Annals of Community Health (AoCH) pISSN 2347-5455 | eISSN 2347-5714
An Indexed (Index Medicus, DOAJ and More), Peer Reviewed, Quarterly, International Journal
focusing exclusively on Community Medicine and Public Health

ORIGINAL RESEARCH ARTICLE

Multivariate Analysis of the Factors affecting Low Birth Weight-A Case-Control Study in a Tertiary hospital of Central India

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Abstract:
Introduction: India accounts for 40 per cent of low birth weight (LBW) in the developing world. The etiology LBW is also complex with demographic, nutritional, reproductive, and socio-economic factors, each potentially playing a role. In this context, this study aims to identify various socio demographic and maternal factors associated with LBW. **Methodology:** A case control study was done involving 200 cases (mothers having LBW singleton babies) and 200 controls (mothers having normal birth weight singleton babies) in a tertiary care hospital of Indore District. The study population was administered a pre-designed, pre-tested, semi-structured interview schedule which enquired into various demographic and socio-economic variables, maternal factors and health care utilization during pregnancy. Data was analyzed using SPSS version 20, regression analysis was done to find out key factors affecting birth weight under socio-economic factors, maternal factors and health care utilization factors. **Results:** Key Socio economic variables affecting birth weight were place of residence, religion and the type of family. Maternal variables affecting LBW were maternal anemia, complications during pregnancy, gestational length, weight gain of the mother and maternal height. The health care utilization parameters affecting LBW were timing of registration of pregnancy, adequate number of ANC visits and consumption of IFA tablets. **Conclusion:** .Study findings suggest that there is an urgent need to improve health literacy of women on various aspects of pregnancy and further training needs to be imparted to field level health workers to improve their communication skills as well as their ability to identify and manage high risk pregnancies.
Key words: Low Birth Weight (LBW), socio-economic factors, maternal factors, health literacy

INTRODUCTION

Low birth weight has been defined by the World Health Organization (WHO) as weight at birth of less than 2,500 grams (5.5 pounds) (1). A baby's low weight at birth is either the result of preterm birth (before 37 weeks of gestation) or of restricted foetal (intrauterine) growth (2). Low birth weight is closely associated with foetal and neonatal mortality and morbidity, inhibited growth and cognitive development, and chronic diseases later in life (3). India alone accounts for 40 per cent of low birth weight in the developing world and more than half of those in Asia (4).

The etiology LBW is complex with demographic, nutritional, reproductive, and socio-economic factors, each potentially playing a role. Some of the causes listed are maternal haemoglobin (Hb) level, maternal nutrition, economic condition, antenatal care, parent's education, tobacco use, maternal age and parity (5). In this context, this study aims to identify various socio demographic and maternal factors associated with LBW.

METHODOLOGY

This was a case –control study conducted in biggest tertiary care Government Medical College hospital of Central India in Indore District. The cases were defined as mothers of low birth weight babies with singleton pregnancies consenting for the study and the controls were mothers of normal weight babies with singleton pregnancies delivering during the same period consenting for the study. The birth weight of child was measured in grams within one hour after delivery. **B**irth weight less

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Annals of Community Health. 2016;4(3):18

Table1: Association of various socioeconomic variables and birth weight

Variables	Mothers of low birth weight baby	Mothers of normal birth weight baby	p-value
MOTHER'S AGE			
18 -25 years	156	156	u value19336.000, p-value=0.75
25-30 years	32	40	
>30 years	12	4	
EDUCATION OF MOTHER			
Illiterate	80	44	u value 16304, p-value=0.003
Primary school	24	20	
Middle school or higher	96	136	
PLACE OF RESIDENCE			
Rural	116	72	chi=17.8, p-value=0.000
Urban	84	128	
RELIGION			
Islam	44	64	chi=5.07, p-value=0.021
Hindu	156	136	
TYPE OF FAMILY			
Joint	156	124	chi=12.2, p-value=0.000
Nuclear	44	76	
SOCIO ECONOMIC STATUS			
Middle	4	8	u value 16528.000, p-value=0.000
Lower Middle	140	164	
Lower	56	28	

Table 2: Multivariate analysis of Effect of selected Socio Economic Variables on Birth Weight

Parameter	B	S.E.	Wald	df	Sig.	Exp(B)
Place of residence	.577	.229	6.368	1	.012	1.781
Religion	-.756	.250	9.127	1	.003	.470
Education of mother	.090	.094	.906	1	.341	1.094
Type of family	.678	.255	7.075	1	.008	1.970
Socio economic status	-.453	.314	2.089	1	.148	.636
Constant	1.218	1.615	.569	1	.451	3.381

than 2500 grams was labelled as Low Birth Weight. The mothers delivering babies of more than 4 kilograms or babies with congenital anomalies or twin babies were excluded from the study.

Sample size was estimated using software Epi Info 7.0 version and cross-checked using software master 2.0 version. The sample size estimation was done taking 80% power, 5% alpha error, and 2 as anticipated odds ratio.200 cases and the same numbers of controls were included in the study. The first 200 cases along with first identified 200 controls during the study period who gave consent were included.

The study population was administered a pre-designed, pretested, semi-structured interview schedule which enquired into various demographic and socioeconomic variables like age , education of mother, place of residence, socio economic status, type of family, religion and maternal factors like maternal height, weight, weight gain during pregnancy, presence of risk factors like anemia, pregnancy induced hypertension, gestational diabetes, previous bad obstetric history, addictions, nutrition throughout pregnancy, parity of mother, birth order of child, birth intervals between babies, gestational length, type of delivery and health care utilization parameters

Table 3: Association of various maternal variables and birth weight

Variables	Mothers of low birth weight baby	Mothers of normal birth weight baby	p-value
Height			
Less than 145 cm	88	56	chi square-8.7, p-value=0.003
More than 145 cm	112	144	
Mother's weight*			
Less than 40 kg	20	16	u value-18112, p-value=0.299
40 -45 kg	80	76	
More than 45 kg	48	108	
Weight gain			
<7kg	136	100	chi-68.391, p-value=.000
7-11 kg	12	100	
Food intake during pregnancy			
More than normal	108	148	uvalue-12880, p-value=0.01
Less than normal	32	32	
As before	60	20	
Maternal haemoglobin			
>11 gm % (no anemia)	48	88	u-value-7808, p-value-.000
10 – 11 gm% (mild anemia)	40	76	
7 -10 gm% (moderate anemia)	92	36	
<7 gm % (severe anemia)	20	0	
Parity			
P1	76	92	u value13464, p-value=0.270
P2	64	64	
P3	60	44	
Birth order			
First birth	80	92	uvalue-13912, p-value=0.303
Second birth	64	68	
Third birth and above	56	40	
Birth interval			
< 24 months	28	8	uvalue-14488,p-value=0.702
25-36 months	32	36	
>36 months	60	64	
Not applicable (p1)	80	92	
Gestational length			
Preterm	76	12	uvalue-11260,p-value=0.000
Term	120	188	
Post term	4	0	

Table continued in next page

like time of registration,no of antenatal visits and intake of iron folic acid tablets. Questionnaire was translated into Hindi and back translated to English. Mothers were interviewed by researchers only.

Data was entered into Microsoft excel spread sheet and analysed using SPSS version 20. Appropriate test of significance like chi-square and Mann-Whitney u were applied wherever necessary. The p-value of less than .05 was considered significant. Multivariate analysis was done using variables found to be having significant difference between case and control groups with chi-square and Mann-Whitney u tests to identify key

Table 3(cont): Association of various maternal variables and birth weight

Variables	Mothers of low birth weight baby	Mothers of normal birth weight baby	p-value
Type of delivery			
Normal	92	76	chi-2.63,
Caesarean	108	124	p-value=.78
Previous bad obstetric history			
Abortion	28	20	
Still birth	4	4	
Neonatal death	8	4	
Previous LBW deliveries	12	0	
No such history	148	156	
Addiction habits			
No addiction	184	188	
Smoking	4	12	p--value=.646
Alcohol	12	0	
Complications during pregnancy			
Pre eclampsia	8	0	
Eclampsia	24	4	
Excessive vomiting	4	0	
Edema	4	0	p-value-.000
UTI	0	4	
Bleeding	20	4	
No complications	140	188	

Table 4: Regression analysis of Effect of selected maternal factors on Birth Weight

	B	S.E.	Wald	df	Sig.	Exp(B)
Maternal Haemoglobin	-0.991	0.188	27.827	1	0	.371
Weight gain	3.414	0.642	28.309	1	0	30.384
Height	0.634	0.321	3.889	1	0.049	1.884
Complications during pregnancy	0.744	0.129	33.11	1	0	2.104
Food intake during pregnancy	-0.315	0.222	2.013	1	0.156	.730
Gestational length	0.795	0.386	4.238	1	0.04	2.215
Constant	-9.107	1.699	28.726	1	0	.000

Table 5: Regression analysis of Effect of selected health care utilization factors on Birth Weight

	B	S.E.	Wald	df	Sig.	Exp(B)
Initiation of ANC	-1.121	0.219	26.272	1	0	0.326
No of ANC visits	0.746	0.313	5.668	1	0.017	2.108
Use of IFA tablets	-0.854	0.367	5.418	1	0.02	0.426
Constant	1.18	1.208	0.955	1	0.328	3.256

variables affecting the birth weight.

RESULTS

In the study sample mean birth weight of LBW babies was 1.80 kg with SD of 0.404 and of normal birth weight babies was 2.90kg with SD of .463. Majority of (78%) the study population in both the groups belonged to age group of 18-25 years. There was no significant association between maternal age and birth weight (p value =.0.75).About 40%of mothers of low birth weight babies were illiterate, 48% had an education of middle school and above, whereas educational qualification of mothers of normal birth babies was significantly better with only 22%being

illiterate and 68% with an education of middle school and above (p-value=0.003).About 58%of mothers of LBW babies belonged to rural areas whereas 64% of mothers of normal weight babies resided in urban areas(p-value =0.000).There was a significant difference between the two groups with regards to religion(p-value= 0.021), type of family(p-value= 0.000)and socio economic status(p-value= 0.000) also. On applying logistic regression taking these entire variables, key variables affecting birth weight were place of residence, religion and the type of family as seen in Table2.

There was a significant difference seen between the two groups with regards to maternal height (p-value=0.003) however no difference was observed with regards to maternal weight in the beginning of pregnancy (p-value=0.299). A significant difference was seen between the two groups with regards to weight gain during pregnancy (p-value=.000). Only 54% mother's of LBW baby increased food intake during pregnancy as compared to74% mothers of normal birth weight babies(p-value=0.01). The prevalence of anaemia was high in both the groups and the overall prevalence being 68%. 76 % mothers of LBW baby suffered from anaemia, as compared to56% mothers of normal birth weight babies(p-value=.000). 30% mothers of LBW babies had some complications during pregnancy while only 6% mothers of normal birth weight babies did so (p-value=.000). The commonly reported complications were pre-eclampsia, eclampsia, excessive vomiting and ante partum bleeding. 38% of LBW babies were preterm while only 6% of normal birth weight babies were preterm (p-value=0.000).

There was no significant differences seen between the two groups with regards to parity of mother (p-value=0.27), birth order of the child(p-value=0.303), birth interval(p-value=0.702), previous bad obstetric histories(p-value=0.8), addictions in mother(p-value=0.64) and the type of delivery(p-value=0.78).

On applying binary logistic regression using variables weight gain, food intake during pregnancy, maternal anaemia, complications during pregnancy, maternal height and gestational length, key variables affecting birth weight were maternal anaemia, complications during pregnancy, gestational length, weight gain and maternal height.

About 72% mothers of normal weight babies had registered their pregnancies in the first trimester as compared to 32% mothers of low birth weight babies(p-value=0.000). Many of mothers of LBW babies (32%)had registered their pregnancies in the third trimester. Only 32% mother's of low birth weight babies received adequate no of ANC visits (4 or more visits have been considered adequate) while 78% mothers of normal birth weight babies did so(p-value=0.000). 70% mothers of low birth weight babies had taken Iron Folic Acid tablets while 92% mother's of normal birth weight baby did so(p-value=.000). Most of them (68%) who did not take the tablets cited side-effects of the tablets for their non-consumption and few felt it was not necessary to take them (31%). On applying binary logistic regression using variables timing of registration of pregnancy, adequate number of ANC visits, consumption of IFA tablets, all the variables were significantly affecting the outcome.

DISCUSSION

In the present study, maternal age had no significant association with LBW which is consistent with studies conducted by Mavalankar et al (6) in India, Fikree and Berenes (7) in Pakistan and Bhaskar et al in Nepal(8).In the present study proportion of low birth weight increased significantly with decrease in educational status as shown by a study done by M W Khan et al in Pakistan (9). In the present study proportion of low birth weight was higher in people residing in rural areas, those belonging to low socioeconomic status and those coming from joint family, findings being similar to a study done in Uttar-Pradesh (10). Accessibility and affordability are major issues that need to be addressed for better utilization of health care.

The association found between maternal height and LBW in this study is similar to other studies (8, 11), but it contrasted with findings of another study (12). A significant difference was observed between the two groups with regards to weight gain and many mothers of low birth weight babies had not increased their food intake during pregnancy. The findings were similar to studies done in Tamil-Nadu and Mumbai (13, 14). A significant association was seen between anaemia and low birth weight which is similar to many

studies (6,8,10,13,15) thus documenting an immense need to address the issue of maternal anaemia with rigorous efforts. In this study mothers having complications of pregnancy especially gestational hypertension were more likely to have low birth weight babies which was similar to studies done by Malvankar et al in Ahmedabad (6). Low gestational age is a risk factor contributing to LBW infants (16, 17, 18).

In the present study birth weight was not significantly affected by variables like parity of mother, interval of pregnancies, addictions, bad obstetric history and type of delivery. These findings were similar to a study done by Yadav et al (19) however in contrast with Roy et al (20) and Mumbare et al (21).

The timing of the first ANC visit was found to be significantly associated with LBW in this study and it was in accordance with the studies by Kercher (22) and Bhaskar et al (8) but in contrast with Yadav et al (19). Bhaskar et al (8) and Singh et al (11) support the finding of this study that LBW was found to be significantly associated with the total number of ANC visits. Intake of iron supplements during pregnancy was found to have a protective effect with respect to LBW in this study which is consistent with Rizvi et al (15) and Bhaskar et al (8).

On multivariate analysis factors affecting the birth weight were place of residence, religion, the type of family, maternal anaemia, complications during pregnancy, gestational length, weight gain, maternal height, timing of registration of pregnancy, adequate number of ANC visits, and consumption of IFA tablets.

CONCLUSION

Integrated and complementary strategies are needed to address the major causes of LBW. The attention needs to be given on improving the health literacy of women on issues regarding nutrition during pregnancy, anaemia and the need for its prevention and correction, and importance of antenatal care.

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