Original Article

Risk Factors for Low Birth Weight among Term Newborns in Babil Maternity and Children Teaching Hospital

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Abstract

Background: Great importance has been attributed to birthweight all over the world because it is considered one of the best predictors of perinatal survival and a good indicator of life quality. **Aims and Objectives:** The aim of this study was to determine the risk factors for low birth weight among term babies in Babil maternity and children teaching hospital. **Materials and Methods:** This was a cross-sectional study conducted in Babil maternity and children teaching hospital. The study was carried out in the neonatal care unit from March 1, 2020 to August 31, 2020. Seven hundred and fifty-four term singleton live births were included in the study. All the neonates were checked for birth weight, and their gestational age was determined from maternal last menstrual period and early (first trimester) ultrasound examination and New Ballard score. Neonates with normal birth weight were considered as gestationally full term (≥37 weeks) with birth weight 2500–4000 g. **Results:** Babies with normal birth weight represent 87.9% of the study sample (663 babies). The number of term neonates with low birth weight was 69/754, with 9.2% and large for gestational age represent 2.9% of the study sample (22 babies). Low birth weight of 2100–2400 g represents 6.3% of the study sample (47 babies). Low birth weight of 1500–2000 g represents 2.9% of the study sample (22) babies. Age of mother, residency, family income, maternal education, antenatal care, bad obstetrical history, illnesses during pregnancy, and parental consanguinity were considered to be risk factors for low birth weight at *P* values of 0.05, <0.001, <0.001, <0.001, <0.001, <0.001, 0.001, 0.002, and <0.001, respectively. However, gender of the baby, parity, and paternal age were not considered to be risk factors. **Conclusion:** The problem of low birth weight among term babies is still common in our country. There was a higher incidence of low birth weight among term neonates in the rural areas and in mothers with low education level and those who live in families with low income. The most common associated risk factors associated with low birth weight were young age mothers, positive parental consanguinity, bad obstetrical history, and illnesses during pregnancy (e.g., hypertension, diabetes mellitus, and urinary tract infection).

Keywords: Low birth weight, risk factors, term newborns

Introduction

Definition of birth weight

The birth weight of an infant is the first weight recorded after birth, ideally measured within the first hours after birth, before significant postnatal weight loss has occurred.[1]

The size at birth reflects fetal growth and health as well as provides important information on the newborn infant.[2] Neonatal birth weight has been an important indicator of common concern in obstetrics and neonatology. This factor is critical for the study of adverse pregnancy outcomes and the prediction of neonatal mortality and morbidity.[3]

A birth weight between 5 pounds, 8 ounces (2500 g) and 8 pounds, and 13 ounces (4000 g) is considered normal for a full-term newborn. Babies who are smaller than this may be referred to as low birth weight or small for gestational age, and babies who are larger than this are considered to be large for gestational age.[4]

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It is important to note that in some cases, low birth weight may be appropriate. For example, a baby born at 30 weeks gestation would "normally" weigh less than 5 pounds, 8 ounces.[5]

Classification of birth weight

According to gestational age

- Small for gestational age (SGA): Birth weight less than the 10th percentile for a child born at that gestational age
- Appropriate for gestational age (AGA): Birth weight from the 10th percentile to the 90th percentile relative to other babies born at that gestational age
- Large for gestational age (LGA): Birth weight greater than the 90th percentile based on gestational age (also called fetal macrosomia)

According to weight

- Extremely low birth weight (ELBW): Birth weight less than 2.2 pounds (1000 g)
- Very low birth weight (VLBW): Birth weight less than 3.3 pounds (1500 g)
- Low birth weight (LBW): Birth weight less than 5.5 pounds (2500 g)
- Normal birth weight: Between 5 pounds, 8 ounces (2,500 g) and 8 pounds, 13 ounces (4000 g)
- High birth weight (HBW): Birth weight of more than 8 pounds, 13 ounces. (4000 g).

These classifications are useful because they often correspond to methods in which clinical care and treatment are provided.[6]

Epidemiology

Great importance has been attributed to birthweight all over the world because it is considered one of the best predictors of perinatal survival and a good indicator of life quality. In developing countries, the high rate of babies born with this characteristic highlights its importance.[7]

There is considerable variation in the prevalence of LBW across regions and within countries; however, the great majority of LBW births occur in low- and middle-income countries and especially in the most vulnerable populations.[8] Nevertheless, LBW is a global concern, as some high-income countries are also faced with high rates for their contexts (e.g. Spain, the UK, and Northern Ireland [UK], and the USA).[9] The average birth weight in babies of European heritage is 3.5 kg, though the range of normal is between 2.5 and 4.5 kg. Babies of south Asian and Chinese heritage weigh about 240 g less. The mean or average birth weight in the USA is 7 pounds, 8 ounces (3,402 g).[10]

Causes of low birth weight

LBW is either caused by preterm birth (i.e., a low gestational age at birth, commonly defined as younger than 37 weeks of gestation) or the infant being SGA (i.e., a slow prenatal growth rate), or a combination of both.[11] In general, risk factors in the mother that may contribute to LBW include:

1. Young age
2. Multiple pregnancies
3. previous low birth weight baby
4. preterm labor
5. poor nutrition
6. heart disease
7. hypertension
8. untreated celiac disease
9. drug addiction
10. alcohol abuse
11. insufficient prenatal care[12-14]
13. Stressful events have been demonstrated to produce significant effects on birth weight. Those mothers who have stressful events during pregnancy, especially during the first and second trimester, are at higher risk to deliver low-birth-weight babies.[15,16]

Causes of intrauterine growth restriction

The ability to reach an optimal birth weight results from the interaction between the fetal growth potential and the environment. The fetus requires several substrates for normal growth, the most important being oxygen, glucose, and amino acids. Any persistent decrease in the availability of any of these substrates will limit the ability of the fetus to reach its growth potential. The availability of substrates necessary for fetal growth may be limited by pathological conditions affecting the mother, the placenta, and the fetus.[17]

Materials and Methods

Study design and settings

This was a cross-sectional study conducted in Babil maternity and children teaching hospital, which serves both urban and rural areas.

The study was carried out in the neonatal care unit from March 1, 2020 to August 31, 2020.

Seven hundred and fifty-four term singleton live births were included in the study. All the neonates were checked for birth weight, and their gestational age was determined from maternal last menstrual period and early (first trimester) ultrasound examination and New Ballard score. Regarding ethical considerations, official agreement was obtained from the Research Ethical Committee, and Babil maternity and children teaching hospital directorate. Before collecting the information, the purpose of the study was explained to the parents and/or caregivers, privacy was considered and the parents were given the right to participate, or not, in the study without any reward.

Inclusion criteria

All newborn babies were delivered at Babil aternity and children teaching hospital by c/s or by normal vaginal deliveries.

Exclusion criteria

Our study excluded preterm neonates, stillbirths, and multiple pregnancies (twins and triplets)

Questionnaire

A detailed questionnaire form was prepared and consisted of three tables. The first one was to collect data concerning the babies' **gender**, **maturity**: term (37–42 weeks) and post-term (more than 42 weeks), and **body weight**: (1–2 kg, 2–2.4 kg, 2.5–4 kg, >4 kg).

The second table was to collect information regarding the maternal age (15–20 years, 21–29 years, 30–40 years, more than 40 years), residency (urban and rural), educational level (illiterate, primary school, secondary school, higher education), obstetrical history (normal, previous history of LBW baby, abortion and early neonatal death), parity (primiparous and multiparous), illnesses during pregnancy (diabetes mellitus [DM], hypertension, and infections such as urinary tract infection [UTI] and toxoplasmosis), family income (low, enough, high), as well as parental consanguinity (related or not related).

Data analysis

Statistical analysis was carried out using SPSS version 23.0. Categorical variables were presented as frequencies and percentages. Continuous variables were presented as (mean ± standard deviation [SD]). Student's *t* test was used to compare means between two groups. Pearson's chi-square and Fisher exact tests were used to find the association between categorical variables. A value of $P \leq 0.05$ was considered significant.

Results

During the study period, from March 1, 2020 to August 31, 2020, the total number of examined newborns was 754. Among those, the number of male gender babies was 390 with 51.7%, and the number of female babies was 364 with 48.3%. The number of babies whose parents live in rural areas was 275 with 36.5% , and for babies whose parents live in urban areas was 479 with 63.5%. The number of babies with low family income was 122 with 16.2%, and for those with enough family income was 554 with 73.5% , and for those with high family income was 78 with 10.3%, as shown in Table 1.

Table 2 shows the distribution of newborn babies according to maternal characteristics including mother age, education, parity, smoking, antenatal care, past obstetrical history, and illness during pregnancy.

Figure 1 shows distribution of newborn babies according to paternal consanguinity including (positive and negative). History of paternal consanguinity was positive in (39.9%) of study sample which represent 301 newborn babies.

The distribution of newborn babies according to birth weight

Figure 2 shows distribution of newborn babies according to birth weight including (LBW (< 2500 g), normal birth weight (2500–4000 g) and LGA (> 4000 g)). LBW represent (9.2%) of study sample (69 babies), normal birth weight represent (87.9%) of study sample (663 babies) and LGA represent (2.9%) of study sample (22 babies).

Regarding maternal age, there were significant differences between means of age of mother according to birth weight as shown in Table 3. Paternal age was found to be not significant risk factor with **P-value** of(0.482).

Table 4 shows the association between birth weight including (LBW and normal birth weight) and

Table 1: Distribution of newborn babies according to sociodemographic characteristics ($n = 754$)

Sociodemographic characteristics	Number	%
Gender		
Male	390	51.7
Female	364	48.3
Total	754	100.0
Residence		
Urban	479	63.5
Rural	275	36.5
Total	754	100.0
Family income		
Low	122	16.2
Enough	554	73.5
High	78	10.3
Total	754	100.0

Table 2: Distribution of newborn babies according to maternal characteristics (n = 754)

Maternal characteristics		
Mother age (years)	(25.14 ± 6.40)	(15–43)
Educational level		
Illiterate	7	0.9%
Primary	164	21.8%
Secondary	213	28.2%
Higher education	370	49.1%
Total	754	100.0%
Parity		
Primigravida	249	33.0%
Multipara	505	67.0%
Total	754	100.0%
Past obstetrical history		
Positive	171	22.7%
Negative	583	77.3%
Total	754	100.0%
Types of past obstetrical history		
Abortion	107	62.6%
Low birth weight	38	22.2%
Neonatal death	26	15.2%
Total	171	100.0%
Illness during pregnancy		
Positive	274	36.3%
Negative	480	63.7%
Total	754	100.0%
Types of illness during pregnancy		
Anemia	67	24.5%
Diabetes mellitus	31	11.3%
Hypertension	63	23.0%
UTI	113	41.2%
Total	274	100.0%

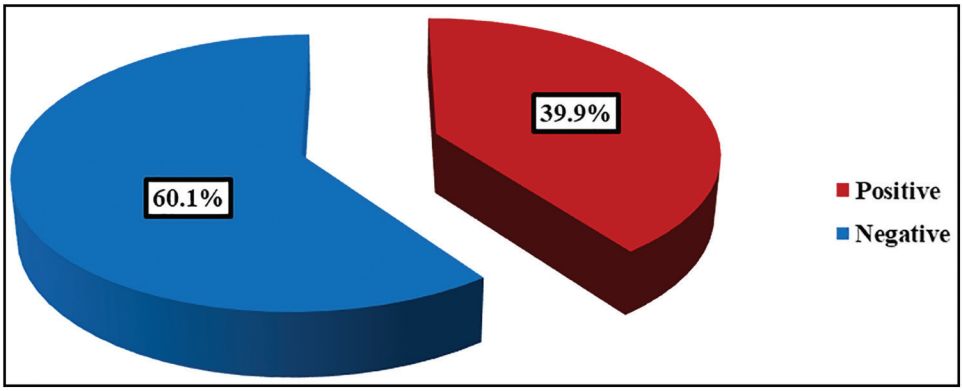

Figure 1: Distribution of newborn babies according to parental consanguinity

socio-demographic characteristics of newborn babies including (gender, residence and family income). There was significant association between birth weight and residence and family income with **P-value of** (<0.001). Gender of the baby was found to be not significant risk factor with **P-value of** (0.2).

Table 5 shows the association between birth weight including (LBW and normal birth weight) and study variables including (mother education, parity, antenatal care, past obstetrical history, illness during pregnancy, paternal consanguinity and mother and father smoking history). Maternal educational level, past obstetrical

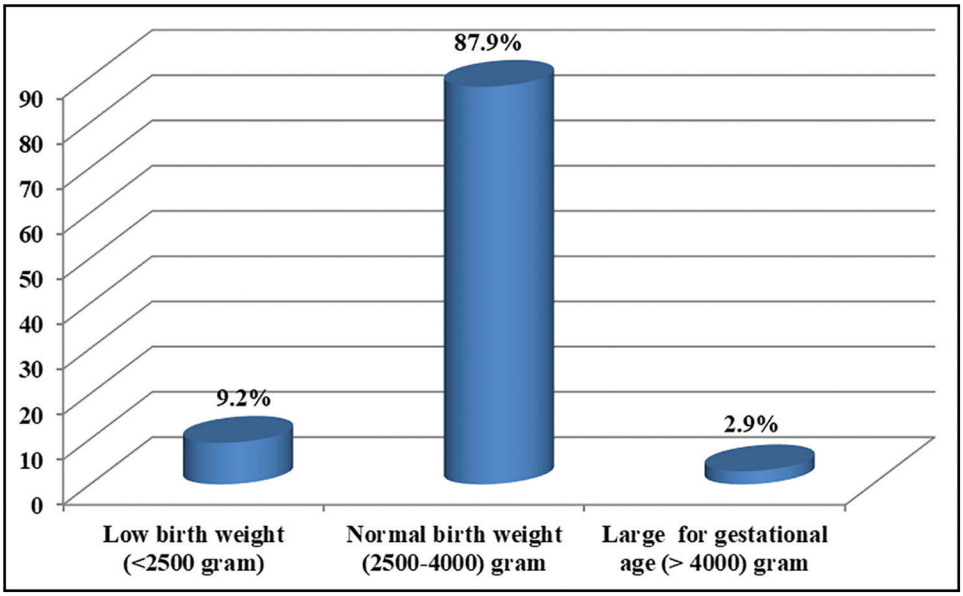

Figure 2: Distribution of newborn babies according to birth weight. *Mean birth weight of study sample was 2972.02 ± 478.90 g with range of 1500–4900 g

Table 3: Mean differences of study variables according to birth weight (n = 732)

Study variables	Birth weight	*N*	Mean	SD	*t* Test	*P* Value
Age of father (years)	Low birth weight (<2500 g)	69	29.64	6.48	–0.707	0.482
	Normal birth weight (2500–4000 g) g	663	30.21	5.86		
Age of mother (years)	Low birth weight (<2500 g)	69	23.41	7.23	**–1.989**	**0.05***
	Normal birth weight (2500–4000 g)	663	25.20	6.25		

*$P \leq 0.05$ was significant

history, illnesses during pregnancy, and parental consanguinity were found to be significant risk factors with ***P* values** of <0.001, <0.001, 0.001, and <0.001, respectively. Parity and father smoking were found to be not significant risk factors with ***P* values** of 0.406 and 0.988, respectively.

Discussion

Our study demonstrated that the percentage of LBW in term neonates was 9.2%, which can be categorized as moderate according to country-specific rates of IUGR-LBW (low [<5%], moderate [(5%–10%], high [10%–15%], and very high [>15%]).[18]

Our results were approximately similar to results done in other areas as Al-Hiali *et al.* showed 10.25%[19] and in Qatar 7.85%.[20]

Our study demonstrated that mothers who live in rural areas and those with low education are associated with a high risk of delivering LBW babies. This is supported by previous studies conducted in Latin America,[21] India,[22] and Karachi, Pakistan.[23] This might be because, when a women's educational level increases, she may be motivated to know health and risk factors, might have the interest to read and listen, watch any information sources, and make an informed decision about their health. Besides, women with some basic level of education can discuss more sensitive issues openly and had a better understanding of the complication associated with pregnancy. Other studies reported that birth weight is not statistically significant with the maternal level of education as in a study by Ubomba-Jaswa *et al.*[24]

In this study, low family income is associated with an increased risk of SGA babies; this risk factor was reported by Britto *et al.*,[25] which reported that mothers of lower family income almost twice times higher to give LBW babies which could be explained by poor maternal nutritional intake among mothers with lower socioeconomic status.[26]

Parity of the mothers was found to be not a risk factor in our study, unlike other studies as in a study by Garces *et al.*,[27] which show a significant association between the parity of women and incidence of SGA babies, as the infants of nulliparous women have lower body weight than women with one or more previous pregnancies.

Table 4: Association between birth weight and sociodemographic characteristics of newborn babies ($n = 732$)

Sociodemographic characteristics	Birth weight		Total	X^2	*P* Value
	Low birth weight (<2500 g)	Normal birth weight (2500–4000 g)			
Gender				**1.374**	**0.241**
Male	31 (44.9)	347 (52.3)	378 (51.6)		
Female	38 (55.1)	316 (47.7)	354 (48.4)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Residence				**17.30**	**<0.001***
Urban	28 (40.6)	437 (65.9)	465 (63.5)		
Rural	41 (59.4)	226 (34.1)	267 (36.5)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Family income				**31.27**	**<0.001***
Low	27 (39.2)	94 (14.2)	121 (16.5)		
Enough	41 (59.4)	495 (74.7)	536 (73.2)		
High	1 (1.4)	74 (11.1)	75 (10.3)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		

*$P \leq 0.05$ was significant

Table 5: Association between birth weight and study variables ($n = 732$)

Study variables	Birth weight		Total	X^2	*P* Value
	Low birth weight (<2500 g)	Normal birth weight (2500–4000 g)			
Mother educational level				**27.80**	**<0.001***
Illiterate	1 (1.4)	6 (0.9)	7 (1.0)		
Primary	26 (37.8)	135 (20.4)	161 (22.0)		
Secondary	29 (42.0)	178 (26.8)	207 (28.2)		
Higher education	13 (18.8)	344 (51.9)	357 (48.8)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Parity					
Primiparus	26 (37.7)	217 (32.7)	243 (33.2)		
Multipara	43 (62.3)	446 (67.3)	489 (66.8)	0.691	0.406
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Past obstetrical history				**13.65**	**<0.001***
Positive	28 (40.6)	139 (21.0)	167 (22.8)		
Negative	41 (59.4)	524 (79.0)	565 (77.2)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Illness during pregnancy				**11.27**	**0.001***
Positive	37 (53.6)	221 (33.3)	258 (35.2)		
Negative	32 (46.4)	442 (66.7)	474 (64.8)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		
Parerntal consanguinity				**19.65**	**<0.001***
Positive	45 (65.2)	250 (37.7)	295 (40.3)		
Negative	24 (34.8)	413 (62.3)	437 (59.7)		
Total	69 (100.0)	663 (100.0)	732 (100.0)		

f = Fisher exact test

*$P \leq 0.05$ was significant

In this study, a significant relation was found between the age of mothers and LBW offspring; teenage mothers (less than 20 years old) were associated with an increased risk of delivering a baby with LBW and this is consistent to Lee[28] and Ferguson *et al*.[29] The association with young age may be related to women taking 2-year post-menarche or longer to reach their adult stature and pelvic dimensions. Also, adolescent mothers may have an even larger nutritional burden; a study in rural Nepal observed lighter newborns and a larger loss of mid-upper arm circumference in pregnancy among adolescent mothers than their older counterparts.[30]

There was no significant difference was observed in this study between men and women. The female newborns with LBW were more than male newborns (31 [44.9%] male neonates and 38 [55.1%] female neonates). This was

consistent with other studies which show an increased incidence of IUGR in female babies as in the studies by Melamed *et al.*[31] and Albar *et al.*.[32] Quinones *et al.*[33] report that male fetuses with IUGR have similar outcomes when compared with female IUGR fetuses, and gender does not play a role in the perinatal outcome in the setting of fetal growth restriction.

Bad obstetrical history (such as previous abortion, previous early neonatal death, previous LBW baby) was found to be a risk factor in our study. This was confirmed in a study by Rahul *et al.*.[34] Another study done by Ashwani *et al.*[35] showed that history of previous abortion and stillbirth were not to be found significant risk factors.

Our study demonstrated that maternal illnesses during pregnancy (gestational hypertension, gestational DM, UTI, and anemia) were found to be highly significant risk factors in this study. This was consistent with Ashwani *et al.*,[35] Rahul *et al.*,[34] and Tara *et al.*[36]

There was statistically significant risk factor in our study regarding parental consanguinity. Similar to other studies as in Fariyal *et al.*[23] and Kramer *et al*.[37] But in Ghina,[38] no significant difference was observed in the decrease in birth weight between the first- and second-cousin marriages.

In our study, no significant relation was found between paternal age and birth weight. This was consistent with Nahum *et al.*,[39] which showed that paternal age did not independently influence birth weight. Other studies found an association between advanced paternal age and increased risk of LBW as in Amina *et al*.[40] In the same study, infants who born to young adult and adolescent fathers had a heightened risk of low birth weight, preterm birth, and small size for gestational age.

This study provides baseline information from a tertiary hospital in this region, which could help with possible interventions regarding maternal and newborn health in the future. We could not take more information on certain risk factors like weight gain during pregnancy because of lack of available data from the records. Interpregnancy interval, drug consumption during pregnancy, and history of TORCH infection during pregnancy were other risk factors that were not included in our study.

Conclusion

This study showed a higher incidence of LBW among term neonates in the rural areas and in mothers with low education level low income. The most common associated risk factors associated with LBW in term babies were gestational hypertension, gestational diabetes, urinary tract infection, and anemia during pregnancy. Smoking during pregnancy was associated with a high risk of birth weight. Poor antenatal care was associated with a higher incidence of low birth weight. Adolescent mothers were significant risk factors for LBW in our study.

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Conflicts of interest

There are no conflicts of interest.

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