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Original Research Article

A STUDY OF MATERNAL FACTORS INFLUENCING THE VERY LOW BIRTH WEIGHT BABIES

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ABSTRACT

Background: The study aimed to estimate the prevalence of very low birth weight (VLBW) among newborns delivered at the tertiary care teaching hospital and to investigate various maternal factors associated with very low birth weight.

Materials and Methods: This study enrolled 250 mothers who had babies weighing <1,500 gm as cases, and 250 mothers who had babies weighing >2500 gm as controls. Maternal factors associated with very low birth weight were analyzed.

Results: The prevalence of VLBW babies was 2.5%. The prevalence of VLBW was 58% among male babies. The prevalence of VLBW babies was high (55.6%) in mothers aged 20 to 25 years. Babies born to mothers from rural areas had a higher percentage of VLBW babies (82%) than those born to mothers from urban areas (18%). When compared to other groups, babies born to uneducated mothers had a higher prevalence of very low birth weight (37.2%). The prevalence of very low birth weight was high among babies of mothers from lower and lower-middle-class (68%) compared to others. The proportion of very low birth weight was higher among babies born to mothers with parity 4 or more (39.6%) compared to others, and this difference is statistically significant. The percentage of very low birth weight was low among babies born to mothers who took iron and folic acid tablets for 100 or more days compared to others, and this difference is of high statistical significance($P<0.0001$). The percentage of VLBW babies born to anemic mothers (Hb<11gm%) was higher compared to those with normal hemoglobin levels (Hb>11gm%) ($P<0.0001$). The prevalence of VLBW was found to be high (70.9%) among subjects with weight gain when compared to subjects who gained more than 9 kg during pregnancy, those who gained less than 9 kg gain($P<0.0001$). The proportion of VLBW babies born to mothers whose pre-pregnancy BMI was <18.5 (35.6%) was significantly higher in babies born to mothers with normal BMI ($P<0.05$). The proportion of VLBW among preterm babies was 62% compared to 38% among term babies ($P<0.0001$). The proportion of VLBW among babies born through caesarean delivery (65.6%) was higher compared to those delivered through normal delivery (30.4%) ($p>0.05$).

Conclusion: Mothers who had illiteracy & belongs to the lower socioeconomic class had a higher chance of delivering VLBW babies. Factors of mothers such as oligohydramnios increased parity, PIH, inadequate consumption of IFA tablets, anaemia during pregnancy, malnutrition, weight gain during pregnancy were found to be associated with VLBW. Most of these factors are modifiable and can be managed easily by providing adequate antenatal care.

Keywords: very low birth weight, caesarean delivery, newborns, maternal factors, rural areas.

INTRODUCTION

The World Health Organization defines Very low birth weight neonates are defined as having a birth weight of less than 1500g at birth, regardless of gestational age. Low birth weight (LBW) is defined as a birth weight of less than 2500 g.[1] Prematurity (Gestational age (GA) 37 weeks) is the leading cause of morbidity in neonates, particularly those with very low birth weight (VLBW). The prevalence of VLBW babies is less than 2% of all births worldwide. In India, VLBW babies account for 4% to 7% of live births and approximately 30% of neonatal deaths.[2,3] The rate of VLBW is a good predictor of infant mortality. India alone is responsible for 40% of low-birth-weight babies in developing countries and more than half of those in Asia. VLBW infants account for more than half of all neonatal deaths. The national incidence of LBW was 18.2%, according to the National Family Health Survey (NFHS)-4 (2015-2016).[4] The primary cause of increased morbidity and mortality in VLBW neonates is their physiologic and metabolic immaturity.[5]

The primary cause of increased morbidity and mortality in VLBW neonates is their physiologic and metabolic immaturity. During their neonatal period, these neonates are at an increased risk of hypoglycemia, jaundice, infection, and re-hospitalization. In developing countries, VLBW is one of the most serious problems in maternal and child health. Factors associated with neonatal health care are(I) socioeconomic factors such as marital status, education, occupation, age, antenatal care visits, parity, and gravidity. (ii) labor and delivery factors of mother and their association with neonatal mortality like place of delivery, delivery assistance, mode of delivery, duration in labor, delivery complications. (iii) new-born factors like sex of neonate, birth weight, Apgar score, gestational age, birth order, fetal presentation, birth spacing, birth asphyxia, neonatal infection.[6] Risk factors associated with neonatal deaths are: (a) maternal factors, (b) neonatal factors (c) delivery factors.

a) Maternal factors There are three types of maternal factors. - Maternal knowledge (mother's understanding of the risks and danger signs of pregnancy, childbirth, and newborn).
b) Neonatal factors: Gender, record of complications during delivery, APGAR score, mother's report of health problems after birth, early initiation of breastfeeding, and use of the kangaroo method of care are all neonatal factors.
c) Delivery factors: delivery factors consist of place of birth delivery (at home or in a healthcare facility), and assistance during delivery.

The main killers of neonatal deaths are preterm birth complications 16%; intrapartum-related events 11%; sepsis or meningitis 7%; pneumonia 3%; others 3%; injury 1%; congenital anomalies 5%; diarrhea 0.3%.[6,7]

The prevalence of the LBW varies greatly by region, socioeconomic status, and urban versus rural location. In India, the difference in the prevalence of low-birth-weight ranges from 10% in high socio-economic class to 56% in the poor slum community. The high prevalence of LBW has been recorded consistently in rural and urban slum populations.[8]

Maternal nutritional status at conception, low maternal weight gain during pregnancy due to inadequate dietary intake, and short stature in mother due to childhood malnutrition are major determinants of low birth weight. Maternal age is a significant predictor of newborn birth weight.

Other important factors influencing birth weight are the physical workload to the mother during pregnancy. The social conditions of the mother also have a significant impact on the birth weight of the baby. So, birth weight distribution and the proportion of babies born with low birth weight have been considered important indicators of socio-economic development.[9]

The study aimed to estimate the prevalence of VLBW among newborns delivered at the tertiary care teaching hospital and to investigate various maternal factors associated with very low birth weight.

MATERIALS AND METHODS

Study Design: Prospective Hospital-based observational case-control study.

Study area: Department of community medicine, Narayana Medical College, Nellore.

Sample size: The sample size is calculated using the formula, $n= 4pq/l^2$ at a 95% confidence interval with an absolute precision of ±5%

n = the minimum sample size required

p = prevalence of low birth weight (assumed) - 20%

According to National Family Health Survey (NFHS) – 4, national prevalence of LBW was 18.2% (2015-16). Hence, prevalence of was assumed to be 20%.

q =100 – p = 100 – 20 = 80%

l = Allowable Error (5%)

Thus, the sample size for the present study was determined as follows:

n = (4 X 20 X 80) / 5 x 5

= 6400 /25 = 256.

Non-response rate of 10% was added, making it 281.

Hence, a sample of 281 rounded off to 300 postnatal mothers was taken for the present study.

Sampling technique: Purposive sampling technique on consecutive cases.

Study Population

Inclusion Criteria

- All newborns born and admitted to the NICU with a bodyweight of less than 1500gms (very low birth weight), regardless of gestational age.
- Mothers of singleton pregnancies who did not have any congenital malformations.

Exclusion Criteria

- Stillbirths
- Multiple pregnancies
- Newborns with major congenital anomalies

Controls: On the day of study group selection, newborns weighing 2.5 kgs or more were chosen using a simple randomized technique, regardless of gestational age.

The factor in the mother which was taken into consideration was.

1. Age
2. Parity
3. Birth interval
4. Height of the mother
5. Weight of the mother
6. Literacy of the mother
7. Per capita income per month
8. Family structure
9. Mother's occupation
10. Antenatal care
11. Maternal disease during the antenatal period.

Anemia

- Pregnancy-induced Hypertension
- Antepartum hemorrhage
- Other Hypertensive disorders
- Heart disease complicating pregnancy/diabetes mellitus, oligohydramnios, UTI and chronic renal disease, viral hepatitis, uterine and cervix structural anomalies, Hydramnios, Malaria, Bronchial Asthma.

12. Bad obstetric history
13. Factor in the newborn were

- Weight of the newborn
- Assessment of gestational age of newborn
- Sex of the child.

Study Variables: The baby's birth weight was investigated about the following variables: maternal age, education and occupation of mothers, father's education and occupation, socioeconomic status, family type and type of locality, Mother's age at marriage and first delivery, parity, inter-pregnancy interval, antenatal care, intake of iron and folic acid tablets, physical activity during pregnancy, and diet intake and consumption of tobacco, obstetric complications during pregnancy, anaemia, bad obstetric history, woman's height, pre-pregnancy BMI and weight gain during pregnancy.

Details of Study Variables:

Maternal Age:

Education

a) Illiterate: An illiterate is a person who cannot read or write. This also includes those who could only sign or can reproduce some writing without any understanding.
b) Primary School
c) Middle School
d) High School
e) Intermediate.
f) Graduate or Post-Graduate.
g) Professional or Honors: All Ph.D. scholars, Doctors, Engineers, and Judges.

Occupation: The occupation of a woman and her husband is classified into the following groups according to Modified Kuppuswamy classification:[10]

a) Unemployed/ House-wife
b) Unskilled: watchman, peon, domestic servant.
c) Semi-skilled: factory or workshop laborer, laboratory or library attendant, and car cleaner.
d) Skilled: driver, carpenter, mechanic, mason.
e) Clerical, Shop-owner, farmer
f) Semi-professional: high school teachers, lecturers, junior administrators, junior doctors, insurance inspectors, commission agents, musicians, research assistants
g) Professional: Doctors, engineers, architects, senior administrative officers, senior lecturers, college principals, lawyers, bank managers, and other professionals.

Category: Open Category (OC)/Backward Caste (BC)/Scheduled Caste (SC)/Scheduled Tribe (ST)

Type of Family: Nuclear family/ Joint family

Socio-economic status: The socioeconomic status scale developed by B.G. Prasad (1961) was used to categorize the socioeconomic status of the study subjects. Per capita income has been updated according to the All-India Wholesale Price Index (AIWPI) (Base 2001=100) for the year 2018. AIWPI for January 2018 is 288.[11,12]

Monthly per capita income limits for the modified B.G. Prasad's Classification have been calculated as follows:

New Value = Old Value x Multiplication factor

Multiplication Factor = 4.93 x 4.63 x AIWPI (Base 2001=100)/100

= 4.93 x 4.63 x 288 /100 = 65.7

Table 1: Modified B. G. Prasad's socioeconomic classification (2018)

Socio-economic Status	PCI as per 1961 B.G. Prasad's Classification in Rs/ Month	Per- capita monthly income (Rs/month) Revised for 2018
I - Upper Class	≥100	≥ 6574
II – Upper Middle	50 – 99	3287 – 6573
III – Middle	30 – 49	1972 – 3286
IV – Lower Middle	15 – 29	986 – 1971
V – Lower	< 15	<985

Age at Marriage & First Pregnancy: Mother's age at the time of marriage and the first delivery was recorded and rounded off to the nearest completed years.

Birth Interval: The time elapsed between the current delivery and the previous one. It is classified as follows: <1 year; 1-2 years; ≥3 year

Gravida: A total number of times the woman has conceived including the present pregnancy.

Parity
History of abortion
Registration of Pregnancy
Several Antenatal Visits: The total number of antenatal visits the women underwent throughout the pregnancy. They have been categorized into two groups: < 4 visits and ≥ 4 visits
Several days IFA tablets are taken: The total number of days of consumption of Iron & Folic Acid tablets has been recorded and has been grouped into two categories. < 100 days and ≥ 100 days
Several IFA tablets consumed: The total number of Iron and Folic Acid tablets consumed in the present pregnancy has been recorded and categorized as: Nil/ < 100 tablets/ 100-200 tablets/ >200 tablets
Tetanus toxoid doses received:
High-Risk Pregnancy:
High-risk pregnancy has been assigned to women who have one or more of the following conditions:
Teen pregnancy, Elderly primipara, Malpresentation, Pregnancy Induced Hypertension, Antepartum hemorrhage, Pre-Eclampsia, Anaemia, Polyhydramnios, Oligohydramnios, Previous cesarean delivery.
Weight gain in present pregnancy: The mother's pre-pregnancy weight and weight just before delivery have been recorded. The weight gain during pregnancy has been divided into three categories:
<9 Kg/ 9-11 Kg/ >11 Kg
Body Mass Index (BMI):
Height of the mother:
Physical Activity during pregnancy: Indian Council for Medical Research (ICMR) in 1989 had identified occupational groups as sedentary, moderate, and heavy workers based on their physical activity.
Sedentary: Housewife, Teacher, Tailor, Executive, Nurse, etc.
Moderate: Domestic servant, Coolie, Beedi worker, Weaver, Agricultural laborer, etc. Heavy: Stonecutter etc.
Anemia: The haemoglobin levels were taken from the records. According to WHO guidelines, anaemia is classified based on haemoglobin levels.
Normal Hb ≥ 11 gm%; Anaemia <11 gm%
Birth weight of baby: Birth weight is recorded from the birth register. All the newborns are weighed immediately after birth by trained nursing personnel before any significant weight loss has occurred.
Birth weight of less than 2.5 kg (2499 g) was considered low.
Birth weight of 2.5 kg or more was considered normal.
Gestational age: The gestational age is determined by the last menstrual period and classified as follows:
Term: ≥ 37 weeks Preterm: < 37 weeks.

Table 2: Normal anthropometric values

Measurements	Normal values
Birth weight	2.77-3.4kg
Length	46-51cm
Head circumference	33.8-34.3 cm
Chest circumference	30-33 cm

Statistical Analysis: The statistical software SPSS version 22 was used for the analysis of the data. Age, education and occupational status of the woman, education and occupational status of the husband, socioeconomic status, type of family, religion, residence, type of house, and so on are all represented by frequency distributions. For discrete data, proportions and the Chi-square test are used. For continuous data, mean, standard deviation, and the student's t-test are used. Regression analysis for prediction of strong predictors. The statistical significance was evaluated at 95% level of confidence intervals.

RESULTS

There is no statistically significant difference in mother's age between the two groups. There was no significant relationship found between the mother's age and the baby's birth weight. In the current study, the majority (55.6 percent) of the study subjects are between the ages of 20 and 25, with the average age of the mothers being 24.9 years. Preterm delivery is the most common cause of VLBW (62%). Preterm AGA accounts for 52% of that preterm, while preterm SGA accounts for 10%. The remaining 38% comes from term SGA babies. The Pearson Chi-squared test was used to compare the study and control groups, and the test is considered significant if the p-value is less than 0.05.
In the current study, the majority (37.2 percent) of illiterate mothers gave birth to low-birth-weight babies, which was very high compared to mothers with primary, middle, and higher education. No significant relationship was identified between the mother's education and the baby's birth weight. All the study subjects are married, and the percentage of very low birth weight among unemployed mothers (67.2%) is higher compared to employed mothers (32.8%). This difference is not statistically significant.

Table 3: Association between VLBW and literacy status of mother

	Case		Control		P-value
	Frequency	Percent	Frequency	Percent	
Education of mother					
Illiterate	93	37.2%	46	18.4%	>0.05
Primary	48	19.2%	97	38.8%	
Middle	52	20.8%	48	19.2%	
High school	37	14.8%	18	7.2%	
inter/high sec	15	6%	33	13.2%	
Grad/PG	5	2%	8	3.2%	
Occupation					
Unemployed	168	67.2%	90	36	>0.05
Unskilled	50	20	95	38.4	
Skilled	32	12.8%	65	26	

Table 4: Association between VLBW and literacy status of the father

	Case		Control		P-value
	Frequency	Percent	Frequency	Percent	
Education of father					
Illiterate	52	20.8%	18	7.2%	< 0.05
Primary	37	14.8%	48	19.2%	
Middle	93	37.2%	97	38.8%	
High school	48	19.2%	46	18.4%	
inter/high sec	10	4%	33	13.2%	
Graduate or PG	10	4%	8	3.2%	
Father-Occupation					
Unemployed	53	21.2%	22	8.8%	< 0.05
Unskilled	35	14%	12	4.8%	
Semiskilled	25	10%	19	7.6%	
Skilled	20	8%	35	14%	
Clerical, Shop owner, Farmer	85	34%	98	39.2%	
Semi-professional	22	8.8%	15	6%	
Professional	10	4%	49	19.6%	

As the level of education increased, the proportion of VLBW decreased and this was found to be statistically significant (P<0.05). The majority of males (58.3%) have a high school education. Only 7.7% have an education of graduate & above level. The majority of them are unskilled workers (74%).

Table 5: Association between VLBW and Maternal Socio-demographic factors

Group	case		Control		P-value
Region	Frequency	Percentage (%)	Frequency	Percentage (%)	
RURAL	205	82%	190	76%	0.297584
URBAN	45	18%	60	24%	
Caste Group					
OC	69	27.6	72	28.8	<0.0001
BC	114	45.6	102	40.8	
SC	38	15.2	44	17.6	
ST	29	11.6	32	12.8	
Religion					
Hindu	115	46%	105	42	>0.05
Muslim	63	25.2%	58	23.2	
Christian	42	16.8%	55	22	
Other	30	12%	32	12.8	
Type of family					
Nuclear	111	44.4	140	56	>0.05
Joint	139	55.6	110	44	
Socioeconomic status					
Lower & Lower Middle	170	68	90	36	>0.05
Middle	49	19.6	95	38	
Upper Middle & Upper	31	12.4	65	26	

In the current study, mothers from rural areas had a higher percentage of very low birth weight babies (82 percent) than those from urban areas (18 percent). However, no significant association could be seen between the place of residence of the mother and the birth weight of the baby (P> 0.05).

In the present study, a higher percentage of very low birth weight was seen in a joint families (55.6%) compared to nuclear families (44.4%). There was no significant relationship found between the type of family and the baby's birth weight. (P>0.05)

In the present study, the percentage of low birth weight was maximum (68%) in mothers belonging to lower and lower-middle-class compared to those from the upper class. However, this difference was not statistically significant. (P>0.05).

No statistical significance was found between LBW and normal birth weight groups about certain maternal socio-demographic factors like religion, family type, and socioeconomic status.

The majority (80%) of study participants were married between 18 to 24 years and 82% of study participants delivered their first child between the age of 18 to 24 years.

The current study looked at the percentage of mothers with three or more living children who had low birth weight is 16.8% and in those with two living children is 57.2%. The relationship between the number of living children and the new-birth born weight is found to not be statistically significant. In the current study, primigravida mothers had a higher percentage of very low birth weight (31.6 percent) than others. The relationship between gravida and baby birth weight is found to be statistically significant (P<0.0001). In the present study, the percentage of very low birth weight is highest among women who are para four or more (39.6%).

The relationship between increasing parity and low birth weight is statistically significant.

21% of neonates were sick. Birth asphyxia and respiratory distress syndrome accounted for 23% and 24% of the 108 sick babies, respectively.

The percentage of very low birth weight in those who did not consume a minimum of 100 IFA tablets during pregnancy (62%) is very high than in those who took them as recommended. The percentage of very low birth weight in those who did not consume a minimum of 100 IFA tablets during pregnancy (62%) is very high than in those who took them as recommended this percentage difference is found to be statistically significant. A highly significant association was found between low birth weight and Iron & Folic Acid tablets consumption during the antenatal period (P< 0.0001) and maternal haemoglobin levels (P< 0.0001). The percentage (66.4%) of very low birth weight among women with a high-risk pregnancy is higher than others. The difference between these is not statistically significant. (P>0.05).

Table 6: Association between VLBW and Maternal Factors

Diet	Birth weight		χ^2 value	P-value
	CASE	Control		
Maternal Weight Gain (Kg)				
<9	22 (70.9%)	9 (29.1%)	78.27	<0.0001
9-11	17 (11.1%)	136 (88.9%)		
>11	9 (7.7%)	107 (92.2%)		
Maternal Body Mass Index				
Underweight	89	23	17.73	0.0005
Normal	65	192		
Overweight	52	26		
Obese	44	9		
MOTHERS HEIGHT				
<=140 cm	84	80	1.585	.453
141-149 cm	95	110		
=>150 cm	71	60		
MOTHERS WEIGHT				
<=40 kg	89	23	12.588	.002*
41-49 kg	86	138		
=>50 kg	75	89		

Percentage of babies born with very low birth weight to underweight mothers, i.e BMI<18.5 (35.6%) is significantly high compared to babies born to mothers with normal BMI (P<0.05). With an increase in mid-arm circumference, the incidence decreases. This is statistically significant. The prevalence of low birth weight (70.9%) was found to be significantly higher in women with less than 9 kg weight gain during pregnancy. (P<0.0001). A very significant association is found between birth weight and maternal Pregnancy weight gain (P<0.0001) and pre-pregnancy BMI (P=0.0005).

Table 7: Association between VLBW and risk Factors

Parameter	Category	Case (n)	Control (n)	χ^2 value	p-value
Baby Sex	Male	145	135	0.8117	0.3676
	Female	105	115		
Gestational Age	Term	95	231	163.035	<0.0001
	Preterm	155	19		
Mode of Delivery	Spontaneous vaginal delivery	76	142	37.7742	<0.00001
	Caesarean section	164	106		
	Assisted delivery	10	2		
Obstetric Complications	Yes	85	32	31.3428	<0.0001
	No	165	218		
Consanguinity History	Present	52	10	32.479	<0.0001
	Absent	198	240		

Preterm delivery is the most common cause of very low birth weight, accounting for approximately 62 percent of all cases. Very low birth weight among male babies (58%) is higher compared to female babies (42%). There was a statistically significant difference between these two groups (P<0.0001). 65% of the study subjects whose period of gestation was less than 37 weeks delivered very low birth weight babies, and this relationship has been found to have a high statistical significance. a higher percentage of very low birth weight babies are through Caesarean delivery (65.6%) compared to Spontaneous vaginal delivery (30.4%). This difference in percentages is statistically significant.

Table 8: Distribution of mothers based on the mode of delivery &obstetric complications

	Birth weight		χ^2 value	P-value
	Case	Control		
Obstetric complications				
Yes	85	32	13.96	<0.0001
No	165	218		
Obstetric Complications				
Cephalo-pelvic disproportion	15	5	8	.00468
Fetal distress	19	6		
Cord around neck	4	1		
Meconium liquor	6	2		
non-progress of labor	9	4		
Foul-smelling amniotic fluid	8	3		
PROM	16	6		
Breech	8	5		
Amniotic fluid				
Clear	148	215	21.4748	.000022
Bloodstained	120	80		
Meconium stained	6	2		
Antenatal corticosteroids				
Antenatal steroid	212	109	-	-
Type of steroid (Dexamethasone)	212	109		

Out of 250 mothers, 34 percent had obstetric complications. Fetal distress accounted for 21% of obstetric complications. There is a one hundred percent correlation between a poor obstetric history in previous pregnancies and a low birth weight.

About 79.6% of pregnant mothers in the study had less than 4 ANC visits and 43.2% of pregnant women in the study utilized both government and private services. There is a relation between several Antenatal visits and no relation between the incidence of very low birth weight and the Place of ANC services.

Table 9: Association between VLBW and maternal risk factors

The health of the mother during pregnancy	Birth weight					P-value
	Case		Control		χ^2	
Healthy	151	60.4	218	87.2	46.4325.	<0.0001
Sick	99	39.6	32	12.8		
SICK CONDITIONS						
Eclampsia & pre-eclampsia	89	89.9	32	100	0.0769	0.78151
Oligo-hydramnios & poly hydramnios	21	21.21	6	18.75		
Maternal Fever	12	12.12	2	6.25		
Anemia	2	2.02	0	0		
Thyroid Disease	25	25.25	12	37.5		
UTI/Renal disorders	5	5.05	2	6.25		
Hepatitis-B	3	3.03	1	3.125		
APH	2	2.02	0	0		
Gestational diabetes mellitus	16	16.16	2	6.25		
Heart disease complicates pregnancy	6	6.06	4	12.5		
Uterus and cervical anomalies	2	2.02	1	3.125		
Bronchial Asthma	3	3.03	2	6.25		
Seizure disorder	16	16.16	2	6.25		

There is no association between the prevalence of very low birth weight and any of the Maternal diseases. The proportion of very low birth weight is found to be higher in women with anemia, i.e., hemoglobin levels of less than 11g%.

Table 10: Comparison of means of some maternal factors between VLBW & Normal birth weight babies

Baby weight		Mean	Std. Deviation	t value	p-value
Mother age	<1.5 kg	23.46	3.696	-.703	.483
	2.5 or more	23.87	3.754		
Age at Marriage	<1.5 kg	18.90	2.055	-.601	.548
	2.5 or more	19.90	11.530		
Age at 1st pregnancy	<1.5 kg	18.83	2.470	-1.103	.271
	2.5 or more	20.31	2.790		
Birth Interval	<1.5 kg	1.3438	2.28342	-.820	.413
	2.5 or more	2.0300	1.22267		
Weight gain	<1.5 kg	8.38	2.818	-5.278	.000
	2.5 or more	11.42	2.388		
Height	<1.5 kg	152.96	4.257	-1.701	.090
	2.5 or more	153.96	3.634		
Hemoglobin	<1.5 kg	8.085	1.4255	-1.824	.069
	2.5 or more	11.769	6.3559		

Except for maternal weight gain (P<0.0001), no other maternal factor differed between groups. The mean maternal weight gain during pregnancy among mothers who had low birth weight babies is 9.38 kg and in those with normal babies is 11.42 kg. This difference is found to be statistically significant. (P<0.0001).

DISCUSSION

The current study found that 2.5% of babies were born with very low birth weight.

The proportion of low birth weight is less than the national average of low birth weight of 18.1% according to NFHS-IV. According to various studies, the proportion of babies born with very low birth weight ranges from 13.8 percent to 45.2 percent.

Soujanya et al,[13] (2016) conducted a retrospective study based on hospital records at Guntur (n=121), found the proportion of low birth weight as 15.9%, There were 44.6 percent male babies and 55.3 percent female babies. These findings are similar to the present study.

This variation in prevalence could be attributed to geographic and socioeconomic differences between communities.

Socio-Demographic and Risk Factors for Low Birth Weight

The proportion of very low birth weight babies was highest in the current study among mothers aged 20-25 years (55.6%). There was no significant relationship found between the mother's age and the baby's birth weight.

A study by Kabilan S et al. reported the proportion of very low birth weight babies was highest among mothers of age 21-30 years (61.6%).[14]

Place of residence and Birth Weight: In the current study, mothers from rural areas had a higher percentage of very low birth weight babies (82 percent) than those from urban areas (18%). However, no significant association could be seen between the place of residence of the mother and the birth weight of the baby (P> 0.05).

AK Jawarkar et al,[15] have done a cross-sectional study at a Government women's hospital, Amravati found that low birth weight was high (33.2%) in rural people which is comparable to the present study.

Mother's education and Birth Weight: In the current study, the majority (37.2 %) of illiterate mothers gave birth to low-birth-weight babies, which was significantly higher than for mothers with primary, middle, and higher education. A significant relationship was identified between the mother's education and the baby's birth weight (P= 0.024).

In this study, a mother's literacy was found to have a strong relationship with very low birth weight. The incidence of very low birth weight is higher in illiterate mothers than in literate mothers. To imply the significance of the literature with very low birth weight, additional studies involving the father's education are required, which is not considered in this study due to limited feasibility.

The higher prevalence of very low birth weight about illiteracy may be associated with lower awareness levels regarding the need for antenatal care services and their utilization.

Religion and Birth weight: In the present study, the majority of very low birth babies belong to the religion 46% of Hindus. There was no significant relationship found between the mother's religion and the baby's birth weight.

Type of Family and Birth Weight: In the present study, a higher percentage of very low birth weight was seen in a joint families (55.6%) compared to the nuclear family (44.4%). There was no significant relationship found between the type of family and the baby's birth weight.

Blue PK et al,[16] identified in a hospital-based cross-sectional study of 1030 postnatal mothers that the prevalence of low birth weight (20.1%) was similar to the present study among study subjects belonging to joint families.

Socioeconomic status and Birth Weight: In the present study, the percentage of low birth weight was maximum (68%) in mothers belonging to lower and lower-middle-class compared to those from the upper class. However, this difference was not statistically significant. (P>0.05). There is a strong association between per capita income and extremely low birth weight. When per capita income is less than $500 per month, the incidence of very

low birth weight increases. This is because maternal nutrition is primarily determined by per capita income and education.

There is no association between family structure and very low birth weight. More research is needed to confirm this association, which includes factors such as food taboos, family atmosphere, environmental factors, customs and family cultures, and so on.

The less proportion of VLBW in the joint and three-generation families might be because they had received more care from family members or strenuous activities might have been shared.

The high proportion of VLBW in low SES mothers might be due to poor nutrition intake during pregnancy and certain cultural practices.

Mother's Occupation and Birth Weight: In the current study, unemployed mothers had a higher percentage of very low birth weight (67.2%) than employed mothers (32.8%). There is no association between maternal occupation and very low birth weight infants in this study. The occupation of fathers, on the other hand, has a significant relationship with very low birth weight. Further research with a larger study group is required to confirm this data, as the number of mothers in the heavy work category is low in this study.

No association between the working status of mothers and the birth weight of babies might be because of the lifestyle of non-working mothers who are mostly homemakers.

Several living children and Birth Weight: In the current study, the percentage of low birth weight in mothers with three or more living children is 16.8 percent, while it is 57.2 percent in those with two living children. The relation between the number of living children and the birth weight of the newborn is found to be statistically significant. (P= 0.038)

Gravida and Birth Weight: In the current study, primigravida mothers had a higher percentage of very low birth weight (31.6%) than others. The relationship between gravida and the birth weight of the baby is found to be statistically significant. (P<0.0001)

Kabilan S et al. reported that the percentage of very low birth weight is higher among primigravida mothers than compared to others.

Parity and low birth weight: In the present study, the percentage of very low birth weight is highest among women who are para four or more (39.6%). The relationship between increasing parity and low birth weight is statistically significant. In this study, there is a significant association between multiparity and very low birth weight.

Mothers of high parity are likely to have shorter intervals since their previous pregnancy, and this might be the reason for higher VLBW outcomes.

Primipara mothers tend to be younger than multipara mothers. Young adolescent mothers are more likely than older mothers to have LBW babies, which could explain these findings.

Intake of IFA tablets and Birth Weight: In the present study, the percentage of very low birth weight in those who did not consume a minimum of 100 IFA tablets during pregnancy (62%) is very high than in those who took them as recommended. This percentage difference is found to be statistically significant.

High-Risk Pregnancy and Birth Weight: In the present study, the percentage (66.4%) of very low birth weight among women with high-risk pregnancies is higher than others. The difference between these is not statistically significant. (P>0.05)

Similar to the current study, a facility-based case-control study,[17] conducted in Ethiopia found an increased risk of delivering low birth weight babies in mothers who had complications during pregnancy.

Maternal Hemoglobin and Birth Weight: In the present study, the proportion of very low birth weight is found to be higher in women with anaemia, i.e., haemoglobin levels of less than 11g%. The disparity in these proportions is found to be statistically significant (P<0.0001).

Khan et al,[18] conducted a cross-sectional study at Layari General Hospital, Karachi, and found a similar higher percentage of low birth weight among mothers with anaemia.

Weight gain during pregnancy and Birth Weight: The prevalence of low birth weight (70.9 percent) was found to be significantly higher in women who gained less than 9 kg during pregnancy in the current study. (P<0.0001).

Kumari P, et al,[19] conducted a hospital-based study at King George hospital, Visakhapatnam found that the prevalence of low birth weight (66.6%) was higher among those women with less than 6 kg weight gain during pregnancy which was similar to the present study.

Maternal BMI and Birth Weight: In the current study, the percentage of babies born with very low birth weight to underweight mothers, i.e, BMI<18.5 (35.6%) is significantly high compared to babies born to mothers with normal BMI (P<0.05). This denotes the importance of the mother's nutritional status in the baby's birth weight.

In this study, the mother's height does not affect the child's birth weight. Previous research by Chhabra P et al,[20] supports this (Asia Pac J Public health 2004). Previous research, such as Malik S. et al,[21] contradicted this study.

The mother's weight was found to have a significant relationship with very low birth weight in this study. When compared to women weighing more than 40 kg, the incidence of very low birth weight is higher in women weighing less than 40 kg.

Relation of the gender of the baby and low birth weight: In the present study, very low birth weight among male babies (58%) is higher compared to female babies (42%). The study identified an association between a child's gender and very low birth weight with an r value of -0.067. Mondal B et al identified a similar association.

NFHS-4 data also reported findings similar to the present study that low birth weight was seen more in female babies (25.2%) than male babies.

N. Swarnalatha et al,[22] conducted a cross-sectional study at Tirupati found that the low birth weight was slightly more in female babies (30.6%) than in male babies (23.5%) which is not comparable to the present study.

Gestational Age and Birth Weight: In the present study, 65% of the study subjects whose period of gestation was less than 37 weeks delivered very low birth weight babies and this relationship was found to be statistically significant.

Kabilan S et al., reported Gestational age of 33-36 weeks delivered very low birth weight babies, and this association was found to be of high statistical significance.

Mode of Delivery and Birth Weight: In the present study, a higher percentage of very low birth weight babies are delivered through Caesarean delivery (65.6%) compared to Spontaneous vaginal delivery (30.4%). This difference in percentages is not statistically significant.

Kabilan S et al. reported Spontaneous vaginal delivery (61.7%) delivered very low birth weight babies than LSCS and assisted labor.

Predictors for Low Birth Weight: In the present study, maternal weight gain of less than 9 Kg and not-so-regular consumption of milk during pregnancy turned out to be the strong predictors of very low birth weight.

Preterm delivery was found to be the most common cause of very low birth weight in this study, accounting for approximately 62 percent of all cases. Preterm AGA accounts for 52% of that preterm, while preterm SGA accounts for 10%. The remaining 38% is made up of term SGA babies. The Pearson Chi-square test was used to compare the study and control groups, and the test is considered significant if the p-value is less than 0.05.

Birth interval & very low birth weight: There was a significant relationship between the birth interval and very low birth weight in this study. When the birth interval is less than 2 years, the incidence of very low birth weight is higher than when the birth interval is more than 2 years. This could be because it takes a minimum of 2-3 years for the mother's nutrition and general health to reach pre-pregnancy levels.

Other factors: There is no correlation between the number of antenatal visits and the incidence of very low birth weight in this study. This could be due to a failure to consider the quality of antenatal care. Previous research by Nair NS et al,[23] does not support this.

There is no association between the incidence of very low birth weight and any of the Maternal diseases in this study. This could be due to shared fetal or genetic factors operating in both the Study and Control groups.

Even though the percentage of very low birth weight babies is higher in mothers with uterine and cervical anomalies when compared to the control group, the significance ratio cannot be attributed due to the small number of women in both groups.

In our study, 34% of mothers who delivered VLBW had obstetric complications. Approximately 79.6 percent of pregnant mothers in the study had fewer than four ANC visits, and 43.2 percent of pregnant women in the study used both public and private services.

The high percentage of LBW about illiteracy may be associated with a lack of awareness about the importance of antenatal care services and their utilization.

The proportion of VLBW was high in mothers who were LSCS, and the association was found statistically significant. This disparity could be attributed to differences in physical activity. Swarnalatha et al., as well as many others, reported similar findings.

In the present study, among all the variables entered into the regression table, maternal weight gain during pregnancy and milk consumption during the antenatal period emerged as strong predictors of birth weight of baby Maternal factors such as age, birth interval, height, weight, midarm circumference, education, type of family, and presence of a bad obstetrics history influence the birth weight of a new born when multiple logistic regression analysis (Wald forward) is used in 5 steps.

Kabilan S et al. reported that 33% of mothers were considered at high risk because of pregnancy-associated complications including preeclampsia (5.1%), gestational hypertension (9.6%), oligohydramnios (6%), and hypothyroidism (4.8%).

As a result, the best mode of delivery for VLBW neonates is debatable, but most authorities recommend a caesarean section for these infants.

Limitations of this study were that it was a single center study and limited to short-term outcome during the hospital course.

CONCLUSION

The frequency of very low birth weight had a significant relationship with the following factors in the mother, in decreasing order of importance.

1. Birth interval: It has been identified that mothers with a birth interval of fewer than 2 years have a higher incidence of very low birth weight.
2. The prevalence of very low birth weight was extremely high in mothers who had any of the BOH in previous pregnancies. This could be due to a variety of factors.
3. Because maternal nutrition is directly related to mid-arm circumference, mothers with MACs less than 20 cm are more likely to have a baby with low birth weight.
4. The weight of the mother is significantly related to the birth weight of the infant. Mothers who

weigh less than 40 kg are more likely to have lighter babies.

5. Very low birth weight is significantly related to per capita income.
6. The age of the mother is strongly related to the incidence of very low birth weight. The incidence of very low birth weight is higher in mothers over the age of 20yrs.
7. The rate of VLBW is much higher in primigravida than in multigravida. This could be due to female reproductive system immaturity and poor adolescent nutrition.

Illiterate mothers have a higher risk of having a baby with a VLBW.

In conclusion, mothers who had illiteracy & belongs to the lower socioeconomic class had a higher chance of delivering VLBW babies. Factors of mothers such as a number of living children oligohydramnios increased parity, PIH, inadequate consumption of IFA tablets, anaemia during pregnancy, malnutrition, weight gain during pregnancy were found to be associated with VLBW. Most of these factors are modifiable and can be managed easily by providing adequate antenatal care.

REFERENCES

1. WHO. Department of reproductive health and research. Kangaroo mother care: a practical guide. 2003. Geneva. WHO. Available at http://whqlibdoc.who.int/publications/2003/9241590351.pdf.
2. Basu S, Rathore P, Bhatia BD. Predictors of mortality in very low birth weight neonates in India. Singapore medical journal. 2008;49(7):556.
3. Tracking progress on child and maternal nutrition- a survival and development priority, UNICEF, November 2009.
4. International Institute for Population Sciences (IIPS) and ICF.2017. National Family Health Survey (NFHS-4), 2015-16: India. Mumbai: IIPS. Volume 1,251-264.
5. Gera T, Ramji S. Early predictors of mortality in very low birth weight neonates. Indian pediatrics. 2001;38(6):596-604.
6. Théoneste NDAYISENGA. Maternal and Newborn Risk Factors associated With Neonatal Mortality in Gitwe District Hospital in Ruhango District, Rwanda. Int. J. Med. Public Health, 2016; 6(2):98-102
7. World Health Organization. Implementation of ANC guidelines and recommendations. In: WHO recommendations on Antenatal Care for a Positive Pregnancy Experience, Luxembourg: Green Ink; 2016:105-117.
8. HPS S. Low Birth Weight: The Indian Perspective [Internet]. Indmedica.com. [cited 23 November 2018]. Available from: https://www.indmedica.com/journals/xhtml/37_lbw_surveillance_sachdev.h tm
9. Deepa H Velankar. Maternal Factors Contributing to low-birth-weight Babies in an Urban Slum Community of Greater Mumbai. Bombay Hospital Journal. 2009; Vol. 51: No.1.
10. Jawarkar AK, LOkare PO and Dore S. Study of socio-demographics and maternal determinants influencing birth-weight. JMGIMS, 2012;17(2):28-33.
11. Tayade S, Kumar Naina. Socio demographic factors affecting perinatal mortality-A study in a rural setup. IOSR Journal of Pharmacy, 2012;2(4):43- 46.
12. Mondal.B.: Risk factors for low birth weight in Nepali infants.: Indian J Pediatr - 2000 Jul; 67(7):477-82.
13. Soujanya M, Sravanthi NL, Vijayalakshmi B, Kanthakumari. Maternal risk factors for term low birth weight neonates: a retrospective hospital based study at Guntur district, Andhra Pradesh. Indian J Pediatr 2016;3(6)433- 439.
14. Kabilan S, Kumar MS. Morbidity and mortality pattern of very low birth weight infants admitted in SNCU in a South Asian tertiary care centre. Int J Contemp Pediatr 2018;5:720-5.
15. Jawarkar AK, LOkare PO and Dore S. Study of socio-demographics and maternal determinants influencing birth-weight. JMGIMS, 2012;17(2):28-33.
16. Bhue PK, Acharya HP, Pradhan SK, Biswal P, Swain AP, Satapathy DM. Socio-demographic factors associated with low birth weight in a tertiary care hospital of Odisha. Int J Community Med Public Health 2018;5(5): 1797-802
17. Dayanithi M. Low birth weight and premature births and their associated maternal factors. Int J Community Med Public Health 2018;5:2277-85.
18. Khan A, Nasrullah FD, Jaleel R. Frequency and risk factors of low birth weight in term pregnancy. Pak J Med Sci. 2016; 32(1):138-142.
19. Kumari R.P. Guduri GB, Venkateswarulu. A study on maternal factors affecting low birth weight in institutional deliveries. 2015;14:45-48.
20. Chhabra P, Sharma AK, Grover VL, Aggarwal OP. Prevalence of low birth weight and its determinants in an urban resettlement area of Delhi. Asia Pacific Journal of Public Health. 2004;16(2):95-8.
21. Malik S, Ghidiyal RG, Udani R, Waingankar P. Maternal biosocial factors affecting low birth weight. The Indian Journal of Pediatrics. 1997;64(3):373-7.
22. Swarnalatha N. Bhuvaneswari P. An epidemiological study of low birth weight in a tertiary care hospital. Int J Cur Res Rev. 2013; 5 (16): 54-62.
23. Nair NS, Rao RS, Chandrashekar S, Acharya D.Bhat HV. Socio-demographic and maternal determinants of low birth weight: a multivariate approach: Indian J Pediatr- 2000; (67(1):9-14.