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MATERNAL CHARACTERISTICS AND ITS ASSOCIATION WITH BIRTH WEIGHT AMONG UNION TERRITORIES OF INDIA

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ABSTRACT

Birth weight plays an important role in public health development. The various indices of health indicators help in identification of areas or communities, needing special public health intervention. In the present study, an attempt made to estimate the prevalence of low birth weight and identification of its association with maternal characteristics across the UT'S (Union territories) of India. To estimate the prevalence of low birth weight and identify the associated risk factor under the paradigm of epidemiological modeling. Fourth round of the National Family Health Survey data was considered for this study and data analysis was carried out for Indian territories. Multivariable logistic regression analysis was done to estimate the prevalence of low birth weight and its association with maternal characteristics. Across the UT's prevalence of low birth weight varied through different predictors as well as overall. Maternal characteristics like; body mass index, religion, anemia and birth order shown risk factor for low birth weight.

Key words: BMI, Anemia, Union territory, LBW, Prevalence

INTRODUCTION

Low birth weight (LBW) is a major cause of neonatal morbidity and mortality. Low birth weight (LBW) defined as birth weight <2500 gram. It is one of the important health indicators, which played an important role in public health development. Low birth weight is as a health indicators helped in identification of areas or communities, needing special public health intervention. In a Pondicherry, a study was conductedon the association of social factors such as social support and spouse abuse during pregnancy on LBW **[1]**. The presence of nonphysical abuse during the antenatal period increased the risk of LBW.Risk of low birth weight and its related data was discussedinthe cross-sectional survey at India level to demonstrate the prevalence of low birth weight & its change due to heaping problem in collected data on birth weight **[2]**. Method of birth weight reporting can also affect the actual scenario of the LBW due to hypothetical or memory recall base or birth size **[3]**. Incidence of LBW wasidentified in rural areas countrywide **[4]**. Prevalence of LBW and itsdifferent risk factor studiedonregional models for assessing regional determinants of LBW in India **[5]**. The prevalence of LBW increasing due to premature births and their associated maternal factors **[6]**. An epidemiological factor related with the low birth weight babies bornwas at risk **[7]**.

Keeping in the view of literature review, questions arise in mind what are the difference on prevalence of low birth weight across the union territory of India. Which health indicators prevalent higher risk on low birth weight? What are the maternalfactors, which play the important role to increase the risk of low birth weight? In the present study, an attempt made to estimate the prevalence of low birth weight and identify its association with various maternal characteristics.

OBJECTIVE

To estimate the prevalence of low birth weight and identify the associated risk factor under the paradigm of epidemiological modeling.

MATERIALS AND METHODS

The data from the fourth round of the National Family Health Survey used for this study. Descriptive statistics and multivariable logistic regression consideredestimating the prevalence of low birth weight and multivariable logistic regression analysis applied to identify risk factors. In the study only the following union territory considered under analysis as per availability of the data, the union territories are as Andaman and

Nicobar Island, Chandigarh, Dadar and Nagar Haveli, Daman and Diu, Lakshadweep, Delhi and Pondicherry.

Data sources: We used fourth round of the nationally representative data from the 2015–2016 National Family Health Surveys (NFHS-4) conducted by the International Institute for Population Sciences under the stewardship of the Ministry of Health and Family Welfare, Government of India.

Variable identification and construction

There are number of variables used under this study, which nominated through outcomes or dependent variable and independent or predictor variables. The outcomes of interest wasbirth weight. Study variables identified with help of different type of literature review, which includes the study outcomes. Therefore, separately described below:

Dependent variables: Birth weight: Babies weight considered for the study at a time of birth. For multivariable logistic regression analysis, birth weight variable divided into two categories, which are low birth weight and normal birth weight.

Independent Variables: The study includes a set of independent variables to understand the extent and differentials and risk factors and its effect onlow birth weight among women. The study divides variables into two categories, namely as socio economic & demographic characteristics/variables. Following independent variables used which are as: - **Place:** Urban / Rural; **Education:** No education / Primary / Secondary / Higher; **Wealth Index:** Poorest / Poorer /Middle/ Richer/ Richest: **Religion:** Hindu/ Muslim/ Christian/ Others; **Body Mass Index:** Underweight/ Normal weight/Overweight: **Birth order:** First order/Second order/Third order/Fourth and above order; **Anemia:** Anemic/Not anemic.

Statistical Analysis

Here a multivariable logistic regression model used wherein birth weight category low birth weight=1 and normal birth weight=0 was used as outcome variable and x_1 (Place of residence), x_2 (Education), x_3 (Wealth Index), x_4 (Religion), x_5 (Body mass index), x_6 (Birth order), x_7 (Anemia) were considered as predictor variables.

Equation of the epidemiological model is:

$$Log\left[\frac{p}{(1-p)}\right] = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7$$

Where, b_1, b_2 , b_3, b_4 ,,,, $b_7$are the logistic regression coefficients and $Log\left[\frac{p}{(1-p)}\right]$ is called log odds or logit of the event.

RESULTS AND DISCUSSIONS

Table 1 represents the pattern of low birth weight across the union territories of India. It is sampled based estimate of the prevalence of low birth weight. In India, prevalence of low birth weight was 18.2%. In Delhi, highest prevalence of low birth weight identified, which is around 27%. Lowest prevalence of low birth weight was in Puducherry, which was 15.9%. Respectively, prevalence of low birth weight has given in **Table 1** for Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu and Lakshadweep. Highest prevalence of anemia was identified across the UT's and it is one of the important risk factor of low birth weight **[9]**.

Table 2 also represents the prevalence of low birth weight for union territories of India; Andaman and Nicobar Islands, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Lakshadweep, Delhi and Puducherry through various predictors; which was respondents place of residence, education, wealth index, religion, body mass index, birth order and level of anemia. Prevalence has given through for each variable whereas its categories may be dichotomous or it may be polychotomous. Those were residing in rural among hem highest low birth weight was around 29% in Dadar and Nagar Haveli Island and lowest is Daman and Diu whenever in Lakshadweep did not have any respondent. Respectively, all other categories of predictors variable was mentioned in the same table. Prevalence of low birth weight due to anemia and its variation was noted from third to fourth round of national family health survey **[10, 11, 13]**.

Table 3 represents the multivariable logistics regression analysis; it infers here occurrence of low birth weight is more or less likely in comparison to normal birth weight across the union territories of India. D & N Haveli and Puducherry were more likely to having occurrence of low birth weight those are residing in rural places in comparison to urban places which was 48% and 25 % respectively. The health vulnerability assessment of urban slums used as a measure for planning of interventions and prioritizing infrequent resource allocation in health system **[8]**. In Chandigarh, among the secondary educated mother occurrence of

low birth weight (OR; 0.13 with 95% confidence interval (0.02 - 0.71) were significantly less likely in comparison to uneducated group. Among the overweight BMI significantly less likely occurrence of LBW in comparison to underweight group. In Delhi, among the anemic group of the mother occurrence of low birth were more likely in comparison to not anemic group, which was 44% more likely to having LBW in comparison to not anemic group of the respondents. Others predictors have given in details in table-3. An epidemiological study was carried out across the India for risk of low birth weight **[12]**.

Table 1: Shows the prevalence of low birth weight among the Union territory of India. According to National Family Health Survey:-2015-2016

Union territory of India	Normal Birth Weight	Low Birth Weight	Total
Andaman and Nicobar Islands	41 (83.7)	8 (16.3)	49
Chandigarh	108 (77.7)	31 (22.3)	139
Dadra and Nagar Haveli	50 (76.9)	15 (23.1)	65
Daman and Diu	19 (82.6)	4 (17.4)	23
Lakshadweep	10 (83.3)	2 (16.7)	12
Delhi	1855 (73.4)	671 (26.6)	2526
Puducherry	174 (84.1)	33 (15.9)	207
India	159342 (81.8)	35478 (18.2)	194820

Table: 2 Shows the prevalence of low birth weight across the Union territories of India through different predictors, according to National Family Health Survey (NFHS-4) – 2015-2016

	A & N Islands	Chandigarh	D & N Haveli	Daman and Diu	Lakshadweep	Delhi	Puducherry
Place							
Urban	3 (15.0)	30 (22.6)	5 (16.7)	3 (18.8)	2 (20.0)	666 (26.6)	21 (14.6)
Rural	5 (17.2)	1 (16.7)	10 (28.6)	1 (14.3)	0 (0.0)	5 (22.7)	12 (19.0)
Education							
No education	0 (0.0)	9 (37.5)	6 (31.6)	0 (0.0)	0 (0.0)	91 (23.6)	1 (16.7)
Primary	1 (20.0)	3 (25.0)	2 (22.2)	1 (33.3)	0 (0.0)	172 (51.8)	1 (11.1)
Secondary	5 (15.2)	12 (17.6)	6 (22.2)	3 (20.0)	1 (12.5)	318 (24.6)	20 (16.0)
Higher	2 (25.0)	7 (20.0)	1 (11.1)	0 (0.0)	1 (33.3)	90 (17.5)	10 (15.6)
Wealth Index							
Poorest	1 (33.3)	2 (66.7)	5 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)
Poorer	1 (20.0)	1 (20.0)	3 (23.1)	1 (33.3)	0 (0.0)	11 (23.9)	3 (14.3)
Middle	2 (18.2)	4 (40.0)	4 (33.3)	1 (20.0)	0 (0.0)	169 (41.7)	8 (17.8)
Richer	2 (11.8)	4 (13.8)	2 (12.5)	2 (20.0)	1 (16.7)	220 (31.7)	12 (18.8)
Richest	2 (15.4)	19 (20.9)	1 (11.1)	1 (14.3)	1 (20.0)	271 (19.7)	10 (13.3)
Religion							
Hindu	5 (14.3)	27 (22.1)	14 (23.0)	4 (19.0)	0 (0.0)	559 (27.1)	32 (16.8)
Muslim	1 (25.0)	3 (33.3)	0 (0.0)	1 (33.3)	2 (16.7)	106 (25.2)	1 (11.1)
Christian	2 (20.0)	0(0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (33.3)	0 (0.0)
Others	0 (0.0)	2 (22.2)	0 (0.0)	0 (0.0)	0 (0.0)	3 (8.3)	0 (0.0)
Body Mass Index							
Underweight	2 (28.6)	6 (35.3)	4 (23.5)	1 (33.3)	0 (0.0)	48 (23.8)	3 (18.8)
Normal weight	5 (17.2)	18 (28.1)	9 (25.0)	2 (14.3)	1 (16.7)	474 (35.4)	19 (18.3)
Overweight	2 (14.3)	7 (12.1)	2 (16.7)	1 (16.7)	1 (20.0)	149 (15.1)	11 (12.8)
Birth order							
First order	5 (19.2)	13 (22.4)	7 (24.1)	2 (18.2)	1 (20.0)	308 (29.3)	17 (15.9)
Second order	2 (11.8)	12 (24.0)	3 (15.0)	2 (25.0)	1 (25.0)	224 (24.1)	12 (15.2)
Third order	1 (20.0)	3 (17.6)	2 (20.0)	1 (33.3)	0 (0.0)	75 (22.2)	3 (16.7)
Fourth and above order	0 (0.0)	3 (20.0)	2 950.0)	0 (0.0)	0 (0.0)	64 (30.8)	1 (33.3)
Anemia							
Anemic	6 (19.4)	21 (20.8)	12 (23.5)	3 (21.4)	1 (16.7)	297 (24.4)	18 (16.5)
Not anemic	2 (11.1)	7 (25.0)	2 (16.7)	2 (22.2)	1 (16.7)	301 (33.3)	15 (15.5)

Table: 3 Shows the adjusted logistic regression analysisfor specific Union territories of India through different predictors variable, according to National Family Health Survey– 2015-16

	A & N	Chandigarh	D & N Haveli	Daman & Diu	Lakshadweep	Delhi	Puducherry
Place of Residence	**OR with 95% CI**	**OR with 95% CI**	**OR with 95% CI**	**OR with 95% CI**	**OR with 95% CI**	**OR with 95% CI**	**OR with 95% CI**
Urban	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Rural	0.96 (0.14 -6.68)	0.18 (0.01 - 4.57)	1.48 (0.22 -9.78)	0.71 (0.05 -9.74)	0.61 (0.004 - 84.63)	0.49 (0.11 - 2.21)	1.24 (0.52 - 2.98)
Education							
Uneducated	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Primary	3.80 (0.05-292.1)	0.24 (0.03 - 1.78)	0.68 (0.08 -5.48)	1.09 (0.01-202.7)	Indeterminate*	3.09 (2.13 - 4.48)	0.58 (0.04 - 9.58)
Secondary	1.89 (0.04 - 99.34)	0.13** (0.02 - 0.71)	0.84 (0.15 - 4.90)	1.02 (0.10 - 100.7)	Indeterminate*	1.13 (0.80 - 1.59)	0.80 (0.09 - 7.12)
Higher	3.6 (0.04 - 349.6)	0.18 (0.03 - 1.14)	0.34 (0.02 -6.99)	0.64 (0.002-261.7)	Indeterminate*	0.81 (0.52 - 1.26)	0.89 (0.08 - 9.24)
Wealth Index							
Poorest	1.00	1.00	1.00	Indeterminate*	1.00	1.00	1.00
Poorer	0.57 (0.01 - 23.99)	0.10 (0.002 - 5.60)	0.42 (0.06 - 2.89)	1.00	Indeterminate*	Indeterminate*	0.51 (0.02 - 12.87)
Middle	0.37 (0.01 -11.65)	0.19 (0.06 - 5.15)	1.29 (0.15 -11.06)	0.25 (0.004 - 15.05)	Indeterminate*	Indeterminate*	0.69 (0.03 - 15.53)
Richer	0.34 (0.01 -10.27)	0.02** (0.001 - 0.65)	0.52 (0.04 -6.88)	0.29 (0.008 - 11.34)	Indeterminate*	Indeterminate*	0.79 (0.04 - 17.43)
Richest	0.41 (0.01 -18.81)	0.11 (0.004 - 3.09)	0.59 (0.02 -14.48)	0.16 (0.003 - 9.65)	Indeterminate*	Indeterminate*	0.52 (0.02 - 12.29)
Religion							
Hindu	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Muslim	1.48 (0.08 - 27.63)	2.82 (0.45 - 17.72)	1.51 (0.01 - 175.14)	1.68 (0.04 - 35.61)	Indeterminate*	0.72** (0.54 - 0.96)	0.58 (0.05 - 6.25)
Christian	1.48 (0.19 - 11.34)	0.68 (0.09 - 4.96)	0.99 (0.01 - 108.96)	Indeterminate*	Indeterminate*	2.67 (0.47 - 15.31)	0.27 (0.01 - 5.72)
BMI							
Underweight	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Normalweight	0.41 (0.04-3.80)	0.43 (0.09 - 1.91)	0.94 (0.22 - 4.12)	0.85 (0.03 - 24.26)	0.57 (0.001 -234.2)	2.08** (1.43 - 3.02)	1.17 (0.27 - 5.11)
Overweight	0.28 (0.02 - 4.11)	0.13** (0.02 - 0.75)	0.72 (0.06 -8.98)	1.09 (0.03 - 45.41)	0.53 (0.001 - 237.2)	0.87 (0.56 -1.34)	0.83 (0.18 - 3.83)
Birth order							
1st order	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2nd order	0.72 (0.12 - 4.23)	1.20 (0.40 - 3.54)	0.47 (0.09 - 2.20)	1.28 (0.11 - 15.57)	2.01 (0.05 - 74.29)	0.63** (0.49 -0.79)	0.96 (0.43 - 2.19)
3rd order	0.54 (0.03 -11.64)	0.33 (0.05 - 2.37)	0.68 (0.10 - 4.55)	1.46 (0.05 - 46.15)	1.15 (0.005 - 241.8)	0.49** (0.35 - 0.69)	1.10 (0.25 - 4.80)
4th& above order	0.27 (0.00 - 239.16)	0.20 (0.02 - 2.18)	1.06 (0.09 - 12.06)	0.14 (0.00 - 194.44)	2.74 (0.01 -524.53)	0.69 (0.47 - 1.03)	5.04 (0.31 - 83.03)
Anemia							
Not anemic	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Anemic	0.70 (0.12 - 4.09)	1.77 (0.52 - 6.04)	0.84 (0.14 - 4.89)	1.06 (0.11 - 10.76)	1.46 (0.06 - 36.92)	1.44** (1.17 - 1.78)	1.06 (0.48 - 2.32)

***Indeterminate means data is not follow normal distribution sample size is very small. ** represents 5% level of significance (p<0.05)**

CONCLUSIONS

Maternal characteristics and its association with birth weight among Union Territories of India were elucidated with low birth weight. Here, low birth weight was considered as key health indicators and its prevalence was varied across the union territories. Health indicator is important for policy, planning and healthcare providers to public. Prevalence of LBW differ across the UT's through several predictors. Respondent who were residing in rural places among them prevalence of low birth weight was highest than urban in D &N Haveli and Puducherry. Among the anemicwere more likely to haverisk of LBW in comparison to not anemic across the union territory except the A & N and Dadar Nagar Haveli. Therefore, anemia is a one of the important maternal characteristic and key risk factor of the low birth weight. In Delhi, occurrence of LBW was significantly less likely in Muslim religion,innormal BMI was less likely to have risk of LBW than other category of BMI. In Daman & Diu and Lakshadweep more likely to have risk of LBW in the category ofsecond and third birth order in comparison to first birth order. In summary, maternal characteristics influence the birth weight across the union territories of India.

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