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The risk of low birth weight in pregnants with hypertension: A case-control study

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***Abstract*---**A singleton live-born baby who weighs less than 2500 gram at birth is considered to have a low birth weight. In this research we aimed to determine whether or not there is an association between hypertension induced by pregnancy and low birth weight. We conducted a retrospective case-control study in the 1st Clinic of the Samarkand State Medical University. Pregnancy-induced hypertension was defined as blood pressure of >140/90 mm Hg. all analyses were carried out using R-studio version 3.6.2. A total of 300 participants were interviewed, of whom 150 were cases and 150 were controls. The majority of responders were between the ages of 21 and 32 (79.3%). The mean age of controls was greater (25.2±6.1 years) than that of cases (24.1 ±5.3 years). Women who gave birth to newborn with a low birth weight were 4.10 times more likely to have experienced pregnancy-induced hypertension (adj. OR = 4.10; 95% CI = 1.94-8.66, p<0.001). Women with previous history low birth weight newborn were more likely to deliver neonate with low birth weight (adj. OR = 2.40; 95% CI = 1.13-5.11, p<0.001).

***Keywords*---**Hypertension, Pregnancy, Low birth weight, Risk factors, Case-control.

1 Introduction

A singleton live-born baby who weighs less than 2500 g at birth is considered to have a low birth weight. This definition applies regardless of the gestational age of

the child. According to statistics provided by the World Health Organization (WHO), 25 million infants are born each year with a low birth weight, which accounts for 17% of all live births (Blanc et al., 2005). Almost 95% of them take place in third-world nations. Over 20 million babies are born each year with a birth weight that is considered to be too low for their age (Lake & Olana Fite, 2019). The majority of these births take place in Asia and Africa (He et al., 2018). Since birth weight is the single most critical determinant in predicting neonatal and infant survival, it is crucial that research be conducted on the risk factors that contribute to this condition.

The findings of studies that looked at pregnancy-induced hypertension as a potential predictor of a baby having a low birth weight were mixed. Researchers have investigated the impact that various forms of pregnancy-related hypertension have on the development of the fetus (Mateus et al., 2019). Even after taking into account potential confounding factors and effect modifiers, the researchers discovered that preeclampsia and severe preeclampsia both increased the likelihood of having a baby with a low birth weight (Agraval 2019). However, a lack of a correlation between gestational hypertension and low birth weight was shown in a number of additional research (Golestan et al., 2014; He et al., 2018; Shen et al., 2019). Preeclampsia and eclampsia were shown to be linked with low birth weight in a hospital-based case control research that was carried out in China in 2017. The study was completed in 2017. This research also came to the conclusion that a mother's advanced age may contribute to her child being born with a low birth weight (Li et al., 2018).

The contradictory results on the role of pregnancy-induced hypertension as a predictor of low birth weight may be explained by discrepancies in the characteristics of research populations, the classification of hypertension, and the definition of the outcome that was utilized. Several types of high blood pressure that may occur during pregnancy have been grouped together in a few research studies (chronic hypertension, gestational hypertension, preeclampsia, and eclampsia) (Kibret et al., 2019). In other studies, each of these classes was investigated on its own. These discrepancies may potentially be explained by the adoption of a different definition of the result (Li et al., 2018). In several research, mean birth weight or gestational age has been used instead of birth weight since birth weight is affected by the length of gestation as well as the pace of development (intrauterine growth restriction). Some researchers have utilized preterm birth or intrauterine growth retardation as a metric of the study's results (Zygula et al., 2020). In this research we aimed to determine whether or not there is an association between hypertension induced by pregnancy and low birth weight.

2 Materials and Methods

Data collection

We conducted a retrospective case-control study in the 1st Clinic of the Samarkand State Medical University. From the clinic's delivery records, information on all women who had given birth between June 2016 and May 2019 was obtained. Only women who had received prenatal treatment throughout the

first to the third trimesters of pregnancy were included. Low birth weight was defined as a singleton newborn born alive weighing less than 2500 grams, regardless of gestational age. All mothers who gave birth to a singleton with a low birth weight were included as cases. Controls were chosen using a simple random selection from a list of mothers who had infants of normal weight during the same period and who fulfilled the inclusion and exclusion criteria. Other outcome factors were the history of congenital abnormalities in newborns, parity, and the diagnosis of essential hypertension. Women with additional medical conditions, such as renal illness, cardiovascular disease, and gestational diabetes, were excluded.

The doctors established the diagnosis of pregnancy-induced hypertension during prenatal care. Pregnancy-induced hypertension was defined as blood pressure of >140/90 mm Hg or an increase in systolic blood pressure of 30 mm Hg and a rise in diastolic blood pressure of 15 mm Hg on more than two occasions after the 20th week of pregnancy. Potential confounding factors were maternal age, ethnicity, education, marital status, maternal weight, parity, history of anaemia, prior history of low birth weight, previous history of abortion, and weight increase during pregnancy. To eliminate selection bias, we analyzed medical records to confirm the reproductive history of patients.

Statistical analyses

Prior to beginning the investigation, an estimate of the sample size and all analyses were carried out using R-studio version 3.6.2. A preliminary investigation into categorical data was carried out with the use of the chi-square test and fundamental logistic regression. Taking into consideration pregnancy-induced hypertension as an exposure factor (power of 80%, frequency of exposure of 15%), it was necessary to have a minimum sample size of 73 for each group. The interaction was analyzed before the confounding was performed. On the basis of the univariate analysis and essential biological factors, a multivariate analysis was conducted.

3 Results and Discussions

During the research period, a total of 300 participants were interviewed, of whom 150 were cases and 150 were controls. The distribution of cases and controls by their sociodemographic features is shown in Table 1. Respondents varied in age from 18 to 45 years of age. The majority of responders were between the ages of 21 and 32 (79.3%). The mean age of controls was greater (25.2±6.1 years) than that of cases (24.1 ±5.3 years). However, this difference was not statistically significant (p=0.31). All cases and controls were married (100%).

Table 1. Sociodemographic characteristics of study population

Variables	Cases n (%)	Control n (%)	P value
Total number	150 (100%)	150 (100%)	-
Maternal age			
<20 years	18 (3.5)	16 (1.3)	0.76
20-34 years	109 (79.5)	115 (80.8)	0.83

>35 years	23 (17.0)	19 (17.9)	0.71
Education			
No formal education	2 (1.3)	1 (0.7)	0.89
Primary	16 (10.7)	18 (15.0)	0.43
Secondary	122 (81.3)	119 (79.3)	0.67
Tertiary	10 (6.7)	12 (8.0)	0.69
Maternal occupation			
High skilled	14 (4.5)	14 (4.5)	0.92
Average skilled	28 (9.0)	17 (5.4)	0.39
Low skilled	117 (37.5)	108 (34.6)	0.41
Unemployed	150 (48.0)	161 (51.6)	0.52

In Table 2, the study population is broken down into two categories of hypertension: pregnancy-induced hypertension without proteinuria and pregnancy-induced hypertension with proteinuria. In this particular research, 16.7% of the pregnant women were given a diagnosis of pregnancy-induced hypertension. In the group of women who gave birth to infants with a low birth weight, 24.0% developed pregnancy-induced hypertension, whereas only 6.0% of women in the control group did. The observed change was statistically significant ($p<0.05$). Proteinuria occurred in 30.6% of the women who had pregnancy-induced hypertension, while none of the women in the control group had proteinuria. 86.1% of moms were diagnosed with pregnancy-induced hypertension later than 28 weeks into their pregnancies. This percentage represents the majority of diagnoses. When compared with the mean gestational age at first diagnosis of high blood pressure in controls (34.51±2.18 weeks), the mean gestational age at first diagnosis of high blood pressure in cases was 33.71±4.27 weeks, which was somewhat lower. According to the results of the bivariate analysis, when compared with the controls, women who gave birth to infants with a low birth weight had a 4.94 times increased risk of developing pregnancy-induced hypertension (OR=4.94; 95% CI=2.28-10.69; $p<0.001$). The other type of pregnancy-induced hypertension was not linked to a lower birth weight.

Table 2. Bivariate logistic regression model

Variables	Cases n (%)	Control n (%)	Unadj. OR, [95% CI]
Hypertension in pregnancy	36/150 (24.0)	9/150 (6.0)	4.94 [2.28-10.69]
No hypertension	114/150 (76.0)	141/150 (94.0)	Ref.

We investigated whether or if there was a relationship or interaction between age, weight growth, and the other relevant factors. However, there was no evidence of a significant interaction found. The use of multivariate logistic regression was used in order to investigate the possible connection between pregnancy-induced hypertension and low birth weight. It was revealed that women who gave birth to newborn with a low birth weight were 4.10 times more likely to have experienced pregnancy-induced hypertension (adj. OR = 4.10; 95% CI = 1.94-8.66, $p<0.001$) than women who did not deliver babies with a low birth weight. Women with

previous history low birth weight newborn were more likely to deliver neonate with low birth weight (adj. OR = 2.40; 95% CI = 1.13-5.11, p<0.001) (Table 3).

Table 3. The results of multivariate logistic

Variables	Adjusted odds ratio (adj. OR)	95% Cl
Pregnancy-induced hypertension		
Yes	4.10	1.94-8.66
No	Ref.	
Maternal weight gain (gestational), kg		
<10	3.11	1.46-6.59
10-12	Ref.	
>12	0.74	0.41-1.31
Gestational age (weeks)		
<37	9.33	3.82-22.75
>37	Ref.	
Previous low birth weight delivery		
Yes	2.40	1.13-5.11
No	Ref.	
Maternal age (years)		
<20	1.18	0.57-2.44
20-34	Ref.	
>35	0.78	0.40-1.51
Maternal education ()		
No formal education	Ref.	1.00
Primary	0.44	0.03-5.38
Secondary	0.51	0.04-5.73
Tertiary	0.41	0.03-5.29
Parity		
1	0.68	0.40-1.17
2-3	Ref.	
>3	2.01	1.02-3.99

Hypertension encompasses a wide range of conditions, including preeclampsia, eclampsia, prenatal hypertension, and persistent high blood pressure. After 20 weeks of gestation, pregnant women may develop pregnancy-induced hypertension, which is a complication that affects 5–10% of all pregnancies (Gudeta & Regassa, 2019).

The factors that lead to low birth weight in a cohort might vary greatly from one instance to the next. Whereas premature birth is the primary cause of low birth weight in developed populations, intrauterine growth retardation is the primary cause of low birth weight in developing populations. Premature birth is the primary cause of low birth weight in developed populations. The findings of this research may thus be extrapolated to apply to rural areas and people in underdeveloped countries.

After taking into account a number of potential confounding factors including gestational age, maternal age, ethnicity, education level, number of children, and a history of low birth weight in a previous pregnancy the researchers of this study came to the conclusion that there was a connection between pregnancy-induced hypertension and low birth weight. The results of this study are consistent with the findings of investigations conducted by other researchers (Asmare et al., 2018; Girma et al., 2019). Women who had severe pregnancy-induced hypertension without proteinuria had a higher rate of low birth weight, according to the findings of a multicenter trial that investigated the role of aspirin in the prevention of eclampsia (Lin et al., 2022). Normotensive mothers and those with mild hypertension had the lowest risk of having a baby with a low birth weight. According to the findings of another research, preeclampsia and gestational hypertension are significantly associated with having infants who are big for their gestational ages (babies weighing more than 4 kg). According to the findings of a research that was carried out by Salmi et al. (2019), there is a correlation between a little elevation in blood pressure and an increase in birth weight.

Some researchers believe that there is a connection between pregnancy-induced hypertension and low birth weight that may be explained by biological causes. During a pregnancy that is developing normally, the. This invasion serves the purpose of anchoring the placenta and connecting it to the circulatory system of the mother. It is hypothesized that the trophoblast invasion into the spiral arteries that feed the placenta is not complete in pregnant women who develop pregnancy-induced hypertension or preeclampsia (Morgan et al. 2019). This results in intrauterine growth retardation and a low birth weight due to the reduced uretro-placental blood perfusion that occurs as a result of the condition. This "hypoperfusion" hypothesis has received support from a significant number of investigations (Sulochana & Priya, 2021).

This case control research was unable to take into account the potential of other variables that may have confounded the results. However, significant confounding variables like as preterm that are related with pregnancy-induced hypertension and low birth weight were adjusted for in this study. Despite this, it is possible that additional confounding factors were not properly identified or controlled. When carrying out a retrospective case control research, recollection bias is a problem that should always be taken into consideration. We analyzed the medical records of the patients in our research to confirm critical exposure status characteristics such whether or not the patients had hypertension, their reproductive history, and whether or not they had had prenatal complications in the past. One of the merits of our research is that we were able to identify both cases and controls. In our research, the cases consisted of any mother who gave birth to a child with a low birth weight within the time period covered by the study. Controls were chosen at random from the same population as the participants, and were comprised of moms who had had infants of a typical weight. It was possible to eliminate selection bias since every prospective case and control participant gave their informed agreement to take part in the study, and there were no nonresponses. The data from the cases and the controls were collected using the same methodology, which helped eliminate any potential recollection bias.

During pregnancy, it may be challenging to maintain a healthy blood pressure and avoid developing pregnancy-induced hypertension. It is possible that the incidence of low birth weight may be reduced by providing women who are at high risk of experiencing pregnancy-induced hypertension with earlier identification as well as more extensive prenatal care.

4 Conclusion

In a nutshell, the findings of this research demonstrated that there is a connection between pregnancy-induced hypertension and a low birth weight. It was shown that women who gave birth to kids with a low birth weight were 4.1 times more likely to have experienced pregnancy-induced hypertension themselves. Instead than focusing only on low birth weight as an endpoint, future study should investigate the possibility of preterm or intrauterine growth retardation. It is important to investigate a variety of hypertension in pregnancy illnesses, including their component problems.

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