Original Article

IMPACT OF BIOSOCIAL CHARACTERISTICS OF THE MOTHER ON BIRTH WEIGHT OF THE NEWBORN

Preeti Padda [1], Surekha Kishore[2], AK Srivastava [3].

[1]Assistant Professor, Department of Community Medicine, GGS Medical College, Sadiq Road, Faridkot, [2] Professor, Department of Community Medicine, Guru Ram Rai Medical College, Dehradun. [3]Associate Professor, Department of Community Medicine, HIMS, Jolly Grant, Dehradun.

Abstract

Objective: To find out the impact of biosocial characteristics of the mother on birth weight of the newborn.
Study Setting: Three most busy hospitals of District Dehradun.
Study Design: Cross sectional descriptive study.
Study Period: One year (i.e. from May 2006 to April 2007.
Study Population: Pregnant females delivering live infants in the study setting during the period of study.
Material & Methods: The study group comprised of 1300 mothers from HIMS Jolly Grant, S.P.S.S. Government hospital Rishikesh and Doon Hospital Dehradun which contributed in equal proportions to the sample. Each hospital was visited for four days in a week till the sample for that hospital was complete and later shifted to the next to follow the same procedure. Interviewing and examination of the mother and the newborn were the main methodologies adopted for the present study. All the mothers who delivered live infants were interviewed within 24 hours after delivery on a pre-designed schedule, and this was followed by the examination of the mother and the new born. Data was collected on a structured and pre-tested questionnaire.
Statistical analysis: Data was entered in SPSS (Version 10.0) & Microsoft Excel programme and were subjected for statistical significance.
Results: The highest prevalence of LBW was found among mothers aged ≤18 years (72.2 percent). A decreasing trend in prevalence of LBW was reported with increasing hemoglobin level. Birth interval of <2 yrs was statistically associated with higher prevalence of LBW. There is a rise of LBW cases in parity of ≥ 5.
Conclusions: Mothers health and the biosocial factors significantly contribute to the prevalence of low birth weight among the newborns.

Key words: LBW, Maternal age, Addiction and hemoglobin level

Introduction

"Birth weight" is the first weight of the fetus or infant obtained after birth and should be measured during the first hour after birth, before the appreciable postnatal loss of weight occurs (1). In 1976, the 29th World Health Assembly agreed on the following definition: Low birth weight (LBW) is a weight at birth of < 2,500 gm (upto & including 2,499 gms) irrespective of gestational age (2).

Nearly 1/3rd of Indian neonates are LBW (Low Birth Weight), weighing less than 2500gm at birth. Over 70 percent of perinatal deaths, 90 percent neo-natal deaths and 50 percent infant deaths occur among LBW babies (3). LBW defines a Heterogonous group of infants: some are born early (premature), some are born growth restricted (Intra-uterine growth retardation or restriction) and others are born both early and growth restricted (4). Causation of LBW is multifactorial and factors associated with LBW are low pre-pregnancy weight (<45kg), malnutrition, severe aneamia, heavy physical work during pregnancy, hypertension, malaria, toxemia, smoking, low socio-economic status, short maternal stature (<145 cm), maternal age (<18yrs and ≥35yrs), primiparity, short interpregnancy period, low educational status etc (3,5).

LBW has long been used as an important public health indicator. LBW is not a proxy for any one dimension of either maternal or perinatal health outcomes. Globally, the indicator is a good summary measure of a multi faceted public health problem that includes long-term malnutrition, ill health, and hard work & poor pregnancy health care (4). Therefore this study was conducted to know the prevalence of LBW babies as well as the effect of biosocial profile of mothers on the same.

Material and methods

A hospital based cross sectional study was conducted in district Dehradun over a period of twelve months (May 2006 to April 2007). The study population consisted of pregnant females delivering live infants at three most busy hospitals of district Dehradun i.e., HIMS Jolly Grant, S.P.S.S. Government hospital Rishikesh and Doon Hospital Dehradun during the study period.

Sample Size was calculated by the given formula $n = PQ/(E/1.96)^2$, where P is maximum expected prevalence rate of LBW and was taken to be 23%. Q = (100-p), E= is the margin of sampling error tolerated= (10%). Thus, Sample Size, $n = 23 \times (77)/(2.3/1.96)^2 = 1285$ (Pre testing and finalization of schedules). Therefore, 1300 mothers were included in the study as study population and out of these 41 mothers gave birth to twins (total newborns= 1341).

Interviewing the mother and examination of the mother and the newborn were the main methodologies adopted for the present study. The data was collected by interviewing the mother within 24 hours of delivery. For this a pretested and structured questionnaire was used as the study tool. The data was compiled and analyzed using Microsoft excel and SPSS 10.0 and subsequently analyzed for statistical significance.

Results

In the present study the maximum respondents were Hindus i.e. 86.3 percent. As far as place of residence is concerned, percentage was almost equal for rural (49.2 percent) and urban areas (50.8 percent). Considering the family type, it was observed that 48.8 percent belonged to nuclear families whereas 51.2 percent to joint families. At the time of study, only 1.3 percent of mothers were below the age of 18 years and 13.6 percent above 30 years. Maximum mothers i.e., 47.4 percent were in the age group of 19-23 years. Considering the educational status, 25.9 percent of the mothers were illiterate and only 6.1 percent had an

Address for Correspondence:
Dr. Preeti Padda, Assistant Professor, Department of Community Medicine, GGS Medical College, Sadiq road, Faridkot, Punjab. Email ID: **drpreetipadda@ gmail.com** Contact No : 09781018838
Received: 20/09/2011 Accepted: 12/12/2011

education of graduate and above. Majority (89.7 percent) of the mothers were housewives.

In this study overall prevalence of LBW was found to be 34.7 percent. Mothers who were Muslims by religion had the highest prevalence (59.8 percent) of low birth weight (LBW) whereas the lowest prevalence of LBW was found in Sikh's i.e. 19.7 percent. The difference was also found to be statistically significant (÷2= 33.55, df= 3, p< .01). Prevalence of LBW is high among illiterate (46.1 percent) and just literate (37.1 percent) mothers with odds ratio of 1.94 and 1.14 respectively but it remained somewhat same in mothers with the education upto 5th and above and results were found to be statistically significant (P<0.01). A significant association was found between birth weight and socio economic status of the mothers. The prevalence of birth weight increased with decrease in the per capita income and differences were statistically significant (P<0.01). Higher prevalence of LBW was found among mothers living in rural areas (38.0 percent) as compared to those living in urban areas (31.5 percent). This difference was found to be statistically significant (p<.05). Similarly, LBW was higher in mothers belonging to nuclear families (38.6 percent) as compared with those belonging to joint families (30.9 percent) (p<.01). About 77.6 percent of the mothers with height < 145 cms delivered LBW babies whereas, among mothers with height ^{3} 145 cms only 32.7 percent delivered LBW (p<.01). LBW had a significant association with pre pregnancy weight of the mother. Birth interval of <2 yrs was also statistically associated with higher prevalence of LBW (p<.01). No statistically significant difference was found between the birth weight of newborns of vegetarian and non-vegetarian mothers.

Table- I: Association of Birth Weight with Maternal Age.

Maternal Age (in years)	Birth Weight LBW (<2500 gm)		(≥2500 gm - 3999 gm)		Total	
	No.	(%)	No.	(%)	No.	(%)
≤18	13	(72.2)	05	(27.8)	18	(100.0)
19-23	213	(33.8)	417	(66.2)	630	(100.0)
24-29	158	(31.1)	350	(68.9)	508	(100.0)
30-35	53	(36.6)	92	(63.4)	145	(100.0)
≥35	28	(70.0)	12	(30.0)	40	(100.0)
Total	**465**	**(34.7)**	**876**	**(65.3)**	**1341**	**(100.0)**
÷2 = 39.72, df= 4, p < 0.01 (Significant)						

Table- I shows a 'U' shaped trend between prevalence of LBW and age of the mother. The highest prevalence of LBW was found among mothers aged ≤18 years (72.2 percent) and those ≥35 years (70.0 percent). Odds ratio for both was calculated to be 5.01 and 4.61 respectively.

Table- II: Birth weight in relation to maternal hemoglobin level.

Maternal Hemoglobin (gm/dl)	Birth Weight LBW (<2500 gm)		(>2500 gm)		Total	
	No.	(%)	No.	(%)	No.	(%)
<6.5	34	(87.2)	05	(12.8)	39	(100.0)
6.5-8.0	100	(64.9)	54	(35.1)	154	100.0)
8.0-11.0	233	(33.4)	464	(66.6)	697	(100.0)
>11.0	98	(21.7)	353	(80.3)	451	(100.0)
Total	**465**	**(34.7)**	**876**	**(65.3)**	**1341**	**(100.0)**
X^2 = 131.85, df= 3, p < 0 .01 (Significant)						

Table- II depicts a decreasing trend in prevalence of LBW with increasing hemoglobin level.

Table- III: Birth weight in relation to parity.

Parity	Birth Weight LBW (<2500gm)		(>2500gm – 3999gm)		Total	
	No.	(%)	No.	(%)	No.	(%)
1	294	(39.2)	456	(60.8)	750	(100.0)
2	103	(25.6)	299	(74.4)	402	(100.0)
3	37	(30.6)	84	(69.4)	121	(100.0)
4	13	(29.5)	31	(70.5)	44	(100.0)
≥ 5	18	(75.0)	06	(25.0)	24	(100.0)
Total	**465**	**(34.7)**	**876**	**(65.3)**	**1341**	**(100.0)**
÷2 = 330.4, df= 4, p < 0.001 (Highly Significant)						

Table- III shows that the prevalence among Primiparous mothers was found to be 39.2 percent and it get decreased up to parity 4 and showed a rise in parity of ≥ 5.

TABLE-IV: Birth Weight in relation to Maternal Addiction Habits

Addiction Habits	Birth Weight LBW (<2500 gm)		(≥2500 gm - 3999 gm)		Total	
	No.	(%)	No.	(%)	No.	(%)
Absent	416	(33.0)	843	(67.0)	1259	(100.0)
Present	49	(59.8)	33	(40.2)	82	(100.0)
Total	465	(34.7)	875	(65.3)	1341	(100.0)
÷2 = 24.23, df= 1, p< .01						
Type of Addiction						
Tobacco chewing	25	(56.8)	19	(43.2)	44	(100.0)
Smoking	17	(58.6)	12	(41.4)	29	(100.0)
Others	7	(77.8)	2	(22.2)	09	(100.0)
Total	**49**	**(59.8)**	**33**	**(40.2)**	**82**	**(100.0)**

This table shows a significant difference between prevalence of LBW among mothers without addiction (33.0 percent) and with addiction (59.8 percent). High prevalence was seen in those who were addicted to tobacco chewing (56.8 percent) and smoking (58.6 percent). Even higher prevalence (77.8 percent) was seen in those addicted to other substances (alcohol, beetle nut, hashish and cocaine).

Discussion

Global studies have revealed that there are multiple factors, which determine the change in Birth weight. It is the interaction of various factors and not one particular factor alone, which determines the Birth weight.

The present study attempts to study the impact of biosocial characteristics of the mother on birth weight of the newborn in the study area and to find the important biosocial factors associated with them. In the present study it has been observed that the prevalence of LBW was highest among Muslims followed by Hindus and lowest in Sikhs. Similarly other studies also reported a significantly higher prevalence of LBW in Muslims as compared to Hindus and other religions (6, 7). This could be due to low literacy levels and lack of awareness among Muslim mothers.

Educational status plays a role in improved nutritional status of women resulting into improved birth weight of the baby. In the present study, maximum prevalence of LBW (46.1 percent) was found among illiterate mothers. In comparison, prevalence of LBW was reported to be 45.8 percent, 66.0 percent (slightly higher as compared to our findings) and 45.5 percent among illiterate mothers by Barua AC (1973), Jain et al (1971) and Joshi et al (2005) (8, 9,10).

In this study the highest prevalence of LBW was found among mothers aged ≤18 years (72.2 percent) and those ≥35 years (70.0 percent). This may be explained by high incidence of pre-maturity among the very young and very old mothers. At both extremes of age, the associated risk of maternal complications also increases which adversely affects the birth weight. Very young age also exerts indirect effects by influencing maternal height, weight and nutrition. Similarly, according to UNICEF, ICMR report (1987) and Chumnijarakij et al (1992) a positive correlation existed with LBW with maternal age less than 18 years and ≥35 years (11, 12).

Maternal hemoglobin is an indirect indicator of overall maternal nutrition and, therefore, low maternal hemoglobin can identify undernourished mothers whose fetus may suffer ill effect of malnutrition. Prevalence of LBW is inversely proportional to the hemoglobin level. Results are supported well by Idris et al (2000) who found that Severe anemia (Hb < 7 gm %) is significantly associated with LBW. (13)

In present study, high prevalence was observed among the primi para (39.2 percent) and those with parity of ≥ 5 (75.0 percent) whereas lowest prevalence (25.6 percent) was observed in mothers with parity two. Improvement of birth weight with parity could be related to changes in the maternal environment for example maternal circulation and reproductive organs acquiring increased capacity to nourish and contain growing fetus or because of increased utero-placental flow in the multi para. Similar findings to our study for association of parity with birth weight have been reported by Chandra (1969), and Datta Banki et al (1978), (14,15). Kaur et al ,(2000) and Ghosh et al documented that mothers who were less than 140 cms height were more prone to have LBW babies and our findings were in conformity with their observations (16,17).

Weight of the mother plays an important role in determining the birth weight of newborn. The present study shows a significant association between pre pregnancy weight and LBW. Maximum prevalence of LBW was observed among mothers with pre pregnancy weight of less than 40 Kg (87.5 percent). The birth weight increased with increase in maternal weight. These findings have been largely supported by the observations of Vega et al (1993), Dhall et al (1995) and Sharma et al (1999) (18, 19, 20).

Of all the drugs consumed by the mothers that can affect the fetus, tobacco is undoubtedly the most common. Several epidemiological studies corroborate the relation between smoking and LBW, an association that is maintained even after controlling for possible confounding factors (1). The results of this study are supported by Low (1981) who also observed increase in incidence of LBW among smokers than non-smokers (21). Risk of LBW was also found to be higher in women with history of tobacco chewing in a study conducted by Rubin et al (1986) (22).

Conclusion

For reducing the prevalence of low birth weight, a comprehensive planning not only in health sector but in all those sectors concerned with social development and welfare have been indicated by the study findings. It is apparent that in a multidimensional problem like LBW, no specific vertical program can be formulated to address the issue on a war footing. The ongoing initiatives in the country are more or less in the right direction but may need operational strengthening and convergence to yield the maximum benefit.

Contribution of Authors:

SK evolved the concept & design of the study & overseeing the final manuscript.

AKS overall supervised the execution of the study and interpret the findings.

PP was responsible for data collection, analysis and drafting the manuscript.

Bibliography

1. Bernabe JV, Soriano T, Albaladejo R, Jaurranz M, Calle ME, Martinez D et al. Risk factors for Low birth weight: A review. European J of Obs & Gynae and Reproductive Biology 2004;116:3-15
2. World Health Organization. International statistical classification of diseases and related health problems. Geneva: WHO; 1992.
3. Paul VK. Textbook of preventive and Social Medicine. In: Gupta P, Ghai OP, editors. Child Health: Newborn care in India, 2nd ed. New Delhi: CBS publishers; 2007. p. 383-84.
4. World Health Organization. Low Birth Weight Estimates. Geneva: WHO; 2004.
5. Park K, editors. Textbook of preventive and social medicine, 18th ed. Jabalpur: Banarsi Das Bhanot publishers. p. 409-11.
6. Aswath PV, Shivram RC, Pirhnesh A, Shanker A. Epidemiology of some influencing factors on birth weight: A retrospective study. IJCM 1982;7(3):11-4
7. Chandra MR, Jain VC, Bhushan V. A study of some aspects of prematurity among deliveries during 1968 at a teaching hospital. Indian J Med Res 1970;58:1125-33
8. Barua AC. Birth weight in Assamese infants. Indian Pediatr 1973;10:125.
9. Jain TP, Sharma R. An epidemiological study of low birth weight. J of Obst. And Gyn. Of India 1971; 21:444.
10. Joshi HS, Subba SH, Dabral SB, Dwevedi S, Kumar D, Singh S. Risk Factors associated with low birth weight in newborns. IJCM 2005;30 (4):142-3
11. UNICEF and ICMR report (editorial). Indian J Pediatr 1987;59: 801-18
12. Chumnijarakij T, Nuchprayoon T, Chitinand S, Onthuam Y, Quamkul N, Dusitsn N, et. al. Maternal risk factors for low birth weight newborn in Thailand. J Med Assoc Thai 1992; 75(8):445-52.
13. Idris MZ, Gupta A, Mohan U, Srivastava AK, Das V. Maternal health and low birth weight among institutional deliveries. IJCM 2000;25(4):156-60
14. Chandra MR. A study of health of pregnant mothers and infants in a group of villages around rural health training center, Lucknow [dissertation]. Lucknow: KGMC;1969.
15. Datta Banik ND. A study of different birth weight babies and related factors. Indian J Pediatr 1978;18:327-34
16. Kaur D, Kaur AP, Rashmi. Changing trends in birth weight. J of Obs and Gynae of India 2002;52(3):32-6
17. Ghosh S, Hooja V, Mittal SK, Verma RK. Biosocial determinants of low birth weight. Indian J Pediatr 1991;14:107-13
18. Vega J, Saez G, Smith M, Agurto M, Morris NM. Risk factors for low birth weight and intrauterine growth retardation in Santiago, Chile. Rev Med Chil 1993 Oct 12;10:1210-9
19. Dhall K, Bagga R. Maternal determinants of birth weight of north Indian babies. Indian J Pediatr 1995;62:333-44
20. Sharma RK, Cooner PPS, Sekhon AS, Dhaliwal DS, Singh K. A study of effect of maternal nutrition on incidence of low birth weight. IJCM 1999;24(2):64-8
21. Low JA. Maternal smoking in human reproduction. Canadian Journal of Public Health 1981; 72:461-65.
22. Rubin DH, Krasilnikoff PA, Livinthal JN, Weile B, Berget B. Effect of passive smoking on birth weight. Lancet 1986; 2:415-7.