

Prevalence and correlates of low birth weight in chittoor district of andhra pradesh, india

Abstract

Low birth weight is one of the important public health problems in both developed and developing countries. It is our hypothesis that the prevalence of low birth weight is influenced by altered life styles and socioeconomic gradients. Our long term objective is to assess the prevalence of low birth weight in different socioeconomic milieu. To accomplish this objective a prospective cross sectional observational study was designed to collect the data on nutritional anthropometry, infant birth weight and mothers physical activity, occupation, education and income among 1000 women in Chittoor District of Andhra Pradesh. Random sampling technique was applied in selecting the subjects. Pre-validated structured questionnaire was used in collecting the information on mother's demography, socioeconomic factors and physical activity. Anthropometric measurements were taken as per the standard procedures. Low birth weight was defined as infant weight below 2.5 Kg upon delivery. In the present study the prevalence of low birth weight was 34.1% and the average body mass index (BMI) among the mothers was found to be 22.27 ± 2.94 . A linear growth rate in birth weight was noticed among the high income educated women. Physical activity failed to differentiate average birth weight. Age adjusted multi-nominal logistic regression model reveals that women with illiteracy and low income were the significant factors in the prevalence of low birth weight. Further, forward conditional model highlights the effect of low income (Odds ratio: 2.5; 95%CI: 1.529, 4.099) as the predominant factor towards the low birth weight. In conclusion, it is inferred that income of the mother found to be significant factor towards the precipitation of low birth weight. Hence, improving the economic status of women will have the sizeable effect in the mitigation of low birth weight.

Keywords: Low birth weight, Body mass index, Socioeconomic status, Physical activity

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Introduction

Birth weight of the baby is an important indicator of reproductive health and general health status of a population. Low birth weight (LBW) is considered as single most important predictor of infant mortality, especially of deaths within the first month of life.¹ According to WHO, LBW is defined as an infant birth weight less than 2500g.² Low and middle income countries are the target populations towards the elevated prevalence of LBW.³ As per the WHO estimates, globally about 25 million LBW babies are born every year and nearly 95% of them are from developing nations.⁴ There seems to be considerable variation in the prevalence of low birth weight across the regions in different countries and vulnerable populations are especially target groups. A recent study demonstrated that in India nearly 8 million infants are born with LBW in 2013 and it is forecasted that there will be a surge in coming years.²

Prospective studies have convincingly highlighted the effect of maternal nutritional status, socioeconomic conditions and life styles towards LBW. Neonatal complications increase markedly depending on infant's birth weight classifications; less the infants weigh, higher the chances of encountering health difficulties.⁵ Infants with LBW may prone for different complications such as birth asphyxia, hypoglycemia, hypocalcaemia, hypothermia increased risk of infections, failure to thrive, diabetes mellitus, hypertension and learning difficulties etc.

Several case control studies emphasized the role of mothers health history, including previous history of low birth delivery, illness, complication in pregnancy, and past adverse pregnancy outcome may cause LBW.⁶ However epidemiological studies have noticed

the mothers socioeconomic conditions and life styles may have sizeable effect on LBW.⁷ Since, the prevalence of LBW is one of the important health indices and is a function of social status and lifestyle, it is important to identify the prevalence and risk factors associated with LBW in different geographical regions. In the light of the above background, an attempt has been made in the present investigation to assess the prevalence and correlates of low birth weight in Chittoor District of Andhra Pradesh, India.

Methodology

The material selected for the present study was 1000 pregnant women in the age range of 16 to 30 years admitted for delivery in the maternity ward of the Government Maternity Hospital, Tirupati. The design of the study was a hospital based cross sectional observational study. The sample size was established assuming a 95% confidence interval with 3% sampling error. The exclusion criteria were: mothers with multiple pregnancies, mothers whose last menstrual period was not exactly known, neonates with congenital malformations, chromosomal anomalies, and hemolytic disease of newborn. Women admitted for delivery were randomized (simple) for selection. This technique allowed us to draw the sample from different socioeconomic settings. The protocol and consent forms were duly approved by the Institutional Ethical Board. Written informed consent was obtained from all the subjects. Newborn infants were examined by the gynecologist within their first 48 hours of life. Information on mothers socio-demographic characteristics and life styles (age, education, occupation, age at marriage, parity, type of family, income, history of smoking and alcohol consumption during pregnancy, mode and place of delivery) were collected through pretested questionnaire.

The maternal anthropometric measurements like height, weight, waist circumference, hip circumference were collected as per the standard procedures.⁸ Outcome of pregnancy is recorded in terms of infant's sex and the anthropometric variables including weight, crown heel length, crown rump length, chest and head, circumferences are measured by non extendable measuring tape. Infants weighing below 2.5 kg are recorded as LBW babies.² Statistical analysis was carried out via SPSS-20 version and p values <0.05 considered as statistical significant. Continuous variables were provided with descriptives and discontinuous variables with percentages. Chi-square test was applied to see the association of LBW with different socioeconomic and life style factors. Age adjusted multinomial logistic regression model was fitted to see the effect of independent factors on LBW. Further, we have developed a forward conditional model to see the simultaneous effect of independent variables on low birth weight.

Results

Base line characteristics of the study sample were shown in Table 1. Majority of the women screened in the present study comes under 21-25 years age group (61%). Around 68 percent of the women were illiterates (68%) and involved in domestic works. Income below <50000 INR was noticed to an extent of 89 percent. Half of the sample physical activity was categorized as sedentary. Normal weight women were observed to be 76%. Birth weight of the baby <2500 g was 34 percent.

Table 1 Baseline characteristics of the study sample

Variable	N	Percent
Age Group (years)		
16-20	176	17.6
21-25	614	61.4
26-30	185	18.5
>30	25	2.5
Education		
Illiteracy	680	68.0
Primary	185	18.5
Secondary	70	7.0
Higher	65	6.5
Occupation		
Housewife	470	47.0
Agriculture	210	21.0
Job	40	4.0
Labours	280	28.0
Income (INR)		
<50,000	886	88.6
>50,000	114	11.4
Physical Activity		
Sedentary	543	54.3
Mild	307	30.7
Moderate	125	12.5
Heavy	25	2.5
BMI (kg/m²)		
Lean weight	89	8.9
Normal weight	761	76.1
Overweight	139	13.9
Obese	11	1.1
Birth weight		
Low birth (<2.5 kg)	341	34.1
Normal weight (≥2.5 kg)	659	65.9

Table 2 shows the data on anthropometry of infant's mother. The average height of the mother found to be 154.15±5.22 ranging between 135.7 and 172.5 cm. Similarly the average weight, BMI, Waist & hip circumferences were found to be 52.90±7.32, 22.27±2.94, 81.58±7.29 and 101.47±7.52 respectively. Data on infants anthropometry was

shown in Table 3. Average birth weight of the infant was 2.58±0.52 ranging between 1.5 and 4.2 kg respectively. The averages for other infants anthropometry like crown heel length, crown rump length, head & chest circumferences were found to be 44.82±3.30, 29.24±3.84, 35.03±2.41 and 32.84±2.46 respectively.

Table 2 Data on anthropometry of infant's mother

Variable	Mean ± SD	Minimum	Maximum
Height (cm)	154.15±5.22	135.7	172.5
Weight (kg)	52.90±7.32	33.3	81.3
BMI (kg/m ²)	22.27±2.94	16.1	41.2
Waist circumference (cm)	81.58±7.29	52.1	107.4
Hip circumference (cm)	101.47±7.52	63.2	122.2

Table 3 Data on infant's anthropometric measurements

Variable	Mean ± SD	Minimum	Maximum
Birth weight (kg)	2.58±0.52	1.5	4.2
Crown heel length (cm)	44.82±3.30	34.1	56.3
Crown rump length (cm)	29.24±3.84	20.4	46.8
Head circumference (cm)	35.03±2.41	27.8	44.3
Chest circumference (cm)	32.84±2.46	24.5	41.2

Data on low birth weight prevalence based on mothers demography, socioeconomic status and lifestyles were shown in Table 4. Age found to have significant association with LBW in the study sample. Even though 21 to 25 years age cohort exhibited greater prevalence of LBW (19 percent) on average, but the prevalence of LBW was found to be elevated to 44 percent when age cohorts were observed independently (data not shown). In the study population illiteracy elevated the prevalence of LBW for about 25 percent (X²=10.17; p<0.05). Mothers occupation failed exhibit significant association with the prevalence of LBW. 32 percent of the women with an income <49,999 INR noticed with LBW. Low birth weight among the women with sedentary activity recorded to an extent of 17 percent (X²=4.76; p<0.05).

Table 4 Prevalence of infant low birth weight based on mother's demography, socioeconomic status and lifestyles

Variable	N	Prevalence	χ ² value
Age group			
16-20	77	7.7	
21-25	187	18.7	
26-30	66	6.6	12.22*
>30	11	1.1	
Education			
Illiteracy	249	24.9	
Primary	60	6.0	
Secondary	20	2.0	10.17*
Higher	12	1.2	
Occupation			
Housewife	160	16.0	
Agriculture	67	6.7	
Job	14	1.4	0.79
Labours	100	10.0	
Income (INR)			
<50,000	320	32.0	
>50,000	21	2.1	14.08*
Physical activity			
Sedentary	171	17.1	
Mild	114	11.4	
Moderate	49	4.9	4.76*
Heavy	7	0.7	

*p<0.05

Age adjusted multinomial logistic regression model was performed to assess effect of mothers demography, socioeconomic status and life styles on infants birth weight. LBW was taken as dependent variable and mothers level of education, occupation, income and physical activity as independent variables in an enter method. When compared to women with higher education, illiterate women are 2.6 times at risk towards the delivery of baby with LBW. Mothers occupation failed to exert significant effect on infants birth weight (Table 5). The odd's of LBW was 2.136 (95%CI: 1.254, 3.639)

among the women with an income of below <50000 INR respectively. Mothers physical activity failed to differentiate low birth weight in the study sample. In order to see the compound effect of mothers demography, socioeconomic status and physical activity on LBW, a forward conditional model was performed and the results were shown in Table 6. Mothers income only taken in the model and the odds of LBW among the women's income below <50000 INR was found to be 2.504 (95%CI: 1.529, 4.099).

Table 5 Age adjusted multinomial regression analysis of infant low birth weight based on mother's socioeconomic conditions

Variable	B	S.E.	Sig.	Exp(B)	95% CI for EXP(B)	
					Lower	Upper
Education						
Higher	Ref.					
Secondary	0.563	0.445	0.205	1.757	0.735	4.201
Primary	0.789	0.436	0.070	2.202	0.937	5.174
Illiteracy	0.963	0.413	0.020	2.620	1.166	5.885
Occupation						
Labours	Ref.					
Job holders	0.982	0.456	0.031	2.670	1.093	6.521
Agriculture	-0.212	0.201	0.292	0.809	0.546	1.200
Housewives	0.163	0.169	0.334	1.177	0.845	1.639
Income						
>50,000	Ref.					
<50,000	0.759	0.272	0.005	2.136	1.254	3.639
Physical activity						
Heavy	Ref.					
Moderate	0.264	0.507	0.602	1.302	0.482	3.515
Mild	0.188	0.488	0.700	1.207	0.464	3.137
Sedentary	-0.068	0.477	0.887	0.934	0.367	2.378

Table 6 Age adjusted multinomial regression analysis of infant low birth weight based on mother's socioeconomic conditions (forward conditional model)

Variable	B	S.E.	Sig.	Exp(B)	95% CI for EXP(B)	
					Lower	Upper
Income						
>50,000	Ref.					
<50,000	0.918	0.252	.000	2.504	1.529	4.099

Discussion

Low birth weight is found to be one of the important social stigmas in both developed and developing countries. Despite the efforts to decrease the newborns with LBW, success has not been satisfactory and the problem still persists in both developed and developing countries.⁹ The low birth weight in the present sample is 34 percent. Our results are in best agreement with the findings of UNICEF-ICMR report which has shown 39.3% incidence of LBW in three slums in Madras, Delhi, Calcutta, and rural areas near Chandigarh, Varanasi and Hyderabad.¹⁰ Chhabra et al.¹¹ observed LBW to an extent of 39.1 % among the urban settlement area in Delhi. In a global survey conducted by UNICEF in 2004, the prevalence of LBW in the United States, Europe, Asian and African countries were 10, 6.4, 18.3, and 14.3 percent, respectively.¹² The observed prevalence of LBW in the present sample is comparatively higher when compared to studies conducted outside India and in line with studies from India. The results of the present study highlight the burgeoning prevalence of LBW among the study sample.

Prospective studies have highlighted that gestational age, maternal age, regular antenatal checkup, mother's height, mother's weight, anemia, physical work, socioeconomic status, tobacco chewing,

and history of abortion are significant determinants of LBW.¹⁰ In the present study LBW seems to be elevated in the age group of 20-25 yrs. Our results are deviating from the studies of Negi et al.¹³ and Agrawal et al.¹⁰ wherein the LBW found to be maximum in mothers with <20 yrs and >30 yrs. None of the anthropometric indicators have extorted significant effect in the elevation of LBW in the present sample. The univariate regression model failed to predict association of several anthropometric indicators towards LBW, however the average weight of the women delivered LBW babies are lower when compared to mothers who were delivered normal weight babies. Chhabra et al.¹¹ observed similar results in their sample. Hence it is recommended to improve the nutritional status of a girl child throughout her life cycle as it will improve the nutritional status of women and will reduce the problem of LBW.

Among the socioeconomic factors are income, education, occupation, household leadership and gender differences are related to LBW.¹⁴ The wide spread differences in the results on the effect of socioeconomic factors on LBW may be due to adoption of different socioeconomic indicators. Largely education has been used as a surrogate variable of social class, and occupation has been used as a proxy of socioeconomic status.¹⁵ In the present sample, 25 percent of the women who gave LBW babies are noticed with no formal

education. Similarly 32 percent of the LBW is recorded among the women with income below 50000 INR (low income as per Indian criteria). LBW is recorded to an extent of 17 percent among the women with sedentary physical activity. In the multivariate regression model education and occupation has exerted significant risk towards LBW. Illiterate women are thrice at risk towards the delivery of LBW baby. Similarly low income women are twice at risk towards the delivery of LBW baby. In the model the effect of physical activity nullified in the presence of education and income. In the forward conditional multinomial model, only income showed significant effect by nullifying the effect of education. Low income women are 2.5 times at risk towards the delivery of LBW baby.

Several studies have identified and analyzed social, medical, and behavioral risk factors for LBW, some of which could contribute to racial disparities in LBW. Hughes & Simpson¹⁶ highlighted that women of low socioeconomic status are at increased risk for delivering LBW babies, whether socioeconomic status is defined by income, occupation, or education. Education may also have independent effects, above and beyond income, because more highly educated mothers may know more about family planning and healthy behaviors during pregnancy. In 1998, the rate of LBW among mothers with less than a high school education was 9 percent, as against 7.9 percent among high school graduates, and 6.5 percent among mothers with at least some college.¹⁷ In the present sample income and education are independently affecting low birth weight as noticed in erstwhile studies in Ethiopia^{18,19} and India.²⁰

Low birth weight has been associated with higher probabilities of infection, malnutrition and handicapping conditions during childhood, including cerebral palsy, mental deficiencies and problems related to behavior and learning during childhood.²¹ Children who survive LBW have a higher incidence of diseases, retardation in cognitive development, and undernourishment. There is also evidence that LBW or its determinant factors are associated with a predisposition to higher rates of diabetes, cardiac diseases and other future chronic health problems.²² Further the biological processes that affect the fetus *in utero* are related to the mother's physiology, including her nutrition, exercise, infections, and consumption of tobacco, alcohol and other drugs.²³

Conclusion

Although education and economy collectively related to LBW, the specific function of each of them is not known. Interventions aimed at reducing the number of LBW infants have had limited success on conditions of the newborn, although some showed benefits in pregnant women.²⁴ To decrease the incidence of LBW, it is important to improve the socioeconomic conditions of the women, besides providing health services interventions.

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Conflicts of interest

None.

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