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School Of Public Health
القدس - فلسطين

Maternal Risk Factors Associated With Low Birth Weight In Gaza Strip

A Thesis

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By

Amgad Fathi Hussein ElShanty
M.B.B. Ch

Supervisor: Dr. Yehia Abed, Ph.D.
Ass. Prof. of Epidemiology, School of Public Health,
AL-Quds University

Adviser: Dr. Dina Abu Sha'aban, MD, MPH.
Director of Women health development Directorate,
MOH

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Endorsement

Thesis Title:

Maternal Risk Factors Associated With Low Birth Weight In Gaza Strip

Supervisor:
Dr. Yehia Abed

Title:
Associate Professor of Epidemiology,
school of Public Health,
Al-Quds University
Date
30.11.2002

Signature:

Advisor:
Dr. Dina Abu Sha'aban

Title:
MD, MPH,
Director of Women Health Development Directorate,
MOH
Date 30-11-002

Signature:

Internal Examiner:
Dr. Suzanne Shasha'a

Title:
Assistant Dean of school of Public Health,
Al-Quds University
Date
4.12.2002

Signature:

External Examiner:
Dr. Fawzi Ahmed Radi

Title:
M.B.B.Ch, D.O.G, M.R.C.O.G,
Head of Gynecology and Obstetric Department,
European Gaza Hospital,Gaza
Date 1.12.2002

Signature:

Dedication

I wish to dedicate this simple work to my parents, and my beloved and my soul's twin, my partner in all avenues of my life... my wife.

Acknowledgement

I would like to express my sincere gratitude to Dr. Yehia Abed Ass. Professor of epidemiology, Al-Quds University for his kind supervision, continuos valuable advice, constant support and encouragement throughout the progress of the work.

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Lastly, my deep respect to my wife who has tolerated many dreary evening and holiday during the study period and for her cooperation made this work possible.

It is impossible to properly thank many people who have participated in helping me to undertake my study.

Abstract

The aim of this study is to identify Maternal Risk Factors of LBW and implementation of appropriate prevention programs in Gaza area.

A hospital based unmatched case control study was carried out at El-Shifa hospital (Central hospital in Gaza mainly for the north, Gaza, and part of mid-zone Governorates). The study population constituted of 125 cases and 125 controls.

Data was collected through a self-constructed structured questionnaire administered to subjects' mothers at hospital. Response rate was 100%. Maternal factors strongly associated with LBW as identifying by study were young maternal age at marriage and during the current pregnancy, Lower paternal educational level, unemployment of parents, extended family, exposure to social problems, maternal stress, and consanguinity. Moreover, short maternal stature with overweight and obesity, low weight gaining during pregnancy due to poor nutrition and some maternal health problems were associated with LBW. Passive smoking and drinking high amount of coffee and tea were also associated with LBW. Furthermore not utilizing of antenatal care services was a contributing factor of LBW. In addition, Primigravida, mothers with short birth intervals, and who were complaining from vaginal bleeding were more probable to Labor LBW. Intrauterine growth retardation and preterm birth were strongly contributes in causing LBW.

The study contributes in highlighting the major maternal risk factors for implementing strategies that could in prevention of LBW. These preventive measures include; socio-economic, maternal health, nutritional, and educational dimensions.

ملخص الدراسة

إن هدف هذه الدراسة هو تحديد عوامل الخطر لدى الأمهات اللاتي ينجبن أطفال أقل من الوزن الطبيعي في غزة والإسهام في تطوير برامج الوقاية من إنجاب أطفال أقل من الوزن الطبيعي.

خلفية الدراسة:

تظهر ضخامة مشكلة إنجاب أطفال أقل من الوزن الطبيعي في ارتفاع معدلات الوفيات والمعدلات المرضية بين هؤلاء الأطفال مقارنة مع الأطفال ذوي الأوزان الطبيعية. وعلى الرغم من وجود تفاوت بين البلدان المتقدمة والبلدان النامية في معدل حدوث هذه المشكلة وتطوراتها السلبية على الصعيد الصحي والاقتصادي مازالت تمثل تحد كبير لمعظم البلدان في العالم. فهي تعتبر مشكلة عالميه عامة تحتاج إلى تكاتف كثير من الهيئات الصحية وغيرها من الهيئات الاجتماعية.

ومحليا وطبقا لتقارير وزارة الصحة الفلسطينية مازالت معدل حدوث هذه المشكلة مرتفع في غزة حيث وصلت نسبة (8.5%) وكذلك نسبة وفيات الأطفال حديثي الولادة بسبب الوزن المنخفض هي الأعلى.

ومن هذا المنطلق ترجع أهمية هذه الدراسة للإسهام في معرفة الأسباب وعوامل الخطر لدى الأمهات قبل الحمل وأثناء فترة الحمل لتفادي إنجاب أطفال أقل من الوزن الطبيعي لمنع حدوث التطورات السيئة الناجمة عن المشكلة مثل تعرضهم للإمراض بسهولة ووفاتهم في سن مبكر وخاصة في السنة الأولى من العمر وتأخر نموهم وتطورهم الفسيولوجي والنفسي والعاطفي والسلوكي مما ينعكس على تحصيلهم المدرسي وأداءهم المهني في المستقبل وما ينجم عن ذلك من تكاليف وتبعات اقتصادية على الدولة مقابل رعايتهم الصحية في السنوات الأولى من أعمارهم ومن خسائر نتيجة غيابهم المتكرر عن المدرسة والتحصيل المتدني في الدراسة والأداء المنخفض في العمل.

الأهداف الخاصة:

من اجل تحقيق الهدف العام فان هذه الدراسة تسعى إلى:

١. استكشاف عوامل الخطر لدى الأمهات اللاتي ينجبن أطفال أقل من الوزن الطبيعي في غزة.

٢. فحص العلاقة بين كل من:

أ: العوامل الاجتماعية والديموغرافية وإنجاب أطفال أقل من الوزن الطبيعي.

ب: صحة الأم أثناء الحمل وإنجاب أطفال أقل من الوزن الطبيعي.

ج: بعض العادات والسلوكيات أثناء الحمل وإنجاب أطفال أقل من الوزن الطبيعي.

د: الوضع الإنجابي للام وإنجاب أطفال أقل من الوزن الطبيعي.

٣: تحديد نسبة حدوث تخلف في النمو داخل الرحم إلى نسبة حدوث ولادات مبكرة بين الأطفال ذوي الأوزان المنخفضة.

منهجية الدراسة:

هذه الدراسة هي استكشافية درست الحالات المرضية في وجود مجموعة ضابطة وجمعت فيها بيانات كمية على النحو التالي:

أ. عينة الدراسة

كون جمهور الدراسة ١٢٥ حالة مرضية تم اختيارهم من مستشفى الشفاء بشكل عشوائي ومتواصل خلال الفترة ما بين ٢ مارس ٢٠٠٢ حتى ٢٣ مايو ٢٠٠٢حيث تم اختيار كل الحالات التي تنجب خلال هذه الفترة بوزن أقل من الوزن الطبيعي و ١٢٥ طفل بوزن طبيعي تم اختيارهم عشوائيا من المستشفى كذلك بحيث خططت عملية اختيارهم باعتبار الطفل الذي ينجب مباشرة بوزن طبيعي هو الحالة الضابطة للحالة المرضية حيث لا يوجد معايير تناظرية بين الحالات المرضية والحالات الضابطة وتم استثناء الأطفال الذين ينجبون متوفيين بدون علامات حياة والأطفال التوائم والأطفال الذين ينجبون خارج مستشفى الشفاء.

ب. أداة جمع المعلومات

تم تصميم استمارة لجمع البيانات عن طول الأم ووزنها وضغطها قبل الولادة واستبانة خاصة كأداة استقصاء لجمع المعلومات وصممت الاستبانة بحيث تشمل بيانات عن الطفل مثل الجنس والوزن عند الولادة ونوع الولادة ووقت الولادة.

وكذلك بيانات عن ظروف الاجتماعية والديموغرافية المحيطة بأم لطفل مثل مكان الإقامة والعمر وعدد سنوات الدراسة والمهنة والقرابة وشكل الأسرة التي تسكنها ووجود مشاكل اجتماعية واقتصادية ومعلومات عن تاريخ الحمل والولادات والوضع الإنجابي للأم مثل عمر الام عند الزواج والولادة الأولى وعدد مرات الحمل السابقة وعدد مرات الإجهاض وولادة أطفال متوفيين وعن حدوث نزيف أثناء فترة الحمل وعن طول فترة الحمل والتباعد بين الأحمال وعن حدوث مشاكل صحية أثناء فترة الحمل وعن ولادات سابقة لأطفال أقل من الوزن الطبيعي وكذلك معلومات عن زيارة الأمهات لمراكز رعاية الحوامل أو الأطباء لمتابعة الحمل.

علما بأنه قد تم تجريب الاستمارة والاستبانة ميدانيا على عدد ١٠ حالات مرضية ومقابلها ١٠ حالات صحيحة وبناء علية تم تعديلات بسيطة على الاستبانة وتم استعمالها.

النتائج:

دلت النتائج على وجود العديد من العوامل لدى الأمهات والتي ارتبطت بقوة بإنجاب أطفال اقل من الوزن الطبيعي في غزة. وأشارت إلى ارتباط المشكلة بكل من التخلف في النمو في الرحم والولادة المبكرة.

أولا: العوامل الاجتماعية والديموغرافية:

بينت نتائج الدراسة أن عمر الأم الصغيرة عند الإنجاب و عند الزواج ومستوى التعليم المتدني سواء للأم أو الأب وعدم عمل الوالدين بوظيفة والإقامة في أسرة ممتدة وتعرض الأم لمشاكل أسرية واجتماعية و اقتصادية ولصدمات ضاغطة أثناء فترة الحمل وزواج الأقارب كلها ظواهر اجتماعية بارزه في مجتمعنا ومصاحبة بشكل كبير لولادة أطفال أقل من الوزن الطبيعي ومشاكل صحية أخرى عند الأطفال.

ثانيا: الوضع الصحي للأمهات:

أثبتت الدراسة وجود علاقة وارتباط إيجابي بين بعض العوامل الصحية مثل قصر القامة للأم والبدانة والسمنة وعدم اكتساب الوزن المناسب في فترة الحمل وإنجاب أطفال أقل من الوزن الطبيعي وهذه مؤشرات عن سؤ التغذية بين الأمهات الحوامل وعلى الرغم مما سبق لم تكن هناك علاقة بين إصابة الأم ببعض الأمراض وهذه المشكلة وعزي ذلك للجودة العالية من الخدمات التي تتقدم من قبل مراكز رعاية الحوامل في وزارة الصحة ومراكز الوكالة مما أدى إلي تقليل وإخفاء تأثير هذه الأمراض على صحة الأم وبالتالي على صحة الجنين وإحدى هذه الخدمات هي تقديم أقراص الحديد للأمهات الحوامل المصابات بفقر الدم أثناء فترة الحمل حيث كان لهذه السياسة الدور الكبير في تقليل الآثار السلبية لفقر الدم على نمو الجنين على الرغم من ارتفاع نسبة الأمهات المصابات بفقر الدم أثناء الحمل.

ثالثا: عادات وسلوكيات الأمهات أثناء فترة الحمل:

دلت النتائج على أن زيارة مراكز رعاية الحوامل في وزارة الصحة ومراكز الوكالة بشكل منتظم وأكثر من أربع مرات خلال فترة الحمل له الدور الواضح في تخفيض نسبة احتمال إنجاب طفل أقل من الوزن الطبيعي. كذلك أثبتت النتائج على قوة العلاقة والارتباط الإيجابي بين التدخين السلبي وشرب الشاي والقهوة بكميات كبيرة وإنجاب أطفال أقل من الوزن الطبيعي.

رابعا: الوضع الإنجابي للام:

بينت الدراسة وجود ارتباط إيجابي ذو دلالة إحصائية بين الحمل الأول والفترات القصيرة بين الأحمال والنزيف المهبلي أثناء الحمل وكذلك ولادة طفل أقل من الوزن الطبيعي مسبقا وبين إنجاب أطفال أقل من الوزن الطبيعي. ولكن لم تثبت الارتباط بين إنجاب أطفال أقل من الوزن الطبيعي وبين وجود تاريخ إنجابي سيئ مثل وجود إجهاض مسبق أو ولادة أطفال ميتين.

التوصيات:

- تحسين وتعزيز جودة الخدمات والأنشطة التي تقدم عن طريق مراكز رعاية الحوامل في جميع القطاعات الصحية وذلك عن طريق إدماجها في جميع مراكز الرعايا الأولية وتوسيع أوجه نشاطاتها وحث التعاون والتكامل بين مراكز متابعة الحوامل التابعة لمختلف القطاعات الصحية.
- تأسيس برنامج شامل ذو نطاق واسع لحماية وعلاج الأمهات اللاتي يعانين من سوء التغذية وفقر الدم و زيادة إدراك الجمهور لقيمة التغذية الجيدة أثناء الحمل عل صحة الأم والجنين.
- تعزيز توعية الأمهات للدور الجوهري والأساسي التي تقوم به مراكز رعاية الحوامل في حمايتها وطفلها من التطورات السلبية التي قد تنشأ في فترة الحمل نتيجة بعض الظروف الصحية والاجتماعية والاقتصادية السيئة.
- زيادة إدراك الجمهور حول ضرورة التخلي عن بعض العادات الفردية السيئة مثل التدخين وشرب المنبهات بكميات كبيرة مثل القهوة والشاي وكذلك بعض العادات الاجتماعية مثل الزواج المبكر و زواج الأقارب والولادات المتكررة في فترات قصيرة.
- عمل حملات منهجية وإعلامية مكثفة لمكافحة التدخين بين الشباب.
- تعزيز وتحسين وضع المرأة في المجتمع الفلسطيني بتشجيعها على مواصلة التعليم العالي وتوفير فرص العمل المناسبة لها وكونها امرأة وتتناسب مع طبيعة تكوينها الفسيولوجي والنفسي.

توصيات بحثية:

- دراسات حول عوامل الخطر التي تؤدي إلى تخلف نمو الجنين وكذلك الولادة المبكرة عند الأطفال ذوي الأوزان المنخفضة في كل من غزة والضفة.

List of abbreviation

LBW	Low birth weight
VLBW	Very low birth weight
ELBW	Extreme low birth weight
SGA	Small for gestational age
AGA	Appropriate for gestational age
IUGR	Intrauterine growth retardation
PI	Ponderal index
BPD	Biparietal diameter
AC	Arm circumference
HC	Head circumference
FL	Femur length
AFP	Alfa feto-protein
CBR	Crude birth rate
LMP	Last menstrual period
IVH	Intra-ventricular hemorrhage
IQ	Intelligent quotient
BMI	Body mass index
TB	Tuberculosis
RI	Respiratory infection
GN	Glomurulonephritis
PN	Pyelonephritis
UTI	Urinary tract infection
PIH	Pregnancy induced hypertension.
PNA	Palestinian national Authority
PMA	Palestinian Monetary Authority
MOH	Ministry of Health
PHC	Primary health care
WHDD	Women's health and development directorate
WHO	World health organization
UNRWA	United nation relief working organization
NGOS	Non- governmental organizations
HMI	Health management information
FDA	Food and drug administration
CICH	Canadian institute of children health
W.B.	West Bank
GBD	Global burden of diseases
GNP	Gross national product.
GDP	Gross domestic product
IOMF	Israeli occupational military forces
SD	Standard deviation
SE	Standard error
OR	Odds ratio
CI	Confidence interval

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Chapter one

Introduction

Introduction

The birth weight of an infant is the single most important determinant of its chances of survival and healthy growth and development. Because birth weight is conditioned by the health and nutritional status of the mother, the proportion of infants born with low birth weights closely reflects the health status of the communities into which they are born. One of the most robust findings in epidemiologic research on the etiology of low birth weight has been the large socioeconomic disparities in both intrauterine growth retardation and preterm birth. Trend data about low birth weight from forty developing countries suggest that LBW rates have not changed substantially over time in most countries.

Low Birth Weight (LBW) infant is an infant weighting less than 2500 gm at birth regardless of the period of pregnancy (1). There are studies which showed that most of the low birth weight (LBW) infants are the result of preterm labor; that is alive infant delivered before 37 week from the first day of the last menstrual period with a weight of less than 2500 gm. On the other hand, other studies suggested that most of the LBW infants have intrauterine growth retardation or small for gestational age (SGA); that is alive infant which is born weighting less than 2500 gm and delivered at 37 week or after that from the first day of last menstrual period (LMP). The data in United States in 1985 showed that, 6.7% of live births where weighted less than 2.5 Kg, and approximately 30% of these infants had SGA while in the developing countries approximately 70% of LBW infants are SGA (2). In general the incidence of LBW is about 7%. Infants with SGA have greater morbidity and -mortality than appropriately grown gestational age matched infants.

The two main causes of LBW infants are SGA and preterm labor. There are several maternal factors, which lead to LBW infants. These factors include maternal age, maternal somatic characteristics (height and weight), education, socio-economic state of the family, maternal habits (addiction, smoking), parity, birth interval and health status of the mother during pregnancy. Each factor may affect the growth of the fetus or may shorten the duration of pregnancy or both.

A Hospital study in-1984 North Yemen found that 26% of newborns had birth weight of less than 2.5Kg (3). WHO documents of 1989 revealed that many studies were performed in South East Asia region found that the incidence of LBW varies from 12% to about30% in various countries of the region (4).

1.1. Need for the study

Unfortunately, global burden of disease (GBD) estimates for LBW are not currently available despite the enormous scale of LBW in developing countries (IUGR predominant) and to much lesser extent in developed countries (prematurity predominant). However, indirect estimates are possible. LBW accounts for 17% of all births globally, of which 90% (approximately 22 million) are born in developing countries (5). LBW is a universal developing country problem, yet striking regional variation exists.

LBW infants have extreme rates of morbidity and mortality from infectious disease, malnutrition, and growth failure including stunting beginning in the neonatal period through childhood and are estimated to account for approximately one third of all deaths occurring in the first year of life. Of the approximately 10.4 million infant deaths each year in developing countries, 33-40% (population attributable risk) can be attributed to LBW, i.e. 3.5 to 4 million infant deaths each

year. Compared to normal birth weight babies, those born with weight 2000-2499g have 4 times higher risk of neonatal mortality and 2 times higher risk of post- neonatal mortality. A birth weight less than 2000 g the risk is 18 and 5 times higher respectively (5). A study on LBW revealed that preterm babies had perinatal mortality rate 13 times higher than that of normal birth weight and full term and 2 times higher than that of babies with SGA (6). The principle causes of death among LBW infants are hyaline membrane disease (respiratory distress), Intraventricular hemorrhage, septicemia, asphyxia, birth injuries and malformation. These children are also more likely to have abnormal cognitive development, neurological impairment, and poor school performance. More recent evidence indicates that adults who are born LBW are at great risk of morbidity and premature mortality from cardiovascular disease, hypertension, and diabetes compared to their normal birth weight counterparts (7). As the studies classify the seriousness of the problem of LBW infants the researcher conducted the study to find out and determine the major maternal factors associated with low birth weight in Gaza. The findings of the study will provide informations towards prevention and control of LBW by improving the antenatal health care and maternal-child health care.

1.2. Objectives

General objective

To determine the maternal risk factors associated with and contributing in LBW in Gaza. The study aims at providing more reliable information for development of appropriate prevention program.

Specific objectives

1- To examine the association between the maternal Socio-demographic factors and LBW infants.

2- To determine the relationship between the maternal health status (somatic characteristics and health problems) and LBW.

3- To examine the association between the maternal habits and behaviors and LBW infants.

4- To clarify the relationship between the gyno-obstetric conditions and LBW infants.

5- To determine the ratio of SGA to preterm labor among LBW.

1.3. Study Questions

1- What are the major maternal risk factors associated with low birth weight in Gaza?

2- What are the effects of maternal socio- demographic conditions "maternal age, parental education level and occupation, maternal residence, family type, social and family problems and stress, and consanguinity" on LBW occurrence?

3- Are there association between maternal health status "maternal height, weight and weight gaining during pregnancy, health problems such as; anemia, hypertension, cardiac diseases, renal diseases, respiratory diseases, and hepatic diseases" and low birth weight?

4- is there association between maternal habits and behaviors "smoking, tea and coffee drinking and antenatal care visiting during pregnancy" and low birth weight?

5- is there association related to gyno- obstetric conditions " age at marriage and first delivery, parity, birth interval, vaginal bleeding and pregnancy induced hypertension" and LBW?

6- What is the ratio of intrauterine growth retardation to preterm babies among low birth weight?

1.4. Study Presuppositions

1- There are differences between cases and controls related to socio-demographic variables, and maternal habits and behaviors.

2- There are differences between cases and controls related to maternal health status, and gyno-obstetric conditions.

1.5. Background to the study

1.5.1. Geography

Palestine

Palestine has an important geographic and strategic location; it is situated on eastern coast of the Mediterranean sea, in the Middle East. It is bordered by Lebanon on the north, by Syria and Jordan on the East, the Gulf of Aqaba on the South and by Egypt and the Mediterranean Sea on the west.

The region has an extremely diverse terrain with coastal plains in the west, hills and mountains in the central area, The Jordan River valley and a plateau in the east and Neqeb desert in the South. Elevations range from 395m below sea level on shores of the sea; the lowest point on the surface of the earth, to 1020 m a top mount El-Khaleel. The region has several fertile areas, which constitute its principal natural resource. The water supply of the region, however, is not abundant, with virtually all of the modest annual rainfall coming in the winter months. The River Jordan, the region's only major stream, flows south through Lake Tiberias to the intensely saline Dead Sea (8). Palestine has a Mediterranean climate. The summer is hot but comfortable in most parts of the country with westerly winds from Mediterranean (Appendix 1).

Gaza Strip

The Gaza strip is a narrow zone of land, bordered on the south by Egypt, on the west by Mediterranean Sea, and on the east and north by Israel. It is 46 kilometers long and 5-12 kilometers wide with an area of 362 square kilometers. The coast has no natural bays or inlets. The altitude is 0-40 meter above sea level. The Gaza

Strip has a subtropical climate with four distinct seasons. It is flat and sandy with little fertile soil. The average rainfall varies from 150-350 mm per year.

The Gaza Strip is administratively divided into five Governorates: North, Gaza, Mid-zone, Khan Younis and Rafah. It has four towns, fourteen villages and eight refugees' camps (8). A few thousand Israelis live in isolated settlements (Appendix 2).

1.5.2. Demography

Population Size and Structure

The mid year population size of Palestine, 2000 is estimated at 3150056 (in Gaza and West Bank), out of which 1590945 (50.5%) are males and 1559111 (49.5%) are females. In Gaza Strip, the population size in the same year is estimated at 1138126 about (36.1%) of total population in Palestine (8) where Gaza city population constitute 12.9% from all Palestinian population, and North Gaza and Mid-zone constitute 6.6% and 5.2% respectively. Out of which 573853 (50.4%) are males and 564273 (49.6%) are females (Appendix 3).

Age and Sex Distribution

Age distribution of the population has important implications on the health status of the population, due to the different health needs, the differential patterns of health care utilization and the different health status among the various age groups. Population pyramid shows age and sex distribution of population. (50.2%) are under 15 years in the Gaza Strip. The age group under 5 years still constitutes the largest proportion with percentage (18.5%) of population. The ages 60 years and above constitutes (4.7%). Up to age 40-44 years there is

gender predominance towards males, in age group 45-49 years there is no gender predominance. Then after that, gender is more predominant towards females. Females of childbearing age groups (15-49 years) constitute (22.9%) of population (8).

Distribution by Refugee Status

According to the UNRWA report in 2000, the total number of refugees is (1428891) in (Gaza and West Bank) where (837750) are residencies in Gaza strip, at percentage of (58.6%). Most refugees still live in overcrowded camps with standard dwelling and sanitation conditions, which have a negative impact on health status. UNRWA is responsible for PHC service provision for refugees. Any way the refugees can access to all health services provided by MOH (8).

Population Density

Population density in the Gaza is very high compared with the density in West Bank and the neighboring countries. Density rate is about 3161 inhabitants per one square kilometer (8).

Population Growth

The estimated population growth in Palestine has been declined from (5.2%) in 1995 to (3.1%) in 1997 and 1998. In 2000, it is (3%) for Palestine (8).

Crude Birth Rate (CBR)

CBR is the number of live birth per 1000 population per year. Despite progressive decline over the years in CBR, it is still high in Palestine. CBR decline from 46.5/1000 in 1995 to 34.5/ 1000 in 1998 and 33.2 in 2000.

According to MOH figures, the total number of reported births in Palestine is 92719 in 2000. In Gaza Strip, the numbers of births are 38,277 in 2000, with average CBR 33.6/1000. The different Governorates of the Gaza Strip show less variation in the birth rate. The rate in Gaza Strip ranges from (37.2/1000) in Gaza City to (30.4/1000) in the Mid- Zone. Male/ Female ratio at birth in Palestine is 1.04 in 2000 (8).

Live Birth by District

MOH figures show that the percentage of live birth in Gaza City (15%) of the total live birth in Palestine (Gaza and West Bank), while in North Gaza is 7 % and 5% in Mid-zone (8).

1.5.3. Socioeconomic status and political overview

The Gaza Strip has been undergoing the new experience of autonomy since peace agreement between the Palestinians and the Israeli Government on September 13th, 1993. Israel still holds overall sovereignty over the Gaza Strip. It has the control over borders, means of communication and security, commercial market, goods and traveler's movement in and out Gaza. It also controls the internal and external export and import, water and the sources of energy. In words it has the full influence over the Gaza economy. The Gaza Strip is considered a poor area. There are no natural economic resources and employment is the main source of household income. Unemployment represents a serious threat that reflects negatively in every aspect of life. Women are concentrated in a very limited number of economic activities compared to their male counterparts. Employment in Israel was very important source of income to Palestinians living in Gaza strip.

The majority of Palestinian labor forces were depending for a livelihood on the daily earning of a low wage in Israel. The number of labors in Israel was about 120,000 workers from West Bank and Gaza.

Those workers were prevented from leaving Gaza Strip and West Bank to their jobs in Israel and all work permits were cancelled. Furthermore, 190,000 to 200,000 workers became unemployed inside Palestine due to closure and siege since Al- Aqsa Intifada have been ignited on September, 29th, 2000, when Israel's likud party leader, Ariel Sharon, visited Al-Haram Al- Sharif, Al-Quds site sacred to Muslims (8). The Palestinian industry, agriculture, and construction had been affected. There are shortages in some essential commodities and goods due to escalating measures by Israeli occupational military forces (IOMF) as tight closures and movement restrictions. Furthermore, isolated the Palestinian territories into small blocks where moving between these areas became very difficult. IOMF sanctions induced severe economic damage and caused shortfall in national income. Therefore over one million Palestinians live in poverty-doubled from before (earning less than $ 2 /day) (8). According to Palestinian Monetary Authority (PMA) the gross National Product (GNP) in Palestine has been subjected to high fluctuations during the last five years. The GNP per capita, decreased from 1,938.6 US$ in 1998, to about 1,771.5 in 2000. Gross Domestic product (GDP) in 2000 was 4,450.8 while it was 4,218.3 in 1998. The PMA reported the unemployment rate at (14.1%) in 2000, it is unstable and with constant fluctuation due to political situation, and the occupation's practices including closure of Palestinian regions and cities and other constraints activities.

1.5.4. Environmental situations

Since the Israeli occupation in 1967, all matters concerning the Palestinian population, including their natural resources and the environment, are governed by Israeli Military orders. Although, The Israeli occupation is eliminated partially, and the Palestinian National Authority has been established, there are many environmental problems in Gaza Strip, which resulted from the prolonged Israeli occupation.

Scarcity and deterioration quality and quantity of the Palestinian water resources may be the most crucial environmental problem and environmental challenges facing the Palestinian people and the Palestinian National Authority at the drawn of the 21st century. The main source of water in Gaza Strip is the groundwater from the coastal aquifer. In addition the utilization of the Israeli settlers to Palestinian wells around the border Gaza Strip and the over- pumping of the wells within the settlements which accelerated the increase of salinity and depletion of the ground water as a result of sea water intrusion into the coastal aquifer system. The percentage of households connecting by water networks are 93.3% in Gaza Strip (8).

It is reported that 53.5% of the population in the Gaza Strip are connected to sewer networks while cesspits and septic tanks receive the rest (8).

Unfortunately, solid wastes are thrown every where because there are no enough dumping sites, and sanitary landfills. These of course result from the policies of Israeli occupation, which prevented from creating an infrastructure for adequate solid waste. The local municipalities utilize the old method of landfills to dispose refuses in open areas, thus negatively affecting environment.

The other environmental problem in Gaza is air pollution. Transportation contributes about (50%) to the air pollution in Gaza Strip, in addition to high density of traffic and the high number of old cars. Furthermore, industry is one of the main sources of air pollution.

1.6. Health service

After the establishment of the Palestinian National Authority in June 1994, the PNA has had responsibility for developing the infrastructure of the health services. THE PNA inherited a health sector that was neglected and fragmented with poor and inadequate facilities and limited qualified health manpower. However, currently in the Gaza strip the four major providers of health care services are:

- The Palestinian Ministry of Health (MOH).
- The United National Relief Working Agency (UNRWA) health services.
- The NON Governmental Organizations (NGO).
- The private sector.

There are 17 hospitals in Gaza strip operated by all health providers with ratio 66,949 person per hospital. The ratio of bed is 1.4 bed per 10000 population. Quantitative distribution of hospitals is not sufficient to provide complete picture on actual situation of secondary health services (8).

Additionally, in the Gaza Strip, there are 100 primary health centers (PHC). The MOH operates 43 centers in Gaza Strip. In Gaza Strip the number increased from 29 in 1994 to 43 in 2000, 18 of them are at level (II), 16 at level (III) and 9 at level (IV). In general , there are 8 centers work 3 shifts (24hours, Emergency services), 6 centers work 2 shifts and the rest of centers work only one shift.

These PHC centers provide special health care services in different aspects. Approximately 28 centers provide antenatal care; three of them have a delivery unit currently operated in Bet-Lahia, Gaza City and Der- Elbalah. These centers are to some extent quality distributed over the areas to ensure service accessibility. The PCBs reported about 95.6% of pregnant women receive antenatal care from skilled personnel, and about 95.2% of women completed three visits and over during their recently pregnancy in 2000. Although the services of high risk pregnancy was provided for mothers by different MCH clinics, it started to be organized in May, 1998 through six high- risk clinics in PHC in Gaza Strip and West Bank (8). There are 14 family planning clinics. UNRWA has 17 PHC centers. These centers located in the refugee camps, and they provide mother and child health and other specialized health services. Health financing for governmental health care sector is derived general taxes (about 60%), health insurance premiums (25- 30%) and co-payments/fees (10- 30%). The PNA spends 8.6% of the GDP on financing the cost of the health sector. Donors largely finance development expenditures (8).

The percent of health insured people was over 50% in 1998, but decreased to 34% in 2000 due to impact of current crisis on Palestinian community.

Women Health Services

The MOH of PNA works toward the improvement of the health and quality of the life of women during all stages of their lives. MOH takes the responsibilities to improve and develop the quality and quantity of women's health services in Palestine. In July, 1995, the MOH has established the women's health and development directorate (WHDD). The directorate- drafted policies concerning

women's health and gathered data related to women's health status and used this information in designing their programs and policies.

Secondary Health Services

In Palestine, all health providers operate 65 hospitals with ratio 48,462 person per hospital. Out of which (17 in GS, with ratio 66,949 person per hospital and 48 hospital in WB with ratio 41,915 person per hospital). The ratio of bed is 1.4 beds per 1000 population. The total number of beds is 4236 thus yielding a ratio 744 persons per bed (without psychiatric beds). This ratio is increased progressively since the Palestinian MOH had taken over the responsibility of health from a ratio more than one thousand person per bed to a ratio of 744 person per bed in 2000. About 57.6% of total beds are belonging to MOH (57.7% in GS, and 42.3% in WB), this indicates that MOH plays the main role in providing secondary health care (8).

Quantitative distribution of hospitals is not sufficient to provide complete picture on actual situation of secondary health services. According to MOH report, about 94.3% of births take place in health institutions and 5.7% at home in Palestine, the vast majority of deliveries took place in hospitals with percentage about 77.5%. The governmental hospitals take the biggest share of total deliveries with percentage 42.3% (50.6% in GS), which may be attributed to better facilities and cheapest for the large group of community and available of having health insurance. It is followed by NGOs hospitals with percentage 34% (9% in GS). The delivery in UNRWA clinics took place with percentage 5.3% (12.4% in GS).

Chapter Two

Literature Review

Literature Review

2.1. Overview

Fetal growth occurs by increases in cell number and size. During first third of gestation, growth occurs primarily by increased cell number or hyperplasia. Hypertrophy occurs during the second third of gestation, cell size increases while the rate of cell division stabilizes. In the final third of gestation, the rate of cell division declines, while cell size continues to increase (1).

During early embryonic development, the pattern of growth is largely dictated by the fetal genome, but as the body size increases, the fetus becomes constrained by maternal and environmental influences such as uterine blood flow, maternal size and maternal nutrition (1).

Average birth weight after a normal pregnancy is 3400g (9). Variations in fetal growth are termed normal birth weight ($\geq$2500g), low birth weight (<2500g), very low birth weight (<1500g) or extremely low birth weight (<1000g). The definition of low birth weight and extremely low birth weight were defined as weighing 2,500g or less and weighing 1,500g or less respectively prior to 1979. In 1979, the definition of LBW was changed and is defined as weighing less than 2,500g and extremely LBW as weighing less than 1,500g (10). But in USA the variation in definition of LBW according to the source of definition still present till now. The definition of low birth weight fails to distinguish between LBW neonates who are premature and those who are merely small for their gestational age (11). Categorizing by weight alone says little about fetal growth rate, most infants with less than normal birth weights are the result of a shorter than normal gestation. Classifying newborns as preterm or term on the basis of weight is also

erroneous because infants with intrauterine growth restriction are smaller than normal at any gestational age (1).

Intrauterine growth restriction (IUGR) is defined as a pregnancy in which the fetal size is less than the 10^{th} percentile of expected estimated size for gestational age. Small for gestational age (SGA) refers to infants whose birth weights are below the 10^{th} percentile for their gestational age. The two terms are often used interchangeably but SGA represents a mathematical or statistical description of a small infant, whereas IUGR is reserved for those fetuses or infants with clinical evidence of abnormal growth (12). A more precise definition of IUGR is one in which the growth of the fetus is less than its genetic growth potential. The infant would be diagnosed as being growth restricted based on its own standard. An accurate determination of gestational age is crucial for the diagnosis of IUGR. Another criteria essential for the diagnosis of IUGR is the availability of a relevant standard for fetal growth throughout gestation appropriate for the population. It is important to differentiate between IUGR and low birth weight infants: all IUGR infants are low birth weight but not all-low birth weight infants are IUGR (12).

The causes of IUGR can be divided into three general categories: fetal, placental or maternal. Fetal factors include genetic conditions and congenital anomalies. Placental factors include abnormally implanted or formed placentas. And finally maternal factors which include, infection, nutrition, uterine perfusion of the placenta, drug use, other medical conditions, and certain demographic variables. Any or all of these may play a role in IUGR. Basically any mismatch between fetal nutritional and oxygenation demands and placental perfusion can result in impaired fetal growth (13).

Asymmetric IUGR refers to an infant whose weight is below normal standards for gestational age but is of normal length and some body organs are more spared than others. It is due mainly too-placental insufficiency (12).

Symmetric IUGR refers to an infant who is proportionately small, with both weight and length below the normal standards for gestational age and whose organs are proportionately reduced in sizes. It is due to chromosomal abnormalities of the fetus and placenta or severe chronic maternal malnutrition (12).

Ponderal index (PI), used to differentiate between asymmetric and symmetric IUGR, assesses the relative fatness or thinness of an infant independent of race, sex, birth rank and gestational age (12). It can be calculated using the following formula:

PI = birth weight in grams / (crown – heel length in cm)^3 x 100

Normal values are 2.32-2.85 (2.32 = thin AGA, 2.85 = obese AGA). Ponderal index is normal in symmetric IUGR infants and low in asymmetric IUGR infants. Ponderal index also measures the severity of asymmetric IUGR infants (the closer the PI to 2.32 the less sparing of the head exists) (14). Infants with a ponderal index of less than the tenth percentile for gestational age or a crown-rump length less than the third percentile are defined as growth restricted (15). The disadvantage to the PI is the potential error introduced by cubing the length.

In order to estimate the time of delivery or gestational age, seven days is added to the date of the first day of the last normal spontaneous menses and subtracting three months. Measurement of fetal size by ultrasound before the 26th week provides reliable gestational age within days (16). Without an accurate gestational age, the appropriateness of fetal growth cannot be established.

There are numerous methods on establishing gestational age. Ballard scores can be used to assess gestational age after the birth of the infant. There are gestational age calculators in which the bi-parietal diameter (BPD), head circumference (HC), abdominal circumference (AC) or femur length (FL) are measured in millimeters, plugged into an equation with the answer being the estimated gestational age. Alfa- Fetoprotein (AFP) measurement in maternal serum at 15 to 20 weeks of gestation may be used as a screening test to detect fetal abnormalities. In order to evaluate AFP levels one must take into account maternal weight and gestational age (12).

Babies born before 37 completed weeks of gestation are premature. Not all-premature babies are LBW. For example, average birth weight at 36 weeks gestation is 2800g (outside the LBW criterion of less than 2500g) (9).

Worldwide, about 16% of live births, or some 20 million infants per a year, are LBW (17). Over 90 % of these infants are born in developing countries. Asia is the region with the highest incidence (19.7%), almost three times that of Europe (6.5%), or the USA (7%) (18).

Low birth weight (LBW) is a major public health problem in the United States, contributing substantially to both infant mortality and to childhood physical impairment. Although infant mortality in the United States has declined steadily over the past several decades and is at a record low of 7.2 per 1,000 live births (19), the United States still ranks 20th in infant mortality compared with other industrialized nations, largely due to its high LBW rate. Over the past decade, the rate of low birth weight births (LBW) (less than 2500 grams) has slowly increased to 7.6%, the highest rate reported since 1976 (20). Forty percent of the deaths in

the population of LBW occur in infants less than 1500 grams (VLBW), with the highest death rate taking place in extremely low birth weight infants (ELBW) who weigh less than 1000 grams (20).

The Health of Canada's children (A CICH profile) reveals that the rate of low Birth Weight decreased slightly between 1970 and 1990. LBW rate had decreased significantly from close to 8 % in the late 1960's to 6.6% in 1975. The decrease continued at a slower rate to 5.5 in 1985. Since the early 1990's there has been an increased in the rate of LBW (21). Between 1990 and 1995, there was a slight increase in the rate from 5.4 to 5.7 %. Overall, the rate of low birth weight has been quite stable over time. In 1995 the low birth weight rate was slightly higher for females than for males (6.1%, and 5.3% respectively) (22). Among the countries that use similar definitions to those in Canada, three had lower rates of low birth weight in 1995; Finland (4.1%), Sweden (4.4%), and Switzerland (5.5%) (23).

Variations between and within geographic regions remain considerable and have not greatly changed. The incidence of LBW, by region, ranges from 31.1% in Middle South Asia and 19.7% for Asia as a whole to 14% in Africa, 10.1% in Latin America, 6.8 in North America and 6.5% in Europe (24).

The incidence of LBW in Lebanon showed an upward from 1986 to 1990. LBW was 4.9% in 1986 and increased to 9.5% in 1990 (25). Similarly, in the longitudinal study, performed over a period of five years (1987- 1991), there emerged an upward trend over that period; LBW incidence increased from 6% in 1987, to a maximum of 14.4% in 1990, at the time of fierce fighting, and then declined to 7.6%, with return of relative calm and security in 1991. According to estimate of WHO made in 2001, it is clear the incidence of LBW in Jordan and

Egypt is similar (10%). But in Syria Arab Republic the rate of LBW is less than that in Egypt and Jordan (7%) (26).

According to health survey 2000, which was implemented, the percentage of LBW in Palestine is 8.6% (8.5% in Gaza, and 8.6% in W.B.) in the year 2000. The LBW incidence among female births is higher than that among males (9.3% among females, 7.9% among males). In addition to that the distribution of LBW infants is higher among infants of illiteracy mothers (11.1%) where it is (8.1%) among infants of educated mothers of secondary and more level (27).

Infant mortality rates rise steeply for infant with LBW in Palestine. In a study in Gaza strip 1997, underreporting in LBW registration among infants is obvious where it was about 3% at HMI records and 5.5% at health centre infant's records. Infant mortality due to prematurity and LBW constituted about 20 – 30 % of total infant mortality in years 1991- 2000 (8).

As a result of study about Epidemiology of neonatal deaths done in governmental hospitals in Gaza by Student of school of Public Health of AL-Quds University in 2000, LBW and prematurity was 54.6% of neonatal deaths (28).

2.2. LBW Outcomes and Health Problems

LBW children can be born at term or before term and have varying degrees of social and medical risk. Because LBW children are not a homogeneous group, they have a broad spectrum of growth, health, and developmental outcomes. While the vast majority of LBW children have normal outcomes, as a group they generally have higher rates of subnormal growth, illness, and neurodevelopment problems. These problems increase as the child's birth weight decreases (29). About 19% or almost 24 million of all infants are born with birth weight less than

2500g. LBW is probably the single most important factor in neonatal mortality. Major contributors to the death of LBW infants are prematurity, infections, birth asphyxia, hypothermia, and inadequate feeding (30). IN the United States, 10% of newborns are termed as being LBW and these infants account for 5 million neonatal intensive care unit days per year. At and annual cost of more than 5 million dollars (31). A decade ago, the costs associated with LBW were estimated at more than 5.4 $ billion, with 75% of these costs due to infant care. Approximately 10% of annual health care expenditure for children result from LBW related problem (20). LBW also has been related to 60 % of infant death (31). It is clear that LBW outcomes can be divided into two groups, one of them is a short- term outcome and the second is long- term developmental outcomes.

2.2.1. Short-Term Outcomes

Of the approximately 10.4 million infant deaths each year in developing countries, 33-40 % can be attributed to LBW. Compared to normal birth weight babies, those born with 2000-2499g have 4 times higher risk of neonatal mortality and 2 times higher of post-neonatal mortality. A birth weight less than 2000g the risk is 18 and 5 times higher respectively (5). A study on LBW revealed that preterm babies had perinatal mortality rates 13 times higher than that of normal birth weight and full term and 2 times higher than that of babies with SGA (6).

The principle cause of death among LBW infants are hyaline membrane diseases, Intraventricular hemorrhage, septicemia, asphyxia, birth injuries, and malformation.

Hyaline Membrane Diseases and Asphyxia

Because of inadequate lung surfactant underdeveloped alveolar and vascular structure, ELBW infants usually require immediate intubation with supplemental oxygenation to maintain adequate gas exchange. These infants also develop hypoxia, hypercarbia and acidosis relatively quickly, so grunting, sternal retraction and nasal flaring are excellent indictors for intubation. Supplemental oxygen should be delivered to keep oxygen saturation between 89-94%. Exogenous surfactant may be given before or during transport to increase lung compliance (9,32).

Intraventricular Hemorrhages

The highly vascular and delicate subependymal germinal matrix lining the cerebral ventricles does not disappear until term (40 weeks) and is particularly vulnerable in ELBW infants. Damage to this vascular tissue may lead to Intraventricular hemorrhage (IVH) and is most likely to occur within the first three to ten days of life. The severity of IVH and its sequelae are variable, so prevention through blood pressure stabilization and external stressor management is critical (32).

Hypothermia

ELBW infants have difficulty regulating their temperature for several reasons. Thermal insulation is poor as body fat does not appear (30) until 26-29 weeks. A significant imbalance between heat production (relatively small mass or body weight) and heat loss (large body surface area) compounds the fact that up to 42

% of an ELBW infant's caloric intake is expended merely maintaining its temperature (32). A lack of epithelial keratin causes evaporative losses alone to be greater than heat production capabilities. Hypothalamic regulation is poor and unreliable. Therefore, these infants are vulnerable to environmental temperature stress.

Hypoglycemia

An immature glucose regulatory system combined with an increase in brain-to-body mass ratios in ELBW infants requires an increased glucose supply. ELBW infants are prone to hypoglycemia due to decreased glucose production and minimal glycogen stores, as well as to hyperglycemia relating to glucose intolerance, decreased insulin production, or an increased resistant to insulin itself. Blood glucose level should be monitored at least one to two hours with an acceptable range of 60-180mg/dl (32).

Skin Infections

Fragile neonatal skin burns, tears and bruises very easily due to lack of significant keratin and the presence of very few epithelial layers. Skin is moist and permeable and when damaged becomes a portal for infection and the establishment of yeast beds. Gentle, thoughtful handling is necessary with minimal and strategic use of adhesive and antiseptics, as well as the central infusion of inotrpes when necessary (32).

2.2.2. Long- Term Developmental Outcomes

LBW children experience combinations of various neuro-sensory, developmental, and health problems, which compound the clinical and educational outcomes. In the following, we will describe some of more common outcomes for children born at LBW.

Neuro-sensory Outcomes

Cerebral palsy is a major neurological abnormality in LBW. The rates of cerebral palsy increase with decreasing birth weight. The over rates of the different conditions including cerebral palsy are remarkably consistent and range from approximately 20% for children with birth weights of less than 1,000g (33) to 14% to 17% for children with birth weight of 1,000g to 1,500g (34) and 6% to 8% for children with birth weights of 1,500 to 2,499g (34). By comparison, rates below 5% are reported for children of normal birth weight (35,36). Blindness occurs mainly among children with birth weights below 1,000 g at rates of 5% to 6%. Deafness, which is found 2%-3% of LBW children, does not seem to specifically affect the smallest babies (35, 36).

Cognitive and Neuropsychological Outcomes

LBW children score significantly lower on intelligence tests than do children of normal birth weight, even when socio-demographic risk factors are taken into account. The mean intelligence quotient (IQ) scores fall within the average range; however, the rates of deficient (IQ<70) and subnormal (IQ70-84) intelligence are

significantly higher than among control groups of children with normal birth weight. These differences increase with decreasing birth weight (33, 35).

Evaluation of Neuropsychological Outcomes of LBW have also include assessments of specific functions, such as language abilities, memory, attention, fine and gross motor condition, perceptual- motor skills, and non- verbal reasoning and problem solving. The majority of recent studies published in the United States involving very LBW children show that members of this group perform more poorly than members of full- term control groups in all area (36, 37). Studies of neuropsychological outcomes also suggest that some cognitive skills may be more compromised than others in LBW children. Comparisons of neurologically intact VLBW children of average intelligence with full- term children in control groups point to selective impairments in areas such as mental arithmetic, visual- motor and fine motor skills, spatial abilities, expressive language, and memory (33,36,38).

Behavioral and Social Competence

The majority of recent studies of behavior and social competence in LBW children pertain to VLBW and ELBW outcome found greater rates of behavioral problems with decreasing birth weight (39, 40). Behavioral Problems have mainly been described in children with cognitive deficits and neuro-motor dysfunction, suggesting brain injury as a cause of these problems. The types of behavioral problems reported in LBW children include conduct disorder, hyperactivity, and attention weakness (41, 42, 43).

School Performance and Academic Achievement

Data about learning problems among LBW children have been analyzed by McCormick (42) from the National Health Interview survey of 1981 and the results was that there is an increased rate of parent- reported learning problems with decreasing birth weight. Additional studies have yielded similar result (36). Levels of achievement in reading, spelling, and math are also lower for VLBW children than for full- term children. Observations of a relatively high rate of learning problems in children of normal intelligence have led some researchers to speculate that LBW children may have specific learning disabilities.

Health Outcomes

As a group LBW children experience more health problems than normal birth weight children. These problems include specific medical and surgical conditions, re-hospitalization, and health –related limitations of activities of daily living (33). Adverse health outcomes increase with decreasing birth weight. The most common medical conditions found in LBW children are asthma, upper and lower respiratory infections, and ear infections. Pulmonary function tests reveal abnormalities which considered to be secondary to either structural differences related to complications of prematurity or to familial asthma (44). More recent evidence indicates that adults who are born LBW are at great risk of morbidity and premature mortality from cardiovascular disease, hypertension, and diabetes compared to their normal birth weight counterparts (7). LBW children are re-hospitalized for the above medical conditions as well as for surgeries, mainly of the eyes, ears, nose , and throat (ear tubes, adenoids, tonsils, tracheal

complications); orthopedic surgery is also performed for cerebral palsy (45). Although respiratory infections decrease after two years of age, health problems persist and contribute to excessive bed days, restricted activity, school absence, and poor school performance (46).

Growth

Growth attainment of LBW children is less than that of their normal birth weight peers (34). Birth weight related differences in mean weight, height, and head circumference increase with decreasing birth weight. Poor growth attainment is seen in both preterm and term children who are born small for age following intrauterine growth failure, and also in preterm children who have normal intrauterine growth but fail to grow after birth because of severe neonatal complications of prematurity such as chronic lung diseases (47).

2.3. Diagnosis of LBW

2.3.1. Predicting during Pregnancy

A LBW may be suspected before delivery if the size of the mother's uterus is small, or if a small fetus is shown by ultrasound. Pregnancy researchers found that many case of extremely premature delivery and poor fetal growth are likely to be determined as early as the first 12 weeks of pregnancy (48). When the suspicious of IUGR and LBW is strong, a complete assessment of maternal risk factors should be undertaken. This includes past medical and obstetric history, medication use, recent infections, occupational or toxic exposures, and a history of tobacco, alcohol or illicit drug use. Prenatal examination may show that the fetus is small for the gestational age (the size of the uterus is low compared to the expected size

for the weeks of pregnancy). The main prerequisite for determining IUGR is precise dating. The most accurate dating method uses ultrasound examination at eight to 13 weeks. Later ultrasound examinations are helpful, but the margin of error is increased. The date of last menstrual period, early uterine sizing and detection of fetal heart tones are helpful ways to accurately date the pregnancy.

Ultra-sonography is normally the first study done to assess IUGR. This test loses its accuracy as the pregnancy progress, but the sensitivity and positive predictive value can be improved if several variables are combined (49). These variables include estimated fetal weight, head circumference, and abdominal circumference. Estimated fetal weight is the most common screen. It is based on the measurements of head circumference, abdominal circumference, and femur length. These measurements are plotted on a preexisting standardized chart. In about 95 % of cases, ultrasound examination allows an estimation of fetal weight with 15-18 % variance (49). An estimated fetal weight of less than sixth percentile strongly correlates with growth retardation and an estimated fetal weight of greater than 20^{th} percentile virtually rules out IUGR. An estimated fetal weight at the 15^{th} percentile or less, or decreasing estimated fetal weight as determined by serial ultrasound examination, is suggestive of IUGR. In all growth-retarded fetuses, the abdominal circumference is the first biometric measure to change. This translates to an increased ratio of head circumference to abdominal circumference. The ratio of head circumference to abdominal circumference is normally one at 32 t0 34 weeks and falls below one after 34 weeks. A ratio of greater than one detects about 85 % of growth- retarded fetus (50). Using of electronic calipers were used with each ultrasound image to measure crown-rump length (the entire head and body, minus the legs), can help

in predicting the LBW and preterm birth in first trimester and can help for earlier intervention such as better nutrition and health care for pregnant women (48).

The first radiographic sign of IUGR may be decreased amniotic fluid volume. About 85% of IUGR infants have oligohydramnios (51). This condition occurs because blood flow from peripheral organs (kidneys) is diverted to the brain. Renal perfusion and urinary outflow rates are commonly reduced in fetuses with IUGR. Amniotic fluids index less than 5cm increase the risk of IUGR. Maternal arterial blood flow increases from 50ml per minute early in pregnancy to about 700 ml per minute at term. The increase is secondary to a gradual decrease in vessel resistant to blood flow through pregnancy. Doppler velocimetry uses ultrasound to measure peak- systolic and end- diastolic flow through the umbilical artery. As the pregnancy progresses, diastolic flow increases, and the systolic/ diastolic ratio should gradually decrease. Three measurements are averaged as systolic/ diastolic ratio. Alteration in placental blood flow occurs in a large number of IUGR pregnancies. Researchers have correlated an increased systolic/ diastolic ratio with IUGR (52). Also grading of placenta by ultrasound helps in diagnosis of IUGR and predicting LBW (53).

Ultra-sonography at three to four week intervals is recommended to assess fetal growth. Appropriate attention must be given to estimate fetal weight, bi-parietal diameter, head circumference, abdominal circumference, and amniotic fluid volume. Third trimester fetal weight gain should be 100 to 200g per week.

Before development of ultra-sonography, delayed fetal growth indicated by low maternal weight gain, Leopold maneuvers and fundal height measurement. A significant lag in fundal height is a 4cm or greater difference than expected for gestational age.

2.3.2. Diagnosis at birth

Weight at birth reflects the intrauterine experience. It is a good indicator not only of mother's health and nutritional status but also the newborn's chances for survival, growth, long term health, and psychological development. In developing countries, many infants are not weighted at birth. As a result, much of the available data on LBW may not be representative of the population at large, they may be biased toward hospital deliveries and there fore be under- estimates of true levels. In middle- East and North Africa 82% of births are not weighted. In other regions, the percentage not weighted ranges from 20- 82 % (54). Almost two-thirds of births in developing countries occur at home and only half are attended by a trained birth attendant (30). Strategies to reduce complications of newborn should therefore also target traditional birth attendants, families, and communities as well as health workers within the formal health care system.

According to studies conducted in Saudia Arabia, Egypt, and Calves, the chest circumference was the best predictor of birth weight, with the highest prediction, correlation, sensitivity, and specificity (55, 56, 57). The use of chest circumference as a surrogate measure of birth weight for several reasons. It is a good predictor of birth weight because the measurements are not affected by sex, and the chest is relatively hard in contrast to middle upper arm. In addition that the tool of measurement is an elastic tape can be made cheaply in quantity and will be easily to carry to use. This tape is marked with chest measurements in centimeters and illiterate midwives can easily recognize the corresponding predictor birth weight in kilograms, divided into colored zones. Red zone below 29 cm, Yellow zone between 29-30 cm, and Green zone above 30 cm. The

midwives advised to refer any newborn whose chest circumference falls within the red zone for professional medical attention if possible, and those in yellow zone should receive special care and close follow up (55).

2.4. Maternal Risk Factors of LBW

2.4.1. Socio-demographic Factors

Under this title, we will discuss four factors which affect the maternal status during pregnancy either directly or indirectly and the subsequently on the health of fetus. These five factors are maternal age, maternal education, maternal occupation, social stress, and consanguinity marriage.

Maternal Age

Age of mother appears to be an important factor in the likelihood of LBW. The best period for child bearing is that which lies between the ages > 18 and < 35 years, as very young mothers don't have the physiological maturity to oppose the additional stresses of pregnancy. Pregnancy in adolescence is associated with an excess risk poor outcome, including LBW and prematurity. Whether this association simply reflects the deleterious sociodemographic environment of most pregnant teenagers or whether biologic immaturity is also causally implicated is not known (58). while exhaustion of these physiological mechanisms occur in old mothers.

Mothers whose that range between 25 and 34 years had significantly lower risks of SGA compared with mothers less than 20 years (6). The researchers of study was done in California in 1993 based on California birth Certificates that maternal age influenced the risk of having LBW infant, but only Latin women who were at

least 25 years of age had an increased risk (59). The percentage of very LBW infants born to mothers age 15 to 19 is lower than the proportion of such births to their younger counterparts but remains slightly higher than the proportion observed for women age 20 and older (60). Teen mothers to be are more at risk of pregnancy complications than older pregnant women. Premature or prolonged labor, anemia, and high blood pressure are the more common risks that young mother to be face. These risks are even greater for teens under 15 years old (61).

In 1995 in Canada, the rate of LBW was higher among women at either end of the age spectrum that is less than 25 and over age 35 (21). In Boulder City, teens are more likely to have LBW birth. In 1998, 8.5% of births to women less than 20 years old were LBW compared to 7.1% of births to women 20 and older. In Colorado in 1998, 10.4% of women younger than 20 had LBW births and in US in 1997, 9.5% of women 15-19 had LBW births (62). According to study conducted among white married mothers to determine whether a young age confers an intrinsic risk of adverse outcomes of pregnancy, the results was that the younger teenage mother (15-17 years old) had a significantly higher risk than mothers who were 20-24 years of age of delivering an infant who had LBW either delivered prematurely or SGA (58).

Women age 35-39 were slightly more likely to have a LBW baby than women in their 20's. Though women over age 40 showed increased risk (63, 64). There are many studies found that women who delay having their first baby until age 30 or older are at increased risk of having a LBW or preterm (63). Swedish study in 1992 showed that first time mothers age 30-34 were 1.2 to 1.4 times as likely to have a LBW, preterm or growth retarded baby as first time mothers age 20-24 (63). First time mothers age 35-39 were at 1.2-1.9 fold greater risk, and those age

40 or more were at 1.4 to2 fold greater risk. Similarly, a1993 study at the University of Washington, Seattle, found that women who were 40 or older were more than twice as likely to have a premature or LBW baby than Women age 20 – 24 (64).

Maternal Occupation

Adverse effects of work on the fetus have been attributed to a presumed decrease in uterine and gestational blood flow which results in reduced uterine absorption and fetal growth (65). There is a close relationship between heavy physical work and low birth weight, an association that is often forgotten. The most frequently used intervention for women identified, as "high -risk" is a reduction of physical exertion and stress. This can be accomplished by a physician prescribing an early work leave or modification of the work load or schedule (66). It has been found that women in office work had a significantly lower proportion of LBW infants than manual workers and unemployed women. Women working in jobs characterized by high levels of physical exertion including heavy lifting experienced an increased risk of giving birth to a preterm, LBW infant (67). Women in manual work as (farmers) had a significantly higher proportions of SGA infants than others. Women who worked in a sitting position had a significantly low proportion of SGA infant than women who stood or walked at work. There is about 1.2 –1.5 time greater risk for LBW among women with jobs requiring prolonged standing (4-6 hours or more) (68).

There does not to be an increased risk of LBW associated with employment itself. This low risk of SGA infant among women in office work may be due to health care and information that are not available to unemployed women (66). Poerksen

and Pettit (1991) suggest that employment leads to better social support and improved access to health care (69). Kiebnoff agrees that socio-economic differences among women may account for association between physical activity and pregnancy outcomes (70).

Maternal Education

It is necessary to modify the attitude of pregnant women including those concerning their life style and educational level in order to reduce preterm labor and low birth weight infants. Pregnant women must be educated to understand their own risks and to recognize early and suspicious signs and symptoms associated with complications, and to modify amenable risk factors as specific stresses, efforts and activities. This degree of patient education and support requires a commitment on the part of medical professionals and providers of prenatal care to improve the content of prenatal care. The employee women usually have a higher educational level and socioeconomic status (70) in addition to better social support.

It is observed that the higher maternal education level, the better the outcome of pregnancy and vice versa, that may be due to the more information about the pregnancy and its complication, about antenatal care and its importance, and about avoiding the risks of pregnancy. Women whose educational status is low (6.5%) comparing her years of education and her age, tend to have an increased percent of LBW babies than those women with high educational status (71). LBW also varies with education, which is considered to be a proxy measure of poverty. In 1985, in Quebec, mothers with lower educational level were twice as likely to have a LBW baby than those with university education. While the LBW

Violence may also have a serious impact on pregnancy outcomes. Several studies also have focused on the relationship between violence in pregnancy and LBW, a leading contributor to infant deaths in the developing world (75, 76, 77). Violence before and during pregnancy can have serious health consequences for women and their children. Pregnant women who have experienced violence are more likely to delay seeking prenatal care (77) and to gain insufficient weight (78). Women who were not abused during pregnancy tended to have a wider network of friends with whom they talk or get together than those who were abuse is consistent with other studies demonstrating a protective role of social support against physical abuse. Extreme stress and anxiety may lead to preterm delivery or fetal growth retardation by increasing stress hormone levels or immunological changes (79, 80). Stress can reduce women's ability to obtain adequate nutrition, rest, exercise, and medical care (81). Stress resulting from abuse appears to be the most likely explanation for the link between violence and LBW.

In a study at the regional hospital in Leon, Nicaragua, researchers found that, after controlling for other risk factors, violence against pregnant women was associated with a three-fold increase in the incidence of LBW. Violence in pregnancy accounted for 16% of LBW among the infants studied and posed a greater risk of LBW than such factors as pre-eclampsia, bleeding, and smoking (82). In Canada, Significantly more LBW infants were born to battered women compared to the women who are not battered. Even with controlling for other major risk factors associated with LBW, such as smoking, race, and prenatal care, a significant correlation between battering an LBW remained (83).

Consanguinity

Consanguinity is the term used to describe marriage between blood relatives who were at least one common ancestor no more than a great- great grand parent. Consanguineous marriage is traditionally common throughout the Eastern Mediterranean Region. Many families consider it as one having significant social benefits, but it is also true this kinship pattern increases the risk of having children with a recessively inherited disorders. El- kariri in 1999 demonstrated there were significant association between consanguinity and low birth weight (84). Similar reports have been seen in small- scale studies in Kuwait by El- Alfi in 1969 (85).

2.4.2. Maternal Health Status

There are some chronic diseases, which may affect the health of the mother during pregnancy and on the birth weight of the newborn. These diseases could be anemia, hypertension, heart diseases, pulmonary diseases, kidney diseases, jaundice due to hepatitis B etc. In addition that the maternal somatic characteristics (height, weight, weight gaining during pregnancy, and body mass index) have a high effect on pregnancy outcomes.

2.4.2.1. Maternal Somatic Characteristics and Nutrition

Maternal Height

Maternal stature was found to influence the frequency of LBW and of small gestational births significantly. There were more preterm labor and SGA infants among the offspring of short mothers' (86).

Significant relationships were also established between post- partum maternal weight and frequency of LBW as well as frequency of preterm birth (86). Study established in Istanbul (Turkey) revealed that there is increase significantly when there is decrease in maternal height "less than 150cm" (86).

In developing world, LBW stems primarily from the mothers of poor nutrition before conception and during pregnancy and short stature due mostly to under-nutrition, and infection during childhood (54). Dora Costa in 1988, found that is the taller the mother, the more likely she was to have a larger birth weight baby. Since maternal height is partly a function of adequate nutrition early in a girls' life, past inequalities in terms of health were transmitted a cross generations. Costa shows further income status grows, so does the level of nutrition, providing increased opportunity for a woman to reach her biological potential in terms of height (87). The same meaning is clarified by Emanuel who shows that intergenerational factors can interfere with genetically controlled aspect of growth, preventing full genetic expression (88). In an individual a mother- to- be- the intergenerational effect is evident in the trend of increasing adult stature in affluent populations. The opposite trend appears in economically declining populations, which have been shown to undergo a decrease in adult stature. Although the reasons are not under stood, it has long known that tall mothers have better birth outcome (88).

Maternal height is both a genetic factor and a measure of mother's net nutritional status during her growing years.

Maternal Weight and Weight Gain during Pregnancy

Pregnancy is no time for a diet. Every woman is different, depending on her body type and how much she weights before conception. Women who were underweight prior to pregnancy usually need to gain a little bit more than woman with normal weight. And over weight woman usually don't need to gain quite that much. Being a healthy body weight is important before pregnancy. Being underweight can make it more likely that baby will have a LBW as a result a greater of ill health. Low pre- pregnant weight (BMI<19.8) is associated with an increase risk about 1.5- 2 times of preterm birth (89), small for gestational, and or LBW (90). Being over weight increases the risk of complications such as high blood pressure and diabetes during pregnancy (91).

It is important to keep in mind that every woman's body is different, and even though it's possible to estimate approximately how much weight a woman should be gaining that based on a woman's body mass index (BMI) at the beginning of the pregnancy. BMI is a measure of a person's weight to height ratio. It is calculated by dividing a person's weight (measured in kilograms) by the square of their height (in meters). There is a wide range of healthy weight for a given height. A normal BMI ranges from 19.8-26. For women whose BMI is normal, the recommended weight gain over the course of entire pregnancy is 11.5-16 kg. Women who are underweight, or have a low BMI (<19.8) should gain more weight (12.5-18kg). And women who are over weight (BMI26-29) or obese (BMI>29) should gain less weight (7-11kg) or (6kg or little more) respectively (91).

Women who do not gain enough weight are at high risk for delivery babies with LBW. Women are 2-3 times more likely to have a full term LBW baby (SGA) if they did not gain at least 10 kg during pregnancy (92). There are many factors that affect weight gaining during pregnancy such as smoking (93), working hard work (94), poor nutrition status during pregnancy (95), and adolescent age during pregnancy (96). There are other factors with less important such as ethnic and race, caring of more than one preschool children, and low educational level.

On the other end of spectrum, gaining too much weight can also present some problems. It can make pregnancy an unpleasant experience. It could lead to hypertension and diabetes. And the excess weight may be difficult to shed later. Too much weight gain due to too much fluid and fat being stored in the body as a result of eating too much salty or spicy food. Even women who feel like they are gaining too much weight should not diet, as it can risk the health of the growing fetus. Women who are concerned that they are gaining too little or too much weight should consult their physician, or midwife, or seek counseling from a nutritionist or registered dietician, which is skilled in counseling pregnant women.

Nutrition Status during pregnancy

Babies grow and develop the whole time they are in the uterus. They need protein, fat, carbohydrates, vitamins, and minerals for the healthy development of every cell in the body. If babies do not get the amount of nutrients, they will not grow well. Babies who do not grow well are born with LBW. Pregnant women need to eat well and are encouraged to fill their appetite by eating a variety of foods.

It is difficult to directly assess the role of nutrition in pregnancy. Therefore indirect measures such as BMI for weight gain in pregnancy are used. Weight

gain is a normal healthy part of pregnancy, especially during the second and third trimesters. Most women will gain a normal amount of weight by eating healthy fully, staying active, and allowing their appetite to guide their intake. But the exact amount of weight gain for pregnant women is not as important as the quality of their diet. A balanced diet and extra amount of calories will usually lead to appropriate weight gain. On average women need an extra 300 calories per day (97). During the first 6 months of pregnancy, most women do not need to eat more food than normal. But the estimated averaged requirement for energy (EAR) increased during the last three months of pregnancy by an average of 800 kJ (200Kcal) per day. If a mother's food intake is very low at this stage and if her fat stores are low, the fetus grows more slowly and the baby may have a LBW (91).

Amore recent study found that both preterm labor and small for gestational age births were associated with several factors, including pre-pregnancy weight, low weekly maternal weight gain, and low maternal energy intake (98). A Canadian study, which linked nutrition Canada survey data from the general population to birth data from statistics, showed that significant factors, which contribute to LBW, included pre- pregnancy height and weight (90). Nutrition is also key determinant of weight, but the relationship is not linear (87).

In order to give birth to a healthy, thriving baby, the nutritional make up of woman's diet is just as important as total caloric uptake. Sometimes this may requires vitamins or mineral supplements, especially iron, calcium, folate, and vitamin D. But vitamin supplements do not substitute for a balanced diet. Pregnant women's protein requirements are more than normal. Sodium should be restricted in order to a void hypertensions well as too much weight gain.

2.4.2.2. Health Problems

Anemia

It is known that pregnancy in severely anemic mothers doesn't necessarily terminate prematurely in both iron deficiency and megaloblastic anemia. But the incidence of LBW babies is three times more in anemic than non-anemic mothers' (99).

The normal level of hemoglobin of an adult female ranges from 11.5 to 16 g/dl. A hemoglobin level of 11g/dl is regarded as the lowest normal limit during pregnancy as blood volume is increased by about 30% with a relatively greater increase in the volume of the plasma than of the red cells. This leads to a fall in the red cell count and in the hemoglobin concentration during pregnancy, although the total mass of hemoglobin in the body is increased by about 15% (100).

In many cases, the important explanation for the fall in hemoglobin concentration is a relative iron deficiency. Studies have shown a U shaped relation between maternal hemoglobin levels and unfavorable outcomes of pregnancy.

The unfavorable pregnancy outcomes associated with low hemoglobin may be related to deficient maternal iron nutrition or to other nutritional factors important for hemoglobin (101).

The net result in hemodilution is a decline in hemoglobin concentration, packed cell volume and red cell count (i.e. relative anemia). But if the diet is adequate or if additional iron is given to pregnant women, the hemoglobin concentration doesn't fall below 12.5 g/dl, which is nearly equal to the non-pregnant level. As a result of these changes, anemia can't be diagnosed in pregnancy using the criteria applied to non-pregnant women (102).

Hypertension

It has recently been discovered that the increase of diastolic pressure during pregnancy is associated with a large increase in fetal growth rates among white women in the USA, although it doesn't have to be true for black women. So it is important to know which specific disorders associated with hypertension appear in the various groups (i.e. large placental infarcts, Abruptio placenta, and severe placental growth retardation). No differences were noted in the mean birth weight in frequency of LBW of preterm and SGA births between infants of mothers who reported urinary tract infection or vaginal bleeding during their pregnancy and the total groups while there were significantly more LBW (14.3%, $p<0.05$) and preterm (33.8%, $p<0.05$) births among infants born to hypertensive mothers (103).

Maternal hypertension is associated with an increased risk of compromised fetal growth and intrauterine death. However, adverse fetal affects are not uniform; some pregnancies are complicated by severe hypertension enough to indicate production of utero- placental insufficiency specifically, high resistance hypertension seems to be associated with an increased incidence of intrauterine growth retardation (SGA). While high cardiac out Put, low resistance hypertension is frequently associated with normal fetal growth (104).

Heart Diseases

Although most patients with heart diseases go through pregnancy and labor successfully if their management is conducted efficiently. There is an added risk is shown by the fact that heart disease is the commonest associated disease to

cause LBW infant. Causes of heart disease in pregnancy are rheumatic heart disease, congenital heart disease, bacterial endocarditis, cardiomyopathy of pregnancy, cardiac arrhythmias and coronary thrombosis.

Rheumatic heart disease remains the most common cause of heart disease during pregnancy in developing countries, mitral stenosis is the most common lesion found and there may be mitral regurgitation, aortic regurgitation and aortic stenosis, all these lesions lead to chronic hypoxemia which result in SGA (105).

Pulmonary Diseases

The majority of respiratory diseases don't affect the course of pregnancy are not affected by pregnancy. Two conditions which require further consideration are pulmonary tuberculosis (TB) and asthma.

Although the incidence of pulmonary TB is very low in developed countries, it is a common disease in developing countries where campaigns hive been mounted to control its spread. It is known that pregnancy has no adverse effect upon pulmonary T.B, and T.B has no effect upon the course of pregnancy, but some studies state that T.B can lead to SGA, due to its debilitating effect on the general health. When the lungs are severely involved, hypoxemia may account for increased predisposition to SGA. On the other hand, fortunately advances in antibiotics and chemotherapy, and surgery have improved the prognosis for patient. The present emphasis is increasingly upon early detection and treatment of patient and their contacts led to decrease the effect.

The effect of pregnancy upon asthma is variable. Asthma has no effect on the course of pregnancy labour or on birth weight. We have to put in mind that if cortisone is the only treatment, which gives relief, there is no contraindication, but

it should not be used in the first 12 weeks, because of possible teratogenic effect (100).

Lobar pneumonia is very uncommon with pregnancy today, but if the patient becomes seriously RI with high fever then abortion, premature labour, or intrauterine death may occur (100).

Renal Diseases

Chronic renal disease during pregnancy gives rise to concern because of fear of deterioration of renal function that could a risk factor. Chronic glomerulonephritis (G.N) and chronic pyelonephritis (P.N) are the most common problems.

The growth of fetus is carefully watched with ultrasound; by such means the optimum time for delivery of fetus can be chosen. It is unlikely to be later than 38 weeks and may haye to be much earlier (35 weeks).

If with (G.N), there is only a little proteinurea and slight hypertension, which doesn't increase during pregnancy. The prognosis is good for mother and child. However, in case in which there is exacerbation o the hypertension, the fetus is at considerable risk. In case of nephrosis the prognosis is already serious, but if the blood pressure rises the fetal risk is greatly increased. Pregnancy with undergoing renal dialysis is likely to be complicated by intrauterine growth retardation and pregnancy induced hypertension (PIH).

In cases of chronic (P.N), it is important to maintain a constant watch for any exacerbation of urinary tract infection, the outcome for fetus is better than in cases of GN, but there is still a tendency for the fetus to be small for date (SGA) (100).

Liver Disease

The most important liver disease has to be concerned is infective hepatitis. Pregnant women may suffer from both Type A and type B. During pregnancy. Both types of hepatitis usually follow a similar course to that in non-pregnant women and spontaneous recovery is to be expected. However in a small number of cases, although liver damage is so severe, it doesn't cause fetal abnormalities but abortion or preterm labor may occur (100).

2.4.3. Maternal Habits and Behavior

Smoking Habits and caffeine intake

It is well known that several substances used for simulating purposes such as alcohol, smoking cigarettes, and caffeine will influence the birth weight of the newborn. A social factor, which has recently been observed to influence on birth weight, is smoking. Heavy smokers tend to have smaller babies.

It was not clear before whether its effect is direct or that the effect is indirect. Indirectly, it was mentioned that the woman who smokes heavily is less nourished than non-smoker (99). Recently it was explored that fetal growth is retarded by direct toxic effect of nicotine, carbon monoxide and other toxins, also there is a strong evidence that smoking restricts the utero-placental blood flow through permanent vascular lesion of uterine vessels. The Placenta of smokers often show vascular lesions which tend to increase not only with the number of cigarettes smoked per day, but also with the number of years the mother has been smoking (106).

For every 10 cigarettes smoked per day the risk of LBW for gestational age increases by a factor of 1.51 (107). With a comparison against smoking, the intervention revealed a 66g average increase in the birth weigh had occurred, and the rate of LBW was reduced from 8.9% to 6.4% i.e. a 30% reduction (108).

Possibly, it is not only direct smoking that causes problems. A significant relationship has been found between passive smoking and LBW (109). According to Ahluwali study in 1997, it is demonstrated that only women over age 30 who were expose to passive smoke in the home had a higher risks of preterm and LBW than women not exposed to smoke in home (110). Another study found that women who were exposed to passive smoke in the work place had a higher risk of having an SGA baby but not if they were only exposed in the home (111).

Additionally, Pregnant women are being warned to limit their daily amount of caffeine - from coffee, tea, cola and chocolate - to help cut the risk of miscarriage or delivering babies with low birth weight. It had been found that during pregnancy, caffeine easily passes from the mother to her unborn child through the placenta. Because the systems for breaking down and eliminating chemicals are not fully developed in the unborn child, blood levels of caffeine may remain elevated for longer periods in the unborn child compared to the mother (112). The effects of caffeine intake on miscarriages, birth defects, and low birth weight have been studied, and different results were obtained in the various studies. A review of more than 20 studies conducted since 1980 found no evidence that caffeine consumption at moderate levels has any discernible adverse effect on pregnancy outcome (112). Groups such as OTIS, March of Dimes, and Motherisk reviewed studies examining caffeine intake during pregnancy and are in agreement that high caffeine intake (>300 mg/day, equivalent to more than 3 cups of coffee/day)

should be avoided during pregnancy. Consumption of moderate to large amounts of caffeine while pregnant has been associated with an increased risk of miscarriage (113). Although some studies suggest that only very large amounts of caffeine increase the risk of miscarriage (114), an analysis of clinical trials found that women who consumed more than 150 mg of caffeine (roughly one to two cups of coffee per day while pregnant had an increased risk of miscarriage or delivering a baby with a low birth weight (115). The FDA has advised women to avoid drinking coffee and consuming other caffeine-containing foods and beverages during pregnancy (116). A woman can reduce her risk of complications during pregnancy and delivery by avoiding harmful substances, such as alcohol, caffeine, nicotine, recreational drugs, and some prescription or over-the-counter drugs. There is also general agreement that low caffeine intake (<150 mg/day, about 1-½ cups of coffee) during pregnancy is not likely to harm the unborn child (112).

Alcohol Abuse

The most significant impact of heavy alcohol use (greater than 1 to 2 drinks per day) is on the development of the fetus (Fetal Alcohol Syndrome Effect "FAS"). For this reason, women should avoid alcohol during pregnancy (117). There is variety of criteria used define alcoholism and moderate drinking. Based on the literature review of kramer, 1987 conclude that heavy drinking from two to four drinks daily is associated with poor neonatal outcomes, including low birth weight (95). These effects probably dose- related. Virji, 1991 demonstrated a difference of 120g between the infants born to mothers who drank moderate amounts of alcohol, compared with none (118). Also it had been found an increased risk of

low birth weight women who drank alcohol at high levels, but the effect was small compared to other risk factors (119). Women who drink large amounts of alcohol may give birth to babies who have FAS or other defect (117). Fetal growth restriction is known to be one of the results of this syndrome (92). Even in the absence of the major abnormalities found in fetal alcohol syndrome, alcohol has been shown to have probable effects on intrauterine growth (92, 118).

Alcohol freely crosses the placenta and reaches the fetus in concentrations equivalent to those in maternal circulation. Adverse effects in the fetus could occur at or below levels which would be considered toxic to the mother (120). Fetal elimination of alcohol is less efficient than the maternal process and it is especially poor during the first half of pregnancy. Placental dysfunction secondary to alcohol use and the direct toxic effects of alcohol are two of the many proposed mechanisms of alcohol- related abnormalities (121). It is important to mention that alcohol drink is absolutely forbidden and prohibited in Islamic religious. Therefore, it is not found frankly and among common in Islamic societies.

Antenatal Care Visits

Quality antenatal care is valuable as a channel for education and interventions for the prevention of low birth weight. Early and regular care is advocated to allow for screening, identification of risk, education about lifestyle issues and, where needed, implementation of specialized care. Health promotion is an integral part of antenatal care. Women with health problems need information and support to modify behaviors. Women who are healthy need encouragement to maintain healthy practices. In the United States and other countries, absent or late prenatal care has been cited as independent risk factor for low birth weight and much

attention has been paid to improve access and use (122,123). Women who received adequate or intermediate antenatal care in Portugal were less likely to have a low birth weight baby than women with in adequate care (124).

2.4.4. Gyno-Obstetric Conditions

Parity and Birth Pregnancy Intervals

In high multiparity of four or more infants the risk of LBW is 80% more compared with low parity (125). The etiology of LBW in multipara can be related to the depletion of nutrient store in the mother's body from the last pregnancies with exhaustion of, the mother, especially when high multiparity is associated with short spacing of two years or less. LBW with multiparity can be also explained by a higher incidence of Abruptio placenta, which leads to antepartum hemorrhage with subsequent preterm labor. In a personal series the incidence of Abruptio placenta amongst primigravida was only 0.7% but amongst pregnants for six times or more was 3% (99). In multiple parity Abruptio placenta is explained by folic acid deficiency. Primigravida is also another contributing factor for LBW as the first born comprises a large proportion of the small babies (126). Birth spacing of two years or less from the previous birth is associated with depletion of the energy of the stores of the mother This thought leads to increase the incidence of LBW babies. Also there is study done in united state which reach to that the intermediate inter-pregnancy intervals (24- 35 months) is the best interval to avoid LBW outcomes. In that study they mentioned that the length of the interval is not a risk factor on its own for having a smaller baby. But the study explained that the length of interval can be related to biological and behavioral

factors that play a role in maternal health status, which in turn influences new born status (127).

Vaginal Bleeding

Vaginal bleeding in early pregnancy is always a cause of concerns. It may occur in cases of abortion or ectopic pregnancy or with a cervical lesion such as a polyp or carcinoma (107). In such cases the possibility that there has been a chorionic separation remains. Therefore placental function could be affected adversely in the latter weeks of pregnancy.

Antepartum hemorrhage is the bleeding from the vagina occurring at anytime after 28 weeks of pregnancy and before the birth of the child.

As defined above, antepartum hemorrhage may be considered under three headings. Hemorrhage from partial separation of the placenta abnormally situated on the lower uterine segment, As in placenta previa. The second one, hemorrhage is unavoidable when the lower segment becomes stretched in labor. The last one is hemorrhage from a lesion of the cervix or vagina such as an erosion, a polyp or a carcinoma and this called incidental hemorrhage.

Vaginal bleeding has close relationship with the risk of small for gestational age (SGA), whether it has occurred in the first, second or third trimester. In the first trimester, it his 1.6 fold increases in risk of delivering SGA infant. Vaginal bleeding limited to the first trimester was associated with a mean birth weight reduction of 124g. While vaginal bleeding in the *first* and subsequent trimesters was associated with 139g decrease in the mean birth weight (128).

Clinical observation suggest that gestational bleeding which is not associated with placenta previa, involves permanent decido-placental damage, possibly leading to

impairment of transfer of oxygen and fetal nutrition, such impairment may account for deficits In fetal development and increased predisposition to shortened gestational lengths (128).

Pre-eclampsia and Eclampsia

Pregnancy induced hypertension (PIH) may cause the onset of preterm labor or labor may have to be induced prematurely to 'rescue' the fetus from a hostile intrauterine environment (99). Pregnancy Induced hypertension complicates3-8% of all pregnancies in primigravida women, and its presence is indicative of underlying essential hypertension or renal disease. PIH is unusual amongst multigravida, but it is more likely to occur in the primigravida women and especially in older women. When the proportional incidence of the condition is examined PIH accounts for 80%, essential hypertension for 18%, chronic renal disease for 2 % and eclampsia for about o.1 %.

In PIH there is generalized spasm which occurs with reduction of uterine blood flow to 50% and occlusion of vascular lesion in the placental beds (99). In addition placental infarcts are more common than normal. Accidental hemorrhage of varying severity can also occur, all these lead to placental insufficiency.

In mild PIH the perinatal mortality is only raised slightly above that for normal pregnant women varying from 20 to 60 per 1000. In severe PIH the perinatal mortality is higher, varying from 100 to 300 per 1000. About half of the fetal deaths occur in uterus a stillborn being delivered. The other half occurs in the neonatal period most babies dying being premature at birth (99).

Chapter Three

Methods and Materials

Methods and Materials

3.1. Study Design

A case-control design for this study has been selected because in this design, data concerning more than one point in time is collected. Case-control studies are relatively simple, cost effective and are used to investigate causes of the disease, especially rare diseases. In case-control design, the exposure status of the cases is usually determined after development of the disease (retrospective data) and usually by direct questioning the affected person or a relative, in such design, the questioning of mothers of baby is used.

3.2. Setting of the study

The data were collected from the mothers of cases and controls who deliver in El-Shifa Hospital, after the delivery and weighting the newborn. The interviews were arranged in labor room, postpartum department, or post-cesarean section department. Worth noting, that the cases were all newborn with LBW according to inclusive criteria and exclusive criteria.

3.3. Period

Study was conducted continuously over 24 hours daily during the period of study from March 2nd, 2002 to 23rd, May 2002.

3.4. Sample Size

An unmatched case-control study was done on 125 cases of LBW newborn delivered during the period of conducting of the study.. LBW incidence in Gaza strip as mentioned in health survey 2000 by PCBS (27) was about 8.5%. The Epi Info (sample size power) and a representative sample formula were used to determine a sufficient representative sample. The formula indicated that a total of 113 subjects are sufficient. Even though, The researcher adds 12 cases to compensate any missing or non-responding cases as well as to increase the representatives, statistical power and reduce standard error. The formula of calculating of sample size is shown in (appendix 4). The case control ratio 1:1.

3.5. Sampling method

All single alive newborns who delivered with birth weight less than 2500 gm during the period between March, 2nd, 2002 to May, 23rd, 2002 were involved in the study (125 cases). Therefore the sample represented approximately all the cases of LBW who presented during this period in El-Shifa Hospital except LBW newborn due to twin.

Controls were selected from the hospital according the following protocol: The single alive newborn who delivered directly after the case within normal birth weight considered a control. If there were two cases delivered in the same time or followed each other, the first two single alive newborns who delivered within normal birth weight after those two cases considered controls for those cases.

3.6. Inclusion and Exclusion criteria

3.6.1. Inclusion criteria

Cases and controls were considered to be eligible for the present study if they were single, alive at birth, delivered in El-Shifa Hospital during the period of March, 2nd, 2002 to May, 23rd, 2002.

3.6.2. Exclusion criteria

1. Dead baby.
2. Twin pregnancy.
3. Delivered outside El-Shifa Hospital.

3.7. Case definition

Operational definition of low birth weight case

" Any single alive newborn weight less than 2500 gm at birth regardless the gestational age or health status".

Operational definition of controls

" Any single alive newborn weight 2500 gm or more at birth regardless the gestational age or health status".

Maternal Gyno-obstetric conditions: such as the age at marriage and of first delivery, number of previous pregnancies, abortions, stillbirths and dead siblings, gestational age, birth interval, vaginal bleeding, and history of previous delivery LBW.

Maternal Health status: Hypertension, cardiac diseases, renal diseases, pulmonary diseases, diabetes mellitus, and hepatic diseases or anemia.

Maternal Habits and behaviors: such as smoking, tea and coffee drinking, antenatal care and physician visiting during the current pregnancy.

The questionnaire was evaluated by group of experts in the field of obstetric, neonatology, pediatric, public health, and research. (Obstetrician, Neonatologist, Pediatrician, Public health specialist, and specialist of research methodology).

3.8.2. Direct method of data collection

Maternal weight, height, blood pressure were assessed before the delivery of women presented in reception room of obstetric department, in high risk pregnancy department, and Antepartum department before entering the labor room and delivery and reported in checklist (Appendix 7). Height was measured by measuring tapes fixed in each department mentioned previously. The mothers were standing upright beside the tape with extended neck, the head and eyes looking to the front, with the arms straight by the side, the palms of the hands facing forward and the feet together without shoes (anatomical position).

Weight was measured by balance scale to the nearest 100 gm in each department, the scale was checked by a known mass for accuracy every time before measurement to confirm the validity of measurement, since considerable error in

weight may result from an unbalanced scale. The mothers were weighted wearing at most a light clothes.

Blood pressure of mother was measured by mercurial sphygmomanometers presented in the previous mentioned department. These sphygmomanometers were adjusted before taking the blood pressure to avoid the instrumental error of measurements. Maternal blood pressure was measured while the mother is lying on her side and her arm is at the level of her heart.

Hb level was measured in the laboratory of El- Shifa hospital laboratory as a routine investigation for each woman admitted the departments of obstetric either for delivery or follow up.

The weight of newborn was measured by balance scale to the nearest 10 g directly after the delivery of baby normally, either by cesarean section, or by other methods such as ventouse or forceps. The single alive newborn with birth weight less than 2500 gm were considered a case irrespective the gestational age or health condition of children. In contrast the single alive newborn with birth weight 2500 gm or more delivered directly after the case was considered as control.

3.9. Personnel

The study conducted in obstetric departments of El- Shifa hospital continuously 24 hours a day. Therefore six qualified nurses from the hospital were trained by the researcher, how to conduct the interview with mothers (standardized technique was used to avoid information bias) and how to measure the maternal height, weight and blood pressure of mothers to reduce the variation in measurements which could results from observer variation (intra-observer or inter-observer) or

intra-subject variation. This had done to confirm the high reliability of measurements and to obtain accurate and productive data for the observer.

3.10. Pilot Study

Pilot testing was done prior to the beginning of data collection to check validity of the questionnaire and to evaluate the response of the participants. Piloting was done for 20 subjects, 10 cases and 10 controls selected from El-Shifa hospital by the same way of conducting the study through five days. The researcher conducted the pilot interviews and evaluated the sustainability of questionnaire. There were no major changes in the questionnaire. Therefore the pilot subjects were included in the study.

3.11. Ethical consideration and procedures

The researcher obtained the necessary approval to conduct the study from Helsinki Committee in the Gaza strip (Appendix 8). The committee is the authorized professional body for giving permission to researchers to conduct studies in the area. Furthermore, confidentially was maintained at all times during the study. An official letter of request of request was sent to MOH obtain approval to conduct the study in El- Shifa Hospital (Appendix 9).

Cases' and controls' mothers were given a full explanation, both verbally and written about the purpose of the study and assurance about the confidentiality of the information and that the participation was completely optional. In addition, due to the lack of knowledge and attitude among mothers in Gaza related to filling and obtaining information about their health conditions, the document had been read and filled to all participants.

Consent forms were prepared to be signed by the interviewer (Appendix 6). In particular cases, if the mothers agreed to participate optionally in the study but in case, they refused to sign the document due to cultural reason (A commonly noticed phenomenon in the Palestinian community is the reluctance to signed documents). An oral agreement is satisfactory beside at least one health professional person as witness.

3.12. Statistical analysis

The data was entered into computer using statistical package for the social sciences for data cleaning and analysis (Windows version 8,SPSS, Chicago,IL,USA). Also Epi Info and Microsoft Excel programs were used for data analysis and summarizing. Data analysis was carried out as follows:

1. Overviewing field questionnaire.
2. Coding of questionnaire.
3. Choosing data entry mode
4. Data entry.
5. Data cleaning.
6. Frequency table for all the study variables.
7. Defining and recoding of certain variables.
8. Cross tabulation and advanced statistical analysis.

Statistical relationships between the variables and low birth weight were assessed using the Chi- square (X^2) test, and P values were calculated for the ordinal level measures ($p< 0.05$). Variables that were statistically significantly by (X^2) were analyzed using Odds Ratios (ORs) and 95% confidence intervals (CIs). The variables which categorized into 3 groups or more, the over all (OR) was

calculated by determining one group as a baseline group and examining other groups separately with it. This method of test was done for the following variables (maternal age, maternal living area, types of family problems, degree of consanguinity, blood pressure types, types of antenatal care centers, birth intervals, gestational age groups, intrauterine growth groups, and period of vaginal bleeding).

3.13. Limitation of the study

The difficulty of reaching to the Mid zone, Rafah, and Kanyounes governorates of Gaza Strip because of the political and military situations of the area during the period of conducting of the study lead the researcher to satisfy to conduct the study in El-Shifa Hospital which provide services mainly for the population of North, and Gaza governorates and a part of mid-zone.

Also because of inaccuracy of registration of birth weight of newborn in the health records and birth certificates of children, and the absence of previous studies in field of low birth weight in Gaza, the question of the accuracy of sample size still need an answer.

The reliance on obstetric file of mother and the recalling of mother in the diagnosis of some health problems such as pre-eclampsia and other diseases was other limitation of the study, women may have some health problems not known to her and not reported in the file of patient.

Due to high cost of laboratory investigations, the researcher was unable to conduct laboratory investigation for the mothers such as random blood sugar, kidney function tests, liver function tests, and urine analysis to confirm or to

exclude some health problems such as diabetes mellitus, renal diseases, liver diseases, and pre-eclampsia.

Due to social consideration, data about smoking and alcohol is not valid and will not considered in the analysis.

3.14. Study variables definition

3.14.1. Dependent Variable

Birth Weight

The birth weight of the newborn will be measured immediately after delivery unclothed by the nurse under observation of the researcher or the group of qualified trained nurses by adjusted weighting scale. Low Birth weight infant (LBW) is an infant weight less than 2500 gm regardless gestational age (1).

3.14.2. Independent variables

Sex of Baby

Sex of baby will be taken immediately after delivery and from the delivery chart.

Time and Date of Delivery

By taking this variable, the researcher can review the file of mother any time if there was any missing data and the researcher interested to get it. Also selection of control for each case was determined according to the order of delivery which registered with the time of delivery.

Type of Delivery

Whether it is normal, by caesarian- section or by other methods such as ventouse or forceps.

Residence and living area

By this variable, the governorate of residence of mother determined, which are North, Gaza, Mid-zone, Rafah, and Khanyounis. Also the type of living area; city, village, and camp was determined according to PCBS report, 1999 (129). The city is any population collection of 10 thousands inhabitants or more, and all the centers of the governorates regardless of its size, and all the population collection of 4000- 9,999 inhabitants in condition of presence at least 4 elements of the following (electrical network, water supply network, post office, health center with full time duty a week, and a secondary school). The village is any population collection less than 4000 inhabitants, and any population collection of 4000- 9,999 inhabitants without presence the 4 elements mentioned previously. The camp is all the population collections which known as camp and governed by UNRWA.

Age of Mother

It is taken from the mother directly, and validated by the file of patient and determined by years.

Educational Level

Educational level of mother or father determined by asking about the attendance to school, and the years of study.

Occupation

The occupation of mother or father determined to recognize the employment from unemployment mothers and fathers.

Consanguinity

To describe marriage between blood relatives who have at least one common ancestor no more than a great- great grand parent according to El-Kariri definition (84). The first-degree cousin is the son or daughter of uncles or aunts. The second degree-cousin is the relative from the same family name but there is no common ancestor (grandparent).

Parity

The number of previous pregnancies not including the current pregnancy to differentiate primigrvida from multiparity and high multiparity (4 children or more) (125).

Live Births

The number of previous live births refers to any child delivered showing the sign of live.

Still Births

The number of previous still births is determined. The term still birth refers to any child delivered after the 28^{th} week of pregnancy that does not afterwards breathe or show any sign of life (100).

Previous Abortions

The term abortion and miscarriage are synonymous and denote the expulsion of the conceptus before the end of the 28th week of pregnancy (100). By asking the mother about the number of previous pregnancies terminated before the 28th week and diagnosed as abortion by the physicians.

Still Alive

The number of previous deliveries of live infants whom are still alive.

Duration of Pregnancy

It is estimated by asking the mothers about their (LMP), if they remember then count up the number of weeks of pregnancy was possible and by asking the mother directly about the duration of pregnancy. This to determine the preterm deliveries and SGA among the cases and the controls. Preterm infant is an infant who is born before 37 weeks of gestation regardless his weight, and full term infant is an infant who is born at 37 weeks or more of gestation and less than or equal 40 weeks, and the postmaturity is abnormal prolongation of pregnancy 14 days or more after full-term (100).

While small for gestational age (SGA) is an infant whose weight at birth less than the 10th percentile of the expected for his gestational age, where appropriate for gestational age is an infant whose weight at birth lies between tenth percentile and 90th percentile, and large for gestational age is an infant whose weight more than nineteenth percentile (130). Small for gestational age, appropriate for gestational age, and large for gestational age was determined by matching newborn birth

weight to his or her gestational age in the growth chart of fetus as shown in (Appendix 9).

Spacing

The duration from the previous birth and the beginning of the current pregnancy by months as stated by the mother.

Antenatal care center services

Asking the mother if she visited the antenatal care centers of MOH, UNRWA, or others and asking her about the regularity and number of visits. The same points about physician visiting were clarified.

Maternal weight and body mass index

The maternal weight measured in kg, and the body mass index (BMI) calculated by dividing mothers' weigh (measured in kg) by the square of the height (in meters). Where the underweight mother has BMI < 19.8, and normal weight mother has BMI 19.8 – 26, and the overweight mother has BMI 26- 29, and obese mother has BMI more than 29 (91).

Health problems

Asking the mother if she was suffering from any health problems during the current pregnancy without mentioning a specific disease. And the diagnosis of any problems which reported in the file of patient was taken in consideration.

Vaginal bleeding

To determine if the mother was complaining from any disorder that lead to bleeding, and by asking about the trimester that bleeding occur within to differentiate between the different causes of bleeding.

Hypertension

Asking the mother if she has history or treated from hypertension. Hypertension is diagnosed if blood pressure is 140 / 90 or over. Hypertension is also diagnosed if there is a rise of 15mm Hg. or more in the diastolic pressure, or a rise 30mm Hg or more in the systolic pressure (73). Where hypotension is diagnosed if the blood pressure 100/60 or less. Hypotension is also diagnosed if there is decline of 20mm Hg. or more, or a decline 30 mm Hg or more in the systolic pressure.

Cardiac Diseases

Asking mother if she has cardiac disease and asking her about dyspnea, palpitation, chest pain, orthopnea, easy fatigability, and edema. Also asking her if she was taking medicine for specific cardiac disease especially rheumatic heart disease and valvular lesions which being diagnosed and known by patient previously.

Renal Diseases

Asking the mother if she has kidney disease and asking about loin pain haematurea, dysurea, and frequency of micturition and oedema of face. Also asking the mother directly if she treated for urinary tract infection (UTI) during

pregnancy and if she was taking medicine for any renal problem during pregnancy such as glomerulonephritis (GN), nephrotic syndrome or pyelonephritis (PN).

Pulmonary and respiratory diseases

Asking the mother if she had T.B or asking about chronic cough with blood, night sweating, loss of weight and appetite and low-grade fever. And asking her if she was on medical treatment for tuberculosis. Also asking the mother if she was complaining of dyspnea and chronic cough mainly at night and early morning without fever and if she was taking medical treatment for bronchial asthma. Other respiratory tract infections were asked about.

Diabetes Mellitus

Asking the mother if she suffered from diabetes mellitus and if she had polyurea polydepsia and increased appetite with weight loss. Also asking the mother if she was on insulin injection during pregnancy.

Jaundice and hepatic diseases

Asking the mother if she had yellowish coloration in the eyes and skin during the studied pregnancy. Also asking her the causes of jaundice if presented.

Anemia

A hemoglobin level of 11g/dl is regarded as the lowest normal limit during pregnancy. So that the mothers of hemoglobin level less than 11 were considered as anemic mother (100).

Smoking

By determining if the mother is active, passive or both smokers. And determining the type of smoking, either cigarette or Hubbell- bubble, the amount of cigarettes and the duration of smoking by years.

Tea and coffee Drinking

To determine if the mother was exposed to caffeine intake, where the caffeine is presented in tea and coffee mainly. The dose of caffeine was related to the number of cups of tea or coffee.

Family Type

Asking the mother if she lived in nuclear family (the family constitute of the father , mother and their sons and daughters) or extended family (the family constitute of fathers, mothers and their children in addition the grandfather and/ or grandmother and/ or uncles and aunts) .

Social problems and stress

Asking the mother if she exposed for any family problems and the type of problems and traumatic stress during the pregnancy.

History of low birth weight

Asking the mother if she had baby with LBW previously.

Chapter Four

Results

Figure 3 Distribution of study population by living area

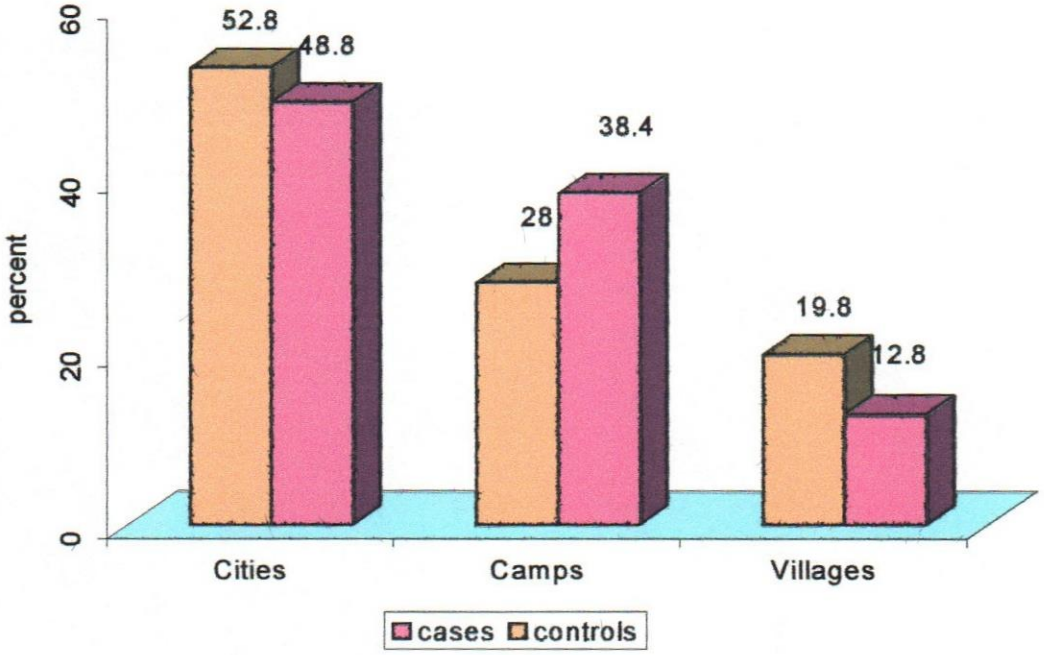
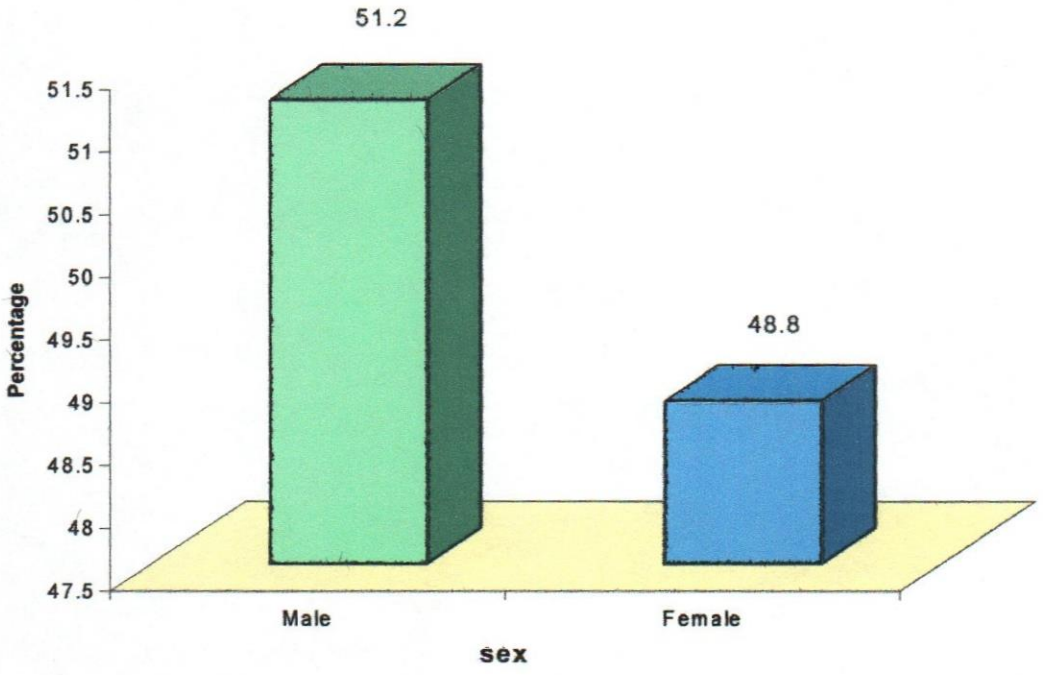


Figure 4 Distribution of study population by sex of baby



The average birth weight for controls was 3282± 429 gm compared to 2145± 293gm of cases. The average of maternal age of total study population was 26.29± 6.37 years. The average of maternal age of controls was 26.38±5.39 years compared to 26.21± 7.24 years of cases. The average of mothers and fathers years of study were 10.06±3.87 years and 9.44± 3.25 years respectively, indicating that, fathers were relatively better educated (Figure 5). Regarding Parents' occupation, the majority of fathers unskilled or not working 61.6%, while the majority of mothers were housewives and only 4.4% of mothers were employed. Around 38.4% of control parents were found to be consanguineous marriages compared to be 65.6% of cases (Figure 6). Normal deliveries of total study population were 82.4% where 14% were by cesarean section and 3.6% by other methods (figure 7). The average of gestational age of study population was 38.5± 2.62 weeks. The mean of gestational age of controls was 39.53± 1.89 weeks compared to 37.43± 2.84 weeks of cases. Figure 8 shows that, 31.8% of cases' mothers that have history of getting LBW infant previously.

Figure 5 Distribution of parents by educational level and gender

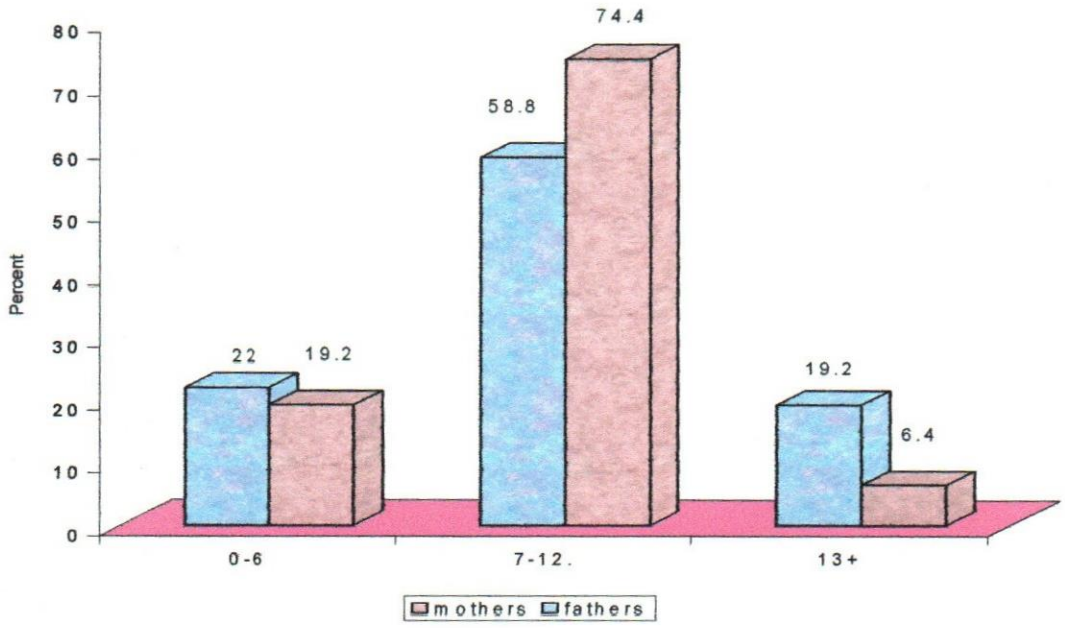


Figure 6 Distribution of study population by consanguinity

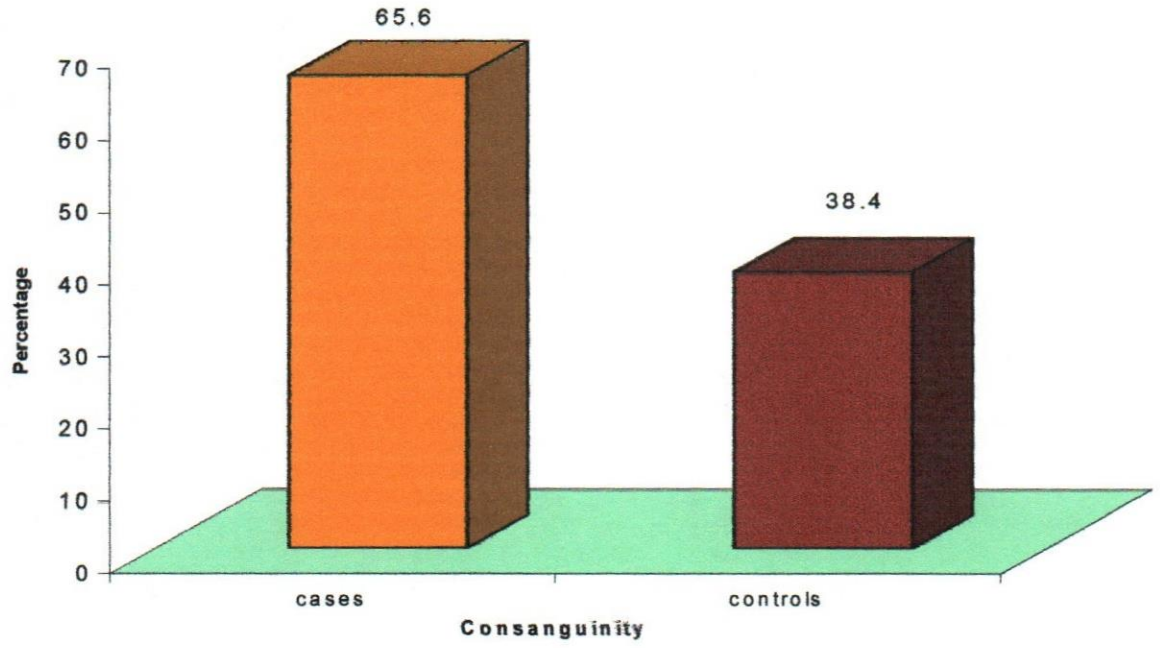


Figure 7 Distribution of study population by type of delivery

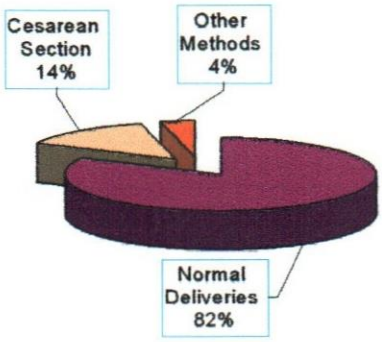
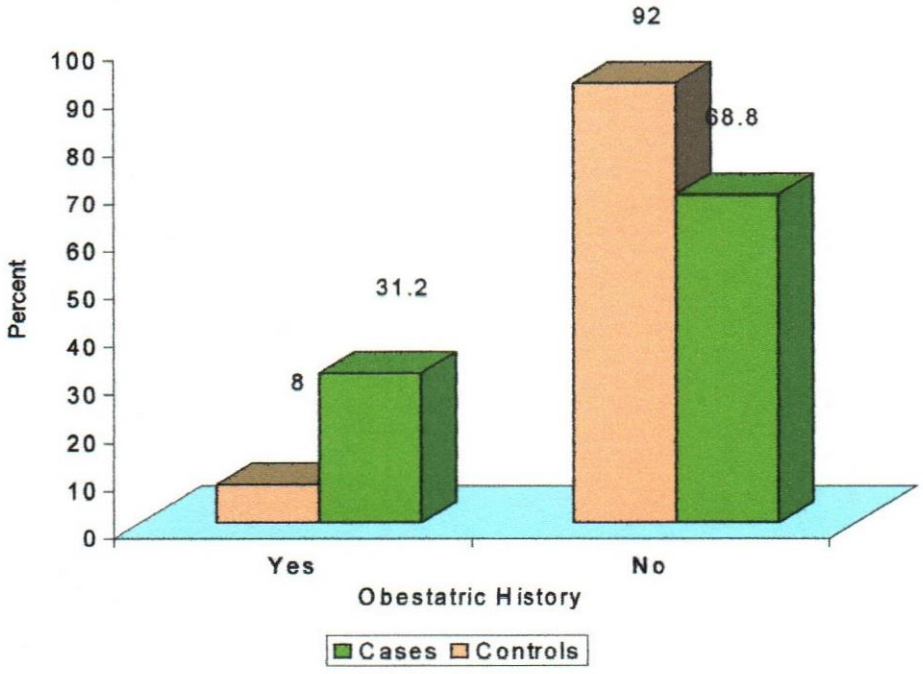


Figure 8 Distribution of cases & controls by obestatric history of LBW



Weight and height were varied between mothers of controls and mothers of cases. Mean weight for controls' mothers before pregnancy was 65.82± 10.79 kgm and 63.67± 11.1 kgm for cases' mothers. While the mean weight for controls' mothers at labour were 76.11± 12.1 kgm and 71.79± 10.76 kgm for cases' mothers. Moreover, the mean of height for controls' mothers was 162.16± 5.6 cm and 157.25± 5.85 cm for cases' mothers. Also it is important to mention that the mean of body mass index of cases' mothers was more than that of controls' mothers 25.78± 4.47 and 25.03±3.97 respectively .In addition the mean (±SD) values for hemoglobin for cases and controls were 10.89± 1.31 and 11.12 ±1.35gm/dl. Where 56.8% of all the mothers of study population were anemic and 43.2% were non-anemic as demonstrated in figure 9.

Figure 9 Distribution of mothers of study populationof by anaemia

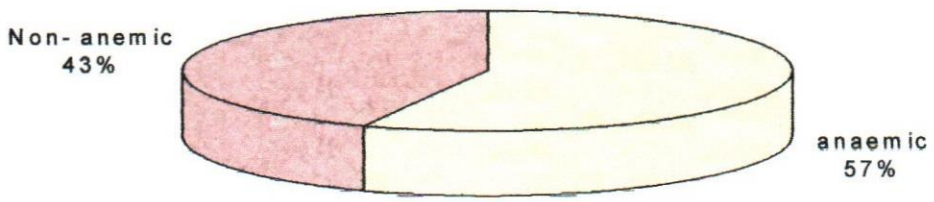


Table 1 Summary of study population Characteristic

Characteristics	Cases			Controls			Total		
	N0.	mean	%	No.	mean	%	No.	mea	%
Newborn Information									
▫ **Gestational Age** (weeks)		37.43			39.5			38.5	
▫ **Type of Delivery**									
Normal Delivery	100		80	106		84.8	206		82.4
Cesarean section	20		16	15		12	35		14
Other methods	5		4	4		3.2	9		3.6
▫ **Gender**									
Male	49		39.2	79		63.2	128		51.2
Female	76		60.8	46		36.8	122		48.8
▫ **Baby Weight** (gm)		2155			2382			2714	
Socio-Demographic variables									
▫ **District**									
North	46		36.8	30		24	76		30.4
Gaza	69		55.2	90		72	159		36.6
Mid-zone	10		8	5		4	15		30
▫ **Living area**									
City	61		48.8	66		52.8	127		50.8
Camps	16		12.8	24		19.2	40		16
Villages	48		38.4	35		28	83		33.2
▫ **Extended Family**	86		68.8	44		35.2	130		
▫ **Maternal age**(years)		26.21			26.38			26.3	
▫ **Maternal age at marriage**		18.25			18.35			18.3	
▫ **Maternal age at 1st**		19.90			20.04			20	
▫ **Maternal educational**		8.28			10.59			9.44	
▫ **Paternal educational** (years)		9.10			11.01			10.1	
▫ **Maternal occupation**									
Housewives	123		98.4	116		92.8	239		95.6
Employed	2		1.6	9		7.2	11		4.4
▫ **Paternal occupation**									
Non- skilled & not work	96		76.8	58		46.4	154		61.6
Employed	29		23.2	67		53.6	96		38.4
▫ **Consanguinity**	82		65.6	48		38.4	130		52
Maternal health status & habits									
▫ **Maternal Anthropometry**									
Weight (Pre-pregnancy)		63.67			65.82			64.7	
Weight (at labour)		71.79			76.11			74	
Height		157.3			162.2			160	
BMI		25.78			25.03			25.4	
▫ **Maternal Hb %**		10.89			11.12			11	
▫ **Disorders during pregnancy**	37		29.6	31		24.8	68		27.2
▫ **Antenatal care visit**	108		86.4	123		98.4	231		92.4
▫ **Number of care visits**		6.34			7.37			6.86	
▫ **Physician visit**	36		28.8	22		17.6	58		23.2
▫ **Number of Phys. visits**		2.02			0.81			1.42	
▫ **Maternal bleeding**	20		16	6		4.8	26		10.4
▫ **Tea Drinking** (Cups)		2.5			2.1			2.3	
▫ **Coffee Drinking** (Cups)		0.72			0.41			0.56	
▫ **History of LBW**	39		31.2	10		8	49		19.6

4.2. Relationship between Maternal Socio-demographic Variables and LBW

Table 2 Distribution of cases and controls by maternal age and paternal education

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Maternal age							
-18	21	16.8	3	2.4	24	9.6	0.000*
19-34	87	69.6	111	88.8	198	79.2	
35+	17	13.6	11	8.8	28	11.2	
Total	125	100	125	100	250	100	
Maternal education							
-6	34	27.2	14	11.2	48	19.2	0.001*
7-12	88	70.4	98	78.4	168	74.4	
13+	3	2.4	13	10.4	16	6.4	
Total	125	100	125	100	250	100	
Paternal education							
-6	39	31.2	16	12.8	55	22	0.000*
7-12	70	56	77	61.6	147	58.8	
13+	16	12.8	32	25.6	48	19.2	
Total	125	100	125	100	250	100	

*Statistical significant

Table 2 shows that the maternal age has an important role in likelihood of low birth weight. The results of this study provides evidence that the mothers of cases of age less than or equal 18 years old is more than that of controls with percentage 16.8% among cases compared with 2.4% among controls. Strong positive association between young mothers and LBW (OR= 8.93, 95% CI= 2.42, 38.96, P= 0.000).On the other hand, there was no association between LBW and mothers of age 35 years and more. In addition the maternal education and paternal education show a relationship with LBW infant, where LBW is more prevalent among less educated mothers or fathers. It is noticed that maternal or paternal education less than or equal 6 years is more among cases 27.2%for mothers' cases and 31.2% for fathers' cases compared to 11.2% and 12.8% respectively for

controls (OR= 2.96, 95% CI= 1.43, 6.20, P= 0.001 for maternal education) and (OR= 3.09, 95% CI= 1.55, 6.22, P= 0.000 for paternal education).

Table 3 Distribution of cases and controls by parental occupation

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Maternal occupation							
House wife	123	98.4	116	92.8	239	95.6	0.031*
Employee	2	1.6	9	7.2	11	4.4	
Total	125	100	125	100	125	100	
Paternal occupation							
Not work & unskilled	96	76.8	58	46.4	154	61.6	0.000*
Employee	29	23.2	67	53.6	96	38.4	
Total	125	100	125	100	250	100	

*Statistical significant

Also the maternal and paternal occupation has an important association with LBW, inspite of that 95.6% of study population were housewives but there was statistically significant differences between cases and controls regarding mothers' occupation where 1.6% of cases' mothers were employed compared with 7.2% of controls' mothers. So there is negative association between mothers' employment and LBW (OR= 4.77, 95% CI= 1.01, 32.96 , P= 0.031). But the relation between paternal occupation and LBW was more statistical significant than that of maternal where 23.2% of cases' fathers were employed compared to 53.6% of control (OR= 3.82, 95% CI= 2.14, 6.85, P= 0.000).

Table 4 Distribution of cases and controls by maternal residence, type of living area and type of family

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Maternal residence							
Outside Gaza Govern.	56	44.8	35	28	91	36.4	0.006*
Inside Gaza Govern.	69	55.2	90	72	159	63.6	
Total	125	100	125	100	250	100	
Maternal Living area							
City	61	48.8	66	52.8	127	50.8	0.168
Camps	48	38.4	35	28	83	33.2	
Village	16	12.8	24	19.2	40	16	
Total	125	100	125	100	250	100	
Family type							
Extended	86	68.8	44	35.2	130	52	0.000*
Nuclear	39	31.2	81	64.8	120	48	
Total	125	100	125	100	250	100	

*Statistical significant

As shown in table 4, significant differences between both groups (cases and controls) were revealed according to maternal residence by governorate, indicating that, the living outside Gaza governorate are more related to LBW where 44.8% of cases' mothers live outside Gaza governorate compared to 28% of controls. Additionally living inside Gaza governorate has negative association with LBW (OR= 0.48, 95% CI= 0.27, 0.84, P= 0.006). However, no statistically significant differences between both groups (cases and controls) regarding mothers' living area were revealed.

Also, the table shows that the 68.8% of cases' mothers were living in extended family while35.5% of controls' mother were living in extended family. Meaning that, living in nuclear family have significant negative association with LBW (OR= 0.25, 95% CI= 0.14, 0.43, P= 0.000).

Table 5 Distribution of cases and controls by family problems, types of problems, social stresses, and tired in work

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Family problems							
yes	46	36.8	11	8.8	57	22.8	0.000*
No	79	63.2	114	91.2	193	77.2	
Total	125	100	125	100	250	100	
Type of Problems							
Social	31	24.8	7	5.6	38	15.2	0.000*
Economic	11	8.8	3	2.4	14	5.6	0.006*
Political	4	3.2	1	0.8	5	2	
No	79	63.2	114	91.2	193	77.2	
Total	125	100	125	100	250	100	
Traumatic stress							
Yes	36	28.8	12	9.6	48	19.2	0.000*
No	89	71.2	113	90.4	202	80.8	
Total	125	100	125	100	250	100	
Tiredness							
Yes	72	57.6	26	20.8	98	39.2	0.000*
No	53	42.4	99	79.2	152	60.8	
Total	125	100	125	100	250	100	

*Statistical significant

Table 5 shows that there is strong positive relation between exposure of mothers to family problems during the pregnancy and LBW (OR= 6.03, 95% CI= 2.81, 13.22, P= 0.000). The study indicated that 36.8% of mothers of cases were exposed to family problems compared to 8.8% of controls, meanwhile, the social problems were the most problems of the family of the study population, where 24.8% of cases' mothers were exposed to social problems compared to 5.6% of controls. Moreover the percentage of cases' mothers who exposed to economic problems was 8.8% compared to 2.4% of controls. This indicating that there was association between LBW and both social problems and economic problems

(OR= 6.39, 95% CI= 2.53, 16.83, P= 0.000 for social problems) and (OR= 5.29, 95% CI= 1.31, 24.76, P= 0.006 for economic problems).

Furthermore, the same table indicated that 28.8% of cases' mother were exposed to traumatic stress as perceived by mother in contrast 9.6% of controls. Strong positive association between exposure to traumatic stress and LBW was revealed (OR= 3.81, 95% CI= 1.78, 8.26, P= 0.000). Additionally, a significant difference between both groups with regard to maternal feeling of tiredness in the work either in home or in job as the mothers perceived. Nearly 57.6% of mothers of cases perceived tiredness in their work during their pregnancy compared to 20.8% of controls. The differences between the two groups were reported to be strongly statistically significant (OR= 5.17, 95% CI= 2.85, 9.42, P= 0.000).

Table 6 Distribution of cases and controls by consanguineous marriage

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
consanguinity							
Yes	82	65.6	48	38.4	130	52	0.000*
No	43	34.4	77	61.6	120	48	
Total	125	100	125	100	250	100	
Consanguinity degree							
First cousin	60	48	33	26.4	93	37.2	0.000*
Second cousin	22	17.6	15	12	37	14.8	0.011*
Non	43	34.4	77	61.6	120	48	
Total	125	100	125	100	250	100	

*Statistical significant

Concerning the relationships between consanguineous marriage and LBW, table 6 shows that 65.6% of consanguineous marriages were found among cases compared 38.4% of consanguineous marriages among controls. Further, the table also shows that LBW occurred more among cases of first –degree marriage with a

percentage of 48% compared with 26.4% of controls. Moreover, the relationships between consanguineous marriages and LBW showed strong positive association (OR= 3.06, 95% CI= 1.77, 5.30, P= 0.000).

4.3. Relationship between Maternal Health Status and LBW

Table 7 Distribution of cases and controls by maternal height, body mass index (BMI), and weight gaining during pregnancy

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Maternal Height							
-150	17	13.6	4	3.2	21	8.4	0.003*
>150	108	86.4	121	96.8	229	91.6	
Total	125	100	125	100	250	100	
Body Mass Index							
underweight	11	8.8	10	8	21	8.4	
Normal weight	52	41.6	73	58.4	125	50	
Overweight & obesity	62	49.6	42	33.6	104	41.6	0.007*
Total	125	100	125	100	250	100	
Weight Gain (kg)							
-7	60	48	27	21.6	87	34.8	0.000*
>7	65	52	98	78.4	163	65.2	
Total	125	100	125	100	250	100	

*Statistical significant

Interestingly, the maternal somatic characteristic has a relationship with LBW. As shown in table 7 there was 13.6 % of cases' mothers were less than or equal 150 cm compared to 3.2% of controls. That means there was strong positive association between maternal height less than or equals 150 cm and LBW (OR= 4.76, 95% CI= 1.45, 17.31, P= 0.003). In addition table 7 shows that the overweight and obesity of mothers has a strong positive association with LBW, where approximately half of cases' mothers were overweight and obese compared

to one third of controls' mothers were so, indicating that normal weight according to the classification of body mass index is a protective factor for delivery LBW (OR= 0.48, 95% CI= 0.27, 0.85, P= 0.007).But there was no association between LBW and underweight mothers. Worth noting that also weight gaining during pregnancy has a relationship with LBW between the two groups, indicating that the gaining of mother more than 7 kg during pregnancy is a protective factor for delivery baby with LBW (OR= 0.3, 95% CI= 0.17, 0.54, P= 0.000).

Table 8 Distribution of cases and controls by maternal disorders and anemia during pregnancy

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Disorders							
Yes	37	29.6	31	24.8	68	27.2	0.394
No	88	70.4	94	75.2	182	72.8	
Total	125	100	125	100	250	100	
Anemia							
Yes	74	59.2	68	54.4	142	56.8	0.444
No	51	40.8	57	45.6	108	43.2	
Total	125	100	125	100	250	100	

*Statistical significant

Worth noting that, although 29.6 of cases' mother were complained of disorders during pregnancy compared to 24.8% of controls, the result shows no statistical significant differences between both groups with regard to mothers' disorders during pregnancy as shown in table 8.

Also the table shows that approximately more than 55% of mothers were complaint of anemia during the third trimester of pregnancy where 59.2% of cases' mother and 54.4% of controls' mothers were anemic. There was difference between cases' mothers and controls' mothers, but this difference did not reach a statistical significant level.

Table 9 Distribution of cases and controls by maternal hypertension induced pregnancy (PIH), type of blood pressure, cardiac diseases and renal diseases

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
PIH							
Yes	21	16.8	12	9.6	33	13.2	0.093
No	104	83.2	113	90.4	217	86.8	
Total	125	100	125	100	250	100	
Blood pressure type							
Hypertension	11	8.8	6	4.8	17	6.8	
Normal	92	73.6	105	84	197	78.8	0.044*
Hypotension	22	17.6	14	11.2	36	14.4	
Total	125	100	125	100	250	100	
Cardiac Diseases							
Yes	4	3.2	1	0.8	5	2	0.175
No	121	96.8	124	99.2	245	98	
Total	125	100	125	100	250	100	
Renal Diseases							
Yes	24	19.2	14	11.2	38	15.2	0.078
No	101	80.8	111	88.8	212	84.8	
Total	125	100	125	100	250	100	

*Statistical significant

Tables 9 and 10, depict different illness encountered during the pregnancy. It could be inferred from the finding that 16.8% of mothers who had suffered from preeclampsia (PIH) were cases. In contrast, controls constitute 9.6%. However the study revealed no significant statistical association between both groups according to Pregnancy-induced hypertension (PIH) (P= 0.093). On the other hand, the study

revealed statistical positive association between abnormal blood pressure (both hypertension and hypotension) of mothers at the time of labor and LBW, where 26.4% of cases' mothers were of abnormal blood pressure compared to 16% of controls. This result suggests that normal blood pressure of mothers at the time of labor is a protective factor for delivery LBW (OR= 0.53, 95% CI= 0.27, 0.99, P= 0.044). Also table 9 shows that there were only 2% of mothers complained of cardiac diseases during pregnancy. There were differences between both groups regard to cardiac diseases but this difference did not reach a statistical significant level. Worth noting that renal diseases of mothers during pregnancy also have no significant association with LBW (P=0.078) where 19.2% of cases' mother complained of renal diseases compared to 11.2% of controls. It is important to mention that the percentage of cases' mothers who complained of pregnancy induced hypertension (PIH) is approximately equal the percentage of controls' mothers who complained from renal diseases, and the same in the controls' mothers as shown in table 9.

Table 10 Distribution of cases and controls by maternal and respiratory diseases

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Respiratory Diseases							
Yes	13	10.4	12	9.6	25	10	0.833
No	112	89.6	113	90.4	225	90	
Total	125	100	125	100	250	100	
Diabetes mellitus							
Yes	2	1.6	5	4	7	2.8	0.250
No	123	98.4	120	96	243	97.2	
Total	125	100	125	100	250	100	

*Statistical significant

As shown in table 10, there were no association between respiratory diseases during pregnancy and LBW in spite of 10% of mothers of study population complained of respiratory diseases during pregnancy; 10.4 were cases' mother compared to 9.6% of controls. Additionally the study indicates that 1.6% of cases' mother were diabetic during pregnancy compared to 4% of controls. However there were no statistically association between diabetes mellitus of mothers during pregnancy and LBW. The study indicated that there was no mother of study population complained of hepatic diseases during pregnancy.

4.4. Relationship between Maternal Habits and Behaviors during pregnancy an LBW

Table 11 Distribution of cases and controls by maternal passive smoking, and smoking in the same room

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Passive Smoking							
Yes	89	71.2	63	50.4	152	60.8	0.001*
No	36	28.8	62	49.6	98	39.2	
Total	125	100	125	100	250	100	
Smoking in the room							
Yes	73	58.4	31	24.8	104	41.6	0.000*
No	52	41.6	94	75.2	146	58.4	
Total	125	100	125	100	250	100	

*Statistical significant

The habit of frequently passive smoking of mothers during pregnancy showed that obvious significant differences among cases and controls. Table 11 shows that 71.2 % of cases' mothers were passive smokers compared to 50.4% of controls. Meaning that, there was strong positive association between LBW and passive smoking (OR= 2.4, 95% CI= 1.4, 4.25, P= 0.001). Moreover the study shows that the positive association between LBW and passive smoking increased when the active smokers smoke in the same room that the mothers live in (OR= 4.26, 95% CI= 2.4, 7.58, P= 0.000), where 58.4% of mothers of cases were exposed for passive smoking in the same room compared to 24.8% of controls. On the other hand, it is important to mention that the percentage of active smokers among the mothers of study population was zero.

Table 12 Distribution of cases and controls by Tea and coffee drinking and the number of cups

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Tea drinking							
Yes	97	77.6	85	68	182	72.8	0.088
No	28	22.4	40	32	68	27.2	
Total	125	100	125	100	250	100	
Number of tea cups							
Less than 2	39	31.2	57	45.6	96	38.4	
More than or equal 2	86	68.8	68	54.4	154	61.6	0.019*
Total	125	100	125	100	250	100	
Coffee drinking							
Yes	44	35.2	27	21.6	71	28.4	0.017*
No	81	64.8	98	78.4	179	71.6	
Total	125	100	125	100	250	100	
Number of coffee cup							
Less than 2	92	73.6	109	87.2	201	80.4	
More than or equal 2	33	26.4	16	12.8	49	19.6	0.007*
Total	125	100	125	100	250	100	

*Statistical significant

Concerning mothers' tea drinking did not reach a statistical significant (P= 0.088), in spite of most of study population (72.8%) were tea drinker where 77.6% of them were cases compared to 68% of controls. However, the association was positive between LBW and the number of cup of tea drunk by mothers during pregnancy. The findings indicated that the percentage of cases' mother who were drinking more than or equal 2 cups of tea during pregnancy was 68.8% compared to 54.4% of controls. Indicating that the habit of drinking less than 2 cups of tea is a protective factor for delivery LBW (OR= 0.54, 95% CI= 0.31, 0.94, P= 0.017). In addition, the results showed that 35.2% of cases' mother had been used to drink

coffee compared to 22.1% of controls. It can be inferred that there was positive association between the habit of drinking coffee and LBW (OR= 1.97, 95% CI= 1.08, 3.60, P= 0.017). Furthermore the same table indicted that 26.4% of cases' mother used to drink more than or equal 2 cups of coffee compared to 12.8% of controls. Concluding that the drinking more than or equal 2 cups of coffee during pregnancy also have strong positive association with LBW (OR= 2.44, 95% CI= 1.21, 4.98, P= 0.007) as shown in table 12.

Table 13 Distribution of cases and controls by antenatal care visits, number of visits, regularity of visits, and type of center

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Antenatal care visit							
Yes	108	86.4	123	98.4	231	92.4	0.000*
No	17	13.6	2	1.6	19	7.6	
Total	125	100	125	100	250	100	
Number of visits							
Less than 4	27	21.6	13	10.4	40	16	0.016*
More than or equal 4	98	78.4	112	89.6	210	84	
Total	125	100	125	100	250	100	
Regularity of Visiting							
Yes	99	79.2	118	94.4	217	86.8	0.000*
Irregular or no visits	26	20.8	7	5.6	33	13.2	
Total	125	100	125	100	250	100	
Type of center							
PHC (MOH)	38	30.4	48	38.4	86	34.4	0.000*
UNRWA	54	43.2	66	52.8	120	48	0.000*
Others	16	12.8	9	7.2	25	10	
No visits	17	13.6	2	1.6	19	7.6	
Total	125	100	125	100	250	100	

*Statistical significant

The results show that 92.4 % of the total study population received antenatal care services during the current pregnancy. Of those who received antenatal care, 86.4% were cases and 98.4% were controls. The relationship between LBW and receiving antenatal care services showed strong negative association (OR= 0.10, 95% CI= 0.02, 0.48, P= 0.000). Moreover, there was statistically significant difference between both cases and controls concerning the number of visits of antenatal care center and the regularity of visiting of the center as illustrated in table 13. The same table showed that percentage of controls who used to visited the antenatal care centers more than or equal 4 visits 89.6% and 94.4% of the controls' mother visited the centers regularly compared to 78.4% and 79.2% of cases respectively. Meaning that there is strong negative association between LBW from one side and visiting the antenatal care centers more than or equal 4 visits and regularity of visiting from other side (OR= 0.42, 95% CI= 0.19, 0.91, P= 0.016) and (OR= 0.23, 95% CI= 0.09, 0.58, P= 0.000) respectively. In addition, the study showed a significant difference between both groups with regard to the type of center of antenatal care. Nearly 73.6% of cases' mother used to visit antenatal care centers of primary health care of Ministry of Health (MOH) and UNRWA compared to 91.2% of controls. Indicating that there is negative association between LBW and following up the pregnancy in the centers of antenatal care of MOH and UNRWA (OR= 0.09, 95% CI= 0.01, 0.46, P= 0.000 for MOH centers) and (OR= 0.1, 95% CI= 0.01, 0.46, P= 0.000 for UNRWA centers). However, there was no significant association between utilizing antenatal care of other centers (NGOS and private sector) and LBW.

Table 14 Distribution of cases and controls by physician visits, and number of visits

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Phvsician visit							
Yes	36	28.8	22	17.6	58	23.2	0.036*
No	89	71.2	103	82.4	192	76.8	
Total	125	100	125	100	250	100	
Number of visits							
Less than 4	101	80.8	114	91.2	215	86	0.018*
More than or equal 4	24	19.2	11	8.8	35	14	
Total	125	100	125	100	250	100	

*Statistical significant

The study showed positive association between LBW and visiting the physician for seeking therapy for any disorder during pregnancy (OR= 1.89, 95% CI= 1.00, 3.61, P= 0.036). As shown in tables 14 it is noticed that 36 (28.8%) mothers of cases visited physician during pregnancy and 22 (17.6%) mothers of controls visited physician. Also it is observed that almost all the mothers of cases who were experienced disorders during pregnancy visited the physician (36 mothers of 37) as shown in tables 8 and 14. In contrast, approximately 71% of mothers of controls who were experienced disorders during pregnancy visited the physician (22 of 31 mothers). Worth noting that result shows a remarkable consistency with the result of table 13 which indicated that visiting any center of antenatal care rather than those of MOH and UNRWA has a positive association with LBW.

In addition the findings in table 14 showed that the more the number of visiting the physician during pregnancy, the more probability of delivery LBW.

The percentage of cases' mother visited physician during the current pregnancy more than or equal 4 is 19.2% compared to 8.8% of controls. Indicating that there

was a positive association between visiting the physician more than or equal 4 times during pregnancy and LBW (OR= 2.46, 95% CI= 1.09, 5.76, P= 0.018).

4.5. Relationship between Gyno-obstetric conditions and LBW

Table 15 Distribution of cases and controls by maternal age at marriage and at first delivery and parity

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Age at marriage							
-18	89	71.2	72	57.6	161	64.4	0.025*
19+	36	28.8	53	42.4	89	35.6	
Total	125	100	125	100	250	100	
Age at first delivery							
-18	49	39.2	40	32	89	35.6	0.235
19+	76	60.8	85	68	161	64.4	
Total	125	100	125	100	250	100	
Parity							
Primigravida	34	27.2	18	14.4	52	20.8	0.013*
1-4	49	39.2	61	48.8	110	44	
>5	42	33.6	46	36.8	88	35.2	
Total	125	100	125	100	250	100	

*Statistical significant

Table 15 shows that 71.2% out of the total cases' mothers were less than 18 years when they have been married, only 57.6% of their counterparts had the same experience. The relationship between the two groups showed strong positive association (OR= 1.82, 95% CI= 1.04, 3.19, P= 0.025). However, no statistically significant differences between controls and their counterparts with regard to the maternal age at first delivery as shown in same table.

The same table shows more than quarter of cases' mothers were Primigravida, in contrast 14.4% of controls' mothers. This result suggests a positive association between LBW and Primigravida with strong statistically differences between both groups (OR= 2.22, 95% CI= 1.13, 4.41, P= 0.013).

Table 17 Distribution of cases and controls by birth interval between last labor and current pregnancy, and the gestational age

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Birth interval months							
-12 months	74	59.2	59	47.2	133	53.2	0.012*
13-36 months	32	25.6	52	41.6	84	33.6	0.007*
>36 months	19	15.2	14	11.2	33	13.2	0.056
Total	125	100	125	100	250	100	
Gestational age weeks							
Less than 37 weeks	47	40.2	8	6.6	55	23.1	
37- 40 weeks	66	56.4	94	77.7	160	67.2	0.000*
42+ weeks	4	3.4	19	15.7	23	9.7	
Total	117	100	121	100	238	100	

*Statistical significant

There were significant differences between cases and controls with regard to the interval between the current pregnancy and previous delivery. The result indicated that 47.2% of controls' mothers had had pregnancy interval 12 months and less, compared with 59.2% of cases' mothers (P=0.012). In addition, the association between LBW and birth interval more than 36 months was weak and marginally statistically significant (0.056). Meaning that, birth interval more than 12 months and less than or equal 36month was negatively associated with LBW (OR= 0.48, 95% CI= 0.27, 0.85, P= 0.007) (Table 17).

Further more table 17 shows that there was a strong negative association between full term (37- 41 weeks) with regard to gestational age and LBW (OR= 0.37, 95% CI= 0.20, 0.68, P= 0.000). The results indicated that the prevalence of LBW among preterm infants is higher than the prevalence of normal birth weight among preterm baby. The percentage of cases that were preterm was 40.2% compared to 6.6% of controls. It is important to mention that there were 12 mothers (8 cases' mothers, and 4 controls') did not know their LMP, so it was difficult to measure their gestational age.

Table 18 Distribution of cases and controls by intrauterine growth during pregnancy

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Intra-uterine growth							
Large for gestational age	1	0.85	12	9.9	13	5.46	0.000*
Appropriate for gestational age	37	31.6	109	90.1	146	61.34	
Small for gestational age	79	67.52	0	0	79	33.20	
Total	117	100	121	100	238	100	

*Statistical significant

About one third (33.2%) of the total study population were small for gestational age (SGA), where two third of cases (67.52%) were so compared to no control was SGA. The results reflected that intrauterine growth retardation has a strong positive association with LBW (OR= 249.47, 95% CI= 35.55, 4987.74, P= 0.000) (Table 18).

It is obvious from tables 17 and 18 that LBW has a strong significant correlation with both prematurity (gestational age less than 37 weeks) and intrauterine growth retardation. However, the association between LBW and IUGR is stronger than that association between LBW and prematurity.

Table 19 Distribution of cases and controls by vaginal bleeding and the period of bleeding during pregnancy

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
Maternal bleeding							
Yes	20	16	6	4.8	26	10.4	0.004*
No	105	84	119	95.2	224	89.6	
Total	125	100	125	100	250	100	
Period of bleeding							
First trimester	8	6.4	2	1.6	10	4	0.04*
Second trimester	8	6.4	3	2.4	11	4.4	
Third trimester	4	3.2	1	0.8	5	2	
No	105	84	119	95.2	224	89.6	
Total	125	100	125	100	250	100	

*Statistical significant

A strong positive association between maternal vaginal bleeding during pregnancy and LBW was revealed (OR= 3.73, 95% CI= 1.37, 10.96, P= 0.004). It was observed that 16% of cases' mothers suffered from vaginal bleeding during pregnancy compared to 4.8% of controls. The study also showed that there is statistical significant difference between both groups with regard the period of bleeding according to the trimester of pregnancy (P= 0.04). Worth noting that the percentage of cases' mothers who suffered from vaginal bleeding in the first trimester and second trimester equal (6.4%) while their percentage in the third percentage is the half (3.3%). In contrast the percentage of controls' mothers who suffered from vaginal bleeding in first or in the third trimester constitute one quarter the percentage of this of cases' mothers (1.6% in first trimester and 0.8% in third trimester for cases' mothers) (Table 19).

Table 20 Distribution of cases and controls by history of delivery LBW

	Cases		Controls		Total		
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**P-value**
History of LBW							
Yes	39	31.2	10	8	49	19.6	0.000*
No	86	68.8	115	92	201	80.4	
Total	125	100	125	100	250	100	

*Statistical significant

Table 20 showed that31.2% of cases' mothers have a history of delivery LBW infants previously compared to 8% of controls. Meaning that a history of delivery LBW has strong positive association with LBW (OR= 5.22, 95% CI= 2.35, 11.86, P= 0.000).

Table 21 Proportion of cases using weight of infant for gestational age as an index; by gestational age group

	Large		Appropriate		Small		Total	
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**NO**	**%**
Gestational age								
Premature (<37 weeks)	1	0.86	37	31.62	9	7.69	47	40.17
Full term (37-40 weeks)	0	0	0	0	66	56.41	66	56.41
Post-mature (> &=42 weeks)	0	0	0	0	4	3.42	4	3.42
Total	1	0.86	37	31.62	79	67.52	117	100

Table 22 Proportion of controls using weight of infant for gestational age as an index; by gestational age group

	Large		Appropriate		Small		Total	
Variable	**No**	**%**	**No**	**%**	**No**	**%**	**NO**	**%**
Gestational age								
Premature (<37 weeks)	2	1.65	6	4.96	0	0	8	6.61
Full term (37-40 weeks)	9	7.44	85	70.25	0	0	94	77.69
Post-mature (> &=42 weeks)	1	0.83	18	14.88	0	0	19	15.7
Total	12	9.92	109	90.08	0	0	121	100

As shown in tables 21, 22, the results indicated that 67.52% of LBW infants (Cases) were small for gestational age (SGA), where 59.83 of them were IUGR only and 7.69% were IUGR and premature in the same time. Worth noting that 40.17% of LBW were premature, where 31.62% 0f them were premature and appropriate for gestational. Indicating that the main cause of LBW was intra-uterine growth retardation. The proportion of premature LBW to LBW due to IUGR is 1:1.5. In contrast, most of controls were appropriate for gestational age (90.08%), where 70.25% of them were full-term and appropriate for gestational age. In addition, the percentage of prematurity among control was 6.61%. So the

proportion of prematurity to full term among controls was 1:10.6. It is worth

to mention there was none of controls SGA, but 9.92% of them were large for

gestational age compared to 1.7% of

proportion of prematurity to full term among controls was 1:11.75. It is important to mention there was none of controls SGA, but 9.92% of them were large for gestational age compared to 1.71 of cases.

Table 23 Summary of statistical significance variables

Factor	Exposure among Cases		Exposure among Controls		Bivariate analysis		
	No	%	NO	%	OR	95%CI	P-V
Maternal age	21	87.5	3	12.5	8.93	(2.42- 38.96)	0.000
Maternal illiteracy	34	70.8	14	29.2	2.96	(1.43- 6.20)	0.001
Paternal illiteracy	39	70.9	16	29.1	3.09	(1.55- 6.22)	0.000
Maternal unemployment	123	51.5	116	48.5	4.77	(1.01- 32.96)	0.031
Paternal unemployment	96	62.4	58	37.6	3.82	(2.14- 6.85)	0.000
Inside Gaza residence	69	43.4	90	56.6	0.48	(0.28- 0.84)	0.006
Nuclear family living	39	32.5	81	67.5	0.25	(0.14- 0.43)	0.000
Family Problems	46	80.7	11	19.3	6.03	(2.81- 13.22)	0.000
Social problems	31	81.6	7	18.4	6.39	(2.53-16.83)	0.000
Economic problems	11	78.6	3	21.4	5.29	(1.31-24.76)	0.006
Traumatic stress	36	75	12	25	3.81	(1.78- 8.26)	0.000
Tiredness	72	73.5	26	26.5	5.17	(2.85- 9.42)	0.000
Consanguinity	82	63.1	48	36.9	3.06	(1.77- 5.30)	0.000
Short maternal stature	17	81	4	19	4.76	(1.45- 17.31)	0.000
Maternal body weight	52	41.6	73	58.4	0.48	(0.27- 0.85)	0.007
Blood pressure (normal)	92	46.7	105	53.3	0.53	(0.27- 0.99)	0.044
Passive smoking in room	73	70.2	31	29.8	4.26	(2.4- 7.85)	0.000
Tea drinking<2 cups/day	39	40.6	57	59.4	0.54	(0.31-0.94)	0.017
Coffee drinking>2 cups	33	67.3	16	32.7	2.44	(1.21- 4.98)	0.007
Antenatal care visit	108	46.8	123	53.2	0.10	(0.02- 0.48)	0.000
four visits and more	98	46.7	112	53.3	0.42	(0.19-0.91)	0.016
Regular visits	99	45.6	118	45.4	0.23	(0.09- 0.58)	0.000
Type of Antenatal center	92	44.7	114	55.3	0.03	(0.12- 0.59)	0.000
Private Physician visits	36	62.1	22	37.9	1.89	(1-3.61)	0.036
Maternal age at marriage	89	55.3	72	44.7	1.82	(1.04- 3.19)	0.025
Primigravida	34	65.4	18	34.6	2.22	(1.13- 4.41)	0.013
Birth interval	32	38.1	52	61.9	0.48	(0.271- 0.85)	0.007
Prematurity	47	85.5	8	14.5	9.48	(24.02- 23.2)	0.000
Intra- uterine growth	79	100	0	0	249	(36- 4988)	0.000
Vaginal bleeding	20	76.9	6	23.1	3.37	(1.37- 10.96)	0.004
History of LBW	39	79.6	10	20.4	5.22	(2.35- 11.86)	0.000

Table 23 summarizes the most important and significant study variables in relation to low birth weight. As shown in the table, young age mother, low educational level and unemployment of parents at a greater risk of LBW. LBW infants are more likely to mothers live outside Gaza governorate, in extended family, suffering from family such as social and economic problems and stresses, and feeling tiredness during home-care. Consanguinity increases the risk of LBW. Moreover short stature, overweight and obesity, low weight gaining during pregnancy and abnormal blood pressure revealed positive association with LBW. Also exposing of mothers during pregnancy to passive smoking and high caffeine intake by tea and coffee drinking are contributing factors in LBW occurrence. Regular antenatal care centers of MOH and UNRWA visiting decreases the chances of getting LBW, while visiting the privet clinics have positive association with LBW. Early marriage, primigravida, short birth interval, suffering from vaginal bleeding and having a history of LBW were associated with LBW.

Both intrauterine growth retardation and prematurity were strongly significant associated with LBW. But intrauterine growth retardation was completely restricted to LBW infants.

Chapter Five

Discussion

Discussion

As part of unmatched case control study of maternal risk factors of LBW, the study identifies some possible maternal factors such as socio-demographic factors, maternal health status during pregnancy, some habits and behaviors of mothers during the current pregnancy, and the gyno-obstetric condition of mothers.

It is important to mention that this study is the first case control study conducted in Gaza strip to test the maternal risk factors of LBW which were studied elsewhere. The results of this research matched with other similar studies in some findings and different in others.

5.1. Socio-demographic factors

It has been found that there was high variation across levels of basic socioeconomic variables except the living area of mothers did not show any association with LBW. Inspite there was no association between the maternal living area and LBW, but there was strong association between the maternal residence according to the governorates. This result could be explained by that all the Gaza strip become as a big city and there is no different between city, camps or villages. Also the difference which present between the residence of mother inside Gaza governorate and outside Gaza governorate in relation to getting LBW could be explained that the mothers who lived inside Gaza governorate could be more educated than mothers lived outside Gaza governorate, or the quality of services of antenatal care of Gaza governorate's centers is higher than that of outside Gaza governorate's centers. Also the accessibility to the antenatal care

centers inside Gaza governorate is more than that outside Gaza governorates. In addition that the socioeconomic status of mothers who live in Gaza governorate is better than that who live outside Gaza governorate.

Maternal age

The results of the study revealed that maternal age less than or equal 18 years old is more prevalent in cases and an obvious and extremely pronounced positive association between LBW and young mothers. It is clear that young mother had significantly more risks of SGA compared with mothers more than 18 years old. This result is accordance with other study (6). Whether this association simply reflects the deleterious socio-demographic environment of most pregnant teenagers or whether biologic immaturity is not known. Therefore, further research is needed in this field. On the other hand, although the percentage of cases' mothers whose age more than or equal 35 years old was more than this of controls, there was no significant association between LBW and mothers older than 35 year old. This is not matched with other studies (63).

Regarding the maternal age at marriage, the results revealed that more than two third of mothers of study population married before or at age 18. Meaning that the early marriage of females is the social and cultural preference in Palestinian society. Moreover there was positive association between LBW and early marriage of mothers, indicating that this result is consistent with the result of study which revealed the significant association between LBW and the young age of mothers.

Maternal education and occupation

The study identifies positive association between LBW and the maternal or paternal illiteracy. The conclusion could be derived from the result is that, the more educated mother can understand their own risks and recognize early and suspicious signs and symptoms associated with complications, and they can modify amenable risk factors as specific stresses, efforts and activities. In addition the quality of antenatal care which provided for the educated mothers could be better than for those mothers of less education level. Furthermore, maternal education may influence fertility rate, affects the age at marriage. Worth noting the risk of LBW also increased among unemployed mothers. The result of present study is consistent with what suggested by Poerksen and Pettit that employment leads to better social support and improved access to health care (69). Also the employee mothers have a higher educational level and socioeconomic status (70).

The results of this study demonstrate a significant negative association between the higher level of fathers' education and employment from one side and LBW from other side. Meaning that the families of fathers with high educational level and employee have a good socioeconomic status, which ensure less maternal stress and anxiety during pregnancy and guarantee good circumstances for mothers to care their pregnancy, to seek good and regular antenatal care and to gain sufficient weight during their pregnancy.

Family type, Social problems and stress

The association between LBW and family and social conditions and circumstances of mothers was evaluated. The study revealed significant association between LBW and all variables of family and social circumstances. The data presented by the present study shows that LBW is more prevalent among mothers who lived in extended family. Meaning that the living in extended family is a risk of getting LBW infant. This explained by that the mothers who live in extended family are more exposed for family and social problems and traumatic stress. Further more that the living in extended family could be indicator of low socioeconomic level of the family which increase the stress and anxiety of the mothers. In addition that the mothers who lived in extended family work in their home more for caring the family members, and this working characterized by high level of physical exertion which increased the risk of giving birth to a preterm LBW infants which is concordance with previous studies (67). Interestingly, that the current study also proved that the strong positive association between LBW and the tiredness which perceived by the mothers in their working in their homes which support that the living in extended family require more physical effort from mothers. Also the study support the previous explanation which clarified that the mothers who lived in extended family are more exposed to social and economic problems and stress by revealing the strong positive association between LBW from one side and family problems such as social and economic problems and maternal stress from other side. This is satisfying with the fact that stress leads to increased catecholamine excretion which will reduce the efficiency of caloric intake and reduced placental weight (74) and that stress can reduce women's ability to obtain adequate nutrition, rest, exercise, and medical care.

Consanguinity

Consanguineous marriage is the social and cultural preference in Palestine society. The result of the study revealed that consanguineous marriage much more prevalent in cases and an obvious and extremely pronounced positive association between LBW and consanguineous. The effect of consanguineous marriage on LBW is not known either directly or due to other conditions. Investigations of the influence of parental consanguinity on infants birth weight was matched with the study done in Gaza strip by El-Kariri Moaen (84). Worth noting that the results of El-Kariri study was similar to the current study regarding the percentage of parental consanguinity among LBW where it was 63.9% in El-Kariri study and 65.6% in the current study. Also the results of current study was concordant with other two studies conducted in Kuwait by El-Alfi (85) and in Iraq by Ramankuty in (131). Furthermore, it is important to mention that the study indicated that 31.2% of cases' mothers have a history of delivering LBW infants. This indicating that maternal genetic variations are likely to affect fetal growth. Therefore further investigations are needed to rule out hereditary LBW.

5.2 Maternal health status

Maternal health status during current pregnancy was assessed; the focus of the recall was on the complaining of mothers from specific diseases during the intended pregnancy and on the weight of mothers before pregnancy. Although the results from this study demonstrate a significant association between LBW and maternal somatic characteristics (height, weight, Body mass index), surprisingly there was no association between maternal health problems and LBW except the disorder of blood pressure.

Maternal Height

Previous studies have concluded that there is increase significantly in LBW when there is decrease in maternal height "less than 150 cm" (86). In the current study, the results were concordance to the results of previous study. There was strong positive association between short mothers (less than or equal 150 cm) and LBW. Most of studies explained the influence of maternal height on LBW by two theories, one of them consider the height as indicator of the nutrition of mothers during childhood (54,87). The other theory regards the maternal height a genetic factor that influences the birth of infant (88).

Maternal weight, body mass index, and weight gaining

The results of this study demonstrated that approximately 50% of mothers' cases are overweight according to BMI. Therefore there was positive association between overweight and obesity and LBW. The result is not surprising and merely reflects the fact that overweight and obese mothers could not practice physical

exercises. Exercising in pregnancy is thought to offer the mother the same benefits as in the non-pregnant state; cardio-respiratory, musclo-skeletal, metabolic and physiological well-being. In addition, the fetus may benefit from enhanced maternal physiological reserves (132). This is supported by the results of one study that found a decreased risk of SGA with moderate physical activity before pregnancy (133). Furthermore being over weight increases the risk of complications such high blood pressure and diabetes during pregnancy (91). In this respect, it is important to mention that there was no association between LBW and underweight. This result is not matched with other previous studies, which revealed that low pre-pregnant weight is associated with LBW, SGA, and preterm birth (89, 90). This point needs more clarification and investigation in future studies. In general the conclusion from the previous results, being a health body weight is important before pregnancy.

Because half of mothers of cases were overweight and obese, we consider that the minimum weight gaining that the mothers must gain during pregnancy is more than 7 kg, inspite of other studied showed that the mothers have to gain at least 10 kg during pregnancy, otherwise they will get fullterm LBW or SGA (92). The data, which generated from this study, revealed that approximately 50% of cases' mothers gain less than or 7 kg. Also there was strong positive association between LBW and the weight gaining less than or 7 kg during pregnancy. Other studies were concordance with this study in explanation the factors that affect weight gaining during pregnancy such as working hard work, poor nutrition status during pregnancy, and adolescent age during pregnancy (94, 95, 96). In addition the low educational level affect the weight gaining of mothers.

during pregnancy, which could reduce the negative impact of low hemoglobin level on infant growth. This free supply of iron for pregnant anemic women could also justify the mild degree of anemia among mothers of study population. Worth noting that hemoglobin level of pregnant women could help to assess the nutrition status of pregnant women during pregnancy. Therefore, the percentage of anemic mothers (56.8%) of study population indicated that there was poor nutrition status among them, but the positive intervention of antenatal care services of MOH and UNRWA by iron supplement policy hides unfavorable pregnancy outcomes associated with low hemoglobin level, which related to deficient maternal iron nutrition. So the reproductive health services need expanded program for prevention and treatment of malnutrition among pregnant women.

Blood pressure and Hypertensive states of pregnancy

According to the PIH diagnosed and reported in the file of pregnant mothers by the obstetrician, the results of the study showed there was no association between LBW and PIH, inspite of that the percentage of cases' mothers who were suffering from PIH is 2 times more than the percentage of the controls' mothers. This result is not matched with other study concerned in the same subject (103). But the explanation of this result could be to two reasons: first, good control of PIH by early diagnosis of the problem during pregnancy by antenatal care visiting and follow up and good management of diagnosed cases. The second factor is that the hypertension of mothers of study population could be low resistance hypertension that improved with simple treatment and change of lifestyle and is frequently associated with normal fetal growth (104). The last explanation was proved by the results of this study, which showed that the percentages of mothers

of cases or controls who diagnosed as Hypertensive mothers on the base of measuring the blood pressure of pregnant women at time of entering the reception room of obstetric department were nearly half the percentage of mothers diagnosed and known as PIH patients. Meaning that the hypertension of mothers with PIH was controlled and is not high resistant hypertension.

Another observation is that a significance association was apparent between abnormal maternal blood pressure (both hypotension and hypertension) and LBW. The result is consistent with previous studies in that abnormal maternal blood pressure either hypertension or hypotension causes utero-placental insufficiency specifically, high resistant hypertension (104). It is important to mention that in this study there were no associations between LBW and maternal hypertension alone or hypotension alone. This means that the follow up of mothers by antenatal care services and early detecting and managing of health problems such as hypertension or hypotension help in reducing unfavorable outcomes of pregnancy. In general, the previous results indicated that normal blood pressure is considered a protective factor for LBW. The normal blood pressure of pregnant women could be achieved easily, if the mothers visits antenatal care centers regularly.

Renal diseases

It has been found that there were no significant association between maternal renal diseases during pregnancy and LBW. Although the results indicated this relation, it is so important to mention that the association between LBW and renal diseases was weak, where the (p-value = 0.078). The other observation is that the percentages of mothers with renal diseases were approximately similar to the

percentages of mothers suffering from PIH (13.2% and 15.2% respectively). Also the p-value of both diseases with regarding to LBW are marginally significant (P = 0.078 for renal disease and 0.093 for PIH). Meaning that it is essential to recognize the correlation between renal diseases and hypertensive state among pregnant women and their impact on the pregnancy outcomes. Therefore further studies are needed in this field to explore the magnitude of the problem of renal diseases and hypertension among pregnant women.

Other disorders

The evidence provided by this study strongly suggests that there were no association between LBW and any health disorders or problems. These results could not matched with the global studies in the first impression. But the fact is because of the presence of good, available and accessible antenatal care in the health care system either in the MOH centers or in UNRWA centers. The study revealed that more than one quarter of the mothers of study population was suffering from at least one health problems. This percentage is not low, but in the same time reflects the tremendous and effective role of antenatal care in Gaza strip in reducing the bad impact of health problems and disorders on the outcomes of pregnancy.

The same observation had been reported in this study in concerning the association of LBW and each of maternal cardiac diseases, Pulmonary diseases, and diabetic mothers, where there were no association. Also the justification is attributed to the services of antenatal care. Finally it is observed in this study that there were no maternal hepatic problems among pregnant women. This point

needs more investigation by further studies because there could be defect in the diagnosis tools for the hepatic disorders.

5.3. Maternal habits and behaviors

Smoking and Caffeine Intake

No single mother reported that she is smoker in this study. But this result was approximately coincidence with the result of woman health and development department of Palestinian MOH, which revealed that percentage of Palestinian smoker women did not exceed 0.5% and most of them were 50 years old and more (134). But the most striking result in this study, the strong positive association between passive smoking and LBW. The results of current study revealed that the risk of getting LBW increased 2.4 times among the mothers exposed for passive smoking than those not. Also the risk of LBW increased 4.26 times among the mothers exposed for passive smoking in the same room than those not. This result was matched with other previous global studies (109, 110). Another observation is that a strong significant association between tea and coffee drinking from one side and LBW from other side. Inspite of that the percentage of tea drinking among the cases' mothers was approximately twice the percentage of coffee drinking among the cases' mothers (77.6%, 35.2%), but the p-value which reflects the significance of association between LBW and the other two variables was lower for coffee drinking (more significance). That's mean the association between LBW and Caffeine intake is dose-related association, where the concentration of caffeine is higher in coffee in comparison the same cup of tea. This is obviously observed in this study, where the positive association between the number of tea-cups or coffee cups and LBW is stronger than the positive

association between just drinking either coffee or tea and LBW. These results are in accordance with the results of OTIS, March of Dimes, and motherisk (112, 115).

Antenatal care visits and physician visits

The result has shown the negative association between antenatal care utilization and LBW. Worth noting, that 92.4% of mothers of study population had visited antenatal care center at least one time. This percent is approximately coincidence with the results of PCBS, 2000 that revealed 95.6% of pregnant women received antenatal care from skilled personnel (8). This reflected that antenatal care is considered as very important aspect in primary health care sector. Additionally, it indicated that the quality of antenatal care service is good and need more support and financial to continue and develop its activities properly. Also services are available and accessible for larger sector of women in Gaza Strip. It is observed that the pregnant mothers who did not visit antenatal care during the current pregnancy were more evidence among Cases' mothers 13.6% compared to 1.6% of controls. Further more the results demonstrated that the number and regularity of visiting antenatal care center is a protective factor from getting LBW infants. This result is matched with the study which showed that intermediate prenatal care in Portugal were less likely to have LBW baby than women with inadequate care (124). Also it is noted according to the previous results of this study the role of antenatal care in reducing and controlling the negative impact of maternal health problems (such as anemia, hypertension, and renal diseases) on bad pregnancy outcomes such as LBW. The study showed that the type of organization which provided the antenatal care services has significant association

with LBW. The study revealed the mothers who received antenatal care services from maternal-childhood health (MCH) centers of MOH or from UNRWA centers had less probability to get LBW infants than the mothers who received these services from other centers such as non-governmental health organizations (NGOS) or private sector. This also supported the previous interpretation, which assumed that the high percent of attendance of mothers in Gaza strip to antenatal care centers attributed to the high quality of these care services in MOH and UNRWA centers and because of accessibility to and availability of these sector for the widest sectors of pregnant women. This reflected the real status of the antenatal care centers in Gaza strip; where there are 28 centers provide antenatal care services from 43 centers of primary health care in MOH. These centers are distributed in the all governorates of Gaza (8).

On the other hand, the visiting of the physician during pregnancy had shown positive association with LBW. The possible explanations for this result are; first, the mothers of LBW infants who visited the physician could not visit the antenatal care centers at all or visited it irregularly. Therefore there was no continues and accurate follow up and management for those mothers especially those mothers were complaining of health problems during the pregnancy. Also it is observed that the percentage of cases' mothers who were suffering from any health problems was similar to those who visited the physician (29.6%, 28.8% respectively). This indicating those mothers were complaining from problems so they prefer to go directly to specialist in private clinics. This practice could be due to the defects of knowledge of those mothers to the content and the quality of services which provided by antenatal care in MOH or UNRWA and defects of their knowledge about the high risk pregnancy care which provided by MCH

clinics of MOH. So they loose the services and health promotion which could be provided for them by these clinics from one side and they could not keep continues attachment with their private physician because of the cost of care in private clinic and the low socioeconomic level of population from another sides. So it is necessary to conduct more studies and researches for evaluation of antenatal care services in MOH and UNRWA and comparing it with the services, which provided in NGOS and private sectors.

5.4. Gyno-obstetric conditions

The gyno- obstetric conditions of mothers was assessed by studying multiple variables reflected the age of mothers, parity, history of stillbirth and abortion, and the spacing between births. The study showed variation in the results, some of these results were accordance with other studies and literature reviews, the other were not. The early marriage of mothers was significantly associated with LBW. But there was no association between age of mother at first labor and LBW. This could be explained that those cases' mothers who married early delayed in pregnancy of first baby, because of some health, gynecological and behavioral problems. Those health and behavioral problems also affects the growth of baby when conception occurs as demonstrated in other studies (127). Therefore the delay of pregnancy among cases' mothers increased the percentage of those mothers among the cases' mothers who labor their first delivery at age 19 and more, so there was no significance association between LBW and age of mothers at first delivery, inspite of there was significant association between LBW and age of mother at marriage. Furthermore, the study did not show any significant association between the bad obstetric history of mother (history of abortion,

stillbirth, and dead siblings) and LBW. This explained that young age among cases' mothers was more than among controls' mothers, so those young mothers had not yet experienced previously obstetric problems as the controls' mothers.

Parity

The study showed that there was positive association between LBW and primigrvida (Previous nullparity). Where the percentage of mothers of LBW who were primigrvida (27.2%) was approximately double the percentage of controls' mothers who were primigravid (14.4%). This result was matched with other previous studies (126). The explanation of this result is that the primigrvida mothers usually be less mature physiologically and psychologically to conceive because of either being too young, or because the first pregnancy is considered a new experience for the mother that influence on her physical or psychological status, which in their role affect on the growth of fetus. Also it is observed in this study that the young age was more among cases' mothers than among controls' mothers. In addition the young age of cases' mothers explained the weak association between LBW and multiparity. Because of their young age, the average of their parity might be low. The mean of parity of cases' mothers was around 3 compared to around 4 for controls' mothers.

Birth interval

Previous studies have concluded that higher rates of LBW and preterm delivery have been associated with shorter intervals between pregnancies, and an interpregnancy interval less than nine months was associated with a significantly greater prevalence of preterm delivery and LBW (135). In this study

approximately the same result was concluded, where there was significant positive association between LBW and birth interval less than or equal one year (12 months). It is important to mention there is variation in definition the short birth spacing, where some studies considered the short interpregnancy interval less than 6 months (127), other studies defined it less than 9 months (135), and some studies considered it less than 2 years (136). The study considered the short birth interval one year and less. The overall conclusion from that was the birth spacing has a significant association with LBW and intermediate birth spacing more than one year and less than 3 years is considered a protective factor against LBW.

Vaginal bleeding

The result of study revealed a strong positive association between vaginal bleeding and LBW. This result was matched with previous studies which showed that vaginal bleeding in the first and subsequent trimesters is associated with 139g decrease in the mean birth weight (128). In addition there was association between the period of bleeding and LBW, where the risk of LBW increased if the vaginal bleeding occurred in the first trimester. This could be due to if the bleeding occurred in first trimester, the health of mother will be affected and that influenced the growth of children, in addition the bleeding in first trimester could persist for subsequent trimesters which aggravate the problems. In addition the direct effect of bleeding in impairment of placento- uteral flow due to hypovalemia which associated with bleeding. Moreover the gestational age could be shortened with vaginal bleeding (128).

5.5.Gestational age and Intra- uterine growth

Babies born with LBW are born either preterm or small for gestational age or both. There is increasing recognition that underlying mechanisms for the two causes of LBW are very different, although some risk factors are common to both. This has caused a plea to deal with these two health issues separately, especially from a research point of view. Because this research considered the first study conducted in Gaza strip concerned with maternal risk factors of LBW, it makes more sense to address both problems together in this study. This study considered as preliminary and exploratory study for other future studies can identify the most critical and important points need more investigation and studying in the field of LBW in Gaza. The results of this study demonstrated high positive association between LBW and each of intrauterine growth retardation and prematurity (gestational age less than 37 weeks). It is important to mention that LBW was more prevalent among small for gestational age babies (Intra uterine growth retardation) (66.7%) and most of them were full term and SGA (55.56%). Furthermore there was none of controls small for gestational age. This result was accordance with other global studies, which showed that intrauterine growth retardation is more predominant among LBW infants of developing countries than in developed countries (2,5). In the same time the results revealed that also that prematurity has significant positive association with LBW. Where 40.17% of cases were premature but most of them (31.62%) were appropriate for gestational and premature. This also supported the results, which demonstrated that the main cause of LBW in Gaza strip is intrauterine growth retardation. In view of above, it can be inferred that one of the most important contributing cause which require a

Conclusion and Recommendations

A number of maternal risk factors have been associated with incidence of LBW in Gaza are identified; these include Maternal Socio-demographic, health status, gyno-obstetric conditions, maternal habits and behaviors.

The major conclusion is derived from the results that, the traditional inverse association between LBW and most of Socio-demographic variables such as, young mother age at marriage and childbearing, mother and father literacy rate, parental unemployment, maternal residence and extended family, social problems, stress exposure and tiredness of mother due to heavy home care tasks during pregnancy, and consanguinity, appear to be common in the area and not only associated with LBW but other poor pregnancy outcomes. The major policy goal, therefore clearly implemented to prevent and improve the situation of women in community.

Some maternal health status has positive association with LBW such short maternal stature, maternal overweight and obesity according to BMI, and low weight gaining during pregnancy. This reflects that the poor nutrition of mothers during pregnancy leads to increase the risk of getting LBW infants. Although, anemia has no association with LBW, but the high prevalence of anemic mothers during pregnancy supports the role of poor nutrition status on the pregnancy outcome and the positive effect of iron supplementation for anemic pregnant women. The absence of association between most health problems and LBW in Gaza demonstrates the negative association between antenatal care and LBW.

Antenatal care services have a protective role against LBW incidence. So that antenatal care is considered as very important aspect in primary health care sector.

The content and quality of antenatal care services is proved by the role of this service in reduction of the negative impact of most maternal health problems (anemia, hypertension, and renal diseases) on poor pregnancy outcomes. In addition the availability of and accessibility to antenatal care centers of MOH and UNRWA is proved by the high percentage of antenatal care centers visiting. This reinforce the need for continues and more development and improvement of the quality and content of antenatal care services of MOH and UNRWA, and the need for collaboration and integration of both MOH and UNRWA organizations in the field of reproductive health. In addition increasing the awareness of the women in the community toward the importance and positive roles of antenatal care services should be concerned. On the other hand, the result provides the positive association between LBW and physician visiting in private clinics. Thus, the role of non-governmental health organizations (NGOS) and privet clinic services needs more evaluation and controlling.

Some maternal habits or behaviors such as high amount of coffee and tea drinking have negative impact on the health of mother and on the growth of fetus. Also the exposure of mother to smoking (passive smoking) has a positive association with LBW. This indicates the importance of health education of pregnant women and their husband to the negative impacts of passive smoking in health and growth of their fetus and the necessary of decreasing the amount of coffee and tea drinking during pregnancy.

Gyno- obstetric conditions of mother showed variation in results. Young maternal at marriage, primigravida, short birth interval, and vaginal bleeding during pregnancy reflected positive association with LBW. This indicated that the risk factors of LBW is more common among young women who are not mature

enough at level of physiology and psychology to experience new event in her life such as the pregnancy. Therefore efforts to enhance the overall quality of mother's life are needed. Furthermore the importance of inserting of the mental health among the services of antenatal care is increased.

The most valuable result of this study is that the major maternal risk factors associated with LBW are related to causes of intrauterine growth retardation more than causes of preterm delivery. This does not mean that preterm delivery has not association with LBW, but it highlights the necessity of direction of measures towards the prevention of intrauterine growth retardation by improving the situation and quality of life styles of woman in the community, increasing the awareness of women toward the services of antenatal care, and supporting the activities for improvement the quality of antenatal care services.

Recommendations

The prevention of LBW is a major challenge because it is a common public health problem, is not restricted to an easy identifiable group, has multiple risk factors and much uncertainly about the underlying causal mechanisms. Furthermore, LBW involves many health care providers and is not amenable to one simple effective intervention. Therefore, the researcher proposes several recommendations that could help in improving the situation and life styles of women in Gaza, which in its role reducing the maternal risk factors associated with LBW. Since, this is the first substantial study on LBW in Gaza, thereby; it may increase the awareness of health professional to the seriousness of problem.

- Enhancing and supporting the quality of activities of antenatal care centers of MOH and UNRWA especially those outside Gaza governorate, and expanding these services by inserting the antenatal care in all centers of primary health care to increase the accessibility and availability of services to all pregnant women.

- Increasing the cooperation and integration between antenatal care centers of MOH and UNRWA.

- Evaluating the quality of antenatal care services in the private and non-governmental sectors.

- Increase awareness of pregnant women about the valuable and substantial role of antenatal care in improving the health of pregnant women and preventing the negative pregnancy outcomes to motivate them toward regular visits of antenatal care.

- Setting an expanded program for prevention and treatment of malnutrition and anemia among women in general and particularly among pregnant women, and strengthening the nutrition programs for the public.

- Increasing the awareness of health professional toward short stature and overweight and obese women as risk factors of LBW.

- Increasing health awareness of public about the value of healthy nutrition and avoiding some social habits such as coffee and tea drinking, and exposing to passive smoking during pregnancy.

- Implementing several measures to decrease smoking among adolescent smoking, including school programs, mass media campaigns, and campaigns to restrict access to tobacco.

- Inserting the community-mental health program in the components of antenatal care.

- Increasing community awareness and counselling concerning the effect of early marriage, short pregnancy interval, and consanguineous marriage involving religious and community leaders.

- Integration of genetic counselling and services into primary health care / MCH.

- Improving the situation of women in the community by encouraging the high education of girls, and involving the women in all life fields and works through multidisciplinary cooperation among education ministry and other ministries.

- Reinforcement maternal education about high-risk signs of pregnancy such as the vaginal bleeding.

- Improving the birth registrations, and focusing on accurate reporting of birth weight in the health records and birth certificates.

- There was no previous valid and reliable data concerning the incidence of LBW. It is suggested that, the MOH should set rules and decisions for accurate reporting the birth in health records and birth certificates.

Research recommendations

- Conducting further studies and researches about the major risk factors associated with intra uterine growth retardation in first priority, and preterm labor in relation to LBW in Gaza strip and West Bank.

- Further studies are required to evaluate the quality of antenatal care in all different health organizations and the clients' perception and satisfaction towards the services of this care.

- Qualitative and quantitative studies of maternal nutrition during pregnancy are needed. The main factors affecting the maternal nutrition during pregnancy.

Chapter Seven

References

References

1-Hay, W., Fetal Growth and Development, in Encyclopedia of Reproduction, N.J. Knobil E,Editor. Academic Press: San Diego. 1998, p.p. 293-307.

2-Bahrman.Nelson Textbook of Pediatrics.14th Ed.W.B.Saunders 1992, p.442.

3-UNICEF-Sana'a. The situation of children and women in Republic of Yemen. Government Republic of Yemen.1984, p. 188.

4-WHO Document 0019h.Draft Guidelines for perinatal care for use in the countries of the South-East Asia region. 1989.

5-Ashworth A. Effects of intrauterine growth retardation on mortality and morbidity in infants and young children. Eur J Clin Nutr, 1998, 52:S1, S34-S42.

6-Barros-FC; Hulty-si;Victor CG;Kirkwood-BR;Vaughan-JP.Comparison of the causes and consequences of prematurity and IUGR;(BIBIOGRAPHIC CITATION): Pediatrics: Aug,1992(2ptl),p.p.238-44.

7-UNICEF. State of the world's children 1999.

8-Palestenian National Authority,MOH."The status of health in palestine".Annual report. Palestine, 2000.

9-Taeusch H. William & Yogmon Michael V. (eds). Follow up management of the High Risk Infant. Little, Brown & Co Boston, 1987.

10-Nancy B. Leidenfrost. National program leader Extension Service, USDA, "Definition of Low Birth Weight". February1993.

11-Sohely Yasmin, David Ostrin, Elizabeth Paul, and Anthony Costello. Neonatal mortality of low birth weight infants in Bangladesh. Bulleetin of the World Health Organization, 2001, 79: p.p. 608-614.

12-Han, V., Intrauterine growth restriction and mechanisms of fetal growth, in Encyclopedia of Reproduction. Academic Press, 1999, p.p. 877-892.

13-Bernstein PS, D.M., Etiologies of fetal growth restriction. Clinical Obstetrics and Gynecology, 1997, 40(4): p.p. 723-729.

14-Alkalay, A., Intrauterine Growth Retardation. http://www.neonatology org/syllabus/iugr.html. 1999.

15-Creasy RK, R.R., Intrauterine Growth Restriction, in Maternal-Fetal Medicine Principles and Practice. W B Saunders Company: Philadelphia, 1994, p.p. 558-574.

16-Cunningham FG,M.P.,Gant NF, Leveno KJ, Gilstrap LC, ed. Williams Obstetrics, 19th ed. Appleton and Lange; Normalk, 1993,p.p 853-882.

17-Mecormic M etal, Factors aasociated with smoking in low income pregnant women. Jclin Epidemiol, 1990, 43: p.p.441-448.

18-Villary, Belizanj. The relative contribution of prematurity and fetal growth retardation to low birth weight in developing and developed societies. Amj obstet. Gyncol, 1982, p.143,793.

19-National Center for Health Statistics (NCHS). Births, Marriages, Divorces, and Death, 1997. MVSR 1998 Jul.28,p.46 (12).

20-Ventura SJ, Martin JA, Curtin SC. Report of final Natality statistics, 1996. MVSR 1998 Jun,30, (11s) p.46.

21-Ann Sprague, Paula Stewart, Prevention of low birth weight in Canada 1993, Best start resource center , Preterm Birth Prevention Conference, Ottawa, April 1998, 2nd edition.

22-The Health of Canada's Children: a CICH profile, 3rd edition.

23-O.E.C.D. Health Data 98: A comparative analysis of 29 countries. Trends in Low Birth Weight. Health Canada, 1998.

24-World Health Organization. World Health Statistics Quartery. 1211 Genev27, Switzerland 1980, 33:p.p. 197-224.

25-A.R. Jurjust, Associate Professor, Department of Human Morphology, Faculty of Medicine, American University of Beirut, Beirut , Lebanon, Low Birth Weight in Lebanon: a morphological partner and a health status indicator, Eastern Mediterranean Health Journal, ,1995 , Vol. 11 (2).

26-Ibrahim M M et al. Save the children: State of The World' Newborn.Bull WHO, 1996,74 (5):p.p. 547-552.

27- Palestinian Central Bureau of statistics.Health Survey, Palestine, 2000 November.

28-Shanti Amjad, Candid of master of Public health, School of Public Health, Al-Quds University, Gaza. Epidemiology of Neonatal Death in Gaza 2001, unpublished Project as a partial requirement for the Degree of Master of Public Health. May,2001.

29-Maureen Hack, Nancy K. Kelin, H. Gerry Taylor. Long-Term Development Outcomes of Low Birth Weight Infants. The Future of Children. Spring 1995, Vol 5 (1).

30-S. Arsan, Neonatology, University of Ankara, Turkey, A.W. Brann, Emory University School School of Medicine, Atlanta, United States of America, et al. Essential Newborn Care.Report of Technical Working Group.Trieste, Italy, 1999 April, 25-29.

31-Joseph Cristopher, DDS. http://floss.com/underweight babies linked to gum.htm. of Underweight Babies Linked to Gum Disease. University of North Carolina, Chapel Hill, Journal Peirodontology, 1996,October.

32-Monica Brown, RN, CCRN, Liza de Guzman, RN, CEN. It's A Small, Small World: Transport of Extremely Low Birth Weight. ALNW Flight Nurses. University of Washington Medical Center.1999.

33-Teplin, S.w., Burchinal,M.,Jonson-Martin,N., Neurodevelopmental,health,and growth status at age 6 years of children with birth weights less than 1001 grams. Journal of Peadiatrics,1991,118:p.p.768-77.

34-Scottish Low Birth Weight Group. The Scottish low birth weight: 1. Survival, growth,neuromotor and sensory impairment. Archives of Diseases in Childhood, 1992, 67:p.p. 675-81.

35-McCormick, M.C., Brooks-Gunn, J., Workman-Daniels, K. The health and developmental status of very low- birth- weight children at school age. Journal of the american Medical Association,1992, 267:p.p.2204-8.

36- Saigal, S., Szatmari, P., Rosenbaum, P. Cognitive abilities and school performance of extremely low birthweight children and matched term controls at age 8 years: A regional study. Journal of Pediatrics, 1991, 118: p.p.751- 60.

37-Halsey, C.L., Collin, M.F., and Anderson, C.L. Extremely low birth weight children and their peers: A comparison of preschool performance. Pediatrics, 1993, 81:p.p. 807-11.

38-Ornestin, M., Ohlsson, A., Edmondds, J., and Asztalos, E. Neonatal follow –up of low birthweight/ extremely low birthweight infants to school age: A critical overview. Acta peadiatrica Scandinavica, 1991, 80:p.p. 741- 48.

39-Petersen, M.B., Greisen, G., Kovacs, R. Status at four years of age in 280 children weighing 2,300 g or less at birth. Danish Medical Bulletin, 1990, 37:p.p. 546-52.

40-Breslau, N., Klein, N., and Allen, L. Very low birthweight: Behavioral sequelae at nine years of age. Journal of the American Academy of Child and Adolescent Psychiatry, 1988, 27,5:p.p. 605-12.

41-Ross, G., Lipper, E.G., and Auld, P.A.M. socialcompetence and behavior problems in premature children at school age. Pediatrics, 1990, 86 p.p. 391-97.

42- McCrmick, M.C., Gortmaker, S.L., and Sobol, A.M. Very low birth weight children: Behavior problems and school difficulty in a national sample. Journal of Pediatrics, 1990, 117: p.p. 678-93.

43- Szatmari, P., Saigal, S., Rosenbaum, P. Psychiatric disorders at five years among children with birthweights< 1000 g: A regional perspective. Developmental Medicine and child Neurology, 1990, 32:p.p. 954-62.

44-Chan, K.N., Elliam, A., Bryan, E., and Silverman, M. Respiratory symptoms in children of low birth weight. Archives of Disease in childhood, 1989, 64:p.p. 1294- 1304.

45-McMcormick, M.C., Workman- Daniels, K. Brooks-Gunn, J., and Peckham, G.J. Hospitalization of very low birth weight children at school age. Journal of Pediatrics, 1993, 122:p.p. 360-65.

46-Mansell, A.L., , Driscoll, J.M., and James, L.S. Pulmonary follow- up of moderately low birth weight infants with and without respiratory distress syndrome. Journal of Peadiatrics, 1987, 110:p.p. 111-15.

47-Hack, M., Merkatz, I.R., McGrath, S.K. Catch –up growth in very low birthweight infants: Clinical correlates. American Journal of diseases of Children, 1984, 138:p.p. 370- 75.

48- Gordon, C.S., Smith, M.D., Malcolm, F.S., smith, Margret, B., McNay and John, E.E. Results of the ultrasound survey,which measured the fetal size of babies born at the Queen Mother's Hospital in Glasgow over a 10- year period. New England Journal of Medicine,1998.

49-Doubilet PM, Benson CB. Sonographic evaluation of intrauterine growth retardation. AJR Am J Roentgenol 1995;164:709-17.

50-Hadlock F. Ultrasound evaluation of fetal growth. In: Callen P, ed. Ultrasonography in obstetrics and gynecology. 3d ed. Philadelphia: Saunders, 1994; p.p. 129-42.

51-Queenan JT, ed. Management of high-risk pregnancy. 3d ed. Boston: Blackwell Scientific, 1994, p.p. 402-12.

52-Ferrazzi E, Bellotti M, Vegni C, Barbera A, Della Peruta S, Ferro B, et al. Umbilical flow waveforms versus fetal biophysical profile in hypertensive pregnancies. Eur J Obstet Gynecol Reprod Biol 1989;33: p.p. 199-208.

53-Kazzi GM, Gross TL, Sokol RJ, Kazzi NJ. Detection of intrauterine growth retardation: a new use for sonographic placental grading. Am J Obstet Gynecol 1983;145: p.p. 733-7.

54-Unicef Statistics. Unicef End Decade Database. Low Birthweight. http: //childinfo .org/edab/lbw.

55-Ali TE, Burnside EB, Schaefer. Relationship between external body measurements in Canadian Holstein Frisian cattle. Dairy Sci 1984, 67: p.p. 3034-44.

56-Rasheed P. Rahman J. Anthropometry of Saudi neonates. Saudi Med J 1991;12(3):p.p. 191-5.

57- Diamond ID, Abd El-Aleem AM, Ali MY et al. The relationship between birth weight, and arm and chest circumference in Egypt. J Trop Paediatr 1991,37: p.p. 323-6.

58-Allison, M.Fraser, M.S.P.H., John, E. Brockert, M.P.H., and R.H. Ward, Ph.D. Association of Young Maternal Age With Adverse Reproductive Outcomes, The New England Journal of Medicine, April 27,1995, 332 (17): p.p. 1113-1118.

59- Elena, F.A., MD, MPH, of UCSF, and Nancy Hessol, MSPH. Older Maternal Age Affects Risk of Low Birth Weight Infants Among Latinas. University of California. UCSF'S Electronic Daily day break news, 17 May, 2000.

60- Alma, M., Sadam, Ph.D., R.D., Extension Specialist, Nutrition. Staying Healthy During Pregnancy, Ohio State University. Extension Fact Sheet. Family and Consumer Sciences, MOB-002-99.

61-Ventura, S.J., Martin, J. A., Manthews, T. J. and Clarke, S.c. Advanced Report of Final Natality Statitistics. Monthly Vital Statistics Report. National Center for Health Statistics, 1994, Vol 44 (11).

62-Nancy, A., Hessol. Department of Medicine, University of California San Francisco, Risk of Low Birth Weight Infants Among Black and White Parents. Obsetrics and Gynecology J, Nov 1998, 92: p.p. 814-822.

63-Bianco, A. Pregnancy outcome at age 40 and older. Obstetrics and Gynecology, June 1996, 87(6):p.p. 917-922.

64-Aldous, M., Edmonson, B. Maternal age at first childbirth and risk of low birthweight and preterm delivery in Washignton State. Journal of the American Medical Association, march 8, 1990, 270 (10): p.p. 659-664.

65-Gabbe, S. & Main, D. (1988). Reproductive problems associated with life-style, work and hazards in the work place. In D. Hollingsworth & R. Resnik (Eds.), Medical counselling before pregnancy (Chapter 5). New York: Churchill Livingstone.

66-E. PapiernikM.D.,JBouyer.Ph.D,J.Dreyfus,NI.D.,D.Coflin,M.D.,G. Winisdorffer. Prevention of Preterm births: A perinatal study nin. In Haguenaw, France. Pediatrics. August 1985, Vol 76 (2).

67-Armstrong, B., Nolin, A. & McDonald, A. Work in pregnancy and birthweight for gestational age. British Journal of Industrial Medicine, 1989, 46: p.p. 196-199.

68-Henriksen, T.B., Hedegaard, M., Secher, N.J. & Wilcox A.J. Standing at work and preterm delivery [abstract] Br J Obstet Gynaecol, 1995, 102(3): p.p. 198-206.

69-Poerksen, A. & Petitti, D. Employment and low birthweight in black women. Social Science and Medicine, 1991, 33(11): p.p. 1281-1286.

70-Klebanoff, M., Shiono, P. & Carey, C. The effect of physical activity during pregnancy on preterm delivery and birth weight. American Journal of Obstetrics and Gynecology, 1990, 163:p.p. 1450-1456.

71- Novbin, J. Saint Paul, Ramsey county Department of Public Health. Low Birth Weight Report For The City Saint Paul (1995-1997), March 2000.

72-Colin, C. Nature egaux et en sante: Quebec. Ministere de la sante et des services sociaux. Governement du Quebec, 1989.

73-AMJ. Obstet.Gynecol. 1993, 169: p.p. 858-65.

74-Pathic D.wadhwa,MD,phD,curt A,Sandman,phD,and thomasJ.Garit, mD.the association between prenatal stress and infant birth weight and gestational age at birth :A prospective investigation February of 8-13,1993.

75-Amaro, H., Fried, L.E., Cabral, H., and Zuckerman, B. Violence during pregnancy and substance use. American Journal of Public Health, 1990, 80(5): 575-579.

76-Berenson, A.B., Wiemann, C.M., Wilkonson, G.S., Jones, W.A., and Anderson, G.D. Perinatal morbidity associated with violence experienced by pregnant women. American Journal of Obstetrics and Gynecology, 1994, 170(6): p.p. 1760-1769.

77-Curry, M.A., Perrin, N., and Wall, E. Effects of abuse on maternal complications and birth weight in adult and adolescent women. Obstetrics and Gynecology, 1998, 92(4 Pt. 1): p.p. 530-534.

78-Berrenson, A.B., Weimann, C.M., Rowe, T.F., and Rickert, V.I. Inadequate weight gain among pregnant adolescents: Risk factors and relationship to infant birth weight. American Journal of Obstetrics and Gynecology, 1997, 176(6): p.p. 1220-1224.

79-.Wadhwa, P.D., Dunkel-Schetter, C., Chicz-Demet, A., Porto, M., and Sandman, C.A. Prenatal psychosocial factors and the neuroendocrine axis in human pregnancy. Psychosomatic Medicine, 1996, 58(5): p.p. 432-446.

80-.Istvan, J. Stress, anxiety and birth outcomes: A critical review of the evidence.PsychologicalBulletin, 1986, 100: p.p.331-348.

81-Campell, J.C. Addressing battering during pregnancy: Reducing low birth weight and ongoing abuse. Seminars in Perinatology, 1995, 19(4): p.p. 301-306.

82-Valdez-Santiago, R. and Sanin-Aguirre, L.H. Domestic violence during pregnancy and its relationship with birth weight. Salud Publica Mexicana, 1996, 38(5): p.p. 352-362.

83-Bullock, L. & McFarlane, J. The birth-weight battering connection. American Journal of Nursing, 1989, p.p. 1153-1155.

84-El-Kariri, M. Customary Consanguineous Marriages, and its impacts in Gaza Strip, Athesis submitted fullfillment of the requirement for the degree of Master of Public Health. Al-Quds University, 1990.

85-El-Alfi, O.S. Birth weights in Kuwait and their relation to consanguinity and to birth order. Journal of the Kuwait Medical Association, 1969, 3: p.p. 227-231.

86-Olcay Neyz, Hully Gunoz, Asuman Celenk, Aygun Dinard, Ruveyde Bundak, and Hullya Saglan. Relationship between some maternal factors and pregnancy outcomes. Department of pediatrics, Faculty of Medicine, Capa, Istanbul- Turkey.

87-Dora Costa, NBR, Faculty Research Follow. A long- Term Comparison of Income and Birth Weight. NBER Working Paper , 1988, No. 6313.

88-Irvin Emanuel. Causes of Poor Pregnancy Outcomes. CHDD research, 1979.

89-Al-Eissa, Y.A. & Ba'Aqueel, H.S. Risk factors for spontaneous preterm birth in a Saudi population. Eur J Obstet Gynecol Reprod Biol , 1994, 57(1): p.p. 19-24.

90-Arbuckle, T., Sherman, G., Kawamoto, Y, & Myers, A. Predictors of birth weight from the nutrition Canada follow-up cohort. Pediatric and Perinatal Epidemiology, 1989, 3:p.p. 115-129.

91- British Nutrition Foundation (BNF), Pregnancy,http://www.org.uk. /facts/ dietthrulife/ pregnancy.html, 1998.

92-Chomitz, V., Lieberman, E. & Cheung, L. Healthy mothers - Healthy beginnings. A white paper. Boston: Harvard School of Public Health, 1992.

93-Groff, J.Y., Mullen, P.D., Mongoven, M., & Burau, K. Prenatal weight gain patterns and infant birth weight associated with maternal smoking. Birth, 1997, 24(4): p.p. 234-239.

94-Hickey, C.A., Cliver, S.P., McNeal, S.F., Hoffman, H.J. & Goldenberg, R. Prenatal weight gain patterns and birth weight among nonobese black and white women. Obstetric & Gynecology, 1996, (4 Part 1) p. 88.

95-Kramer M.S. Preventing preterm birth: are we making progress? Yale J Biol Med, 1997, 70(3): p.p. 227-232.

96-Hediger, M., Scholl, T., Ances, I., Belsky, D. & Salmon, R. Rate and amount of weight gain during adolescent pregnancy: Associations with maternal weight-for-height and birth-weight. American Journal of Clinical Nutrition, 1990, 52: p.p. 793-799.

97-Halton Region Health Department. Prevention of Low Birth in Canada. Canaadian Institute of Child Health, Ontario MOH. Healthdept@ region. halton. on. ca., 1993.

98-Lang J, Lieberman E, Cohen A. A comparison of risk factors for preterm and term small- for- gestational – age birt. Epidemiology, 1996, 65(5): p.p. 663- 737.

99-Derek Lieweilyn-Jones. Fundamentals of Obstetric and Gynaecology.5th Ed. Wdf Publishing.1992 volume (1).

100-T.L.T.Lewis,G.V.P.Champerlain.Obstetrics by Ten Teatchers.15thEd.Edward Arnold. 1993.

101-WHO ,Organisation Mondiale DE LA SANYE. Uses of birth-weight data in public health planning and practice.

102-Weatherall, A.J.,Leadingham, J.G.G.and WarneR, D.A. Oxford textbook of medicine (Ist Ed as single volume). 1984.

103-Hyten and Leitch .1971.

104-Tomas R.Eastrling, MD, Tomas J.Benedetti, M.D., Karen C. earlson, R.N., Debra A.Braten, R.N., Judy Wilson,R.N.,and Barbars.The effect of maternal haemodynamics on fetal growth in hypertensive pregnancies llthEd. Annual meeting of society of perinatal obstetricians, ,Sanfransisco,California,January28-Feb.2,1991.

105-Block, S.B.,Lanos,A.J. and Crasy,A.K. Responses of the growth-retarded fetus to acute hypoxemia American Journal of Obs. and Gyn., 1984, 184: p.p. 878-885.

106-Onaltingius,SCAxelsson,oo,Eklund,G.,Lindmark,Go, smoking, maternal age, and fold growtli;Obstetrics and Gynecology1985, 66: 449-451.

107- Mac- Donald, A.D, ArmstrongB.G.Soalm,M., Cigarette, Alcohol, and Coffe consumption and prematurity. American Journal of Pediatric health. 1992, 82: p.p. 87-90.

108-Haddow E., Knight,G.'i'.JUoza,E.M.,Polomaki,and N.J., continine, assisted intervention in. pregnancy to reduce smoking and birth weight delivery. British Journal of Pediatrics and Gynecology, 1991, 98: p.p. 859-865.

109-Ellard G.A., Johnstone F.D., Prescott R.J., Ji-Xian W., & Jian-Hua M. Smoking during pregnancy: the dose dependence of birthweight deficits. Br J Obstet Gynaecol, 1996, 103(8): p.p. 806-813.

110-Ahluwalia, I.B. , Grummer-Strawn, L & Scanlon, K.S. Exposure to environmental tobacco smoke and birth outcome: increased effects on pregnant women aged 30 years or older. Am J. Epidemiology, 1997, 146(1): p.p. 42-47.

111-Fortier I., Marcoux S. & Brisson J. Passive smoking during pregnancy and the risk of delivering a small-for-gestational-age infant. Am J Epidemiology, 1994 139(3): p.p. 294-301.

112-OTIS, March of Dimes, and Motherisk program. Caffeine and Pregnancy.U.S. Food and Drug Administration and National Soft Drink Association. May,2002.

113-Infante-Rivard C, Fernandez A, Gauthier R. Fetal loss associated with caffeine intake before and during pregnancy. *JAMA* 1993, 270: p.p. 2940–3.

114-Klebanoff MA, Levine RJ, DerSimonian R. Maternal serum paraxanthine, a caffeine metabolite, and the risk of spontaneous abortion. *N Engl J Med* 1999;341: p.p. 1639–44.

115-Fernandes O, Sabharwal M, Smiley T. Moderate to heavy caffeine consumption during pregnancy and relationship to spontaneous abortion and abnormal fetal growth: a meta-analysis. *Reprod Toxicol* 1998;12: p.p. 435–44.

116-Caffeine in pregnancy. Rockville, MD: Food and Drug Administration, 1981, FDA: p.p. 81–1081.

117-Clarren, S. Alcohol-related birth defects: The clinical situation as defined over 15 years of experience. Proceedings Alcohol and Child/Family Health. Vancouver, 1988.

118-Virji, S. The relationship between alcohol consumption during pregnancy and infant birthweight. Acta Obstetricia et Gynecologica Scandinavica, 1991, 70: p.p. 303-308.

119-Faden V.B., Graubard B.I., & Dufour M. The relationship of drinking and birth outcome in a US national sample of expectant mothers. Paediatr Perinat Epidemiol, 1997, April, 1(2): p.p. 167-180.

120-Driscoll, C., Streissguth, A. & Riley, E. Prenatal alcohol exposure: Comparability of effects in humans and animal models. Neurotoxicology and Teratology, 1990, 12: p.p. 231-237.

121-Dattel, B. Substance abuse in pregnancy. Seminars in Perinatology, 1990, 14(2): p.p. 179-187.

122-Behrman, R. Preventing low birth weight. Summary. Division of Health Promotion and Disease Prevention Institute of Medicine. Washington, DC: National Academy Press, 1985.

123-Hulsey, T., Patrick, C., Alexander, G. & Ebeling, M. Prenatal care and prematurity: Is there an association in uncomplicated pregnancies? Birth, 1991, 18(3): p.p. 146-150.

124-Barros, H., Tavares, M. & Rodrigues, T. Role of prenatal care in preterm birth and low birthweight in Portugal. J Public Health Med, 1996, 18(3): p.p. 321-328.

125-Musaiger A.0., El-samani,F.Z., Demographic and Maternal factors Predicting the birth weight of full term babies Saudia Medical Journal, 1991,12: p.p. 84-88.

126-B.D.Glukman and JE Hording. Nutritional and hormonal regulation of fetal growth - evolving concepts, university of Ankland, Ankland, newzland. Actapediatric Journal, 1994, 399: p.p. 60-63.

127-Kaarlela C. UCSF Study Finds Length of Time Between Pregnancies Can affect Health of Baby,University of California, UCSF's Electronic Daily daybreak news, June17, 1998.

128-Williams, PLA, Pletendorf.R, Lieberman, E.and Mansor R. Advanced infant outcomes associated with first trimester vaginal bleeding. Obs. and Gyn, 1991,78: p.p. 14-18.

129-Palestine National authority, Palestinian Central Bureau of Statistics. Population, housing, and establishment census,1997. Final results of population report, May,1999, SRS:017.

130-Gamal N. Low Birth Weight, Manual of Pediatrics, p. 12.

131-Ramankutty, P. Astudy of birth weight of Iraqi Children. Journal of tropic Paediatrics,1983, 29: p.p. 5-10.

132-Wolfe, L., Hall, P., Webb., K., Goodman, L., Monga, M. & McGrath, M. Prescription of aerobic exercise during pregnancy. Sports Medicine, 1989, 8(5), 273-301.

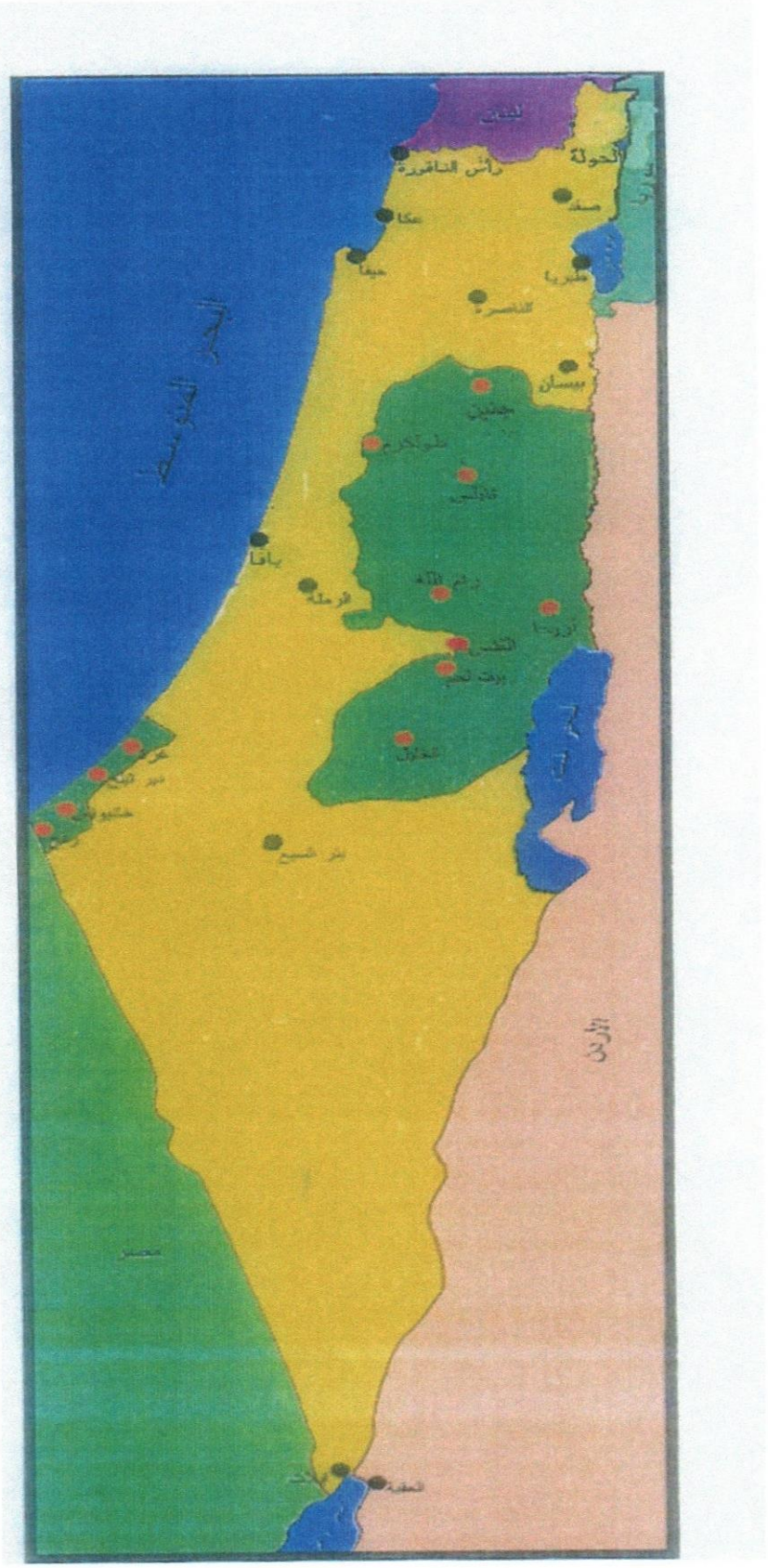
133-Stewart, P.J., Dulberg, C., Niday, P., Nimrod, C. & Tawagi, G. Population attributable risk for prematurity and small for gestation age babies. Final report, 1994.

134-Palestinian National Authority. Palestenian Women Status in gaza. Women Health Development Directorate, MOH, 1998.

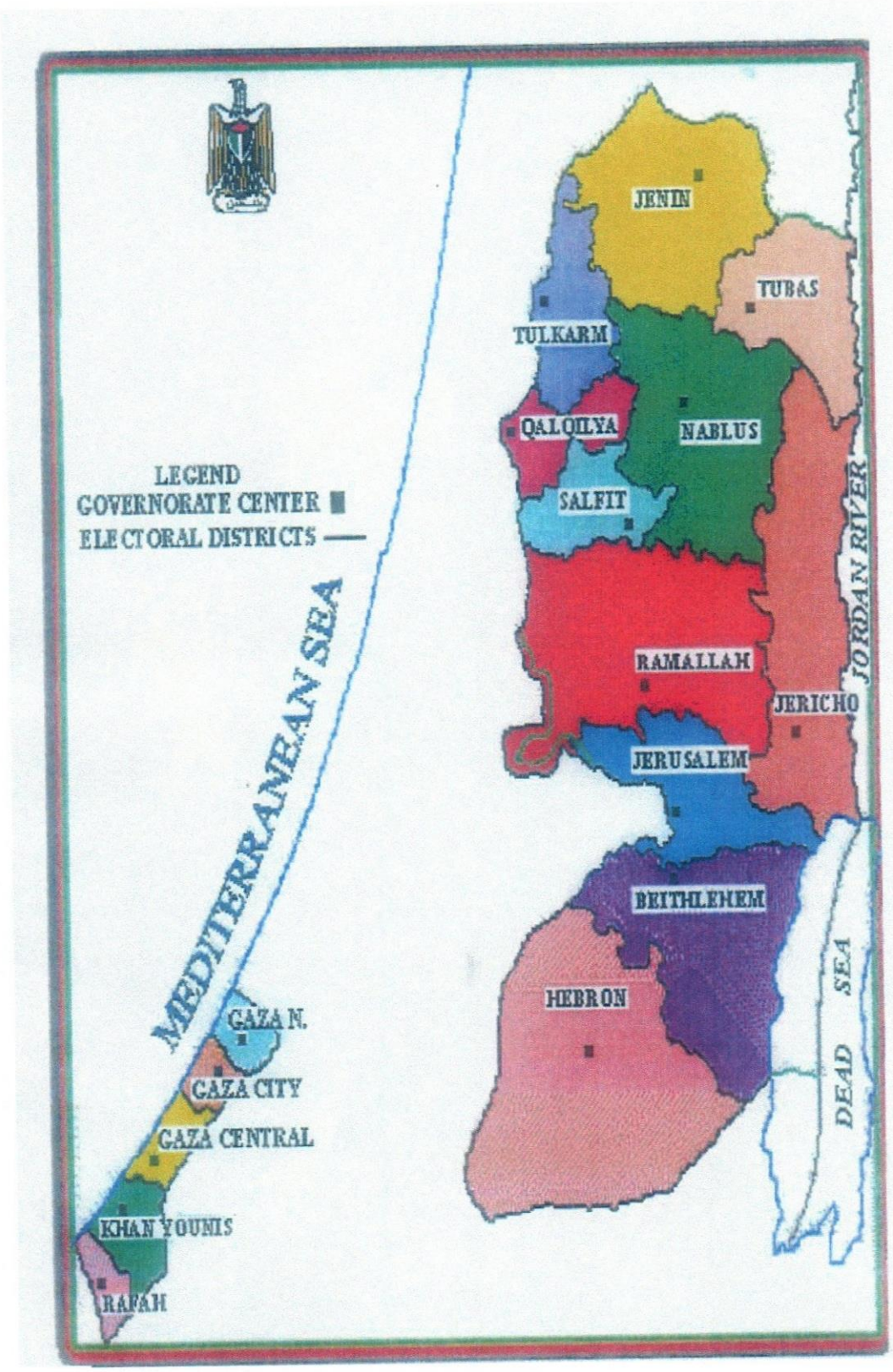
135-James S. Rawlings, M.D., Virginia B. Rawlings, R.D., M.S.P.H., and John A. Read, M.D. Prevelance of Low Birth Weight and Preterm Delivery in Relation to the Interval between Pregnancies among White and Black Women. The New England Journal of Medicine, January, 12, 1995, 332 (2): p.p. 69-74.

136-Hussein M., Professor of Gynaecology and obstetrics, Cairo University. Obstetrics, Cairo.

Appendix 1 Map of Palestine

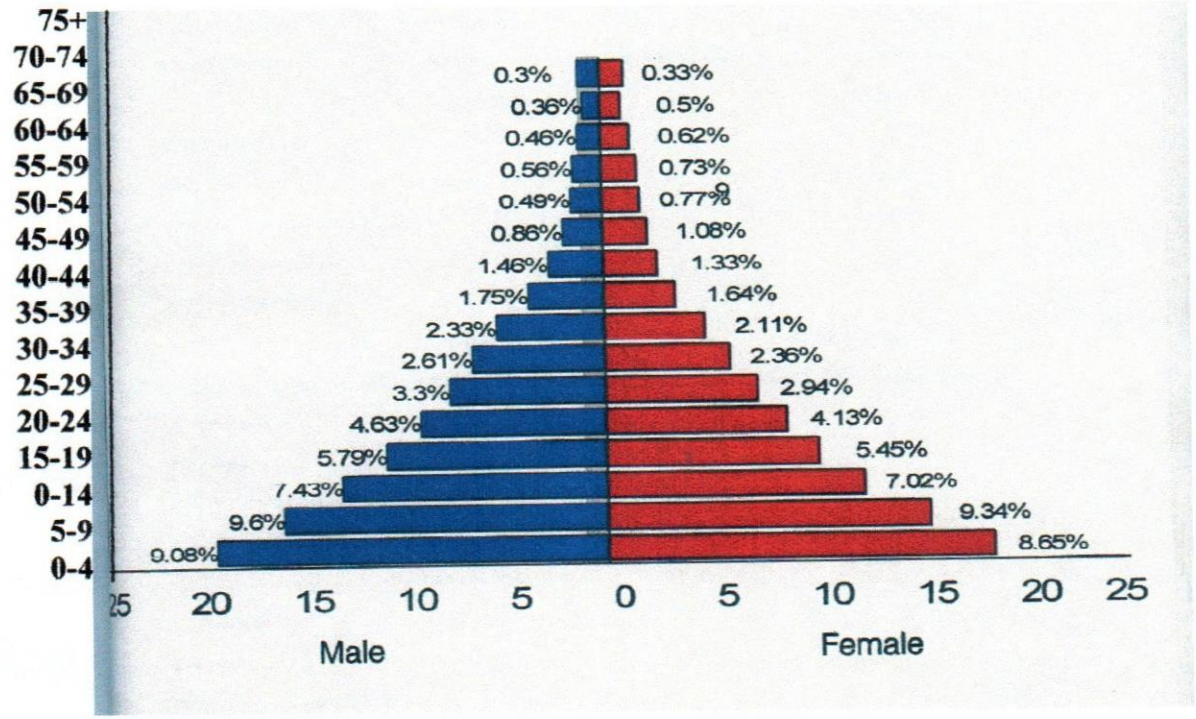


Appendix 2 Map of Gaza and west Bank Governorates



Appendix 3 Population pyramid

Appendix 3 Population pyramid



Appendix 4 Representative Sample Formula

- **Formula to calculate sample size for single binomial parameter:**

$SE = SD / \sqrt{n}$

$SE = \sqrt{p)\,(q)} / \sqrt{n}$

$SE\,(p) = \sqrt{p\,(1-p)/\,n}$

So, if P= 8.5% i.e. p= 0.08 and q = 1- p =0.92

And if D (difference) = 0.05

$\therefore D = Z \times SE.$ So, $D = 1.96 \times SE = 1.96 \times \sqrt{p\,(1-p)/\,n}$

$0.05 = 1.96 \times \sqrt{0.08 \times 0.92/n}$

$\therefore n = (1.96)^2 \times (0.08 \times 0.09)/\,(0.05)^2$

By calculation, n = 113.

N.B:

D	Difference.
P	Prevalence of disease.

Appendix 5.1

بسم الله الرحمن الرحيم

مقدمة الاستبانة

هذه الدراسة حول العوامل التي تؤدي إلى ولادة أطفال أقل من الوزن الطبيعي في قطاع غزة يقوم بها الباحث أمجد فتحي الشنطي، وهو طبيب و باحث في جامعة القدس.نأمل أن تشاركينا في هذه الدراسة بتزويدنا ببعض المعلومات التي تخدم الدراسة وبالتالي تمكن الباحث من تحديد العوامل التي تؤدي إلى ولادة أطفال أقل من الوزن الطبيعي في بلدنا، حتى نجد لها حلول في المستقبل تحد من هذه المشكلة وننجب أجيال أصحاء يحمون ويخدمون فلسطيننا بسواعدهم العفية، علماً أن المعلومات التي نتحصل عليها معلومات سرية وخاصة لا يطلع عليها سوى الباحث و أن النتائج ستكون عامة بشكل معدلات وأشكال إحصائية لا تحتوي على أسماء ولا عناوين.

الطبيب الباحث/ أمجد الشنطي.

Appendix 5.1

Al-Quds University
Jerusalem

School of public health

جامعـــة القـــدس
القـــــدس

كلية الصحة العامة

استبيان حول الأطفال حديثي الولادة ذي الأوزان الأقل من الطبيعي

الجزء الأول: بيانات من ملف الحالة.

- مستشفى----------.
- رقم الملف---------- ▪ رقم كرت متابعة الحمل----------.
- الرقم المسلسل---------- ▪ رقم الحالة----------.
- نوع الحالة : ▪ case ▪control
- اسم الأم----------.
- عمر الأم----------.
- عنوان السكن الدائم----------.

▪مدينة ▪ قرية ▪ مخيم

- وزن الطفل عند الولادة----------جم.
- جنس الطفل: ▪ ذكر ▪أنثى
- تاريخ الولادة: يوم------- ------/------/----------.
- وقت الولادة:----------.
- نوع الولادة: ▪طبيعية ▪ قيصرية ▪ آخر----------.
- التشخيص النهائي: ----------

الجزء الثاني: بيانات من الأم عن طريق المقابلة.

١-ضغط دم الأم عند دخولها غرفة الولادة----------مم زئبقي.

٢-طول الأم عند دخولها غرفة الولادة ----------سم.

٣-وزن الأم عند دخولها غرفة الولادة----------كجم.

٤-هل تعرفين وزنك قبل الحمل؟----------كجم.

٥- نسبة الهيموجلوبين عند الولادة----------. فصيلة الدم----------.

٦-كم كان عمرك عند الزواج؟----------سنة.

٧-كم كان عمرك عند الولادة الأولى؟----------سنة.

٨-هل التحقت بالمدارس؟ ▪نعم ▪لا

٩-إذا نعم: كم عدد سنوات الدراسة التي أتممتها؟----------سنة.

١٠-هل تعملين بوظيفة مدفوعة لأجر؟ ▪نعم ▪لا

١١- ما هي طبيعة عملك؟----------.

١٢-هل تشعرين بإجهاد جسدي أثناء العمل؟ ▪نعم ▪لا

١٣-هل زوجك ألتحق بالمدارس؟ ▪نعم ▪لا

١٤-كم عدد سنوات الدراسة التي أتمها؟----------سنة.

١٥-هل زوجك يعمل؟ ▪نعم ▪لا

١٦-إذا نعم، ما هي طبيعة عمله؟----------.

١٧- هل هناك قرابة بينك وبين زوجك؟ ▪نعم ▪لا

*إذا نعم: درجة القرابة؟ ▪قرابة درجة أولى "أبنا عم،عمة،خال،خالة ▪قرابة درجة ثانية" من العائلة"

١٨-كم مرة حملت قبل هذه المرة؟----------.

١١٩- كم منهم ولدوا أحياء؟----------.

٢٠-كم منهم ولدوا أموات؟----------.

٢١-كم مرة حصل إجهاض؟----------.

٢٢-كم من أطفالك الذين ولدوا أحياء بقوا أحياء؟----------.

٢٣-متى كانت آخر دورة شهرية؟-----/-------/----------.

٢٤-كم استمرت فترة هذا الحمل؟----------أسبوع.

٢٥-كم كانت الفترة بين ولادتك السابقة و بداية هذا الحمل؟----------شهراً.

٢٦ -هل سبق هذا الحمل مباشرة إجهاض؟ ▪نعم ▪لا

٢٧-إذا نعم : كم الفترة بين الإجهاض الذي سبق هذا الحمل مباشرة و هذا الحمل؟-------شهراً.

٢٨-هل كنت تتابعين هذا الحمل بانتظام في مراكز طبية أو عيادات؟ ▪نعم ▪لا

٢٩-أين كنت تتابعين هذا الحمل؟ ▪ رعايا أولية حكومي ▪رعاية وكالة الغوث ▪غير ذلك

٣٠-هل زياراتك للعيادة و المركز الطبي كانت بشكل دوري ومنتظم؟ ▪نعم ▪لا

٣١ - كم مرة زرت العيادة أو المركز الطبي خلال فترة هذا الحمل؟----------مرة.

٣٢-هل كنت تشكين خلال هذا الحمل من مشكلة صحية أو مرض؟ ▪نعم ▪لا

٣٣ – إذا نعم: ما هي هذه المشكلة أو المرض؟----------.

٣٤-هل كنت تزورين الطبيب لعلاج هذا المرض أو المشكلة؟ ▪نعم ▪لا

٣٥- إذا نعم: كم مرة زرت الطبيب لعلاج هذا المرض في فترة الحمل؟---------- مرة.

٣٦-هل كنت تشكين خلال فترة هذا الحمل من نزيف مهبلي؟ ▪نعم ▪لا

٣٧-إذا نعم: متى؟ خلال الأشهر الثلاثة ▪الأولى ▪ الثانية ▪ الأخيرة

٣٨-هل كنت تشكين خلال فترة هذا الحمل مما يلي:

٣٨.ا ارتفاع في ضغط الدم؟ ▪نعم ▪لا

٣٨.ب مرض في القلب؟ ▪نعم ▪لا

إذا نعم: ما هو مرض القلب؟----------.

٣٨. ج مرض في الكلى أو المسالك البولية؟ ▪نعم ▪لا

إذا نعم: ما هو مرض الكلى؟----------.

٣٨. د مرض في الرئة أو الجهاز التنفسي؟ ▪نعم ▪لا

إذا نعم: ما هو مرض الجهاز التنفسي؟----------.

٣٨. هـ مرض السكري؟ ▪نعم ▪لا

٣٨. و مرض اليرقان (الصفراء)؟ ▪نعم ▪لا

إذا نعم: سبب الوقان----------.

٣٨.ز مرض فقر الدم (الأنيميا)؟ ▪نعم ▪لا

٣٨.ح أي مرض آخر؟ ▪نعم ▪لا

إذا نعم ما هو المرض؟----------.

٣٩-هل يوجد أحد من أفراد العائلة الذين يسكنون معك يدخن؟ ▪نعم ▪لا

٤٠-إذا نعم: هل كان معتاداً أن يدخن في الغرفة التي تتواجدين فيها في فترة الحمل؟ ▪نعم ▪لا

٤١-هل كنت تدخنين فترة هذا الحمل؟ ▪نعم ▪لا

٤٢-إذا نعم: ما نوع التدخين؟ ▪ سجائر ▪ أرجيلة

٤٣-إذا سجائر: كم عدد السجائر يومياً؟----------سيجارة/يوم.

٤٤-إذا أرجيلة: ▪ يوميا ▪ أسبوعيا ▪ أحيانا

٤٥-من متى بدأت التدخين؟----------سنة.

٤٦-هل توقفت عن التدخين أثناء الحمل؟ ▪نعم ▪لا

٤٧-هل معتادة على شرب الشاي ؟ ▪نعم ▪لا

٤٨-إذا نعم، كم كوباً من الشاي تشربين يومياً؟ ---------- كوب.

٤٩- هل معتادة على شرب القهوة ؟ ▪نعم ▪لا

٥٠-إذا نعم، كم كوباً من القهوة تشربين يومياً؟ ---------- كوب.

٥١- هل تسكنين مع أهل زوجك؟ ▪نعم ▪لا

٥٢-هل كنت تشكين من مشاكل أسرية أثناء هذا الحمل؟ ▪نعم ▪لا

٥٣- إذا نعم، ما هي أسبابها؟ ▪ اجتماعية ▪اقتصادية ▪سياسية

٥٤- هل تعرضت خلال فترة هذا الحمل لصدمات عصبية ؟▪نعم ▪لا

٥٥- هل سبق لك ولادة أطفال أقل من الوزن الطبيعي (<٢٥٠٠جم)؟▪ نعم ▪لا

Appendix 5.2

Al-Quds University
Jerusalem

School of public health

جامعـــة القـــدس
القـــــدس

كلية الصحة العامة

Questionnaire about risk factors of low birth weight infants

First part: Information from the file

- Hospital----------.
- File No.---------- Antenatal card No.----------.
- Serial No.---------- Case No.----------.
- Case type: □ case □ control.
- Mother name----------.
- Mother age----------.
- Permanent Residence----------.

□City □ Village □Camp

- Baby weight----------gm.
- Baby sex: □ Male *Female
- Deliver date: Day----------/----------/----------.
- Time of delivery----------.
- Type of delivery: □Normal □Cesarean section □ Others----------.
- Diagnosis----------

Second Part: Information by interview

1- Mother Blood pressure at labour room----------mmHg.

2- Mother Height----------cm.

3- Mother Weight at labour room----------kg.

4- Mother weight before pregnancy----------kg.

5- Haemoglobin level at labour---------- Blood group---------.

6- Mother age at marriage----------years.

7- Mother age at first delivery----------years.

8- Did you attend to school? □Yes □No

9- If yes, how many years you had studied?----------years.

10- Did you work in employment job? □Yes □No

11- What is your work?----------.

12- Did you perceive tiredness during your work? □Yes □No

13- Did your husband attend school? □Yes □No

14- How many years your husband had studied?----------

years.

15- Did your husband work? □Yes □ No

16- If yes, what is the type of your husband work?----------

17- Consanguinity between you and your husband? □Yes □ No

- If yes, Degree of Consanguinity: □ First. □Second.

18- How many times had you conceive before this time? ----------.

19- How many baby delivered alive? ----------.

20- How many baby delivered stillbirth? ----------.

21- How many times you had experienced abortion?----------.

22- How many baby still alive?----------.

23- Last Menstrual Period date:----------/----------/----------.

24- duration of this pregnancy----------weeks.

25- Birth interval between last labour and this pregnancy----------months.

26- Was there abortion before this pregnancy directly? □Yes □No

27- If, yes Duration between last abortion and this pregnancy?----------months.

28- Did you follow this pregnancy regularly at antenatal care centers? □Yes □No

29- Where did you follow this pregnancy? □PHc □UNRWA □Others

30- was the visits of antenatal care centers regular? □Yes □No

31- How many times you visited the center of antenatal care? ----------.

32- Did you complain of any health problems during this pregnancy? □Yes □ No

33- If yes, What is your health problem?----------.

34- Did you visit the physician for treatment your health problem? ? □Yes □No

35- If yes how many times you visited the physician? ----------.

36- Did you complain of vaginal bleeding during this pregnancy? ? □Yes □No

37- If yes, □At first trimester □At second trimester □At third trimester

38- Did you complain of the following during pregnancy:

38.a. Hypertension ? □Yes □ No

38.b. Cardiac diseases? □Yes □No

If yes, what is the cardiac disease?----------.

38.c. Renal diseases or UTI? □Yes □No

If yes, What is the renal disease?----------.

38.d. Respiratory diseases? □Yes □No

If yes, What is the respiratory disease?----------

38.e. Diabetes Mellitus? □Yes □ No

38.f. Jaundice? □Yes □ No

If yes, the cause:----------.

38.g. Anaemia? □Yes □No

38.h. Any other Problem? □ Yes □ No

If yes, what is it? ----------.

39- Was there any one of your family member smoker? □Yes □No

40- If yes, was he smoking in the same room you set? □ Yes □ No

41- Did you smoke during pregnancy? □Yes □No

42- If yes, Type of smoking: □ Cigarettes □ Hubbell- bubble

43- If cigarettes, how many cigarettes daily? ----------daily.

44- If Hubbell-bubble, □Daily □Weekly □Sometimes.

45- How many years have you been smoker? ----------years.

46- Did you stop smoking during pregnancy? □ Yes □ No

47- Had you used to drink tea? □Yes □No

48- If yes, how many cups of tea do you drink daily? ---------- Cups/day.

49- Had you used to drink coffee? □Yes □ No

50- If yes, how many cups of coffee do you drink daily? ----------Cups/day.

51- Did you live in extended family (your husband family)? □Yes □No

52- Did you suffer from family problems during this pregnancy? □Yes □No

53- If yes, what is the cause? □ Social □Economic □ Political

54- Did you expose to traumatic stress during this pregnancy? □ Yes □ No

55- Had you a history of delivering low birth weight babies (<2500 gm)?

□ Yes □No

Appendix 7

دراسة العوامل لدى الأمهات التي تؤدي إلى إنجاب أطفال أقل من الوزن الطبيعي

الرقم	اسم الأم	الضغط (مم زئبقي)	الطول (سم)	الوزن الحالي (كجم)	الوزن قبل الحمل (كجم)

Appendix 8

بسم الله الرحمن الرحيم

السلطة الوطنية الفلسطينية
وزارة الصحة
لجنة هلسنكي

Palestinian National Authority
Ministry of Health
Helsinki Committee

Date: 13/3/2002 — التاريخ:

Mr./ **Amjad Fathi El-Shanti** — السيد: أمجد فتحي الشنطي

I would like to inform you that the committee has discussed your application about: — نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:-

" Maternal risk factors associated with low birth weight in Gaza, 2002, A hospital based case-control study" — *"عوامل الخطر لدى الأمهات اللاتي ينجبن أطفال أقل من الوزن الطبيعي في غزة، 2002"*

In its meeting on March 2002 and decided the Following:- — و ذلك في جلستها المنعقدة لشهر مارس 2002 و قد قررت ما يلي:-

To approve the above mention research study. — *الموافقة على البحث المذكور بعاليه.*

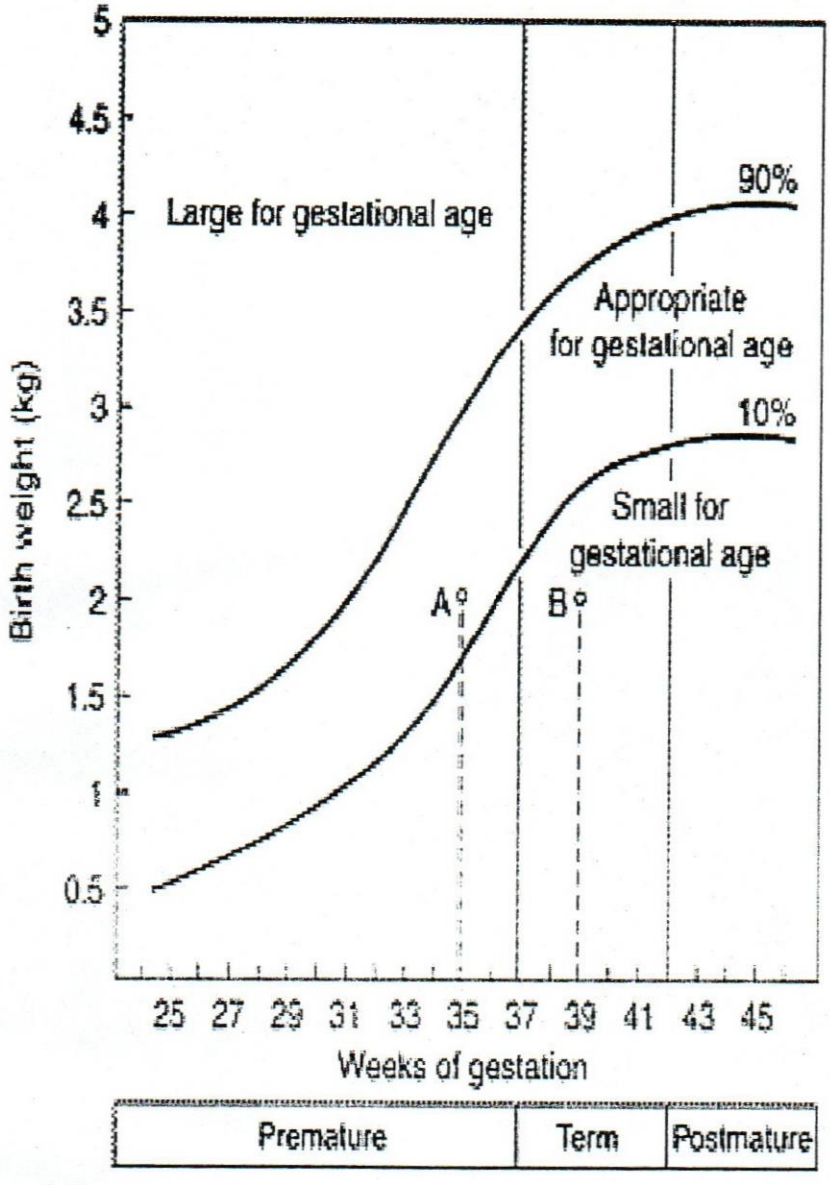
Signature — توقيع

Member	Deputy Chairman	Chairman
عضو	نائب الرئيس	رئيس اللجنة

Conditions:-
Valid for 2 years from the date of approval to start.
It is necessary to notify the committee in any change in the admitted study protocol.
The committee appreciate receiving one copy of your final research when it is completed.

غزة مجمع الناصر الطبي-تلفاكس 972-7-2878166 ص ب (5314) البريد الإلكتروني: ghsrc@palnet.com
Gaza El-Nasser Medical Complex. - Telefax 972-7-2878166 – P.O.Box (5314) E. Mail ghsrc@palnet.com

Appendix 10 Chart of Fetus Growth by Weight and Gestational Age



Adapted from Sweet AY: "Classification of LBW infant" , in care of the High Risk Neonate, ed. 3, edited by MH Klaus and AA Fanaroff. Philadelphia, WB Saunders company, 1986.