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Prevalence Rate of Macrosomia and Stillbirth and Their Relation to Associated Maternal Risk Factors

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ABSTRACT

Background: The three types of macrosomia include morbidity and death in mothers, fetuses, and neonates. Birth weights of more than 4250 g in non-diabetic women and over 4000 g in moms with diabetes are associated with higher fetal mortality rates, according to a study examining the association between birth weight and fetal death. Types I and II diabetes mellitus, gestational diabetes, length of pregnancy, and heredity are all linked to fetal macrosomia. Birth weight and the risk of macrosomia are influenced by racial, ethnic, and genetic variables. There are no recognized risk factors for the majority of babies weighing more than 4500 g.

Objective: This study aimed to ascertain the frequency of abnormal birth weight and related maternal risk factors.

Patients and methods: This study was a retrospective cross-sectional study design had been used to analyze 130 delivery records for singleton pregnancies.

Results: The mean age of the study participants was 30.1 years old, mean BMI was 27.0 kg/m^2, 11.5% had gestational diabetes, 4.6% had hypertension and 86.9% were multigravida. Median parity of multigravida was 3, 38.9% had previous CS, 3.5% had previous abortion, 7.1% had previous macrosomia and 9.7% had previous stillbirth. The mean gestational age of the study participants was 37.6 weeks, 54.6% had CS, 13.8% had postpartum hemorrhage, 4.6% had perineal tear and 10.0% had prolonged labor. The mean birth weight of the delivered infants was 3215.0 gm, 11.5% had LBW, 8.5% were premature, 6.2% had dystocia, 4.6% had hypoglycemia and 7.7% admitted to NICU. Prevalence rates of macrosomia and stillbirth were 4.6% and 3.1% respectively. After regression analysis, only gestational diabetes and previous history of macrosomia were significant independent risk factors for macrosomia. Other independent variables were insignificant. After regression analysis, only high parity and previous history of abortion were significant independent risk factors for stillbirth. Other independent variables were insignificant.

Conclusion: The unfavorable pregnancy outcome of stillbirth has been linked to ken macrosomia. Health promotion programs that attempt to avoid pregnancies might be applied to help lower the prevalence of stillbirths, given the apparent correlation between mother age and higher risk.

Keywords: Stillbirth, Rate of macrosomia, Maternal risk factors.

INTRODUCTION

Both developed and low- and middle-income nations have abnormally high rates of adverse pregnancy outcomes (APOs), including stillbirths and abnormal birth weights. An APO may be an abortion, low birth weight (LBW), early delivery, stillbirth, or perinatal mortality according to WHO guidelines [(1)].

The WHO defines LBW as weighing less than 2,500 grams at delivery. The two factors that affect it are the length of the gestation and intrauterine growth. Thus, LBW is caused by either the resumption of intrauterine development, a short gestation period (> 37 weeks), or both [(2)].

Macrosomia is another pregnancy complication linked to a higher risk of negative maternal and neonatal outcomes, yet it receives little attention in most underdeveloped nations. Macrosomia is traditionally described as a birth weight of more than or equal to 4.0kg. The prevalence of macrosomia in affluent countries ranges from 5% to 20% [(3)].

In many underdeveloped countries, the high rate of stillbirths is a cause for concern. For example, low- and middle-income countries account for nearly all (97-99 percent) of the estimated 3 to 4 million stillbirths and 3 million neonatal deaths that occur globally each year. Stillbirths and neonatal deaths are typically caused by the same causes. The primary risk factors for stillbirth are preterm birth, fetal growth limitation, maternal infections during pregnancy, intrapartum complications, and congenital abnormalities [(4)].

To guide preventative public health activities aiming at improving pregnancy outcomes, researchers must investigate the prevalence of stillbirth and abnormal birth weight, as well as the relative effects of various risk factors. The primary goal of this study was to determine the frequency of abnormal birth weight and associated maternal risk factors, as well as pregnancy complications such as stillbirth.

PATIENT AND METHOD

This study was a retrospective study design that had been used to analyze 130 delivery records for singleton pregnancies.

Inclusion criteria: All pregnant women with documented delivery history.

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Exclusion criteria: Multiple births and any chronic illnesses history.

Techniques:
The following maternal data was taken from the birth book in the labor and delivery ward: Maternal age, gravity (number of pregnancies over her lifetime), parity, or the quantity of living children, sulfadoxine-pyrimethamine dosage and partner engagement with HIV status during labor and delivery method.

The following new baby details are provided: Birth weight and gender and status at birth.
A low-birth weight newborn weighs less than 2.5 kg at birth, while macrosomia is defined by the WHO as a birth weight of more than 2.5 kg, or exceeding 4.0 kg. This research classified all birth weights > 4.0 kg as macrosomic, birth weights ≥ 2.5 kg < 4.0 kg as normal and birth weights < 2.5 kg as LBW [(5)].

Ethical approval: This study was authorized by Tanta Faculty of Medicine's Ethics Committee, and the health administration provided written approval for the use of medical records. Informed consent was not obtained, however, because this study was carried out at the population level, utilizing data from medical records without identifying specific patients or conducting interviews. The Helsinki Declaration was followed throughout the course of the investigation.

Statistical analysis

SPSS version 20.0 was used to analyze the collected data. The quantitative information was shown as mean ± SD. Qualitative data were presented as frequencies and percentages. When comparing two means, the independent-samples t-test was utilized for significance. The X^2-test of significance was employed to compare proportions between two qualitative factors. P values less than 0.05 were expected to be statistically significant.

RESULTS

The mean age of the study participants was 30.1 years old, mean BMI was 27.0 kg/m^2, 11.5% had gestational diabetes, 4.6% had hypertension and 86.9% were multigravida. Median parity of multigravida was 3, 38.9% had previous CS, 3.5% had previous abortion, 7.1% had previous macrosomia and 9.7% had previous stillbirth (Table 1).

Table (1): Demographic characteristics and obstetric history of the study participants

Variables	Study participants (n=130)
Age (years): Mean ± SD	30.1 ± 4.9
BMI (Kg/m^2): Mean ± SD	27.0 ± 2.4
Gestational diabetes, n (%): Yes No	 15 (11.5%) 115 (88.5%)
Hypertension, n (%): Yes No	 6 (4.6%) 124 (95.4%)
Gravidity, n (%): • Primigravida • Multigravida	 17 (13.1%) 113 (86.9%)
For multigravida only (n=113)	
Parity: Median (Range)	3 (1 – 6)
Previous CS, n (%): Yes No	 44 (38.9%) 69 (61.1%)
Previous abortion, n (%): Yes No	 4 (3.5%) 109 (96.5%)
Previous macrosomia, n (%): Yes No	 8 (7.1%) 105 (92.9%)
Previous stillbirth, n (%): Yes No	 11 (9.7%) 102 (90.3%)

The mean gestational age of the study participants was 37.6 weeks, 54.6% had CS, 13.8% had postpartum hemorrhage, 4.6% had perineal tear and 10.0% had prolonged labor (Table 2).

Table (2): Maternal outcome of the study participants

Variables	Study participants (n=130)
Gestational age at birth (weeks): Mean ± SD	 37.6 ± 1.7
Mode of labor, n (%): Normal vaginal delivery CS	 59 (45.4%) 71 (54.6%)
Postpartum hemorrhage, n (%): Yes No	 18 (13.8%) 112 (86.2%)
Perineal tear, n (%): Yes No	 6 (4.6%) 124 (95.4%)
Prolonged labor, n (%): Yes No	 13 (10.0%) 117 (90.0%)

The mean birth weight of the delivered infants was 3215.0 gm, 11.5% had LBW, 8.5% were premature, 6.2% had dystocia, 4.6% had hypoglycemia and 7.7% admitted to NICU. Prevalence rates of macrosomia and stillbirth were 4.6% and 3.1% respectively (Table 3).

Table (3): Fetal outcome of the study participants

Variables	Study participants (n=130)
Birth weight (gm): Mean ± SD	3215.0 ± 484.1
LBW, n (%): Yes No	 15 (11.5%) 115 (88.5%)
Premature, n (%): Yes No	 11 (8.5%) 119 (91.5%)
Dystocia, n (%): Yes No	 8 (6.2%) 122 (93.8%)
Infant hypoglycemia, n (%): Yes No	 6 (4.6%) 124 (95.4%)
NICU, n (%): Yes No	 10 (7.7%) 120 (92.3%)
Macrosomia, n (%): Yes No	 6 (4.6%) 124 (95.4%)
Still birth, n (%): Yes No	 4 (3.1%) 126 (96.9%)

After regression analysis, only gestational diabetes and previous history of macrosomia were significant independent risk factors for macrosomia. Other independent variables were insignificant (Table 4).

Table (4): Binary logistic regression analysis of independent variables significantly associated with macrosomia

Variables	S.D	Wald	Sig.	Odds ratio (95% CI)
Maternal age	0.73	2.0	0.1	1.4 (0.92 – 11.4)
BMI	0.63	1.9	0.2	1.4 (0.87 – 14.0)
Gestational diabetes	0.55	9.4	0.002 (S)	0.18 (0.06 – 0.54)
Hypertension	0.68	2.8	0.09	0.32 (0.09 – 1.2)
Parity	0.72	0.09	0.7	0.81 (0.2 – 3.2)
Previous macrosomia	0.82	4.9	0.02(S)	6.1 (1.2 – 30.4)

After regression analysis, only high parity and previous history of abortion were significant independent risk factors for stillbirth. Other independent variables were insignificant (Table 5).

Table (5): Binary logistic regression analysis of independent variables significantly associated with stillbirth

Variables	S.D	Wald	Sig.	Odds ratio (95% CI)
BMI	0.57	2.4	0.09	1.7 (0.97 – 8.4)
Hypertension	0.48	1.8	0.2	1.2 (0.99 – 14.2)
Parity	0.64	5.1	0.03 (S)	1.8 (1.2 – 13.4)
Previous abortion	0.89	6.7	0.009 (S)	4.6 (1.2 – 17.5)

DISCUSSION

Both rich and low- and middle-income nations have abnormally high rates of APOs, including stillbirths and abnormal birth weights. According to WHO criteria, an APO might be a stillbirth, LBW, abortion, perinatal death, or preterm delivery [(6)].

Birth weights under 2500 g are classified as LBWs by the WHO. The duration of the gestation and intrauterine growth are the two elements that influence it. Consequently, either a short gestation period (37 weeks) or a sluggish intrauterine development rate (or a mix of both) results in LBW. Still, it is important to remember that not all tiny infants or premature births result from illness, and not all newborns impacted by IUGR are small [(7)].

Macrosomia is another pregnancy issue associated with a greater risk of poor maternal and newborn outcomes, yet it receives little attention in most developing countries. Macrosomia is typically defined as a birth weight greater than or equal to 4.0 kg [(8)]. Macrosomia, which has been linked to obesity in later life, may make delivery more challenging. Because of the challenges involved with delivering critical obstetric care services in resource-constrained Ghana, this might pose an additional risk to mothers and neonates [(9)].

The average age of the mothers was 30.14.9 years. Their BMI averaged 27. They experienced gestational diabetes in 11.5% of them and hypertension in 4.6%. They were multigravida in 86% of cases, with a typical parity of three. 3.5% had previously abortion, 7.5% had previously suffered macrosomia, and 9.1% had previously had a stillbirth. Our findings are similar to a study by **Bedu-Addo *et al.*** [(10)] who found that the majority of the participants were between the ages of 21–25 (28.5%) and 26–30 (26.30%), with only 0.5% being between the ages of 41–45. The majority of the participants, 107, had only a basic education (53.5%). The majority of the participants were multigravida, with 99 (49.5%) and multipara, with 76 (38.0%), respectively. In addition, a higher number of the

participants had normal weight, with 94 (47.0%) having normal weight and just 11 (5.5%) having a previous history of fetal macrosomia.

The mean gestational age was 37.6 ± 1.7 weeks in this study, which demonstrated that the maternal outcome was 37.6 ± 1.7 weeks. CS was found in more than half of them (54.6%). Postpartum hemorrhage affected 13.8% of the women. Perineal tear affected 4.6% of them. 10% of them were in labor for an extended period of time. In terms of fetal outcome, the average birth weight was 3215.0 gm. LBW was found in 11.5% of the population. 8.5% of the babies were born too soon. Dystocia affected 6.2% of the population. Infant hypoglycemia affected 4.6% of the children. 7.7% of babies are admitted to the NICU. Macrosomia affected 4.6% of them. Stillbirths accounted for 3.1% of the total. **Agbozo *et al.*** [(11)] found that the average birth weight was 2.9870 ± 0.50 kg, which is similar to our findings. LBW was estimated to be 9.69% (n14543, CI: 8.8–10.6), whereas macrosomia was estimated to be 3.03%. One hundred and eighteen babies (2.77% of the study group) died before or shortly after birth. Stillbirth was 9.2% among low-birth weight newborns, 1.94% among newborns of normal birth weight, and 6.2% among macrosomia newborns. **In Madoue *et al.*** [(12)] study, the incidence of fetal macrosomia was 7.6%. According to a Nigerian study conducted by **Ezegwui *et al.*** [(13)] where the rate was 8.1%. In the Nordic countries, the greatest reported incidence is 20%.

The overall stillbirth rate of 31 per 1000 births in this research is more than the 13 per 1000 births national average. It's also greater than the rate reported in research done in Ghana's Upper East area, which was 23/1000 deliveries**,** and lower than the rate recorded in Ghana's Central area, which was 35/1000 deliveries [(14)]**.**

The risk factors identified for macrosomia include diabetes, multiparity, weight increase, advanced maternal age, maternal BMI, and gestational age greater than 41 weeks. Several techniques have been used to screen for macrosomia, including maternal factors, first trimester nuchal translucency, and biochemical markers as pregnancy-associated plasma protein A and free beta-human chorionic gonadotropin, however the rate of diagnosis is poor [(15)].

Neonatal hypoglycemia is more common in heavy newborns and is riskier the greater the baby's birth weight. Newborns weighing more than 4,500 g were seven times more likely to develop newborns hypoglycemia than neonates weighing appropriately for gestational age. Infants with a birth weight of less than 4,000 grams delivered by non-diabetic mothers had a 2.4% risk of neonatal hypoglycemia, compared to 5.3% for those whose mothers had gestational diabetes [(16)]**.**

In Caucasians, shoulder dystocia affects 0.58% to 0.70% of the population. It also appears to differ by race, with only 0.3% of Chinese people experiencing it. The research has often stated that shoulder dystocia risk increased with birth weight. However, there are significant differences between studies in the incidence of shoulder dystocia in different birth weight groups. A recent research conducted in Norway found that the incidence varied between 1%, 2%, 4%, and 6% for birth weights of 4,200–4,399 g, 4,400–4,599 g, and 4,600 g respectively. However, a different study found that the incidence increased to nearly 20% for birth weights over 4,500 g. Although there is a connection, at least half of the deliveries affected by shoulder dystocia include infants weighing less than 4,000 grams [(17)]. In 2020, **Bedu-Addo *et al.*** [(10)] found a significant correlation between macrosomia and obesity.

In many studies, macrosomia has been associated with a 2-3 fold increase in intrauterine fetal mortality. **Zhang and colleagues** [(18)] found that stillbirth risk increased significantly for those born between 4,500 and 4,999 g (OR 2.7, 95% CI 2.2–3.4) and increased significantly at 5,000 g (OR 13.2, 95% CI 9.8–17.7). **Mondestin *et al.*** [(19)] examined this complex relationship because maternal diabetes is associated with both macrosomia and fetal death. They discovered that while the cutoff birth weight varied between diabetic and non-diabetic women, 4,000 g in the case of the former and 4,250 g in the latter, the fetal death rate increased in macrosomia fetuses in both categories.

CONCLUSION

Stillbirth and other unfavorable pregnancy outcomes were linked to macrosomia. The implementation of health promotion initiatives focused at avoiding pregnancies should contribute in the decrease of stillbirth rates, as there appears to be a correlation between maternal age and higher risk.

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