ORIGINAL ARTICLE

Assessment of maternal risk factors associated with low birth weight neonates at a tertiary hospital, Nanded, Maharashtra

Vijay Kishanrao Domple, Mohan K. Doibale[1], Abhilasha Nair, Pinkesh S. Rajput

Department of Community Medicine, Dr. Shankarrao Chavan Government Medical College, Nanded, Maharashtra, [1]Department of Community Medicine, Government Medical College, Aurangabad, Maharashtra, India

ABSTRACT

Background: To assess the maternal risk factors associated with low birth weight (LBW) neonates at a tertiary hospital, Nanded, Maharashtra. **Materials and Methods:** This study was carried out in a tertiary care hospital in Nanded city of Maharashtra between January 2014 and July 2014 among 160 cases (LBW-birth weight ≤2499 g) and 160 controls (normal birth weight-birth weight >2499. Data collection was done by using predesigned questionnaire and also related health documents were checked and collected the expected information during the interview after obtaining informed consent from mothers. The data were analyzed by Epi Info 7 Version. **Results:** The present study found the significant association among gestational age, sex of baby, type of delivery, maternal age, religion, education of mother and husband, occupation of mother and husband, type of family, maternal height, weight gain, hemoglobin level, planned/unplanned delivery, bad obstetric history, interval between pregnancies, previous history of LBW, underlying disease, tobacco chewing, timing of first antenatal care (ANC) visit, total number of ANC visit, and iron and folic acid (IFA) tablets consumption with LBW. No significant association was found among maternal age, residence, caste, consanguinity of marriage, socioeconomic status, gravida, birth order, multiple pregnancy, and smoking with LBW in our study. **Conclusion:** It was concluded that hemoglobin level, weight gain during pregnancy, gestational age, planned/unplanned delivery, bad obstetric history, and IFA tablets consumption during pregnancy were independent risk factors for LBW.

Key words: Case–control study, gestational age, low birth weight, maternal risk factors, neonates, normal birth weight

Address for correspondence:
Dr. Vijay Kishanrao Domple, Department of Community Medicine, Dr. Shankarrao Chavan Government Medical College, Vishnupuri, Nanded - 431 606, Maharashtra, India.
E-mail: drdigvijay@yahoo.co.in

INTRODUCTION

Low birth weight (LBW) is defined as weight <2500 g at birth regardless of gestational age.[1] LBW is a leading cause of prenatal and neonatal deaths, and as such it remains a worldwide issue and one of the most important public health problems particularly in developing countries.[2] National Family Health Survey-III has found that in India, 21.5% babies are born with LBW.[3] There are numerous factors contributing to LBW, both maternal and fetal. The maternal risk factors are biologically and socially interrelated; most are, however, modifiable.[4] The maternal and fetal risk factors for LBW are varying among different geographical regions. Therefore, we planned the present study to assess the maternal risk factors associated with LBW neonates at a tertiary hospital, Nanded, Maharashtra.

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MATERIALS AND METHODS

The present case–control study was carried out in the postnatal ward of a tertiary care hospital in Nanded city of Maharashtra between January and July 2014. The sample size was calculated by online sampsize calculator[5] by using odds ratio = 2, exposed controls for anemia[6] = 22.5%, alpha risk = 5%, and power = 80%. The resulting sample size was 160 each for cases and controls (Total = 320). The ratio of cases and controls was 1:1. The cases were group matched to controls for age group only (±5 years). A total of 160 cases (LBW) and 160 controls (normal birth weight-[NBW]) were selected by systematic random sampling from the total number of deliveries conducted in this hospital from January 2014 to July 2014 from the admission register of postnatal ward. Mothers who delivered a live newborn weighing ≤2499 g were chosen as cases whereas mothers who delivered a live newborn weighing >2499 g were selected as controls. According to the hospital policy, regarding the birth weight of newborn, the weights of newborns were taken immediately after birth with infant weighing scale which was calibrated periodically to minimize the instrumental error. The approval from the Institutional Ethical Committee was obtained before commencing the study. The informed consent was obtained from mother before the interview and also explained the purpose of study. Data collection was done by using predesigned questionnaire, and also the current case record sheet, previous health records, antenatal cards were checked and gathered the desired information during the interview. The study variables included in our study were sociodemographic profile of the mother like maternal age, education, occupation, consanguinity, per capita income, type of family and socioeconomic status as per the Modified BG Prasad's classification. Baby characteristics included were sex, birth weight, gestational age, and type of delivery. The constitutional factors of mother included were height, weight, and hemoglobin level. According to the World Health Organization, hemoglobin level below 11 g/dl in pregnant women constitutes anemia.[7] Obstetric history included were parity, interval between pregnancies, bad obstetric history, consumption of iron and folic acid (IFA) tablets, and antenatal care (ANC) visits during current pregnancy. The history of addiction was asked regarding consumption of alcohol and tobacco in any form. Medical risks predating pregnancy (underlying disease) was also recorded by including diabetes, urinary tract infection, premature rupture of membrane, pregnancy induced hypertension, eclampsia/preeclampsia, and others. The data was entered in excel sheet and analyzed by Epi Info 7 Version (Atlanta, Georgia, USA) for mean, standard deviation, Chi-square test, and unconditional logistic regression considering the level of significance of $P < 0.05$. The risk factors which were found statistically significant by Chi-square test, only those risk factors were selected for the unconditional logistic regression for assessing independence of maternal risk factors associated with LBW neonates.

RESULTS

The mean birth weight of LBW was 2.0584 ± 0.2888 kg and of NBW was 2.8419 ± 0.3209 kg. Among cases, mean age was 23.43 ± 3.89 years and among controls, mean age was 23.36 ± 3.477 years. Among the NBW babies, majority (98.75%) were full term whereas among the LBW babies, majority (52.50%) were preterm. This association was found to be statistically significant ($P < 0.001$). Most (59.38%) of the LBW babies were females whereas males (55%) dominated among NBW babies, and this association was statistically significant ($P = 0.01$). Maximum babies, both NBW (79.38%) and LBW (67.5%) were full term normal delivery. More than half of the mothers belonged to the age group between 19 and 23 years (55.94%), followed by 24–28 years age group (33.44%). Rural residence dominated in both case (56.88%) and control group (52.50%). Majority of cases and controls were Hindus (62.81%) and belonged to open category (39.38%). Mothers of most of the LBW babies were illiterate (37.50%) whereas mothers of most of the NBW babies were having intermediate education (21.25%). This association was found to be statistically significant ($P < 0.001$). Similarly, fathers of majority of LBW babies were illiterate (21.25%), whereas those of NBW babies were high school passed (26.88%), again a statistically significant association ($P < 0.001$).

Maximum mothers in both groups (73.13% cases and 43.13% controls) were unemployed and maximum fathers in both groups were semi-skilled workers (50% cases and 55% controls), and both these associations were found to be statistically significant ($P < 0.001$). Mothers with non-consanguineous marriage dominated in both case (73.13%) and control group (81.88%). Mothers belonging to socioeconomic status Class IV as per the Modified BG Prasad classification were in majority in both groups (34.38% cases and 45.63% controls). Most of the LBWs (46.88%) and NBWs (70%) were found in joint families with significant association ($P < 0.001$) with type of family. Average height in range of 151–160 cm was seen in both groups (62.50% cases and 63.75% controls). This association between maternal height and birth weight of babies was found to be statistically significant ($P = 0.0019$).

Mothers of most of the LBW babies (58.75%) had average weight gain of ≤7 kg whereas those of the NBW babies (98.13%) had average weight gain of 8–14 kg. This association was found to be statistically significant ($P < 0.001$). Hemoglobin level in mothers of cases (78.13%) was in the range of 8–11 g/dl and that of controls (51.25%) was >11 g/

dl with statistically significant association ($P < 0.001$) with birth weight of babies. Planned pregnancies (80%) outnumbered among LBW babies while unplanned (70%) among NBW pregnancies. Exactly half of the mothers of LBW babies were multigravida whereas in case of NBW babies, they were slightly more than half (53.13%). Among mothers of LBW babies, 16.25% had bad obstetric history and this was found to be statistically significant ($P < 0.001$).

First ordered babies topped among birth order in both case (50%) and control group (46.88%). In most of the cases (23.75%) and controls (40.63%), the interval between pregnancies was between 1 and 2 years, which was statistically significant ($P < 0.001$). Mothers of 25% LBW babies had previous LBW child, and this association was found to be statistically significant ($P < 0.001$). Among mothers of LBW babies, 1.25% had multiple pregnancy whereas none of the mothers of NBW babies had multiple pregnancy but this association was not statistically significant ($P = 0.155$).

Underlying disease was present in 51.88% cases, and this was significantly associated ($P < 0.001$) with LBW of babies. There was no significant association between both smoking ($P = 0.316$) and tobacco chewing ($P = 0.0179$) with LBW babies. None of the mothers in both case and control group gave a history of alcohol addiction. Maximum mothers in both groups (46.88% controls and 84.38% cases) had their first ANC visit before 20 weeks of gestational age. While more than half of the mothers of case group (58.13%) had <4 ANC visits, reverse is true for control (60%) with more than 4 ANC visits. The association between ANC visits and birth weight of babies was statistically significant ($P = 0.001$). More mothers in control group (94.38%) gave a history of IFA tablets consumption as compared to only 56.25% mothers in case group and this was significantly associated ($P < 0.001$) with birth weight of babies [Table 1].

Unconditional logistic regression analysis showed that the most important risk factors significantly associated with LBW neonates were hemoglobin level ($P = 0.035$), weight gain during pregnancy ($P < 0.001$), gestational age ($P < 0.001$), bad obstetric history ($P = 0.0086$), IFA tablets consumption ($P = 0.0008$), and planned/unplanned pregnancy ($P < 0.001$). It was found that mothers with hemoglobin level <8 g/dl had 3.28 times greater risk of giving birth to LBW neonates than with hemoglobin level >8 g/dl. Similarly, mothers with weight gain during pregnancy ≤7 kg had 38.10 times greater risk of giving birth to LBW neonates than with ≥8 kg weight gain mothers. The mothers of preterm neonates were 100.20 times more likely to give birth to LBW neonates than both full term and post term. Mothers with bad obstetric history were 36.64 times greater risk of giving birth to LBW neonates than who had good obstetric history and mothers with no history of IFA tablets consumption were at 8.82 times greater risk of giving birth to LBW neonates [Table 2].

DISCUSSION

The present study was conducted to assess the maternal risk factors to LBW neonates. The gestational age (preterm/full term/post term) was significantly associated with LBW in our study. This finding about gestational age was consistent with the findings by Sengupta *et al*.,[8] Sutan *et al*.,[9] Ghani *et al*.,[10] and Bendhari and Haralkar.[11] The type of delivery (Full term normal delivery/cesarean section/assisted delivery) was significantly associated with LBW in our study. Only Bendhari and Haralkar[11] showed the similar findings but contrast findings were reported by Deshpande *et al*.[6] and Singh *et al*.[12] regarding type of delivery.

The maternal age (19–38 years) was not significantly associated with LBW in our study and also similar findings were showed by Matin *et al*.,[13] Sengupta *et al*.,[8] Deshpande *et al*.,[6] Singh *et al*.[12] whereas significant association was noted by several studies.[2,9,11,14-17] The residence (urban/rural) was not significantly associated with LBW in our study as well as similar findings reported by Matin *et al*.[13] However, contrast findings about residence were showed by Ghimire *et al*.[16] and Nagargoje *et al*.[18]

The caste was not significantly associated with LBW as well as similar findings was showed by Singh *et al*.[12] The education of mothers was significantly associated with LBW and similar findings were reported by many studies[2,4,6,10,11,13,15,19,20] whereas contrast findings were revealed by Bhatti *et al*.,[17] Sengupta *et al*.,[8] and Nagargoje *et al*.[18] The education of husband was significantly associated with LBW in the present study but not significant association was reported by Nagargoje *et al*.[18]

The occupation of mothers was significantly associated with LBW in our study, and similar findings were showed by Deshpande *et al*.,[6] Viengsakhone *et al*.,[2] Matin *et al*.,[13] and Bendhari and Haralkar[11] but contrast findings were revealed by Rizvi *et al*.[4] and Nagargoje *et al*.[18] The consanguinity of marriage was not significantly associated with LBW in our study and same finding was showed by Rafati *et al*.[20]

The socioeconomic status by the Modified BG Prasad's classification was not significantly associated with LBW in the present study and similar findings were reported by Sengupta *et al*.,[8] Nagargoje *et al*.,[18] and Bhatti *et al*.[17] however, significant association with LBW was revealed by Matin *et al*.,[13] Bendhari and Haralkar,[11] Deshpande *et al*.,[6] Mumbare *et al*.,[21] and Dalal *et al*.[15] The type of family (Nuclear/Joint/Three generation) was significantly associated with LBW in our study as well as similar findings by Bendhari and Haralkar[11] but contrast finding was reported by Deshpande *et al*.[6]

Table 1: Distribution of risk factors for low birth weight

Variable	Total (*n*=320) (%)	Birth weight (kg)		χ^2	*P*
		<2.5	>2.5		
Gestational age					
Preterm	86 (26.88)	84 (52.50)	2 (1.25)	114.34	<0.001
Full term	230 (71.88)	72 (45.0)	158 (98.75)		
Post term	4 (1.25)	4 (2.5)	0 (0)		
Sex					
Male	153 (47.81)	65 (40.63)	88 (55)	6.625	0.010
Female	167 (52.19)	95 (59.38)	72 (45)		
Type of delivery					
FTND	235 (73.44)	108 (67.5)	127 (79.38)	11.107	0.0039
Cesarean section	77 (24.06)	44 (27.5)	33 (20.63)		
Assisted delivery	8 (2.50)	8 (5.0)	0 (0)		
Maternal age (years)					
19-23	179 (55.94)	83 (51.88)	96 (60.00)	4.143	0.246
24-28	107 (33.44)	60 (37.50)	47 (29.38)		
29-33	27 (8.44)	12 (7.50)	15 (9.38)		
34-38	7 (2.19)	5 (3.13)	2 (1.25)		
Residence					
Urban	145 (45.31)	69 (43.13)	76 (47.50)	0.618	0.432
Rural	175 (54.69)	91 (56.88)	84 (52.50)		
Religion					
Hindu	201 (62.81)	96 (60.00)	105 (65.63)	11.488	0.009
Buddhist	46 (14.38)	33 (20.63)	13 (8.13)		
Muslim	72 (22.50)	31 (19.38)	41 (25.63)		
Christian	1 (0.31)	0 (0)	1 (0.63)		
Caste					
Open	126 (39.38)	60 (37.50)	66 (41.25)	5.700	0.127
OBC	67 (20.94)	39 (24.38)	28 (17.50)		
SC	117 (36.56)	59 (36.88)	58 (36.25)		
ST	10 (3.13)	2 (1.25)	8 (5.00)		
Education of mother					
Illiterate	86 (26.88)	60 (37.50)	26 (16.25)	31.914	<0.001
Primary	61 (19.06)	29 (18.13)	32 (20.00)		
Middle	55 (17.19)	33 (20.63)	22 (13.75)		
High school	47 (14.69)	18 (11.25)	29 (18.13)		
Intermediate	47 (14.69)	13 (8.13)	34 (21.25)		
Graduate	24 (7.50)	7 (4.38)	17 (10.63)		
Education of father					
Illiterate	42 (13.13)	34 (21.25)	8 (5.00)	29.108	<0.001
Primary	51 (15.94)	29 (18.13)	22 (13.75)		
Middle	47 (14.69)	18 (11.25)	29 (18.13)		
High school	74 (23.13)	31 (19.38)	43 (26.88)		
Intermediate	65 (20.31)	23 (14.38)	42 (26.25)		
Graduate	36 (11.25)	22 (13.75)	14 (8.75)		
Professional	5 (1.56)	3 (1.88)	2 (1.25)		
Occupation of mother					
Unemployed	186 (58.13)	117 (73.13)	69 (43.13)	38.076	<0.001
Unskilled worker	47 (14.69)	9 (5.63)	38 (23.75)		
Semiskilled worker	62 (19.38)	23 (14.38)	39 (24.38)		
Skilled worker	15 (4.69)	5 (3.13)	10 (6.25)		
Semiprofessional	9 (2.81)	6 (3.75)	3 (1.88)		
Professional	1 (0.31)	0 (0)	1 (0.63)		
Occupation of father					
Unemployed	5 (1.56)	5 (3.13)	0 (0)	25.872	<0.001
Unskilled worker	47 (14.69)	17 (10.63)	30 (18.75)		
Semiskilled worker	168 (52.50)	80 (50.00)	88 (55.00)		
Skilled worker	70 (21.88)	33 (20.63)	37 (23.13)		
Semiprofessional	24 (7.50)	22 (13.75)	2 (1.25)		
Professional	6 (1.88)	3 (1.88)	3 (1.88)		

Contd...

Table 1: Contd...

Variable	Total (*n*=320) (%)	Birth weight (kg)		χ^2	*P*
		<2.5	>2.5		
Consanguinity					
Non-consanguineous	248 (77.50)	117 (73.13)	131 (81.88)	3.513	0.061
Consanguineous	72 (22.50)	43 (26.88)	29 (18.13)		
Socioeconomic status					
I	9 (2.81)	3 (1.88)	6 (3.75)	6.591	0.159
II	46 (14.38)	25 (15.63)	21 (13.13)		
III	84 (26.25)	45 (28.13)	39 (24.38)		
IV	128 (40.00)	55 (34.38)	73 (45.63)		
V	53 (16.56)	32 (20.00)	21 (13.13)		
Type of family					
Nuclear	94 (29.38)	63 (39.38)	31 (19.38)	18.855	<0.001
Joint	187 (58.44)	75 (46.88)	112 (70.00)		
Three generation	39 (12.19)	22 (13.75)	17 (10.63)		
Maternal height (cm)					
≤140	6 (1.88)	4 (2.50)	2 (1.25)	14.947	0.0019
141-150	93 (29.06)	54 (33.75)	39 (24.38)		
151-160	202 (63.13)	100 (62.50)	102 (63.75)		
≥161	19 (5.94)	2 (1.25)	17 (10.63)		
Weight gain (kg)					
≤7	96 (30.00)	94 (58.75)	2 (1.25)	126.30	<0.001
8-14	223 (69.69)	66 (41.25)	157 (98.13)		
≥15	1 (0.31)	0 (0)	1 (0.63)		
Hemoglobin level (g/dl)					
<8	21 (6.56)	21 (13.13)	0 (0)	80.048	<0.001
8-<11	203 (63.44)	125 (78.13)	78 (48.75)		
≥11	96 (30.00)	14 (8.75)	82 (51.25)		
Planned/unplanned delivery					
Planned	176 (55.00)	128 (80.00)	48 (30.00)	80.808	<0.001
Unplanned	144 (45.00)	32 (20.00)	112 (70.00)		
Gravida					
Primigravida	155 (48.44)	80 (50.00)	75 (46.88)	0.313	0.576
Multigravida	165 (51.56)	80 (50.00)	85 (53.13)		
Bad obstetric history					
Present	27 (8.44)	26 (16.25)	1 (0.63)	25.281	<0.001
Absent	293 (91.56)	134 (83.75)	159 (99.38)		
Birth order					
First	155 (48.44)	80 (50.00)	75 (46.88)	2.471	0.650
Second	105 (32.81)	47 (29.38)	58 (36.25)		
Third	44 (13.75)	23 (14.38)	21 (13.13)		
Fourth	10 (3.13)	6 (3.75)	4 (2.50)		
Fifth	6 (1.88)	4 (2.50)	2 (1.25)		
Interval between pregnancies					
None	155 (48.43)	80 (50)	75 (46.87)	17.26	<0.001
1–2	103 (32.18)	38 (23.75)	65 (40.63)		
2–3	41 (12.81)	25 (15.63)	16 (10.00)		
3–4	16 (5.00)	13 (8.13)	3 (1.88)		
≥5	5 (1.56)	4 (2.50)	1 (0.63)		
Previous LBW (*n*=165 as 155 primigravida were excluded)					
Yes	24 (14.54)	20 (25)	4 (4.70)	13.66	<0.001
No	141 (85.45)	60 (75)	81 (95.29)		
Multiple pregnancy					
Yes	2 (0.63)	2 (1.25)	0 (0)	2.012	0.155
No	318 (99.38)	158 (98.75)	160 (100)		
Underlying disease					
Present	134 (41.88)	83 (51.88)	51 (31.88)	13.147	<0.001
Absent	186 (58.13)	77 (48.13)	109 (68.13)		

Contd...

Table 1: Contd...

Variable	Total (*n*=320) (%)	Birth weight (kg)		χ^2	*P*
		<2.5	>2.5		
Smoking					
Yes	1 (0.31)	0 (0)	1 (0.63)	1.003	0.316
No	319 (99.69)	160 (100)	159 (99.38)		
Alcohol					
Yes	0 (0)	0 (0)	0 (0)		
No	320 (100)	160 (100)	160 (100)		
Tobacco chewing					
Yes	40 (12.50)	27 (16.88)	13 (8.13)	5.600	0.0179
No	280 (87.50)	133 (83.13)	147 (91.88)		
First ANC visit					
No ANC visit	23 (7.19)	23 (14.38)	0 (0)	55.878	<0.001
≤20 weeks	210 (65.63)	75 (46.88)	135 (84.38)		
>20 weeks	87 (27.19)	62 (38.75)	25 (15.63)		
Number of ANC visit					
≤4	157 (49.06)	93 (58.13)	64 (40.00)	10.516	0.001
>4	163 (50.94)	67 (41.88)	96 (60.00)		
IFA tablets consumption					
Yes	241 (75.31)	90 (56.25)	151 (94.38)	62.541	<0.001
No	79 (24.69)	70 (43.75)	9 (5.63)		

IFA – Iron and folic acid; ANC – Antenatal care; LBW – Low birth weight; FTND – Full term normal delivery

Table 2: Unconditional logistic regression analysis of risk factors for low birth weight

Risk factors	OR	CI		*P*
		Lower	Upper	
Hemoglobin	3.282	1.085	9.926	0.035
Weight gain	38.107	6.879	211.079	<0.001
Gestational age	100.201	14.674	684.18	<0.001
First ANC visit	1.034	0.663	1.610	0.882
Education of case	0.584	0.143	2.377	0.453
Education of husband	6.500	0.923	45.749	0.060
Occupation of case	1.732	0.657	4.567	0.266
Occupation of husband	356.532	0.000	>1.0E12	0.982
Bad obstetric history	36.643	2.493	538.479	0.0086
IFA tablets consumption	8.820	2.479	31.374	0.0008
Planned/unplanned				
Pregnancy	0.054	0.017	0.166	<0.001
Underlying disease	0.772	0.265	2.243	0.634

OR – Odds ratio; CI – Confidence interval; IFA – Iron and folic acid; ANC – Antenatal care

The maternal height (≤140 cm to ≥161 cm) was significantly associated with LBW in the present study, and similar findings were reported by several studies.[6,11,12,18,19,21] However, contrast findings were showed by Sutan *et al*.,[9] Matin *et al*.,[13] and Sengupta *et al*.[8] The weight gain (≤7 kg to ≥15 kg) during pregnancy was significantly associated with LBW in the present study, and similar findings were reported by Sengupta *et al*.,[8] Mumbare *et al*.,[21] Singh *et al*.,[12] Sutan *et al*.,[9] and Ghani *et al*.[10]

The haemoglobin level (<8 g/dl to ≥11 g/dl) during pregnancy was significantly associated with LBW in our study, and similar findings were reported by many studies,[6,11-15,18,19,21] however, contrast findings were showed by Bhatti *et al*.[17] and Sengupta *et al*.[8] The planned/unplanned delivery was significantly associated with LBW in our study but Rafati *et al*.[20] showed that significant association was observed between planned/unplanned pregnancy and LBW.

The gravida (primigravida/multigravida) was not significantly associated with LBW in the present study, and similar findings were reported by Deshpande *et al*.[6] and Sutan *et al*.,[9] however, contrast findings were showed by Bendhari and Haralkar.[11] The bad obstetric history was significantly associated with LBW in the present study and similar findings were observed by Deshpande *et al*.[6] and Ghimire *et al*.,[16] however, contrast findings were reported by Bendhari and Haralkar[11] and Sengupta *et al*.[8] The birth order was not significantly associated with LBW in our study but significant association was reported by Viengsakhone *et al*.[2]

The interval between pregnancies was significantly associated with LBW in our study, and similar findings were showed by many studies[6,10,11,15,17-21] however, contrast findings were reported by Sengupta *et al*.,[8] Sutan *et al*.,[9] and Ganesh Kumar *et al*.[14] The previous LBW was significantly associated with LBW in the present study whereas similar findings reported by Sutan *et al*.,[9] Ghani *et al*.,[10] and Rafati *et al*.[20] The multiple pregnancy was not significantly associated with LBW in our study, but contrast finding was revealed by Ghani *et al*.[10]

The underlying disease during pregnancy such as diabetes, pregnancy-induced hypertension, and eclampsia/preeclampsia was significantly associated with LBW in the present study and similar finding was noted by Rafati *et al*.,[20] but no significant association was showed

by Sengupta *et al*.[8] Tobacco chewing was significantly associated with LBW in the present study. Similar findings were reported by Deshpande *et al*.,[6] Mumbare *et al*.,[21] Dalal *et al*.,[15] however, contrast findings was suggested by Nagargoje *et al*.[18] The timing of first ANC visit was significantly associated with LBW in our study and similar findings were reported by Ghani *et al*.,[10] Anjum *et al*.,[19] and Bendhari and Haralkar,[11] however, contrast finding was showed by Nagargoje *et al*.[18]

Total number of ANC visit was significantly associated with LBW in the present study, and similar findings were showed by many studies,[6,11,12,15,19] however, contrast findings were reported by Bhatti *et al*.,[17] Rizvi *et al*.,[4] Ganesh Kumar *et al*.,[14] and Nagargoje *et al*.[18] The IFA tablets consumption was significantly associated with LBW in our study and Matin *et al*.[13] showed the significant association between iron and vitamin consumption as well as Rizvi *et al*.[4] reported significant association between only iron consumption and LBW.

In this study, there was a significant association of religion and occupation of husband with LBW whereas no significant association of smoking with LBW, but we could not find any study to relate. No mother had given history of alcohol addiction in our study.

We tried to minimize the recall bias for most of the factors by cross verifying the related documents such as ANC card and previous health records, however, we could not verify the factors such as smoking, alcohol, tobacco chewing, and IFA tablets consumption during pregnancy. Instrument bias was minimized by calibrating the instrument (infant weighing scale) periodically.

CONCLUSION

The present study found the significant association among gestational age, sex of baby, type of delivery, maternal age, religion, education of mother and husband, occupation of mother and husband, type of family, maternal height, weight gain during pregnancy, hemoglobin level, planned/unplanned delivery, bad obstetric history, interval between pregnancy, previous history of LBW, underlying disease, tobacco chewing, timing of first ANC visit, total number of ANC visit, and IFA tablets consumption with LBW. The study also found that hemoglobin level, weight gain during pregnancy, gestational age, planned/unplanned delivery, bad obstetric history, and IFA tablets consumption during pregnancy were independent risk factors for LBW.

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Conflicts of interest
There are no conflicts of interest.

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