



Socioeconomic Determinants of Mothers for Low Birthweight Newborns in Rural and Peri-Urban Areas of Birbhum District, West Bengal, India.

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ABSTRACT

Background

Low birth weight (LBW) is a major public health problem worldwide especially in low and middle income countries. Several international studies have indicated an association between maternal socioeconomic deprivation levels and adverse birth outcomes. Factors associated with birth weight operate broadly through genetic, socio-demographic and environmental channels.

Objective

The objective of this study is to identify significant socio-economic determinants of mothers associated with LBW babies in rural and peri-urban areas of Birbhum district, West Bengal.

Materials and Methods

The study consisted of women who participated in 3 blocks of Birbhum district (Suri 1, Rajnagar and Md Bazar) between the months of March to November 2023 who gave birth in last 2 years. Logistic regression analysis was used to estimate the association between maternal and socioeconomic factors with low birth weight. Data were analyzed by using STATA software. The out-off level of significant was chosen at $p < 0.05$.

Results

The overall prevalence of low birth weight was 19.30 % among boys and 22.38% among girls. Low birth weight was associated with maternal factors like maternal age of 20-35 years at birth (adjusted OR: 1.56, 95% CI: .94 2.60) and >35 years (adjusted OR: .98, 95% CI: .34 2.82), maternal education graduation and above (adjusted OR: .58, 95% CI: .15 2.20) and upper quintile of maternal households (adjusted OR: 2.64, 95% CI: 1.08 6.45).

Conclusion

Adequate attention should be given to the mother's nutritional status. Programs on maternal health services can be merged with maternal nutrition to bring about an overall decline in the LBW of children in India.

Key Words: Low birth weight, maternal socioeconomic factors

Introduction

The global rate of LBW is estimated to be 14.6%, with higher rates in developing countries (Blencowe et al., 2019). Most women's desire to work out of home often means delaying marriage and pregnancy until older years, which affects the person's health and ultimately the society, as well [Bonzini M et al, 2009]. In developing countries, the low birth weight rate is twice as high than in developed countries with 16.5% against 7%. Despite progress in socio-economic and health care in recent decades, the proportion of low birth weight infants is still high, and is even increasing in some countries [Muglia LJ, et al, 2010]. The majority of LBW occurs in low and middle-income countries, and it occurs to the marginalized and vulnerable sub-population groups [Chawanpaiboon S, et al, 2019, UNICEF and WHO, 2004].

Low birth weight (LBW), defined as a birth weight less than 2500g, is a significant risk of death and disability [Glass HC, 2015]. The mother's nutritional deficiency and poor healthcare services put the baby at risk, such as preterm birth or LBW. Further, providing reproductive health services such as contraception to delay age at first pregnancy and to increase intervals between births can reduce the chance of delivering an LBW newborn [Park H-J, 1995-2010, Conde-Agudelo A, 2006, Moreira AIM, 2018]. In India, women have been historically deprived on multiple socio-political and economic grounds that have further put their children at high risk, such as preterm birth and LBW [Chellan R, 2007, Park H-J, 2015, Mavalankar DV, 1992].

Methods

Mothers (aged 14 to 40 years) of 421 low birth weight newborns were interviewed by a self-designed questionnaire in the study area consisted by 3 blocks, Suri-1, Rajnagar and Md Bazar in Birbhum district, West Bengal. Infant's LBW (<2500 grams) as outcome variable was examined in association with all independent predictors as maternal household wealth status, religion, caste, age, education, sanitation, antenatal care received, iron and folic acid tablets taken and exclusive breastfeeding. Multivariable logistic regression examined the association between each socioeconomic variable and each outcome separately adjusting for maternal age, maternal education, type of house, type of fuel used in cooking, wealth index, skill birth attendant in delivery, number antenatal care etc.

Outcome variable

The outcome variable in this study was LBW, measured by grams based on the WHO cutoff (birth weight < 2500 g), and recorded a binary response variable with a membership class label: LBW and non-LBW. The membership class label was coded as "0" for LBW and "1" for non-LBW.

Explanatory Variables

Religion was coded as Hindu, Muslim, and Christian and other. Caste was recorded as Scheduled Tribes, Scheduled Castes, Other Backward Classes and others. The Scheduled Castes include a group of the population that is socially segregated and financially/economically by their low status as per Hindu caste hierarchy. The Other Backward Classes are considered low in the traditional caste hierarchy, but include the intermediate socioeconomic groups. The "others" caste category is identified as those having higher social status.

Iron and folic tablets once daily for 100 days, starting after 12 weeks (first trimester) of pregnancy, and hence a total of 100 tablets are to be dispensed. In the research, the authors divided the period into two categories, those who have taken below 100 tablets and those who have taken 100 tablets and more.

Houses made from mud, thatch, or other low-quality materials are called kuccha houses, houses that use partly low-quality and partly high quality materials are called semi-pukka houses, and houses made with high quality materials throughout, including the floor, roof, and exterior walls, are called pukka houses.

Again, in the study, sanitary latrine has been divided into no toilet, pit latrine and sanitary latrine. Open defecation is identified as no toilet.

Type of fuel used has been divided into LPG, coal/gul, wood, electricity, and straw/shrubs/grass and dung cakes.

In the formation of the quintile, five groups have been created such as poor, poor middle, middle, upper middle, and upper. Quintile was calculated based on the type of house, type of fuel materials used for cooking, sanitation, and household assets through principal components analysis (PCA) guidelines

Results

Table-1 represents basic characteristics of the participants by two groups; 1) women with infants who were normal birth weight (NBW) (≥ 2500 g) and 2) women with infants who were LBW (<2500 g). Pearson's Chi-square tests identified differences between the maternal socio-economic and nutritional status in both groups. Child's religion, caste/tribe and type of house were significantly associated with LBW of infants ($P < 0.05$). Association between LBW and wealth index was statistically insignificant.

About 42.99%, 28.27 % use no improved toilet facility and unclean cooking fuel facility, respectively. Again about 49.16% of the households belongs poor, poor middle and middle quintile while 50.83% of households belong to upper middle and upper quintile as we are studying population among rural and peri-urban population in the study area.

In table-2 shows that illiterate 12.35%, exclusive breastfeeding less than 6 months 79.80% and type of caesarian delivery 32.03% among study population. But association between LBW and maternal education, exclusive breastfeeding and type of delivery were insignificant.

Table -3 shows adjusted and unadjusted OR for LBW (in logistic regression models). After adjusting for all of the variables included in the study (adjusted model); religion, caste and iron and folic acid tablets (IFA) taken were statistically significant. Women with Muslim had odds of giving birth to an infant with LBW (OR = 1.99, 95% CI: 1.19 - 3.34, $P < 0.05$) compared to women with reference to Hindu population. Again women with general category had odds of giving birth to an infant with LBW (OR = 2.84, 95% CI: 1.66 - 4.87) with reference to scheduled caste population.

Table-4 shows after adjusting for all of the variables included in the study (adjusted model) type of house such floor, wall and roof (mud) were statistically significant. Moreover, women who had any sanitary latrine (OR= 0.0.51; 95% CI: .29 .88; p=0.017) or type of house in floor with mud (OR= 0.47; 95% CI 0.28 0.79; p=0.005) had reduced odds of having a newborn with LBW. Again type of house in wall with mud (OR = 0.41, 95% CI: .23 .72; p =0.002) and type of house in roof with mud (OR = 0.46, 95% CI: .23 .92; p= 0.028) had reduced odds of having a newborn with LBW.

Discussion

Maternal education, lack of antenatal visits and iron and folic acid tablets taken are significant predictors of LBW. Additionally they may be very poor and lacks access to adequate healthcare resources (e.g., antenatal care, iron supplements, etc.) which consequently may influence fetal growth. Therefore, interventions to improve the education level of women and female children are important to reduce prevalence LBW in India.

Low socio-economic status is one of the strongest predictors of LBW in low-income countries. [Ohlsson A, et al 2008, Elshibly EM et al, 2008, Mumbare SS, 2012]. In contrast to previous findings, low socio-economic status was not significantly associated with LBW in this study. Perhaps in spite of poor socio-economic status if a woman could maintain a good nutritional status and avoid potential medical complications during pregnancy, giving birth to a normal weight baby might be a possibility.

Breastfeeding infants during the first six months of life has been proven to be the perfect source of nutrition for infants, as it is a rich source of anti-bacterial and anti-inflammatory bioactive molecules [*Pediatrics*. 2012]. Exclusive breastfeeding more than 6 months shows 20.19% and the association between exclusive breastfeeding and LBW is not statistically significant in the study.

Conclusion

Maternal socio-economic status such as type of house, wealth index, iron and folic acid taken more than or equal to 100 received were identified in this study as important determinants of LBW in India. These key mediating factors that need to be considered to improve birth weight of infants and targeted public health interventions are needed to improve these factors.

Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Ethical Approval

This study was executed under the umbrella of the Searching for Alternative benevolence (SAB), a reputed charitable registered organization. The ethical approval was obtained from the ethics review committee appointed by the chairperson of the governing body of Searching for Alternative benevolence (SAB). After obtaining an informed and written consent from the participants, this survey was performed.

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Table-1: Socioeconomic characteristics of the households by normal birth weight-NBW (≥ 2500 g) and low birth weight-LBW (< 2500 g)

Determinants	All N	NBW(334)	%	LBW(87)	%	p-value
Sex of child						
Boy	228	184	80.70	44	19.30	0.453
Girl	193	150	77.72	43	22.28	
Religion						
Hindu	243	182	74.90	61	25.10	0.016
Muslim	176	150	85.23	26	14.77	
Christian	1	1	100.00	0	0.00	
Others	1	1	100.00	0	0.00	
Caste						
SC	129	88	68.22	41	31.78	0.002
ST	37	32	86.49	5	13.51	
OBC	42	33	78.57	9	21.43	
General	213	181	84.98	32	15.02	
Sanitary Latrine						
No Toilet	181	138	76.24	43	23.76	0.224
Pit Latrine	11	10	90.91	1	9.09	
Sanitary Latrine	229	186	81.22	43	18.78	
Type of House						
Floor						
Pucca	191	161	84.29	30	15.71	0.016
Semipucca	22	18	81.82	4	18.18	
Mud	208	155	74.52	53	25.48	
Wall						
Pucca	150	129	86.00	21	14.00	0.004
Semipucca	57	47	82.46	10	17.54	
Mud	214	158	73.83	56	26.17	
Roof						
Pucca	129	109	84.50	20	15.50	0.039
Semipucca	207	163	78.74	44	21.26	
Mud	85	62	72.94	23	27.06	
Type of Fuel Used						
LPG/natural gas	109	85	77.98	24	22.02	0.743
coal/gul	20	16	80.00	4	20.00	

wood	129	102	79.07	27	20.93	
electricity	10	8	80.00	2	20.00	
straw/shrubs /grass	91	76	83.52	15	16.48	
dung cakes	62	47	75.81	15	24.19	
Number of rooms used						
1	85	57	67.06	28	32.94	0.487
2	226	185	81.86	41	18.14	
3	71	59	83.10	12	16.90	
>=4	39	33	84.62	6	15.38	
Quintile						0.09
Poor	61	48	78.69	13	21.31	
Poor Middle	71	53	74.65	18	25.35	
Middle	75	58	77.33	17	22.67	
Upper Middle	112	84	75.00	28	25.00	
Upper	102	91	89.22	11	10.78	

Table-2 Basic characteristics of the women by normal birth weight-NBW (≥ 2500 g) and low birth weight-LBW (< 2500 g)

Determinants	All N	NBW(334)	%	LBW(87)	%	P-value
Maternal Education						0.691
Illiterate	52	46	88.46	6	11.54	
Primary	48	35	72.92	13	27.08	
Middle School	97	73	75.26	24	24.74	
Secondary & Higher Secondary	198	160	47.90	38	39.18	
Graduation and above	24	19	79.17	5	20.83	
Don't know	2	1	50.00	1	50.00	
Skill Birth Attendant						0.560
Skilled	406	323	79.56	83	20.44	
Unskilled	15	11	73.33	4	26.67	
Exclusive Breastfeeding						0.304
< 6 months	336	270	80.36	66	19.64	
>=6 months	85	64	75.29	21	24.71	
Type of Delivery						0.903
Normal	284	226	79.58	58	20.42	
Caesarian	136	107	78.68	29	21.32	
Forceps	1	1	100.00	0	0.00	
Number of ANC's						0.634
< 4	213	167	78.40	46	21.60	
>= 4	208	167	80.29	41	19.71	
Iron and folic acid Tablets taken						0.001
<100	150	106	70.67	44	29.33	
>=100	271	228	84.13	43	15.87	

Table-3: Logistic regression for adjusted and unadjusted odds ratio (OR) of low birth weight (LBW)

Determinants	Unadjusted OR(95% CI)	p-value	Adjusted OR(95% CI)	p-value
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Sex of child				
Boy(Reference)				
Girl	.83(.52 1.33)	0.452	.85(.53 1.38)	0.531
Religion				
Hindu(Reference)				
Muslim	1.93(1.16 3.21)	0.011	1.99(1.19 3.34)	0.008
Christian				
Other				
Caste				
SC(Reference)				
ST	2.98(1.08 8.20)	0.034	2.52(.89 7.14)	0.081
OBC	1.70(.748 3.89)	0.203	1.65(.72 3.80)	0.235
General	2.63(1.55 4.46)	0.000	2.84(1.66 4.87)	0.000
Age(Year)				
<20(Reference)				
20-35	1.51(.91 2.50)	0.106	1.56(.94 2.60)	0.083
>35	1.12(.41 3.03)	0.820	.98(.34 2.82)	0.981
Education				
No Education(Reference)				
Primary	.35(.12 1.01)	0.054	.38(.12 1.12)	0.081
Middle School	.39(.15 1.04)	0.061	.40(.15 1.07)	0.069
Secondary& Higher Secondary	.54(.21 1.37)	0.202	.63(.24 1.62)	0.341
Graduation and above	.49(.13 1.82)	0.291	.58(.15 2.20)	0.431
IFA tablets taken				
<100(Reference)				
>=100	2.20(1.36 3.55)	0.001	2.47(1.50 4.07)	0.000
Antenatal Visit				
<4 (Reference)				
>=4	1.12(.69 1.79)	0.633	1.28(.78 2.11)	0.317
Quintile				
Poor(Reference)				
Poor Middle	.79(.35 1.79)	0.585	.84(.36 1.92)	0.685
Middle	.92(.408 2.09)	0.85	1.04(.45 2.39)	0.922
Upper Middle	.81(.384 1.71)	0.586	.95(.44 2.05)	0.912
Upper	2.24(.933 5.37)	0.071	2.64(1.08 6.45)	0.032

AOR=blood pressure, weight, blood group, hemoglobin and blood sugar measured

Table-4: Logistic regression for adjusted and unadjusted odds ratio (OR) of low birth weight (LBW)

Determinants	Unadjusted OR(95% CI)	p-value	Adjusted OR(95% CI)	p-value
Sanitation facility				
No Toilet(Reference)				
Pit Latrine	1.27(.64 2.50)	0.484	1.15(.57 2.29)	0.689
Sanitary Latrine	.55(.32 .94)	0.031	.51(.29 .88)	0.017

Type of House				
Floor				
Pukka(Reference)				
Semi pukka	.83(.26 2.65)	0.764	.71(.22 2.30)	0.577
Mud	.54(.33 .89)	0.017	.47(.28 .79)	0.005
Wall				
Pukka(Reference)				
Semi pukka	.76(.33 1.74)	0.524	.72(.31 1.68)	0.460
Mud	.45(.26 .79)	0.006	.41(.23 .72)	0.002
Roof				
Pukka (Reference)				
Semi pukka	.67(.37 1.21)	0.193	.62(.34 1.13)	0.123
Mud	.49(.25 .97)	0.041	.46(.23 .92)	0.028
Type of Fuel used				
lpg/natural gas(Reference)				
coal/gul	1.12(.34 3.69)	0.841	1.25(.36 4.31)	0.718
wood	1.06(.57 1.98)	0.839	.94(.50 1.79)	0.872
electricity	1.12(.22 5.67)	0.883	1.20(.196 7.43)	0.838
straw/shrubs /grass	1.43(.69 2.92)	0.327	1.20(.579 2.52)	0.612
dung cakes	.88(.42 1.84)	0.745	.82(.39 1.74)	0.621

AOR=blood pressure, weight, blood group, hemoglobin and blood sugar measured