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Factors associated with low birth weight among tribal and non-tribal population in India: Evidence from National Family Health Survey-4 (2015–2016)

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ABSTRACT: The tribal population (8.6%) is vulnerable to neonatal mortality and morbidity in India. Birth weight is an important decisive factor for most neonatal survival and postnatal development. The present study aims to compare the prevalence and associations of certain socio-economic, demographic, and lifestyle variables with low birth weight (LBW) among tribal and non-tribal populations in India. The present investigation utilized retrospective data of the National Family Health Survey (NFHS-4, 2015–16) among tribal (N=26635) and non-tribal (N=142162) populations in India. Birth weight variation of the newborn was categorized into LBW (<2500 gm) and NBW (≥2500 gm). ANOVA, chi-square ($\chi 2$) analysis, and binary logistic regression (BLR) were applied using SPSS (version 16.0). The prevalence of LBW was higher in non-tribal (17.2%) than tribal (13.5%), and the population-specific birth weight was significantly higher in tribal than non-tribal population ($p<0.01$). Higher tribal population concentration (47.0%) areas has a lower (7.4%) prevalence of LBW in the northeast zone, whereas greater non-tribal population concentration (27.1%) areas was found higher in the central zone (19.2%). The BLR analysis showed that rural habitat, lower educational attainment, lack of own sanitary toilet facility, a lower wealth index, absence of electricity, high pollutant fuel exposure, Hindu and Muslim religion, elevated maternal age at first birth, maternal anemia as well as home delivery of newborn have greater odds for LBW ($p<0.05$). In India, tribal populations are vulnerable and marginalised; their birth weight is significantly higher than that of non-tribals, and they have a lower prevalence of LBW and higher female birth rates. Mother's socio-economic status and perceptions towards hygiene and better lifestyles acquired by educational upliftment positively affect the birth weight of the newborn in both the tribal and non-tribal population in India.

KEY WORDS: Birthweight, Low Birth Weight, Tribal population, Socio-Demographic variables

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Introduction

Birth weight is the most decisive single most factor associated with perinatal, postnatal and neonatal mortality in several developing countries. It has a long-term negative impact on neonate's survival, physical growth and development, health status, anthropometric parameters and cognitive development during childhood to adulthood (Mondal, Dey, Sen 2018; Khan, Mozumdar, Kaur 2020). The birth weight is defined as the first weight of the newborn, which is classified as Normal birth weight (NBW) ≥2500 gm, and Low birth weight (LBW) <2500 gm (WHO 2004). The LBW encounters due to intrauterine growth retardation, preterm deliveries and growth retardation are attributed to mortality, morbidity, environment conditions, maternal characteristics and health status, poverty, social-demographic disparities and economic burden among vulnerable segments of the population (Metgud, Naik, Mallapur 2012; Talie, Taddele, Alemayehu 2019). Although, the prevalence of LBW has declined over the past decade, it is still considered as one of the major public health problems in India, where a sizable number of research studies have reported the population-specific prevalence of LBW (ranged between 10% to 56%) (Sen, Roy, Mondal 2010; Ravikumar, Rajeshkannan 2016; Toshniwal et al. 2017; Dey, Mondal, Dasgupta 2019; Khan, Mozumdar, Kaur 2020). The population-specific birth weight variation has been a prime concern that has been significantly influenced by certain determinant factors including parental genetic (Lunde et al. 2007; Mallia et al. 2017), maternal anthropometrics and nutritional status (Papazian et al. 2017; Azcorra and Mendez 2018), demographic condition (Haldre et al. 2007; Schempf et al. 2007), socio-economic status (Olson et al. 2010; Martinson, Reichman 2016), lifestyle factors (Abraham et al. 2017; Kataoka et al. 2018) and seasonal variations (Mondal, Dey, Sen 2018; Zhang, Yu, Wang 2017).

In the present globalized and ever--changing world, the tribal populations are also facing difficulties to sustain a strategic distance from its impact in India. These populations have experienced significant socio-economic, demographic and epidemiological transitions that directly or indirectly affect their health status, nutrition and disease outcomes (Kumar, Pathak, Ruikar 2020; Bharali, Mondal 2021). As per Census (2011), a total of 8.6% population belongs to various tribal communities dispersed over 30 states and 6 union territories across India. The tribal populations has remained isolated from the mainland development activities to a greater extent compared to non-tribal community; often living in distant, hilly and forest areas. However, owing to their unique cultural practices and ethnic distinctions, these populations have always been focused on population investigations (Kshatriya, Acharya 2016; Singh et al. 2020). The tribal populations have a rich ethno-medicine knowledge and strictly follow their traditional practices. Presently, in spite of coexisting with other non-tribal communities, the tribal populations are still following their inherited traditional knowledge for their livelihood (Ministry of Tribal Affairs 2018; Narain 2019). The prevalence of poverty and inaccessibility of healthcare facilities make the tribal populations exceptionally vulnerable in terms of health status, maternal morbidity and mortality, nutritional status and poor reproductive outcomes (Moosan et al. 2019; Das et al.

2020; Bharali, Mondal 2021). Moreover, the health status of indigenous or tribal population provides important insight in terms of implementation of appropriate public health strategies to the concerned population. National Family Health Survey -4 (2015–16) reported that the child mortality (<5 years) was 57.2 per 1000 live births among the tribal population, significantly higher as compared to 38.5 per 1000 live births among non-tribal populations. The infant mortality rate was 44.4 per 1000 live births while others of 32.1 per 1000 live births in India (IIPS 2017; Ministry of Health & Family Welfare and Ministry of Tribal Affairs 2018). The tribal newborns have 19.0% greater risks of neonatal morbidity and 45.0% higher chance of post-neonatal morbidity compared to non-tribal newborns in India (Anderson et al. 2016). Several researchers have reported that majority of the tribal populations are suffering from a high disease burden which includes communicable and non-communicable disease, poor reproductive outcomes, mental health, malnutrition (both overweight-obesity and undernutrition) and poor health-seeking behaviours in the population (Kshatriya, Acharya 2016; Kumar, Pathak, Ruikar 2020; Bharali, Mondal 2021). Maternal healthcare service utilization, antenatal care, immunizations services and healthcare delivery were significantly lower among tribal than non-tribal population due to the lack of education, awareness and lack of transportation facilities in India (NFHS-4 2015–16; IIPS 2017; Ministry of Health & Family Welfare and Ministry of Tribal Affairs 2018; Bharali, Mondal 2021). Recent investigations have shown a large birth weight variations (i.e., LBW) among numerous tribal populations across India (Thakre et al. 2018; Narwade, More 2018). The prevalence of LBW has shown multiple causes and manifestations, and reducing such magnitude has been recognized as a public health priority, as population-specific, systematic and comprehensive strategies are necessary for the target population. Moreover, the population-specific investigations are necessary to understand and identify the possible association between determinant variables. This, in turn, requires a special attention to the researcher due to estimating the magnitude, ethnic variations and possible mechanism of a biological variable (i.e., LBW). The present study attempts to compare the prevalence of LBW among the tribal and non-tribal populations in India and ascertain the associations of socio-economic, demographic and lifestyle variables with newborn's birth weight in India. The findings of the present investigation are essential to implementation of appropriate intervention strategies in order to improve the overall health status, socio-economic conditions, related to specific reproductive outcomes (e.g., LBW) among the vulnerable segment of populations.

Material and methods

The present cross-sectional investigation was carried out utilising the secondary data from the National Family Health Survey (NFHS-4, 2015–16) undertaken by the International Institute for Population Sciences (IIPS), Mumbai, India. This study sample consists of 259627 birth weight data from a total of thirty states and six Union Territories of India. The sample included 168797 neonates were analysed in the present investigation, where a total of 142162 and 26635 of the neonates belonged to various non-tribal and tribal populations, respectively. It is to be mentioned that the decrease in analysed sample size was due to the elimination of outlying observations along with twin or multiple births and 'not adjure resident' (not present during data collection).

Variables

The dependent variable was birth weight variation of the newborn and was categorized into LBW (<2500 gm) and NBW (≥2500 gm) (WHO, 2011). The birth weight ranges are selected from 1500–4500 gm as extreme LBW (<1500 gm), and extreme overweight (>4500 g) newborns were excluded from employing outliers. The independent variables were the type of place of residence (rural, urban), religion (Hindu, Muslim, Other), age of respondent at 1st birth (≤19 years, 20–29 years, ≥30 years), level of anaemia (severe, moderate, mild, not anaemic), level of mother's education (illiterate, primary, secondary, higher), presence of electricity (yes, no), type of toilet facility (sanitary, not sanitary), toilet facilities shared with other households (yes, no), type of cooking fuel (high pollutant, low pollutant), sex of child (male, female), place of delivery (home, institution), family wealth index (poorest, poorer, middle, richer, richest) and zone (central, east, north, north-east, south, west). High pollutant fuel group consists of kerosene, coal, lignite, charcoal, wood, straw, shrubs, grass, agricultural crop, animal dung and others, whereas low pollutant fuel group consists of electricity, Liquified Petroleum Gas (LPG), natural gas and biogas. A total of 30 Indian states and union territories were divided into six zones/regions as per NFHS categorization. The wealth index was measured on household assets and facilities. Households were given scores based on the number and kinds of consumer goods they owned, ranging from a television to a bicycle or car, and housing characteristics such as the source of drinking water, toilet facilities and flooring materials. These scores were derived using principal component analysis. The calculation of the wealth index was done by the IIPS itself and was contained in the data supplied. In case of sharing of toilet facility, those who have no toilet facility excluded from the overall data set. Therefore, a total of 70317 cases are not included, and a total of 5% (821) data on maternal anaemia was also found to be missing from the dataset.

Statistical Analysis

The statistical analyses were conducted using the Statistical Package of Social Sciences (SPSS, version 16.0). Data were divided into two sub-groups, i.e. tribe and non-tribe, all the data mentioned as scheduled tribes were clustered in Tribe groups and the remaining populations were accumulated into the non-tribe community. The frequency distribution was depicted in terms of descriptive statistics (mean and standard deviation). The mean comparisons of birth weight between the sexes (male and female) and the populations (tribal and non-tribal) were analysed using One-Way Analysis of Variance (ANOVA). The chi-square (χ^2) analysis was performed to assess the significant prevalence of LBW among newborns. The binary logistic regression (BLR) analysis was carried out to determine the simultaneous effects of covariates on the dependent variable (i.e. LBW). The dependent variables were dichotomous in nature and entered in the BLR analysis, where newborns with LBW were coded as '0' and NBW as '1'. A p-value of

<0.05 was considered being significant, and 95% Confidence Interval (CI) was used to determine the strength of association between independent and dependent variables in separate population-specific regression analysis. Similarly, the independent variables were entered as a set of dummy variables and odds were obtained by comparing the reference category. The reference categories for the independent variables were 'urban' residence, 'Other' religion, '≥30' years age of respondent at 1st birth, 'non-anaemic', 'higher' educational status, presence of 'electricity' and 'sanitary toilet facility', 'own' toilet, 'low pollutant' cooking fuel, 'richest' wealth index, 'male' child, 'institutional' delivery and 'West' zone of India.

Results

A total 168797 birth records were selected, of which 26635 (15.8%) and 142162 (84.2%) were tribal and non-tribal, respectively. However, while the overall prevalence of LBW was 16.6%, the tribal population was 13.5% and the non-tribal group had 17.2% LBW neonates independently. The results of ANOVA showed that, the population specific mean difference was significantly higher among tribal population (2919.23±539.299 gm over 2809.30±540.480 gm), and sex-specific mean difference was lower among male children (2855.16±547.149 gm over 2794.99±533.970 gm), though in both population the mean birth weight was lower in case of girl child (Table 1).

Descriptive analysis of independent variables among Tribal and Non-tribal communities

The descriptive statistics of newborn's birth weight and maternal variables are presented in (Table 2). The prevalence of girl child is higher among tribes (51.5% over 47.2%) and in both communities' girls have a greater prevalence of LBW. In the study population, the tribes have maximum numbers of Hindus (53.0%), followed by the 'other' religious group (47.6%) and very nominal frequency of Muslims (2.6%), though Muslims have 17.5% LBW babies nearer to the Hindus (18.7%). On the other hand, the distribution of population according to religious belief widely ranged from Hindus (82.2%), Muslims (12.9%) and others (5.3%) but the prevalence of LBW newborns was not very much dispersed among the various religious groups i.e. Hindu (17.4%), Muslims (16.5%) and others (16.0%) among non-tribal populations. The early age of first child birth i.e., teenager mothers (≤19 years) having maximum (14.7%) number of LBW followed by the age groups 20–29 years (13.1%) and elderly (10.4%) mothers, though among the non-tribal group the elderly (18.1%)

Table 1. Descriptive statistics and mean differences of newborn's birth weight among tribal and non-tribal population in India

Variables		Tribe	Non-tribe	F-value	P-value
Birth weight	LBW	2044.88±237.099	2010.15±245.933	63.167	<0.001
	NBW	3055.96±435.066	2975.25±424.336	691.151	<0.001
Sex	Female	2886.03±524.589	2777.46±533.982	95.275	<0.001
	Male	2950.46±550.979	2837.74±544.651	442.089	<0.001

Table 2. Profile of socio-economic, demographic, lifestyle variables and prevalence of LBW among tribal and non-tribal population in India

VARIABLES	CATEGORY	TRIBE				NON-TRIBE			
		LBW (%) [N= 3602 (13.5)]	NBW (%) [N=23033 (86.5)]	Total (%) [N=26635]	Chi^2-value	LBW (%) [N=24445 (17.2)]	NBW (%) [N=117717 (82.8)]	Total(%) [N=142162]	Chi^2-value
Type of residence	Rural	3159 (14.7)	18363 (85.3)	21522 (80.8)	1.278 **	17545 (17.3)	83925 (82.7)	101470 (71.3)	2.278
	Urban (R)	443 (8.7)	4670 (91.3)	5113 (19.2)		6900 (17.0)	33792 (83.0)	40692 (28.7)	
Religion	Hindu	2642 (18.7)	11455 (81.3)	14097 (53.0)	6.913 **	20198 (17.4)	95997 (82.6)	116195 (81.7)	16.678 **
	Muslim	121 (17.5)	570 (82.5)	691 (2.6)		3031 (16.5)	15337 (83.5)	18368 (12.9)	
	Others (R)	984 (7.8)	11688 (92.2)	12672 (47.6)		1216 (16.0)	6383 (84.0)	7599 (5.3)	
Age of respondent at 1st birth	≤19 (R)	1373 (14.7)	7965 (85.3)	9338 (35.1)	24.484 **	8329 (17.8)	38360 (82.2)	46689 (32.8)	24.750 **
	20-29	2100 (13.1)	13951 (86.9)	16051 (60.3)		15403 (16.8)	76137 (83.2)	91540 (64.4)	
	≥30	129 (10.4)	1117 (89.6)	1246 (4.7)		713 (18.1)	3220 (81.9)	3933 (2.8)	
Anemia level #	Severe	58 (22.5)	200 (77.5)	258 (1.0)	1.196 **	266 (21.8)	956 (78.2)	1222 (0.9)	66.906 **
	Moderate	567 (16.0)	2975 (84.0)	3542 (13.3)		3597 (18.8)	15576 (81.2)	19173 (13.5)	
	Mild	1577 (15.2)	8806 (84.8)	10383 (39.0)		10056 (17.2)	48341 (82.8)	58397 (41.1)	
	Not anemic (R)	1376 (11.2)	10945 (88.8)	12321 (46.2)		10401 (16.6)	52279 (83.4)	62680 (44.1)	
Highest educational level	No education	1338 (19.1)	5671 (80.9)	7009 (26.3)	2.989 **	6323 (18.8)	27295 (81.2)	33618 (23.6)	2.552 **
	Primary	611 (14.2)	3688 (85.8)	4299 (16.1)		3626 (18.9)	15551 (81.1)	19177 (13.5)	
	Secondary	1513 (11.1)	12063 (88.9)	13576 (51.0)		12105 (16.8)	59841 (83.2)	71946 (50.6)	
	Higher(R)	140 (8.0)	1611 (92.0)	1751 (6.6)		2391 (13.7)	15030 (86.3)	17421 (12.3)	
Electricity	No	504 (17.5)	2383 (82.5)	2887 (10.8)	42.85 **	2664 (17.9)	12238 (82.1)	14902 (10.5)	5.432 *
	Yes (R)	3098 (13.0)	20650 (87.0)	23748 (89.2)		21781 (17.1)	105479 (82.9)	127260 (89.5)	
Type of toilet facility	Not sanitary	2533 (16.7)	12671 (83.3)	15204 (57.1)	2.980 **	12753 (17.8)	58885 (82.2)	71638 (50.4)	37.348 **
	Sanitary (R)	1069 (9.4)	10362 (90.6)	11431 (42.9)		11692 (16.6)	58832 (83.4)	70524 (49.6)	

Toilet shared with other households ##	Yes	212 (11.2)	1681 (88.8)	1893 (7.1)	5.786 *	2647 (18.2)	11881 (81.8)	14528 (10.2)	37.178 **
	No (R)	1302 (9.5)	12466 (90.5)	13768 (51.7)		11030(16.2)	57261 (83.8)	68291 (48.0)	
Type of cooking fuel	High pollutant	3043 (15.2)	17005 (84.8)	20048 (75.3)	1.899 **	16238 (17.9)	74278 (82.1)	90516 (63.7)	96.914 **
	Low pollutant (R)	559 (8.5)	6028 (91.5)	6587 (24.7)		8207 (15.9)	43439 (84.1)	51646 (36.3)	
Wealth index	Poorest	1550 (18.8)	6680 (81.2)	8230 (30.9)	3.682**	4867(18.4)	21537 (81.6)	26404 (18.6)	1.428 **
	Poorer	911 (13.4)	5876 (86.6)	6787 (25.5)		5464 (18.1)	24704 (81.9)	30168 (21.2)	
	Middle	656 (11.7)	4965 (88.3)	5621 (21.1)		5314 (17.3)	25322 (82.7)	30636 (21.5)	
	Richer	328 (8.5)	3523 (91.5)	3851(14.4)		4888 (17.0)	23845 (83.0)	28733 (20.2)	
	Richest(R)	157 (7.3)	1989 (92.7)	2146 (8.1)		3912 (14.9)	22309 (85.1)	26221 (18.4)	
Sex of child	Female	1831 (14.2)	11081 (85.8)	13723 (51.5)	9.251 *	12355 (18.4)	54712 (81.6)	67067 (47.2)	1.342 **
	Male(R)	1771 (12.9)	11952 (81.7)	12912 (48.5)		12090 (16.1)	63005 (83.9)	75095 (52.8)	
Place of delivery	Home	628 (15.0)	3570 (85.0)	4198 (15.8)	8.787 *	1947 (20.0)	7780 (80.0)	9727 (6.8)	58.370 **
	Institution (R)	2974 (13.3)	19463 (86.7)	22437 (84.2)		22498 (17.0)	109937 (83.0)	132435 (93.1)	
Zone	Central	953 (17.5)	4483 (82.5)	5436 (20.4)	7.830 **	7377 (19.2)	31131 (80.8)	38508 (27.1)	3.823 **
	East	685 (18.8)	2953 (81.2)	3638 (13.6)		4707 (15.2)	26170 (84.8)	30877 (21.7)	
	North	422 (21.0)	1591 (79.0)	2013(7.5)		5655 (18.7)	24578 (81.3)	30233 (21.3)	
	North-east	933 (7.4)	11642 (92.6)	12575 (47.2)		1183 (13.1)	7875 (86.9)	9058 (6.4)	
	South	169 (19.2)	709 (80.8)	878 (3.3)		3267 (15.7)	17594 (84.3)	20861 (14.6)	
	West (R)	440 (21.0)	1655 (79.0)	2095 (7.9)		2256 (17.9)	10369 (82.1)	12625 (8.9)	

#821 (0.5%) cases are missing from data set ; ##70317 (41.7%) cases are excluded from data set due to not having any toilet facility; *p<0.05; **p<0.01

mothers having maximum numbers of LBW followed by teenager mothers i.e. ≤19 years (17.4%) among the tribal population. Zone wise distribution of birth weight differed considerably between the tribe and non-tribe communities. The tribal population was highly concentrated with a minimum LBW prevalence (7.4%) to the North east (47.2%), while the LBW level to the North and West region was highest (21.0%) whereas the overall tribal population was 7.5% and 7.9% respectively. The non-tribal population, on the other hand, had the highest LBW prevalence (19.2%) and population concentration (27.1%) in Central region and the lowest LBW prevalence (13.1%), and population concentration (6.4%) in the North east region.

BLR analysis of independent variables among tribal population

In BLR analysis, all the independent variables had significant association with the prevalence of LBW ($p<0.05$). Rural population had greater chance (odds: 1.814; 95% CI: 1.634–2.013; $p<0.001$) of having LBW new-born. There was a clear indication that the Hindus having the highest odds (odds: 2.741; 95% CI: 2.534–2.964; $p<0.001$), followed by the Muslims (odds: 2.537; 95% CI: 2.055–3.133; $p<0.001$). Additionally, mother's age at first pregnancy between 20–29 years (odds: 1.145; 95% CI: 1.064–1.232; $p<0.05$) and ≥30 years (odds: 1.493; 95% CI: 1.233–1.807; $p<0.05$) had higher odds of having LBW. Severe (odds: 2.307; 95% CI: 1.713–3.106; $p<0.001$) and even moderate level (odds: 1.516; 95% CI: 1.364–1.685; $p<0.001$) of anaemic mothers have higher odds. Women who were non-educated (odds: 2.715; 95% CI: 2.262–3.259; $p<0.001$) exhibited a higher odds value than those with primary education (odds: 1.906; 95% CI: 1.572–2.312; $p<0.001$). The results further showed that absence of electricity (odds: 1.410; 95% CI: 1.271-1.563; $p<0.001$), having shared (odds: 1.207; 95% CI: 1.035–1.408; $p<0.001$) and no sanitary toilet (odds: 1.938; 95% CI: 1.796–2.091; $p<0.001$), high pollutant fuel users (odds: 1.930; 95% CI: 1.755–2.122; $p<0.001$), female child (odds: 1.115; 95% CI: 1.039-1.196; $p<0.001$) and home delivery (odds: 1.151; 95% CI: 1.049–1.264; $p<0.001$) had highly significant effects on the birth weight of newborn. Decrease in wealth index indicates an increased odd of having LBW.

BLR analysis of independent variables among non-tribal population

In BLR analysis, among the non-tribes, no significant association was found among the rural people with the prevalence of LBW ($p>0.05$) though higher odds are found among rural population (odds: 1.024; 95% CI: 0.993–1.056; $p<0.001$). Women faithful to Hindu (odds: 1.104; 95% CI: 1.037–1.176; $p<0.001$) and Muslim (odds: 1.037; 95% CI: 0.965–1.116; $p<0.001$) religion having significantly higher odds of being LBW babies. The results further showed that age at first pregnancy between 20–29 years (odds: 1.073; 95% CI: 1.042–1.105; $p<0.05$) had higher and age at first pregnancy ≥30 years (odds: 0.981; 95% CI: 0.901–1.067; $p<0.05$) had lower odds of having LBW. Moreover severe anaemic level (odds: 1.399; 95% CI: 1.219–1.605; $p<0.001$), no education (odds: 1.456; 95% CI: 1.384–1.533; $p<0.001$), primary education (odds: 1.466; 95% CI: 1.385–1.551; $p<0.001$), absence of electricity (odds: 1.054; 95% CI: 1.008–

1.102; $p<0.001$), sharing (odds: 1.157; 95% CI: 1.104–1.212; $p<0.001$) and without sanitary toilet (odds: 1.090; 95% CI: 1.060–1.120; $p<0.001$), high pollutant fuel (odds: 1.157; 95% CI: 1.124–1.191; $p<0.001$), lesser wealth index (odds: 1.289; 95% CI: 1.231–1.349; $p<0.001$), female child (odds: 1.177; 95% CI: 1.145–1.210; $p<0.001$), home delivery (odds: 1.223; 95% CI: 1.161–1.288; $p<0.001$) and North-east zone (odds: 1.448; 95% CI: 1.342–1.563; $p<0.001$) had highly significant effects on the birth weight of a new born (Table 2).

Discussion

The prevalence of LBW is one of the most significant measures of reproductive outcomes of intrauterine growth retardation, and determines the risks of mortality, morbidity and inadequate development and overall survival of newborns (Sen, Roy, Mondal 2010; Dey, Mondal, Dasgupta 2019; Khan, Mozumdar, Kaur 2020). The present investigation reports the existence of the newborn's birth weight variations among tribal and non-tribals populations in India, utilizing NFHS-4 data (2015–2016) (Table 1). The prevalence of LBW was significantly higher among the non-tribal groups than the tribal populations ($p<0.001$). Similarly, the mean birth weight was significantly higher among tribal than non-tribal populations ($p<0.01$) (Table 1). The sex-specific mean LBW was higher among females than males in both tribal and non-tribal populations ($p<0.05$). The overall prevalence of LBW was observed to be 13.5% and 17.2% among tribal and non-tribal populations, in India utilizing NFHS-4 (2015–16), respectively (Table 2). Interestingly, the present investigation showed that regions with a higher concentration of tribal populations had a lower prevalence of LBW, and higher magnitude of LBW observed among the non-tribal population in India. Thus, present study suggests that a lower prevalence of LBW among tribal than the non-tribal population in India, is attributed to community unity and rich indigenous knowledge, traditional healthcare practices, ethnomedicine use and cultural practices in population (Narwade, More 2018; Pushpangadan, George 2010).

Several researchers have reported that aside from the health concern, LBW is a socio-economic burden due to socio-economic inequality (Borah, Agarwalla 2016; Patale, Masare, Bansode 2018). They argue that an improvement in socio-economic status can provide better facilities such as nutritious food, electricity, appropriate sanitary facilities, improved education, which may act as a safeguard to the attainment of appropriate newborn's birth weight for future generations. Therefore, the wealth index is strongly associated with the LBW prevalence, which has lower odds of being LBW in the higher ranges of wealth indices (Table 3). The advent of electricity appears to be related to development and modernity, with the acquisition of lights and improvement as well as the better use of time and staying connected with the outside world on electronic media by another. It can be confirmed that electricity's presence does not influence the imminent newborn's birth weight directly, but influences with major determinants may be found very powerful to describe the biological outcome in a population. Tshotetsi et al. (2019) have reported that the absence of electricity independently increased the odds of being LBW in the South African population.

Table 3. Binary logistic regression analysis and association of socio-economic, demographic, lifestyle variables and LBW among tribal and non-tribal population in India

VARIABLES	CATEGORY	TRIBE						NONTRIBE					
		(B)	SE	Exp (B) odds	95% CI of ODDs	R^2	P value	(B)	SE	Exp (B) odds	95% CI of ODDs	R^2	P value
Type of residence	Rural	0.595	0.053	1.814	1.634 -2.013	0.010	<0.001	0.024	0.016	1.024	0.993-1.056	<0.001	0.131
	Urban (R)	-	-	-	-			-	-	-	-		
Religion	Hindu	1.008	0.040	2.741	2.534-2.964	0.048	<0.001	0.099	0.032	1.104	1.037-1.176	<0.001	<0.001
	Muslim	0.931	0.108	2.537	2.055-3.133			0.037	0.037	1.037	0.965-1.116		
	Others (R)	-	-	-	-			-	-	-	-		
Age of respondent at 1st birth	≤19 (R)					0.002	<0.001					<0.001	<0.001
	20-29	0.136	0.037	1.145	1.064-1.232			0.071	0.015	1.073	1.042-1.105		
	≥30	0.401	0.097	1.493	1.233-1.807			-0.02	0.043	0.981	0.901-1.067		
Anemia level #	Severe	0.836	0.152	2.307	1.713-3.106	0.008	<0.001	0.335	0.070	1.399	1.219-1.605	0.001	<0.001
	Moderate	0.416	0.054	1.516	1.364-1.685			0.149	0.021	1.161	1.113-1.210		
	Mild	0.354	0.040	1.424	1.318-1.539			0.045	0.015	1.046	1.015-1.078		
	Not anemic (R)	-	-	-	-			-	-	-	-		
Highest educational level	No education	0.999	0.093	2.715	2.262-3.259	0.020	<0.001	0.376	0.026	1.456	1.384-1.533	0.003	<0.001
	Primary	0.645	0.098	1.906	1.572-2.312			0.382	0.029	1.466	1.385-1.551		
	Secondary	0.367	0.092	1.443	1.205-1.729			0.240	0.024	1.272	1.213-1.333		
	Higher(R)	-	-	-	-			-	-	-	-		
Household has: electricity	No	0.343	0.053	1.410	1.271-1.563	0.003	<0.001	0.053	0.023	1.054	1.008-1.102	<0.001	0.020
	Yes (R)	-	-	-	-			-	-	-	-		

Type of toilet facility	Non-sanitary	0.662	0.039	1.938	1.796-2.091	0.021	<0.001	0.086	0.014	1.090	1.060-1.120	<0.001	<0.001
	Sanitary (R)	-	-	-	-			-	-	-	-		
Shared Toilet facilities ##	Yes	0.189	0.078	1.207	1.035-1.408	0.001	0.016	0.145	0.024	1.157	1.104-1.212	0.001	<0.001
	No (R)							-	-	-	-		
Type of cooking fuel	High pollutant	0.657	0.048	1.930	1.755-2.122	0.014	<0.001	0.146	0.015	1.157	1.124-1.191	0.001	<0.001
	Low pollutant (R)	-	-	-	-			-	-	-	-		
Wealth index	Poorest	1.078	0.088	2.940	2.476-3.490	0.025	<0.001	0.254	0.024	1.289	1.231-1.349	0.002	<0.001
	Poorer	0.675	0.090	1.964	1.646-2.344			0.232	0.023	1.261	1.206-1.319		
	Middle	0.515	0.093	1.674	1.396-2.007			0.180	0.023	1.197	1.144-1.252		
	Richer	0.165	0.101	1.179	0.968-1.438			0.156	0.023	1.169	1.117-1.224		
	Richest (R)	-	-	-	-			-	-	-	-		
Sex of child	Female	0.109	0.036	1.115	1.039-1.196	0.001	0.002	0.163	0.014	1.177	1.145-1.210	0.002	<0.001
	Male (R)	-	-	-	-			-	-	-	-		
Place of delivery	Home	0.141	0.048	1.151	1.049-1.264	0.001	0.003	0.201	0.026	1.223	1.161-1.288	0.001	<0.001
	Institution (R)	-	-	-	-			-	-	-	-		
Zone	Central	0.224	0.064	1.251	1.102-1.419	0.055	<0.001	-0.085	0.027	0.918	0.872-0.967	0.005	<0.001
	East	0.136	0.068	1.146	1.002-1.310			0.190	0.028	1.210	1.145-1.278		
	North	0.002	0.077	1.002	.863-1.165			-0.056	0.028	0.946	0.896-0.998		
	North-east	1.199	0.064	3.317	2.929-3.757			0.370	0.039	1.448	1.342-1.563		
	South	0.109	0.101	1.115	.915-1.360			0.158	0.030	1.172	1.105-1.243		
	West (R)	-	-	-	-			-	-	-	-		

821 (0.5%) cases are missing from data set; ##70317 (41.7%) cases are excluded from data set due to not having any toilet facility.

However, these types of research investigations are rare in the Indian context. In this study, it has been observed that tribal people mostly use high pollutant fuel (e.g., wood, coal, straw, grass) (75.3% vs. 63.7%) which may be due to the easier availability of these resources near their habitat. Interestingly, they also produce a lesser frequency of LBW babies than the non-tribal group (15.2% vs. 17.9%), possibly due to the overall prevalence of LBW, the number of babies are much higher among non-tribal compared to tribal groups (Table 2). Households using high polluting fuels find adverse in contrast with safer fuels, with increased chances of LBW in populations in already reported by other investigations (e.g., Pope et al. 2010; Milanzi, Namacha 2017). Biomass as fuel has released high levels of harmful chemicals, such as carbon dioxide, suspended particulate matter, ozone and formaldehyde, which are likely to penetrate into maternal blood and directly impact the foetus and may result in a rise in the risks of LBW (e.g., Glinianaia et al. 2004; Naeher et al. 2007).

Researchers have reported that maternal education has a protective effect on newborns birth weight. It is evident from the present study that lack of education has significantly increased the prevalence of LBW babies in both tribal and non-tribal populations ($p<0.01$). In this sense, tribal populations are more vulnerable to the better-educated mother than the non-tribal populations in India (Table 3). Similar findings reported in the case of a sanitary toilet facility, and its sharing with other households in non-tribal populations ($p<0.05$). The event of home delivery was remarkably high in both populations (Table 3). The total home delivery preferences were observed to be lower in the non-tribe group; meanwhile, the magnitude of LBW was observed to be higher among the non-tribe community. Perhaps the tribal's are more acquainted with prenatal care in their homes. Level of education seems to be a significant predictor of maternal nutrition and health status by taking wise decision while choosing food or eating habits and utilizations of healthcare facilities (Hassan et al. 2017; Bharali, Mondal 2021), although, some contradictory studies reported insignificant association in populations (Solanki et al. 2012; Noor et al. 2015). Several researchers have also reported that education increases the safe hygiene practices in communities (Dreibelbis et al. 2013; Padhi et al. 2015), which may prevent adverse pregnancy outcomes from infections or stress during pregnancy. A hospital-based study from sub-Saharan Africa has reported a higher risk of poor obstetrics outcome among babies born to mothers using shared sanitation facilities (e.g., Olusanya, Ofovwe 2010). Similarly, recent research investigation has reported a significant associations between sanitation, types and sources of drinking water and poor reproductive outcomes (i.e., preterm birth and LBW) among women in India (Baker et al. 2018; Patel et al. 2019). Moreover, mother's education influences them to choose the right place of delivery, which may not directly affect the variation of birth weight, but may be due to enriched medical facilities and the skilled help of the health worker during the delivery crisis.

The analysis of the demographic factors showed that the urban populations found to have many benefits, such as better access to healthcare services, which may support a healthier child and proper antenatal and natalcare in comparison to the rural population. However, in rural non-tribal people, the LBW prevalence is higher than in a rural population. In the present investigation, most of the mothers in both the non-tribal and tribal groups (96.7% and 89.6%, respectively) believed in the Hindu religion and comparison, with Muslim and other religious believes, and Hindu mother experiencing higher LBW newborns. Moreover, this could be attributed to a particular religion having some significance in various cultural practices, which in turn may affect the newborn's birth weight. Previously reported studies are in support of the present investigation that maternal religious attendance was found to have protection against LBW (Burdette et al. 2012; Shahnawaz et al. 2014). However, several investigations have reported inconsistency in the population (Van Den Oord, Rowe 2001; Khatun, Rahman 2009). There are plenty of studies in which the effect of maternal age (i.e. their chronological age) has ascertained the associations with birth weight. However, in Indian literature, the effect of age at first childbirth of mother is uncommon. Further, height and pelvic dimensions are almost complete by two years after menarche, which supports the importance of low maternal age at first birth as an exposure. A recent study conducted in the USA has indicated that at first births the increased risk of adverse pregnancy and birth outcomes are more prevalent among the women of young and advanced maternal ages (Schummers et al. 2019). This research has a conflicting impact between tribal and non-tribal populations, based on the influence of mother's age at first birth on birth weight. Elevated maternal age has a negative effect on the birth weight of the newborn in non-tribal communities, but it does not work for the tribal population in India. Anaemia is one of the most prominent haematological predictors of gestational complications and adverse birth outcomes. Earlier studies have reported that maternal anaemia has remarkable effects on birth weight of a child (Figueiredo et al. 2018; Kumari et al. 2019), which is supported by this investigation results that higher odds of having LBW is assistance by the severe anaemic mother both tribal and non-tribal population (Table 3).

Conclusion

The tribal population of India is predominantly inhabited in mostly rural and remote areas. Despite being most disadvantaged, oppressed and showed higher mean birth weight, the tribal population exhibits a lesser prevalence of LBW and played a better role in sex ratio and a higher percentage of birth of girl child in comparison to the non-tribal population in India. Home deliveries are preferable for the tribal population, and the LBW prevalence was lower than the non-tribes population because of their rich traditional healthcare practices. Therefore, neonatal and post-natal care should be improved immensely in the tribal population in order to reduce neonatal mortality and morbidity, which may be due to higher household deliveries performed in population. The analysis of socio-economic status and perceptions towards hygiene and better lifestyle acquired by educational upliftment have been found to have an equally positive impact on birth weight of newborn on both tribal and non-tribal populations. Prevalence of LBW among the tribes was observed to be lower than the overall scenario of the country but still has found to be an alarming situation. Therefore, an appropriate healthcare intervention and awareness programme are necessary to improve the existing LBW statistics among tribal as well as the non-tribal population as well as enhance the overall child health scenario.

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Conflict of interests

The authors have no conflicts of interest to declare.

Authors' contribution

Conceptualised and designed by SD and NM. Analysed the data by SD. Wrote the paper by SD and NM. Revised and finalised the manuscript by SD, NM and KB.

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