study are consistent with the results of Gebregzabiherher et al. (2017) which showed that the risk factors of low birth weight include the mothers with a history of abortion. On the other hand, the current study are somewhat consistent with the results of Feresu et al. (2015) which revealed that the lack of prenatal care, mother's mid-arm circumference below 28.5 cm, previous stillbirth, rural residence, and eclampsia increased the risk of low birth weight.

Given the results abstained in the current study, eclampsia is considered as a risk factor for low birth weight, this could be attributed to the fact that with increase in the mother blood pressure; perfusion to the fetus via the placenta will decrease, leading to IUGR, hypoxia, and restricted fetus size. So, because of the great number of women who have adequate antenatal care index; this factor did not fall within the model.

Also, these results are not consistent with the results of Wehby et al. (2009) which showed that antenatal care delay increased significantly low birth weight and preterm birth when accounting for self-selection using the CML model but not in the standard probit model, also, the antenatal care was found to be ineffective on average in the birth defect group.

Regarding the place of given ANC, the results showed that there was a significant difference between the adequacy of ANC and the place of given ANC (Governmental

/UNRWA) (adequate received services), p-value .000, received services groups p-value.012, and utility .000)

The UNRWA place provided more adequate ANC than governmental clinics.

The utility of ANC services was enough good (86.6% among controls and 86.5% among case). This findings showed that there is no a significant differences between cases and controls (p-value = .879).

Finally, the differences between the present study results and other previous research studies could be attributed to the differences in the study design and the sample included. Also, it could be attributed to the nature of antenatal care provided for the mothers

# Chapter Five

# Conclusion and Recommendations

## 5.1 Conclusion

The main aim of this study was to assess the effect of adequacy of ante-natal care on low birth weight in Gaza Governorates. Case-control study design was applied in the current study, in which the 69 cases were selected by convenient accidental sampling method from the babies who have had low birth weight, while the controls were 69, they are selected by the same sampling method from those who are healthy. Control of confounding variables was conducted by a method of matching between cases and controls in terms of: 1) maternal age, 2) infant's sex and 3) medical risks during pregnancy.

A structured interview questionnaire was used in this study for both cases and controls. Same questionnaire was distributed to the cases and controls. The questionnaire was designed in Arabic language and it was revised by experts in the field. The researcher used the statistical package for the social science (SPSS version 22) for analysing the data. Multiple logistic regressions were used.

The study results revealed that the mothers who had eclampsia were more likely to get baby with low birth weight five times than the mothers had not the case. Mothers who had previous abortion more than one time were more likely to get baby with low birth weight two times and half than the mothers never have abortion.

Employed Mothers were at higher risk to get low birth weight three times and half than unemployed mothers.

## 5.2 Recommendations

1. Implementing physical examinations for all mothers before and during pregnancy to detect any problems which lead to low birth weight.
2. Conducting preventing and therapeutic measures for the mothers who have abortion.
3. Increasing awareness by conducting health educational workshops for the mothers in order to prevent preeclampsia and eclampsia.
4. Putting therapeutic plan for mothers who have eclampsia as soon as possible.

## 5.3 Recommendations for future research

1. Conducting the study on a bigger sample size, this might reveal more results especially for the prenatal factors which affect the birth weight.
2. Inclusion other factors related to antenatal care within the study tool which may have effect on birth weight.
3. Conducting other studies in the future to build the evidence base so that effective preventive and treatment of low birth weight babies can be implemented.
4. Encouraging researchers to conduct further research studies regarding the effect of eclampsia, stillbirth, and abortion on birth weight.

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# Annex 1: Approval from Helsinki

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: 05/02/2018** **Number:** PHRC/HC/337/18 الاسم:

**Name:** MARYAM M. SHAATH

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:

**The Effect of Adequacy of Pre-natal Care on Birth Weight and Pre-term Birth in Gaza Governorates: Case-Control Study**

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/337/18 in its meeting on 05/02/2018 و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

**Signature**

**Member** **Member**

**Chairman**

**Specific Conditions:-**

**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.

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين

# Annex 2: Approval from the Ministry of Health

State of Palestine
Ministry of health

دولة فلسطين
وزارة الصحة

التاريخ:12/03/2018
رقم المراسلة 200684

**السيد : رامي عيد سليمان العبادله المحترم**

مدير عام بالوزارة /الإدارة العامة لتنمية القوى البشرية - /وزارة الصحة

**السلام عليكم ,,,**

**الموضوع/ تسهيل مهمة الباحثة// مريم شعت**

التفاصيل //
بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحثة/ **مريم محمد شعت**
الملتحقة ببرنامج ماجستير التمريض – جامعة القدس أبوديس في إجراء بحث بعنوان:-
**"مدى تاثير كفاية رعاية ما قبل الولادة على الوزن عند الولادة والولادة قبل الميعاد في محافظات غزة"**
حيث الباحثة بحاجة لتعبئة استبانة من عدد من الأمهات الأطفال ذوي الاوزان المنخفضة او ولدوا قبل موعد الولادة الطبيعي او كليهما في حضانة مجمعي الشفاء وناصر الطبيين ومستشفى غزة الأوربي وأخرى ممن اطفالهن لا يعانون من هذه المشكلة.
نأمل توجيهاتكم لذوي الأختصاص بضرورة الحصول على الموافقة المستنيرة من الأمهات اللاتي لديهن استعداد للمشاركة في البحث ومن ثم تمكين الباحثة من التواصل معهن، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسئولية.
وتفضلوا بقبول التحية والتقدير،،،
ملاحظة / تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 5 شهر من تاريخه.

**محمد ابراهيم محمد السرساوي**
**مدير دائرة/الإدارة العامة لتنمية القوى البشرية -**

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## Annex 3: Consent Form

**The Effect of Adequacy of Ante-natal Care on Birth Weight in Gaza Governorates**

**Dear mother,**

This is a questionnaire about the effect of adequacy of antenatal care on birth weight in Gaza governorates. With this questionnaire, we want to map adequacy of antenatal care in pregnancy outcome in the Gaza Strip. The questionnaire is part of thesis for the master degree of nursing profession. The results of this study will be used for scientific research only. Your participation in our study is of great importance to decrease infant mortality and for the future of our children. The questionnaire will take about 20 minutes of your time. Your participation in the study is voluntary. You are free to withdraw from the study at any time. The data obtained in this study will be kept strictly confidential and your data will be coded under a random identifier that cannot be linked to you personally.

Thanks a lot for your cooperation

**Researcher**

Maryam Shaath

**Master candidate of MCHN**

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## Annex 4: The Effect of Adequacy of Antenatal Care on Birth Weight in Gaza Governorates:

**Serial number _____**

## Part One: Socio Demographic Data of the Mother and father

| | | | |
|---|---|---|---|
| **1. Age of the mother** | …….. years | | |
| **2. Place of residence** | □ Camp | □ City | □ Villages |
| **3. The residence is** | □ Rented | □ Owned | |
| **4. Type of subject** | □ Case | □ Control | |
| **5. Level of mother's Education** | □ Illiterate | □ Secondary school or below | |
| | □ University | □ Master or above | |
| **6. Level of father's education** | □ Illiterate | □ Secondary school or below | |
| | □ University | □ Master or above | |
| 7. **Occupational status of the mother** | | □ Working | □ Not working |
| **8. Occupational status of the father** | | □ Working | □ Not working |
| **9. Nature of mother citizenship** | | □ Refugee | □ Citizen (non refugee) |
| **10. Nature of father citizenship** | | □ Refugee | □ Citizen (non refugee) |
| **11.The degree of kinship with your Husband** | | □ First degree □ Second degree<br>□ Third degree □ No relation | |
| **12. Household income** | ------ | | |
| **13. family size** | -------- | | |

## Part Two: Pregnancy-related characteristics and ANC

| | | | |
|---|---|---|---|
| **14. Gravida** | □ Primigravida | □ Multigravida | |
| **15. Parity** | □ Primipara | □ Multipara | |
| **16. Abortions** | …… times | | |
| **17. Still births** | …… times | | |
| **18. Place of ANC** | □ Governmental | □ UNRWA | □ Private |
| **19. Antenatal care provider** | □ Specialist | □ Nurse | |
| **20. History of obstetric risks** | □ Yes | □ No | |
| **21.Medical risks during pregnancy** | □ Yes | □ No | |

**22. Did you experience one of the following complications during current pregnancy?**

| **Complication** | **Yes** | **No** |
|---|---|---|
| Anemia | | |
| Gestational Diabetes | | |
| pre-eclampsia & eclampsia | | |
| Abruptio Placenta | | |
| Placenta Previa | | |
| Other | ---------- | |

| | | |
|---|---|---|
| **23. Chronic health problems** | □ Yes | □ No |
| **24. If yes, what is the health problem** | □ Diabetes | □ Asthma |
| | □ Hypertension | □ Heart diseases |
| | □ Kidneys disorder | □ Thyroid gland diseases |
| | Other …… | |

| | | | |
|---|---|---|---|
| **25. Did you take medications during Pregnancy ?** | □ Yes | | □ No |
| **26. History of congenital anomalies** | □ Yes | | □ No |
| **27. If yes, mention the disease** | ---------- | | |
| **28. Initiation of antenatal care visits** | □ After the 12th week of gestation (Inadequate) | | |
| | □ Before the 12th week of gestation (Appropriate) | | |
| **29. Number of visits during pregnancy** | ---------- times | | |
| **30. Gestational age at first visit "Booking"** | -------- weeks | | |
| **31. Duration of pregnancy** | ☐ <37 weeks<br>☐ 37- 42 weeks | | |
| **32.Type of delivery** | □ Vaginal<br>□ C/S | □Vacuum<br>□ Planned C/S | □ Forceps<br>□ Unplanned C/S |

## Part Three: Infant Data

| | | | |
|---|---|---|---|
| **33. Birth weight** | ------- grams | | |
| **34. Gestational age at delivery** | -------- weeks | | |
| **35. Infant's sex** | □ Male | □ Female | |
| **36. Place of data collection** | □ Shifa | □ Nasser | |
| **37. SCBU admission** | □ Yes | | □ No |

**38. What kinds of examinations were done during these visits to antenatal care?**

| **Examinations** | **Yes** | **No** |
|---|---|---|
| Measuring weight | | |
| Measuring height | | |
| Measuring blood pressure | | |
| Measuring blood sugar | | |
| Urine analysis | | |
| Measuring fundal height | | |
| Ultrasound | | |
| Listening to fetal heart sound | | |

## Annex 5: Control Panel

| Name | Job Title |
|---|---|
| Dr. Ahmad Nijem | Assistant professor – AlAzhar University |
| Dr. Mohammed Tabash | Assistant professor of Public health |
| Dr. Ehab Nasser | Assistant professor – AlAzhar University |
| Dr. Areefa El- Bahri | Assistant professor – Islamic University of Gaza |
| Dr. Mohammed Abu- Raya | Expert in Child Health and Nutrition |

## Annex 6: Sample Size

### Sample Size for Unmatched Case-Control Study

For:

| | |
|---|---|
| Two-sided confidence level(1-alpha) | 95 |
| Power(% chance of detecting) | 80 |
| Ratio of Controls to Cases | 1 |
| Hypothetical proportion of controls with exposure | 87.5 |
| Hypothetical proportion of cases with exposure: | 67.74 |
| Least extreme Odds Ratio to be detected: | 0.30 |

| | Kelsey | Fleiss | Fleiss with CC |
|---|---|---|---|
| Sample Size - Cases | 70 | 69 | 79 |
| Sample Size - Controls | 70 | 69 | 79 |
| Total sample size: | 140 | 138 | 158 |

References

Kelsey et al., Methods in Observational Epidemiology 2nd Edition, Table 12-15
Fleiss, Statistical Methods for Rates and Proportions, formulas 3.18 &3.19

CC = continuity correction
Results are rounded up to the nearest integer.
Print from the browser menu or select, copy, and paste to other programs.

Results from OpenEpi, Version 3, open source calculator--SSCC
Print from the browser with ctrl-P
or select text to copy and paste to other programs.

**العنوان: أثر كفاية الرعاية الصحية ما قبل الولادة على وزن الأطفال عند الولادة بمحافظات غزة**

**اعداد: مريم شعت**

**إشراف: د. مازن أبو قمر**

**ملخص الدراسة:**

تلعب الرعاية الصحية ما قبل الولادة دوراً هاماً في الوقاية من انخفاض الوزن عند الولادة، حيث يعتقد أن الرعاية الصحية ما قبل الولادة والدقيقة في الوقت المناسب هي عامل مهم في منع مضاعفات الحمل. هدفت هذه الدراسة إلى تقييم أثر كفاية الرعاية الصحية ما قبل الولادة على وزن الأطفال عند الولادة في محافظات غزة. اعتمدت الدراسة على عينة قدرها ١٣٨ (٦٩ من الأمهات اللواتي أنجبن أطفال ذوي الوزن الطبيعي و٦٩ من الأمهات اللواتي أنجبن اطفال أقل من الوزن طبيعي) تم أخذهم بطريقة العينة الملائمة، وقد استخدمت الباحثة استبانة كأداة لجمع البيانات حيث تم استخدام مختلف الأساليب والاجراءات الإحصائية لتحليل البيانات مثل النسب المئوية، المتوسط الحسابي، اختبار مربع كاي، وبديله اختبار فشر والإنحدار الخطي البسيط والمتعدد. لقد كشفت نتائج الدراسة أن الأمهات اللواتي يعانين من تسمم الحمل تزيد فرصة الولادة للأطفال من ذوي الوزن المنخفض بمقدار خمس مرات مقارنة بالنساء اللواتي لا يعانين من هذه المشكلة، كما أظهرت نتائج الدراسة أن الأمهات اللواتي لديهن علاوة على ذلك، فإن الأمهات اللواتي أجهضنَ لاكثر من مرة واحدة تزداد احتمالية الولادة للأطفال من ذوي الوزن المنخفض بمقدار مرتين ونصف مقارنة بالنساء اللواتي لم يجهضنَ، وأن الأمهات اللواتي يعملن خارج البيت تزداد احتمالية الولادة للأطفال من ذوي الوزن المنخفض بمعدل ثلاث مرات ونصف مقارنة بالأمهات اللواتي لم يجهضنَ. لخصت نتائج الدراسة إلى أن كفاية الرعاية الصحية ما قبل الولادة لم يكن لها تأثيراً على وزن الأطفال عند الولادة، حيث لعبت عوامل أخرى دورًا في هذا التأثير مثل الإجهاض وتسمم الحمل ، وقد أوصت الباحثة بضرورة إجراء تدابير الوقاية والعلاج للأمهات اللواتي يعانين من الإجهاض وتسمم الحمل ، وأن هناك حاجة ماسة إلى مزيد من الدراسات مستقبلاً تشمل عوامل أخرى ذات الصلة بالرعاية الصحية ما قبل الولادة والتي قد يكون لها تأثير على وزن الأطفال عند الولادة.