Original Article:

Study of demographic, maternal, placental factors and birth weight of the neonate

DR. Jyoti A. Salunkhe[1], Dr. SV Kakade[2]

[1] *Krishna Institute of Nursing Sciences, KIMSDU, Karad, Maharashtra, India,*
[2] *Dept. of Preventive and Social Medicine, KIMS, KIMSDU, Karad, Maharashtra, India,*
Address for Correspondence:
DR. Jyoti A. Salunkhe; Krishna Institute of Nursing Sciences,
Krishna Institute of Medical Sciences Deemed University Karad
Karad, Satara District, Maharashtra, India. **E-mail**: jasalunkhe. Salunkhe9@gmail.com

KEYWORDS

low birth weight, Head circumference, placental weight, number of cotyledons, fetal length.

ABSTRACT

Background-Birth weight is an important determinant of child survival, healthy growth and Development. In Obstetrics, the relationship of birth weight and maternal, obstetric and placental factors has been long appreciated.

Materials and Methods- A prospective study was conducted on 180 mothers at Krishna Hospital Karad. Every consecutive mother was recruited and maternal and obstetric profile was completed. The neonates were weighed during the first hour after delivery using electronic weighing scales. All fresh and cleaned placentas were examined immediately after delivery.

Result- There was a significant association found between gestational age and the birth weight and significant correlation found between mean placental weight, placental diameter and numbers of cotyledons and birth weight ($p< 0.001$).

Conclusion- The study conclude that the commonest risk factors for low birth weight was maternal education, gestational age, placental weight, and diameter, number of cotyledon, fetal length, and head circumference.

Introduction

Low birth weight (LBW) (<2500 g) is the single most important risk factor in neonatal and infant health.[1]BW occurs in 15.5% of all live births or about 20.5 million infants per year worldwide [2]LBW occurs in preterm babies (< 37 weeks of gestation), infants with intrauterine growth restriction (IUGR) and full-term infants.[3]

Two primary factors are known to correlate with LBW, namely: Maternal health; and, placental structure[4]The developing fetus is dependent on the mother.[7] On the other hand, the placenta must be well developed and healthy to ensure that the available nutrients from the mother are delivered to the fetus.[5] Comparative studies of maternal socio-demographic factors in various countries and in sub- Saharan Africa show that young age and/or maternal age greater than 35 and lifestyle (e.g. physical activities) during pregnancy are high risk factors to poor fetal growth and pregnancy outcomes.[6] It has been reported that placental factors alone contribute to neonatal growth retardation in 36% of LBW cases.[7] Placental morphological changes include the length, breadth, weight and any shifts from central insertion of the umbilical cord on the

chorionic plate to an irregular velamentous insertion.[8] Such changes affect the placental efficiency with regards to adequate development of the vasculature to meet the nutrient and oxygen supply to the fetus.[9] The placental weight serves as a marker of the available surface area for maternal-fetal nutrient exchange.[10]

Materials and Methods

A prospective study was conducted at Krishna Hospital and MRC Karad on 180 mothers delivered at the Maternity Wards from 1st December 2018. Every consecutive mother was recruited during their admission till desired sample size was completed.

Sample size: The sample size was calculated,

$$n = \left[\frac{Z\alpha + Z\beta}{C} \right]^2 + 3$$

Where, **Z** = the standard normal variate at 5% significance level.

$$C = 0.5 \ln \frac{(1+r)}{(1-r)}$$

Sample size with 95% confidence and 80% power
Maximum sample size was = 179
n = 179
n = 180 = final sample for study.

At recruitment, an informed consent was obtained. Subsequently, a socio-demographic characteristic, maternal and obstetric profile was completed. Mothers were followed until delivery. The neonates were weighed during the first hour after delivery using electronic weighing scales. The placentas were examined immediately after delivery covering the weight, diameter and cotyledons present at maternal surface.

All the parameters of infant were measured after birth. The high risk neonates were excluded from the study. The crown heel length was measured in supine position with full extension of knee. Head circumference of neonates was measured by placing measuring tape around the head to pass above the ears and eyebrows. Accurate gestational age was assessed from the weeks of gestation to the last menstrual period, or both. The study was approved by the Protocol and Ethical Committee of the KIMSDU Karad. Data was analyzed by using SPSS V20.

Results-

Table 1: Demographic variable and birth weight: [N=180]

Demographic variable	**No %**	**Birth Weight Mean ± SD**	**No of LBW (<2500) (%)**	**No of NBW (≥ 2500) (%)**
1.Age of Mother:				
< = 25 yrs	96(53.3)	2778.5 ± 510.8	22 (22.9)	74 (77.1)
> 25 yrs.	84 (46.7)	2775.3 ± 507.0	28 (33.3)	56 (66.7)
Test value & p value ⟶		(t =0.043 ;p=0.966)	(χ2 =2.423; p= 0.120)	
2.Education of Mother:				
≤ Higher Secondary	80 (44.4)	2729.8 ± 578	28 (35.0)	52 (65.0)
> Higher Secondary	100(55.6)	2814.8 ± 441.8	22 (22.0)	78 (78.0)

Test value & p value ⟶		(t =0.043 ;p=0.966)	**(χ2 =3.744; p= 0.053)**	
3.Monthly family income:				
Rs.< = 15000	86 (47.8)	2746.8 ± 420.8	25 (29.2)	61 (70.9)
Rs. > 15000	94 (52.2)	2804.6 ± 576.6	25 (26.6)	69 (73.4)
Test value & p value ⟶		(t =0.762 ;p=0.447)	(χ2 =0.137; p= 0.711)	

Table 1 shows that mothers aged >25 years, having education less then higher secondary and having family income ≤15000 rupees delivered 33.3%, 35% and 29.2% LBW babies respectively. There was significant association found between education of mother and birth weight (p=0.053).

Table 2: Maternal variables and birth Weight: [N=180]

Maternal variable	**No %**	**Birth Weight Mean ± SD**	**No. of LBW (<2500) (%)**	**No .of NBW (≥ 2500) (%)**
1. H/O Preeclampsia:				
Yes	22 (12.20)	2657.0 ± 509.4	8 (36.4)	14 (63.6)
No	158(87.8)	2793.7 ± 506.7	42 (26.6)	116 (73.4)
Test value & p value ⟶		(t = 1.185 ;p=0.238)	(χ2 =0.921; p= 0.337)	
2. Type of delivery:				
Normal	90 (50.0)	2795.1 ± 455.7	22 (24.4)	68 (75.6)
Caesarean section	90 (50.0)	2758.9 ± 556.7	28 (31.1)	62 (68.9)
Test value & p value		(t = 0.477;p=0.634)	(χ2 =0.997; p= 0.318)	
3.Gestational Age in (Wks) :				
≤ 37 Preterm	17 (9.4)	2188.2 ± 422.5	13 (76.5)	4 (23.5)
> 37 Not -Preterm	163 (90.6)	2838.4 ± 476.4	37 (22.7)	126 (77.3)
Test value & p value ⟶		**(t =5.408 ; p=0.001)**	**(χ2 =22.187 ; p= 0.001)**	
4.H/O Maternal diabetics				
Yes	7 (3.9)	2763.4 ± 475.0	3 (42.9)	4 (57.1)
No	173 (96.1)	2777.5 ± 510.2	47 (27.2)	126 (72.8)
Test value & p value ⟶		(t = 0.072; p=0.943)	(χ2 =0.826; p= 0.364)	
5.Gravida				
Primi gravida	96 (53.3)	2785.9 ± 513.3	25 (26.0)	71 (74.0)
2 and above gravida	84 (46.7)	2766.8 ± 594.0	25 (29.8))	59 (70.2)
Test value & p value ⟶		(t = 0.250; p=0803)	(χ2 =0.309; p= 0.578)	

Table 2 shows that mothers with h/o preeclampsia (12.20), and h/o diabetic (3.9)s were delivered (36.6%), (42.9%) of LBW babies respectively. Mothers delivered with caesarean section (50%) and multi gravid mothers (46.7%) gave birth to 31.1% and 29.8% LBW babies respectively. There was a significant association found with gestational age and the birth weight of the baby (p< 0.001).

Table 3: Placental Variable and Birth Weight: [N=180]

Placental variable	**No %**	**Birth Weight Mean ± SD**	**No. of LBW (<2500) (%)**	**No .of NBW (≥ 2500) (%)**
1. Placental weight in (g):				

≤ 500gm	40 (22.2)	2465.2 ± 587.4	23 (57.5)	17 (42.5)
> 500gm	140 (77.8)	2866.1 ± 446.1	27 (19.3)	113 (80.7)
Test value & p value ⟶		**(t =4.653 ; p<0.001)**	**(χ2 =22.646; p< 0.001)**	
2. Placental Diameter (cm):				
≤ 20cm.	52 (28.9)	2554.9 ± 541.9	24 (46.2)	28 (53.8)
> 20cm.	128 (71.1)	2867.2 ± 465.7	26 (20.3)	102 (79.7)
Test value & p value ⟶		**(t =3.885; p<0.001)**	**(χ2 =12.308; P< 0.001)**	
3. Number of Cotyledon:				
≤ 17 Number	56 (31.1)	2598.9 ± 531.7	22 (39.3)	34 (60.7)
> 17 Number	124 (68.9)	2857.4 ± 477.1	28 (22.6)	96 (77.4)
Test value & p value ⟶		t = 0.401;p=0.689	χ2 =1.173; p= 0.279	
		(t = 3.246 ;p=0.001)	**(χ2 =5.366; p= 0.021)**	

Table 3 shows that there was significant correlation between mean placental weight and birth weight of babies (p< 0.001). Placental diameter was associated with birth weight of babies (p< 0.001). Mothers having numbers of cotyledons < 17, (39.3%) delivered LBW babies and found significant association with birth weight (p< 0.001)

Table 4: **Fetal Variable and Birth Weight:** **[N=180]**

Fetal variable	**No %**	**Mean birth weight ± SD**	**No. of LBW (<2500) (%)**	**No .of NBW (≥ 2500) (%)**
1.Length of Baby in Cms:				
≤ 50	81 (45.0)	2591.0 ± 443.4	32 (39.5)	49 (60.5)
> 50	99 (55.0)	2929.2 ± 508.1	18 (18.2)	81 (81.8)
Test value & p value ⟶		**(t =4.702 ;p <0.001)**	**(χ2 =10.098; p= 0.001)**	
2. Head Circumference in (Cms.)				
≤ 35	160 (88.9)	2714.8 ± 463.5	50 (31.2)	110 (68.8)
> 35	20 (11.1)	3275.0 ± 579.8	00.0 (0.0)	20 (100)
Test value & p value		**(t = 4.949;p<0.001)**	**(χ2 =8.654; p= 0.0.003)**	
3.Apgar Score at 1- minute:				
≤ 7	12 (6.7)	2628.0 ± 635.2	05 (41.7)	07 (58.3)
> 7	168 (93.3)	2787.6 ± 497.9	45 (26.8)	123 (73.2)
Test value & p value ⟶		(t =1.053 ;p=0.294)	(χ2 =1.236; p= 0.266)	
4.Apgar Score at 5- minute:				
≤ 7	11 (6.1)	2676.9 ± 642.1	4 (36.4)	7 (63.6)
> 7	169 (93.9)	2783.5 ± 499.3	46 (27.2)	123 (72.8
Test value & p value		(t =0.674 ;p=0.501)	(χ2 =0.431; p= 0.512)	
5. NICU Admission:				
Yes	26 (14.4)	2777.5± 711.6	9 (34.6)	17 (65.4)
No	154 (85.6)	2776.9 ± 467.7	41 (26.6)	113 (73.4)
Test value & p value ⟶		(t = 0.007;p=0.996)	(χ2 =0.708; p= 0.400)	
6. Fetal distress:				

Yes	18 (10.0)	2822.2 ± 644.3	5 (27.8)	13 (72.2)
No	162 (90.0)	2772.0 ± 492.3	45 (27.8)	117 (72.2)
Test value & p value ⟶		(t = 0.398;p=0.691)	(χ2 =0.000; p= 1.000)	
7.Gender:				
Male	89 (49.4)	2850.5 ± 505.1	20 (22.5)	69 (77.5)
Female	91 (50.6)	2705.1 ± 502.5	30 (33.0)	61 (67.0)
Test value & p value ⟶		**(t = 1.937;p=0.054)**	(χ2 =2.470; p= 0.116)	

Table 4 reveals that crown heel length of baby and head circumference, gender showed significant co-relation with birth weight (p<0.001).

Discussion-

The incidence of low birth weight neonates in India varies between 25-30%. [1] In the present study mothers >25 years, having education less then higher secondary and less family income, were delivered more number of LBW. The study conducted by TS Raghu Ramen et al [11] noted that 64.5% of low birth weight neonates were born to mothers in the family income of < Rs 2000 per month and by Sengupta et al. [12] noted significant association with LBW. The study conducted by Salunkhe et al. [13] was observed significant difference in relation to education (p<0.001). The study conducted by Chandra S Metgud [14] noted that maternal illiteracy was the risk factor significantly associated with the birth weight of the newborn.

In the present study mothers with h/o preeclampsia and h/o diabetics were delivered more percentage of low birth weight babies. The study conducted by Viswanatha Kumar HM et al.[15] and Fairley L et al. [16] noted that hypertension was found to be significantly associated with low birth weight babies. In another study by Larysa A [17] et al. noted that, pre-eclampsia is associating strongly with LBW.

In the present study there was significant correlation between mean placental weight and birth weight of babies (p< 0.001). In the study conducted by Larysa A et al. [17] found that the very strong association of placental weight with LBW.

In the present study the LBW was 27.8% which was similar to study conducted by Avinash S. et al. [18] noted that there were 105 (27.6%) LBW babies.

In the present study there were 17(9.4%) preterm deliveries. There was a significant association found between gestational age and the birth weight of the baby (p<0.001). The study done by Theresia B. Temu et al. [19] noted that a high prevalence of preterm deliveries i.e. 14.2%. Another researcher by Avinash S. et al. [18] noted an incidence preterm delivery was (19.5%).

In the present study multigravida mothers delivered more percentage (29.8%) of LBW babies. The study conducted by Fairley L in Scotland [20] noted that multiparty and higher number of births is a common factor associated with low birth weight. In another study conducted by Viswanatha Kumar HM et al. [15] noted that 65% of the LBW babies were born to multipara mothers.

In this study, anthropometric parameters of newborns' that is crown heel length and head circumference showed the high correlation (p<0.001) with birth weight. The study conducted by Achebe C Ugochukwu [21] et al. was noted that head circumference and crown to heel length had significant, linear, positive correlation with birth weight (p<0.001).

Conclusion-

The study concluded that maternal age, low education and income, any chronic medical illnesses, gestational age and morphometric placental factors were the risk factors of LBW. This study shows the positive correlation of morphmetric parameters of placenta with birth weight.

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