ORIGINAL ARTICLE

STUDY OF LOW BIRTH WEIGHT (LBW) OF NEWBORNS IN RELATION TO VARIOUS MATERNAL FACTORS: A CASE-CONTROL STUDY FROM KISHANGANJ, BIHAR

Sanjay Kr. Choudhary¹, Kashif Shahnawaz², Gaurav Varma³, Nilanjana Ghosh⁴, Gautam Sarker⁵, Laxman Kumar⁶

HOW TO CITE THIS ARTICLE:

Sanjay Kr. Choudhary, Kashif Shahnawaz, Gaurav Varma, Nilanjana Ghosh, Gautam Sarker, Laxman Kumar. "Study of Low Birth Weight (LBW) of Newborns in Relation to Various Maternal Factors: A Case-Control Study from Kishanganj, Bihar". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 08, February 24; Page: 1817-1822, DOI: 10.14260/jemds/2014/2062

ABSTRACT: BACKGROUND: Newborns having birth weight less than 2500 gms (2.5 kg) is defined as low birth weight (LBW) newborns, measurement being taken preferably within the first hour of life (WHO-1994). Out of 23 million LBW infants, 7-10 million LBW babies are in India, which constitutes about 30% of live births per year. **OBJECTIVE:** This study was conducted to identify and quantify the effects of weight, height and body-mass index (BMI) of mothers, responsible for LBW of babies. **MATERIALS AND METHODS:** The study was a case-control study, performed in a RTHC of kishanganj district, Bihar, from November-2013 to December-2013. A total of 360 newborns (120 cases and 240 controls) were selected for study during the study period. Every singleton newborn baby having birth weight <2.5 kg was included as a case and those having birth weight > 2.5 kg were included as control in this study. The relation of birth weight of newborns to few maternal factors, such as weight, height and BMI, were studied. **STATISTICAL ANALYSIS:** This was done in SPSS 17. Odd's ratio with 95% confidence interval was calculated. **RESULTS:** In this study, we observed that mothers having weight less than 45 kg were having 5.45 times (OR=5.45) more chances of getting LBW babies. Similarly, mothers having height less than 145 cm and BMI < 18.5 were having 2.46 times (OR=2.46) and 3 times (OR=2.91) more chances of having LBW babies, respectively. **CONCLUSION:** This study concluded with the findings that weight, height and BMI of mothers was strongly related with LBW of newborns. Hence, it is necessary to strengthen the existing maternal services at the basic level of the community.

KEYWORDS: Low-birth weight, Newborns, Maternal Factors.

INTRODUCTION: According to the World Health Organization (WHO), any baby who weighs less than 2500 gms. (2.5 kg) is termed as a "Low Birth Weight" baby, irrespective of when the baby is born during a pregnancy. According to UNICEF, the incidence of LBW neonates is about 30% in India. Majority of LBW neonates in our country weigh between 2000-2499 gms. We are home to 8 million LBW infants born each year and around three fourths of them are delivered at full term of gestation. This shows that the major LBW problem in India is due to intrauterine growth retardation (IUGR), in contrast to Western World, where it is mainly due to prematurity. The prevention of LBW babies are public health priority in many developing countries, including India. In India, one third of the babies are born with LBW and it is mainly due to the young age and poor nutrition of the mothers, which is compounded by the stress of repeated pregnancies (Ghosh Shanti, 2006)¹. A very few studies, have so far been carried out in this region. A case-control study was therefore carried out to elucidate some of the major factors for LBW among newborns in the existing set-up, so that appropriate corrective

ORIGINAL ARTICLE

---

measures can be taken to reduce the outcome. In this section, we shall go through the various observations made by different people at different places and times to see the outcomes of the association of variable maternal factors on birth weight of newborns.

OBJECTIVE: To identify and quantify the effect of weight, height and BMI of mothers, responsible for LBW of the babies.

Influence of Maternal Weight: It is a common phenomenon to observe the relationship between maternal weight and birth weight of the fetus and their relation is quite well known. Pachauri et al. (1971)² found 52.2 kg (SD=7.64 kg) as a mean maternal weight for their series. Moreover, they have also noted the facts that the simple correlation coefficient between the weight of the babies at birth and maternal weight is significant. The increased risk for IUGR with low weight gain in the second or third trimester remained significantly elevated, even after controlling for the rate of weight gain, in the other two trimesters, as reported by Strauss R and Dietz WH (1999)³. Rowe et al. (2001)⁴, stated that maternal weight gain during pregnancy has an effect on the newborn's weight gain. Tan KH and Yeo GSH (2009)⁵ in their study at Singapore, concluded that anthropometric differences in maternal weight is an important factor that affects birth weight.

Influence of Maternal Height: That the height of the mother may have a role to play in the causation of differences in birth weight has been investigated by some authors. Using maternal height as an index of nutritional status in the year of growth, Baird (1962)⁶, showed that for married primiparas in Aberdeen, the pre-maturity rate for single births is 11.7 percent for women under 5 feet 1 inch, 7.8 percent for women between 5 feet 1 inch to 5 feet 3 inches and 5.6 percent for women of 5 feet 4 inches and above. He also mentioned that the relationship of the height of the mother to prematurity holds true in each social class. The view of the height of the mother having a close association with the birth weight has been strongly supported by Pachauri and Marwah (1971)¹. They gave a value of $r=0.073$ ($P<0.05$) for birth weight and maternal height and found 151.0 cm (SD=9.56 cm) as a mean height of the mothers of their series. Sushma Malik et al. (1997)⁷, noted a strong correlation between birth weight and maternal height among other factors in their study. The study conducted by Rao, Prakash and Nair (2001)⁸, revealed the association between maternal height and birth weight. Accordingly, the mean birth weight increased steadily from 2550 gms. in women with height less than 145 cm to 3145.4gms. in women with height more than or equal to 160 cm. There was a significant difference in the mean birth weight in different categories of maternal height except among those with maternal height between 150 to 160 cm. when compared to women with a height of 160 cm or more. Elshibly and his colleague (2008)⁹, concluded from their observation that maternal height was found to be one of the most important maternal parameters which influences birth weight and the risk for LBW.

MATERIALS AND METHODS: This was a case-control study, conducted in RTHC, Pothia, Kishanganj. This center caters the need of about 1 Lakh population in this area. This is the field practice area of M.G.M. Medical College, Kishanganj. Institutional Ethics Committee approval and consent were taken. Study period was from November-2013 to December-2013 (one month). A pre-designed, pre-tested study schedule was used to collect data. Both open and close ended questions were kept in the schedule. Privacy of the individuals was maintained and confidentiality was gained from mothers of

ORIGINAL ARTICLE

the selected children. Staff nurses were properly trained, how to measure the weight of newborn. Every singleton newborn baby having birth weight <2.5 kg was included as a case and those having birth weight >2.5 kg were included as control in this study.

Weight of the newborns were taken just after birth, by using a baby weighing machine, either by ourselves or by attending trained staffs. Weight was measured to the nearest of 100 mg. Measurement of the mother's weight and height was taken by using an electronic scale and stadiometer. Weight was measured to the nearest 0.1 kg, and height was measured to the nearest 0.1 cm. Predicting Variables were considered. The relation of birth weight of newborns to few maternal factors, such as weight, height and BMI, were studied.

Sample Size: A total of 120 cases and 240 controls were selected during study period. This gave a power of 80% for detecting OR>2.1 as significant at 5% level, if the prevalence of exposure among controls is between 20-60%.

Sampling Technique: All the singleton newborns with LBW delivered at this RTHC, during the study period, were taken as the cases. Newborns with birth weight less than 2500 gms. were considered as LBW newborns. Controls were singleton newborn babies who were appropriate for gestational age and were delivered at this center. After selection of each case as defined, the next available two newborns that had fulfilled the criteria for controls given above were selected and included in the control group. This ensured a case-control ratio of 1:2.

Statistical Analysis: This was done in SPSS 17. Odd's ratio with 95% confidence interval was calculated. The observations in this study were compiled and results were analyzed.

Observation: Birth weight of newborns was taken just after birth either by ourselves or by attending trained staffs. This case-control study was carried out in the RTHC, Pothia, Kishanganj. This is the field practice area of M.G.M. Medical College, Kishanganj. The relation of birth weight to few epidemiological factors such as weight, height and BMI of the mothers were studied and presented below in the form of tables.

Maternal weight in kg	Study Group (n=120)		Control Group (n=240)		Odd's ratio	95% CI
	No. of Cases	Percentage	No. of Controls	Percentage		
< 45 kg	32	26.66	15	6.25	5.45	2.81 to 10.56
≥ 45 kg	88	73.34	225	93.75		
Total	120	100.00	240	100.00		

Table 1: Showing distribution of cases according to weight of mothers

Chi-square = 29.4,

df = 1,

P value = <0.0001

ORIGINAL ARTICLE

Height (in cm)	Study Group (n=120)		Control Group (n=240)		Odd's ratio	95% CI
	No. of Cases	Percentage	No. of Controls	Percentage		
≤145 cm	22	18.33	20	8.33	2.46	1.28 to 4.73
>145 cm	98	81.67	220	91.67		
Total	120	100.00	240	100.00		

Table 2: Showing distribution of cases according to height of mothers

Chi-square=7.76,   df=1,   P value=0.005

BMI	Study Group (n=120)		Control Group (n=240)		Odd's ratio	95% CI
	No. of Cases	Percentage	No. of Controls	Percentage		
≤18.5	17	14.16	7	2.91	5.43	2.21 to 13.65
>18.5	103	85.84	233	97.09		
Total	120	100.00	240	100.00		

Table 3: Showing distribution of cases according to BMI of mothers

Chi-square=16.3,   df=1,   P value=<0.0001

DISCUSSION: This case-control study was carried out in the RTHC, Pothia, Kishanganj. Table 1 (Maternal Weight), Table 2 (Maternal height) and Table 3 (Maternal BMI) shows the maternal nutrition. Among the maternal factors, maternal malnutrition, i.e. maternal weight<45 kg, maternal height<145 cm and BMI<18.5, were significantly associated with LBW. Similarly odd's ratio of maternal weight <45 kg, maternal height<145 cm and BMI<18.5 was found to be 5.45, 2.46 and 5.43 respectively. Similar findings were observed by B S Deswal (1999), J.V.Singh and D.Kumar (Indian Journal of Community Medicine, 1999, Vol.24, Issue3)¹⁰. D.Acharya et al (2004)¹¹, Mavalankar DV and Trivedi CR et al (1992)¹², observations were also consistent with these findings. Karmer's meta-analysis and studies conducted abroad Ferraz EM et al (Brazil) (1990)¹³, had similar findings in their study.

SUMMARY & CONCLUSION: We observed 360 newborns, out of these 120 were having LBW babies (cases) and 240 were normal weight babies (controls). On the basis of analysis, we summarize the study as below:-

- Mothers having maternal weight<45 kg were 5.45 times (OR=5.45) chances of getting LBW babies.
- Mothers having maternal height<145 cm had 2.46 times (OR=2.46) chances of getting LBW babies.
- Mothers having BMI<18.5 have 3 times (OR=2.91) chances of having LBW babies.

This study concluded with the findings that several factors like weight, height and BMI of the mothers was strongly related to LBW, though there are various other factors also like poor

ORIGINAL ARTICLE

ANC, Smoking & bad obstetric history. Thus, it is a multifactorial phenomenon. Thus, this study strongly concludes that maternal nutrition is a very important factor in the developing country like India. Thus, if mother's nutritional need is adequately supplemented, sizeable percentage of LBW can be prevented. Hence, it is the need of the hour to strengthen the existing maternal services at the basic level of the community taking in account the responsible factors in mind.

REFERENCES:

1. Ghosh Shanti. Food-role on health, nutrition and development programme. Economic and Pol. weekly vol. XLI (34): 3664-3666 (2006).
2. Pachauri S, Marwah SM and Rao N SN. A multifactorial approach to the study of factors influencing birth weight in the urban community of New Delhi. J.Med. Research, 59:1318-1339 (1971).
3. Strauss RS and Dietz WH. Low maternal weight gain in the second or third trimester increases the risk for intrauterine growth retardation. Jour. of Nutrition (1999).
4. Edwin JCG Vanden Oord, Rowe DC. A step in another direction- looking for maternal genetic and environmental effects on racial differences in birth weight. Demography: 38(4): 573-576 (2001).
5. Tan K and Yeo GSH. Influence of maternal height, weight and body-mass index on birth weight in an Asian population. The Internet Journal of Gynaec. And Obstet; 11 (2): (2009).
6. Baird D. Environmental and obstetrical factor in prematurity with special reference to experience in Aberdeen. WHO Bull; 26: 291 (1962).
7. Malik S, Ghidiyal RG, Udani R and Wangankar P. Maternal biosocial factors affecting low birth weight. Ind Jour Paediatrics, 64 (3): 373-377 (1997).
8. Rao RPS, Prakash KP and Nair SK. Influence of pre-pregnancy weight, height and weight gain during pregnancy, on birth weight. Bahrain Med Bulletin, 23(1): (2001).
9. Elshibly EM and Schwalisch G. The effect of maternal anthropometric characteristics and social factors on gestational age and birth weight in Sudanese newborn infants. BMC Public Health, 8:244 (2008).
10. Deswal BS, Singh JV and Kumar D. A study of risk-factors for low birth weight. Ind. Jour. Comm. Med. Vol XXIV (3):127-131 (1999).
11. Acharya D, Nagraj K, Nair NS, and Bhat HV. Maternal determinants of IUGR- a case-control study in Udupi district, Karnataka. Ind J Comm Med. Vol. XXIX (4): (2004).
12. Mavalankar DV et al. Risk factor for preterm and term low birth weight in Ahmedabad. Int Jr Epidem. 1992, 21:263-72.
13. Ferraz EM et al. Determinants of pre-term delivery and IUGR in North East Brazil Jr Epid. 1990, 19: 103-8.

AUTHORS:

1. Sanjay Kr. Choudhary
2. Kashif Shahnawaz
3. Gaurav Varma
4. Nilanjana Ghosh
5. Gautam Sarker
6. Laxman Kumar

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of Community Medicine, I.G.I.M.S, Patna, Bihar.
2. Assistant Professor, Department of Community Medicine, M.G.M.M.C. & L.S.K. Hospital, Kishanganj, Bihar.
3. Associate Professor, Department of Community Medicine, M.G.M.M.C. & L.S.K. Hospital, Kishanganj, Bihar.
4. Assistant Professor, Department of Community Medicine, M.G.M.M.C. & L.S.K. Hospital, Kishanganj, Bihar.

5. Assistant Professor, Department of Community Medicine, M.G.M.M.C. & L.S.K. Hospital, Kishanganj, Bihar.
6. Assistant Professor, Department of Community Medicine, M.I.M.S, Barabanki, Lukhnow, U.P

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Kashif Shahnawaz,
Manhar Road, Chhoti Quazipura,
Dist. Darbhanga, Bihar, PIN – 846004.
E-mail: kashif.shahnawaz98@gmail.com

Date of Submission: 27/01/2014.
Date of Peer Review: 28/01/2014.
Date of Acceptance: 04/02/2014.
Date of Publishing: 18/02/2014.