**ORIGINAL ARTICLE**

**Birth weight in high risk and normal pregnancy: a comparative study**

*Short title: High-risk pregnancy*

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**ABSTRACT**

**Objective.** High-risk pregnancy (HRP) is characterized as a complex pregnancy when one or more factors have a negative impact on the pregnancy outcome.  This study aimed to find out the impact of high-risk pregnancy on the birth weight.

**Materials and Methods.** A comparative case-control study was conducted between 1st September to 1st December on 250 pregnant women giving birth at Kirkuk city hospitals. A case group of 125 cases (high-risk pregnancies) and a control group of 125 cases (normal pregnancies) were allocated.

**Results.** The study found that there was a significant association between chronic hypertension($p=0.030$), pre-eclampsia ($p=0.013$), GDM($p=<0.001$), placenta accreta($p=0.028$), and anemia($P=0.033$) and the weight of the newborn. About 8.0% of the women with high-risk pregnancies have had low birth weights, whereas 4.0% reported high birth weights. Compared to 0.8% of the women with normal pregnancies having low birth weight and (1.6%) having a high birth weight. Also, the findings revealed a high association between the weight of neonates born to women who had High-risk pregnancies in comparison to those who were born to women who had normal pregnancies at ($P=<0.001$).

**Conclusions.** The main findings revealed that high-risk pregnancy affects the newborn's weight.  Creating and implementing into practice interventional strategies to raise pregnant women's awareness of the importance of regular screenings is highly recommended. Furthermore, complications should be managed effectively to minimize the negative impacts on

the weight of newborns.

## INTRODUCTION

The weight of a newborn during birth is an essential indicator of maternal and fetal health [1]. Birth weight is significant because newborns with extremely low birth weights have a 100 times higher risk of death than those with normal birth weights [2]. A newborn birth weight is classified as normal (2.5 to 4.0 kilograms), low weight (less than 2.5 kilograms), and macrosomia (greater than 4.0 kilograms)[3]. Strong evidence from large-scale epidemiological studies suggests that a higher risk of chronic diseases including diabetes, hypertension, and coronary artery disease is connected with a low-weight newborn at birth [4]. Low birth weight may affect the newborn's health and the health of future generations [4,5].  High-risk pregnancy (HRP) is characterized as a complex pregnancy when one or more factors have a negative impact on the pregnancy outcome [6]. Each year, over 500,000 women die as a result of complications associated with pregnancy around the world [7]. Most maternal deaths result from direct medical causes [8]. The health of women during pregnancy, childbirth, and the postnatal period is referred to as maternal health [9]. Most complications that occur during pregnancy can be either preventable or treatable; other complications may exist prior to pregnancy but become more serious during pregnancy, especially if not managed as part of the woman's care [10]. Every stage of pregnancy must be a positive experience that allows maternal and their newborns to reach for their full well-being and health [11].  A current systematic review shows that the incidence of iron deficiency during the early stages of pregnancy has been found to be associated with increased mortality among mothers and an elevated likelihood of experiencing unfavorable pregnancy outcomes, such as low birth weight, preterm, or fetal growth restrictions [12]. In addition to autism spectrum disorders and attention deficit hyperactivity disorder in offspring [13], other condition such as gestational diabetes mellitus (GDM) is linked to various risk factors, the body weight of special importance. A body mass index (BMI) ranging from 25.1 to 29.9 not only increases the likelihood of developing GDM but also increases the risk of suffering from negative effects during pregnancy [14]. Other study has demonstrated a correlation between insufficient levels of vitamin D and adverse outcomes such as low birth weight, gestational hypertension, and premature delivery [15]. In the light of these considerations, the main focus of this study was to determine the influences of high-risk pregnancies such as (gestational hypertension-eclampsia- pre-eclampsia, chronic hypertension, gestational diabetes, anemia, placenta previa and abruptio and placenta accreta, hyperthyroidism / hypothyroidism, and antiphospholipid syndrome) to answer how various complications during pregnancy can impacts birth weight. This is because it is widely known that metabolic disease is more common in babies of mothers who have risk during pregnancy [5]. In Iraq, there is lack of research on the impact of high-risk pregnancies on the birth weight, this knowledge gap impedes the development of effective strategies and interventions to reduce the negative impacts of pregnancy problems and optimize neonatal birth weight outcomes. The aims of this study was to find out the impact of high-risk pregnancy on the birth weight among women living in Kirkuk, Iraq and to inform about the development of strategies to improve women's health during pregnancy.

**MATERIALS AND METHODS**

A comparative case-control study was conducted on 250 pregnant women, 125 women were having high-risk pregnancy (case group) while the other 125 were having a normal pregnancy (control group). The data were collected during the period of three months (1st September to 1st December 2023) from (Azadi Teaching Hospital, Kirkuk General Teaching Hospital, Maternity Gynecology and Pediatric Hospital). According to the statistical records of the above hospitals, in 2022, each hospital has approximately received 750 (8.33%) birth per month with annually about 9000 (100%) births. For the purpose of this study the medical conditions of all pregnant women were diagnosed by gynecologists and obstetricians, and the gestational age has been determined based on Nägele's rule in Identifying first day of last normal menstrual cycle LNMP Count and confirmed through ultrasound examination. Monitoring and treatment plans are usually implemented during pre-natal care through primary health care centers taking into account the specific needs of each high-risk pregnancy, in order to achieve the best possible illness management and minimize potential hazards.

*Inclusion criteria*

Pregnant women with all age, singleton fetus who were live and born with gestational age of 37-41 weeks as well as pregnancy to a high risk with the following definitions were used for pregnancy related high risk:

- Gestational hypertension: It is diagnosed by the gynecologists when the mother's blood pressure is greater than 140/90 mm Hg in the second half of the pregnancy (after 20 weeks of gestation) and there is no protein urea [16].

- Pre-eclampsia : Hypertension of at least 140/90 mmHg measured on at least two separate times at least 4 hours apart and in the presence of at least 300 mg protein in a 24-hour urine collection [17].

- Eclampsia: A severe consequence of pre-eclampsia characterized by new-onset multifocal, focal, or tonic-clonic seizure activity or unexplained coma during pregnancy or postpartum [18].

- Chronic hypertension: using a systolic BP/diastolic BP threshold of 140/90 mmHg [19].

- Gestational diabetes: Defined as FBG 5.1 mmol/L, 1 hour plasma glucose 10.0 mmol/L, or 2 hours plasma glucose 8.5 mmol/, according to the international diabetes and pregnancy research group criteria [20].

- Anemia : Anemia in pregnancy as serum hemoglobin levels less than 11 g/Dl [21].

- Pacenta previa Is placental implantation in the lower uterine segment overlaying the endocervical os, and it is a major cause of fetal and mother morbidity and mortality [22].

- Abruptio placenta: Characterized by the complete or partial separation of a site implanted placental before delivery. It occurs in 0.8 to 1% of the total births [23].

- Placenta accreta: Failure of separation of placenta from the uterine wall after delivery of the human fetus [24].

- Thyroid disease: increased iodine clearance in the kidneys, and the thyrotrophic impact of human chorionic gonadotropin (HCG) [25,26].

- Antiphospholipid syndrome : Autoimmune condition characterized by the presence of at least one type of circulating antiphospholipid antibody and the development of arterial or venous thrombotic events and/or pregnancy morbidity [27].

*Exclusion criteria*

The study excluded fetuses with abnormalities, multiple pregnancies, and pre- and post-term deliveries because these conditions may influence and contribute to variations in neonatal weight [28, 29, 30,31].

*Statistical analysis*

Data was analyzed by using (statistical package SPSS version 27), a descriptive statistic were including frequency and percentage and mean for average value and SD to show how spread out the data around the mean. Meanwhile, inferential statistics used to find out the association for contingency table include: Chi Square and Fisher-freedman Halton test was used when expected frequencies were less than 5, and confidence interval of (99%CI) were reported. The significance threshold was set at P-value 0.05 or less.

**RESULTS**

The socio-demographic characteristics of the participants are illustrated in table (1) the majority maternal age in case and control group were between (21-27) years which represent 92 (36.8%) with mean age (29.06 ± 6.104), and about 77 (30.8%) were primary educated, and 211(84.4%) of participants were house wife, while 185 (74%) of participant were urban residents.

According to table (2), which displays reproductive parameters, the study indicates that 51 (40.08%) of the pregnant women in the case group had three or more prior pregnancies (gravidity), compared to around 28 (22.40%) in the control group. Furthermore, 64 (51.20%) of the case group's participants had 1-2 prior births (parity), compared to 62 (49.60%) of the control group.
In both groups, 69 people (or 27.6%) have had an abortion in the past.

In relation to the delivery mode 61 (48.8%) of the women in the control group and 97 (77.6%) of the women in the case group had birth via C/S. Furthermore, of the participants in the high-risk group, 6 (4.80%) had a history of TORCH infection; 76 (60.8%) had a family history of chronic disease, such as diabetes and hypertension, whereas in control group 69 (55.2%) had a family history; and with regard to the history of gynecological diseases, 36 (28.8%) of the case group's participants had PCOS, compared to 17 (13.6%) of the control group.

Regarding antenatal care in case group 74 (59.2%) of pregnant women were attending antenatal care compared to 79 (63.2%) in control group. Also, in terms of pre pregnancy BMI, about 44 (35.2%) were obese in case group compared 23 (18.4%) in control group.

Table (3) shows the association between high-risk pregnancy and it is impact on birth weight. As shows there was a weak association between gestational hypertension, eclampsia, placenta previa, placenta abruption, hypothyroidism, hyperthyroidism, and antiphospholipid syndrome with birth weight at P=>0.05. In the meantime, there is a significant association between chronic hypertension and birth weight at P=0.030 and CI: [0.028-0.037], significant association between pre-eclampsia and birth weight at P=0.013 and CI: [0.012-0.018], there was a high significant association between gestational diabetes P=<0.001 and CI: [0.00-0.001] and significant association between anemia and newborn weight at P=0.033 and CI: [0.03-0.04]. Further, there was a significant association between placenta accreta and birth weight at P=0.028 and CI: [0.027-0.036].

Table (4) displays the weight distribution of neonates born to women with high-risk pregnancies compared to those born to women with normal pregnancies. The findings indicated that 20 (8.0%) babies who born to high-risk pregnancy had low birth weight, and 95 (38%) weighted normal, whereas, 10 (4.0%) had excessive birth weight. Meanwhile, among those who born to normal pregnancies, about 2 (0.8%) had low birth weight and 119 (47.6%) had normal weight, and 4 (1.6%) were having macrosomia. As shows, there was a high significant association between weight of neonates born to women who had high risk pregnancies with those who born to women who had normal pregnancies at P=<0.001 and and CI: [0.0-<0.001].

## DISCUSSION

Ensuring the safety and well-being of pregnant women and neonate is crucial, and a comprehensive maternal care plays a significant role in achieving this. Consulting healthcare professionals for prevention strategies is an optimal approach for minimizing pregnancy-related risks. Healthcare seeking behaviour refers to actions performed to seek initial and continued medical care for perceived health problems, with the goal of finding a suitable solutions [32]. The current study aimed to find out the impact of high-risk pregnancy on the birth weight among women living in Kirkuk city. The findings revealed that in both case and control group maternal age were between (21-27 years) which represent (36.8%), that's in line with study by Gomindes et al., [33] who found that women aged between (22-25 years ) which represent (40%) in Vantamuri and (49%) in Kinaye were most at risk during pregnancy. Due to Iraqi culture most females get married and start having children at very young age [34]. Both advance and younger age pregnancies are at a higher risk of having a negative pregnancy outcome [35]. In terms of antenatal care, the study shows (61.2%) of women in both groups were visiting primary healthcare centers to undergo ANC. Regular ANC care has several benefits for maternal health, including a lower risk of, premature labor, postpartum hemorrhage, and anemia. While minimizing the declining neonate death, improving the nutritional status of children, chance of stillbirth and reducing neonatal admission to neonatal intensive care unit (NICU) [36]. The finding showed that (33.60%) of women in both groups were overweight. That's in a line with the study conducted by Lutfi et al., [37]. Pre-pregnancy BMI is essential factor due to gestational weight gain which is strongly affected by pre-pregnancy BMI, and the prevalence of excessive weight gain during pregnancies increases with pre-pregnancy BMI and women age [37].

Maternal health conditions effects the likelihood of developing pregnancy-related problems [38]. Furthermore, the association between high-risk pregnancy and effect on birth weight, according to each condition the current study found that chronic hypertension is significantly associated

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with newborn birth weight at (P=0.030). This is in agreement with a study conducted by Panaitescu et al. [39] in the United Kingdom, which found a strong relationship between chronic hypertension and birth weight (P= 0.0001). Chronic hypertension during pregnancy has the potential to impact the weight of newborns. Healthcare providers can utilize this knowledge to provide careful monitoring over pregnant women both prior to and during pregnancy, while also promoting the adoption of a health-conscious lifestyle, stress management, and the avoidance of smoking and alcohol intake. In terms of pre-eclampsia previous study by Nakimuli et al, [40] and Abdul-Kader and Ghalib [41] revealed a significant association between pre-eclampsia and birth weight: this is consistent with the current study that found low birth weight babies were born to four out of six pregnant mothers with pre-eclampsia, indicating that there was a significant link between pre-eclampsia and birth weight (P=0.013). Quaresima et al. [42] revealed that 9.4% of mothers who experienced stillbirth incidents were diagnosed with hypertensive disorder of pregnancy (HDP). The main etiologic theory of pre-eclampsia posits that a decrease in blood flow to the uterus and placenta is the primary pathological factor that leads to the onset of preeclampsia as well as reduced uteroplacental blood flow leads to decreased birth weights [43]. To mitigate the adverse impact of preeclampsia on neonatal weight and conditions, it is essential for clinical practice to emphasis early detection and diagnosis, as well as regular prenatal visits that involve frequent blood pressure checks, regular urine tests, and monitoring of fetal growth [44]. Furthermore, the current study found a highly significant relationship between gestational diabetes mellitus and birth weight at (P=0.001). That agrees with study by Yang et al., [45] who found that (GDM) have a strong correlation with elevated birth weight and a heigh likelihood of large for gestational age (LGA) and macrosomia. While Quaresima et al. [42] revealed that 15.09% of mothers who experienced stillbirth incidents were diagnosed with gestational diabetes. Growth of the fetus was mostly affected by the amounts of glucose after a meal, rather than the fasting blood glucose levels. In women with gestational diabetes change in amino acid metabolism, can contribute to abnormalities in fetal growth [46]. It is recommended that women with gestational diabetes who were diagnosed in their first or early second trimester consider the indications for fetal echocardiography [47]. These findings have the potential to be beneficial for healthcare providers in implementing personalized care that meets special circumstances. This offers recommendations for maintaining a lifestyle involving issues such as dietary choices, physical exercise, and weight control. Regarding the finding of the current study there was association between maternal anemia and birth weight at (P=0.033), that's agree with a study by Villalva Luna and Prado [21] who found that pregnant women of advance ages who have anemia are six times more likely to give birth to babies with low birth weight, this may due to the insufficient consumption of iron-rich foods throughout pregnancy may decrease the final outcome of maternal hemoglobin, resulting in abnormalities to fetal growth, such as preterm delivery and low birth weight. A prevalent approach to treat iron deficient anemia is administering iron supplements. The findings of this study also showed a significant association between placenta accreta and birth weight (P=0.028). This finding is supported by Farquhar et al., [48] who revealed a significant association between placenta accreta and birth weight. And disagree with study by Jauniaux et al., [49] who found that the occurrence of negative outcomes in newborns of pregnancies complicated by placenta accreta is associated with early birth rather than poor fetal growth. clinical practice should be focus on timely identification and diagnosis of conditions, allowing the implementation of suitable strategies and interventions to enhance birth outcomes. And primary diagnoses by using prenatal ultrasound, with magnetic resonance imaging (MRI) typically employed as a supplementary diagnostic method [50]. Regarding the comparison between

weight of neonates born to women who had high risk pregnancies with those who born to women who had normal pregnancies, the current study found that in case groups (high-risk pregnancies), (8.0%) were having low birth weight, (38.0%) were within the normal birth weight, and (4.0%) were macrosomia, while in control groups (pregnancies without risk), 0.8% were having low birth weight, 47.6% were having normal birth weight, and 1.6% were born with macrosomia. Which revealed that there was a high significant association between the weight of neonates born to women who had high risk pregnancies and those born to women who had normal pregnancies at ($\chi$2=19.99, P=0.001). That's agree with previous studies by Wagata et al. [51]. Other studies by Majella et al. [52] who found (18.4%) of women with high risk pregnancies had a low birth weight, (81.6%) had a normal weight, in women with normal pregnancies (8.6%) had a low birth weight, (91.4%) normal weight, and this revealed that significant association between birth weight and high risk pregnancies at (P = 0.004). Weight of newborn is a credible and specific factor that is directly related to maternal nutrition and health during pregnancies [53]. Low birth weight (LBW) is associated with the adequacy and effectiveness of antenatal care (ANC). Furthermore, it is a consequence of either preterm delivery or intrauterine growth restriction. Pregnant women undertake a number of essential services during antenatal care (ANC) appointments, which are vital for the well-being of both the mother and the developing fetus [54]. On other hand, A lot of healthcare services are provided by private clinics [55]. In a developing country like Iraq, where there are continually problems related to the health of mothers and children, there is a pressing requirement to enhance both the demand for the quality of reproductive health care. The provision of antenatal education alone is not the complete solution, but it can contribute to a partial resolution, pregnant women would not be able to fully utilize the information they have received if services are not easily accessible and of excellent quality [56]. Medical practitioners can use the strength point discovered from the study of how high-risk pregnancies affect birth weight to develop focused interventions. These may include focusing on maternal-child healthcare programs for low-high and severe risk during pregnancy, raising awareness among the general population to prevent future adverse outcomes, utilizing the screening tool to reduce adverse pregnancy outcomes, and thereby decreasing maternal and neonate morbidity rate.

_Strengths and Limitations_

This study is regarded as the first in Iraq to compare the birth weight of major high-risk pregnancies condition. And by incorporating a control group, the study is enhanced as it enables direct comparisons between pregnancies at high risk and normal pregnancies. Rigorous inclusion criteria were applied in order to reduce the potential for selection and misclassification bias. The study's limitations arise from the relatively small sample size, which adversely impacts the ability to draw conclusive results for various disorders. A broad range of disorders and the collection of all high-risk pregnancies without taking into account the specific circumstances may obscure significant diversity. The lack of a list of records for high-risk cases in the settings of this study presented further difficulties for the researcher as the data could not be used retrospectively.

## CONCLUSIONS

The main findings revealed that high-risk pregnancy affects the newborn's weight. Creating and implementing into practice interventional strategies to raise pregnant women's awareness of the importance of regular screenings is highly recommended. Furthermore, complications should be managed effectively to minimize the negative impacts on the weight of newborns.

## COMPLIANCE WITH ETHICAL STANDARDS

**Authors contribution:** The conceptualization and methodology were developed by R.F. and S.M.A. Data curation, formal analysis, investigation, and project administration of the study was created by R.F. and all the study was supervised by S.M.A. and both authors are responsible for the study.

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**Study registration:** Not applicable

**Disclosure of Interests:** not applicable

**Ethical Approval:** Ethical approval was obtained from the Ministry of Health (Ref.: NO.717/2023), Kirkuk Health Directorate as well as Kirkuk University-Nursing collage-post graduated ethical committee.

**Informed consent:** Informe consent was obtained from pregnant women who participated in the study

**Data sharing:** the data that support the finding of this study are available from the corresponding author upon reasonable request.

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**Table (1) Distribution of the demographic characteristics of the participants.**

| Demographic and obstetric characteristics | | High Risk pregnancy (Case group) | | Normal pregnancy (control group) | | Total | |
|---|---|---|---|---|---|---|---|
| | | Freq. | % | Freq. | % | Freq. | % |
| Maternal age | ≤ 20 | 5 | 4.0% | 11 | 8.8% | 16 | 6.4% |
| | 21 - 27 | 48 | 38.4% | 44 | 35.2% | 92 | 36.8% |
| | 28 - 34 | 40 | 32.0% | 50 | 40.0% | 90 | 36.0% |
| | 35 - 41 | 26 | 20.8% | 19 | 15.2% | 45 | 18.0% |
| | > 41 | 6 | 4.8% | 1 | 0.8% | 7 | 2.8% |
| | Mean ± SD | 29.82 ± 6.512 | | 28.30 ± 5.588 | | 29.06 ± 6.104 | |
| Level education | Illiterate | 9 | 7.2% | 9 | 7.2% | 18 | 7.2% |
| | Primary | 28 | 22.4% | 49 | 39.2% | 77 | 30.8% |
| | Secondary | 46 | 36.8% | 27 | 21.6% | 73 | 29.2% |
| | Diploma | 13 | 10.4% | 15 | 12.0% | 28 | 11.2% |
| | Bachelor | 29 | 23.2% | 25 | 20.0% | 54 | 21.6% |
| Maternal occupation | House wife | 103 | 82.4% | 108 | 86.4% | 211 | 84.4% |
| | Student | 4 | 3.2% | 7 | 5.6% | 11 | 4.4% |
| | Employee | 18 | 14.4% | 10 | 8.0% | 28 | 11.2% |
| Residence | Rural | 24 | 19.2% | 25 | 20.0% | 49 | 19.6% |
| | Urban | 94 | 75.2% | 91 | 72.8% | 185 | 74.0% |
| | Suburban | 7 | 5.6% | 9 | 7.2% | 16 | 6.4% |

**Table (2) Reproductive parameters of participants.**

| | | High Risk pregnancy (case group) | | Normal pregnancy (control group) | | Total | |
|---|---|---|---|---|---|---|---|
| | | Freq. | % | Freq. | % | Freq. | % |
| **Gravida** | 1 – 2 | 46 | 36.80% | 75 | 60.00% | 121 | 48.40% |
| | 3 – 4 | 51 | 40.80% | 28 | 22.40% | 79 | 31.60% |
| | ≥ 5 | 28 | 22.40% | 22 | 17.60% | 50 | 20.00% |
| | Mean ± SD | 3.49 ± 2.184 | | 2.59 ± 1.656 | | 3.04 ± 1.985 | |
| **Para** | Nulliparous | 30 | 24.00% | 44 | 35.20% | 74 | 29.60% |
| | 1 – 2 | 64 | 51.20% | 62 | 49.60% | 126 | 50.40% |
| | 3 – 4 | 22 | 17.60% | 15 | 12.00% | 37 | 14.80% |
| | ≥5 | 9 | 7.20% | 4 | 3.20% | 13 | 5.20% |
| | Mean ± SD | 1.83 ± 1.726 | | 1.32 ± 1.423 | | 1.58 ± 1.600 | |
| **Abortion** | Yes | 47 | 37.60% | 22 | 17.60% | 69 | 27.60% |
| | No | 78 | 62.40% | 103 | 82.40% | 181 | 72.40% |
| **Mode of delivery** | NVD | 28 | 22.4% | 64 | 51.2% | 92 | 36.8% |
| | C/S | 97 | 77.6% | 61 | 48.8% | 158 | 63.2% |
| **History of (TORCH) infection** | Yes | 6 | 4.80% | 0 | 0.00% | 6 | 2.40% |
| | No | 119 | 95.20% | 125 | 100.00% | 244 | 97.60% |
| **Family history of chronic disease (HP-DM)** | Yes | 76 | 60.8% | 69 | 55.2% | 145 | 58.00% |
| | No | 49 | 39.2% | 56 | 44.8% | 105 | 42.00% |
| **History of gynecological disease** | PCOS | 36 | 28.8% | 17 | 13.6% | 53 | 21.20% |
| | Endometriosis | 0 | 0.0% | 1 | 0.8% | 1 | 0.40% |
| | No | 89 | 71.2% | 107 | 85.6% | 196 | 78.40% |
| **Antenatal care** | Yes | 74 | 59.20% | 79 | 63.20% | 153 | 61.20% |
| | No | 51 | 40.80% | 46 | 36.80% | 97 | 38.80% |

| BMI | Underweight | 1 | 0.80% | 2 | 1.60% | 3 | 1.20% |
|-----|-------------|---|-------|---|-------|---|--------|
| | Healthy Weight | 41 | 32.80% | 55 | 44.00% | 96 | 38.40% |
| | Overweight | 39 | 31.20% | 45 | 36.00% | 84 | 33.60% |
| | Obese | 44 | 35.20% | 23 | 18.40% | 67 | 26.80% |

NVD: normal vaginal delivery, C/S: caesarean section, TORCH: toxoplasmosis, others (syphilis, hepatitis B), rubella, cytomegalovirus (CMV), and herpes simplex, BMI: body mass index, HP: hypertensive, DM: diabetes mellitus, PCOS: poly cystic ovarian syndrome, BMI: body mass index.

**Table (3) Association between high-risk pregnancies and births weight.**

| Items | | High risk pregnancy (case group) | | | P-Value | Sig. | CI 99% |
|---|---|---|---|---|---|---|---|
| | | Low birth weight | Normal birth weight | High birth weight | | | |
| Chronic hypertension | Yes | 1 | 2 | 2 | 0.030 ⊥ | S | [0.028-0.037] |
| | No | 19 | 93 | 8 | | | |
| Gestational hypertension | Yes | 5 | 24 | 3 | 0.946 $\chi^2$ | NS | [1.00-1.00] |
| | No | 15 | 71 | 7 | | | |
| Eclampsia | Yes | 0 | 2 | 0 | 1.000 ⊥ | NS | [1.0-1.0] |
| | No | 20 | 93 | 10 | | | |
| Pre-eclampsia | Yes | 4 | 2 | 0 | 0.013 ⊥ | S | [0.012-0.018] |
| | No | 16 | 93 | 10 | | | |
| Placenta previa | Yes | 1 | 1 | 0 | 0.424 ⊥ | NS | [0.414-0.44] |
| | No | 19 | 94 | 10 | | | |
| Placenta abruption | Yes | 0 | 1 | 0 | 1.000 ⊥ | NS | [1.0-1.0] |
| | No | 20 | 94 | 10 | | | |
| Gestational Diabetes | Yes | 4 | 7 | 6 | <0.001 ⊥ | HS | [0.00-0.001] |
| | No | 16 | 88 | 4 | | | |
| Hypothyroidism | Yes | 1 | 11 | 2 | 0.469 ⊥ | NS | [0.457-0.483] |
| | No | 19 | 84 | 8 | | | |

| Items | | High risk pregnancy (case group) | | | | | |
| | | Low birth weight | Normal birth weight | High birth weight | P-Value | Sig. | CI 99% |
|---|---|---|---|---|---|---|---|
| Hyperthyroidism | Yes | 1 | 5 | 0 | 1.000 ⊥ | NS | [1.0-1.0] |
| | No | 19 | 90 | 10 | | | |
| Anemia | Yes | 8 | 60 | 3 | 0.033 $\chi^2$ | S | [0.03-0.04] |
| | No | 12 | 35 | 7 | | | |
| Placenta accrete | Yes | 2 | 0 | 0 | 0.028 ⊥ | S | [0.027-0.036] |
| | No | 18 | 95 | 10 | | | |
| APS (antiphospholipid syndrome) | Yes | 8 | 25 | 5 | 0.179 $\chi^2$ | NS | [0.171-0.191] |
| | No | 12 | 70 | 5 | | | |

Low birth: weight < 2.5 kg, Normal birth: weight 2.5-3.999 kg, High birth: weight ≥ 4 kg,

⊥: Fisher Freeman-Halton Exact Test, $\chi^2$: Chi Square test, CI: confidence interval 99%

**Table (4) Comparative between weight of neonates born to women who had High risk pregnancies with those who born to women who had normal pregnancies.**

| Birth Weight | High risk pregnancy (case group) | Normal pregnancy (control group) | Total | P value(sig.) CI 99% |
|---|---|---|---|---|
| Low birth weight | 20 (8.0%) | 2 (0.8%) | 22 (8.8%) | <0.001 (HS) |
| Normal birth weight | 95 (38.0%) | 119 (47.6%) | 214 (85.6%) | |
| High birth weight | 10 (4.0%) | 4 (1.6%) | 14 (5.6%) | [0.0-<0.001] |
| Total | 125 (50.0%) | 125 (50.0%) | 250 (100.0%) | |
| Chi Square test=19.99, d.f.=2 | | | | |