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RESEARCH ARTICLE

LOW BIRTH WEIGHT-A HOSPITAL BASED CASE CONTROL STUDY

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ABSTRACT

Birth weight has been defined by the World Health Organization as weighing less than 2,500 grams are approximately 20 times more likely to die than heavier babies.2 more common in developing than developed countries; a birth weight below 2,500 grams contributes to a range of poor health outcomes. The present study was done with an objective to find out risk factors associated with low birth weight and strength of association between hypothesized risk factors and low birth weight. The study population was postnatal mothers along with singleton live born baby, delivered during the study period. In present case control study, the incidence of low birth weight found was 27.73 %. Univariate analysis showed following factors to be significantly associated with low birth weight- maternal age, gestational age at the time of birth, low socioeconomic status, occupation of mother, low education of mother, primiparity, parity of 4 and 5, maternal height <145 cm ,maternal weight < 45 kg, less than 4 anc visits, inadequate intake of iron and folic acid (ifa) tablets, complications during pregnancy, bad obstetric history, severe and moderate anemia, addiction of mother, household heavy physical activity of mother. Following factors to be significantly associated with low birth weight- maternal age, gestational age at the time of birth, low socioeconomic status, occupation of mother, low education of mother, primiparity, parity of 4 and 5, maternal height <145 cm, maternal weight < 45 kg, less than 4 anc visits, inadequate intake of if a tablets, complications during pregnancy, bad obstetric history, severe and moderate anemia, addiction of mother, household heavy physical activity of mother.

Key words: Low birth weight, Maternal factors, Ante-natal care, Case control study.

INTRODUCTION:

Low birth weight has long been used as an important public health indicator. Low birth weight 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 multifaceted public health problem that includes long-term maternal malnutrition, ill health and hard work and poor pregnancy health care [1]

Birth weight has been defined by the World Health Organization as weighing less than 2,500 grams are approximately 20 times more likely to die than heavier babies [2] more common in developing than developed countries; a birth weight below 2,500 grams contributes to a range of poor health outcomes. The goal of reducing low birth weight incidence by at least one third between 2000 and 2010 is one of the major goals in 'A World Fit for Children', the declaration and plan of action adopted by the United Nations general assembly special session on children in 2002[1]. The reduction of low birth weight also forms an important contribution to the Millennium Development Goal (MDG) for reducing child mortality. Low birth weight is therefore an important indicator for monitoring progress towards these internationally agreed-upon goals.

MATERIALS AND METHODS:

Present study was done in postnatal care ward of Obstetrics and Gynaecology department. The study population was postnatal mothers along with singleton live born baby, delivered during the study period of 24 months (August 2011 to July 2013). A total of 130 cases and 260 controls were selected. Two controls were selected per case thus making a proportion of 1:2. This is calculated by taking power of 80%, odds ratio of 2, two sided significant level as 0.05 and proportion of controls with exposure as 0.3. The data collection consisted of two types of procedures- personal interview and anthropometric measurements. Mothers of babies with birth weight > 2,499 g who were born consecutively after

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each case, constituted the control group. A written informed consent of mother of the newborn baby was taken before starting the interview.

The participants were interviewed using a pre-tested standard structured questionnaire. Anthropometric measurements of mother included postpartum weight and height. Other variables were Maternal age, gestational age at the time of birth, sex of the newborn, maternal educational and occupational status, socioeconomic status, type of family, type of residence, parity, birth spacing, bad obstetric history, obstetric complications during pregnancy, total ANC visits, time of ANC registration, consumption of iron and folic acid (IFA), calcium tablets, rest received in daytime, physical activity, addiction, hemoglobin percentage and maternal height and weight. All the data was entered into the Epi Info software (version 7). Association of the risk factors under study was assessed by applying chi – square test taking a level of significance of $P < 0.05$. To assess the strength of association the odds ratio and 95% confidence interval of odds ratio was calculated.

RESULTS

The distribution of cases and controls according to sex of the newborn is shown in table 1.

Table 1: Distribution of cases and controls according to sex of the newborn

Sr. No.	Sex of the newborn	Cases	Controls	Total
1	Female	69(53.08%)	127(48.85%)	196(50.26%)
2	Male	61(46.92%)	133(51.15%)	194(49.74%)
3	Total	130 (100%)	260 (100%)	390(100%)

There was more number of female babies in case group (53.08%) than control group (48.85%). However, this difference was statistically not significant. [$\chi 2=0.62$, df = 1, P=0.43, OR=1.18 (0.77-1.80)]

Table 2 a: Distribution of cases and controls according to gestational age at the time of birth

Sr. No.	Gestational age at the time of birth	Cases	Controls
1	$\leq$ 34 wks	35(26.92%)	11(4.23%)
2	35 wks	25 (19.23%)	23(8.85%)
3	36 wks	19 (14.62%)	34(13.08%)
4.	37 wks	16(12.31%)	45(17.30%)
5.	38 wks	12(9.23%)	52 (20.00%)
6.	39 wks	12(9.23%)	57(21.92%)
7.	40 wks	7(5.38%)	24 (9.23%)
8.	41 wks	3(2.31%)	9(3.47%)
9.	42 wks	1(0.77%)	5 (1.92%)
10.	Total	130 (100%)	260 (100%)

Table 2 b: Distribution of cases and controls according to gestational age at the time of birth

Sr. No.	Gestational age at the time of birth	Cases	Controls
1	< 37 wks	79(60.77%)	68(26.15%)
2	$\geq$37 wks	51 (39.23%)	192(73.85%)
3	Total	130 (100%)	260 (100%)

Table 2-a and 2-b showed that most of the cases delivered at 34 wks of gestation (26.92%)followed by 35 wks of gestation(19.23%) and most of the controls delivered at 39 wks of gestation (21.92%) followed by 38 wks of gestation (20%) . More number of cases delivered at a gestation of less than 37 wks (60.77%) as compared to controls (26.15%).This difference was statistically significant. Preterm delivery showed a risk of having low birth weight 4.37 times that of term delivery [$\chi 2=44.21$, df = 1, P=0.000, OR=4.37 (2.79-6.84)].

Table 3: Distribution of cases and controls according to type of residence

Sr. No.	Residence	Cases	Controls	Total
1	Rural	102(78.46%)	180(69.23%)	282(72.31%)
2	Urban	28 (21.54%)	80 (30.77%)	108(27.69%)
3	Total	130 (100%)	260 (100%)	390(100%)

$\chi 2=3.68$, df = 1, P=0.054, OR=1.61(0.98-2.65) (Not significant)

Table 3 shows that overall most of the participants in both groups were from rural area (72.31%) More number of cases lived in a rural area (78.46 %) as compared to controls (69.23%).However; this difference was statistically not significant.

Table 4: Distribution of cases and controls according to religion

Sr. No.	Religion	Cases	Controls
1	Hindu	97 (74.62%)	210 (80.77%)
2	Muslim	12 (09.23%)	23 (08.85%)
3	Buddhist	19 (14.62%)	26 (10.00%)
4	Others	02 (01.53%)	01 (0.38%)
5	Total	130 (100%)	260 (100%)

Table 4 shows that higher number of mothers in both case and control group were Hindus (74.62%, 80.77% respectively) followed by Buddhists (14.62%, 10.00% respectively)

Table 5: Distribution of cases and controls according to type of family

Sr. No.	Type of family	Cases	Controls
1	Nuclear	33 (25.38%)	47(18.08%)
2	Joint	97 (74.62%)	213 (81.92%)
3	Total	130 (100%)	260 (100%)

$\chi 2=2.83$, df =1, P =0.09, OR =1.54 (0.92 – 2.55) (Not significant)

Table 5 shows that overall majority of mothers belonged to joint families in both groups (74.62%, 81.92% respectively). More number of cases belonged to nuclear family than the controls (25.38%, 18.08% respectively). However, this difference was statistically not significant.

Table 6: Distribution of cases and controls according to height of mother

Sr. No.	Height (cm)	Cases	Controls
1	< 145 cm	49 (37.69%)	47(18.08%)
2	$\geq$ 145 cm	81 (62.31%)	213 (81.92%)
3	Total	130 (100%)	260 (100%)

$\chi 2$=17.97, df = 1, P= 0.000 , OR= 2.74 (1.70 - 4.40) (Significant)
Table 6 shows that more number of cases had a height < 145cm than the controls (37.69 %, 18.08 % respectively).This difference was statistically significant. Mothers with a height < 145 cm showed a risk of having low birth weight baby 2.74 times that of mothers with a height ≥ 145 cm.

Table 7: Distribution of cases and controls according to postpartum weight of mother

Sr. No.	Weight (kg)	Cases	Controls
1	<45 kg	61(46.92%)	73(31.74 %)
2	≥45 kg	69 (53.08%)	157(68.26%)
3	Total	130 (100%)	260 (100%)

$\chi 2$ = 8.19, df =1, P = 0.004, OR = 1.90 (1.22 - 2.95) (Significant)
Table 7 shows that comparatively higher number of cases were having weight of < 45 kg as compared to controls (46.92%,31.74% respectively).This difference was statistically significant .Maternal weight < 45 kg showed a risk of having low birth weight baby 1.90 times that of mothers with weight ≥ 45 kg. Table 13 showed that higher number of women in both groups received 4 or more ANC visits. However, the number of women who received inadequate ANC visits was more amongst the cases (44.62%) than the controls (28.85%).The difference was statistically significant.

Table 8: Distribution of cases and controls according to adequacy of antenatal visits

Sr. No.	ANC visits	Cases	Controls
1	Inadequate	58 (44.62%)	75 (28.85%)
2	Adequate	72 (55.38%)	185 (71.15%)
3	Total	130 (100%)	260 (100%)

$\chi 2$= 9.59, df = 1, P= 0.001, OR= 1.98 (1.28 - 3.07) (Significant)
Table 8 shows that higher number of women in both groups received 4 or more ANC visits. However, the number of women who received inadequate ANC visits was more amongst the cases (44.62%) than the controls (28.85%).This difference was statistically significant. Mothers who received inadequate ANC visits showed a risk of having low birth weight baby 1.98 times that of mothers who received adequate ANC visits.

Table 9: Distribution of cases and controls according to time of antenatal registration

Sr. No.	Time of antenatal registration	Cases	Controls
1	2^{nd}, 3^{rd} trimester	41 (31.54%)	63 (24.23%)
2	1^{st} trimester	89 (68.46%)	197(75.77%)
3	Total	130 (100%)	260 (100%)

$\chi 2$= 2.36, df =1, P= 0.12, OR= 1.44(0.90-2.29) (Not significant)
Table 9 shows that registration after first trimester was seen more in case group than control group (31.54%, 24.23% respectively). However, this difference was statistically not significant.

DISCUSSION:

In present study, the incidence of low birth weight was 27.73 %, which was more than that observed in National Family Health Survey-3 (21.5%) [3]. this could be because present study was carried out in a tertiary care hospital where many of the pregnant women were referred from the peripheral centres due to high risk pregnancy.
Table 1 showed that there were more number of female babies in case group (53.08%) than control group (48.85%). However, this difference was statistically not

significant. [χ2=0.62, df = 1, P=0.43, OR=1.18 (0.77-1.80)]. A possible explanation for this finding could be small sample size of this study. This finding was in accordance with that of a study conducted by, H.S. Joshi et al [4] where proportion of low birth weight was 32.59% in males and 36.37 % in females; however this difference was found statistically insignificant. Similarly, Choudhary et al [5] (χ2=0.070,P>0.05), Sarthak Sengupta And Minakshi Barua [6] (χ2=0.42) and Selina Khatun and Mahmudur Rahman [7] found that female sex of the newborn had no association with low birth weight.

Ashtekar et al [8] concluded that there was no difference in the average birth weight of male and female babies (P>0.05). Contradictory to this, Kramer [2] found that males had a higher birth weight and lower risk of IUGR compared to females. He calculated that the relative risk of IUGR (for females) was 1.19. However, Kramer pointed out that the influence of infant sex on birth weight depends upon the population being studied, and the effect may be greater in developing countries than in developed countries.

Table 2-a, 2-b shows that most of the cases delivered at 34 wks of gestation (26.92%)followed by 35 wks of gestation(19.23%) and most of the controls delivered at 39 wks of gestation (21.92%) followed by 38 wks of gestation (20.00%). More number of cases delivered at a gestation of less than 37 wks (60.77%) as compared to controls (26.15%). This difference was statistically significant. Preterm delivery showed a risk of having low birth weight 4.37 times that of term delivery [χ2=44.21, df = 1, P=0.000, OR=4.37 (2.79-6.84)].

Similar results were seen in a study done by Shah U P et al [9] .They compared low birth weight babies with gestational age at delivery, preterm deliveries (<37 weeks) accounted for 80% as compared to 48.4% in the full term deliveries. Gestational age at delivery was found to be significantly associated with birth weight of new born (χ2= 6.37, P =0.01). Contradictory to these findings, Samiran Bisai et al [10] found that among all births 9.97% were preterm (< 37 weeks of gestation) and 90.03% were term (37- 41 weeks gestational age) neonates. Similarly, among all low birth weight babies, 80.16% were term and 19.84% were preterm.

Table 3 shows that overall most of the participants were from rural area (72.31%) More number of cases lived in a rural area (78.46 %) as compared to controls (69.23%). However, this difference was statistically not significant. [χ2=3.68, df = 1, P=0.054, OR=1.61(0.98-2.65)]. Similarly, P. S. Thomre et al [11] [P=0.96, OR=0.99 (0.60 - 1.62)] and Selina Khatun and Mahmudur Rahman [12] found no association between area of residence and low birth weight. Contradictory to our findings, Padda P. Et al [13] found that higher prevalence of low birth weight was found among mothers living in rural areas (38.0%) as compared to those living in urban areas (31.5%). This difference was found to be statistically significant (P<0.05).

Table 4 shows that higher number of mothers in both case and control group were Hindus (74.62%, 80.77% respectively) followed by Buddhists (14.62%, 10.00% respectively). 09.23% of cases were Muslims as compared to controls (08.85%). Table 5 showed that the majority of mothers belonged to joint families in both groups (74.62%, 81.92% respectively). More number of cases were belonged to nuclear family than the controls (25.38%,18.08% respectively). However, the difference was statistically not significant [X^2=2.83,df =1, P=0.09, OR=1.54 (0.92 – 2.55)]. Similar results were observed by Biswas R. Et al [14] (χ2=3.30, p>0.050) and Selina Khatun and Mahmudur Rahman [7] who found a non significant association between type of family and low birth weight.

Contradictory to our findings, Padda P. Et al [13] found that low birth weight was higher in mothers belonging to nuclear families (38.6 %) as compared with those belonging to joint families (30.9 %) (p<0.01). Similarly, Choudhary et al [5] found that nuclear families were associated with low birth weight (χ2=37.644, P = 0). Table 6 showed that majority of cases had a height < 145cm than in the controls (37.69 %, 18.08 % respectively).This difference was statistically significant. Mothers with a height less than 145 cm showed a risk of having low birth weight 2.74 times that of Mothers with a height ≥ 145 cm [χ2=17.97, D .F= 1, P= 0.000 , OR= 2.74 (1.70 - 4.40)].

In a hospital based case control study done by D.Acharya et al [15], maternal height < 145 cm was associated with a higher risk of low birth weight [OR=4.48(1.75-11.5)]. Padda P. Et al [13] found that about 77.6 % of the mothers with height < 145 cm delivered low birth weight babies whereas, among mothers with height ≥145 cm only 32.7 % delivered low birth weight (p<0.01). Contradictory to these findings, Biswas R. Et al [14] (χ2 =2.13, P>0.05) and Choudhary et al [5] (χ2= 0.4180, P > 0.05) found that maternal height <145 cm had nonsignificant association with low birth weight. The mean weight of mothers in the study group was 46.24+/-9.49 which was lower than the mean weight of mothers in the control group (49.88+/-5.59).

Table 7 showed that comparatively higher number of cases were having weight of < 45kg as compared to controls (46.92%, 31.74% respectively).The difference was statistically significant. Mothers with postpartum weight < 45 kg showed a risk of having low birth weight 1.90 times that of mothers with postpartum weight ≥ 45 kg [χ2 = 8.19, df =1, P = 0.004, OR = 1.90 (1.22 - 2.95)].

The mean weight of mothers in the study group was 46.24+/-9.49 which was lower than the mean weight of mothers in the control group (49.88+/-5.59)

These finding were consistent with the study done by M. A. Ullah et al [16], who measured maternal weight at 3rd trimester and found that maternal weight < 50 kg had statistically significant association with low birth weight ($\chi2$=23.23). In a cross sectional study done by P.S.Thombre et al [11], it was found that number of mothers with weight <40kg (postnatal weight) were more in low birth weight group (54.3%). This difference was found to be significant [OR=0.15(0.07-0.33), p<0.001].

K.S.Negi et al [17] also found that, maximum number of low birth weight babies in their study were delivered by mothers whose gestational weight at third trimester was less than 45kg (P<0.01,OR =8.2). Similar results were seen by Pandey S. Et al [18] [OR=7.0 (3.3-14.73)] and D.Acharya et al [15] where maternal weight of < 45 kg was a significant risk factor for IUGR [OR= 7.0 (3.3-14.73)]. In contrast to our study, Choudhary et al [5] revealed no significant association between maternal height ($\chi2$=0.4180, P > 0.05), maternal weight ($\chi2$= 1.832, P> 0.05) and low birth weight.

Mothers who received inadequate ANC visits showed a risk of having low birth weight 1.98 times that of mothers who received adequate ANC visits [$\chi2$= 9.59, D .F. =1, P= 0.001, OR= 1.98 (1.28 - 3.07)]. Similar results were seen in a study conducted by Selina Khatun and Mahmudur Rahman [7] where a positive effect of number of antenatal care visit on birth weight was seen. Those mothers who received 4 or more antenatal care visits gave birth to higher birth weight babies in comparison to mothers who received less than 4 antenatal care visit ($\chi2$= 268.678,p<0.001).

In a study done by S.D.Singh et al [19] ,mothers with one antenatal visit had almost six times higher risk of having a low birth weight baby in comparison to mothers who had 5 or more antenatal visits (p < 0.001). Kramer [2] found that the number of ANC visits a woman received was not a significant risk factor for delivery of a low birth weight baby. Similarly, Biswas R. Et al[14] ($\chi2$ =2.62, df =1 p>0.05), Afshan Bhatti et al [20] ($\chi2$=2.482, p<0.289) found a non significant association between total ANC visits and low birth weight.

Table 9 shows that registration after first trimester was seen more in case group than control group (31.54%, 24.23% respectively). However, this difference was statistically not significant [χ^2= 2.36, df =1, P= 0.12, OR= 1.44(0.90-2.29)]. These findings were similar to that of Biswas R. Et al [14] ($\chi2$=1.11, df=2 ,P>0.05) where most of the controls were registered at 12-16 wks(73.9%) and most of the cases were registered at gestational age of > 16 wks (33%).A non significant association was found between time of registration of pregnancy and low birth weight.

While, in studies done by Selina Khatun and Mahmudur Rahman [7] ($\chi2$=219.054, P<0.001), Deshpande Jayant D.et al [21] [OR=2.18(1.42-3.35) P=0.0004], P.S.Thombre et al [11] (P< 0.001) found that the birth weight of babies significantly influenced by the time of registration. Table 15 showed that the number of women who consumed inadequate IFA tablets were significantly higher amongst the cases than the controls (56.15%, 41.15% respectively).This difference was statistically significant. Inadequate intake of IFA tablets showed a risk of having low birth weight 1.83 times that of mothers who consumed adequate IFA tablets[χ^2= 7.84, df = 1,P = 0.005, OR= 1.83 (1.19 -2.80)].

P.S.Thomre et al [11] in their study found that mothers who had not received iron and folic acid supplementation showed a significant association with low birth weight [P= 0.002 OR=0.24(0.09 - 0.63)]. While, Selina Khatun and Mahmudur Rahman [7] found non-significant association.

CONCLUSION:

In present case control study, the incidence of low birth weight found was 27.73 %. Univariate analysis showed following factors to be significantly associated with low birth weight- Maternal age, gestational age at the time of birth, low socioeconomic status, occupation of mother, low education of mother, primiparity, parity of 4 and 5,maternal height <145 cm ,maternal weight < 45 kg,less than 4 ANC visits, inadequate intake of IFA tablets, complications during pregnancy, bad obstetric history, severe and moderate anaemia, addiction of mother, household heavy physical activity of mother.

Factors like sex of the newborn, residence, type of family, birth spacing, time of ANC registration, intake of calcium tablets, rest received in daytime, physical activity in other work done were insignificantly associated with low birth weight.

Conflict of interest: None

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