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Risk Factors of Perinatal Mortality in the Gaza Strip

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Dedication

To whom who they have been the source of my inspiration, who gave me the strength whenever I was thinking to give up…. To my beloved parents

To my husband who encouraged and supported me throughout this journey

To my lovely children: Karam, Mohammed, and Salma

To my sisters and brothers,

To my friends who have been a great source of inspiration, and

To my respectful teachers

Asmaa K. El Najar

Declaration

I certify that this thesis submitted for the degree of master is the result of my own research, except where otherwise acknowledged, and that this thesis or any of its parts has not been submitted for higher degree to any other university or institution.

Signed:

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Date:/……/…….

Acknowledgement

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Abstract

Perinatal mortality is considered an essential epidemiological indicator of mother and child health. Globally, perinatal mortality remains unacceptably high and multifactorial in its etiology. Perinatal mortality reflects the quality of health care provided to pregnant women, natal care, and postnatal care. Understanding risk factors and causes of perinatal mortality is substantial to develop strategies and programs aiming to reduce the perinatal mortality rate. This study aims to identify the main risk factors of perinatal mortality in the Gaza Strip, including early neonatal mortality and stillbirth in the Gaza Strip.

The design of the study is a descriptive, analytical, case-control design. The study was conducted at four governmental hospitals in the Gaza Strip: Al-Shifa Hospital, Nasser Complex Hospital, Al-Aqsa Hospital, and Al-Imarati Hospital. All cases of perinatal mortality recorded at the study settings from January 2018 to September 2018 were included as cases (263), while, controls (263) were selected using simple random technique of pregnant women who gave birth to a live newborn aged more than 28 days at the time of data collection. In total, 526 women participated in the study. Cases and control were matched by place and time of the delivery. A self-developed questionnaire and the general health questionnaire were used to collect data. Both data management and analysis were conducted using SPSS programs, and the analysis involved frequency distribution, chi-square, t-test and Logistic regression analysis.

There was a significant association between perinatal mortality and selected socio-economic factors such as maternal age, smoking status and number of family members. Maternal risk factors such as previous history of stillbirth, previous history of early neonatal deaths, previous history of preterm birth, and history of previous offspring with congenital anomalies were significantly associated with perinatal mortality. Associated disease with the last pregnancy including anemia, pre-eclampsia and maternal infection were also significantly associated with perinatal mortality. Additionally, gestational age, Caseation Section as mode of delivery, intrapartum complication, placental complication, umbilical cord complication, amniotic fluid complication, uterine complication, and postpartum complication were associated with high risk of perinatal mortality. Infant-related risk factors such as fetal birth weight, product of pregnancy, fetal growth restriction and fetal abnormalities were significantly associated with perinatal mortality. Findings of logistic regression have revealed that the main predictors of still birth were a higher number of previous pregnancies, lower number of live births, having intrapartum complication, and placental complication such as placenta previa and abruption. While, the main predictors of early neonatal deaths as predicted by logistic regression were previous history of early neonatal deaths, amniotic fluid complication, and meconium stained complication.

It is important to establish intervention programs aim to provide preconceptual care within all governmental primary health care centers, improve the quality of antenatal, intrapartum, and postnatal care, quality of health education programs and quality of care provided within the Neonatal Intensive Care Units in order to reduce the likelihood of perinatal mortality. Improving the quality of medical records documentation is a must, especially in the gynecological and neonatal intensive care units. There is a need to conduct in-depth qualitative studies to deeply explore risk factors of perinatal mortality through conducting longitudinal studies to identify the main risk factors covering all cases of perinatal deaths that deliver outside the Ministry of Health hospitals.

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List of Abbreviations

APH	Antepartum Hemorrhage
AOR	Adjusted Odds Ratio
BMI	Body Mass Index
CDC	Centers for Disease Control and Prevention
CI	Confidence Interval
CS	Cesarean Section
FGR	Fetal Growth Restriction
GHQ	General Health Questionnaire
GS	Gaza Strip
HR	Hazard Risk
ICD-10	International Classification of Disease
ISPID	International Society for the Study and Prevention of Perinatal and Infant Death
IVF	In Vitro Fertilization
IUD	Intra Uterine Device
LBW	Low Birth Weight
MOH	Ministry of Health
NCD	Non-Communicable Disease
NCHS	National Center of Health Statistics
NGO	Non-Governmental Organization
NICU	Neonatal Intensive Care Unit
NIS	New Israeli Shekel
OR	Odds Ratio
PCBS	Palestinian Central Bureau of Statistics
PHC	Primary Health Care
PROM	Premature Rupture of Membrane
RR	Relative Risk
SD	Standard Deviation
SDG	Sustainable Development Goal
SPH	School of Public Health
RDS	Respiratory Distress Syndrome
UN	United Nation
UNICEF	United Nations Children's Emergency Fund
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
WB	West Bank
WHO	World Health Organization

Chapter One

Introduction

1.1 Background

Perinatal mortality is an important and essential indicator of population health, particularly mother and child health. Generally speaking, it reflects the quality of obstetric and neonatal care available in any country (World Health Organization-WHO, 2006). Perinatal mortality also refers to deaths around the time of delivery and includes both stillbirths and early neonatal mortalities that occur in the first week of life. WHO defines perinatal mortality as the number of stillbirths and deaths in the first week of life per 1,000 of total births. The perinatal period starts at 22 completed gestational weeks (154 days) and ends by completing seven days after birth (WHO, 2018). Globally, neonatal mortality, including early neonatal deaths remains unacceptably high. According to the WHO, approximately 2.6 million newborns die every year in their first month of life, and a similar number applies for stillbirths (WHO, 2017a). The burden of perinatal mortality is higher in South Asia (39%) and Sub-Saharan Africa (38%) than in other low- and middle-income countries (Froen et al., 2016).

Perinatal mortality is multifactorial in etiology and depends on the quality of health care provided to the pregnant women, natal care and postnatal care (Bayou & Berhan, 2012). Maternal and fetal risk factors of perinatal mortality are inherently linked. Therefore, all programs addressing the care improvement of one often have an impact on the outcomes of the other. Providing pregnant women with good quality care during pregnancy and labour could avert such deaths (Daftary et el., 2016). Stillbirth which is also known as "fetal death" is a major public health issue, but it is mainly overlooked (MacDorman and Gregory, 2015), even the Sustainable Development Goals (SDG) underlined the interest of reducing newborn deaths, but not stillbirths (WHO, 2016a). Worldwide, stillbirths are prevalent; in 2015, 18.4 stillbirths per 1,000 live births occurred compared with 24.7 stillbirths in 2000 (Froen et al., 2016). WHO defines stillbirth as a baby who was born with no signs of life at or after 28 weeks of gestation (WHO, 2016a). It occurs intra uterus before onset of labour due to pregnancy complications or maternal diseases; however, about half of stillbirths occur during labor (WHO, 2015). Most of stillbirths are due to preventable causes such as maternal infection, maternal life style factors. Interestingly, unpreventable causes such as congenital abnormalities contribute only 7.4% of stillbirth

after 28 weeks, and stillbirth after 28 weeks could be prevented through high quality care for mothers and newborns during the antenatal and intrapartum periods (Froen et al., 2016).

Globally, there are approximately 7,000 newborn deaths every day, amounting to 46% of all child deaths under the age of 5 years (WHO, 2016b). Seventy-five percent of neonatal deaths occur during the first week of life, and about 1 million newborns die within the first 24 hours after delivery (WHO, 2017b). The SDGs, which were adopted in 2015 by the United Nations (UN), included the reduction of neonatal mortality under Goal 3. The second target of Goal 3 is: *By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births*" (UN, 2015). More than 60 countries over the world need to accelerate progress to reach the SDG target by 2030, and about half of them will not reach the target by 2050 (WHO, 2016b).

1.2 Research problem

As mentioned above, thousands of newborns die on a yearly basis due to pregnancy and delivery-related issues. Worldwide, 98% of perinatal mortality occurs in developing countries (WHO, 2006). In Arab countries, the neonatal deaths declined from 31 deaths per 1000 lives in 1990 to 18 deaths in 2016, and in the Gaza Strip (GS) and West Bank (WB), the neonatal mortality rate declined from 22 deaths per 1,000 live births in 1990 to 11 deaths per 1,000 live births in 2016 (World Bank, 2018). According to the annual report of the Ministry of Health (MoH) (2018), the neonatal mortality rate (0- 28 day) reached 6.2 deaths per 1,000 live births in 2018 in comparison to 4.8 deaths per 1,000 live birth in 2017, which accounted for 59.6% of infant deaths (MoH, 2018). Unluckily, there is scarcity of data, if any, on stillbirths. Information about perinatal deaths in most low- and middle-income countries is scanty, and underreporting is still a main problem, especially early deaths and stillbirths. According to Freon and Colleagues (2011), nearly all stillborn babies and half of newborn deaths don't receive a birth or a death certificate, since stillbirth is not recognized in the global burden of diseases. It is neither counted as missed lives in disability adjusted life years nor fully identified as an individual death by the International Classification of Diseases (ICD) (Freon et al., 2011).

In Palestine, particularly in the GS, despite the progress achieved in reducing the maternal mortality (MoH, 2018), there is an obvious gap in the available data on early perinatal mortalities, including rate of perinatal morbidity per 1000 live births. The limited availability of data is even worse when it comes to stillbirth, mainly due to underreporting issues. Thus, for any strategic objective or plan to reduce perinatal mortality, it will be hard to track the main risk factors that are not yet known. This study aims to identify the main risk factors of perinatal mortality in the GS. It will be the first study to include both early neonatal deaths and stillbirths.

1.3 Justification of the study

This study will be among the first studies on perinatal morality in the GS. As the study will identify the main risk factors associated with perinatal mortality, results of the study could be used by policy and decision makers to design and implement interventions or programs to reduce the rates of both stillbirths and early neonatal mortalities. Additionally, it is expected that the study will help the Researcher to identify the main problems, if any, of medical records documentation. Thus, recommendations to improve the quality of documentation, including accuracy and reliability will be proposed. Stillbirth rate may be one of the indicators of the quality of a country's medical system (Liu, Wang, Yu, & Su, 2014). Since stillbirth is still a neglected issue, a clear understanding of the causes and risk factors of stillbirths is very important in setting successful programs aimed to reduce stillbirth's burden. It requires a more intensive program of capacity building of policy makers and healthcare providers to recognize the causes of stillbirths and identify where the change in practice can be and needs to be made (Aminu et al., 2014). The neonatal period is the most vulnerable period in child survival that reflects the quality of care and follow-up provided for women and children, particularly at the first 48 hours after the delivery (UN, 2015). Since perinatal outcomes are strongly related to the maternal condition, any programs for reducing perinatal mortality will also affect maternal mortality, as the underlying causes are entwined (WHO, 2016c). Any reduction in mortality rates from either stillbirths or early neonatal moralities will benefit the entire society through reducing avertable deaths.

Furthermore, perinatal mortality has a negative impact on emotional and psychological wellbeing of affected women, along with the social issues. In General, having history of perinatal mortality is considered a vulnerability factor, particularly in low and middle

income countries (Gausia, Moran & Koblinsky, 2011). Few studies have explored the emotional and psychological cost associated with perinatal mortality globally.

The study will also introduce the benefits to healthcare providers at both primary and secondary healthcare levels through knowing different modifiable risk factors attributed to perinatal mortality in order to avoid them and improve their role in providing suitable healthcare education and counseling for pregnant women. It will also give benefit for society and mothers by raising awareness on the importance of perinatal care during pregnancy and after delivery by improving their commitment to physician visits and enhancing their life style.

1.4 Aim and objective of the study

1.4.1 Aim

The study aims to identify the main risk factors of perinatal mortality including early neonatal mortality and stillbirth in the GS. Ultimately, the study will provide policy makers and health providers with recommendations that might help in reducing the perinatal morality rate and thus avert unnecessary deaths and reduce associated health care cost.

1.4.2 Specific objectives

1. To identify the main maternal risk factors associated with perinatal mortality;
2. To explore the main fetal risk factors of perinatal mortality;
3. To recognize variations in the perinatal mortality in relation to selected socioeconomic variables;
4. To ascertain variations in perinatal mortality in reference to health care related factors;
5. To suggest possible recommendation to reduce perinatal mortality rate.

1.5 Context of the study

1.5.1 Gaza Strip's demographic characteristic

The total area of Palestine is about 27,000 square kilometers, the GS and WB represent 22% of occupied Palestine, with estimated population of 4.98 million by mid-2019

(Palestinian Central Bureau of Statistics-PCBS-, 2019a). About 60.1% of population reside in the WB, while 39.9% reside in GS (MoH, 2018).

The GS is a small piece of land on the Eastern Coast of the Mediterranean Sea with a total area of 365 square kilometers and total population around 1,989,970 million (PCBS, 2019b). It is divided into five governorates: North Gaza, Gaza City, Deir Al Balah, Khanyounis and Rafah. The GS is considered as one of the most densely populated areas over the world that reached 5,453 people per Km2 (PCBS, 2019b). The vast majority of the GS population (66.7%) represents refugees. Children under 15 years represented 41.6% of population, and elderly people who were more than 60 years represented 4.3% from the total population (MoH, 2018).

According to MoH's annual report, the total fertility rate per woman in the GS was 3.7 baby for each woman at the reproductive age (15-49 years). Almost all Palestinian women live in the GS delivered at healthcare facilities; most of them (67.3%) delivered at governmental hospitals. In the GS, the crude birth rate was 29.8 per 1,000 population, while the crude death rate was 2.76 deaths per 1,000 population. The infant mortality rate in the GS was 10.4 deaths per 1,000 live birth; this rate had increased by 1.4 deaths per 1000 livebirth compared to 2017, and the neonatal mortality rate was 6.2 deaths per 1000 livebirth (MoH, 2018).

In Palestine, the leading causes of death in 2018 were cardiovascular diseases (46.2%), cancer (10.6%) and respiratory diseases (5.7%), reflecting the main health challenges facing the Palestinian Health Care System. Perinatal mortality is considered as the fourth most common cause of death, causing 5.0% of fatalities (MoH, 2018). With regard to infant mortality, the first leading cause is congenital malformation, representing 21.9% of all infant deaths, followed by prematurity and Low Birth Weight (LBW), representing 20.2%, while Respiratory Distress Syndrome (RDS) represented 18.2% from all infant deaths (MoH, 2018).

1.5.2 Health Care System

The health care system in Palestine is complex and fragmented; it includes four main healthcare providers: MoH, the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA), nongovernmental organizations (NGOs) and the private sector. MoH is the main healthcare provider that provides primary, secondary and

tertiary healthcare services. UNRWA is the main health provider that provides mainly primary healthcare services and purchase secondary health services for refugees only. NGOs provide nonprofit primary, secondary and tertiary health services. Private sectors provide for-profit primary, secondary and tertiary services.

Generally, the Palestinian health system suffers from severe fragmentation and weak coordination among different healthcare providers. The MoH, which is the main provider, has been facing significant challenges resulting from the impact of the Israeli Occupation; it has also suffered from political and financial crises due to the Palestinian rift, which has affected the functionality of the system (WHO, 2016d).

Maternal and Child health services are provided mainly through MoH, UNRWA, NGOs, and private providers. The main services include antenatal care obstetric care and postnatal care. There are four main governmental hospitals that provide obstetric services; Al-Shifa Hospital, Naser Hospital, Al-Aqsa Hospital and Al-Imarati Hospital. MoH's data shows that 100% of births in the GS take place at equipped healthcare facilities and in the presence of a specialist and trained medical staff (MoH, 2018). There were about 56,861 deliveries that occurred in Gaza's hospitals during 2018; 70.2% of which occurred at governmental hospitals (MoH, 2018). According to the annual hospital report -MoH (2017), there was an increase in congenital anomalies by 100% (190 in 2017 in comparison with 95 in 2016) and an increase in perinatal mortality during and after the labor by 41% (297 deaths in 2017 in comparison to 210 deaths in 2016), while there was a decrease in intrauterine death by 33.6% (213 deaths in 2017 in comparison with 321 deaths in 2016) (MoH, 2017). Post-natal care is provided through primary health care (PHC) in MoH and by UNRWA. In 2018, there were 52.849 women who received post-natal care through governmental PHC and UNRWA clinics. Only, there were 25.6% of women who received the service through governmental PHC and 41.9% received post-natal home visits. In the UNRWA clinics, the percentage of post-natal care reached up to 99% (MoH, 2018).

1.5.3 Socioeconomic characteristics

The GS suffers from hard economic conditions due to the ongoing Israeli blockade, which has contributed to high unemployment and poverty rates. In 2018, the unemployment rate reached 52.0%, while the poverty rate reached 53.0%, with 33.8% suffering from deep poverty (PCBS, 2018a). The female participation rate in labour

force in Palestine was very low compared to the male participation rate (19.0% female participation against 71.2% male participation in 2017); also, there was a pay gap between males and females with regard to average daily wages; since the average daily wage of females was 84.6 NIS compared to 111.6 NIS for males. The unemployment rate among females at the age group 15-29 years was 65.8%, and the unemployment rate among females with 13 and higher years of schooling represented 53.8% at the same age group (PCBS, 2018b). With regard to education, the illiteracy rate in Palestine is considered as one of the lowest in the world; it reduced by 80% during the period from 1997 till 2018 (13.9% to 2.8%, respectively). The illiteracy rate varies according the age groups, where the highest rate of illiteracy was among elderly age group (65 and above). In Palestine, there was still a gap in 2017 in the literacy rate between males and females, where the gap was in favor of the males by 3.0% (95.6% for females compared to 98.6% for males) (PCBS, 2018b).

1.6 Operational definition

Live birth: it is defined as the complete expulsion or extraction from the mother of a product of human conception, irrespective of the duration of pregnancy, which shows any evidence of life (i.e., heartbeats, umbilical cord pulsations, breathing, or voluntary muscle movement), regardless of whether the umbilical cord has been cut-off or the placenta is attached (WHO, 2006).

Perinatal period: it starts at 22 completed weeks (154 days) of gestation and ends seven completed days after birth (WHO, 2016d).

Perinatal mortality: it refers to the number of stillbirths and deaths in the first week of life (early neonatal mortality) (WHO, 2006).

Stillbirth or fetal deaths: it refers to a dead born fetus occurring before (ante partum death) or during (intrapartum death) birth once a pregnancy has reached 26 weeks (WHO, 2006)

The neonatal period: it is the period that begins with birth and ends 28 complete days after birth (WHO, 2006).

Neonatal mortality: it refers to the deaths occurring during the first four weeks after birth, and it is sub-divided into the following:

Early neonatal death: the deaths occurring during the first seven days of life after birth.

Late neonatal death: the deaths of newborns after the seventh day but before the 28th day of life after birth.

Case: all stillbirths after 26 weeks of pregnancy and neonatal deaths occurring at the first week of delivery.

Control for early neonatal: live births of women who delivered during the same period of the data collection, from the same hospital and aged more than one month.

Control for stillbirth: live births of pregnant women who were pregnant during the first eight months in 2018 and delivered a live birth aged at least one month.

Chapter Two

Literature Review

2.1 Conceptual Framework

A conceptual framework is the researcher's synthesis of literature on how to explain phenomena. It reflects the researcher understands of how different variables in the study connect with each other (McGaghie, Bordage, & Shea, 2001). In this Research, the researcher provides more knowledge about risk factors related to perinatal mortality occurring in the GS in order to use this knowledge to develop recommendations for policy makers to set policies and programs that help in preventing avoidable perinatal mortalities. The Researcher listed possible risk factors of perinatal mortality, stillbirths and early neonatal deaths. Such factors are related to maternal, fetal, socio-economic or health system characteristics.

2.2 Risk factors of perinatal mortality (stillbirths and early neonatal deaths)

2.2.1 Socio-economic factors

Socio-economic factors are related to the social and economic conditions of the study participants. They include socio-demographic data such as study participants' age, refugee status and education, as well as life style characteristics such as smoking and consanguineous marriage. They also include economic and housing conditions such as employment status, income, house type and family members.

2.2.2 Fetal risk factors

Fetal factors are related to the infant's conditions and complications during and after the birth. The fetal factors that contribute to perinatal mortality, either stillbirths or early neonatal deaths, include fetal gender, gestational weeks, Fetal Growth Restriction (FGR), prematurity (birth weight and age), birth trauma, asphyxia, fetal abnormalities and genetic factors. Additionally, there are fetal risk factors related to early neonatal deaths such as neonatal characteristics including immaturity, infection, RDS and admission to the Neonatal Intensive Care Unit (NICU).

2.2.3 Maternal risk factors

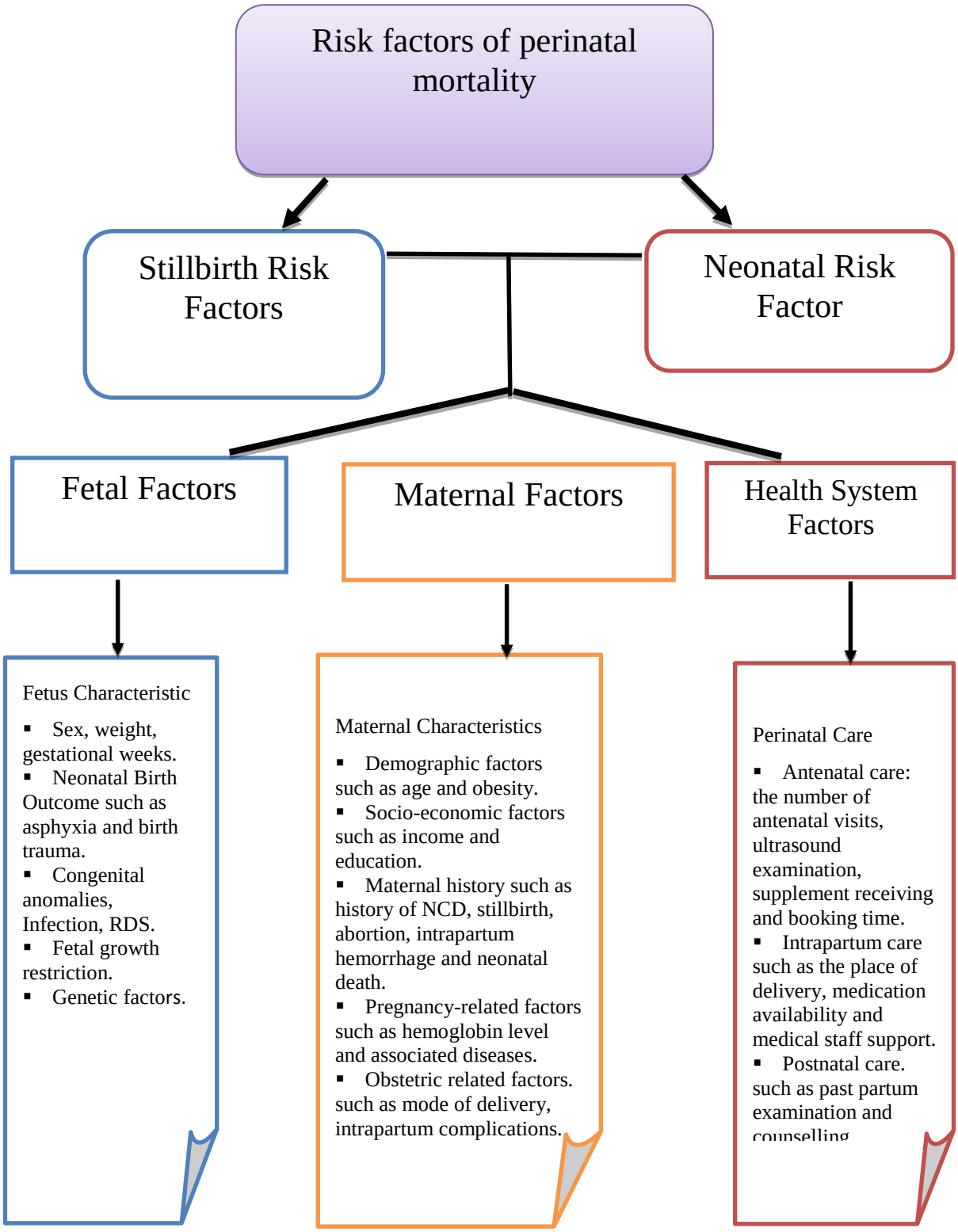
These factors are related to maternal conditions and complications before, during and after the delivery. Maternal related factors include:

- **Previous maternal history,** such as gynecological abnormalities**,** gravida, parity, birth spacing, and the number of live births.
- **Pregnancy-related factors**, such as complications during pregnancy (gestational diabetes, hypertension, preeclampsia, and ante-partum hemorrhage), hemoglobin concentration, placental complication, and psychological factors.
- **Maternal history**, such as previous history of Non-Communicable Diseases (NCD) (diabetes, hypertension, cardiac and mental health problems), previous history of stillbirths, previous history of neonatal death, previous miscarriages including abortion, involuntary childlessness, previous history of intrapartum hemorrhage, and previous LBW.
- **Obstetric-related factors,** such as intrapartum complications (premature rupture of membrane (PROM), dystocia (prolonged or obstructed labor), preterm delivery, mode of delivery, placental abnormalities, umbilical cord and amniotic fluid abnormalities and past partum complication.
- **Anthropometric factors,** such as weight, height and Body Mass Index (BMI).

2.2.4 Health system-related factors

Accessibility and availability barriers of health services can be divided into the following: supply barriers, which means that the health system prevents the use of service, and demand barriers, which indicates the individual's inability to use services. Lack of access is due to lack of awareness, information, resources, facilities, health care provider and cost (Roozbeh, Nahidi & Hajiyan, 2016). The health system should provide demand and supply services including the following: antenatal care such as antenatal session, booking time, medical supplement, ultrasound examination. Intrapartum care such as the place of birth, qualification of birth attendant and psychological support, and post-partum care including discharge examination and counselling, post-partum examination and counselling.

Figure (2.1) Conceptual Framework



2.3 Definition of perinatal mortality

Perinatal mortality is defined as the number of stillbirths and deaths within the first week of life (early neonatal mortality), (WHO, 2016e). Different countries apply different definitions of stillbirths, and sometimes different studies within the same country use different definitions. It is clear that upper middle-income countries mostly use a lower gestational age as a cut- off point. In contrast, low- income and lower middle- income countries prefer to use a higher gestational age as a cut- off point. The National Centre for Health Statistics (NCHS) refers to deaths occurring at 20 weeks or more of gestation as stillbirths. NCHS subdivides stillbirths to early stillbirths which last from 20 to 27 weeks of gestation and late stillbirths which is 28 weeks or more of gestation. For international comparability, the WHO defines stillbirth as a baby born with no signs of life at or after 28 weeks of gestation or stillbirths with a weight of 1000 grams or more, or with a baby length of 35 cm or more (WHO, 2016e).

Pregnancies resulting in fetal demise before 20 weeks are categorized as miscarriages. International Classification of Diseases (ICD-10) classifies perinatal death according to the time into ante-partum, intrapartum or neonatal. The aim of this timing is to determine risk factors and causes of deaths during each period and to set programs and interventions to each period. The WHO defines early neonatal deaths as deaths occurring in the period of the first 7 days after birth. The WHO considers deaths occurring during the first week of life very important because they account for the large number of deaths and can be targeted by intervention around the time of birth (WHO, 2016e).

2.4 Epidemiology of perinatal mortality

The perinatal mortality rate is higher in developing regions with 50 perinatal deaths/1000 total births than in developed ones with 10 perinatal deaths/1000 total births, and above 60/1000 in the least developed ones (WHO, 2006). Globally, there are more than 5 million perinatal mortalities occurring each year (Blencowe et al., 2016). About half of the world's dead babies do not currently receive a birth certification; almost all stillbirths and most of neonatal deaths don't receive death certificates. It is important to improve reporting systems for counting all births and deaths and reporting the causes of death. Reporting system is considered as a matter of human rights and a prerequisite for decreasing stillbirths and neonatal mortality (WHO, 2016e).

Each year, about two million babies die during the first week of their lives; they accounted for over a third of the global under-five mortality burden (WHO, 2019). In 2018 alone, an estimated 2.5 million newborns died mostly from preventable causes (UN, 2019). According to the WHO, worldwide, there were 2.6 million stillbirths in 2015 with the rate of more than 7,178 deaths per day. The vast majority (98%) of deaths occurred in low- and middle-income countries, and half of the stillbirths occurred during the intrapartum period (WHO, 2019). Stillbirths rates range from 3.1/1000 births in high income countries to 28.3/1000 births in sub-Saharan Africa, since the highest stillbirth's rate (about three fourths of stillbirths) reported in sub-Saharan Africa and in south Asia. Three fifths (60%) of deaths occur in rural areas, and more than 50% occur in emergency and conflict areas (Froen et al., 2016).

2.5 Risk factors of perinatal mortality

2.5.1 Socio-economic factors

Socio-economic factors have an influence in birth outcome. One study conducted in Duhok to identify risk factors of perinatal mortality reported that there were significant associations between perinatal mortality and the mother's occupation status with (P value 0.049), mother's level of education with (P value 0.037), mother's residential area with (P value 0.048) and antenatal care visits with (P value 0.052) (Abdulmalek & Yusif, 2018). Lahaseh (2014), reported a negative association between the mother's high education level and neonatal mortality (P value 0.042, Odds Ratio (OR) 1.28, 95% Confidence Interval (CI) 1.098-1.642). Another registry-based study conducted in Russia in 2017 to identify risk factors of perinatal mortality reported that there is an association between perinatal mortality and education level, marital status, and smoking during pregnancy with (P value <0.001) (Usynina et al., 2017).

Different studies reported a contribution of low socio-economic status to stillbirth. Low socio-economic status was the most significant risk factor of perinatal mortality (Brahmanandan et al., 2017). Stillbirths were more prevalent among less educated women (Ulizzi & Zonta, 2002). In a study involving 60,154 births conducted in five developing countries to explore stillbirth rates, the study results reported that the lack of formal education increases the relative risk of stillbirths by 1.6 (95% CI 1.4–1.8) (McClure et al., 2007). Sinha and Colleagues (2016) reported that the place of delivery and most of the socio-economic variables were not significantly different, except for family income and

house ownership (Sinha et al., 2016). Social factors like unemployment of the mother or unemployment of her partner, smoking in pregnancy and passive smoking have a significant increase in the risk of stillbirth outcome (Gardosi et al., 2013). Harding (2015) study showed that smoking increased the risk of neonatal death. Smoking less than 10 cigarettes before 3 months of pregnancy increased the risk of stillbirth outcome (Adjusted Odds Ratio (AOR) 1.55, 95% CI 1.02-2.35) (George & Saade, 2013).

Another study showed that newborns of high-income mothers had a big survival advantage over low-income ones in unadjusted analyses (OR 0.86), and the most educated mothers had a big survival advantage over the least educated ones (OR 0.77) (Lohela et al., 2019). One study conducted in 2007 reported that the socio-economic related risk factors of early neonatal deaths were poor education (OR 1.6; 95% CI 1.1 - 2.6), families living in a slum area (OR 2.0; 95% CI 1.2;3.5) and families living within one room (OR 2.2; 95% CI 1.1-4.2) (Schoeps et al., 2007).

In the case-control study that was established in the GS about determinants and risk factors of neonatal mortality in the GS (2012), the researcher reviewed 220 cases of mothers who lost newborn infants at the neonatal period (1-28 day) and 495 controls matched by sex and locality. The researcher studied different risk factors associated with neonatal mortality and found that neonatal mortality in the GS increased with mothers' consanguinity (OR 1.49) and the number of dependents; since mothers who have more than four dependents have higher risk than those who had fewer dependents (OR 1.56). The study recommended the need for a program of socio-cultural and economic approaches, in addition to the need for improving the healthcare services during pregnancy and the perinatal period to reduce neonatal mortality in the GS (Awour, Abed, & Ashour, 2012).

Another study conducted in GS showed that consanguinity is one of the risk factors of infant mortality (OR 2.4) (Van den Berg et al., 2015). One study conducted to determine the association between socio-economic and cultural factors and perinatal mortality reported that whenever the mother had a higher level of education, her compliance to had antenatal care increased and vice versa, the low education have a negative association with perinatal mortality. The same trend was observed with maternal income (Yifru & Asres, 2014).

2.5.2 Maternal risk factors

2.5.2.1 Age

Findings of different studies were varied with regard to association between the mother's age and perinatal mortality. One study reported an increase in the risk of perinatal mortality with maternal age, while others didn't (Ziadeh, 2002). Maternal age at 35 years old and above was considered a significant risk factor of stillbirths in many developing countries (McClure et al., 2011). Stillbirths increased in women at the age of 35 and accelerated rapidly after the age of 40 (Ulizzi & Zonta, 2002). One study reported that there is an association between maternal age and stillbirths with (P value <0.005). The study compared to the reference group (20-24 years), and it reported that younger maternal age (≤ 19 years) (HR 1.68, 95% CI 1.16-2.43) and older maternal age (≥ 35 years) (HR 1.48, 95% CI 1.01-2.16) were associated with a higher risk of stillbirth mortality (Sinha et al., 2016).

One study showed that stillbirths increase slightly at a maternal age younger than 25 years and older than 35 years, but this increase was not statistically significant (Gardosi et al., 2013). Another study established in India indicated that maternal age at more than 35 increases the risk of stillbirths with OR up to 2.31 (95% CI 1.81-2.95) (Bhattacharyya & Pal, 2012). Conversely, some studies reported the relation between young maternal (<20 years) and the increase in the risk of stillbirths. One of these studies was a national survey that included 8481 Chinese mothers, and it showed an increase in the risk of stillbirth in both mothers with 40 years and more (OR 2.98, 95% CI 2.67-3.32) and teen mothers (OR 2.57, 95% CI 2.29-2.98) (Hi et al., 2012).

Harding (2015) showed that the age of mothers under 25 years or more 40 increases the risk of neonatal death. Another registry-based study reported an association between the mother's age and perinatal mortality (Usynina et. al., 2017). In contrast, one study reported no association between the mother's age and perinatal mortality (Iman & Husna, 2018).

2.5.2.2 Parity

The association between parity and perinatal mortality is uncertain. One study reported a decrease of the risk of perinatal mortality with high parity women (Ever et al., 2010), while others reported that high parity leads to high intrapartum complication risk which then

increases the risk of perinatal mortality (Uke & Brown, 2007). There was a high significant association between perinatal mortality and parity (P value 0.005) (Iman & Husna, 2018). In developing countries, many studies reported parity as another maternal-related risk factor of stillbirths. A conducted multi-country study reported an increase in risk of stillbirths at both primiparity (RR 1.3, 95% CI 1.2-1.5) and parity ≥5 (RR 1.2; 95% CI 1.1–1.3) (McClure et al., 2011). Another study conducted in Palestine in 2008 showed the same result with regard to positive association between primiparity and parity ≥5 and the increase in the risk of stillbirths (Assaf et al., 2008). In contrast, Usynina and Colleagues' (2017) study reported no association between parity and perinatal mortality (P value 0.732) (Usynina et al., 2017).

With regard to mothers who had multiple pregnancies, one study demonstrated an association between multiple pregnancies and the increase in the risk of perinatal mortality (Richardus et al., 1998).

2.5.2.3 Birth intervals

To decline the risk of maternal, fetal and perinatal adverse outcomes, the recommended birth intervals should be at least 24 months between the live birth and the next pregnancy, and at least 6 months between the abortion and the next pregnancy. Intervals of five years and more between two pregnancies increase the risk of both maternal comorbidities such as preeclampsia and perinatal outcome such as pre-term, LBW and small infants. Women with intervals less than six months have a higher possibility of maternal morbidity and even maternal mortality (WHO, 2005). One study reported that mothers who had birth intervals less than 24 months were at high risk to have perinatal mortality outcome (Afshan, Narjis, & Mazhar, 2019). In developing countries, neonatal mortality was reduced by 40% among mothers who had preceding intervals of 3 years and more compared to mothers who had birth intervals less than 2 years (Upadhyay & Setty-Venugopal, 2002). In contrast, another study reported no significant difference in neonatal mortality with regard to birth space (Manandhar et al., 2004). The odds of early neonatal mortality ware higher among study participants with birth intervals less than 2 years (AOR 2.6; 95% CI 1.4-4.9) (Kibria et al., 2018).

2.5.2.4 Maternal medical history

Previous history of medical problems (mental, diabetes) increases the risk of stillbirths, except gestational diabetes that has shown no association with stillbirth rate (Gardosi et al., 2013).

In comparison with women who do not have a history of stillbirth, women who have a previous history of stillbirth are more likely to experience stillbirth again (Kupka et al., 2009; George & Saade, 2013). The odds of perinatal mortality among mothers who had a previous history of early neonatal deaths are more likely than mothers who had no previous history of early neonatal mortality with (AOR 6.36; 95% CI 1.51–26.76) (Getive & Fantahun, 2017). Mothers who had history of neonatal mortality were more likely to experience fetal deaths during perinatal period than who hadn't (AOR 5.42, 95% CI 2.27-12.96) (Roro, Sisay, & Sibley, 2018). The odds of perinatal mortality were approximately twice higher among mothers who had a previous history of miscarriage or abortion and reached up to more than four times among mothers who had a history of child death (Hosssain et al., 2019). One study reported an association between the increase in the risk of perinatal mortality with previous history of abortion (P value 0.003) and with previous history of preterm deliveries (P value <0.001), while the study showed no association between perinatal mortality and previous history of perinatal mortality (P value 0.059), nor with previous history of gestational diabetes (P value 0.094) (Usynina et al., 2017). Maternal who have previous preterm babies were at high risk to get preterm births in the following pregnancies (RR 2.7; CI 2.1-3.4) and subsequent increased the risk of perinatal mortality (RR 2.5, CI 1.9-3.5) (Mahande & et al., 2013). Another study reported an increase of the odds of stillbirth among mothers who had a previous preterm birth history by 63% in singleton pregnancies (AOR 1.63; 95% CI 1.41–1.88) and 75% increased odds of stillbirths in twins' pregnancies (AOR 1.75; 95% CI 1.20–2.56) when compared to mothers who did not have a preterm birth history (Ibrahimou & et al., 2015)

2.5.2.5 Maternal co-morbidity

There was a significant association between perinatal mortality and antepartum hemorrhage (APH) with (P value 0.034), while there was no significant association between perinatal mortality and pregnancy induced pre-eclampsia (P value 0.469) (Usynina et al., 2017). Different studies reported that maternal conditions as diabetes, elevated blood pressure, anemia disorders increase the risk of stillbirth in developing

countries. Maternal-related risk factors such as diabetes were considered among the main possible causes attributed to stillbirths, and the percentage attribution ranged from 8-50% stillbirths (Aminu et al., 2014; Harding, 2014). A national survey conducted in Pakistan in 2019 reported that antepartum maternal complications such as hemorrhage and hypertensive disorder resulted from the major stillbirths causes at a percentage of 19% (Afshan, Narjis, & Mazhar, 2019). Another study showed a strong statistically significant association between diabetes and macerated stillbirths (OR 1.41, 95% CI 1.11-1.75) and elevated blood pressure and macerated stillbirths (OR 3.86, 95% CI 1.27-11.70), whereas, there was no association between diabetes and elevated blood pressure with fresh stillbirths (Stringer et al., 2011). There was a significant association between perinatal mortality and hypertensive disorders (chronic hypertension, pre-eclampsia and eclampsia) with (P value <0.001) and a significant association between perinatal mortality and severe anemia (P value <0.001) (Vogel et al., 2013). There was a strong association between early neonatal deaths and presence of complications in pregnancy with (OR 8.2; 95% CI 5.0-13.5) (Schoeps et al., 2007). One study reported that preeclampsia and ante partum hemorrhage are strongly associated with stillbirths (Gardosi et al., 2013). In contrast, another study reported an association between perinatal mortality and APH (OR 1.7; P value 0.034), while there was no association between perinatal mortality and preeclampsia (P value 0.469) (Usynina et al., 2017). There was an association between perinatal mortality and coexisting anemic medical conditions. The perinatal mortality increased among anemic mothers by 2.6 times more than it did among mothers with a normal hemoglobin level with (AOR 2.6; 95% CI 1.38–4.91) (Getive & Fantahun, 2017).

2.5.2.6 Violence

Different studies reported an association between early neonatal deaths and presence of domestic violence. One study reported an increase in the risk of neonatal mortality with mothers who were exposed to domestic violence by 2.7 folds (OR 2.7; 95% CI 1-6.5) (Gardosi et al., 2013). Another study reported an increase in the risk of neonatal mortality by 1.5 times among mothers who were exposed to violence (OR 1.58) (Awour, Abed, & Ashour, 2012). Domestic violence was considered a significant risk factor of perinatal mortality; mothers who experienced domestic violence during pregnancy had risk to have perinatal deaths outcome 2.59 times higher than mothers who didn't experienced violence (95% CI 1.35-4.95) (Ahmed, Koenig, & Stephenson, 2006). One prospective cohort study was conducted to determine the impact of psychological violence during pregnancy on the

pregnancy outcome. The study results reported an association between violence during pregnancy and PROM, and recommended setting an appropriate intervention to prevent the effect of violence on mothers and fetuses (Abdollahi et al., 2014).

2.5.2.7 Obesity

Different studies reported an association between perinatal mortality and maternal obesity. One of these studies demonstrated this association between perinatal mortality and obesity with (P value 0.001). Overweight and obese maternal increased the risk of perinatal mortality by 30% (Usynina et al., 2017).

A cohort study conducted to determine an association between perinatal mortality and maternal BMI revealed a significant increase in the risk of stillbirth with the increase in BMI between 30-34.9 (OR 1.4; 95% CI 1.04-2.0) and BMI more than 35 (OR 1.6; 95% CI 1.1 – 2.3). In contrast, the risk of stillbirths decreased with BMI less than 20. Such associations weren't seen with early neonatal mortality (Francis et al., 2009). One study demonstrated an association between overweight mothers and neonatal mortality, since babies who were born to overweight mothers had high odds of early neonatal deaths, but this association wasn't seen with obese mothers. One study proved an association between obesity and perinatal mortality, since newborns who were delivered to obese women were more likely to die with a greater odd of perinatal mortality (AOR 1.46, 95% CI 1.13–1.89) (Ezeh et al., 2019). A similar result was reported in another study that showed an increase in the odds of perinatal mortality by 57% higher among obese mothers (Hosssain et al., 2019). Obese mothers with BMI ≥ 30 were at high risk to have stillbirth outcomes (Gardosi et al., 2013). The risk of stillbirths was higher among obese and overweight mothers than normal weight mothers (AOR 1.72, 95% CI 1.22-2.43) (George& Saade, 2013). Harding (2015) study showed obese women with BMI > 30 increase the risk of neonatal death.

2.5.2.8 Maternal obstetric complication

One study reported an association between early neonatal deaths and the presence of clinical problems during delivery (OR 2.9; 95% CI 1.4-5.1) (Schoeps et al., 2007). Another study demonstrated a significant association between perinatal mortality (stillbirths and END) and placental complications (placenta previa and placental abruption) with P value (<0.001) (Vogel et al., 2013). Placental-related causes as placenta praevia

and placental abruption were recognized in many studies as major causes of stillbirths, with a percentage attribution of between 7.5% and 42% (Aminu et al., 2014; Harding, 2014; Vijayan & Hiu, 2012). One study conducted in four low-income countries using verbal autopsy reported that APH was estimated to have accounted for 10% of 134 stillbirths (Engmann et al., 2012).

Overall umbilical cord-related causes such as prolapse, loop and knot have been strongly associated with stillbirth and were reported to be responsible for 2.9–12% of stillbirths (Aminu et al., 2014; Harding, 2014). Another study reported a strong association between umbilical cord accidents and stillbirth's outcome with (OR 29.63, 95% CI 14.23-61.71) (Olusanva & Solanke, 2009). Amniotic fluid causes as chorioamnionitis and oligohydramnios, and uterine causes as rupture and anomalies were considered the least frequency causes of stillbirths with a reported percentage of 6.5% and 10.7%, respectively (Aminu et al., 2014; Harding, 2014; Ukaegbe et al., 2011).

Obstetric complications, placental abnormalities, fetal genetic or structural abnormalities, abnormal cord abnormalities are some of the fetal risk factors related to stillbirths (Doheny, 2011). Unclassified/unknown/unexplained causes were reported with a large attribution percentage from 3.8 – 57.4% (Aminu et al., 2014; Harding, 2014). Unexplained antepartum and intrapartum were considered among the major causes of stillbirths at percentages 33.0% and 21.0%, respectively (Afshan, Narjis, & Mazhar, 2019). Meconium aspiration is another crucial cause of neonatal mortality, it was occurred among 1-3% of live births (Ross, 2005). In developing countries, a few studies were interested about the association between meconium aspiration syndrome and neonatal mortality and morbidity. One study reported that from 170 neonates who had meconium aspiration syndrome, 25% were died (Louis et al., 2014)

Yego and Colleagues (2014) studied factors of maternal obstetric complications related to fetal and early neonatal mortality and found that PROM, hemorrhage and dystocia were significantly associated with mortality with P values ($p < .001$, $p\ 0.02$, and $p\ 0.01$ respectively), and cases had higher AOR than control (AOR 5.9, 2.4, 1.9 respectively) (Yego et al., 2014). Intrapartum complications can affect the pregnancy's outcome if not managed appropriately. These complications are related to either fetal such as fetal distress and abnormal presentation or related to maternal such as pre-eclampsia, eclampsia

and cord accidents. Programs have to target pre and intra-partum conditions in order to improve the birth's outcome (McClure & Goldenberg, 2016).

2.5.2.9 Mode of delivery

There was a high significant association between perinatal mortality and the CS mode of delivery (P value 0.001) (Iman & Husna, 2018). One study reported an association between perinatal mortality and the CS mode of delivery, since newborns who were delivered through the CS mode of delivery were more likely to die than those who were delivered through vaginal delivery with (AOR 2.85, 95% CI 2.02–4.02) (Ezeh et al., 2019). In contrast, another study demonstrated that the odds of perinatal mortality were less likely among mothers who delivered through the CS mode of delivery than mothers who delivered through spontaneous vaginal delivery with (AOR 0.48; 95% CI 0.27– 0.86) (Getive & Fantahun, 2017).

2.5.3 Fetal risk factors

2.5.3.1 Birth outcome

The pregnancy outcome of twins, or more, were associated with a higher risk to both the fetus and the mother than in the case of one. About one half of the twins and almost all of the triplet fetuses are born preterm and have higher rates of deaths than single babies. The risk of early neonatal mortality in multiple births was about six times higher in the neonatal period (range 3-15) when compared to single births. In less developed countries, the proportion of multiple births is increasing since an assisted reproduction technique is becoming increasingly available. In addition, mortality rates for boys during early neonatal period are higher than they are for girls (WHO, 2006).

One previous study demonstrated that multiple births (twins and more) have a different risk factor of perinatal mortality rates in comparison with single births (Helmerhorst et al., 2004). The odds of perinatal mortality among twin babies were approximately twice higher than among single births (Hosssain et al., 2019). With regard to the gender of the newborn, one study reported that perinatal mortality was higher among male babies than it was among their female counterparts with (AOR 1.45; 95% CI 1.25–1.68) (Ezeh et al., 2019). Male neonates have a higher risk of early neonatal mortality than their female counterparts (Crudes Odds Ratio (COR) 1.6; 95% CI 1.1-1.2) (Kibria et al., 2018). One study reported an increase of the risk of perinatal mortality among multiple birth babies

(AOR 3.59, 95% CI 1.20-10.79) and among male birth outcome (AOR 5.47, 95% CI 2.50-11.99) (Roro, Sisay, & Sibley, 2018). In contrary, another study showed that regardless of the high perinatal mortality rate being common among male babies, the difference was not statistically significant (Hugara et al., 2013).

2.5.3.2 Prematurity and low birth weight

Low birth weight is not considered as a direct cause of neonatal mortality, although it is associated with many neonatal deaths (WHO, 2006). Prematurity and LBW are among the most significant risk factors of perinatal mortality (Brahmanandan et al., 2017). The risk of perinatal mortality was increased among LBW neonates (RR 5.97, CI 5.88-6.07), and highly increases among extreme LBW neonates (RR 40.44; CI 39.66-41.23) (Sugai et al., 2017). One study showed that regardless of the high perinatal mortality rate being common among babies who having LBW, the difference was not statistically significant (Hugara et al., 2013). Another study reported an increase of the risk of perinatal mortality among newborns with body weight less than 2,500 grams by 17-folds higher than the risk of perinatal mortality among newborns having a birth weight of 2,500 grams and more, heavy newborns did not demonstrate an increasing in the risk of perinatal mortality in the same study (Usynina et al., 2017). Usynina and Colleagues (2017) study results were similar to another study that reported an increase in the odds of perinatal mortality among newborns with LBW compared to newborns with normal birth weight with (AOR 16.45; 95% CI 9.57–28.26) (Getive & Fantahun, 2017).

Sugai and Colleagues (2017) reported that the risk ratio of perinatal mortality in LBW neonates was 5.97 (95% CI 5.88–6.07), and this risk ratio increased with extremely LBW neonates to reach 40.44 (95% CI 39.66–41.23) (Sugai et al., 2017). Yego and Colleagues (2014) reported that birthing newborns weighing less than 2500 grams had significant association with perinatal mortality ($p<0.001$, AOR 6.6) (Yego et al., 2014).

One study conducted in the GS about determinants and risk factors of neonatal mortality in the GS (2012) reported that the LBW increases the risk of neonatal death than in the case of a normal one (OR 13.04, 9.08 respectively) (Awour, Abed, & Ashour, 2012). Another study reported an association between LBW (OR 17.3; 95% CI 8.4-35.6) and preterm live births (OR 8.8; 95% CI 4.3-17.8) with early neonatal mortality (Schoeps et al., 2007).

Different studies reported an association between prematurity and stillbirths. A prospective cohort study conducted in Tunisia, where an adjusted birthweight OR reached to 6.05 (95% CI 1.85-19.78) among 87 stillbirths, reported a strong association between prematurity and stillbirths (Nouaili et al., 2010).

2.5.3.3 Intrapartum-related complications

In the absence of intrapartum care, complications during delivery such as birth asphyxia and trauma, which often occur together, are common causes of perinatal death in the most severe cases, while with less severe cases, asphyxia and trauma will cause disability. It was estimated that asphyxia causes around 7deaths /1000 births in developing countries, whereas this proportion is less than one death/1000 births in developed countries (WHO, 2006). A high perinatal mortality rate was also reported among babies who had intra-uterine complications like growth restriction, meconium aspiration, fetal distress and congenital anomalies (Hugara et al., 2013). Intrapartum-related causes as asphyxia and birth trauma have an attribution percentage of stillbirths with 3.1% and 25%, respectively (Aminu et al., 2014; Harding, 2014; Bhattacharyya & Pal, 2012; Hinderaker et al., 2003). Intrapartum asphyxia represented 21.0% of stillbirths causes (Afshan, Narjis, & Mazhar, 2019).

2.5.3.4 Congenital anomalies

Congenital anomalies are considered among the most common causes of stillbirth in developed countries and increasingly reported in multi studies as a cause of stillbirth in developing countries. The most common congenital causes of stillbirth in high- income countries are cardiovascular and chromosomal, while there is no available detailed information for most developing country settings (Flenady et al., 2011). One study reported that fetus-related factors such as infection and congenital anomalies has attributed to increase the risk of stillbirth at a percentage of 2.1- 33%, (Aminu et al., 2014; Harding, 2014). One study conducted in Palestine reported that congenital anomalies represented about 29% of infant mortality (Van den Berg et al., 2015). The perinatal mortality was more likely among newborns with congenital anomalies than newborns with no congenital anomalies. The AOR of perinatal mortality equals 34.04 (95% CI 7.14–162.41) (Getive & Fantahun, 2017). Congenital anomalies considered as the second major cause of neonatal mortality, the most common anomalies reported were congenital heart defects followed by neural tube defect (Bhide, Gund, & Kar, 2016).

2.5.3.5 Fetal Growth Restriction FGR

One study reported that intra-uterine growth restriction is one of the most significant risk factors of perinatal mortality (Brahmanandan et al., 2017). FGR demonstrated a 2.7-fold increase in perinatal mortality with (P value <0.001) (Usynina et al., 2017).

In a cohort study conducted in England (2009-2011) to study risk factors of stillbirths, the Researchers found that modifiable risk factors as maternal obesity, smoking in pregnancy and FGR, together, accounted for 56.1% of stillbirths. FGR which was not recognized nor predicted during the antenatal period was considered as the highest and strongest risk factor of stillbirths. The relative risk was 4.0 (95% CI 2.8-5.7) in case of detection FGR antenatally, compared to 8.0 relative risk when FGR was not detected antenatally (95% CI 6.5-9.9) (Gardosi et al., 2013). Harding (2014) considered FGR as the main risk factor of stillbirth (Harding, 2014). The neonatal FGR reported a 2.7-fold increase in the risk of perinatal mortality (Usynina et al., 2017).

2.5.3.6 Gestational age

In Palestine, one retrospective cohort study was conducted in 2011 at one of the largest hospitals in Nablus city to study the rate and risk factors related to stillbirth. The study results showed that the stillbirth rate for gestational age ≥ 28 weeks was 7.1 deaths/1000 births, and the researchers considered this rate fairly when compared with neighboring countries like Jordan, Egypt and Israel that estimate stillbirth rates 13, 10 and 5, respectively. This study indicated that prematurity, small fetuses, fetal macrosomia and maternal hemoglobin concentration were significant risk factors that should be taken in consideration in policy setting to reduce stillbirth and perinatal mortality rates and recommend to add more information on the registration system such as maternal height, weight, blood pressure, albumin urea and hyperglycemia conditions to enhance the reporting value and affirm the need to learn more precisely about the number of stillborn who are due to intrapartum death (Cung et al., 2014). One study reported an increase the risk of perinatal mortality among earlier gestational age (RR 10.22, 95% CI 10.03–10.40) and among later gestational age (RR 2.55, 95% CI 2.48-2.63) (Sugai et al, 2017).

Yego and Colleagues (2014) represented in their case–control study that there was a significant association between fetal and early neonate mortality and gestational age at an admission below 37 weeks relative to gestational age 37-42 weeks ($p<0.001$; AOR16.6) (Yego et al., 2014).

Another study reported that the main risk factors of early neonatal deaths are neonate birth weight and gestational age (Indongo, 2014). There was a high significant association between perinatal mortality and gestational age (P value 0.001) (Iman & Husna, 2018).

2.5.3.7 Other factors

One study conducted in the GS about increasing neonatal mortality among Palestinian refugees showed that the main causes of infant deaths were preterm birth 39% and infection 19%, while the risk factors for infant death were preterm birth and high-risk pregnancies (OR 9.88, 3.09 respectively). They used infant mortality to reflect neonatal mortality (Van den Berg et al., 2015). Another study reported an increase in the odds of perinatal mortality among preterm deliveries about two times higher than it is among term deliveries (AOR 2.02; 95% CI 1.08–3.77) (Getive & Fantahun, 2017).

2.6 Risk factors and causes of stillbirth

Attention to stillbirths has increased over the past decades, and now, new global strategies for women's, children's and adolescents' health include prevention of stillbirths in their vision statement. Worldwide, stillbirths are prevalent; in 2015, 18.4 stillbirths per 1000 total births occurred compared with 24.7 stillbirths per 1000 total births in 2000 (Froen et al., 2016). Although there are high numbers of stillbirths worldwide, but in developing countries stillbirths received little attention in policy programs, and few research studies investigated the issue of stillbirth (McClure et al., 2009). McClure and Colleagues (2009) searched all the English articles and publications related to perinatal mortality and stillbirths in developing countries in order to understand rates, causes and possible preventive strategies of stillbirths. They concluded that obstetric care, particularly in labor and delivery, should reduce stillbirth rates in developing countries and recommended that more research studies are needed to understand more about causes and preventive strategies of stillbirths specific to geographical area (McClure et al., 2009). Stillbirth rates have become steady in the last few decades. This steady state has occurred after an obvious decline at the first half of the 20th century (Rochman, 2011). Being aware of the

different risk factors of stillbirth lead to focus more attention and effort to lower the incidence of stillbirths since many causes of stillbirth are still unknown. CDC summarizes three broad categories at which stillbirths occur; the first one is related to the fetal status such as birth defect and genetic problems, which contribute to stillbirth cases; the second is about problems with placenta or umbilical cord, and the last is the condition related to mothers such as NCD problems (CDC, 2017).

There is an obvious conflict with regard to the difference between risk factors and causes of stillbirth, and two terminologies are used interchangeably by most of the authors, whereas risk factors related to stillbirth are related mainly to pregnant women and their communities, and causes of stillbirth are mainly related to clinical condition (Aminu et al., 2014). The causes of stillbirths are not established currently for many cases, and mostly, it is not recorded accurately or even at all (Froen et al., 2011). The main risk factors of stillbirth are well-known and often overlapped. These factors include the age of mothers (>35 years), presence of infection, noncommunicable disease and life style factors like nutrition, obesity and smoking (Froen et al., 2016). Different studies were conducted to identify causes and risk factors associated with stillbirth in low- and middle-income countries. One of these studies was accomplished in 2014 through systematic literature review from 2000-2013 of 142 studies related to this item. From these studies, only 2.1 % (3 studies) were conducted in low-income countries. Although at the health facility level most maternity registers record information on the condition at birth (alive, stillborn), stillbirth is currently not recognized in the Global Burden of Disease; it is neither counted as missed lives in disability- adjusted life years nor fully identified as an individual death by the ICD. The study resulted in maternal factors such as age, parity, history of previous stillbirth, multiple gestation, mode of delivery and maternal morbidity; socio-economic factors such as the socio-economic status and education; healthcare service factors such as access of care, lack of or inadequate antenatal care, care setting and place of birth. Fetal factors such as fetal sex, birth weight, gestational age at birth and prematurity are the most commonly reported factors associated with stillbirth in developing countries. According to the International Society for the Study and Prevention of Perinatal and Infant Death (ISPID); infection, preeclampsia and placental abruption are considered as main medical disorders associated with stillbirths in developing countries (ISPID, 2013).

There is a need to conduct research studies to investigate risk factors associated with stillbirths in order to develop suitable interventions (Lawn et al., 2011).

2.7 Risk factors and causes of neonatal deaths

Although the number of neonatal deaths declined from 5.1 million in 1990 to 2.6 million in 2016, this decline is still slow in comparison to the decline in post-neonatal and under five mortality; 49% compared with 62%, which led to increase the proportion of neonatal deaths among under five deaths from 40% in 1990 to 46% in 2016 (United Nations Children's Emergency Fund-UNCEF-, 2018). In some areas like Sub-Saharan Africa, the decline in neonatal mortality is attributable to the increased number of births, while the neonatal mortality did not change from 1990 till 2016 (WHO, 2016b). There is an evidence that there has been no measurable reduction in early neonatal mortality over the past decade (UN, 2012). Most intervention programs were established to reduce under five mortality rates directed toward improving survival after the first four weeks of life (WHO and UNICEF, 2012). The neonatal period is the most vulnerable period in child survival. It reflects the quality of care and follow-up provided for women and children, particularly at the first 48 hours after the delivery. The survival of newborns increases accordingly with an enhanced and improved health service quality (UN, 2015). Different studies in developing countries were established to identify the risk factors and causes of neonatal mortality. The most common cause of neonatal death was prematurity (54.7%) that was reflected in birth weight, which is mainly under 2500 grams and gestational age < 37 gestational weeks (Indongo, 2014; Harding, 2014). RDS, asphyxia and sepsis congenital malformation are the major causes of neonatal deaths (Indongo, 2014; Zupan, 2005).

Birth trauma, surgical complication, tetanus, hypothermia and jaundice are fewer common causes of neonatal deaths (Indongo, 2014). Yego and Colleagues (2014) showed that there is a significant association between mortality and neonatal complication such as asphyxia, congenital malformation and RDS with an AOR of cases higher than control (AOR= 2.4, 2.9 and 1.6 respectively).

In low- and middle-income countries, the main medical causes of early neonatal deaths are prematurity and intrapartum-related problems such as birth asphyxia (Lohela et al., 2019).

2.8 Accessibility of health services

Health system factors have clear association with newborn deaths, especially in health setting where resources are scarce and the quality of care is inadequate (Velaphi & Rhoda, 2012). In developing countries, 83% of pregnant women received prenatal care only once (Neupane & Doku, 2012), and the barriers of services included political, financial, operational and socio-cultural barriers which led to the inequitableness and low coverage of services (Chiang et al., 2013).

In contrast with developed countries, neonatal mortality in developing countries is still high primarily due to poor antenatal care, negligence of female health and nutrition, and lack of skilled health providers (Indongo, 2014). Delay in receiving health services was common in neonatal death cases, and the most common reasons for this delay was the lack of facilities including medication and supplies that were needed for premature neonate care, the lack of trained and available health providers, the lack in referring neonate to higher level health facilities, and delay in decision making about the cesarean section (CS) during prolonged labour making (Indongo, 2014). One of the main interventions to save lives of early neonate is the presence of a skilled health staff (Bhutta et al., 2014).

According to ISPID, 99% of stillbirths in the world occurred in developing countries, and the main risks of stillbirth are lack of skilled care, poor diet and lack of emergency obstetric (ISPID, 2013).

The association between the lack of antenatal care with the high risk of perinatal mortality was reported in different studies, one of which found that about one third (31.8%) of perinatal mortality occurred among mothers with poor antenatal care (Iman & Husna, 2018). Nouaili and Collogues (2010), at their cohort study to determine risk factors of perinatal mortality, found that inadequate antenatal care increased the risk of stillbirth among the Tunisian population with an AOR 3.50 (95% CI 1.07 - 11.43) (Nouaili et al., 2010). Another study reported an association between the lack of antenatal folic acid supplement and booking after 13 weeks, which increased the risk of stillbirths (Gardosi et al., 2013).

Roozbeh and Colleagues (2016) provided a systematic review of barriers related to using prenatal care for the first time. They investigated in their descriptive study the barriers related to prenatal care utilization by women and showed that the negative attitude towards

health care is the most important individual barrier for prenatal services utilization. Poverty, economic situation and service cost are financial barriers to prenatal care. Long waiting period, transportation, psychological, social, and attitudinal barriers also affect the access to prenatal care. They recommended paying attention to all domain barriers, especially individual and financial barriers to improve prenatal service coverage (Roozbeh et al., 2016). In their case-control study established to identify risk factors of fetal and early neonatal deaths, Yego and Colleagues (2014) reported the association of the number of antenatal visits, since the odds of having 0-1 antenatal visits relative to 2-3 visits were higher for cases than controls (p<.001; AOR 5.4) and cases had lower odds of having four or more antenatal visits relative to 2-3 visits (AOR 0.3), qualification of birth attendant; having a birth attendant who was a doctor rather than a midwife (p 0.01; AOR 0.4) (Yego et al., 2014).

One study reported that, with regard to sub-optimum access to antenatal care, the risk of newborn deaths increased twice when mothers attended fewer than four antenatal sessions during pregnancy in comparison with mothers who attended four or more times (Awour, Abed, & Ashour, 2012). Consistent results were reported in another study conducted at the West Bank; the study reported an association between antenatal visits more than 4 visits and fewer neonatal deaths (OR 2.980; P value 0.001; CI 2.504-6.656). Furthermore, the study reported an association between antenatal care follow-up in the private sector with fewer neonatal deaths (P value 0.007, CI 2.82-665.13, OR 43.3) (Lahaseh, 2012). Mothers who received an appropriate natal care and delivered at a health facility by skilled health personnel were less likely to have early neonatal deaths outcome than the ones who didn't utilize these services (Kibria et al., 2018).

2.9 Economic costs of perinatal mortality

Knowledge about the magnitude of the cost of neonatal health-ill is still lacking at the society level, and the cost of stillbirth remains poorly described. The knowledge about the economic cost of stillbirth and neonate is extremely important to estimate the size of its impact on families and health services and to give information for decision-makers to set the needed policies in order to decrease perinatal deaths (Owgulu et al., 2015). The cost of stillbirth is not restricted to the loss of life, which is considered as a direct cost of stillbirth. It costs 10-70% more than live birth from funeral cost and income lost due to work off, it also has an indirect cost through its effect on the reduction of work productivity (WHO,

2016 b). Stillbirth goes beyond that to include financial cost to parent and adverse impacts on the daily functioning, relationships, employment, and economic cost for the society at the long term (Heazell et al., 2016; Owgulu et al., 2015). Furthermore, it has a number of psychological effects such as anxiety, maternal depression, shame, suicidal thoughts, post-traumatic stress disorder (PTSD) and guilt (Hughes & Riches, 2003). About 4.2 million women are living with depression associated with a previous stillbirth, in addition to the stigma that exacerbate trauma for families (Froen et al., 2016). Neonates are among those patients generating the highest hospital costs in recent years (Shanmugasundaram, Padmapriya, & Shyamala, 1998). The Neonatal Intensive Care Unit (NICU) reflects the cost of early neonatal deaths, particularly for infants with LBW, since it was considered among the costliest hospital admissions and one of the most expensive components of pediatric healthcare (Zupancic et al., 2003). Life expectancy of preterm neonate is nevertheless improved by increasing the length of stay at hospitals, which in turn increases the hospital cost (Chalfin et al., 1995; Geitona et al., 2007). A retrospective study conducted in Istanbul to assess hospital costs of 211 preterm babies admitted to NICU, in a 12-month period show, that there was a statistically significant relationship between the length of hospital stay, ventilation duration, presence of intervention, RDS, sepsis and hospital costs (P value 0.001, 0.001, 0.003, 0.002, 0.001, respectively) (Comert et al., 2012).

Chapter Three
Methodology

This chapter provides a detailed description of study methodology and full description of quantitative data collection methods and tools. It highlights study design, study population, sampling, data entry and data analysis, study settings, and data collection tool. Then, it describes validity and reliability of the study instruments, ethical consideration, and finally limitation of the study.

3.1 Study design and method

The researcher used quantitative research approach; the design of the study is a matched retrospective case- control design. Case- control studies are useful for identification of risk factors related to specific disease or condition. Compared to other study designs, case-control studies are easy and quick and they are accomplished within shorter period of time and relatively less expensive than other studies.

Case control studies can't generate incidence rate and more subjected to recall bias. Additionally, selection of controls can be difficult and it will be more difficult if records keeping is inadequate or unreliable (Lewallen & Courtright, 1998). The researcher used this design to identify the main risk factors of perinatal mortality in the GS by comparing cases (stillbirths and early neonatal deaths) with controls (live newborns). The researcher used matched case control design (by time and place of birth) with one control for each case.

3.2 Study population

The study includes two-population: cases and controls. Cases are women who had stillbirths or early neonatal deaths outcome during the period from January 2018 till August 2018. All cases, with available contact info, delivered at governmental hospitals (Al- Shifa Hospital, Nasser Complex Hospital, Al Aqsa Hospital and Al Imarati Hospital) at the first eight months of the year 2018 were selected to participate in the study. The total number of cases enrolled in the study was 263 participants.

Controls are divided into two groups:

- Controls of early neonatal deaths was selected from women who delivered at the same week, at the same hospital and their infants aged at least one month.
- Controls of stillbirths was selected from women who were pregnant during the first eight months in 2018 and delivered a live birth at the same expected date as cases and their infants aged more than 28 days.

The total number of controls enrolled in the study was 263 participants.

3.3 Study setting

The study was hospital based, it was conducted at 4 governmental hospitals in GS: Al-Shifa Hospital, Nasser Complex Hospital, Al Aqsa Hospital and Al Imarati Hospital. These hospitals were the only governmental hospitals that provide obstetric services in the GS during the period of data collection. In this study, the Researcher compromised all cases at these hospitals during the first eight months of the year 2018, while, cases from other private or NGOs hospitals were excluded. Controls were selected from the women who delivered at the same hospital and had a live baby aged more than one month.

3.4 Study period

The study was initially proposed in March 2018. The proposal of the research was submitted and approved from the school of public health (SPH) committee in May 2018. Another ethical approval was obtained from Helsinki Committee to conduct this research. Upon the approvals, the researcher started to develop the study data collection tool. The study questionnaire was designed in August 2018. After that, the researcher consulted experts in gynecological and research fields to review and approve the tool. In September 2018, the questionnaire was complete and approved.

Before starting data collection, the researcher trained three data collectors. Pilot study was conducted during October 2018, where 15 cases and 15 controls were selected randomly and interviewed and their medical files were reviewed as well. Actual data collection started in November 2018 and lasted five months till March 2019. Data entry was done in parallel with data collection, and it was developed on Statistical Package of Social Science (SPSS) program. The data entry ended at in May 2019 in parallel with finishing data collection. Data analysis started in April 2019 and ended in May 2019. During this

period, the researcher started to generate descriptive analysis and inferential analysis using tables and graphs. Annex (1) describes the duration in details.

3.5 Selection of study participants

Selection of the cases was conducted by involving all mothers who delivered at mentioned hospital at first eight months in 2018 and have correct contact information in their medical records. Poor documentation and inaccurate or missing contact information, the reaching out the cases was very demanding and extended the period of data collection. Selection of controls was conducted by selecting mothers who delivered at the same period of time through a simple random technique.

3.6 Eligibility criteria

3.6.1 Inclusion criteria

- Cases were operationally defined as women who had stillbirth outcome at age 26 weeks of gestation and more and early neonatal deaths at the first week of life at abovementioned governmental hospitals during the first eight months of 2018.
- Controls were operationally defined as women who had live birth outcomes and were delivered at the same hospital and in the same period of time. Age of infants was at least 28 days.

3.6.2 Exclusion criteria

- With regard to cases, the researcher excluded all women who had fetal deaths at age less than 26 weeks of gestation and women who had late neonatal deaths at all hospitals (more than one week after delivery).
- With regard to controls, the researcher excluded all women who had live birth as pregnancy outcome occurred at other hospitals not included in the study or occurred at different period of time.

3.7 Sampling

3.7.1 Sample calculation

Based on the prevalence of stillbirths and early neonate deaths in GS, the Researcher calculated the sample size by using Epi-Info sample size statistical calculator and considered the following parameters:

- Confidence level is 95%.
- The odds ratio is assumed to equal 2
- The power is 80%.
- Ratio of controls to cases 1.
- Percent of controls exposed 33.3%.

The estimated sample size was 187 cases and 187 controls from the governmental hospitals, as shown in (Annex 2). The researcher took all available cases of stillbirths and early neonatal deaths reported in the first 8 months of 2018 to reach the required sample size. Cases were distributed as 128 stillbirths and 135 early neonatal deaths.

3.8 Study instrument

The study instrument was self-developed data collection tool that covered all variables needed to identify risk factors of perinatal mortality. The questionnaire was developed to cover study objectives after reviewing the literature and previous studies to include all possible risk factors related to perinatal mortality. The questionnaire was reviewed by experts and their comments were taken into consideration, in addition pilot study helped in modification the questionnaire until formulating the final version. The questionnaire covered the following components.

- Maternal factors like past and present medical and obstetric history
- Fetal factors such as age gestational age, gender, weight, congenital abnormalities
- Health system related factors as antenatal services, intrapartum and post-partum services
- Socioeconomic factors like age, education, economic status**.**

All these factors contribute in perinatal mortality as mentioned previously in the literatures**.**

The researcher has also used the General health questionnaire 12 (GHQ 12), it is a reliable and valid instrument that can be used for measuring psychological well-being of study participants during the last pregnancy. The GHQ questionnaire contains 12 items and the researcher has taken 6 scores as cut point to study participants well-being. Since, stress score less than 6 indicated an absence of mental problem, while stress score 6 and more indicated a presence of mental problem.

3.9 Data collection

The data collection lasted 5 months, from November 2018 to May 2019 by using self-developed collected tool that covered all variables needed to identify risk factors of perinatal mortality as mentioned at previous literatures. The tool includes factors related to mother such as age and maternal history, factors related to fetus as congenital anomalies, sex, weight and gestational weeks, factors related to socioeconomic condition of mothers as income and education and factors related to healthcare system and services introduced to women and their babies during pregnancy, antenatal care, Intrapartum care, and postnatal care. The same tool was completed from both cases and controls, and because the researcher could not reach the required sample size, the data collection time extended for additional 2 months. The researcher collected data through direct and indirect methods:

- **Direct method** through reviewing the study participants' files at the onset of hospital admission and completed needed variables from patient file for both cases and controls. All variables related to past and current obstetric history, medical and gynecological history were reviewed from the participants' files.
- **Indirect method** was done by 3 trained data collectors via interviewed questionnaire for variables that didn't register in patient file such as socio demographic variables as income, employment, consanguinity, education, stress assessment and past obstetrical comorbidities. The researcher and data collectors communicated with both cases and controls who had fetus at age of more than one month to complete an interviewed questionnaire.

3.10 Data management and statistical analysis

Data entry was accomplished during the same time of data collection. The researcher reviewed all questionnaires to ensure complete filling and any missing variables were completed by recalling the participants directly or revised their medical files. The researcher designed data entry model by using SPSS program (version 23). SPSS was used to conduct data entry, data cleaning, frequency and cross tabulation, and data analysis**.** The researcher coded all variables in questionnaire to ease the process of data entry and analysis. The process of data entry was performed completely one week after the end of data collection. In addition, about 5% of data entry was reentered. The first step after complete data entry, the researcher cleaned the data by checking all variables frequencies to check any missing, errors or illogical values. After that, descriptive

statistics were conducted for basic characteristics of the sample, using the mean and standard deviation for continuous variables and percentages for categorical variables. The researcher ran the analysis using the dependent variable: cases and controls, is dichotomous variable and the independent variables categorized into four domains: risk factor related to fetus, risk factor related to mothers, socio-economic risk factors and health care services related factors.

Inferential statistics was conducted according to the type of variables, for example, to compare between cases and controls with regard to categorical variables, chi-square test was used, and in the cases of presence of any violation of chi-square assumption, fisher's exact test was used. While, with regard to continuous variables, T- test was used to explore differences between cases and controls. P-value equal or less than 0.05 was considered statistically significant, with CI of 95%.

3.11 Scientific rigor

3.11.1 Validity and reliability

Experts in obstetrics, research, and public health evaluated components, context, and the content of the instruments and their comments were taken in consideration, to ensure their relevance, also face validity of the measurement was done. Pilot study was conducted before the actual data collection to examine the suitability of the tool. To assure instrument reliability, the researcher collected the data with help of well-trained data three data collectors. Additionally, the researcher did data entry in the same time of data collection, to give chance for possible correction to increase data quality. Re-entry of 5% of the data after finishing data entry was assured correct entry procedure and decreased entry errors.

3.12 Response rate

The response rate among controls was 100%, while there were two study participants who have early neonatal deaths refused to respond, so the response rate among cases was 99.2%.

3.13 Pilot study

The researcher conducted pilot study before the actual collection of data, it was done through collecting data randomly from 15 cases and 15 controls. The pilot study was done

to ensure the appropriateness of the collection tool and to improve the validity and reliability of the study. Modification of some questions were done and new questions were added after pilot study.

3.14 Ethical consideration

- The researcher collected and analyzed data confidentially and no information will be shared.
- The researcher had approval from School of Public Health at Al-Quds University.
- The researcher had an ethical approval from Helsinki Committee to conduct this study.
- Another approval was obtained from the Human Resources Development Directorate general in the MoH for conducting this study. An Admin approval was asked from the Director General of MoH.
- An informed consent obtained from all participants (cases and controls) after providing them sufficient information about the goal of study, the procedures of data collection and the benefits of results on the health of mothers and their babies and guaranteed complete confidentiality and privacy of their own information.

3.15 Limitation of the study

- Current situation in the GS from blockade and power shortage
- This type of studies is susceptible to the effect of recall bias
- Inability to calculate prevalence because it was case-control study
- The study conducted only at governmental hospital and didn't include other sectors
- Weakness of computerized system used in hospitals led to lack of some important information needed for the study.
- The difficulty to reach all cases included in the period of data collection due to lack of incomplete and inaccurate contact info of clients.

Chapter Four

Data Analysis and Findings

This chapter summaries the main findings of the study in a comparative way between cases and controls. First, it outlines the main risk factors related to perinatal mortality in the GS including, socio demographic factors, past and current gynecological and obstetrical history, along with maternal and infant physical characteristics. Second, it demonstrates health care system related factors and other relevant risk factors between cases and controls. Finally, throughout this Chapter, findings of this study will be discussed in light of previous studies.

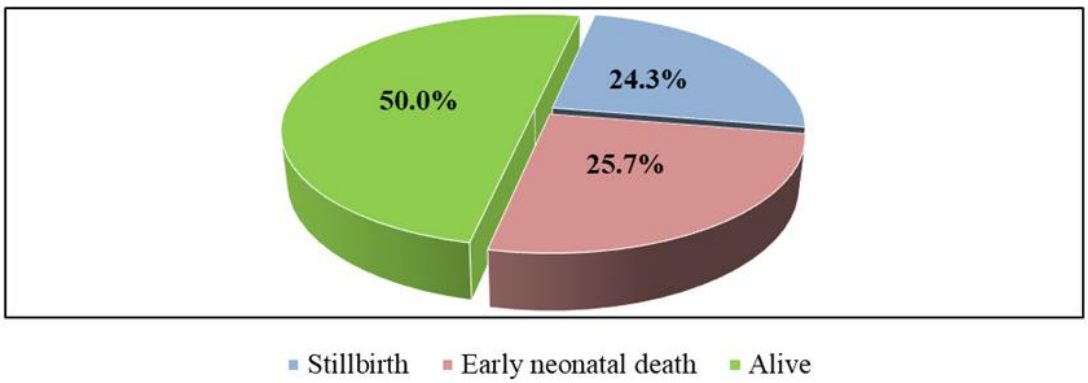
4.1 Maternal characteristics

4.1.1 Socio-demographic factors

4.1.1.1 Demographic characteristics

It is worth reminding the reader that the overall number of study participants was 526 women, distributed as 263 cases and 263 controls. The matching between cases and control was done according to the place of delivery and time of delivery. As shown in Figure (4.1), of the cases, 128 participants had stillbirth's as pregnancy outcome (48.7%) and 135 participants had early neonatal deaths as birth outcome (51.3%). All controls (263 participants) had a live birth as pregnancy outcome and their infants aged more than 28 days, at the time of data collection.

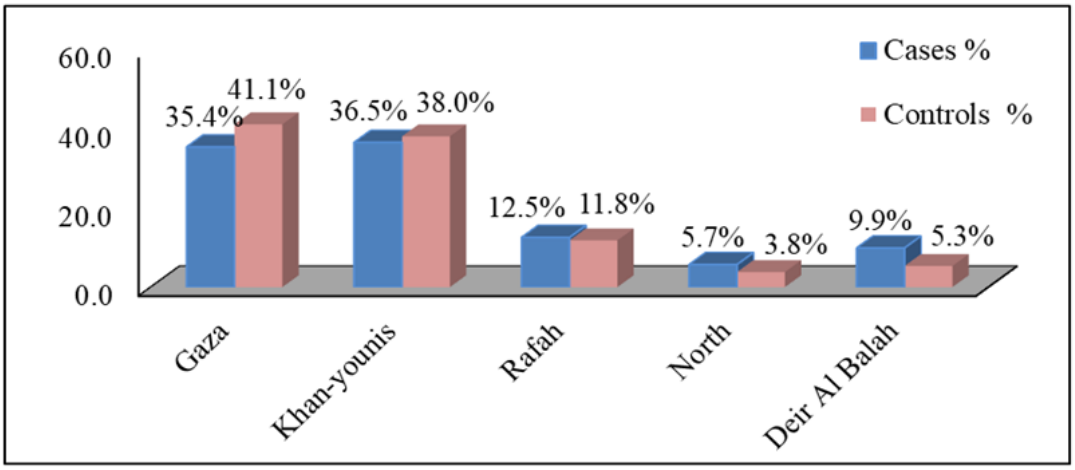
Figure (4.1): Percentage distribution of study participants by birth outcomes



Distribution of study participants by Governorates shows that 38.2% of the study participants were from Gaza, 37.3% of the study participants were from Khan-younis, 12.2% of the study participants were from Rafah, 7.6% of the study participants were from Dier Al Balah and 4.8% were from the North. Figure (4.2) shows the percentage

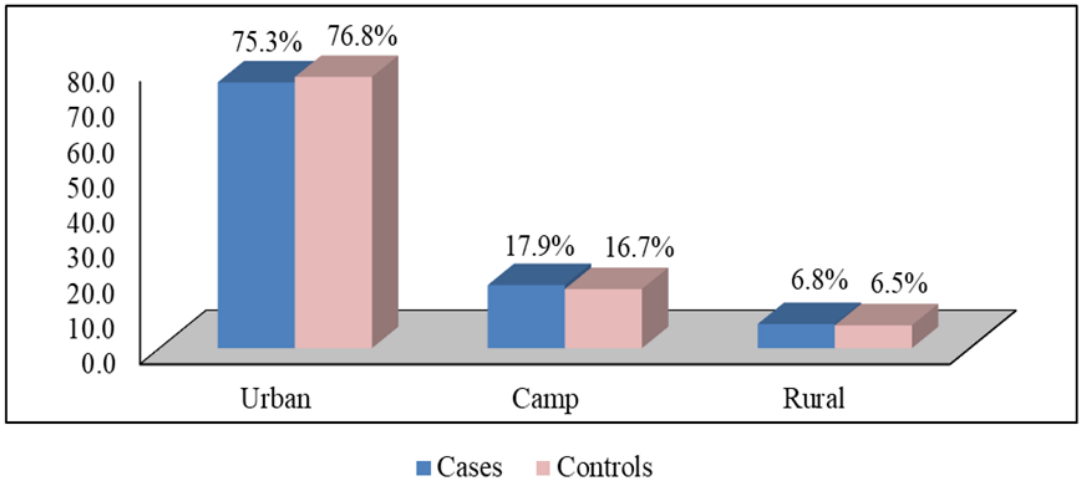
distribution of cases and controls by governorates, and it shows that more than two-third of cases (71.9%) were from Gaza and Khan-younis governorates distributed as 35.4% and 36.5%, respectively.

Figure (4.2): Percentage distribution of study participants by governorates



The study has included all cases who had perinatal mortality during the data collection period, it is worth mentioning that the patient record documentation was incomplete and inaccurate. Improving the quality of patient record documentation is highly recommended. Of the total study participants, more than three quarters of study participants (76%) living in urban areas compared to 17.3% living in camps, and 6.7% living in rural areas, as shown in Figure (4.3). It is noticeable that no statistically significant differences were reported between cases and controls with regard to their place of living, with (χ^2 0.16, P value 0.920), statistics are not shown.

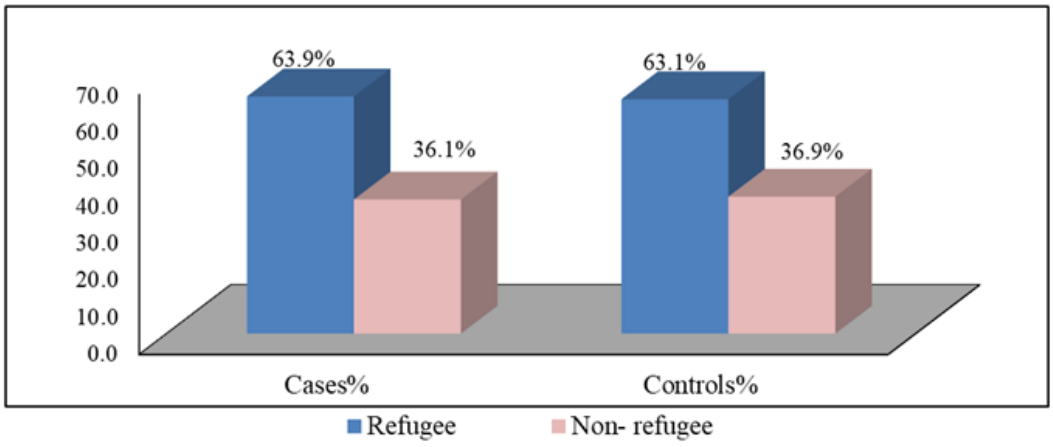
Figure (4.3): Percentage distribution of study participants by place of living



Regarding to refugee status, about two-third of the study participants (63.5%) were refugees and 36.5% were non-refugees.

Study findings have shown that 63.9% of cases were refugees and 36.1% were non-refugees compared to 63.1% and 36.9% among controls, respectively, as shown in Figure (4.4). The differences between cases and control with regard to refugee status were statistically not significant, with (χ^2 0.033, P value 0.928). Statistics are not shown. Distribution of study participants by refugee status is consistent with the percentage distribution of the GS population by refugee status in which 65% are refugee (PCBS, 2018).

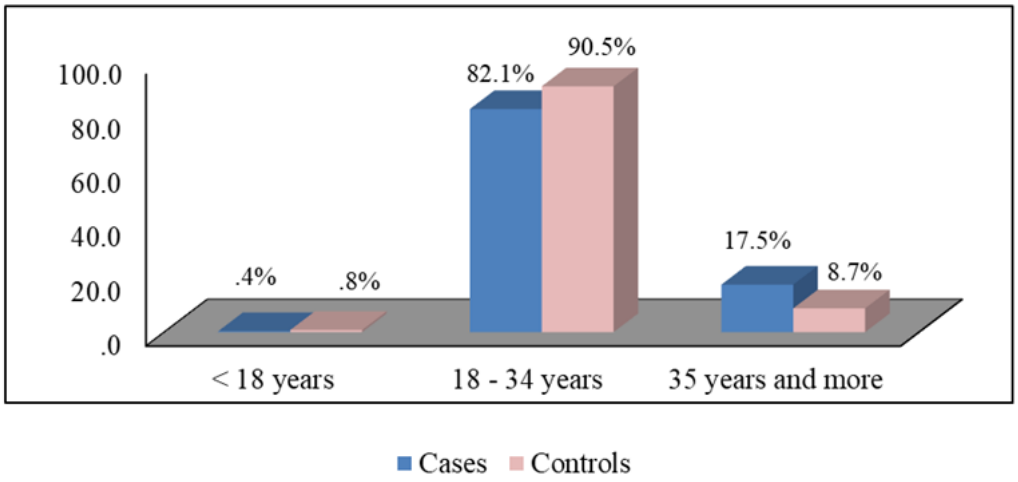
Figure (4.4): Percentage distribution of study participants by refugee status



The study results have revealed that, the overall mean age of study participants was 27.19 years (SD ±5.9), and there was a statistically significant difference between the mean age of cases (27.76 years, SD±6.2) compared to controls (mean 26.62 years, SD ±5.49), with (t test 2.22, P value 0.027). In other words, cases have slightly higher mean age than controls. The study results have shown that the prominent age group of study participants was age group 18-35 years at (86.3%). The percentage of 18-35 years' age group among cases was 82.1% compared to 90.5% among controls. It is worth mentioning that a total of 0.6% of all study participants aged less than 18 years old, and 13.1% of study participants aged more than 35 years, as shown in Figure (4.5). The results of this study are consistent with findings of previous studies that have shown association between age and perinatal mortality. The risk of perinatal mortality is higher among women aged more than 35 years old and among adolescents (McClure et al., 2011; Ulizzi & Zonta, 2002; Sinha et al., 2016; Bhattacharyya, R. & Pal, A. 2012; Hi et al., 2012, Froen et al., 2016). On contrary,

the findings of the study are inconsistent with the result of Iman & Husna (2018) study that did not find an association between mother age and perinatal mortality.

Figure (4.5): Percentage distribution of study participants by age groups



4.1.1.2 Socio-economic characteristics

Distribution of study participants according to smoking status has shown that 20 participants (3.8%) were smokers during the last pregnancy. Remarkably, of smokers, the majority (19 cases) were from cases compared to only one smoker among 263 controls. The differences were statistically significant, with (P value 0.000). This result is congruent with previous studies that revealed an association between smoking and perinatal mortality (Harding, 2014; Gardosi et al., 2013; Froen et al., 2016).

Of all study participants, 26.8% were exposed to indoor smoking during the last pregnancy from their husbands and/or relatives, distributed as 27.8% among cases and 25.9% of controls. The differences between cases and controls were statistically not significant, with (χ^2 0.242, P value 0.694). The study results are inconsistent with Gardosi and Colleagues (2013) study that reported an association between perinatal mortality and passive smoking. Even though, smoking is relatively uncommon among women in the Gaza, it is still important to include the adverse effect of smoking as part of antenatal care.

Regarding to study participants' years of schooling, the study results have shown that the overall mean of mother's years of schooling was 13.1 years (SD±2.6), and there was no

statistically significant difference between the mean of years of schooling among cases (13.15 years, SD±2.68) and the mean of years of schooling among controls (13.04 years, SD±2.55), with (t test 0.499 P value 0.618). The study results have shown that more than three quarters of study participants (80.8%) have accomplished their secondary school and above (>12 years) compared with 19.2% who have not accomplished their secondary school (< 12 years). Generally, maternal education level boosts the ability of mothers to acquire knowledge on health issues and optimal use of health services (Hahn & Truman 2015). Previous studies reported an association between perinatal mortality and poor education (Ulizzi & Zonta, 2002; McClure et al., 2007; Lohela et al., 2019; Schoeps et al., 2007; Iman & Husna, 2018). The study results have not shown a significant association between mother's educational level and perinatal mortality mainly due to the fact that both cases and control have same education level. Within the context of Palestine, education is compulsory to the 9^{th} grade. In 2018, the illiteracy rate among Palestinians aged 15 years and more was 2.8%, which is consider one of the lowest in the world. Concerning to husbands' years of schooling, the overall mean of husbands' years of schooling was 12.15 years (SD±3.22), with no statistically significant difference between cases (mean 12.27 years, SD±3.13) and controls (mean 12.03 years, SD±3.3), as shown in Table (1).

Concerning to economic status of participants, findings of this study have shown that the overall mean of family monthly income was 742.6 NIS (SD ±806.91), and there was difference between the mean of family income among cases 747.48 NIS (SD±788.62) compared to controls 737.79 NIS (SD± 826.0), but these differences were statistically not significant, with (t test 0.137, P value 0.891). These results were inconsistent with previous study results that reported an association between family income and perinatal mortality (Sinha et al., 2016).

Concerning to the employment status, the study results have shown there were no statistically significant differences with regard to the employment status between unemployed cases (93.9%) and unemployed controls (93.5%,), with (χ^2 0.032, P value 0.857). With regard to husbands' employment status, more than 69% of participants married to employed husband, at which the percentage of cases who married to employed husbands was slightly less than controls (69.2% vs 70%), however, these differences were

statistically not significant, with (χ^2 0.036, P value 0.925). The study findings have shown that the majority of the study participants were unemployed (93.7%) and overall mean of family monthly income was 742.6 NIS, the number which is faraway from 1974 NIS -the cut point of deep poverty in according to PCBS report (PCBS, 2019, b). Unemployment rate reaches up to 52% in GS, this reflects the economic deterioration of Gaza's economy. According to PCBS (2017b), females' participation rate in labour force is very low compared to males' participation rate (19.0% vs.71.2%). Inconsistent with previous studies that reported an association between perinatal mortality and employment status and low economic level (Gardosi et al., 2013; Iman & Husna, 2018; Lohela et al., 2019), the study results did not find significant association between perinatal mortality and economical status.

The study results have shown that, of all employed participants, 6.3% have worked in services and other related jobs, including education and health sectors. And, the most common husbands' working jobs among study participants were working in services and other related jobs including health, education and military services. These are major governmental and UNRWA sectors that provide an employment chance within GS.

Regarding to housing conditions, findings of study have shown that more than three quarters of study participants (80.6%) were living in houses made of concrete in which the percentage of participants who lived in concrete houses was higher among control (82.1%) than among cases (79.1%). The differences were statistically not significant, with (χ^2 0.77, P value 0.44). It is worth mentioning that the majority of study participants were living in owned houses 92.8%, with no significant difference between cases and controls.

With regard to number of rooms per household, the results of the study have shown that the mean of the number of rooms per household was 2.12 rooms, distributed as 2.10 rooms per household among cases and to 2.14 rooms for control. The differences were statistically not significant, with (t test 5.30, P value 0.596).

Table (4.1): Percentage distribution of study participants by socio-economic status

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	**%**	**No.**	**%**	**No**	**%**		
Mother smoking status**	Yes	19	7.2	1	0.4	20	3.8		0.000*
	No	244	92.8	262	99.6	506	96.2		
	Total	263	100	263	100	526	100		
Passive smoking (indoor)	Yes	73	27.8	68	25.9	141	26.8	0.242	0.694
	No	190	72.2	195	74.1	385	73.2		
	Total	263	100	263	100	526	100		
Mother employment Status	Working	16	6.1	17	6.5	33	6.3	0.032	0.857
	Not working	247	93.9	246	93.5	493	93.7		
	Total	263	100	263	100	526	100		
Husband employment status	Working	182	69.2	184	70	373	70.9	0.036	0.925
	Not working	81	30.8	79	30	153	29.1		
	Total	263	100	263	100	526	100		
House type	Concrete	208	79.1	216	82.1	424	80.6	0.778	0.44
	Asbestosis	55	20.9	47	17.9	102	19.4		
	Total	263	100	263	100	526	100		
Consanguineous marriage	Yes	126	47.9	111	42.2	237	45.1	1.728	0.22
	No	137	52	152	58	289	55		
	Total	263	100	263	100	526	100		
Relative degree	1st double cousin	20	16	9	8	29	12.2	5.618	0.132
	1st cousin	59	47	53	48	112	47.3		
	2nd cousin	22	17	16	14	38	16		
	Same family	25	20	33	30	58	24.5		
Family type	Nuclear family	191	72.6	207	78.7	398	75.7	2.643	0.127
	Extended family	72	27.4	56	21	128	24.3		
	Total	263	100	263	100	526	100		
	Parameter	**Cases**		**Controls**		**Total**		**t test**	**P value**
Mothers' years of schooling	Mean	13.15		13.04		13.1		0.499	0.618
	SD	2.68		2.553		2.619			
	Total	**263**		**263**		**526**			
Husbands' years of schooling	Mean	12.27		12.03		12.15		0.839	0.402
	SD	3.13		3.3		3.22			
	Total	**263**		**263**		**526**			
Total family income	Mean	747.48		737.79		742.6		0.137	0.891
	SD	788.62		826.004		806.91			
	Total	263		263		526			

*** Statistically significant at 95% CI**

**** Fisher's exact test used**

Regarding to consanguinity of marriage, findings of study have shown that 45.1% of study participants were married to their relatives. Consanguineous marriage was higher among cases (47.9%) than among controls (42.2%). The differences were statistically not significant, with (χ^2 1.72, P value 0.22). The findings are inconsistent with the findings of

other studies have shown an association between consanguinity and infant mortality (Awour, Abed, & Ashour, 2012; Van den Berg et al., 2015).

Among cases, about two thirds of study participants (63%) were married to their first relative degree relatives, 17% were married to their second relative degree and 20% of participants were married from the same family, compared with 56%, 14% and 30% among controls, respectively.

Concerning to family type, the study results have shown that about three quarters (75.7%) of study participants were living in nuclear families compared to 24.3% living in extended families. Percentage of participants who were living in extended families was higher among cases (27.4%) than among controls (21%). As shown in Table (1), the differences were statistically not significant, with (χ^2 2.64, P value 0.127).

4.1.2 Obstetric information

4.1.2.1 Obstetric history of study participants

In this section, the Researcher compares between cases and controls with regard to their previous obstetrical and gynecological history. Results of the study have shown that the mean age of mothers at first marriage was 20.11 years (SD±3.38), where 19.2% of study participants were married at age less than 18 years, with no statistically significant difference between cases (mean 20.28 years, SD±3.8) and controls (mean 19.9 years, SD±2.9), with (t test 1.179, P value 0.239), as shown in Table (2).

Concerning to the age of mother at first pregnancy, the study findings revealed that the overall mean of age at first pregnancy was 20.77 years (SD±3.49), with statistically significant differences between cases who had higher mean of age at first pregnancy 21.1 years (SD±3.82) than controls (mean 20.4 years, SD±3.1), with (t test 2.18, P value 0.029), as shown in Table (2).

Regarding to the age of participants at first delivery, study findings have shown that cases had higher mean of age at first delivery 21.98 years (SD±3.82) compared to controls (mean 21.21 years, SD±3.14), these differences were statistically significant, with (t test 2.52, P value 0.012), as shown in Table (4.2).

Table (4.2): Percentage distribution of study participants by maternal marriage, pregnancy and delivery ages.

Variable	Parameter	Cases	Controls	Total	t test	P value
Mother age at first marriage	Mean	20.28	19.941	20.11	1.179	0.239
	SD	3.806	2.901	3.38		
	Total	263	263	526		
Mother age at first pregnancy	Mean	21.1	20.44	20.77	2.18	0.029*
	SD	3.82	3.1	3.49		
	Total	263	263	526		
Mother age at first delivery	Mean	21.98	21.21	21.6	2.52	0.012*
	SD	3.82	3.14	3.51		
	Total	263	263	526		
Mother age at current delivery	Mean	27.7	26.62	27.19	2.223	0.027*
	SD	6.24	5.497	5.906		
	Total	263	263	526		

*** Statistically significant at 95% CI**

The study results have shown that there was a statistically significant difference between cases and controls concerning to the number of live births, as the mean number of live births among cases was 2.19 (SD±2.26), which was significantly lower than the mean number of live births among controls (mean 3.14, SD±1.98), with (t test 5.15, P value 0.000). In the other words, controls had higher number of live births than cases. This is may be attributed to almost of cases were married at higher age and had assisted pregnancy like In Vitro Fertilization (IVF) method during the last and the past pregnancies so, they are more likely to loss pregnancy than women who had a normal past and last pregnancies.

Furthermore, with regard to the number of family members, the study results have revealed that the overall mean of family members of study participants was 5.04 members (SD± 2.60), at which controls had higher mean of family members 5.44 members (SD ± 2.47) than cases (mean 4.63 members, SD± 2.668), and the differences were statistically significant, with (t test 3.611, P value 0.000). This result is consistent with the finding of Awour and Colleagues (2012) study that has shown women who have four and more dependents were at higher risk to have neonatal morality.

The results have shown that there were no statistical differences between cases and controls with regard to number of previous pregnancies (gravida) and number of all deliveries (parity), as shown in Table (3). The study findings are consistent with Usynina and Colleagues (2017) study that reported no association between parity and perinatal mortality. On contrary, the findings of the study are inconsistent with other studies that reported parity of ≥ 5 as one of maternal risk factor of perinatal mortalities (Iman & Husna, 2018; McClure et al., 2011; Assaf et al., 2008) and Richardus and Collogues (1998) study that reported an association between gravida and risk of perinatal mortality.

Table (4.3): Comparison between cases and controls with regard to history of previous pregnancies and deliveries

Variable	Parameter	Cases	Controls	Total	t test	P value
Number of previous pregnancies	Mean	4	3.65	3.82	0.019	0.985
	SD	2.99	2.45	2.74		
	Total	263	263	526		
Number of all deliveries	Mean	3.22	3.21	3.21	1.447	0.148
	SD	2.43	2.03	2.24		
	Total	263	263	526		
Number of live births	Mean	2.19	3.14	2.67	-5.15	0.000*
	SD	2.26	1.98	2.18		
	Total	263	263	526		
Number of family members	Mean	4.63	5.44	5.04	3.611	0.000*
	SD	2.668	2.47	2.60		
	Total	263	263	526		

*** Statistically significant at 95% CI**

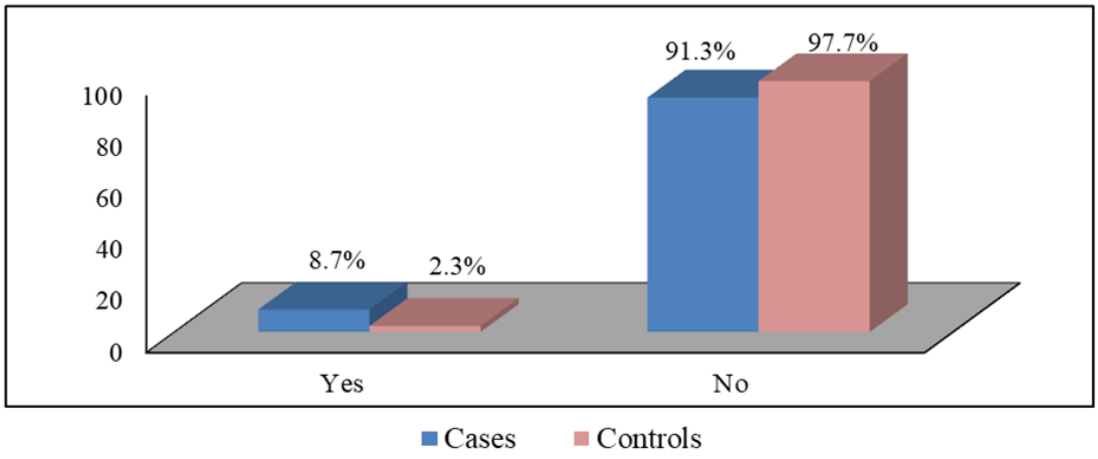
Of all study participants, only 1% had a positive history of congenital abnormality in their reproductive system. There were no significant differences among cases and controls, with (χ^2 1.81, P value 0.373), as shown in Table (4). The most common type of congenital abnormality is bicornuate uterus.

Concerning to the mode of previous deliveries, the study findings have shown that about one fifth of participants (18.3%) had at least one previous CS mode of delivery, in which cases and controls had approximately similar rates with 19.4% and 17.1 %, respectively, and these differences were statistically not significant, with (χ^2 0.459, P value 0.286). The study results have shown that the mean number of CS deliveries among cases was 1.54 times (SD±1.23) while the mean number of CS delivery among controls was 1.51 times (SD±0.92). The most common reasons for the first CS delivery were fetal distress, breech

presentation, cephalo-pelvic disproportion, and obstructed labor among both cases and controls. Interestingly, more than one fifth of the study participants (23.9%) who had previous CS delivery, had another CS delivery for the second time and 10.4% had more than two CS deliveries. The main reasons for the repeated CS were previous CS and cephalopelvic disproportion among both cases and controls.

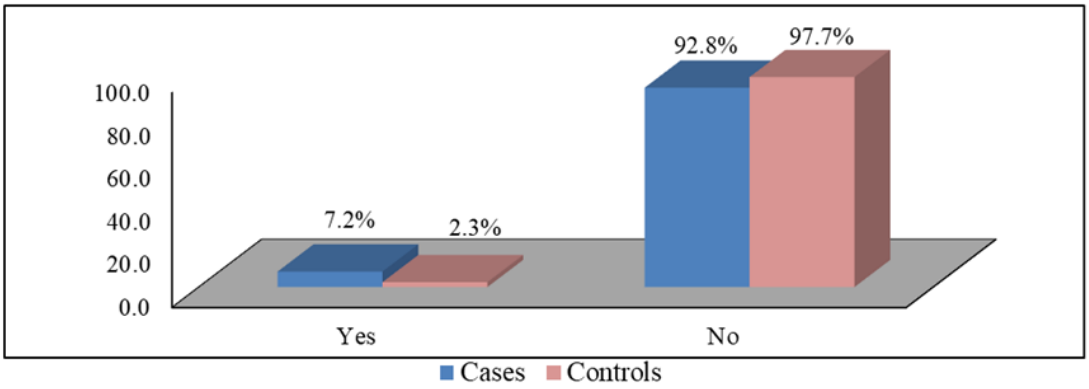
Regarding to previous pregnancy outcomes, the study findings have shown that 5.5% of all study participants had a history of previous stillbirths' as pregnancy outcome. Cases had higher percentage of history of previous stillbirths' as pregnancy outcome (8.7%) than controls (2.3%), and the differences were statistically significant with (χ^2 10.5, P value 0.001), as shown in Figure (4.6). This result is congruent with Kupka and Colleagues (2009) and George & Saade (2013) findings which have shown that mothers who have previous stillbirth are more likely to experience stillbirths for another time.

Figure (4.6): Percentage distribution of study participants by history of previous stillbirths



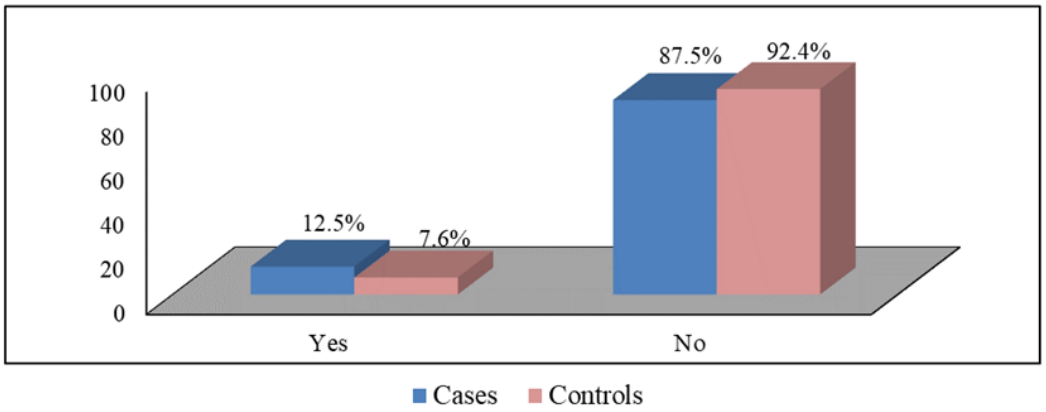
Concerning to the history of previous early neonatal deaths, cases had higher percentage of early neonatal deaths (7.2%) compared to controls (2.3%), and the differences were statistically significant, with (χ^2 7.09, P value 0.006), as illustrated in Figure (4.7). The study findings are congruent with previous studies that reported an increase of the odds of perinatal mortality among mothers who have previous history of early neonatal deaths (Getive & Fantahun, 2017; Roro, Sisay, & Sibley, 2018). While, the study results are incongruent with Usynina & colleagues (2017) study that reported no association between perinatal mortality and previous history of perinatal mortality.

Figure (4.7): Percentage distribution of study participants by history of previous early neonatal deaths



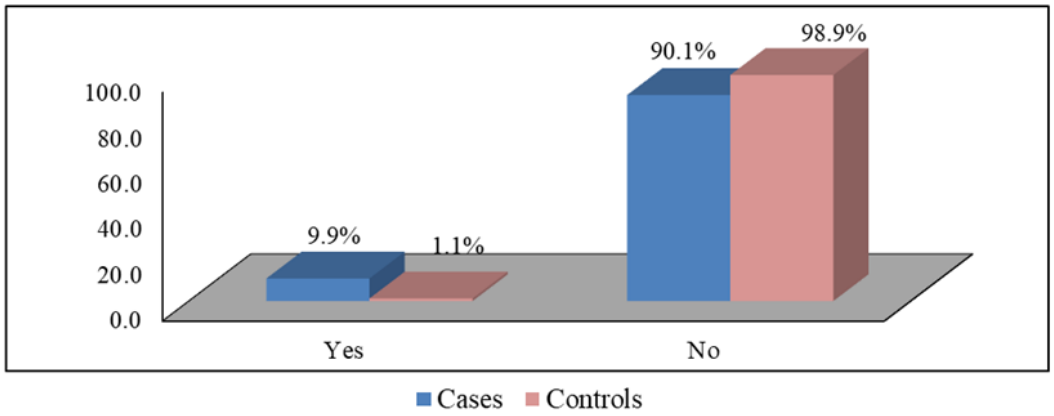
Furthermore, the study findings have revealed a statistically significant difference between cases and controls with regard to history of previous preterm deliveries, since, cases had higher percentage of previous preterm deliveries (12.5%) compared to controls (7.6%), with (χ^2 3.54, P value 0.041), as shown in Figure (4.8). The findings of the study are congruent with the previous studies that demonstrated an association between perinatal mortality and previous preterm deliveries (Mahande et al., 2013; Ibrahimou et al., 2015).

Figure (4.8): Percentage distribution of study participants by history of previous preterm deliveries



Moreover, the study results have shown that 5.5% of study participants had previous live births with congenital anomalies. The percentage of cases (9.9%) who had births with congenital anomalies was statistically significantly higher than controls (1.1%,), with (χ^2 19.306, P value 0.000), as shown in Figure (4.9).

Figure (4.9): Percentage distribution of study participants by history of previous births with congenital anomalies



The significant association between perinatal mortality and previous pregnancy outcomes indicates the importance of providing preconception care and high-quality antenatal care for subsequent pregnancies.

The study findings have revealed that 31.4% of study participants had at least one previous miscarriage. The percentage of cases who had previous miscarriage- spontaneous abortion- was 33.8% which was higher than among controls (28.9%), but the differences were statistically not significant, with (χ^2 1.49, P value 0.130). The findings of the study are incongruent with previous studies that shown an association between perinatal mortality and history of previous abortion (Usynina et al, 2017; Hosssain et al, 2019). In addition, the study findings have shown that no statistically significant differences between cases and controls with regard to termination of previous pregnancies due to post date, previous history of post-natal deaths outcomes, and history of a previous low weight births (less than 2500 gm), as shown in Table (4).

The study results have shown that the percentage of study participants who had a family history of stillbirths was 7.8%. Cases had higher percentage of family history of stillbirth (9.5%) than among control (6.1%), but the differences were statistically not significant. Furthermore, the study results have shown that 6.7% of study participants had a family history of early neonatal deaths. Although cases had higher percentages of family history of early neonatal deaths (8.4%) compared to controls (4.9%), the differences were statistically not significant, as shown in Table (4).

Table (4.4): Percentage distribution of study participants by their previous birth outcomes and family history birth outcomes

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Congenital abnormality in reproductive system**	No	259	98.5	262	99.6	521	99.0		0.373
	Yes	4	1.5	1	.4	5	1.0		
	Total	263	100	263	100	526	100		
Previous CS delivery	No.	212	80.6	218	82.9	430	81.7	0.459	0.286
	Yes	51	19.4	45	17.1	96	18.3		
	Total	263	100	263	100	526	100		
Previous miscarriage history	No	174	66.2	187	71.1	361	68.6	1.492	0.130
	Yes	89	33.8	76	28.9	165	31.4		
	Total	263	100	263	100	526	100		
Previous termination of pregnancy due to post date	No	251	95.4	254	96.6	505	96.0	0.446	0.329
	Yes	12	4.6	9	3.4	21	4.0		
	Total	263	100	263	100	526	100		
Previous history of stillbirths	No	240	91.3	257	97.7	497	94.5	10.547	0.001*
	yes	23	8.7	6	2.3	29	5.5		
	Total	263	100.0	263	100	526	100		
Previous history of early neonatal deaths	No	244	92.8	257	97.7	501	95.2	7.097	0.006*
	Yes	19	7.2	6	2.3	25	4.8		
	Total	263	100	263	100	526	100		
Previous history of post neonatal deaths	No	256	97.3	261	99.2	517	98.3	2.826	0.088
	Yes	7	2.7	2	.8	9	1.7		
	Total	263	100	263	100	526	100		
Previous history of preterm baby	No.	230	87.5	243	92.4	473	89.9	3.546	0.041*
	Yes	33	12.5	20	7.6	53	10.1		
	Total	263	100	263	100	526	100		
Previous baby with congenital anomalies	No	237	90.1	260	98.9	497	94.5	19.306	0.000*
	Yes	26	9.9	3	1.1	29	5.5		
	Total	263	100	263	100	526	100		
Previous history of low birth weight	No	227	86.3	225	85.6	452	85.9	0.063	0.450
	Yes	36	13.7	38	14.4	74	14.1		
	Total	263	100	263	100	526	100		
Family history of SB	No	238	90.5	247	93.9	485	92.2	2.1	0.096
	Yes	25	9.5	16	6.1	41	7.8		
	Total	263	100	263	100	526	100		
Family history of END	No	241	91.6	250	95.1	491	93.3	2.5	0.080
	Yes	22	8.4	13	4.9	35	6.7		
	Total	263	100	263	100	526	100		

*** Statistically significant at 95% CI**

**** Fisher's exact test used**

Regarding to the history of previous diseases during the previous pregnancies, the study findings have shown that more than 40% of study participants complained from recurrent vaginal infection, 6.5% had pre-eclampsia, and 4.9% had APH during their previous pregnancies. The study results have shown that no statistically significant difference between cases and controls with regard to the above-mentioned diseases, as shown in Table (5).

The study findings have revealed that the percentage of cases who had a history of previous recurrent cervix infection was 13.3%, which was statistically higher than controls (5.7%), with (χ^2 9.26, P value 0.01).

Table (4.5): Percentage distribution of study Participants by previous pregnancies diseases

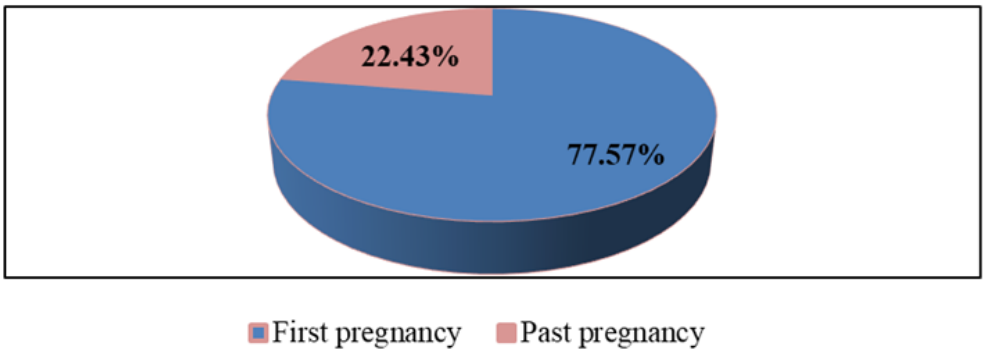
Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Previous history of pre-eclampsia	No	243	92.4	249	94.7	492	93.5	1.132	0.188
	Yes	20	7.6	14	5.3	34	6.5		
	Total	263	100	263	100	526	100		
Previous history of APH	No	250	95.1	250	95.1	500	95.1	0.00	0.579
	Yes	13	4.9	13	4.9	26	4.9		
	Total	263	100	263	100	526	100		
History of recurrent vaginal infection	No	155	58.9	151	57.4	306	58.2	0.125	0.395
	Yes	108	41.1	112	42.6	220	41.8		
	Total	263	100	263	100	526	100		
History of recurrent cervix infection	No	226	85.9	247	93.9	473	89.9	9.266	0.010*
	Yes	35	13.3	15	5.7	50	9.5		
	Don't know	2	.8	1	.4	3	.6		

*** Statistically significant at 95% CI**

4.1.2.2 Past pregnancy characteristics

The study results have shown that, 77.57% of all study participants had a previous pregnancy prior the last one, distributed as 76% among cases and 79% among controls, as shown in Figure (4.10).

Figure (4.10): Percentage distribution of study participants by history of past pregnancy



The study findings have revealed that the vast majority of study participants (97.5%) with previous pregnancy had conceived normally compared to only 2.5% who had conceived through assisted methods such as using medication to induce ovulation or through IVF. There is no significant difference between cases and controls with regard to conception way, as shown in Table (6)

The overall mean of gestational age of past pregnancy was 35.55 gestational weeks (SD±8.75). The study findings have shown that the mean of gestational age among cases (34.6 weeks, SD±10) was lower than controls (mean 36.9 weeks, SD±7.07), and the differences were statistically significant, with (t test 3.40, P value 0.001).

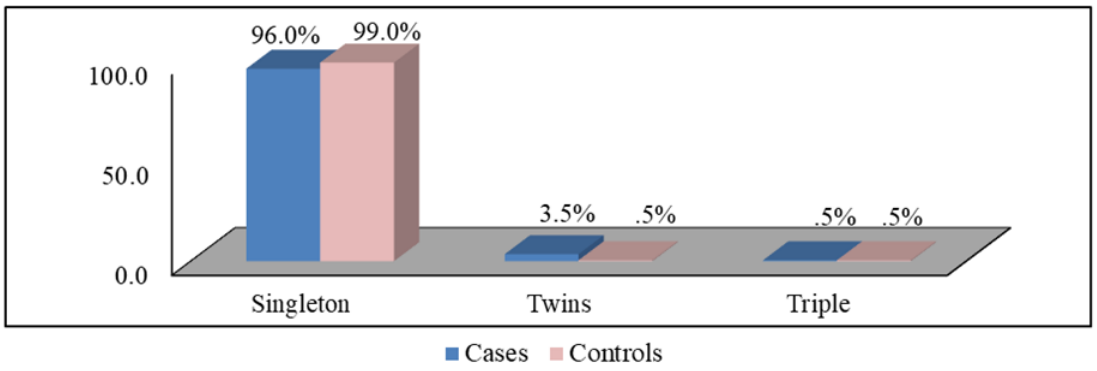
The results have shown that the overall mean of intervals between the past two pregnancies was 25.15 months (SD±19.19). Cases had lower mean intervals (24.38 months, SD±22.41) compared to controls (mean 25.89 months, SD±15.5), but the differences were statistically not significant, with (t test 0.792, P value 0.429). According to WHO, 2015, the intervals between two subsequent pregnancies should be at least 24 months to reduce the risk of negative perinatal outcome. Previous studies have demonstrated an association between perinatal mortality and short birth intervals, less than 24 months (Afshan, Narjis, & Mazhar, 2019; Upadhyay & Setty-Venugopal, 2002; Kibria & et al, 2018). The study findings did not reveal as association since both cases and controls have birth intervals more than 24 months.

Concerning to co-morbidities during the past pregnancy, the results have revealed that 22.8% of study participants had at least one comorbidity during the last pregnancy. Cases had lower percentage of past pregnancy comorbidities (20.5%) than controls (25%), and

the differences were statistically not significant, as shown at Table (6). The study findings are incongruent to previous study that reported an association between stillbirth and previous medical history except gestational diabetes (Gardosi et al, 2013)

More than one-third of study participants (38.7%) had Iron deficiency anemia during their past pregnancy. Urinary tract infection, elevated blood pressure and gestational diabetes were the most common co-morbidities reported during the past pregnancy. APH and hematological associated disorders were the least common problems during the past pregnancy. The study results related to previous pregnancy history may be subjected to recall bias, along with poor documentation. It is important to improve the quality of documentation of clients record with regard to previous pregnancy history to facilitate accurate data collection for other researchers.

Figure (4.11): Percentage distribution of cases and controls by previous pregnancy outcome



With regard to the past pregnancy outcome, study findings have shown that 97.5% of the study participants had a singleton birth outcome, 2.0% had twins birth outcome and 0.5% had a triplet birth outcome. There were no statistically significant differences between cases and controls with regard to past pregnancy outcomes, as shown in Table (6).

The study results have revealed that, there were a highly statistically significant differences between cases and controls with regard to the outcome of the past pregnancy, in which a significant proportion of cases (72.5%) had past alive birth, 14.5% had past abortion, 6.5% had past early neonatal deaths and 4.0% had stillbirth outcomes compared with 89.4%, 7.2%, 1.0% and 1.9% of controls, respectively, with (P value 0.000).

Concerning to the types of stillbirth as outcome of past pregnancy, about two-third (66.7%) of past stillbirths' outcome were classified as antepartum fetal deaths (macerated stillbirth), while, one quarter (25.0%) of deaths were classified as intrapartum fetal deaths (fresh stillbirth) and 8.3% of deaths were classified as termination of pregnancy. Turning to the causes of the past stillbirth pregnancy, study results have shown that congenital anomalies was considered as the major cause of past stillbirths (33.3%). Antepartum complication and LBW were other common stillbirth causes with 16.7%, finally prematurity and intrapartum complication were the least common causes of past SB. About 25.0% of stillbirths did not have a specific known cause of death thus reported within patient file as unknown/ unspecified causes. This reflect that health providers do not investigate cases of stillbirth; thus, the main causes of still births are not reported.

Concerning to the type of past pregnancy early neonatal deaths outcomes, study findings have shown that all past neonatal deaths were occurred at hospitals. The main causes of death were congenital malformation (40.0%), prematurity (33.3%) and intrapartum complication (26.7%). LBW and septicemia were the most common causes of past early neonatal deaths.

Table (4.6): Percentage distribution of study participants by past pregnancy characteristics

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Previous pregnancy**	Normal	194	97.0	204	98.1	398	97.5		0.351
	Assisted	6	3.0	4	1.9	10	2.5		
	Total	200	100.0	208	100.0	408	100.0		
Co- morbidities during previous pregnancy	No	159	79.5	156	75.0	315	77.2	1.173	0.167
	Yes	41	20.5	52	25.0	93	22.8		
	Total	200	100.0	208	100.0	408	100.0		
Previous pregnancy outcome*	Singleton	192	96.0	206	99.0	398	97.5		0.089
	Twins	7	3.5	1	.5	8	2.0		
	Triple	1	.5	1	.5	2	.5		
	Total	200	100.0	208	100.0	408	100.0		
Outcome of previous pregnancy	Stillbirth	8	4.0	5	1.9	13	2.9	24.78	0.000*
	END	15	6.5	2	1.0	17	3.7		
	Alive baby	147	72.5	187	89.4	334	81.1		
	Aborted	29	14.5	15	7.2	44	10.8		
	PND	3	1.5			3	.7		
	Total	200	100.0	208	100.0	408	100.0		

*** Statistically significant at 95% CI**

**** Fisher's exact test used**

Note: 2 cases had twins (alive + early neonatal deaths) and one control had twins (alive + stillbirths)

4.1.2.3 Physical characteristics

Concerning to the study participants' physical characteristics, study findings have shown that the overall mean of study participants' BMI was 24.19 (SD±3.76) before last pregnancy compared to 27.52 (SD±4.5) at the end of last pregnancy. Cases and controls have shown similar figures with regard to BMI before and after pregnancy with no statistically significant difference between cases and controls, as shown in Table (7). These results were inconsistent with previous studies that reported obesity and overweight were from the main modifiable risk factors of perinatal mortality (Usynina et al, 2017; Gardosi et al., 2013; Ezeh et al, 2019; Hosssain et al, 2019; George& Saade, 2013). Since BMI of study participants at the beginning of pregnancy was less than 25; the study results did not prove an association between obesity and perinatal mortality. Francis and Colleagues (2009) have reported an association between stillbirths and BMI of less than 20.

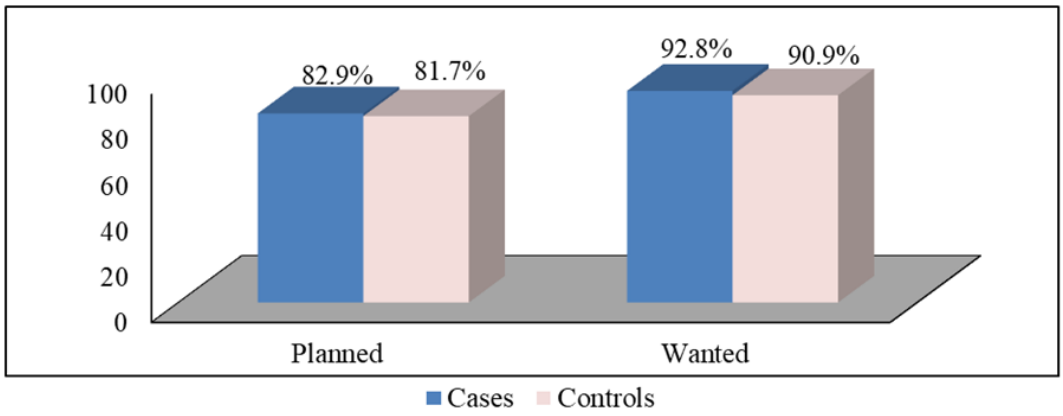
Table (4.7): Percentage distribution of study participants by physical characteristic

Variable	Category	Cases	Controls	Total	t test	P value
Height in cm	Mean	161.71	161.35	161.53	0.61	.54
	SD	6.967	6.42	6.69		
	Total	255	261	516		
Weight at the beginning of pregnancy (kg)	Mean	62.80	63.67	63.25	0.87	.38
	SD	11.38	11.210	11.29		
	Total	250	260	510		
Weight at the end of pregnancy (kg)	Mean	71.01	72.53	71.64	1.33	.18
	SD	12.27	13.360	13.13		
	Total	244	258	502		
Body mass index before pregnancy	Mean	23.98	24.40	24.19	1.25	0.21
	SD	3.82	3.70	3.76		
	Total	250	260	510		
Body mass index after pregnancy	Mean	27.19	27.83	27.52	1.61	0.10
	SD	4.22	4.75	4.51		
	Total	244	258	502		

4.1.2.4 Last pregnancy characteristics

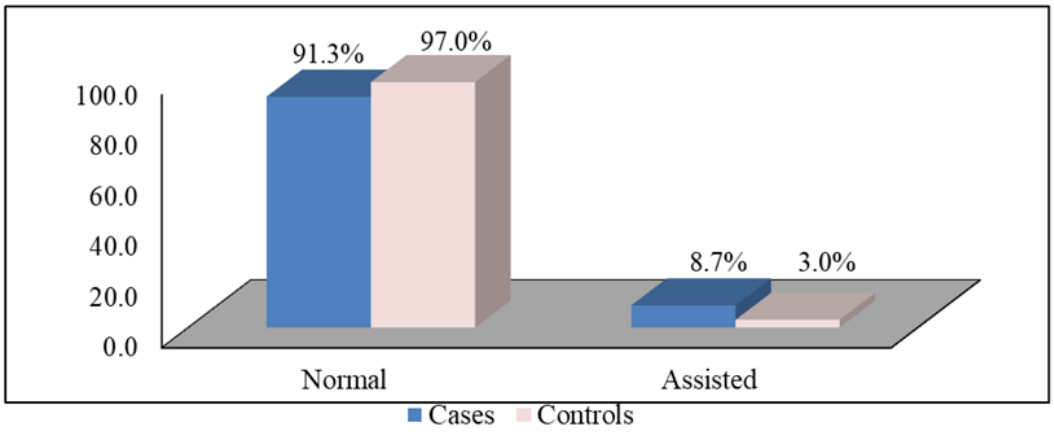
Concerning to the last pregnancy, the study results have shown that a significant proportion of study participants (82.3%) planned their last pregnancy, distributed as 82.9% of cases and 81.7% of controls. The majority of both cases (92.8%) and controls (90.9%) wanted this pregnancy, as shown in Figure (4.12).

Figure (4.12): Percentages distribution of study participants by the selected variable



Additionally, study results have shown that of all study participants, there were 5.9% used an assisted reproductive technology. The proportion of cases who had an assisted reproductive technology (8.7%) was higher than controls (3.0%), and the differences between cases and controls were statistically significant, with (χ^2 7.71, P value 0.005), as shown in Figure (4.13).

Figure (4.13): Percentage distribution of study participants by selected variables



With regard to study participants who used assisted reproductive technology in the last pregnancy, study findings have shown that around three quarters of cases (73.9%) had in IVF and just above one quarter (26.1%) had a pregnancy induced medication compared to 25.0% and 75.0% among controls, respectively.

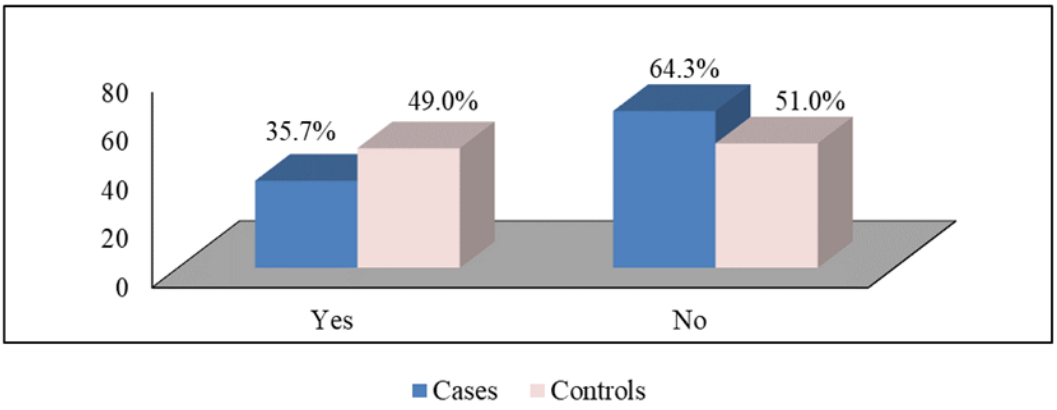
The study findings have also shown that 42.4% of study participants used a contraceptive method prior to the last pregnancy. There were a statistically significant differences

between cases and controls with regard to contraceptive use, since, lesser proportions of cases (35.7%) used a contraceptive method prior last pregnancy compared to controls (49.0%), with (χ^2 9.53, P value 0.002), as shown in Figure (4.14).

Nearly half of study participants used contraceptive method prior to the last pregnancy, this result supports the result that mentioned above with regard to presence of more than 24 months' interval between the two last pregnancies of study participants. It is worth mentioning that most of health providers most MCH clinics provide family planning services free of charge.

The most common contraceptive method used among study participants was the natural method at (37.7%) followed by intrauterine device (IUD) at (26.5%). Contraceptive pills (18.8%) and condom (17.0%) were other contraceptive methods used. According to the MoH (2018), the most frequent contraceptive method used among women in the GS is IUD (39.7%).

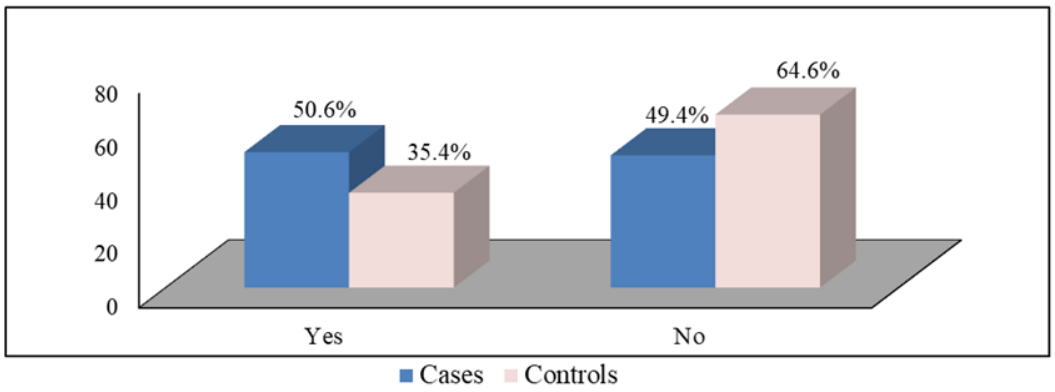
Figure (4.14): Percentage distribution of study participants by contraceptive usage prior the last pregnancy



The study results have shown that more than one-quarter of study participants (27.0%) were classified as a high-risk pregnancy, in which 30.4% of cases were classified as a high-risk pregnancy compared to 23.6% of controls, but these differences were statistically not significant, with (χ^2 3.12, P value 0.07). The criteria of classification the risky of pregnancy is common among all study participants such as (anemia, previous abortion, previous CS mode of delivery, previous or current preeclampsia), so the differences are not significant.

Concerning to a previous history of co-morbidities prior to the last pregnancy, the study results have shown that 12.4% of study participants had a previous chronic disease. The most common previous diseases were elevated blood pressure (37%) and diabetes mellitus (12%). Cases and controls have shown approximately similar figures with regard to previous disease (12.5% and 12.2%, respectively), and these differences were statistically not significant, as shown in Table (8).

Figure (4.15): Percentage distribution of study participants by last pregnancy associated diseases.



Regarding to complications developed during the last pregnancy, the study results have revealed that about half (43.0%) of study participants had a complication during the last pregnancy. More than half of cases (50.6%) developed at least one complication during the last pregnancy compared to 35.4% of controls, and the differences were a highly statistically significant, with (χ^2 12.41, P value 0.000), as shown in Figure (4.15).

The study findings have shown that the most common problems associated with the last pregnancy were Anemia (41.6%), pre-eclampsia (26.5%), and premature birth (21.6%). These results are congruent with previous studies (Aminu et al., 2014; Harding, 2014; Gardosi et al., 2013; Schoeps et al., 2007; Usynina et al, 2017; Afshan, Narjis, & Mazhar, 2019; Stringer et al, 2011; Vogel et al, 2013, Getive & Fantahun, 2017) that have shown an association between perinatal mortality and presence of associated diseases such as anemia and pre-eclampsia and APH.

Concerning to placental problems associated with the last pregnancy, the study findings have shown that of all study participants, 5.7% had a placental problem during the last pregnancy. The percentage of cases who had placental problems during last pregnancy

(9.5%) was higher than controls (1.9%), and the differences were statistically significant, with (χ^2 14.14, P value 0.000). The study results have shown that placenta previa was the most common problem among study participants (63.3%) followed by placental abruption (33.3%). The results are consistent with previous studies (Aminu et al., 2014; Harding, 2014; Vijayan & Hiu, 2012) which have shown that placenta previa and placental abruption are among the most common causes of stillbirths.

With regard to infection associated with the last pregnancy, the study results have shown that 39.4% of study participants had experienced infection during the last pregnancy. The percentage of cases who had infection during the last pregnancy (32.3%) was lower than among controls (46.4%), and the differences were statistically significant, with (χ^2 10.90, P value 0.001). The most common infections among study participants were vaginal infection (32.3%) and urinary tract infection (14.4%). Consistent with previous studies, infection; vaginal and urinary tract infection is considered as a main risk factor of stillbirths (Froen et al., 2016; Aminu et al., 2014; Harding, 2014).

The study results have revealed that 5.7% of study participants suffered from physical injuries during the last pregnancy such as fall, violent personal injury and vehicular injuries, in which the percentage among controls (8.0%) was higher than among cases (3.4%), and the differences were statistically significant, with (χ^2 5.09, P value 0.024). large number of cases had an assisted last pregnancy and large number lost their previous pregnancies, so mothers and their families be more caution with regard to dealing with this pregnancy.

Of all study participants, there was 2.7% exposed to X-ray during the last pregnancy. The percentage of controls who exposed to X ray during the last pregnancy was higher than cases, with no statistically significant difference between cases and controls.

With regard to the hospital referral in the last pregnancy, the results have shown that, more than one-third of study participants (35.4%) were referred to hospital during the last pregnancy. The percentage of cases who referred to hospital (44.5%) was higher than among controls (26.2%), and the differences were statistically significant, with (χ^2 19.16, P value 0.000), as shown in Table (8). Since most of cases suffered either from pregnancy complication or obstetric complication, so the number of women needed hospital referral for more investigation were higher among cases than controls.

Table (4.8): Percentage distribution of study participants by characteristics of the last pregnancy

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Pregnancy planned	No	45	17.1	48	18.3	93	17.7	0.118	0.732
	Yes	218	82.9	215	81.7	433	82.3		
	Total	263	100.0	263	100.0	526	100.0		
Pregnancy wanted	No	19	7.2	24	9.1	43	8.2	0.633	0.426
	Yes	244	92.8	239	90.9	483	91.8		
	Total	263	100.0	263	100.0	526	100.0		
Type of last pregnancy	Normal	240	91.3	255	97.0	495	94.1	7.713	0.005*
	Assisted	23	8.7	8	3.0	31	5.9		
	Total	263	100.0	263	100.0	526	100		
Using contraceptive prior last pregnancy	No	169	64.3	134	51.0	303	57.6	9.536	0.002*
	Yes	94	35.7	129	49.0	223	42.4		
	Total	263	100.0	263	100.0	526	100.0		
Last pregnancy classification	Low risk	183	69.6	201	76.4	384	73.0	3.125	0.077
	High risk	80	30.4	62	23.6	142	27.0		
	Total	263	100.0	263	100.0	526	100.0		
Mother suffered from previous disease	No	230	87.5	231	87.8	461	87.6	0.018	0.895
	Yes	33	12.5	32	12.2	65	12.4		
	Total	263	100.0	263	100.0	526	100		
Mother suffered from Associated disease	No	130	49.4	170	64.6	300	57.0	12.413	0.000*
	Yes	133	50.6	93	35.4	226	43.0		
	Total	263	100.0	263	100.0	526	100.0		
Mother suffered from placental problem	No	238	90.5	258	98.1	496	94.3	14.14	0.000*
	Yes	25	9.5	5	1.9	30	5.7		
	Total	263	100.0	263	100.0	526	100		
Mother suffered from infection	No	178	67.7	141	53.6	319	60.6	10.905	0.001*
	Yes	85	32.3	122	46.4	207	39.4		
	Total	263	100.0	263	100.0	526	100.0		
Mother suffered from physical injuries	No	254	96.6	242	92.0	496	94.3	5.09	0.024*
	Yes	9	3.4	21	8.0	30	5.7		
	Total	263	100.0	263	100.0	526	100.0		
Exposure to X- ray or other imaging	No	258	98.1	254	96.6	512	97.3	1.174	0.279
	Yes	5	1.9	9	3.4	14	2.7		
	Total	263	100.0	263	100.0	526	100.0		
Mother was referred to hospital	No	146	55.5	194	73.8	340	64.6	19.164	0.000*
	Yes	117	44.5	69	26.2	186	35.4		
	Total	263	100.0	263	100.0	526	100.0		

*** Statistically significant at 95% CI**

4.1.2.5 Stress Assessment during the last pregnancy

The study findings showed that about one fifth of the study participants (19.6%) were exposed to a social problem during the last pregnancy. The percentage of controls who were exposed to social problems from their husbands or their families was higher than the percentage of cases, but the differences were statistically not significant (χ^2 test 0.323, P value 0.851), as shown in Table (15).

The study findings revealed that the family economic situation was the most prominent cause of these social problems at (46.7%), followed by being women living at extended families (33.8%).

Concerning to the psychological problems related to the pregnancy such as unwanted pregnancy and the gender of the fetus. The study results showed that 8.0% of the study participants were exposed to such type of problems with no significant association between cases and controls, with regard to being exposed to psychological problems during the last pregnancy (χ^2 test 0.171, P value 0.918). The study results showed that 57.0% of the study participants who were exposed to psychological problems suffered from this problem due to unwanted pregnancy cause either from the mother or her husband, while 31.6% were exposed to these problems because of the gender of the fetus.

With regard to physical violence during the last pregnancy, the study findings revealed that 7.0% of study participants were exposed to physical violence during the last pregnancy. The percentage was higher than among controls with no statistically significant differences between cases and controls with regard to being exposed to physical violence during the last pregnancy, as shown in Table (15). The main causes of physical violence were financial causes and problems with the husband's family.

Table (4.9): The percentage distribution of the study participants by social, psychological and physical violence during the last pregnancy

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Mother exposed to social problem	not at all	214	81.4	209	79.5	423	80.4	0.323	.851
	occasionally	32	12.2	36	13.7	68	12.9		
	frequently	17	6.5	18	6.8	35	6.7		
	Total	263	100.0	263	100.0	526	100.0		
Mother exposed to psychological problems	not at all	242	92.0	242	92.0	484	92.0	0.171	.918
	occasionally	17	6.5	18	6.8	35	6.7		
	frequently	4	1.5	3	1.1	7	1.3		
	Total	263	100.0	263	100.0	526	100.0		
Mother exposed to physical violence	not at all	245	93.2	244	92.8	489	93.0	0.812	.666
	occasionally	13	4.9	16	6.1	29	5.5		
	frequently	5	1.9	3	1.1	8	1.5		
	Total	263	100.0	263	100.0	526	100.0		

During the data collection, the researcher used GHQ12 at cut point of six to the overall study participants stress during the last pregnancy. The study results have shown that there was 90.1% of study participants had a 6 and more degrees at stress score. The differences between cases and controls with regard to stress score ware statistically not significant, with (t test 0.08, P value 0.884), as shown in Table (16). The findings of GHQ12 are of limited use due to recall biased in which the study participants had to answer the GHQ12 during their last pregnancy.

Table (4.10): Stress assessment score of study participants during the last pregnancy by using General Health Questionnaire (GHQ12)

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Stress score	less than 6	27	10.3	25	9.5	52	9.9	0.08	0.884
	6 and more	236	89.7	238	90.5	474	90.1		
	Total	263	100.0	263	100.0	526	100.0		

4.1.2.6 Last delivery characteristics

The study findings have revealed that the overall mean of gestational age at last delivery was 36.64 gestational weeks (SD±4.38). Cases had lower mean of gestational age (34.16 weeks, SD±4.82) than controls (mean 39.12 weeks, SD±1.68), and the differences between cases and controls were a statistically significant, with (t test 15.75, P value 0.000), as shown in Table (9). This difference more attributed to stillbirth cases since more than three five of stillbirths (60.2%) had gestational age less than 37%. This result is consistent with previous studies that have shown increased in risk of perinatal mortality with gestational age of less than 36 weeks (Cung et al., 2014; Schoeps et al.,2007; Yego et al., 2014; ISPID, 2013; Indongo, 2014; Harding, 2014; Iman & Husna, 2018).

The mean of hemoglobin concentration of study participants at the time of delivery was 10.67 mg/dl (SD ±1.33). The study findings have shown that there were no statistically significant differences between cases and controls with regard to hemoglobin level at time of delivery, as shown in Table (9). Anemia is considered as one of the most important health issues in the GS. The percentage of anemic pregnant women who attended at governmental health care clinics reach up to 39.7% women in 2018 (MoH, 2018). The study results have shown that 46.6% of study participants were anemic at hemoglobin cut point 11gm/dl. The results are inconsistent with Cung and Colleagues, (2014) study that reported maternal hemoglobin concentration was significant risk factor of perinatal mortality and should be taken in consideration on policy setting to reduce perinatal mortality (Cung et al., 2014). Lack of association between perinatal mortality and hemoglobin level in this study reflects that anemia is a common problem among GS women.

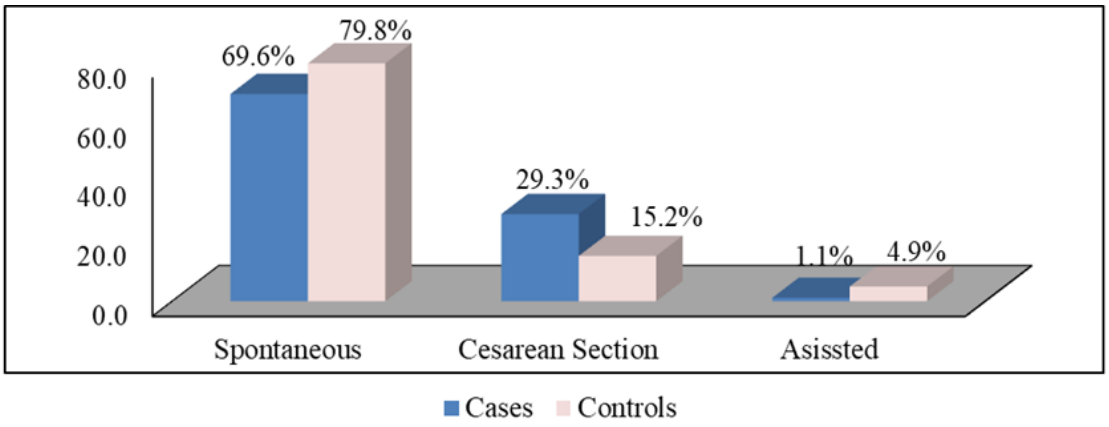
Table (4.11): Percentage distribution of study participants by last delivery selected variables

Variable	Category	Cases	Control	Total	t test	P value
Gestational age at last delivery	Mean	34.16	39.12	36.64	15.75	0.000*
	SD	4.822	1.68	4.38		
	Total	263	563	526		
Duration of labor (hours)	Mean	3.707	5.59	4.65	4.115	0.000*
	SD	4.04	6.26	5.35		
	Total	263	263	526		
Hemoglobin level at time of delivery	Mean	10.65	10.67	10.67	0.148	0.883
	SD	1.35	1.3	1.33		
	Total	263	263	526		

*** Statistically significant at CI (95%)**

Study results have shown that, of all study participants, more than one fifth (22.2%) had a CS mode of delivery. This percentage is congruent with the percentage of MoH report. The reported percentage of CS mode of delivery within governmental hospital was 23.2% (MoH, 2018). The percentage of cases (29.3%) who had CS mode of delivery in the last delivery was higher than controls (15.2%), and the differences between cases and controls were highly statistically significant, with (χ^2 19.81, P value 0.000), as shown in Figure (4.16). This is attributed to the high percentage of cases that experienced pregnancy and obstetric complication, so CS mode of delivery was considered as an urgent need with such cases to prevent further mother's and fetus's complication. The results are consistent with previous studies that demonstrated an association between perinatal mortality and mode of delivery with (P value 0.001) (Iman & Husna, 2018; Ezeh et al, 2019). While, the results are inconsistent with Getive & Fantahun, (2017) study that reported a decrease of the odds of perinatal mortality among CS mode of delivery compared to spontaneous vaginal delivery.

Figure (4.16): Percentage distribution of study participants by the mode of last delivery



Study results have shown that, a major proportion of cases (71.4%) had an urgent CS delivery and 28.6% had an elective CS delivery compared to 50% and 50% of controls, respectively, as shown in Table (10). The main reasons of CS delivery for cases were fetal distress (40.3%), previous CS mode of delivery (37.7%), and termination of pregnancy (24.7%), while, the main reasons of CS delivery among controls were previous CS deliveries (42.5%) and fetal distress (20%).

Study results have revealed that, the mean of labor duration of study participants was 4.65 hours (SD±5.35), in which the duration of labor among cases (3.70 hours, SD±4.04) was statistically significantly lower than controls (mean 5.59 hours, SD±6.62), with (t test 4.11, P value 0.000), as shown in Table (9). Since most of cases had CS mode of delivery, so they take less duration time during labor.

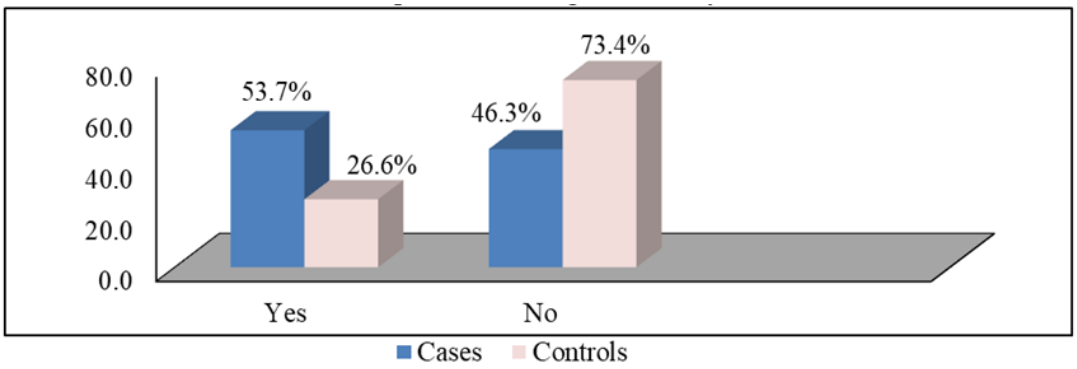
Concerning to intrapartum complications developed during the last delivery, the study results have shown that 40.0% of study participants had intrapartum complication during the last delivery. Cases had a higher percentage (53.7%) of intrapartum complication than controls (26.6%), and the differences were statistically significant, with (χ^2 39.66, P value 0.000), as shown in Figure (4.17).

The most common intrapartum complications among both cases and controls were premature rupture of membrane (PROM) (31.4%) and fetal distress (25%).

Consistent to previous studies (Schoeps et al., 2007; doheny, 2011; Yego et al., 2014; Hugara et al., 2013), this study reported a strong association between perinatal mortality

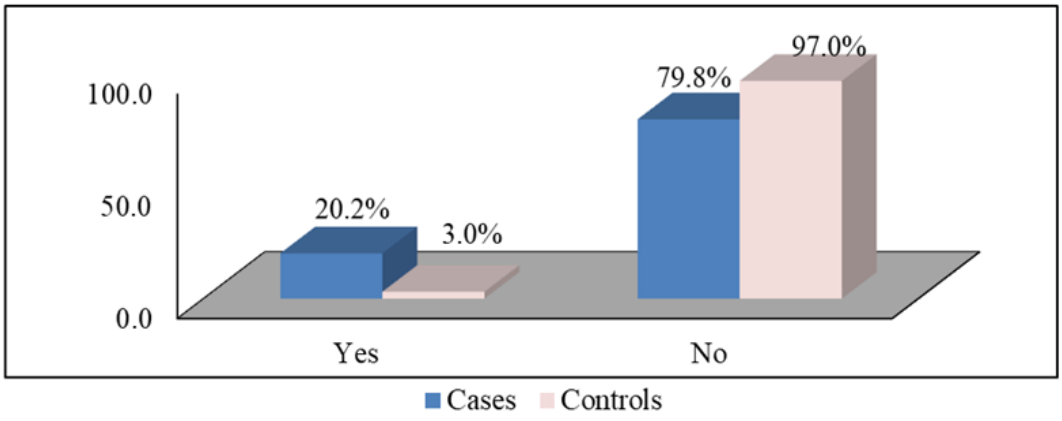
and intrapartum complication. Engmann and Colleagues (2012) have reported a strong association between stillbirths and APH (Engmann et al., 2012).

Figure (4.17): Percentage distribution of study participants by intrapartum complications during last delivery



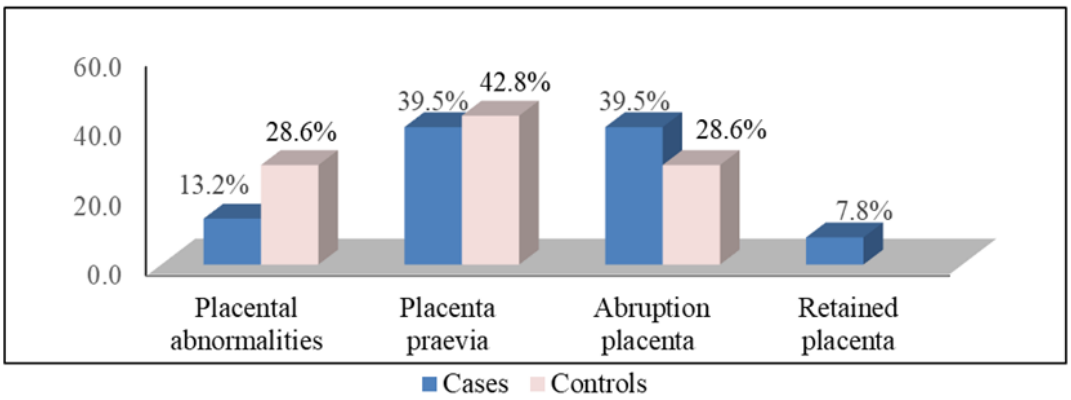
Regarding to placental complication during the last delivery, the study results have shown that 11.6% of study participants had placental complication during the last delivery. There were 20.2% of cases had placental complication in comparable with 3% of controls, and the differences were statistically significant, with (χ^2 37.5, P value 0.000), as shown in Figure (4.18). The study results were consistent with previous studies (Aminu et al., 2014; Harding, 2014; Vijayan & Hiu, 2012; doheny, 2011) that have shown an association between stillbirth and placental complications.

Figure (4.18): Percentage distribution of study participants by placental complications during last delivery.



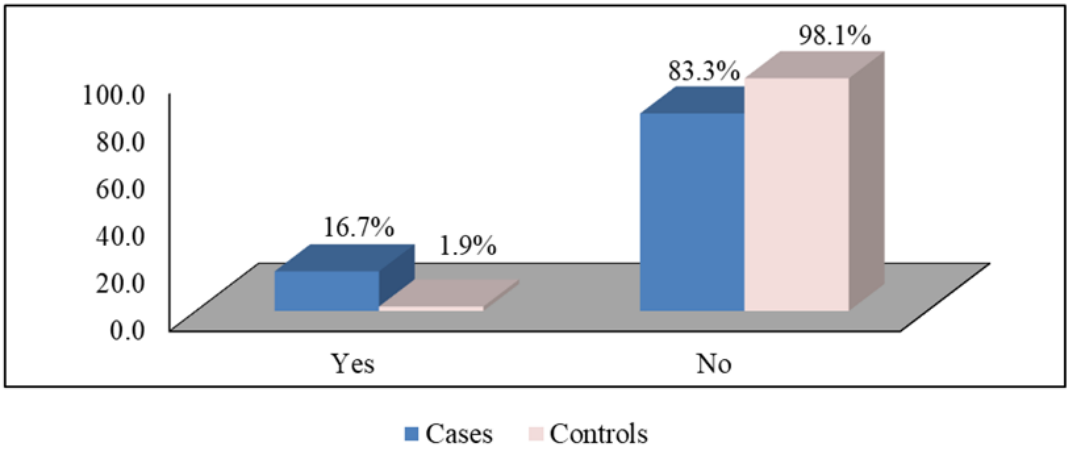
The study results have shown that the most common placental complication among both cases and controls was placenta previa, with (39.5%) and (42.8%), respectively. Placental abruption and placenta abnormalities were other common placental problems among study participants, as shown Figure (4.19).

Figure (4.19): Percentage distribution of study participants by type of placental complications during last delivery



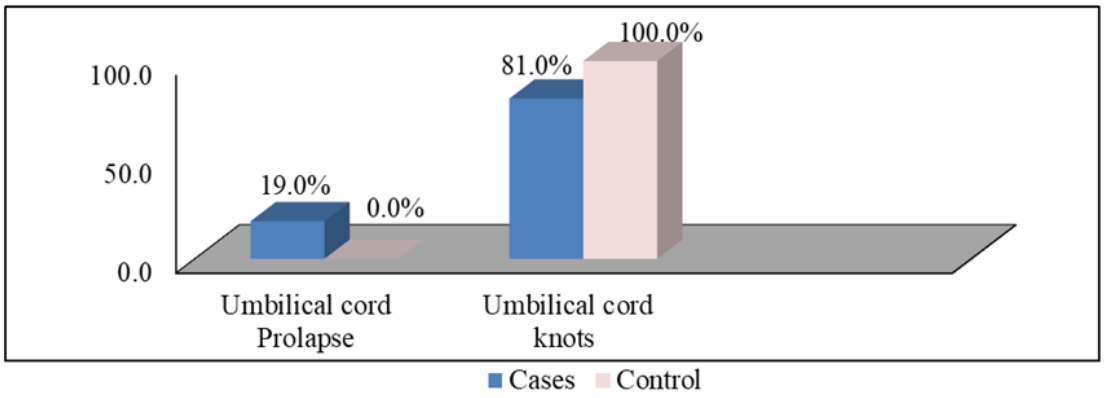
Concerning to umbilical cord complication developed during the last delivery, study findings have shown that 9.3% of study participants had umbilical cord complication during the last delivery, as shown in Table (10). Cases had higher statistically significant percentage of umbilical cord complication (8%) than controls (1.5%), with (χ^2 34.22, P value 0.000), as shown in Figure (4.20). The results of the study are congruent with previous studies that reported a strong association between stillbirth and umbilical cord accident (Aminu et al., 2014; Harding, 2014; Olusanva & Solanke, 2009; doheny, 2011).

Figure (4.20): Percentage distribution of study participants by umbilical complications during last delivery



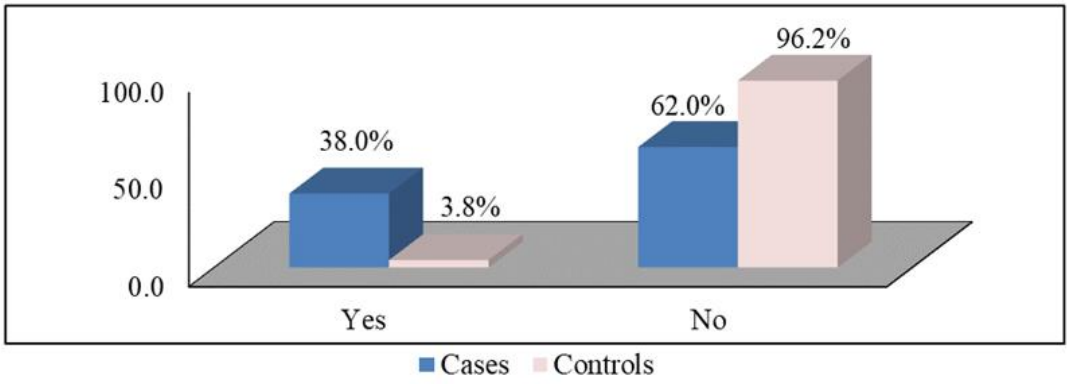
Results have shown that the most common umbilical cord complication among both cases and controls was umbilical cord knots (81.0%) and (100%), respectively, as shown in Figure (4.21).

Figure (4.21): Percentage distribution of study participants by types of umbilical complication during last delivery



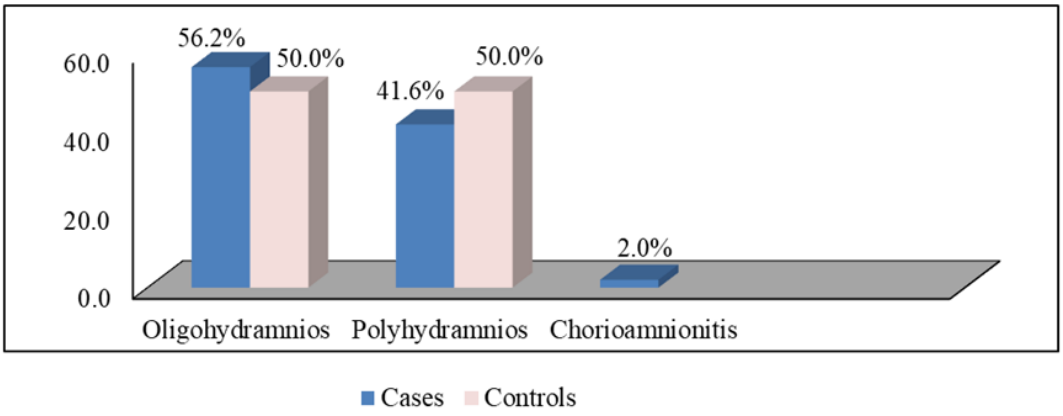
Study results have revealed that around one fifth (20.9%) of study participants had an amniotic fluid complication during the last delivery. In which the percentage of cases who had an amniotic fluid complication (38%) was statistically significantly higher than controls (3.8%), with (χ^2 93.1, P value 0.000), as shown in Figure (4.22). The findings are congruent with previous studies that reported amniotic fluid causes considered as one of stillbirth causes with reported percentage 6.5% (Aminu et al., 2014; Harding, 2014; Ukaegbe et al., 2011).

Figure (4.22): Percentage distribution of study participants by amniotic fluid complications during last delivery



With regard to the most common amniotic fluid complication of study participants during the last delivery, study results have shown that half of study participants had oligohydramnios during the last delivery (50.0%) and more than one third (38.2%) had polyhydramnios, distributed among cases and controls as shown in Figure (4.23).

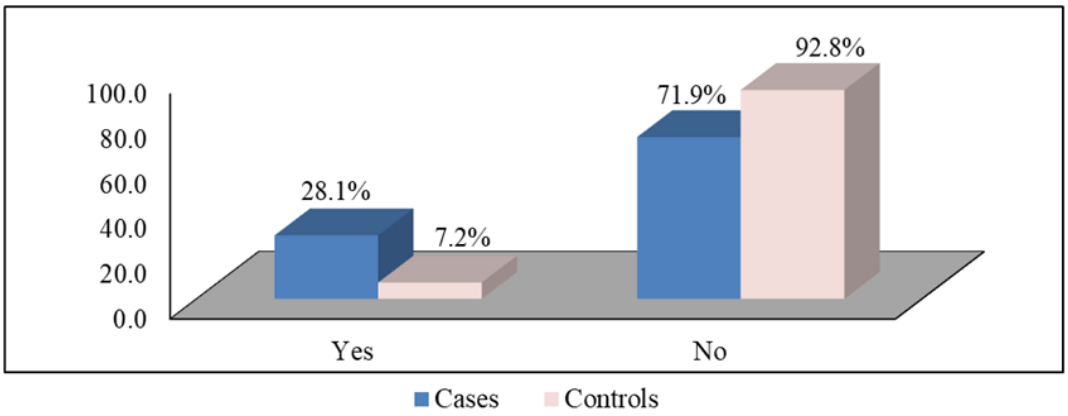
Figure (4.23): Percentage distribution of study participants by type of amniotic complications during last delivery



Concerning to uterine complication, the study findings have revealed that 17.7% of study participants had uterine complication during the last delivery. More than one quarter of cases (28.1 %) developed uterine complication during the last delivery compared to 7.2% of controls. The differences between cases and controls were statistically significant, with (χ^2 39.5, P value 0.000), as shown in Figure (4.24). Rupture membrane was the most common uterine complication among study participants at (65.6%). Previous studies

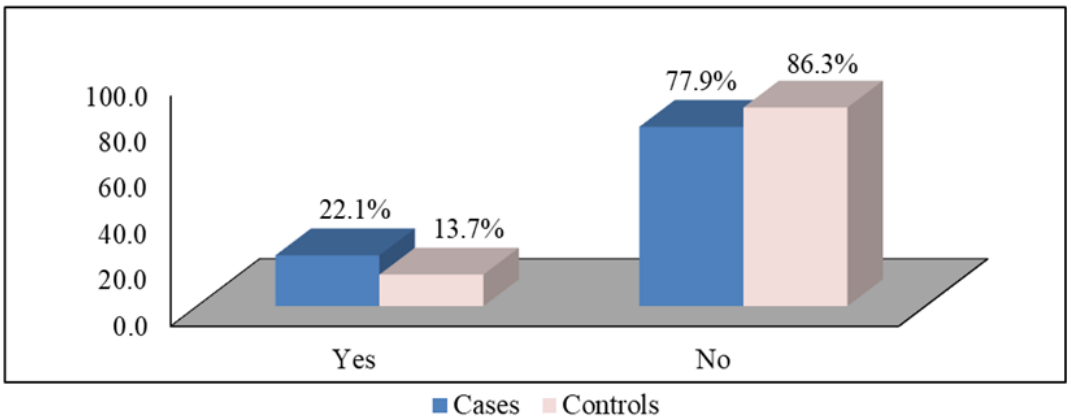
(Aminu et al., 2014; Harding, 2014; Ukaegbe et al., 2011) classified uterine rupture and uterine abnormalities as main risk factors of stillbirth.

Figure (4.24): Percentage distribution of study participants by uterine complications during last delivery



Finally, the study results have shown that 17.9 % of study participants developed post-partum complication during the last delivery. Cases had higher statistically significant post-partum complication (22.1%) than controls (13.7%), with (χ^2 6.2, P value .012), as shown in Figure (4.25)

Figure (4.25): Percentage distribution of study participants by post-partum complication during last delivery



The most common post-partum complications among study participants during the last delivery were post-partum hemorrhage (47.9%) and fever for more three days (24.5%).

Post-partum sepsis, metabolic acidosis and deep vein thrombosis were other common postpartum complications among cases.

Table (4.12): Percentage distribution of study participants by characteristics of the last delivery

Variable	Category	Cases		Control		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Onset of labor	Spontaneous	120	45.6	184	70.0	304	57.8	32.19	0.000*
	Induced	67	25.5	40	15.2	107	20.3		
	CS	76	28.9	39	14.8	115	21.9		
	Total	263	100	263	100	526	100		
Mode of delivery	Spontaneous	183	69.6	210	79.8	393	74.7	19.81	0.000*
	Assisted	3	1.1	13	4.9	16	3.0		
	CS	77	29.3	40	15.2	117	22.2		
	Total	263	100	263	100	526	100		
Intrapartum complication	No	118	46.3	193	73.4	311	60.0	39.66	0.000*
	Yes	137	53.7	70	26.6	207	40.0		
	Total	255	100	263	100	518	100		
Placental complication	No	210	79.8	255	97.0	465	88.4	37.55	0.000*
	Yes	53	20.2	8	3.0	61	11.6		
	Total	263	100	263	100	526	100		
Umbilical complication	No	219	83.3	258	98.1	477	90.7	34.23	0.000*
	Yes	44	16.7	5	1.9	49	9.3		
	Total	263	100	263	100	526	100		
Amniotic complication	No	163	62.0	253	96.2	416	79.1	93.11	0.000*
	Yes	100	38.0	10	3.8	110	20.9		
	Total	263	100	263	100	526	100		
Uterine complication	No	189	71.9	244	92.8	433	82.3	39.51	0.000*
	Yes	74	28.1	19	7.2	93	17.7		
	Total	263	100	263	100.0	526	100		
Post-partum complication	No	205	77.9	227	86.3	432	82.1	6.27	0.012*
	Yes	58	22.1	36	13.7	94	17.9		
	Total	263	100	263	100	526	100.0		

*** statistically significant at 95% CI**

4.2 Infant related risk factors

4.2.1 Infant characteristics

With regard to stillbirth as outcome of the last pregnancy, the study results have shown that 88.3% last stillbirths' outcome were classified as antepartum fetal death (macerated stillbirths) compared to 10.9% of stillbirths were classified as intrapartum fetal deaths (fresh stillbirth). The most common reported causes of stillbirths were congenital malformation (20.3%) and antepartum complication especially umbilical cord knot (10.2%). The results are consistent with the results of other studies that reported congenital anomalies as main risk factor of stillbirth (Aminu et al., 2014; Flenady et al., 2011; Harding, 2014; Hugara et al., 2013).

The study results have shown that about two third (60.2%) of stillbirths were documented as unknown causes, and this could reflect the poor documentation in medical files. The percentage of stillbirths who hadn't specific known cause of death is higher than the percentage reported in previous studies which demonstrated that from 3.8-57.4% of still births were reported as unknown / unspecific/ unclassified causes (Aminu et al., 2014; Harding, 2014).

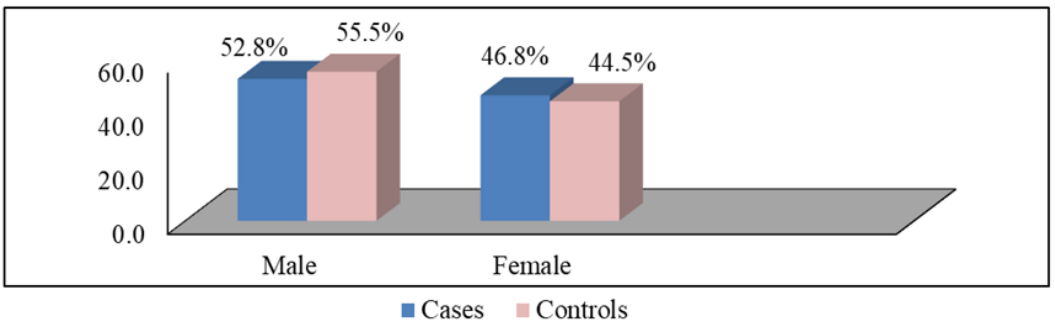
Prematurity, LBW, and intrapartum complication are the also common causes of stillbirths, and these results are slightly different form the findings of previous studies that reported intrapartum complication (asphyxia, birth trauma, meconium aspiration and fetal distress) and prematurity as main causes of stillbirths (Hugara et al., 2013; Aminu et al., 2014; Harding, 2014; Bhattacharyya & Pal, 2012, Nouaili et al., 2010).

With regard to type of early neonatal deaths, the study findings have revealed that 97.8% of early neonatal deaths were hospital admitted that means the death was occurring at hospital. The most common reported causes of early neonatal deaths were prematurity (40.7%), congenital malformation (38.5%), septicemia (25.2%) and intrapartum complication (11.1%). The results are congruent with previous studies that reported an association between prematurity and early neonatal deaths (Schoeps et al.,2007; Indongo, 2014; Harding, 2014, Lohela et al., 2019).

The study findings have shown that of all study participants, there were 54.2% had a male birth outcome compared to 45.6% had a female as birth outcome. Cases and controls have shown approximately similar findings with regard to gender of birth outcome, with no statistically significant difference between cases and controls, as shown in Figure (4.26).

Congruent to Hugara & Colleagues (2013) study, there is no statistical association between perinatal mortality and gender of birth outcome. While, the study results are inconsistent with previous studies that reported an increase of the risk of perinatal mortality among male higher than female (Ezeh et al, 2019; Kibria & et al, 2018; Roro, Sisay, & Sibley, 2018).

Figure (4.26): Percentage distribution of study participants by gender of birth outcome



Note: there was one ambigous case (0.4%)

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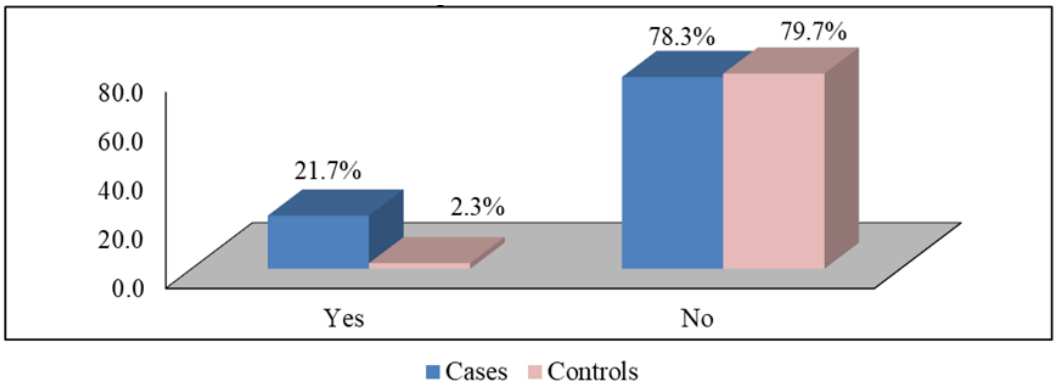
indings have revealed that the majority of study participants (91.8%) had a singleton birth outcome. The percentage of cases who had a singleton baby (84.8%) was lower than controls (98.9%). In contrary, the percentage of cases who had twins and more (15.2%) was higher than controls (1.1%). Triplet and a quadruplet birth outcome were reported only among cases at 0.8% and 0.1%, respectively. The differences between cases and controls with regard to number of birth outcomes were statistically significant, with (χ^2 34.73, P value 0.000), as shown in Table (11). The study results are consistent with previous studies that have shown an association between perinatal mortality and multiple birth (Helmerhorst et al, 2004; Hosssain et al, 2019; Roro, Sisay, & Sibley, 2018).

Concerning to birth weight, study results have shown that the mean weight of births at last delivery was 2692 gram (SD±996.07). Cases have shown lower mean of birth weight (2112.9 gm, SD±1024.69) than controls (mean 3256.8 gm, SD±540.18), and the differences between cases and controls were statistically significant, with (t test 15.8, P value 0.000). Since cases have lower gestational age at the time of birth than controls, so they did not complete their full-term pregnancies, thus, their neonates were having LBW. These results are congruent with previous studies that reported an association between neonatal mortality and LBW (Schoeps et al.,2007; Yego et al., 2014; Indono, 2014; Awour, Abed, & Ashour, 2012).

The study findings have shown that, 88.3% of study participants had normal fetal growth. The percentage of cases who had fetus with growth restriction were 21.7% compared to only 2.3% of control, and the differences between cases and controls were highly statistically significant, with (χ^2 48.46, P value 0.000), as shown in Figure (4.27).

Figure (4.27): Percentage distribution of study participants by presence of fetal growth restriction



Consistent with of the findings of previous studies (Gardosi et al., 2013; Harding, 2014) the results of this study have shown an association between perinatal mortality and FGR.

Regarding to fetal abnormalities, study findings have shown that one fifth (20.0%) of study participants had a newborn with fetal abnormalities. It is worth to indicate that all fetal abnormalities occurred only among cases. Results have shown that 39.9% of cases had babies with congenital abnormalities, with highly a statistically significant differences (P value 0.000). The study results are consistent with previous studies that reported an association between congenital anomalies and perinatal mortality (Aminu et al, 2014; Harding, 2014; Getive & Fantahun, 2017; Bhide, Gund, & Kar, 2016).

The study results have shown that the most common fetal abnormalities were cardiac deformities (21.9%) and body dysmorphic abnormality (17.1%). Diaphragmatic hernia, hydrops fetalis have shown the same figures at 12.4%, followed by neural tube defect (anencephaly and spina bifida) (11.4%) and potter syndrome (10.5%). Unknown congenital abnormalities, cleft palate and congenital pneumonia were from the most common fetal abnormalities. Edward syndrome, ascites, microcephaly, macrosomia, esophageal atresia and congenital metabolic disorder were presented among fetuses as least

common abnormalities. Consistent with Flenady and Colleagues study, cardiovascular disease is the most congenital anomalies caused stillbirths (Flenady et al., 2011).

Table (4.13): Percentage distribution of study participants by infant characteristics of the last pregnancy

Variable	Category	Cases		Control		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Gender of fetus	Male	139	52.9	146	55.5	285	54.2	1.32	0.516
	Female	123	46.8	117	44.5	240	45.6		
	Ambiguous	1	.4			1	.2		
	Total	263	100.0	263	100.0	526	100.0		
Product of pregnancy	Single	223	84.8	260	98.9	483	91.8	34.67	0.000*
	Twins and more	40	15.2	3	1.1	43	8.2		
	Total	263	100.0	263	100.0	526	100.0		
Fetal growth restriction	No	191	78.3	257	97.7	448	88.3	48.46	0.000*
	Yes, and confirmed by scan	38	15.6	3	1.1	41	8.1		
	Yes, but normal growth by scan	12	4.9	1	.4	13	2.6		
	Yes, but no scan performed	3	1.2	2	.8	5	1.0		
	Total	244	100.0	263	100.0	507	100.0		
Fetal abnormalities	No	158	60.1	263	100.0	421	80.0	131.19	0.000*
	Yes	105	39.9			105	20.0		
	Total	263	100.0	263	100.0	526	100.0		
Variable	**Category**	**Cases**		**Controls**		**Total**		**t test**	**P value**
Fetus birth weight (gm)	Mean	2112.97		3256.84		2692		15.8	0.000**
	SD	1024.69		540.18		996.07			
	Total	256		263		519			

*** Statistically significant at 95% CI**

4.2.2 Neonatal deaths characteristics

The study results have shown that all early neonatal deaths were admitted in neonatal intensive care unit. The mean age of early neonatal deaths was 2.70 days (SD±1.85) for the first baby and 3.5 days (SD±2.03) for the second baby.

The study findings have revealed that the main causes of NICU admission were RSD at 69.6% followed by immaturity 43.7%, then sepsis 25%. LBW, congenital anomalies,

septic shock and birth asphyxia were from other most common causes of NICU admission. Additionally, Jaundice, hypothermia, birth trauma and hypoglycemia were the least common causes of NICU admission. The results are consistent with Indongo (2014) and Zupan (2005) studies which reported RDS, asphyxia, sepsis congenital malformation are the major causes of neonatal deaths and consistent with another study that reported birth trauma, hypothermia, jaundice are fewer common causes of neonatal deaths (Indongo, 2014).

The study results have shown that 6.7% of study participants who had early neonatal deaths had a mechanical fetal injury, since 14.1% experienced asphyxia during delivery.

4.3 Health care system related factors

4.3.1 Antenatal care characteristics

The study findings have shown that the vast majority of study participants (99.6%) had antenatal care during the last pregnancy. More than half of study participants (58.2%) received antenatal care from UNRWA clinics compared to 30.4% received antenatal care from governmental primary health care clinics. It is worth mentioning that MoH primary health care clinics and MoH hospitals in addition to UNRWA clinics provides free antenatal care. Previous studies reported an association between perinatal mortality and lack of adequate antenatal care (Iman & Husna, 2018; Nouaili et al.,2010). Health facilities should ensure the quality of antenatal care including early detection of complication (Chaibva, & et al, 2019). Further studies related to the quality of perinatal care were recommended.

The study results have shown that the overall mean of gestational age at first antenatal visit was 8.67 weeks (SD±4.89) in which the mean gestational age at first antenatal care visit for cases (8.16 gestational weeks, SD±4.83) was lower than controls (mean 9.18 gestational weeks, SD±4.91), and the differences were statistically significant, with (t test -2.37, P value 0.01). Despite highly antenatal care utilization coverage, the time of initiating antenatal care is mainly at the second trimester of pregnancy. Since perinatal mortality was significantly associated with maternal complication during pregnancy, it is

recommended to start antenatal care during the first trimester to enhance the best outcomes of antenatal care.

The study results have shown that the mean of total antenatal visits during the last pregnancy was 9.07 times (SD±4.12), in which there were no statistically significant differences between cases and controls with regard to numbers of antennal visits, as shown in Table (12). According to MoH (2018), the average of antenatal visit was 6.9 visits per each pregnant woman, distributed as 5.9 visits per pregnant woman at ministry of health and 7.3 visits per pregnant woman at UNRWA clinics (MoH, 2018). About two third percentage of study participants (63.2%) had antenatal care though multi health providers so the total mean of antenatal visits is higher that the reported one.

The results of this study are inconsistent with previous study (Neupane & Doku, 2012) which reported that more than three quarters of women (83.0%) had only one antenatal care in developing countries (Neupane & Doku, 2012).

Of all study participants, almost all women (97.7%) had received routine examination during the antenatal care, including blood pressure measurement, weight measure, urine analysis and Hb level examination. There were no statistically significant differences between cases and controls with regard to received antenatal care during the last pregnancy, as shown in Table (12).

The study findings have revealed that 90.5% of study participants had at least one ultrasound examination during their last pregnancy. Cases and controls had approximately similar figures with regard to ultrasound examination during the last pregnancy, with no statistically significant differences, as shown in Table (12).

Concerning to the number of ultrasound examination, the study results have shown that the overall mean of ultrasound examination was 4.93 times (SD±3.12). There were statistically significant differences between cases (mean 5.32 times, SD±3.52) and controls (mean 4.54 times, SD±2.61), with (t test 2.74, P value 0.006). In other words, cases had higher number of times of ultrasound examination than controls. This is because about one third of cases (30.4%) of cases were classified as high risk pregnancy which means they

have to be examined by ultrasound on regular bases and to the fact that UNRWA protocols restrict conducting ultrasound examination to high risk pregnancy. Ultrasound examination especially early ultrasound examination before 24 weeks of pregnancy is recommended to enhance early fetal abnormalities detection which is considered as one of perinatal mortality risk factors in this study.

The majority of study participants (85.3%) had done gestational diabetes screening at 24-28 gestation weeks. The percent of cases (87.1%) who did gestational diabetes screening was higher than controls (83.5%), but these differences were statistically not significant, as shown in Table (12). The percentage of gestational diabetes considered to be higher than this percentage (85.3), but this may be attributed to recall bias of study participants or study participants were unknowing the type of blood test that they have done at the second trimester of pregnancy.

The study results have shown that, the vast majority of study participants (98.3%) received at least one type of supplements during the last pregnancy. Cases and controls had approximately similar proportions with regard to supplement receiving at 98.5% and 98.1%, respectively, and there were no statistically significant differences between cases and controls with regard to supplement receiving, as shown in Table (12). The main supplements received during the last pregnancy were folic acid (92.6%), ferrous sulfate tablets (90.5%), and multivitamins (44.3%). All supplements are provided for free to all pregnant women. The shortage of medication especially at governmental primary health centers hinder the availability of these supplements. Since folic acid and iron prevent maternal anemia, preterm birth, LBW and puerperal sepsis (WHO, 2017c), it is recommended to increase supplement coverage to include all pregnant women to improve maternal and neonatal outcomes.

Concerning to medications used during pregnancy, there were 30.3% of study participants had taken at least one type of medication. The percent of cases (33.1%) who received medications other than supplements during the last pregnancy was higher than controls (27.6%), and these differences were statistically not significant, as shown in Table (12). The most common medication used during the last pregnancy were antibiotics (28.3%), antihypertensive drug (20.8%) and baby aspirin, pregnancy stabilizers with (12.6%).

With regard to lab investigations done during the last pregnancy, the study results have shown that 97.3% of study participant did lab investigations, with no statistically significant differences between cases and controls. Furthermore, study findings have shown that the percent of cases (87.1%) who received proper counselling during the last pregnancy from women's perspective was higher than controls (83.5%), and the differences between cases and controls were statistically not significant, as shown in Table (12).

The study results have shown that midwives provided proper counselling for 43% of study participants, while 40% of study participants had their counselling from both doctors and midwives. The most common topics of counselling that were given to study participants were nutrition during pregnancy, and importance of being compliment with dietary supplements (58.8%), the use of medication during pregnancy (50.6%) of study participants, and 45.4% of study participants had written information about timing and content of antenatal care. Whereas, the least topics of counselling were personal hygiene, breast feeding and family planning. The researcher recommends to conduct more health education and counselling sessions especially at governmental primary health care centers, and to conduct more studies to ensure the quality of health education session.

Study findings have revealed that 60.7% of study participants received psychological support during the last pregnancy. Fifty-four percent (54%) of cases received psychological support from medical staff compared to 67.4% among controls, and the differences were statistically significant (χ^2 test 9.91, P value 0.002). In other words, the percent of cases who had psychological support during the last pregnancy was lower than controls.

Table (4.14): Percentage distribution of study participants by characteristics of antenatal care

Variable	Category	Cases		Control		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Antenatal care follow up**	No			2	1	1	.4		0.49
	Yes	263	100	261	99	99	99.6		
	Total	263	100	263	100	100	100		
Routine examination at each visit	No	9	3.4	3	1.1	12	2.3	3.02	0.08
	Yes	254	96.6	258	98.9	512	97.7		
	Total	263	100	261	100	524	100		
Ultrasound examination	No	24	9.1	26	10	50	9.5	0.11	0.75
	Yes	239	90.9	235	90	474	90.5		
	Total	263	100	261	100	524	100		
Gestational diabetes screening	No	33	12.9	43	16.5	76	14.7	2.58	0.27
	Yes	229	87.1	218	83.5	447	85.3		
	Total	263	100	261	100	524	100		
Supplements receiving	No	4	1.5	5	1.9	9	1.7	0.12	0.73
	Yes	259	98.5	256	98.1	515	98.3		
	Total	263	100	261	100	524	100		
Other medication receiving	No	176	66.9	189	72.4	365	69.7	1.87	0.17
	Yes	87	33.1	72	27.6	159	30.3		
	Total	263	100	261	100	524	100		
Required lab test	No	9	3.4	7	2.7	16	3.1	0.24	0.62
	Yes	254	96.6	254	97.3	508	96.9		
	Total	263	100	261	100	524	100		
Proper consultation	No	34	12.9	43	16.5	77	14.7	1.32	0.25
	Yes	229	87.1	218	83.5	447	85.3		
	Total	263	100	261	100	524	100		
Psychological support	No	121	46.0	85	32.6	206	39.3	9.91	0.002*
	Yes	142	54.0	176	67.4	318	60.7		
	Total	263	100	261	100	524	100.0		
Variable	**Category**	**Cases**		**Controls**		**Total**		**t test**	**P value**
Gestational age at first antenatal care	Mean	8.16		9.18		8.67		2.37	0.01*
	SD	4.83		4.91		4.89			
	Total	263		261		524			
Total number of antenatal visits	Mean	9.05		9.10		9.07		0.118	0.90
	SD	4.35		3.90		4.12			
	Total	263		261		524			
Times of ultrasound examination	Mean	5.32		4.54		4.93		2.74	0.006*
	SD	3.52		2.61		3.21			
	Total	239		235		474			

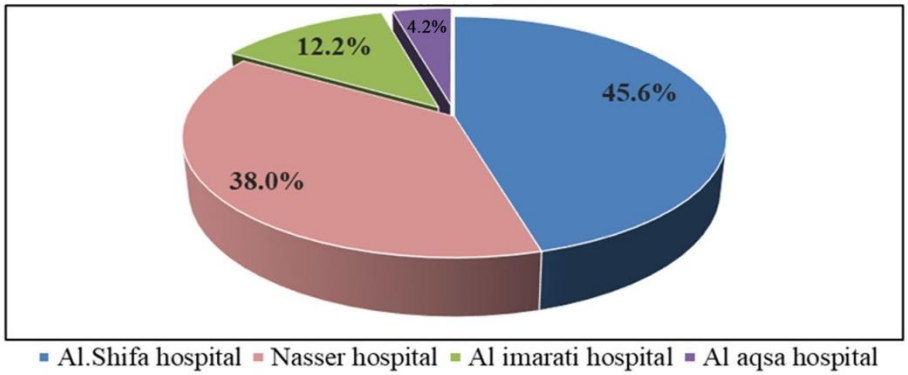
*** Statistically significant at 95% CI**

**** Fisher's exact test used**

4.2.2 Intrapartum care characteristics

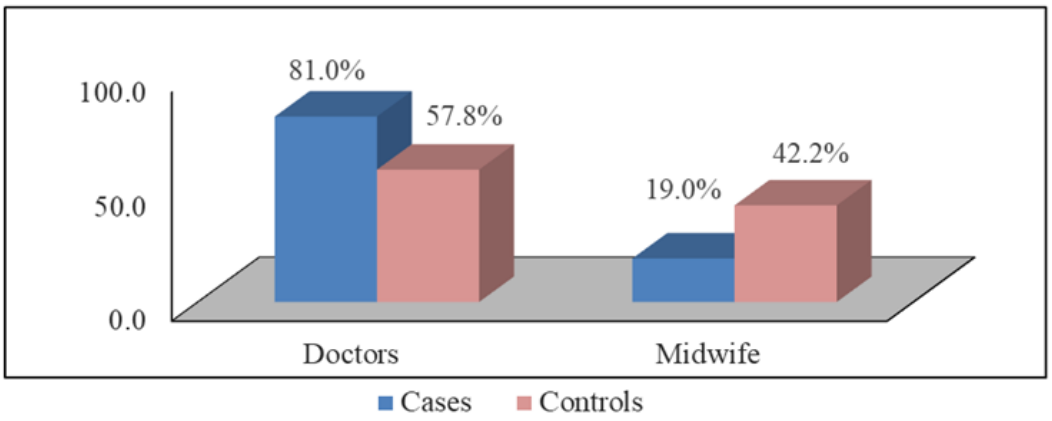
The study results have shown that the distribution of study participants according to place of delivery as follow; 45.6% were delivered at Al Shifa Hospital, 38% were delivered at Nasser Hospital, 12.2% were delivered at Al Imarati Hospital and 4.2% were delivered at Al Aqsa Hospital, as shown in Figure (4.28). According to MoH (2018), 100% of deliveries occurred at health institutions. The percentage of deliveries which occurred at governmental hospital reach to 67.3% of total deliveries during 2018. The study sample was collected from governmental hospitals as most of cases had complications during pregnancy or during delivery so they were in need to deliver at hospitals. The researcher recommends to conduct more studies with regard to perinatal mortality and includes all cases that deliver at NGOs or at private sector.

Figure (4.28): Percentage distribution of study participants by place of birth



The study results have shown that 81% of cases were delivered by medical doctors and 19.0% were delivered by midwife assistance compared to 57.8% and 42.2% of controls, respectively. The differences between cases and controls were statistically significant, with (χ^2 test 33.30, P value 0.000). In other words, the percent of cases who delivered by assistance of doctors was higher than controls, as shown in Figure (4.29)

Figure (4.29): Percentage distribution of study participants by last delivery assistance



With regard to medication received during the last delivery, the study results have shown that 82.3% of study participants received medication during the last delivery, in which the percent of cases (88.6%) who received medication during the last delivery was statistically higher than controls (76%), with (χ^2 test 14.23, P value 0.000). The study results have shown that the medications were available for the majority of study participants (99.3%), with no statistically significant differences between cases and controls, as shown in Table (13).

Concerning to intrapartum examination, study findings have shown that the percent of cases (97.3%) who received intrapartum examination was lower than among controls (98.5%), with no statistically significant differences between cases and controls, as shown in Table (13).

The study results have shown that 70.3% had received psychological supported from medical staff during the last delivery. The percent of cases (69.2%) how received psychological support during last delivery lower than controls (71.5%), with no statistically significant differences between cases and controls, as shown in Table (13).

Table (4.15): Percentage distribution of study participants by characteristics of intrapartum care

Variable	Category	Cases		Control		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Delivery assistance	Doctor	213	81.0	152	57.8	365	69.4	33.30	0.000*
	Midwife	50	19.0	111	42.2	161	30.6		
	Nurse	263	100	263	100	526	100		
Received medication	No	30	11.4	63	24.0	93	17.7	14.23	0.000*
	Yes	233	88.6	200	76.0	433	82.3		
	Total	263	100	263	100	526	100		
Availability of medication	No	1	0.4	2	1.0	3	.7	0.51	0.590
	Yes	232	99.6	198	99.0	430	99.3		
	Total	233	100	200	100	433	100		
Intrapartum examination**	No	7	2.7	4	1.5	11	2.1		0.54
	Yes	256	97.3	259	98.5	515	97.9		
	Total	263	100	263	100	526	100		
Support and encourage	No	81	30.8	75	28.5	156	29.7	0.33	0.57
	Yes	182	69.2	188	71.5	370	70.3		
	Total	263	100	263	100	526	100		

*** Statistically significant at 95% CI**

**** Fisher's exact test used**

4.3.2 Post-partum care characteristics

It is worth reminding that 77.7% of study participants were delivered normally, while 22.3% were delivered via CS mode of delivery. The study findings have revealed that from the study participants who delivered normally, there were 91.7% received postpartum care via taken vital sign every hour during the first 6 hours after normal delivery, with no statistical differences between cases and controls. In contrast, the study results have shown that 94.0% of study participants who delivered by CS mode of delivery had received

postpartum care via taken vital sign every ¼ hourly in the first hour and every 4 hours thereafter. The percent of cases (97.4%) who received post-partum examination after CS delivery was statistically higher than controls (87.5%), with (P value 0.04), as shown in Table (14).

Concerning to study participants' examination before discharge and postpartum examination, the study findings have shown that there were no statistically significant differences between cases and controls, as shown in Table (14).

The study results have revealed that 53.8% of study participants received proper counselling before hospital discharge. There were 49.0% among cases received discharge counselling compared with 58.6% among controls, and the differences were statistically significant between cases and controls, with (χ^2 test 4.78, P value 0.03). In other words, the proportion of cases received counselling at discharge was lower than controls. In addition, the percentage of cases who had proper post-partum counselling (56.7%) was statistically lower than controls (76.8%), with (χ^2 test 24.05, P value 0.00), as shown in Table (14). According to MoH (2018), the percentage of mothers who had post-partum care during governmental primary health care clinics was 25.6% compared to 99% during UNRWA clinics. In addition, 41.9% had post-partum care via home visit.

The study findings have shown that 84.4% of cases who had stillbirth or early neonatal death outcome received bereavement support program commenced with family. Most of cases had psychological support either from their husbands or/and from their families.

Table (4.16): Percentage distribution of study participants by characteristics of postpartum care

Variable	Category	Cases		Controls		Total		χ^2 test	P value
		No.	%	No.	%	No.	%		
Vital signs were taken every hour during the first 6 hours	No	17	9.1	17	7.6	34	8.3	0.306	0.580
	Yes	169	90.9	206	92.4	375	91.7		
	Total	186	100.0	223	100	409	100.0		
C/S delivered woman was observed 1/4 hourly in the first hour and every 4 hours thereafter**	No	2	2.6	5	12.5	7	6.0		0.045*
	Yes	75	97.4	35	87.5	110	94.0		
	Total	77	100.0	40	100.0	117	100.0		
Examination before discharge	No	33	12.5	25	9.5	58	11.0	1.24	0.265
	Yes	230	87.5	238	90.5	468	89.0		
	Total	263	100.0	263	100.0	526	100.0		
Post-partum examination	No	47	17.9	52	19.8	99	18.8	0.31	0.577
	Yes	216	82.1	211	80.2	427	81.2		
	Total	263	100.0	263	100.0	526	100.0		
Proper counselling before discharge	No	134	51.0	109	41.4	243	46.2	4.78	0.03*
	Yes	129	49.0	154	58.6	283	53.8		
	Total	263	100.0	263	100.0	526	100.0		
Proper post-partum counselling	No	114	43.3	61	23.2	175	33.3	24.05	0.00*
	Yes	149	56.7	202	76.8	351	66.7		
	Total	263	100.0	263	100.0	526	100.0		
Bereavement support program commenced with family	No	41	15.6			41	15.6		
	Yes	222	84.4			222	84.4		
	Total	263	100.0			263	100.0		

*** Statistically significant at 95% CI**

**** Fisher's exact test used**

4.4 Logistic regression

The Researcher used logistic regression analysis to explain the impact of socioeconomic, maternal, fetal and socioeconomic factors on the both stillbirths and early neonatal deaths. As shown in Table (16) Logistic regression analysis results have shown that there was appositive association between maternal age and increase the risk of stillbirth outcome. In the other words, study participants with higher age are more likely to have stillbirth as pregnancy outcome. The results have shown that for each one-year increase of maternal

age, the odds to have stillbirth outcome increases by 1.1 (OR 1.1), controlling all other variables. The results of this study are consistent with different previous studies that have shown an association between stillbirths and maternal aged more than 35 years (McClure et al., 2011, Ulizzi & Zonta, 2002; Bhattacharyya & Pal, 2012; Hi et al., 2012). The results are also congruent with Sinha and Colleagues (2016) study that reported an association between stillbirths and maternal aged less than 19 years and more than 35 years. But the findings are inconsistent with Gardosi and Colleagues (2013) that reported no significant association between stillbirths and maternal age less than 25 years and more than 35 years. The logistic regression analysis also revealed a positive association between stillbirths and number of previous pregnancies (gravida), which means, study participants with higher number of previous pregnancies are more likely to have stillbirth's as pregnancy outcome. The results have shown that for each one increase in number of previous pregnancies, the odds to have stillbirths increases by 60% (OR 1.59), controlling all other variables. This study results are congruent with previous literature results that reported an association between perinatal mortality and multiple pregnancies (Richardus et al., 1998). The results have shown a negative association between stillbirth and number of live births, since study participants who have more than two live births are less likely to have stillbirth as pregnancy outcome than participants who have two or less live births. The results have revealed that having two or more live births reduces the likelihood of stillbirths by 0.89% (Odds Ratio 0.11), controlling all other variables.

The study findings have shown that there is a positive association between stillbirth and previous history of babies with congenital anomalies. Study participants who had previous babies with congenital anomalies are more likely to have stillbirth outcome by about 7 folds more than study participants who hadn't (OR 6.81). This is could be attributed to high chance to have another baby with congenital anomalies, and as mentioned above in the study results, congenital anomalies were significantly associated with perinatal mortality. one of previous studies reported a statistically significant association between maternal history of previous congenital anomalies and having birth with congenital anomalies (OR59.0, 95% CI 5.74–607.0) (Ammen, Alalaf, & Shabila, 2018).

Concerning the risk pregnancy, the study findings have shown a negative association between increased the risk of stillbirth and high-risk pregnancy. Study participants who were classified as high risk pregnancy are less likely to have stillbirth than study

participants who were classified as low risk pregnancy (Odds Ratio 0.39). This is could be attributed to good follow up and high quality of antenatal care provided to high risk pregnancy cases, including frequent ultrasound examination. Since high risk cases were classified according to having comorbidities with pregnancy such as diabetes, APH and pre-eclampsia, the study findings are consistent with previous studies that reported an association between stillbirths and complication during pregnancy (Aminu et al., 2014; Harding, 2014; Afshan, Narjis, & Mazhar, 2019; Stringer et al., 2011).

Concerning to placental complications, the study results have revealed a positive association between stillbirth's outcome and placental complication such as placental abruption and placenta previa. The study participants who have placental complication during the last delivery are 7 folds more likely to have stillbirth's outcome than who haven't (Odds ratio 7.24). The results are consistent with previous studies that reported a positive association between stillbirths and placental complication (Aminu et al, 2014; Harding, 2014; Vijayan & Hiu, 2012; Vogel et al, 2013). Furthermore, the study results have shown that study participants who experience intrapartum complications during the last delivery are more likely to have stillbirths by two and half folds (Odds Ratio 2.48). The study results are consistent with previous study that reported an association between intrapartum complications and stillbirths (Doheny, 2011; McClure & Goldenberg, 2016) and an association between APH and stillbirths (Engmann et al., 2012).

The study results have shown a negative association between stillbirth and fetal weight, which means, the odds of stillbirth among study participants who had fetus weight less than 2,500 grams is more than among study participants who had fetus weight 2,500 gram and more, thus, LBW increases the risk of stillbirth by 0.91% (Odds Ratio 0.09). The study findings are congruent with Sugai and Colleagues (2017) that reported an association between perinatal mortality with LBW and with extreme LBW, and congruent with previous literatures that reported an association between perinatal mortality and LBW (Usynina et al., 2017; Getive & Fantahun, 2017; Yego et al, 2014; Schoeps et al, 2007). The results are inconsistent with Hugara and Colleagues (2013) study which reported that association between perinatal mortality and LBW was insignificant.

Table (4.17): Predictors of stillbirths among study participants by using binary logistic regression

Variable	B	S.E.	Wald	P value	Exp(B)	95% CI. for EXP(B)	
						Lower	Upper
Refugee status (reference=no)	0.08	0.31	.07	0.80	1.08	0.59	2.01
Mother age	0.10	0.04	6.56	0.01*	1.11	1.02	1.20
Mother education (reference < 12 years)	0.52	0.42	1.52	0.22	1.68	0.74	3.85
Husband's education (reference < 12 years)	-0.19	0.32	00.35	0.55	0.83	0.44	1.56
Cigarette smoking (reference = no)	0.07	3.53	0.00	0.98	1.07	0.00	1077.91
Consanguinity marriage (reference=no)	-0.09	0.30	0.10	0.76	0.91	0.51	1.64
Family members (reference <6)	-0.54	0.48	1.26	0.26	0.58	0.23	1.49
Gravida	0.47	0.22	4.28	0.04*	1.59	1.02	2.47
All deliveries	-0.32	0.25	1.58	0.21	0.73	0.44	1.20
Number of live births (reference ≤ 2)	-1.22	0.48	6.41	0.01*	0.30	0.11	0.76
Previous history of abortion (reference= no)	-0.50	0.50	1.00	0.32	0.61	0.23	1.62
Previous history of stillbirth (reference= no)	0.33	0.75	0.20	0.66	1.40	0.32	6.05
Previous history of early neonatal deaths (reference= no)	-0.99	0.98	1.02	0.31	0.37	0.05	2.53
Previous history of post neonatal deaths (reference= no)	-1.52	1.62	0.88	0.35	0.22	0.01	5.23
Previous history of preterm baby (reference= no)	-0.08	0.58	0.02	0.89	0.93	0.30	2.86
Previous history of fetus congenital anomalies (reference= no)	1.92	1.01	3.58	0.05*	6.81	0.93	49.69
Risk of pregnancy (reference=low risk)	-0.94	0.40	5.66	0.02*	0.39	0.18	0.85
Intrapartum complication (reference=no)	0.91	0.31	8.67	0.00*	2.48	1.35	4.53
Placental complication (reference=no)	1.98	0.55	12.81	0.00*	7.24	2.45	21.39
Fetus weight (reference <2500)	-2.45	0.38	41.25	0.00*	0.09	0.04	0.18
Stress score (reference <6)	0.47	0.55	0.74	0.39	1.60	0.55	4.70
Constant	-0.56	7.25	0.01	0.94	0.57		

*** Statistically significant at 95% CI**

Log likelihood 318.772

As shown in Table (4.18), the regression analysis results have shown that there was a positive association between maternal age and early neonatal deaths. In the other words, study participants who aged 35 years and more are more likely to had early neonatal deaths by 10 folds more than study participant who aged less than 35 years (Odds Ratio 9.88), controlling all other variables. The study results are consistent with Harding (2015) study that reported an association between neonatal deaths and maternal age less than 20 years and more than 40 years, and congruent with Usynina and Colleagues (2017) study that reported an association between perinatal mortality and maternal age. The findings are inconsistent with Gardosi and Colleagues (2013) that reported no significant association between perinatal mortality and maternal age (Iman & Husna, 2018; Gardosi et al., 2013).

The logistic regression analysis also revealed a positive association between early neonatal deaths and previous history of early neonatal deaths, since the study participants who experienced a previous history of early neonatal deaths are more likely to experience early neonatal deaths for the second time by more than 10 folds than who didn't (Odds Ratio 10.05), controlling all other variables. The study results are consistent with previous studies that reported an association between early neonatal deaths and previous history of early neonatal deaths (Getive & Fantahun, 2017; Roro, Sisay, & Sibley, 2018).

Concerning to gestational age, the findings have shown a negative significant relationship between early neonatal deaths and gestational age 37 weeks and more. In the words, study participants who delivered at gestational age 37 weeks and more are less likely to have early neonatal deaths outcome than study participants who delivered at gestational age less than 37 weeks. The odds of early neonatal deaths decreased by 81% (OR 0.19). The results are consistent with previous studies that reported an association between early neonatal deaths and gestational age less than 37 weeks (Yego et al., 2014; Indongo, 2014)

The study results have shown a negative association between early neonatal deaths and fetal weight, which means, the odds of early neonatal deaths among study participants who had fetus weight less than 2,500 grams is more than among study participants who had fetus weight 2,500 gram. According WHO (2006), although LBW associated with many

neonatal deaths but it was not considered as a direct cause of neonatal mortality. Sugai and Colleagues (2017) reported an association between perinatal mortality with LBW and with extreme LBW. The results of this study are consistent with previous literature that reported an association between early neonatal mortality and LBW (Schoeps et al., 2007) and an association between neonatal mortality and birth weight (Awour, Abed, & Ashour, 2012). While, the findings are inconsistent with Hugara and Colleagues (2013) study which reported that the association between perinatal mortality and LBW was not significant. Concerning to amniotic fluid complications, the study results have revealed a positive association between early neonatal mortality and amniotic fluid complications such as oligohydramnios and polyhydramnios. The study participants who experienced amniotic fluid complications during the last delivery are more likely to have early neonatal mortality by 4 folds more than who didn't (Odds ratio 4.30), controlling all other variables. The study results are congruent with previous studies that reported an association between early neonatal deaths and amniotic fluid complications (Aminu et al., 2014; Harding, 2014; Ukaegbe et al., 2011). Regarding to meconium aspiration syndrome, the findings have shown that there is a positive association between early neonatal deaths and meconium aspiration syndrome. Study participants who experienced meconium aspiration complication at the last delivery are more likely to have early neonatal deaths outcome. The odds of early neonatal deaths were increased by 1.3 folds (odds ratio 1.31), controlling all other variables. The findings are consistent with previous studies that reported meconium aspiration syndrome was an important cause of neonatal mortality and morbidity (Ross, 2005; Louis et al., 2014).

Table (4.18): Predictors of early neonatal deaths among study participants by using binary logistic regression.

Variable	B	S.E.	Wald	P value	Exp(B)	95% CI. for EXP(B)	
						Lower	Upper
Mother age (reference <35)	2.29	1.14	4.03	0.04*	9.88	1.06	92.47
Family members (reference <6)	-1.31	0.82	2.57	0.11	0.27	0.05	1.34
Previous history of early neonatal deaths (reference= no)	2.31	1.00	5.36	0.02*	10.05	1.42	70.86
Previous history of preterm baby (reference= no)	-1.55	0.95	2.65	0.10	0.21	0.03	1.37
Previous history of abortion (reference= no)	-0.10	0.45	0.05	0.82	0.90	0.37	2.19
Associated disease (reference=no)	-0.68	0.61	1.25	0.26	0.51	0.15	1.68
Gestational age (reference <37)	-1.64	0.88	3.51	0.05*	0.19	0.03	1.08
Fetus weight (reference <2500)	-3.06	0.88	12.19	0.00*	0.05	0.01	0.26
Product of pregnancy (reference= singleton)	2.21	1.53	2.09	0.15	9.13	0.45	183.45
Amniotic complication (reference=no)	1.46	0.74	3.89	0.05*	4.30	1.01	18.32
Premature rupture of membrane complication (reference=no)	-0.45	0.65	0.48	0.49	0.64	0.18	2.28
Meconium stained aspiration complication (reference=no)	2.10	0.94	5.04	0.02*	8.20	1.31	51.47
Umbilical cord complication (reference=no)	1.58	1.20	1.73	0.19	4.87	0.46	51.48
Stress score (reference <6)	0.13	0.99	0.02	0.89	1.14	0.16	7.96
Gravida	-0.04	0.22	0.03	0.87	0.97	0.63	1.48
Constant	1.30	1.91	0.46	0.50	3.67		

*** Statistically significant at 95% CI**
Log likelihood 99.502

Chapter Five
Conclusion and Recommendation

5.1 Conclusion

This retrospective case-control study aims to determine the main risk factors of perinatal mortality (stillbirths & early neonatal deaths) in the Governorates of the GS. The main risk factors included are socio-demographic, maternal, infant and healthcare services related factors. The study participants were selected from women who delivered at the following governmental hospitals: Al-Shifa Hospital, Naser Medical Complex Hospital, Al-Aqsa Hospital and Al-Imarati Hospital during the period from January 2018 till august 2018. The number of all study participants was 526 women, distributed as 263 cases and 263 controls. The researcher used a self-developed questionnaire that covered all the variables needed to identify risk factors of perinatal mortality, along with using general health questionnaire 12 for stress assessment.

With regard to the socio-demographic factors, perinatal mortality is significantly associated with maternal age, number of family members and maternal smoking status. On the other hand, perinatal mortality was not significantly associated with the refugee's status, mothers and husbands' education status, mothers and husbands' employment status, family income, consanguineous marriage, or house conditions.

Regarding the maternal-related factors, the Researcher studied both the past and the current maternal obstetric history. With regard to the previous history of previous pregnancies and deliveries, the study results have revealed a statistically significant relationship between perinatal mortality and the mother's age at first pregnancy, mother's age at first delivery and number of live births. The number of previous pregnancies and the number of all deliveries were not significantly-associated with perinatal mortality. Regarding previous pregnancies' outcome and the family births history outcome, the study findings showed a statistically-significant relationship between perinatal mortality and previous history of stillbirth, previous history of early neonatal deaths, previous history of preterm birth outcomes and history of previous babies with congenital anomalies. There was no statistically-significant relationship between perinatal mortality and previous miscarriage, previous termination of pregnancy due to post date, previous history of late neonatal deaths, or previous history of low birth weight. The study results showed a significant

relationship between perinatal mortality and past pregnancy birth outcome. Additionally, the study results revealed that perinatal mortality was not significantly-associated with the family history of stillbirth or with the family history of early neonatal deaths. Moreover, there was no significant relationship between perinatal mortality and congenital abnormalities of the maternal reproductive system and previous CS mode of delivery.

Regarding previous pregnancies diseases, the study results showed no significant association between previous history of preeclampsia, previous history of APH or previous history of vaginal infection, while previous history of cervix infection was significantly-associated with perinatal mortality.

In regards to the maternal physical characteristics, the study results showed no significant association between perinatal mortality and maternal body mass index before and at the end of the pregnancy.

Concerning the current maternal pregnancy characteristics, the study findings revealed a significant association between perinatal mortality, the type of the last pregnancy whether it was normal or assisted, and contraceptives' use prior the last pregnancy, while there was no significant association between perinatal mortality and the risk of the last pregnancy. Suffering from a previous disease was not significantly-associated with perinatal mortality, while there was a significant association between perinatal mortality and an associated disease with the last pregnancy such as anemia, pre-eclampsia or premature birth. There was a significant association between perinatal mortality and maternal placental problems such as placenta previa, placental abruption, maternal infection, vaginal infection, urinary tract infection, physical injury; falling down injury and hospital referral.

With regard to the last delivery characteristics, the study results showed an association between perinatal mortality and gestational age, mode of delivery, onset of labor and duration of delivery. The hemoglobin level at hospital admission was not significantly-associated with perinatal mortality. Additionally, there was a significant association between perinatal mortality and intrapartum complication such as PROM and fetal distress. Furthermore, placental complication such as placenta previa, umbilical cord complication such as umbilical cord knot and amniotic fluid complication such as oligohydramnios and polyhydramnios, were significantly associated with perinatal mortality. Moreover, uterine complication such as uterine rupture and post-partum complication such as post-partum

hemorrhage and fever for more three days were also significantly associated with perinatal mortality.

Regarding infant-related factors, the study results showed a significant association between perinatal mortality, fetal birth weight and product of the last pregnancy whether it was singleton or twins and more product, while there was no association between perinatal mortality and the gender of birth. Moreover, the findings of the study have shown a significant association between perinatal mortality, fetal growth restriction and fetal abnormalities.

The study findings have revealed that the most common causes of NICU admission of early neonatal deaths were respiratory distress syndrome, immaturity, low birth weight, congenital anomalies, septic shock and birth asphyxia. Meanwhile, jaundice, hypothermia, birth trauma and hypoglycemia were considered among the least common causes of NICU admission.

As for the healthcare-related factors, during the antenatal period, the study results showed there was high utilization of antenatal care with no association between perinatal mortality and antenatal follow-up, routine examination, ultrasound examination, supplement and medication receiving and proper consultation. On the other hand, the gestational age at booking, times of ultrasound examination and psychological support were significantly associated with perinatal mortality. With regard to the intrapartum characteristics, the study findings showed an association between perinatal mortality, delivery assistance and medication of delivery, while there was no association between perinatal mortality and medication availability, intrapartum examination or psychological support during delivery. The study findings revealed a significant association between perinatal mortality and post-partum examination after CS mode of delivery, counseling before discharge and post-partum counselling. There was no association between perinatal mortality and post-partum normal delivery examination and discharge examination.

5.2 General recommendations

1. Introducing preconception care to cover all governmental PHCs is a must to reduce the likelihood of adverse pregnancy outcomes.
2. There is a dire need to conduct health education campaigns that aim to raise women's awareness on pregnancy and obstetric complications and its impact on fetal and maternal mortality and morbidity.
3. Although there is a good utilization of antenatal care, time of initiating antenatal care needs to be improved, starting as early as possible during the first trimester.
4. Postnatal care needs to be done in a systematic way covering all newly delivered women, not only covering high risk pregnancies as in the governmental PHCs.
5. It is extremely important to improve the quality of provided intrapartum care, as large portion of stillbirth deaths occurred during delivery.
6. Significant improvement in the quality of care provided within the Neonatal Intensive Care Units is a must to reduce early neonatal morality.
7. Exerting more efforts in designing programs aimed to prevent perinatal mortality in Gazan hospitals. This could be done through developing certain programs for women at high risk of perinatal deaths, especially women who have history of previous stillbirth or early neonatal morality.
8. Introducing or reinforcing programs related to the provision of psychological support to pregnant women during pregnancy, labor and after delivery.
9. Understanding and proposing preventive measures to reduce risk factors of prematurity and low birth weight since they are strongly associated with perinatal deaths.
10. Although smoking is not common among women in the Gaza Strip, its adverse effects and impact on pregnancy outcomes should be included in antenatal health education programs, both active and passive smoking.
11. Fetal congenital malformation is a main risk factor of perinatal death; thus, early identification and proper interventions should be a priority.
12. Improving the quality of patient record documentations to include accurate and reliable information is instantly needed.

5.3 Recommendation for further research

1. Conducting more research, especially qualitative studies, to deeply explore the associated factors with perinatal mortality.
2. Conducting longitudinal studies to deeply understand and identify causes of perinatal mortality among women in the GS.
3. Further research studies covering cases of perinatal deaths that deliver at NGOs and/or at private sectors are highly needed
4. Conducting more studies to assess the causes and impacts of CS as mode of delivery on the maternal and fetal outcome.
5. Conducting additional studies to assess the impact of health education programs during and after the pregnancy in reducing unwanted pregnancy outcomes.
6. There is a need to conduct mixed method studies to assess the quality of provided antenatal care.
7. Further research studies are needed to investigate the impact of ongoing stressors on pregnancy outcomes, covering political, financial, social, and psychological stressors.
8. Further research studies are needed to investigate the impact of lifestyle factors on perinatal deaths.

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Annexes

Annex (1): Period of the study

Researcher activities	Mar. 18	Apr. 18	May 18	Sep. 18	Oct. 18	Nov. 18	Dec. 18	Jan. 19	Feb 19	Mar. 19	Apr. 19	May 19	June 19	July 19
Writing proposal														
Proposal approval														
Preparing and validating collected data tool														
Pilot study and modification														
Data collection														
Data analysis														
Result writing														

Annex (2): Sample size calculation

Unmatched Case-Control Study (Comparison of ILL and NOT ILL)

Two-sided confidence level: 95%

Power: 80 %

Ratio of controls to cases: 1

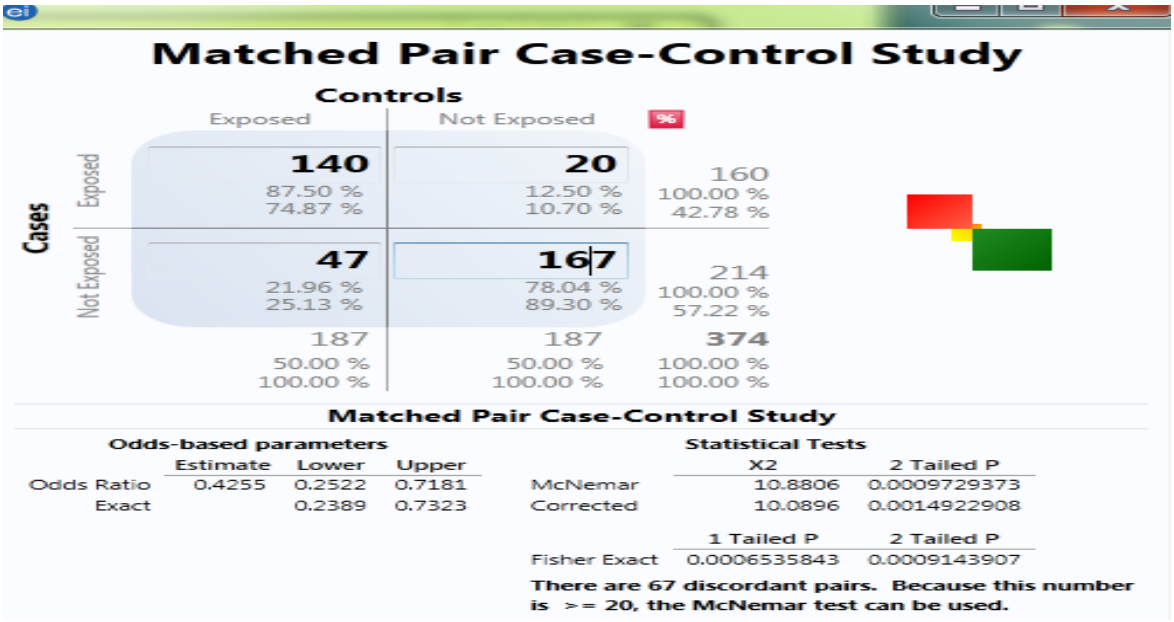
Percent of controls exposed: 20 %

Odds ratio: 2

Percent of cases with exposure: 33.3 %

	Kelsey	Fleiss	Fleiss w/ CC
Cases	173	172	187
Controls	173	172	187
Total	346	344	374

Annex (3): Examples of data analysis



Matched Pair Case-Control Study

Controls

Cases	Exposed	Not Exposed	%
Exposed	**140** 87.50 % 74.87 %	**20** 12.50 % 10.70 %	160 100.00 % 42.78 %
Not Exposed	**47** 21.96 % 25.13 %	**167** 78.04 % 89.30 %	214 100.00 % 57.22 %
	187 50.00 % 100.00 %	187 50.00 % 100.00 %	**374** 100.00 % 100.00 %

Matched Pair Case-Control Study

Odds-based parameters

	Estimate	Lower	Upper
Odds Ratio	0.4255	0.2522	0.7181
Exact		0.2389	0.7323

Statistical Tests

	X2	2 Tailed P
McNemar	10.8806	0.0009729373
Corrected	10.0896	0.0014922908

	1 Tailed P	2 Tailed P
Fisher Exact	0.0006535843	0.0009143907

There are 67 discordant pairs. Because this number is >= 20, the McNemar test can be used.

1. An independent sample T-test will be used to compare means of number of antenatal care visits between cases and control

	Mean	**N**	**Std. Deviation**	**Std. Error**
Cases				
Control				

Groups Differences								
	Mean	**SD**	**SE(Mean)**	**95% CI**				
				Lower	**Upper**	**T**	**DF**	**Sig**

2. Chi-square test will be used to examine the difference between cases and control with regard to body mass index.

Variable Categories	**BMI Status**								**Total**	**P-Value**
	Underweight		**Normal**		**Over weight**		**Obese**			
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**		
Case										
Control										
Total										

3. Logistic regression will be used to determine which independent variables affect the probability of having stillbirths and early neonatal births, from the different variables under the study.

Ln [p/ (1-p)] = $\alpha + \beta X + e$

- p is the probability that the event occurs,
- p/(1-p) is the "odds ratio"
- ln[p/(1-p)] is the log odds ratio, or "logit"

P-value equal or less than 0.05 was considered statistically significant, with Confidence Interval (CI) of 95%

Model*:* Log (x1) =α + β1 (x2) + β2 (x3) + β3 (x4) + β4 (x5) +β5 (x6) +ε

Annex (4): Estimated Budget

Item	Expected USD
Transportation for data collectors	1,200
Communication for data collectors	1,300
Stationaries for data collections	1,200
Data collection fee: 4 data collectors	2,500
Data entry	700
Data analysis	700
Stationaries, printing questionnaires	800
Writing study findings	1,500
Dissemination of study findings	1,500
Printing study	1,500
Total USD 12,900	

Annex (5): Experts and professional consulted

The study tool (interviewed questionnaire) was reviewed and evaluated by the following experts:

Dr. Khitam Abu Hamad, Al Quds University

Dr. Bassam Abu Hamad, Al Quds University

Dr. Yehia Abed, Al Quds University

Dr. Hamza Abd Al Gawad, Al Quds University

Dr. Yousef Al Gaish, Islamic University

Dr. Arefa Al Bahri, Islamic University

Dr. Rihab Quqa, UNRWA

Dr. Waleed Abu Hatab, Gynecologist

Dr. Hali Zoarob, Gynecologist

Dr. Nashwa Skaik, WHO

Ph. Khalid Abu Samaan, WHO

Ph. Huda Anan, WHO

Cover Letter

Perinatal Mortality Risk Factors Questionnaire

Serial No: -----

Dear Participant

You are chosen to be a participant for this research "Risk Factors of Perinatal Mortality in the Gaza Strip". You are selected because you have met the selection criteria for participation.

This study is being carried out as a part of the requirements for the master degree of public health at Al-Quds University, School of Public Health–Palestine.

The aim of this study is to identify the main risk factors associated with perinatal mortality in Gaza-Strip, which might help in developing preventive programs aiming to reduce it.

I appreciate your participation in this research study and you need to answer the interviewers questions that do not take more than 15 minutes.

Confidentiality of the data will be provided and maintained. Even through I welcome your participation, participation is optional.

Researcher

Asma Khamis El. Najar

Date		**Serial No.**		
1. personal information				
1	Name	2	File Number	
3	Subject	□Case	□Control	
4	Residency	□Gaza □Khan-Younis □Rafah □Middle □North		
5	Locality type	□ Urban □ Rural □ Camp		
6	Refugee status	□ Refugee □ Non- refugee		
7	Mother's age	----------years		
8	Mother's years of schooling	----------years		
9	Woman's employment status	□ Working □ Not working if working, ask 10		
10	Type of mother's work	□ Agriculture, Hunting, Forestry & Fishing □ Mining, Quarrying & Manufacturing □ Construction □ Commerce, Hotels & Restaurants □ Transportation, Storage & Communications □ Services & Other		
11	Husband's years of schooling	----------years		
12	Husband's work	□ working □not working if working, ask 13		
13	Type of husband’s work	□ Agriculture, Hunting, Forestry & Fishing □ Mining, Quarrying & Manufacturing □ Construction □ Commerce, Hotels & Restaurants □ Transportation, Storage & Communications □ Services & Other		
14	Total family income (all sources)	---------- ILS		
15	Mother's age at first marriage	----------year		
16	Do you smoke cigarettes?	□ Yes □ No if yes, number of daily cigarettes ……		
17	Does your husband smoke cigarettes indoor?	□ Yes □ No if yes, number of daily cigarettes ……		

2. Socio-demographic characteristics		
1	Current marital status	□ Married □ Divorced □ Separated □ Widowed
2	Consanguinity	□ Yes □ No
3	If yes, relative degree	□ 1st double cousin □ 1st cousin □ 2nd cousin □ From the same family
4	Total household family members	----------Members
5	Do you live in	□ Nuclear family □ Extended family
6	Your house is made of	□ Concrete □ Asbestosis □ Other, indicate ----------
7	Your house is	□ Owned □ Rented □ Other / specify ----------
8	Kind of house where family live	□ Villa □ House □ Apartment □ Separate Room □Tent □ Slum
9	Number of rooms in your house?	---------- rooms
3.Past obstetrical information		
1	Age at first pregnancy	……. years
2	Age at first delivery	---------- years
3	Do you have any congenital gynecological abnormalities? (Cervix & Uterus)	□ Yes □ No □ I don't know If yes, specify □ Bicornuate uterus □ Hypo-plastic uterus □ Vaginal atresia □ other, specify…….
4	Number of previous pregnancies (Gravida)	…… pregnancy □ do not know
5	Number of all deliveries (Para)	---------- delivery
6	Number of live births	---------- births
7	Previous spontaneous miscarriage	□ Yes □ No if yes, Specify, number ….

8	History of previous termination of pregnancy due to post date	□ Yes □ No if yes, Specify number---------- Gestational week (1) ……... Gestational week (2) ……... Gestational week (3) ……...
9	History of previous stillbirth	□ Yes □ No if yes, specify number ---------- Gestational week (1) ……... Gestational week (2) ……... Gestational week (3) ……...
10	History of previous early neonatal deaths	□ Yes □ No if yes, Specify number …... 1. At ……. Days after delivery 2. At ……. Days after delivery 3. At ……. Days after delivery
11	History of previous postnatal death (28- 360) days	□ Yes □ No if yes, Specify number ---------- 1. At ……. Days after delivery (monthly if daily is not possible) 2. At ……. Days after delivery (monthly if daily is not possible) 3. At ……. Days after delivery (monthly if daily is not possible)
12	History of previous preterm deliveries	□ Yes □ No □ I don't know if yes, Specify number---------- Gestational week (1) ……... Gestational week (2) ……... Gestational week (3) ……...
13	Previous babies with congenital abnormalities	□ Yes □ No □ I don't know if yes, Specify number …... type of abnormalities □ Cleft lip or palate □ Imperforated anus □ Diaphragmatic hernia □ Hypospadias □ Cardiac deformities □ Esophageal atresia □ Neural tube defect □ Other, specify…….
14	Previous history of pre-eclampsia	□ Yes □ No □ I don't know
15	Previous antepartum hemorrhage	□ Yes □ No if yes, specify number …...
16	Previous low birth weight (less than 2500 gm.)	□ yes □ No □ I don't know if yes, specify number …...
17	Do you have a history of recurrent vaginal infection?	□ Yes □ No □ I don't know

18	Do you have a history of recurrent cervix infection?	□ Yes □ No □ I don't know
19	Do you have a family history of stillbirth?	□ Yes □ No if yes, □ mother □ sister □ other, specify…...
20	Do you have a family history of early neonatal death?	□ Yes □ No if yes, □ mother □ sister □ other, specify …...
21	Previous delivery by CS	□ Yes □ No if yes, Specify number---------- Causes of CS delivery: □ Don't know. □ Cephalo-pelvic disproportion. □ Fetal distress. □ Termination of the pregnancy, specify the cause---------- □ Other indications, specify----------

4. Past pregnancy

1	Past pregnancy was	□ Normal □ Assisted reproductive technology
2	If past pregnancy was assisted, which type used?	□ Fertility medication □ IVF □ other specify….
3	Interval between the last two pregnancies	----------months
4	Gestational age at birth	----------weeks
5	Co-morbidities during past pregnancy	□ Hypertension □ Diabetes □ Anemia □ Kidney problem □ Asthma □ Cancer □ Epilepsy □ Heart □ Mental disorders condition □ Endocrine (hypo/hyper thyroids) □ Hematological disorder □ Antepartum hemorrhage □ Urinary tract infection □ Uterine abnormalities □ Other, specify.....
6	Past pregnancy outcome was	□ Singletons □ Twins □ Triples □ more, specify…...
7	Outcome of pregnancy (first 7 days after delivery)	□ Stillbirth (ask Q 8, 9) □ Early neonatal death (ask 8, 10, 11) □ Alive baby □ Aborted (Go to next section)

8	Birth order of stillbirth or neonatal death	---------- order
9	Type of stillbirth	□ Antepartum fetal death □ Intrapartum fetal death □ Time of fetal death not known □ Termination of pregnancy
10	Type of neonatal death	□ Non-admitted neonatal death □ Neonatal death in hospital □ Termination of pregnancy
11	Cause of death	□ Congenital malformation □ Antepartum complication □ Intrapartum complication □ Prematurity □ Low birth weight □ Septicemia □ Unknown/ unspecified □ Other, specify …….
5. Current pregnancy		
1	Was pregnancy planned	□ Yes □ No
2	Was pregnancy wanted	□ Yes □ No
3	Type of pregnancy	□ Normal □ Assisted reproductive technology
4	If pregnancy was assisted, which type used	□ Fertility medication □ IVF □ other, specify….
5	Using a contraceptive prior to this pregnancy	□ Yes □ No if yes, specify method: □ Contraceptive pills □ IUD □ Condom □ Others, specify…….
6	Current pregnancy was classified as	□ Low risk pregnancy (Normal) □ High risk
7	Have you suffered from diseases before the current pregnancy?	□ Yes □ No if yes, specify □ Diabetes □ Hypertension □ Heart disease □ Bronchial asthma □ Anti-phospholipid syndrome □ Epilepsy □ Viral hepatitis
8	Have you suffered from diseases associated with current pregnancy?	□ Yes □ No if yes, Which trimester? ……..

		Specify □ Premature labor □ Preeclampsia □ Anemia □ Edema (swollen arm and legs) □ Vaginal bleeding specify trimester…… □ Oligohydramnios (low amniotic fluid) □ Gestational diabetes □ Ante partum hemorrhage □ Thrombo-embolism □ Eclampsia □ Cholestasis □ Trauma (Q9) □ Exposure to toxic agent
9	Have you suffered from placenta problem?	□ No □ Yes, if yes, specify □ Placenta Previa □ Placenta Abruption □ Others, specify…….
10	Have you suffered from any type of infection?	□ No □ Yes, if yes, specify □ Pyelonephritis □ Vaginal infection □ Lower urinary tract infection □ Other infections specify…….
11	Have you suffered from physical injuries during pregnancy?	□ No □ Yes, if yes, specify □ Vehicular □ Fall □ Violent personal injury □ Other specify…….
12	Mothers usage of drug	□ Yes □ No if yes, answer Q13, Q14
13	What was the type of medication used?	---------- ----------
14	At which gestational week you used drugs?	……. Weeks
15	Have you been exposed to X- ray or other type imaging?	□ Yes □ No
16	Have you been referred to any other health care providers during pregnancy?	□yes □ no
17	Have you been exposed to any significant social problem during this pregnancy (problem with your husband or his family and other related problem)?	□ Not at all □ Occasionally □ Frequently Explain …….

18	Have you been exposed to any psychological problem during this pregnancy (unwanted pregnancy, gender of the fetus and other related problem)?	□ Not at all □ Occasionally □ Frequently Explain …….
19	Have you been exposed to any physical violence (trauma) during this pregnancy (husband, his family or others)	□ Not at all. □ Occasionally. □ Frequently. Explain …….
6. Current pregnancy outcome		
1	Gestational age at delivery	….. Weeks
2	Mother age at delivery	……. Years
3	Date of birth	
4	Duration of labor	….. Hours □ Unknown
5	Hemoglobin level at admission	----------mg/dl
6	Fetal heart sound at admission	□ Yes □ No if yes, □ normal □ abnormal □ unknown
7	Birth out come	□ Stillbirth □ Early neonatal death □ Alive In case that outcome is alive baby or early neonatal death answer (Q10- Q19)
8	Type of stillbirth	□ Antepartum fetal death □ Intrapartum fetal death □ Time of fetal death not known □ Termination of pregnancy
9	Type of neonatal death	□ Non-admitted neonatal death □ Neonatal death in hospital □ Termination of pregnancy
10	Cause of death	□ Congenital malformation □ Antepartum complication □ Intrapartum complication □ Prematurity □ Low birth weight □ Septicemia □ Unknown/ unspecified □ Other, specify …….

11	Onset of labor	□ Spontaneous (normal vaginal) □ Induced □ C/S before onset □ Unknown
12	Mode of delivery	□ Spontaneous (normal vaginal) □ Assisted (□ forceps and □ vacuum) □ Caesarean (□ elective □ urgent) (answer Q 10) □ Unknown
13	Main reason of caesarean section?	□ No medical indication □ Previous caesarean □ Breech presentation □ Pre-eclampsia □ Antepartum hemorrhage □ Maternal request □ Intra uterine fetal death □ Intra uterine growth restriction □ Fetal abnormality □ Fetal distress □ Cord presentation/prolapse □ Failure to progress □ Termination of pregnancy □ Other specify.....
14	Have you suffered from Obstetric complication (Intrapartum)?	□ Yes □ No □ Un record If yes, specify □ Obstructed labor □ APH (antepartum hemorrhage) □ HDP (hypertensive disorders) □ Mal presentation □ PROM (premature rupture of membranes) □ Uterine rupture □ Meconium stained □ Congenital malformation □ Umbilical cord problem □ Non-reassuring CTG □ Fetal bradycardia □ Others specify……..
15	Have you suffered from placental complication?	□ Yes □ No □ Un record If yes, specify □ Placental abnormalities □ Placenta praevia □ Placental abruption
16	Umbilical related complication	□ Yes □ No □ Un record If yes, specify □ Umbilical cord abnormalities □ Prolapse □ loop and knot

17	Amniotic complication	□ Yes □ No □ Un record If yes, specify □ Chorioamnionitis □ Oligohydramnios □ polyhydramnios
18	Uterine complication	□ Yes □ No □ Un record If yes, specify □ Rupture membrane □ Anomalies
19	Complication after delivery	□ Yes □ No □ Undocumented If yes, specify □ Post-partum hemorrhage □ Post-partum sepsis □ Fever more than 3 days
7. Maternal physical information		
1	Height in cm	
2	Weight in kg at the beginning of pregnancy)	
3	Weight gain in kg during pregnancy	
8. Infant Characteristics		
1	Gender	□Male □Female
2	Birth weight in gram	
3	Length at birth (cm)	
4	Product of this pregnancy	□Single □Twines □ Triple □Quadruplet □ others, …..
5	Gestational age at delivery	…….. weeks
6	Fetal Growth Restriction (FGR)	□ Yes □ Yes, and confirmed by scan □ Yes, but normal growth by scan □ Yes, but no scan performed □ Unknown
7	Fetal Abnormalities	□ Yes, If yes, answer Q 8 □ No
8	Type of congenital abnormalities	□ Cleft lip or palate. □ Imperforated anus. □ Diaphragmatic hernia. □ Hypospadias. □ Esophageal atresia. □ Cardiac deformities □ Neural tube defect □ Other specify

8.1 For early neonatal death		
1	Day of death after delivery	……. Day
2	Had the baby admitted to the neonatal intensive care unit (NICU)?	□ Yes □ No □Unknown If yes skip to Q3
3	Reasons for admission to NICU?	□ Birth asphyxia □ Infection □ Birth trauma □ RDS (Respiratory Distress Syndrome) □ Hypothermia □ Jaundice □ Immaturity. □ Transient tachypnea. □ Hypoglycemia. □ Low birth weight. □ Other specify----------
4	Mechanical fetal injury	□ Yes □ No □ Unknown if yes, answer Q5
5	What was the type of injury?	□ fracture □ subgaleal hematoma □ Shoulder dystocia □ asphyxia □ Brachial plexus injury □ other, specify……
9. Healthcare System- Related Factors		
9.1 Antenatal care (ANC)		
1	ANC follow up	□ Yes □ No if yes answer Qs (2-12), if no answer Q (13)
2	Place of antenatal care	□ Governmental PHC □ UNRWA clinics □ Governmental hospital □ NGO's hospital □ Private clinics □ Other, specify…….
3	Gestation age at first antenatal visit	…. Weeks □ Unknown
4	Total number of antenatal visits	….. Visits □ Unknown
5	Routine examination was delivered at each visit	□ Yes □ No □ Unknown If yes, specify □ Blood pressure

		□ Weight □ Urine analysis □ HB level
6	Ultrasound examination done	□ Yes □ No If yes, …...times/ pregnancy
7	Screening of gestational diabetes at 24-28 week of gestation	□ Yes □ No □ Unknown
8	Have you received supplements during pregnancy?	□ Yes □ No if yes answer Qs(9)
9	Which supplement have you received? And when did you start to take it?	□ Folic acid at …… month of pregnancy □ Ferrous at …… month of pregnancy □ Multivitamin at …… month of pregnancy □ Omega 3 at …… month of pregnancy □ Others, specify the type ……. And at …… month of pregnancy
9	Did you have other medication	□ Yes □ No □ Unknown If yes, ask 10.11.12. If no ask 13
10	Which type of medication	…….
11	From where did you obtain medication?	□ governmental clinics □ bought from out of pocket □ refill from UNRWA/ NGOs
12	How do you evaluate your compliance with medication?	□Weak □ Moderate □ Strong □No compliance
13	Have you done the required lab test regularly?	□ Yes □ No □ Unknown if answer is NO answer Q12
14	Why not?	□ Lack of resources □ Long waiting time □ Other, specify….
15	Have you received proper consultation, from your perspective?	□ Yes □ No
16	Who did consult you?	□ Doctor □ Midwife □other, specify …..
17	What was the kind of consultation?	□ Written information about number, timing and contents of antenatal care □ Pregnancy complication □ Obstetric complication □ Usage of medication □ Nutrition and dietary supplement □ Personal hygiene □ Breast feeding □ Family planning
18	Have you received any psychological support?	□ Yes □ No
9.2 Intra partum care (IPC)		

1	Place of birth	□ Al-Shifa hospital □ Nasser hospital □ Al-Imarati hospital □ Al-Aqsa hospital
2	Delivery assisted by	□ doctor □ midwife □ nurse □ do not know
3	Availability of medication during delivery	□Yes □ No □Unknown Types: □ Labor inducing medication □ analgesic
4	Vital signs were taken (BP, HR, and Temp)	□Yes □ No □Unknown
5	Abdominal examination was conducted	□Yes □ No □Unknown
6	Uterine contraction assessment	□Yes □ No □Unknown
7	vaginal examination was conducted	□Yes □ No □Unknown
8	Lab tests was conducted	□Yes □ No □Unknown
9	Auscultate fetal heart beat (CTG)	□Yes □ No □Unknown
10	Support and encourage women	□Yes □ No □Unknown
11	Drugs used during delivery	□ Intravenous therapy □ Anesthetic agents □ Oxytocin agents □ Pethidine / analgesics □ Unknown
12	Did the baby receive Vit.K medication?	□Yes □ No □Unknown

9.3 Post-Partum Care (PPC)

1	Your vital signs were taken every hour during the first 6 hours directly after normal delivery	□Yes □ No □Unknown
2	Assessed observation for C/S delivered women 1/4 hourly in the first hour and every 4 hours thereafter.	□Yes □ No □ Unknown
3	Did the women take pre discharge examination?	□ Yes □ No □ Unknown If yes, ask 4,7
4	Who did examine you	□ doctor □ midwife □ nurse □ do not know
5	Did the women take post-partum examination?	□ Yes □ No □ Unknown If yes, ask 6.7
6	Who did examine you?	□ doctor □ midwife □ nurse □ do not know

7	What was the kind of examination?	□ Breast feeding problem □ Infection □ Medication usage after delivery □ BP measuring □ Bleeding examination □ Anemia □ Lower urinary tract infection □ Post-partum depression
8	Have you received proper counseling before discharge?	□ Yes □ No □ Partially
9	Have you received post-partum counseling?	□ Yes □ No If yes, When? …… days after delivery By Whom (ask question 10) □ doctor □ midwife □ nurse □ do not know
10	Which provider?	□ Governmental PHCC □ UNRWA □ Other, specify……
12	Were you consulted on the following points?	□ Self-care and hygiene □ Perinatal care □ Stitches care, if any □ Diet and fluid intake □ Danger sign □ Breast feeding □ Baby care, including screening for thyroid & PKU, vaccination □ Mobility and exercise □ Family planning □ Sexual activity □ Vaccination
13	In case of perinatal mortality; did Bereavement support program commenced with family	□ Yes □ No

Stress assessment (GHQ-12)

	• Able to concentrate.	□ Yes □ No
	• Loss of sleep over worry	□ Yes □ No
	• Playing a useful part.	□ Yes □ No
	• Capable of making decisions	□ Yes □ No
	• Felt constantly under strain	□ Yes □ No
	• Couldn't overcome difficulties	□ Yes □ No
	• Able to enjoy day-to-day activities.	□ Yes □ No
	• Able to face problems.	□ Yes □ No
	• Feeling unhappy and depressed	□ Yes □ No
	• Losing confidence	□ Yes □ No
	• Thinking of self as worthless	□ Yes □ No
	• Feeling reasonably happy	□ Yes □ No

Annex (6): Helsinki Approval

المجلس الفلسطيني للبحث الصحي

Palestinian Health Research Council

تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار

Developing the Palestinian health system through institutionalizing the use of information in decision making

Helsinki Committee

For Ethical Approval

Date: 04/06/2018 **Number:** PHRC/HC/398/18

Name: Asma Khamis Jawdat El Najar الاسم:

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

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Risk Factors of Perinatal Mortality in the Gaza Strip

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/398/18 in its meeting on 04/06/2018

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

Signature

Member **Chairman** **Member**

Genral Conditions:-

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

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين

شارع النصر - مفترق العيون

Annex (7): Approval Request

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

التاريخ:2018/10/23

حضرة الدكتور/ رامي العبادلة المحترم
مدير عام تنمية القوى البشرية–وزارة الصحة

تحية طيبة وبعد،،،

الموضوع: مساعدة الطالبة أسماء النجار

نشكر لكم دعمكم الدائم لمسيرة العلم والتعليم وخصوصاً دعم كلية الصحة العامة وطلابها، ونود أعلامكم بأن الطالبة المذكورة أعلاه تقوم بعمل بحث كمتطلب للحصول على درجة الماجستير في الصحة العامة–مسار الإدارة الصحية بعنوان:

"Risk factors of Perinatal mortality in the Gaza Strip"

وعليه نرجو من سيادتكم التكرم بالموافقة على تسهيل مهمة الطالبة في إنجاز هذا البحث والموافقة على جمع البيانات من ملفات السيدات في أقسام والولادة وملفات الأطفال في أقسام المستشفيات الحكومية (مجمع دار الشفاء الطبي (الحضانة)، ومستشفى ناصر الطبي، ومستشفى الأقصى، والمستشفى الإماراتي) التابعة لإداريكم الموقرة.

علماً بأن الفئة المستهدفة للبحث هي حالات وفيات المواليد لعمر 7 أيام بعد الولادة، و حالات وفيات الأجنة داخل الرحم من عمر 24 أسبوع فما فوق.

و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد
منسق عام برامج الصحة العامة
فرع غزة

نسخة:
- الملف

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ص.ب. 51000 القدس

Annex (8): Moh Approval

State of Palestine
Ministry of health

دولة فلسطين
وزارة الصحة

السيد : رامي عيد سليمان العبادله المحترم

التاريخ:08/11/2018
رقم المراسلة 258699

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

السلام عليكم ,,,

الموضوع/ تسهيل مهمة الباحثة// أسماء النجار

التفاصيل //
بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحثة/ **أسماء خميس النجار**
الملتحقة ببرنامج ماجستير الصحة العامة – مسار الإدارة الصحية – جامعة القدس أبوديس في إجراء بحث بعنوان:-
"Risk factors of perinatal mortality in Gaza Strip"
حيث الباحثة بحاجة الاطلاع على الملف الطبي وتعبئة نموذج لجمع البيانات من ملفات النساء عند الولادة (الإجهاض عند 26 اسبوع والذين توفوا ابنائهن حتى اسبوع بعد الولادة) في مستشفيات قطاع غزة الحكومية التي تقدم خدمات الولادة، وعينة ضابطة من النساء اللاتي ليس لديهن هذه المشكلة ، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي، ودون تحمل الوزارة أي أعباء أو مسئولية.
وتفضلوا بقبول التحية والتقدير،،،
ملاحظة/ البحث حصل على موافقة لجنة اخلاقيات البحث الصحي
ملاحظة / تسهيل المهمة الخاص بالدراسة أعلاه صالح لمدة 5 شهر من تاريخه.

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

10.6.2019

التحويلات

■ محمد ابراهيم محمد السرساوي(مدير دائرة)	← رامي عيد سليمان العبادله(مدير عام بالوزارة)	إجراءاتكم بالخصوص(08/11/2018)
■ رامي عيد سليمان العبادله(مدير عام بالوزارة)	← عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	إجراءاتكم بالخصوص(08/11/2018)
■ عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← مدحت عباس خضر حسن (مدير عام بالوزارة)	إجراءاتكم بالخصوص(08/11/2018)
■ عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← كمال عواد محمد خطاب(مدير مستشفى)	إجراءاتكم بالخصوص(08/11/2018)
■ عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← محمد خليل محمد زقوت(مدير)	إجراءاتكم بالخصوص(08/11/2018)
■ عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	← وليد مرزق رزق ماضي(مدير مستشفى)	إجراءاتكم بالخصوص(08/11/2018)
■ محمد خليل محمد زقوت(مدير)	← عمر عبد الله حسين الاسطل(مدير دائرة)	للإطلاع و توجيهاتكم بالخصوص(08/11/2018)
■ محمد خليل محمد زقوت(مدير)	← بيان مصباح غانم شراب(مدير صيدلية)	للإطلاع و توجيهاتكم بالخصوص(08/11/2018)
■ محمد خليل محمد زقوت(مدير)	← علاء الدين محمود فايز المصري(طبيب رئيس قسم)	للإطلاع و توجيهاتكم بالخصوص(08/11/2018)
■ محمد خليل محمد زقوت(مدير)	← وليد عبد احمد ابوحطب(طبيب مسجل مساعد / ممارس عام)	للإطلاع و توجيهاتكم بالخصوص(08/11/2018)

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فاكس. 8-2826295 (970+)
Gaza Tel. (+970) 8-2846949
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عنوان البحث: دراسة عوامل الخطورة لوفيات ما حول الولادة (الأجنة داخل الرحم بعد عمر 26 أسبوع من الحمل والمواليد في الأسبوع الأول من الولادة) في قطاع غزة

الباحثة: أسماء خميس النجار

إشراف: د. ختام أبو حمد

الملخص:

المقدمة : تعد وفيات الأطفال في فترة ما حول الولادة من أهم المؤشرات الصحية للأم والطفل؛ لأنها تعكس جودة الخدمات الصحية المقدمة للأم والطفل على حد سواء خلال فترة الحمل وأثناء الولادة وفترة ما بعد الولادة. حسب منظمة الصحة العالمية فإن وفيات ما حول الولادة تشمل كلاً من وفيات الأجنة في رحم الأم من الأسبوع 22 من الحمل ووفيات المواليد خلال الأسبوع الأول من الولادة. عالمياً، ما زالت معدلات وفيات المواليد عالية بشكل غير مقبول، حيث يسجل سنوياً حوالي 2.6 مليون وفاة للمواليد خلال السبعة أيام الأولى من الولادة بمعدل 7000 وفاة يومياً منها مليون وفاة تسجل للمواليد خلال أول 24 ساعة من الولادة ونفس العدد من الأجنة تموت داخل الرحم (2.6 مليون جنين سنوياً). حوالي 98% من وفيات ما حول الولادة تحدث في دول العالم الثالث.

وفاة الأجنة داخل رحم الأم يعد من المشاكل الصحية الأساسية والتي بتم إهمالها بالغالب. قد تحدث وفيات الأجنة داخل الرحم أثناء الحمل بسبب مشاكل صحية تحدث للأم خلال الحمل، لكن حوالي نصف وفيات الأجنة يحدث أثناء الولادة، الأمر الذي يعني أن أغلب العوامل المسببة لهذه الوفيات يمكن تجنبها من خلال تحسبن جودة الخدمة المقدمة للأم خلال هذه الفترة. في قطاع غزة لا توجد المعلومات الكافية لأسباب وفيات ما حول الولادة ويزداد الأمر تعقيداً مع وفيات الأجنة داخل الرحم حيث تعتبر هذه المشكلة الصحية من المشاكل المهملة كلياً بحيث لا يتم إصدار شهادات ولادة أو شهادات وفاة لوفيات الأجنة داخل الرحم.

لذا يعد فهم عوامل الخطورة وأسباب حدوث وفيات الأطفال في هذه الفترة جوهرياً لوضع السياسات والبرامج التي تهدف لتقليل معدلات وفيات ما حول الولادة. هذه الدراسة تهدف إلى دراسة عوامل الخطورة المسببة لوفيات ما حول الولادة في قطاع غزة و تشمل كل من وفيات الأجنة داخل الرحم في الأسبوع 26 من الحمل أو أكثر ووفيات الأطفال في الأسبوع الأول من الولادة وتعد الأولى في قطاع غزة التي تتناول وفيات ما حول الولادة بشقيها.

تصميم الدراسة: تعد هذه الدارسة من الدراسات الوصفية التحليلية التي تشتمل على كل من الحالات والعينة الضابطة. تم عمل الدراسة من خلال اختيار الحالات من جميع المستشفيات الحكومية التي تقدم خدمة الولادة والحضانة للأطفال حديثي الولادة في قطاع غزة وعددها أربعة: مستشفى الشفاء، مستشفى ناصر، مستشفى الأقصى والمستشفى الاماراتي. حيث تم إدراج جميع الأمهات التي لديها حالة وفاة جنين في الأسبوع 26 وما فوق من الحمل أو وفاة مولود خلال الأسبوع الأول من الولادة في المستشفيات الأربعة المذكورة في الفترة ما بين يناير 2018 حتى نهاية أغسطس 2018. بلغ عدد الحالات 263 حالة يقابلها 263 سيدة تم اختيارها بشكل عشوائي ليمثلوا العينة الضابطة في الدراسة على شرط أن تكون السيدات في العينة الضابطة قد أنجبن طفلاً سليماً تجاوز عمره 28 يوماً في نفس فترة الولادة للحالات و في نفس مكان الولادة. إجمالي العينة في الدراسة بلغ 526 سيدة. تم استخدام برنامج تحليل إحصائي لإدخال البيانات ومعالجتها و تحليلها.

النتائج

العوامل المتعلقة بالأم: تم دراسة مختلف العوامل المتعلقة بالأم منها

1.**العوامل الإجتماعية والإقتصادية:** أظهرت الدراسة وجود علاقة ذات دلالة إحصائية بين وفيات المواليد في فترة ما حول الولادة و بعض العوامل الإقتصادية والإجتماعية المتعلقة بالسيدات مثل: عمر السيدة حيث تم إثبات علاقة بين زيادة فرصة حدوث وفيات ما حول الولادة لدى السيدات الأكبر سناً. وكذلك التدخين بحيث أن السيدات المدخنات

أكثر عرضة لحدوث وفيات ما حول الولادة بالإضافة إلى عدد أفراد الأسرة. لكن لم تثبت الدراسة وجود أي علاقة ذات دلالة إحصائية ما بين وفيات ما حول الولادة ومكان سكن السيدة، سنوات التعليم سواء للأم أو الأب، العمل ، إجمالي الدخل، صلة القرابة الزوجية، بالإضافة إلى الظروف المعيشية الأخرى المتعلقة بطبيعة المسكن.

2. **تاريخ الولادات السابقة للسيدات:** أوضحت الدراسة بأن السيدات التي لديها تاريخ سابق لوفاة جنين خلال أو بعد الأسبوع 26 من الحمل أو تاريخ سابق لوفاة طفل في الأسبوع الأول من الولادة أكثر عرضة لوفاة جنين او طفل آخر في نفس الفترة الزمنية. كما وأظهرت الدراسة بأن السيدات التي لديها تاريخ سابق بوجود ولادة مبكرة أو إنجاب أطفال تعاني من تشوهات خلقية فإن احتمالية حدوث وفيات أطفال لديها في فترة ما حول الولادة أكثر من غيرها من السيدات.

3. **العوامل المتعلقة بالحمل والولادة:** وجود أمراض مصاحبة للحمل مثل الأنيميا و ضغط الحمل والإلتهابات لها علاقة ذات دلالة إحصائية مع وفيات المواليد في فترة ما حول الولادة. لم يتم إثبات علاقة ذات دلالة إحصائية ما بين وفيات ما حول الولادة ومعدل الهيموجلوبين لدى السيدات.

بالإضافة لما سبق، عدد أسابيع الحمل، الولادة القيصرية للسيدات، المضاعفات التي تحدث أثناء الولادة، المشاكل الصحية التي تحدث في المشيمة، المشاكل الصحية التي تحدث في الرحم، مشاكل الحبل السري أو مشاكل السائل الامنيوسي المحيط بالجنين جميعا لها علاقة ذات دلالة إحصائية مع زيادة احتمالية حدوث وفاة للأطفال في فترة ما حول الولادة.

العوامل المتعلقة بالطفل: أثبتت الدراسة وجود علاقة ذو دلالة إحصائية ما بين وفيات ما حول الولادة وبعض العوامل المتعلقة بالطفل مثل نقص وزن الجنين، وجود أكثر من طفل (توام وما فوق) كنتيجة للحمل، وجود ضمور في نمو الطفل او وجود تشوهات خلقية جميعاُ تزيد فرصة حدوث وفيات الأطفال في فترة ما حول الولادة.

العوامل التي تتعلق بالخدمات الصحية :تم دراسة العوامل المتعلقة بالخدمات الصحية المقدمة للسيدة خلال فترة الحمل و فترة اثناء الولادة وفترة ما بعد الولادة وعلاقتها بوفيات ما حول الولادة ولم تثبت الدراسة وجود علاقة ذات دلالة إحصائية بين وفيات ما حول الولادة والخدمات التي تتلاقاها السيدة خلال الحمل أو توفر الادوية خلال الولادة أو الفحص الطبي بعد الولادة. لكن تم إثبات وجود علاقة ذات دلالة إحصائية ما بين وفيات ما حول الولادة وضعف خدمة الدعم النفسي التي تقدم للسيدات خلال الحمل و سوء خدمة المشورة الطبية التي تتلاقها السيدة بعد الولادة وخلال الأسبوع الأول من الولادة.

استخدام التحليل الاحصائي المعروف بالإنحدار اللوجيستي أوضح بان العوامل المتوقعة لزيادة حدوث وفيات الأجنة في عمر 26 أسبوعاً من الحمل أو أكثر هي زيادة عدد الحمولات السابق للسيدة، عدد الأطفال الأحياء، وجود مشاكل أثناء الولادة، وجود مشاكل صحية في المشيمة مثل انفصال المشيمة. بينما من أهم العوامل المتوقعة لزيادة احتمالية حدوث وفيات الأطفال خلال الأسبوع الأول من الولادة تتمثل في : وجود تاريخ سابق للسيدة بوفاه طفل لديها خلال الأسبوع الأول من الولادة و المضاعفات في السائل الامنيوسي المحيط بالجنين .

التوصيات

وضع برامج للعناية بالسيدات في فترة ما قبل الحمل خاصة في العيادات الحكومية بالإضافة إلى تحسين جودة الخدمات المقدمة للسيدات خلال فترة الحمل، الولادة وما بعد الولادة. كما وأوصت الدراسة بالاهتمام بجودة البرامج التثقيفية المقدمة للسيدات و جودة الخدمات المقدمة في حضانات الأطفال في المستشفيات المختلفة. تحسين نظام التسجيل الطبي خاصة في أقسام الولادة وأقسام الحضانة على قدر عالٍ من الأهمية. بالنهاية، أوصت الدراسة بعمل مزيد من الدراسات الكيفية التي تقوم بدراسة الحالات بشكل أعمق وكذلك دراسات على فترة زمنية أطول لبحث الأسباب المتعلقة بوفيات الأطفال في فترة ما حول الولادة بحيث تشمل هذه الدراسات جميع القطاعات الصحية التي تقدم خدمات الولادة للسيدات و الحضانة للمواليد.