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Low Birth Weight among Deliveries, and Adolescent and Advanced Maternal Age Pregnancy

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ABSTRACT

Background: We did this study to evaluate the prevalence of low birth weight among deliveries, adolescent pregnancy and advanced maternal age pregnancy. We also assessed the factors affecting the low birth weight among institutional deliveries at the level of primary hospital.

Methods: A hospital-based retrospective cross-sectional study was done in Grahun Primary Hospital of Syangja, Nepal using data maintained in register book over last five years. We excluded all those deliveries with multiple pregnancy and incomplete records, and included 2473 participants in final analysis using convenient sampling. The relevant information was filled up in Microsoft Excel 2019 v16.0 and descriptive and inferential statistics was calculated using statistical package for social sciences, IBM SPSS® v21 (IBM, Armonk, New York).

Results: The prevalence of low birth weight at Grahun Primary Hospital was 11.08%. The prevalence of adolescent pregnancy and advanced maternal age pregnancy was 18.03% and 02.18% respectively. Male newborns had significantly higher mean birth weight as compared to the female newborns (3101.48 ± 506.60 v/s 2967.53 ± 484.97, P-value <0.001). Female newborns had higher odds of low birth weight as compared to those male newborns (11.99% v/s 8.29%, AOR=1.56, 95% CI= 1.17-2.07). Pregnant women with lower gestational age (<37 weeks or preterm) had a higher odds of low birth weight as compared to pregnant women with normal gestational age (37-42 weeks) (AOR = 11.59, 95% CI 8.49-15.83).

Conclusions: The low birth weight depends upon gestational age of mother and gender of newborn. Local organizations should work to bring down low birth weight, and adolescent pregnancy and advanced maternal age pregnancy of mother.

Keywords: Low birth weight; Nepal; primary hospital; teenage/adolescent pregnancy.

INTRODUCTION

Low birth weight (LBW) and prematurity are the important determinants of neonatal mortality.[1,2] As proposed by the Barker theory and Brenner hypothesis, the LBW contributes to the origin of chronic non-communicable diseases like systemic hypertension, diabetes mellitus, and chronic renal insufficiency in adult age.[3] Similarly, the adolescent/teenage or the advanced maternal age pregnancy possesses several adverse maternal and perinatal outcomes.[4,5]

Despite the importance of newborn weight and maternal age in determining the health status of newborns and mothers, there is a paucity of literature regarding the status of LBW among deliveries and adolescent and advanced maternal age pregnancy at the primary level hospital.

Therefore, we did this study to evaluate the prevalence of low birth weight among deliveries, teenage pregnancy, and advanced maternal age pregnancy. We also figured out the factors affecting the LBW among institutional deliveries at the level of the primary hospital.

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METHODS

We carried out a hospital-based retrospective cross-sectional study at the Grahun Primary Hospital. This hospital lies in Waling Municipality of Syangja district of Nepal. We prepared a semi-structured questionnaire to collect data about the pregnant women who underwent deliveries and their newborns from the hospital register book. Newborn characteristics included birth weight, gender, the status of birth, and immediate complications at birth. Pregnant women's characteristics included maternal age, gestational age, gravida, parity, and mode of delivery. Birth weight was measured using a weighing scale (DOCBEL-BRAUN, Docbel industries, New Delhi, India) to the nearest of 100 g. Complete sets of entries of all the mothers delivering between 13th April 2016 to 13th April 2021 were included in the study. We excluded all those deliveries with multiple pregnancies and incomplete records. Out of the 2495 deliveries, only 2473 entries fulfilling the inclusion criteria were taken into the final analysis.

Entered data of excel sheet (Microsoft Excel v16.0, WA, USA) was analyzed using Statistical Packages for Social Sciences (SPSS), IBM SPSS® v21 (IBM, Armonk, New York). Frequency, proportion, mean, median, and/or interquartile range were used to express descriptive statistics. We described the categorical data as frequency and proportions and continuous data as mean ± standard deviation (SD) or median and interquartile range, as applicable. Differences in participants' characteristics were analyzed using the chi-square test and unpaired t-test (two-tailed) as applicable. The binary logistic regression was used to identify the association of low birth weight with newborn and maternal characteristics. For univariable logistic regression analyses, odds ratios (OR) and 95% Confidence Interval (CI) were calculated. Multivariable logistic regression was used to determine independent newborn and maternal characteristics associated with low birth weight, and adjusted odds ratios (AOR) were calculated at a 95% Confidence Interval (CI). All variables with $P < 0.05$ were retained in the final multivariable model.

Ethical approval was taken from Nepal Health Research Council (Proposal ID: 194-2021 and Reference no. 2980) after submitting the approval letter from the hospital.

Adolescent (AP): It is the pregnancy under 20 years of age. [6]

Advanced age pregnancy (AAP): People who are pregnant at age 35 or older.[5]

Gestational age (GA): It is the weeks that elapsed between the first day of the last normal menstrual period (not presumed time of conception) and the date of delivery, irrespective of whether the gestation results in a live birth or a fetal death.[7]

Low Birth Weight (LBW): Low birth weight is defined as birth weight less than 2500 g.[8,9]

Macrosomia: Macrosomia means birth weight more than 4000 or 4500 g regardless of fetal gestational age.[10] We took 4500 g as cut-off.

Term pregnancy: Term pregnancy is defined as pregnancy from 37 weeks period of gestation to 42 weeks period of gestation.[11]

Birth asphyxia: It is defined by the World Health Organization (WHO) as "the failure to initiate and sustain breathing at birth".[12]

Neonatal seizure: It is defined as the occurrence of sudden, paroxysmal, abnormal alteration of electrographic activity at any point from birth to the end of the neonatal period.[13]

Neonatal jaundice: It is defined as clinically visible yellowish discoloration of skin and/or sclera due to raised unconjugated bilirubin in blood.[14]

Respiratory distress: Respiratory distress in the newborn is recognized as one or more signs of increased work of breathing such as tachypnea, nasal flaring, chest retractions, or grunting.[15]

RESULTS

In the present study, the mean birth weight was 3040.60 ± 501.25 grams. The prevalence of LBW and VLBW was 11.08% and 00.97 % respectively. Male newborns had significantly higher mean birth weight as compared to the female newborns (3101.48 ± 506.60 v/s 2967.53 ± 484.97, P-value <0.001). Majority of newborns (54.55%, 1349) were males. Out of total alive births (n=2436), there were no immediate complications detected within 24 hours in majority of the cases (98.64%, 2403), and fewer of them had birth asphyxia (00.74%, 18) followed by neonatal seizure and respiratory distress (00.29%, 7

and 00.21%, 5) **(Table 1).**

Table 1. Newborn characteristics (N=2473).

Characteristics	Frequency	Proportion (%)
1. Birth weight (g)		
Mean ± SD (Range) (g)	3040.60 ± 501.25 (500-4700)	
Low Birth Weight (<2500 g)	274	11.08
Average for gestational age	2191	88.60
Macrosomia (≥4500 g)	8	0.32
2. Low birth weight		
Very Low Birth Weight (<1500 g)	24	00.97
Extremely Low Birth Weight (<1000 g)	11	00.44
3. Birth weight by gender (P-value<0.001)		
Male (Mean ± SD) (Range) (g)	3101.48 ± 506.60 (500-4500)	
Female (Mean ± SD) (Range) (g)	2967.53 ± 484.97 (600-4700)	
4. Gender		
Male	1349	54.55
Female	1124	45.45
5. Birth status		
Alive	2436	98.50
Still Birth	37	01.50
6. Immediate Complications at Birth# (<24h)		
No Complications	2403	98.64
Birth Asphyxia	18	00.74
Neonatal jaundice	3	00.12
Neonatal seizure	7	00.29
Respiratory distress	5	00.21

#Out of live birth (n=2436)

The mean maternal age of pregnant women at the time delivery was 23.64 ± 4.40 years. The prevalence of adolescent/teenage pregnancy (AP/TP) and advanced maternal age pregnancy (AMAP) was 18.03% and 02.18% respectively. The mean gestational age was 38.23 ± 2.03 weeks. Similarly, the mean gravida and parity were 1.73 ± 0.78 and 0.67 ± 0.75 wees respectively. In terms of gestational age, prematurity (<37 weeks) and post term were noted in 9.62% and 0.97% respectively. Majority of them were primigravida (44.68%, 1105) followed by second-gravida (41.61%, 1029). The primary mode of delivery was vaginal (99.35%, 245) **(Table 2).**

Table 2. Pregnant women characteristics at delivery (N=2473).

Characteristics	Frequency	Proportion (%)
1. Maternal age (years)		
Mean ± SD (Range) (in years)	23.64 ± 4.40 (14-42)	
<20 years	446	18.03
20-34 years	1973	79.79
≥35 years	54	02.18
2. Gestational age (weeks)		
Mean ± SD (Range) (in weeks)	38.23 ± 2.03 (21-44)	
Preterm (<37 completed weeks)	238	09.62
Normal (37 completed to <42 weeks)	2211	89.41
Post term (≥42 weeks)	24	00.97
3. Gravida		
Mean ± SD (Range)	1.73 ± 0.78 (1-4)	
1 (Primigravida)	1105	44.68
2	1029	41.61
3	252	10.19
≥4	87	03.52
4. Parity		
Mean ± SD (Range)	0.67 ± 0.75 (0-3)	
Nullipara	1161	46.95
Primipara (1)	1028	41.57
Multipara (≥2)	284	11.48
5. Mode of delivery		
Vaginal Delivery	2457	99.35
Instrumental Delivery	16	00.65

In the multivariate analysis to assess the risk factors associated with low birth weight, female newborns had one and half times higher odds of low birth weight as compared to those male newborns (11.99% v/s 8.29%, AOR=1.56, 95% CI= 1.17-2.07, P-value= 0.02). The pregnant women with lower gestational age (<37 weeks or preterm) had more than eight times higher odds of LBW as compared to pregnant women with normal gestational age (37-42 weeks) (39.52% v/s 7.18%, AOR = 8.95, 95% CI 6.41-12.48) **(Table 3).**

Table 3.Risk factors associated with low birth weight. (n= 2436)[1]								
Variables	**Low Birth Weight**		**OR**	**95% CI**	**P-value**	**AOR[2]**	**95% CI**	**P-value**
	No (%)	**Yes (%)**						
Gender of newborn					**0.002**			
Male	1217 (91.71)	110 (8.29)	1 (Ref.)			1 (Ref.)		
Female	976 (88.01)	133 (11.99)	1.51	1.16-1.97	0.003	1.56	1.17-2.07	**0.002**
Maternal age (years)					**0.014**			
20 to 34	1769 (90.86)	178 (9.14)	1 (Ref.)			1 (Ref.)		
<20	375 (86.21)	60 (13.79)	1.59	1.16-2.18	0.004	0.95	0.66-1.36	0.778
≥35	49 (90.74)	5 (9.26)	1.01	0.40-2.58	0.977	1.16	0.41-3.28	0.780
Gestational age (in completed weeks)					**<0.001**			
37 to 42	2044 (92.82)	158 (7.18)	1 (Ref.)			1 (Ref.)		
<37	127 (60.48)	83 (39.52)	8.46	6.14-11.65	<0.001	8.95	6.41-12.48	**<0.001**
≥42	22 (91.67)	2 (8.33)	1.18	0.27-5.05	0.827	1.22	0.28-5.36	0.790
Gravida					**<0.001**			
Primigravida	929 (85.86)	153 (14.14)	1 (Ref.)			1 (Ref.)		
Multigravida	1264 (93.35)	90 (6.65)	0.43	0.33-0.57	<0.001	0.73	0.31-1.77	0.490
Parity					**<0.001**			
Nullipara	977 (85.93)	160 (14.07)	1 (Ref.)			1 (Ref.)		
Primipara	951 (93.51)	66 (6.49)	0.42	0.31-0.57	<0.001	0.57	0.24-1.40	0.221
Multipara	265 (93.97)	17 (6.03)	0.39	0.23-0.66	<0.001	0.46	0.17-1.25	0.127
Mode of delivery					0.251			
Vaginal	2180 (90.08)	240 (9.92)	1 (Ref.)			-		
Instrumental	13 (81.25)	3 (18.75)	2.10	0.59-7.41	0.209	-	-	-

[1]Among alive newborn only (excluding the still birth cases)
[2]Adjusted for gender of newborn, maternal age, gestational age, gravida, and parity

DISCUSSION

The prevalence of LBW and VLBW in the present study was 11.08% and 00.97 %, respectively. This is consistent with study by Asmare Talie et al. at Dangla Primary Hospital, Amhara Regional State, Northwest Ethiopia in, 2017, where the magnitude of LBW was 10.3%.[16] Similarly, in Nepal, the prevalence of LBW in the tertiary-level hospital is variable and ranges from 11 to 23%. In Koshi Zonal Hospital, the prevalence of low birth was 23.1%.[17] The prevalence of LBW at a tertiary level teaching hospital is 21.6%.[18] Similarly, the prevalence of LBW at other teaching hospitals, viz., Dhulikhel hospital and Patan Academy of Health Sciences, was 11.07% and 11.99% , respectively.[19,20] So, there seem to be comparable proportions of LBW at our primary level hospital in reference to studies from other tertiary and teaching level hospitals.

Adolescent pregnancy (AP) has been associated with obstetric and neonatal complications. The prevalence of AP in this study was 18.03%. This finding is similar to a study done in a community hospital in rural Nepal, where the prevalence of teenage pregnancy was 29.06%.[21] Similarly, the prevalence of advanced-

maternal-age (AMA) pregnancy was 2.18%. This is consistent with a study from the tertiary center, where the rate of advanced-aged pregnancy was 5.73%.[22] In the same way, a study was done in 29 countries (Africa, Asia, the Middle East, and Latin America) and revealed that the magnitude of pregnant women with advanced maternal age was 12.3%.[23]

In multivariate analysis, the female newborn had higher odds of LBW as compared to male newborns. The mean birth weight was higher in males than females which was statistically significant in our study. This fact is also evident from an analysis of National Demographic Health Survey 2011 which showed female infants had 1.5 times higher odds of being small than male infants. This is physiological and apparently due to androgen action more in males than females.[24,25]

In our study, maternal age did not have an influence on LBW. But in a study by Shanshan Wang et al. about changing trends of birth weight with maternal age, the risk of low birth weight decreased with the increase of maternal age until 36 years old, then increased when maternal age was older than 36 years old.[26]

LBW and prematurity (<37 weeks) are associated with an increased risk of morbidity and mortality. In this study, the prevalence of prematurity is 9.62%. This is comparable to multiple other studies from Nepal and beyond. The incidence of prematurity was 9.30% in a 14-month multi-centric observational study from Nepal.[27] A hospital-based study done in Ethiopia showed the prevalence of prematurity as 10.2%.[28]

Similarly, women with second-gravida and third-gravida had 57% and 70% less likely to had LBW (AOR = 0.43, 95% CI 0.31-0.60; AOR = 0.30, 95% CI 0.16-0.54) respectively as compared to women with first gravida. This finding is consistent with a study by Maru Mekie et al., which concluded that gravida ≤ 5 had lower risk of LBW baby.[26]

The limitation of the present study is its retrospective design. Due to this, we could not study anthropometric variables of pregnant women and other factors like socio-economic factors and number of antenatal visits responsible for LBW. We were unable to study obstetric complications of pregnant women.

CONCLUSIONS

The important predictors of LBW are the gestational age of the mother and the gender difference of the newborn. Governmental and non-governmental organizations working for child health and maternal health should focus on identified factors to tackle the prevalence of LBW and address teenage pregnancy.

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CONFLICT OF INTEREST

The authors report no conflict of interest.

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