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Original Research Article

Socio-demographic determinants of Low Birth Weight in newborn: A case control Study

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Abstract

Background: There are many potential factors for low birth weight (LBW). Not that all the factors, should be present in a given area. The factors vary from one area to another, depending upon geographic, socioeconomic and cultural factors. Thus it is necessary to identify factors prevailing in a particular area responsible for low birth weight, so as to plan the strategy to tackle this important problem. Therefore present case control study is undertaken to estimate the socio-demographic determinants of babies with low birth weight and to identify the maternal risk factors associated with it.

Objectives: To study socio-demographic determinants of low birth weight among Low birth Weight newborn (cases) and normal weight newborn (controls) in a tertiary care hospital in central India.

Methods: Hospital based case control study, to study socio-demographic determinants of LBW. Data was collected from 217 cases and 217 controls full-term, singleton live newborn delivered in study institute, matched for parity.

Result: Association of rural residence (OR=2.82, 95% CI=1.79-4.43, P=0.0001), working status of mother (OR=2.45, 95% CI=1.08-5.68, P=0.0001), gender female (OR=2.61, 95% CI=1.77-3.84, P=0.0001) and gestational age 38 weeks (OR=2.43, 95% CI=1.58-3.72, P=0.0001) are highly significant. Nuclear type of family (OR=1.49, 95% CI=1.00-2.23, P=0.04) and birth interval less than 36 month (OR=1.72, 95% CI=0.98-3.02, P=0.044) is marginally significant with LBW. Association of bad obstetrics history with low birth weight like, abortion (OR=2.53, 95% CI=1.44-4.52, P=0.0005), still birth (OR=6, 95% CI=1.98-24.32, P=0.0003) and intra uterine death (OR=7.2, 95% CI=0.91-325.9, P=0.0323) were found to be significant. Association of co-morbid conditions/complications with low birth weight found in anaemia (OR=5.07, 95% CI=2.95-8.95, P=0.0001), pregnancy induced hypertension (OR=14.07, 95% CI=5.87-40.61, P=0.0001), anti partum haemorrhage (APH) (OR=10.21, 95% CI=4.67-25.33, P=0.0001), premature rupture of membrane (PROM) (OR=26.98, 95% CI=8.50-136.21, P=0.0001), malpresentation(OR=7.33, 95% CI=2.75-24.51, P=0.0001), eclampsia(OR=4.11, 95% CI=0.81-40.11, P=0.05) and oligohyramnios(OR=7.2, 95% CI=0.91-325.9, P=0.032).

Conclusion: After multiple logistic regressions, factors found significantly associated with low birth weight were Place of Residence, Gender, APH, Anaemia, Pre-eclampsia, PROM, Malpresentation, Stillbirth, Abortion and Eclampsia. Most of these factors are preventable with little intervention by strengthening maternal health services.

Keywords: Low birth weight, Socio- demographic factor, case control study, multiple logistic regression.

1. Introduction

Low-birth-weight (LBW) is universally used as an indicator of health status and is an important subject of national concern and a focus of health policy. LBW has been shown to be associated with a higher risk for childhood mortality and morbidity. Number of factors like, maternal, socio-environmental and genetic is responsible for the normal health, development and survival of children [1].

At the population level, the proportion of babies with a LBW is an indicator of a multifaceted public-health problem that includes long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy. On an individual basis, LBW is an important predictor of newborn health and survival and is associated with higher risk of infant and childhood mortality [1].

By international agreement a low birth weight baby is one with a birth weight less than 2500 gm, the measurement being taken preferably within first hour life, before significant postnatal weight loss occurred[2].

Kramer has identified 43 potential factors for low birth weight [3]. Not that all the factors, should be present in a given area. The factors vary from one area to another, depending upon geographic, socioeconomic and cultural background. Thus it is necessary to identify factors prevailing in a particular area responsible for low birth

weight, so as to plan the population specific strategy to tackle this important problem.

Therefore present case control study is undertaken to estimate the socio-demographic determinants of babies with low birth weight and to identify the maternal risk factors associated with it.

2. Material and Methods

2.1 Study design and setting

This parity matched hospital based case control study was carried out at PNC wards and Labour room of teaching institute in central India. Study period from March 2013to February 2014.

2.2 Selection of study subject

Full-term, singleton, live newborn delivered at study institute. Multiple births, still birth, preterm birth, hydrocephalus and obvious congenital anomalies were excluded from study. Cases and controls were matched for parity.

Cases: Birth weight less than 2500gm.

Control: Birth weight more than or equal to 2500 gm.

2.3 Sample size

Considering the prevalence of LBW 22% for Maharashtra as per NFHS-III, anticipated Odds Ratio = 2 for unfavourable pregnancy outcome in previous pregnancy [4], power 90%, α error 5%, sample size required was 217. Hence 217 cases and 217 controls were selected for the study.

2.4 Methodology

Ethical clearance from the Institutional Ethics Committee was obtained prior to study. Written permission to conduct the study was sought from Department of Obstetrics and Gynaecology of study institute. Informed consent from the mothers was taken prior to the interview. Information of cases and controls were recorded in predesigned and pretested proforma. Socioeconomic status assessed by using BG Prasad scale for rural residence and Kuppuswamy scale for urban residence, modified as per CPI of September 2013.

2.5 Statistical Analysis

Descriptive statistics (percentage, mean, standard deviation and range) were used to summarize baseline characteristics of the study subjects. Continuous data were analyzed by applying t-test and categorical data were analyzed using chi-square test. Crude and Adjusted Odds ratio along with 95% confidence interval were calculated. $P < 0.05$ was taken as statistically significant**.**

3. Results

The present case-control study included 217 cases of Low birth Weight newborn and 217 controls normal weight newborn after matching for parity. Most cases and controls were primi-para 105 (48.39%), followed by 98 (45.16%) second parity and 14 (6.45%) of third parity. Mean maternal age of cases was 23.77±3.60 years and control was 24.06±3.49 years. Maternal age of majority of cases 123 (56.68%) was in age group 20-24 years followed by 61 (28.11%) in age group 25-29 years. There were 17 (7.83%) teenage mothers and 16 (7.47 %) were elderly. Maternal age of majority of controls were 123 (56.68%) in age group of 20-24years followed by 60 (27.65%) in age group of 25-29 years. There were 13 (5.99%) teenage mothers and 21 (9.68%) were elderly.

Cases from rural area n=78 (35.95%) outnumbered controls n=36 (16.59%). Majority of cases and controls belonged to Hindu religion 137 (63.13%) and 147 (67.74%) respectively. Maternal literacy rate of cases and control were 100%. Majority of cases and control were educated up to high school 121 (55.76%) and 128 (58.97%) respectively. Working mother among cases 23 (10.60%) outnumbered controls 10 (4.61%). Majority of cases and control were from upper socio-economic status (class I, II & III) 139 (64.05%) and 148 (68.20%) respectively. Nuclear family found in 100 (46.08%) cases and 79 (36.41%) controls. Higher frequency of females was observed: 138 (63.59%) females in cases verses 87 (40.09%) females in controls. Most of the cases, 162 (74.65%) and controls 119 (54.84%) had gestational age of 38 wks. Only 9 (4.15%) and 5 (2.31%) mothers of cases and controls respectively had less than or equal to three ANC visits. Total 112 study subjects had parity two and three. Birth interval less than 36 months was observed more amongst cases, 60 (53.56%) than controls, 45 (40.18%). Normal vaginal delivery observed in 136 (62.67%) and 127 (58.53%) amongst mothers of cases and controls respectively.

Table 1: Distribution of socio-demographic determinants amongst study population

Determinants	Cases (n=217)		Controls (n=217)		OR (95% CI)	X^2 df=1	P
	No	%	No	%			
Residence Rural	78	35.95	36	16.59	2.82 (1.79-4.43)	20.29	0.0001
Urban	139	64.05	181	83.41			
Religion Hindu	137	63.13	147	67.74	0.82 (0.54-1.24)	1.02	0.31
Other	80	36.87	70	32.26			
Occupation Working	23	10.60	10	4.61	2.45 (1.08-5.68)	5.54	0.018
Home maker	194	89.40	207	95.39			
Socio-economic status Upper class (I, II & III)	139	64.05	148	68.20	0.83 (0.53-1.26)	0.83	0.36
Lower class (IV & V)	78	35.95	69	31.80			
Type of Family Nuclear	100	46.08	79	36.41	1.49 (1.00-2.23)	4.19	0.04
Joint/three generation	117	53.92	138	63.59			
Gender Female	138	63.59	87	40.09	2.61 (1.77-3.84)	24	0.0001
Male	79	36.41	130	59.91			
Gestational Age 38 wks	162	74.65	119	54.84	2.43(1.58-3.72	18.67	0.0001
39 & 40 wks	55	25.35	98	45.16			
No of ANC visit ≤ 3	9	4.15	5	2.31	1.83 (0.50-6.40)	1.18	0.27
≥ 4	208	95.85	212	97.69			
Birth Interval <36mth	60	53.56	45	40.18	1.72 (0.98-3.02)	4.03	0.044
(n=112) ≥36mth	52	46.44	67	59.82			
Tobacco chewing Yes	9	4.15	2	0.92	4.65 (0.93-31.5)	4.57	0.03
No	208	95.85	215	99.08			
Type of Delivery Normal Vaginal	136	62.67	127	58.53	1.19 (0.79-1.78)	0.78	0.337
Caesarean section	81	37.33	90	41.47			

Table 1 shows, association of rural residence, working status of mother, gender female and gestational age 38 weeks are highly significant. Nuclear type of family and birth interval less than 36 week is marginally significant with LBW. However religion, socioeconomic status, number of ANC visits, habit of tobacco chewing and type of delivery does not show any significance with LBW.

Table 2: Association of bad obstetrics history with low birth weight in study subject

BOH	Cases (n=217)		Controls (n=217)		OR (95% CI)	P value
	No	%	No	%		
Abortion	50	23.04	23	10.60	2.53(1.44-4.52)	0.0005
Still birth	22	10.13	4	1.84	6.00(1.98-24.32)	0.0003
IUD	7	3.22	1	0.46	7.20(0.91-325.9)	0.0323

Table 2 shows, association of bad obstetrics history with low birth weight. Abortion and still birth were found to be highly significant. Intra uterine death was marginally significant.

Table 3: Co-morbidity and risk of low birth weight of study subject

Co-morbid conditions/ Complication/	Cases (n=217)		Controls (n=217)		OR (95% CI)	P value
	No	%	No	%		
Anaemia	195	89.86	138	65.59	5.07(2.95-8.95)	0.0001
PIH	62	28.57	6	2.76	14.07(5.87-40.61)	0.0001
APH	61	28.11	8	3.69	10.21(4.67-25.33)	0.0001
PROM	59	27.19	3	1.38	26.98(8.50-136.21)	0.0001
Malpresentations	32	14.75	5	2.30	7.33(2.75-24.51)	0.0001
Eclampsia	8	3.68	2	0.92	4.11(0.81-40.11)	0.05
Ologohydramnios	7	3.23	1	0.46	7.20(0.91-325.9)	0.032
Foetal distress	22	10.14	28	12.90	0.76(0.4-1.43)	00.367
Previous LSCS	13	5.99	20	9.21	0.63(0.28-1.37)	0.204
CPD	9	4.15	12	5.53	0.74(0.27-1.96)	0.502
SCD	6	2.76	3	1.38	2.03(0.44-10.37)	0.31

Table 3 shows co-morbidity and risk of low birth weight. On bivariate analysis factors found to be significant association with low birth weight were anaemia, pregnancy induced hypertension, anti partum haemorrhage (APH), premature rupture of membrane (PROM), malpresentation, eclampsia and oligohyramnios.

Table 4: Multiple Logistic Regression Analysis for risk factors of Low birth weight-Final Model

Risk factor	Adjusted Odds ratio (95% CI)	P value
Place of Residence	2.08 (1.10-3.93)	0.024
Gender	3.14 (1.79-5.51)	0.000
APH	9.10 (3.28-25.29)	0.000
Anaemia	2.09 (1.03-4.24)	0.041
Preeclampsia	27.51 (10.73-70.55)	0.000
PROM	36.29 (10.16-129.63)	0.000
Malpresentation	12.73 (4.29-37.76)	0.000
Stillbirth	19.81 (4.07-96.49)	0.000
Abortion	2.76 (1.04-7.29)	0.041
Eclampsia	8.66 (1.54-48.52)	0.014

Table 4 shows in multiple logistic regression analysis, after adjusting for other factors, determinants found to be significantly associated with low birth weight were: Place of Residence, Gender, APH, Anaemia, Pre-eclampsia, PROM, Malpresentation, Stillbirth, Abortion and Eclampsia.

4. Discussion

In present case control study matched for parity, maternal age had no significant association with LBW. Our findings are consistent with Mavalankar DV [5], Anand K [6], and Fikree FF [7]. LBW was found significantly more in rural subjects as compared to urban subjects; this may be due to continuous strenuous physical work through pregnancy. Similar finding observed by Nagargoje MM [4], Agrawal G [8], Bhargava SK [9], Jain AK [10] and Jolanta D [11].

Maternal literacy rate of cases and control were 100%. No association observed between educational level and LBW. Amin N [12], Malik S [13] and Deswal BS [14] also not observed any association between LBW and educational level. However Biswas R [15] and Idris MZ [16] found significant association between low maternal education and LBW in hospital based study.

Significant association observed between working mother and LBW, may be due to their physical work. This finding conforms the finding of Ghosh S [17], Fedric J [18], Dougherty CRS [19] and Anand K [6]. There was no significant association found between socioeconomic status and birth weight of baby, similar observation found in studies by Dougherty CRS [19] and Das K [20]. However Fedric J [18], Dowding [21], Deshmukh JS [22], Deswal R [14], Anand K [6] Joshi SM [23] Biswas R [15] and More SN [24] observed significant association between socioeconomic status and birth weight of baby.

LBW was observed significantly more in nuclear family than joint/three generation families, as also observed by Mumbre SS [25], Deshpande JD [26] and Yadav DK [27]. In this study LBW was more among females than male, consistent finding with Kaushal SK [28] and Carmen R [29].

LBW was more in gestational age of 38 weeks than more than 38 weeks, consistent with finding of Carmen R [29]. No association observed between number of ANC visits and LBW. Similar findings observed by Nagargoje MM [4] and Malvankar DV [5]. Significant association was fond between LBW and inter-pregnancy interval less than 36 months. Joshi HS [30], Das K [20] and Deswal R [14] also observed significant association between inter pregnancy interval and birth weight of baby. Association of tobacco chewing and LBW was observed in this study, also reported by Mumbre SS [25], Deshpande JD [26] and Deshmukh JS [22].

Study shows that LBW was associated with bad obstetrics history, APH, PIH, Ologohydramnios, PROM, malpresentation and eclampsia. Maternal anaemia is significantly associated with LBW. Similar observation in studies carried out by Malvankar DV [5], Mumbre SS [25], Deshpande JD [26], Nagargoje MM [4], Ghosh S [17], Anand K [6], Yadav DK [27], Idris MZ [16] and Joshi HS [30].

In multiple logistic regression, after adjusting for other factors, factors found to be significantly associated with LBW were place of residence, female gender, APH, Anaemia, Pre-eclampsia, PROM, malpresentation, stillbirth, abortion and eclampsia. However factors like type of family, history of tobacco chewing, gestational age and birth interval were not found significantly associated with LBW.

5. Conclusion

In this case control study carried out in tertiary care hospital to study socio-demographic determinants of low birth weight in newborn, number of factors like rural place of residence, working status of mothers, nuclear family, female gender, gestational age 38 weeks, birth interval less than 36 months, history of maternal tobacco chewing, bad obstetric history (abortion, still birth and IUD), anaemia, PIH, APH, PROM, malpresentation, oligohyramnios were found to be significantly associated with LBW. Most of these determinants can be modified by simple interventions. Strengthening maternal health services, iron and folic acid supplementations, motivating mothers to avoid tobacco chewing, strengthening anti natal care services for early identification and management of risk factors like anaemia and hypertension are some of these simple interventions. There is need to strengthen strategy to fulfil unmet needs of family planning services particularly for spacing.

References

[1] UNICEF (US). Malnutrition in South Asia: A regional profile. New Delhi: Rosa publications, 1997.

[2] Park K. Park's Text book of preventive and social medicine. 22th Edition, Jabalpur: M/s Banarsidas Bhanot, 2013.

[3] Kramer MS. Determinant of low birth weight: Methodological assessment and meta-analysis. *Bulletin WHO* 1987; 65(5): 663-737.

[4] Nagargoje M M *et al* A case control study for risk factors of low birth weight in Nagpur city of Maharashtra *Indian Journal of Community Health* July 2010-June 2011; 22(2): 4-7.

[5] Mavalankar DV, Trivedi CC, Gray RH. Maternal weight, height and risk of poor pregnancy outcome in Ahmadabad, India. *Indian Paediatrics.* 1994; 31: 1205-12.

[6] Anand K, Garg BS. A study of factors affecting low birth weight. *Indian J Community Med*. 2000; 25(2): 57-62.

[7] Fikree FF, Rahbar MH. Risk factors for stunting and wasting at age six, twelve and twenty-four months for squatter children of Karachi, Pakistan. *J Pak Med Assoc* 2000 Oct; 50(10):341-8.

[8] Agarwal G *et al* Maternal Risk Factors Associated with Low Birth Weight Neonates in a Tertiary Care Hospital, Northern *India J Community Med Health Educ*. Vol.2:177.

[9] Bhargava SK, Singh KK, Saxena BN. ICMR task force National collaborative study on identification of high risk families, mothers and outcome of their offspring with particular reference to the problem of maternal nutrition, low birth weight, perinatal and infant mortality and morbidity in rural and urban slum communities. *Indian Paediatrics.* 1991; 28:1473-1480.

[10] Jain A.K., Determinants of Regional variation in Infants in Rural India Population Studies: 1985; 39: 407-24.

[11] Jolanta D *et al* "Maternal socio-economic factors and the risk of low birth weight in Lithuania" *Medicina.* 2004; 40(5): 475-82.

[12] Amin N, Abel R, Sampath Kumar V. Maternal risk factors associated with low birth weight. *Indian Journal of Paediatrics* 1993; 60: 269-74.

[13] Malik S, Ghidiyal RG, Udani R, Waingankar R. Maternal Biosocial factors affecting low birth weight. *Indian Journal of Paediatrics.* 1997; 64:373-7.

[14] Deswal BS, Singh JV, Kumar D. A study of Risk factors for low birth weight. *Indian Journal of Community Medicine* 1999; 24(3): 127-31.

[15] Biswas R, Dasgupta A, Sinha RN, Chaudhari RN. An epidemiological study of low birth weight newborns in the district of Puruliya, West Bengal. *Indian J Public Health* 2008 Apr-Jun; 52(2):65-71.

[16] Idris MZ, Gupta A, Mohan U, Kumar A, Srivastava, Das V. Maternal Health and low birth weight among institutional deliveries. *Indian J Community Med* 2000; 25(4): 156-60.

[17] Ghosh S, Hooja V, Verma RK. Biosocial determinants of birth weight. *Indian Paediatrics* 1977; 14(2): 107-14.

[18] Fedric J, Adelstein P. Factors associated with low birth weight infants at term. *British Journal of Obstetrics and Gynaecology* 1978; 85 (1): 1-7.

[19] Dougherty CRS, Jones AD. The determinants of birth weight. *American Journal of Obstetrics and Gynaecology*. 1982; 144: 190-200.

[20] Das K, Ganguly SS, Saha R, Ghosh BN. Interrelationship of birth weight with certain biological and socioeconomic factors. *Indian J of Public Health* 1981; 25(1): 11-9.

[21] Dowding. Assessment of effect of birth order and socioeconomic status on birth weight. *British Medical Journal* 1981; 282: 683-6.

[22] Deshmukh JS, Motghare DD, Zodpey SR and Wadhava SK. Low birth weight and associated maternal factors in an urban area. *Indian Paediatrics* 1998; 35:33-5.

[23] Joshi SM, Pai NP. Effect of maternal biosocial determinants, on the birth weight in a slum area of greater Mumbai. *Indian Journal of Community Medicine* 2000; 25(3): 121-4.

[24] More NS, Bapat U, Das S, Barnett S, Costello A, Fernandez A *et al.* Inequalities in maternity care and newborn outcomes: one- year surveillance of births in vulnerable slum communities in Mumbai. Int. J Equity Health 2009; Jun 5; 8:21.

[25] Mumbare S S *et al*, "Maternal Risk Factors Associated with Term Low Birth Weight Neonates: *A Matched-Pair Case Control Study" Indian Paediatrics*, January 2012; 49:25-28.

[26] Deshpande J D *et al* "Maternal Risk Factors for Low Birth Weight Neonates: A Hospital Based Case-control Study in Rural Area of Western Maharashtra, India" *National Journal of Community Medicine* Oct-Dec 2011; 2 (3):394-398.

[27] Yadav DK *et al* Risk Factors Associated with Low Birth Weight *J Nepal Health Res Counc*, Oct 2011; 9 (19):159-64.

[28] Kaushal SK *et al* A study of maternal factor and birth weight in a border District of Uttar Pradesh: A hospital based study. *Indian Journal of Community Health* April 2012-June 2012; 24(2):86-90.

[29] Carmen R *et al.* Low birth weight in Spain associated with socio-demographic factors *Journal of Epidemiology and Community Health* 1995; 49:38-42.

[30] Joshi H S *et al* Risk Factor Associated with Low Birth Weight in Newborns *Indian Journal of Community Health*, Oct-Dec 2005; 30(4):142-143.