

COMPARISON OF RISK FACTORS FOR LOW BIRTH WEIGHT AMONG MOTHERS WITH NORMAL AND LOW BIRTH WEIGHT BABIES

VINODKUMAR MUGADA^{A,C-F}

• ORCID: 0000-0002-9364-9874

RAJ KIRAN KOLAKOTA^{A,C-E}

• ORCID: 0000-0001-9998-3059

ABHILASHA SAKALABATHULA^{B,E,F}

• ORCID: 0000-0001-9404-1636

BINDU PAVANI KOLA^{B,E,F}

• ORCID: 0000-0002-3432-4455

Department of Pharmacy Practice,
Vignan Institute of Pharmaceutical Technology,
Duvvada, AP, India

A – study design, **B** – data collection, **C** – statistical analysis, **D** – interpretation of data, **E** – manuscript preparation, **F** – literature review, **G** – sourcing of funding

ABSTRACT

Background: Low birth weight is an alarming problem in developing countries and has severe future complications.

Aim of the study: Our study aimed to compare the risk factors among mothers with low and normal birth weight babies.

Material and methods: A cross-sectional study was carried out on 1000 mothers with normal and low birth weight babies (500 per group) over two years. Maternal parameters including age, hemoglobin levels, gravida, maternal weight gain, height, pregnancy-induced hypertension, etc., were collected along with anthropometric data of the child. We compared risk factors among the low and normal birth weight babies using the chi-square test, determining statistical significance at $p < 0.05$, and high statistical significance at $p < 0.01$.

Results: Highly statistically significant associations were observed between low birth weight and seven variables: maternal age ($p = 0.0074$), maternal height ($p < 0.0001$), weight ($p < 0.0001$), weight gain ($p < 0.0001$), hemoglobin ($p < 0.0001$), severe anemia ($p < 0.0001$), and pregnancy-induced hypertension ($p < 0.0001$).

Conclusions: Our study observed significant modifiable risk factors like weight gain, weight, hemoglobin, and anemia among mothers with low birth weight babies. If we focus on raising awareness surrounding these risk factors, there may be an improvement in the birth weight of babies in this population.

KEYWORDS: infant, low birth weight, hemoglobin, risk factors, anemia, India

BACKGROUND

Low birth weight (LBW) is the principal cause of fetal and postnatal deaths, and is one of the most pressing preventable public health problems prevalent in developing countries [1]. LBW babies are live babies who are weighing less than 2500 grams regardless of their gestational age and measured before the occurrence of remarkable postnatal weight loss [2,3]. According to the latest World Health Organization (WHO) data published in 2017, low birth weight deaths in India reached 3.75% of total mortality, and ranked 17th in the world [4]. In 2015, 20.5 million newborns, an estimated 14.6% of all babies born globally that year, suffered from low birth weight [5]. These babies were more likely to die

during their first month of life, and those who survive face lifelong consequences including a higher risk of stunted growth, low IQ, and adult-onset chronic conditions such as obesity and diabetes [5]. Death among low birth weight neonates is 20 times higher than normal birth weight infants [6,7]. In our region of study, the majority of patients are from rural areas, and are mostly unaware of the factors contributing to low birth weight. Therefore, we aimed to assess the risk factors causing low birth weight among low and normal birth weight babies. The result may assist in the planning of effective management strategies, and may contribute to reducing the prevalence of low birth weight to some extent.

AIM OF THE STUDY

Our study aimed to compare the risk factors among mothers with low and normal birth weight babies.

MATERIAL AND METHODS

Study design

A comparative observational study was carried out among mothers with normal and low birth weight babies.

Study duration and study site

The study duration was two years (October 2017 to October 2019), and was carried out in a maternity in-patient ward, Department of Obstetrics and Gynecology.

Study participants

Mothers with normal and low birth weight babies were included. Mothers who got abortion, with insufficient data in the case sheet were excluded from the study. Written informed consent was obtained from all participants.

Sampling technique and sample size

Simple random sampling technique was employed to select the subjects. The sample size for each group was 500 (n=1000).

Data collection

Maternal parameters such as age, height, weight, weight gain, gravidity, level of hemoglobin, presence or absence of hypertension, gestational diabetes mellitus, history of abortions, history of multiple pregnancies, information about urinary tract infection during pregnancy etc., were collected from obstetrics records. We interacted with mothers (if they were willing to cooperate for data collection) or with care takers for any other significant data. The babies were categorized into very low birth weight (<1500 g), low birth weight (<2500 g) and normal birth weight (>2500 g).

Data analysis

Frequency, mean, and standard deviation were calculated for quantitative data. Chi-square test was used to compare the association of risk factors for low birth weight among mothers with normal birth weight and mothers with low birth weight. Minitab (version 18.0) was used. A $p < 0.05$ was considered statistically significant, and a $p < 0.01$ was considered as highly statistically significant association.

RESULTS

Tab. 1 represents the proportion of risk factors among mothers with low vs. normal birth weight. The mean age of mothers with low birth weight was 18.76 ± 0.84 years. The proportion of mothers with

maternal age <20 years (53.4%), maternal height <145 cm (60.6%), weight <40 kg (12.8%), maternal weight gain <7 kg (23%), Hemoglobin <10 g/dL (94.4%), severe anemia <7 g/dl Hb (23.6%) and pregnancy-induced hypertension (16.6%) was higher than mothers with normal weight babies. Only 7.4% of mothers with low birth weight babies reported urinary tract infection.

Table 1. Distribution and comparison of risk factors among low and normal birth weight babies.

Name of the risk factor	Very LBW	LBW	Total	NBW	p-value	
Maternal Age	<20 years	59	208	267 (53.4%)	226 (45.2%)	0.0074
	>20 years	37	196	233 (46.6%)	274 (54.8%)	
Maternal Height	<145 cm	66	237	303 (60.6%)	90 (18%)	<0.0001
	>145 cm	30	167	197 (39.4%)	410 (82%)	
Maternal Weight	<40 kg	14	50	64 (12.8%)	5 (1%)	<0.0001
	>40 kg	82	354	436 (87.2%)	495 (99%)	
Weight Gain	<7 kg	59	60	119 (23%)	7 (1.4%)	<0.0001
	>7 kg	37	344	381 (76.2%)	493 (98.6%)	
Hemoglobin	<10 g	87	385	472 (94.4%)	89 (17.8%)	<0.0001
	>10 g	9	19	28 (5.6%)	411 (82.2%)	
Severe Anemia	<7 g	33	85	118 (23.6%)	67 (13.4%)	<0.0001
	>7 g	54	300	382 (76.4%)	433 (85.4%)	
PIH	Present	34	49	83 (16.6%)	15 (3%)	<0.0001
	Absent	62	355	417 (83.4%)	485 (97%)	
UTI		10	27	37 (7.4%)	-	-

LBW = Low Birth Weight; NBW = Normal Birth Weight; PIH = Pregnancy Induced Hypertension; UTI = Urinary Tract Infection; $p < 0.01$ is statistically highly significant.

DISCUSSION

Key results

We observed a highly statistically significant association ($p < 0.01$) between low birth weight of babies and maternal factors including age, height, weight, weight gain, hemoglobin, severe anemia, and pregnancy induced hypertension.

Interpretation

We observed that 53.4% of low birth weight babies are born to mothers aged less than 20 years; few studies reported similar findings [8,9]. Maternal age was highly statistically significantly associated with low birth weight ($p=0.007$); Ahankari et al. [10] also reported a similar association ($p=0.008$). However, Domple et al. [11] reported contrasting findings. The National Population Policy of India states that poor physical, mental, and emotional development of pregnant women less than 21 years old will result in low birth weight babies. In this regard, they suggested delayed marriages for girls younger than 21 years, and also to make contraception widely available to delay age at first pregnancy [12].

We observed a highly statistically significant association with low birth weight and maternal height

($p < 0.0001$). Dimple et al. [11], Kader et al. [13] reported statistically significant associations of low birth weight babies with maternal height. Women with short stature (height < 145 cm) are at risk of delivering low birth babies [13]. Maternal height could affect intrauterine growth, and any deficiency in stature could impose physical limitations on the fetus [14]. However, the cut-off point for the maternal height varies across populations and ethnicities, as identified by similar studies conducted in different regions and countries [15–17].

The mean weight of mothers with low birth weight was 36.8 ± 2.3 kg. We observed a highly statistically significant association with maternal weight. Agarwal et al. [9], Chhabra [18] also reported a statistically significant association. A low pre-pregnancy is a marker for minimal tissue nutrient reserves [19], and changes in maternal blood flow prevent the fetus from receiving an adequate supply of nutrients [20]. Lower volume expansion in malnourished underweight women decreases micronutrient status and may reduce fetal growth [21].

We observed a highly statistically significant association with maternal weight gain ($p < 0.0001$); some studies have reported similar results [11,16,22–24]. Intrauterine growth depends upon calorie intake and nutritional stores, mostly fat. Inadequate weight gain will affect this and contributes to low birth weight babies [25].

We observed a highly statistically significant association between low birth weight and hemoglobin ($p < 0.0001$), as well as severe anemia ($p < 0.001$); some studies reported statistically significant association between low birth weight and hemoglobin [2,11,22]. Anemia, especially if critical, could impair oxygen delivery to the fetus and thus interfere with healthy intrauterine growth or pregnancy duration [14]. Two major mechanisms by which anemia causes low birth weight are intrauterine growth restriction due to low oxygenation, and reduced size and surface of the placenta

[26,27]. The importance of iron, and thus hemoglobin, in the development of the fetus, is well established. Indian women are known to be iron deficient. Therefore, the Reproductive and Child Health Program included the provision of iron supplements to pregnant women [28].

We observed a statistically significant association between low birth weight and pregnancy-induced hypertension ($p < 0.0001$). Dimple et al. [11], Bhaskar et al. [29] reported significant association, while Sengupta et al. [30] reported no association. Adequate blood flow to fetus depends on both systolic and diastolic blood pressure [14], and decreased blood perfusion leads to intrauterine growth retardation and low birth weight [31]. We observed 7.4% of urinary tract infection cases among mothers. Infection causes fever, and the resulting changes in the level of cytokines due to mobilization of the maternal immune system [32], unregulated apoptosis, and transcription of heat shock proteins, may divert resources away from normal protein synthesis and development [33].

Limitations of the study

Data on urinary tract infection of mothers with normal birth weight babies cannot be obtained because of insufficient data.

CONCLUSIONS

Maternal weight gain, weight, hemoglobin levels, and anemia were the observed risk factors observed among our study subjects. Awareness surrounding these modifiable risk factors may help improve the birth weight of babies.

ETHICAL APPROVAL

The study was approved by the ethical committee (VIPT/IEC/49/2017).

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Correspondence address:

Vinodkumar Mugada
Department of Pharmacy Practice,
Vignan Institute of Pharmaceutical Technology
Duvvada, AP, India-530049
E-mail: viptpharmd@gmail.com

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