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Original Research Article

Relationship of low birth weight and socioeconomic factors: a case-control study in tertiary care centre in north Kerala

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ABSTRACT

Background: Low birth weight (LBW) is an important indicator of infant mortality in our community. Though the studies were conducted on LBW with various risk factors all over the world, no studies were on Kuppuswamy socioeconomic status and relationships of LBW. Hence, this study was aimed to evaluate the socioeconomic factors associated with LBW using the modified Kuppuswamy SES 2022 version.

Methods: A case-control study was designed using consecutive sampling as per patient registration in the first four months of the year 2023. A total of 452 newborn babies were taken. Of these, 171 cases and 217 control groups were taken. An independent student's t-test was used for the comparison of the mean values of the study groups. The comparison of frequency across categories was done using the chi-square test. Maternal risk and new born outcome were calculated using odds ratio.

Results: The study revealed that there was a significant difference between the mean Kuppuswamy SES scores among the study group. The scores were 10±3.8 and 11±4.3 for the case and control groups, respectively. This suggests that the case group is represented in socioeconomic class IV and was in poorer categories than the control group.

Conclusions: The present study revealed that there was a significant correlation between modified Kuppuswamy SES 2022 version and low birth weight. Another finding from the study was that mothers with a low body mass index (BMI) during the pregnancy period are more likely to have low birth weight babies than mothers with a normal BMI.

Keywords: Body mass index, Low birth weight, Maternal factor, Modified Kuppuswamy socioeconomic status scale, Socio-demographic factors

INTRODUCTION

In India, approximately 83% of neonatal deaths occur due to complications from low birth weight (LBW).[1] According to one cross-sectional survey-based study on the National Family Health Survey (NFHS)-5 (2019-2021), the prevalence of newborns with LBW in India was 17.29 %.[2] Various factors are associated with LBW, but the majority of all studies have focused on maternal risk factors. One of the findings was that the variation in the prevalence of LBW may be due to varying geographic and socioeconomic differences among the different communities.[3] Poor economic status of mothers has been associated with a higher prevalence of low birth weight in infants. [4]

LBW and its complications have to be identified at an early stage in our community. Maternal risk factors are changeable in the present situation, but they are all interrelated, both biologically and socially. So, early detection of interrelated factors is needed. In maternal and newborn health related research, social factors including socio-economic factors are the most relevant area, which is to be studied in the present scenario. Socioeconomic status (SES) is a concept, created to measure the social determinants of an individual, which include education, occupation and income. The most widely used social status assessment scale in India is the Kuppuswamy scale, which is being revised from time to time due to the changing nature of the income slab of the head of the family.[5] From the literature, we have not obtained a clear picture of term low birth weight and the relation of socioeconomic status on the basis of Kuppuswamy socioeconomic status. Therefore, this study focused to find out the relationship between term low birth weight in tertiary care centre and socioeconomic factors using the modified Kuppuswamy SES scale in 2022.

METHODS

Study population

Term live-born singleton babies less than 2500 g were included in the case group, and live singleton babies with a birth weight greater than 2500 gm and less than 4000 gm were included in the control group in a Jacob and Jacob study.[6] A consecutive sample was taken from the patient register, satisfying the inclusion criteria. For data collection, a proforma was prepared and pre-validated. It contains mother's details, baby details and an updated Kuppuswamy SES scale version 2022.

Study period

Live born babies details were collected during the period from January 2023 to April 2023.

Sample size

From a study by Singh et al, the average proportion of graduate mother's and above was 39.2% expecting similar results with an effect size of 15%.[7] The minimum sample size was required for this study was calculated by applying the formula, $n = 2 \times (Z_{\alpha/2} + Z_{1-\beta})^2 \; p \times q/d^2$ and required minimum sample size was 166 in each group.

The data collection was started after obtaining the approval of the institutional human ethics committee, Government Medical College, Kozhikode, Kerala (ref. no. GMCKKD/RP 2023/IEC/147). Data collection was done using patient records from the medical records of the obstetrics and gynecology department. After checking for the completeness of records, we selected 171 cases and 217 controls. So, a total of 388 new-born baby details were used for this study (Figure 1). Data related to mothers included age, height, weight, BMI, pulse rate, haemoglobin (Hb), random blood sugar (RBS) and thyroid stimulating hormone (TSH) level; pregnancy related factors, gestational age and previous pregnancy details. Maternal risk factors including iron deficiency anemia, gestational-induced hypertension, thyroid disease and other medical histories, were taken from the records. Clinical profiles of mothers' including pulse rate, hemoglobin, RBS and TSH had been matched before grouping. Information related to babies, such as date of birth, birth weight and sex, birth order, 5-minute appearance, pulse, grimace, activity and respiration (APGAR) score was taken from the records. For studying the SES, information's been obtained from the records related to babies' family background, mother and fathers' educational status, job status and their income status. The ration card number was verified by using the website of civil Supplies of the Government of Kerala.[8] The socio-economic status (SES) was assessed using a modified version of Kuppuswamy scale. Mothers' required weight gain during pregnancy was obtained using a software pregnancy weight gain calculator.[9] All the information obtained from the records was documented in a pre-tested proforma. The obtained data was entered in the Microsoft Excel 2010 version for analysis.

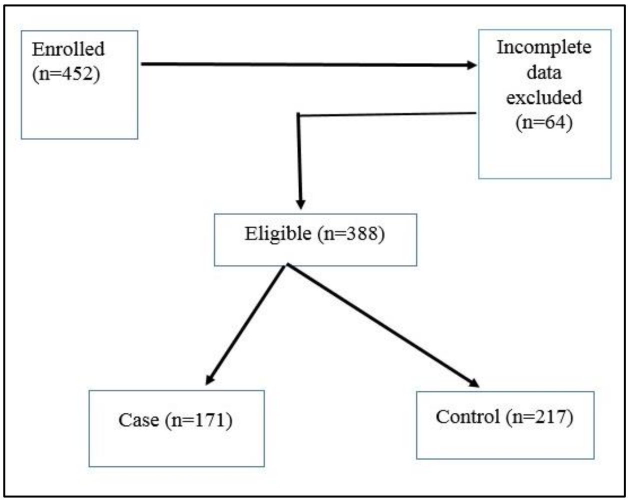

Figure 1: Selection of study groups.

Statistical analysis

After data cleaning, it was used for analysis using the statistical software SPSS IBM version 23.0. Descriptive statistics such as mean and standard deviation were used for quantitative data. Mean values between the groups were compared using the student's t-test for normally distributed data. Non-normally distributed data was tested for normality. Categorical variables were expressed as frequency and percentage. The comparison of frequency across categories was done using the chi-square test or Fisher's exact test. Maternal risk and newborn outcome of LBW were presented as an odds ratio (OR) at a 95% confidence interval (CI). For all the statistical tests, a two-sided probability of $p<0.05$ was considered for statistical significance.

RESULTS

The study was focused on understanding the relationship between low birth weight and socio economic factors. So associated maternal base line clinical features also could be included. Among this study, majority of mothers' ages were between 20 and 30 years, which were proportionately 82.5% in the case (n=171) and 81.6% in the control group (n=217), respectively. The p value was 0.894, which is greater than 0.05, so the relationship between mother's age and low birth weight was not statistically significant between groups. This study also describes the variables such as locality, districts, religion, and community of the mothers. All the variables were analyzed statistically; there were no association found between groups.

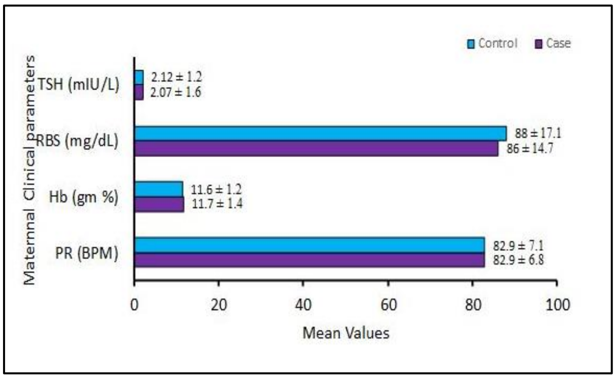

Figure 2: Comparison of maternal clinical parameters of the study groups.

PR-Pulse rate, BPM- beats per minute, Hb- hemoglobin, gm%- gram percentage, RBS- random blood sugar, mg/dL-milligram per decilitre, TSH- thyroid stimulating hormone and mIU/l milli-international unit per litre.

Maternal clinical parameters before delivery is showing the above figure (Figure 2). The parameters were taken for this study was pulse rate, hemoglobin level, random blood sugar and thyroid stimulating hormone. All the values are presented in mean and standard deviation.

Maternal anthropometric factors

Maternal anthropometric factors including height, weight and BMI were a highly significant factor that determines the birth weight of newborns. In this study mean height of mothers in the control group was 154.3±6.1 cm and the case group was 152.5±6.7 cm. The p value was 0.005 ($p<0.01$**) so, it was found to be a statistically significant difference between the groups. Other anthropometric parameters were presented in the below figures (Figure 3 and 4).

Figure 3 shows a comparison of women mean weight changes (Figure 3A) and BMI changes (Figure 3B) before and during pregnancy. In this figure term at pregnancy means gestational age at 37 weeks or above (≥ 37 week or up to 42 weeks). The mean body weight of mothers before pregnancy was 47.02±9.5 kg and 52.6±10.8 kg for the case and control groups, respectively. Simultaneously, during pregnancy, mothers' mean body weights were 57.3±10.6 kg and 64.6±10.4 kg for the low birth weight and normal birth weight groups, respectively. The mean BMI before pregnancy was at a normal level in both groups (case group: 20.2±4.2 kg/m^2; control group: 22.1±4.4 kg/m^2). Simultaneously, the mean BMI of term at pregnancy (≥37 week) in both the case and control groups was proportionately increased (case group: 24.6±4.5 kg/m^2; control group: 27.1±4.1 kg/m^2) as the gestational age of fetus increased. From the analysis statistically significant correlation was found between maternal pre pregnant BMI and birth weight of babies (Pearson's correlation, r=0.205 ($p<0.001$***).

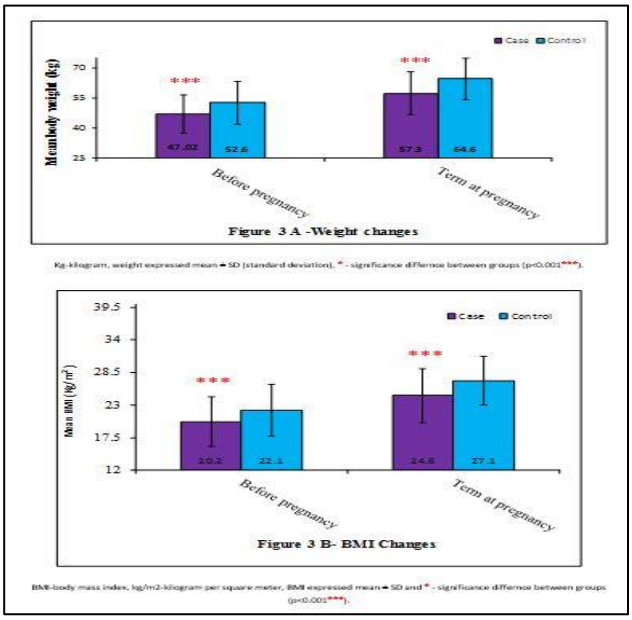

Figure 3: Comparison of mothers' weight changes: (A) and BMI changes; (B) in the study groups.

Term at pregnancy- baby birth between 37 weeks and 42 weeks, body weight expressed mean±SD (standard deviation) in kg (kilogram), BMI- body mass index expressed mean±SD in kg/m^2 (kilogram per square meter) and *-significance difference between groups ($p<0.001$***).

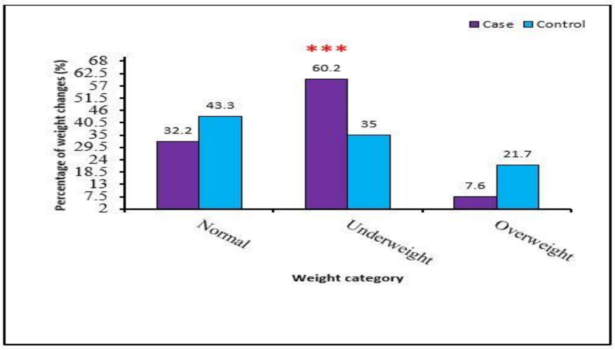

Figure 4: Comparison of mothers' weight changes according to gestational age of the study groups.

*-significance ($p<0.001$***).

Figure 4 shows the percentage of mothers' weight changes during pregnancy. Percentage of weight changes of mothers in the low-birth-weight babies (n=171) were (n=55) 32.2% for normal weight mothers, (n=103) 60.2% for underweight mothers, and (n=13) 7.6% for overweight mothers. Simultaneously, percentage of weight changes of mothers in normal birth weight babies (n=217) were (n=94) 43.3% for normal weight mothers, (n=76) 35 % for underweight and (n=47) 21.7% for overweight mothers respectively. The percentage of underweight mothers is higher in the low-birth-weight babies group when compared with the percentage of mothers in the normal birth weight babies group. The p value was <0.001, so the result was statistically significant between the groups. The relationship of maternal weight changes and birth weight of babies, there was a strong correlation and was statistically significant (Pearson's correlation, r=0.212; p<0.001***).

Social and economic factors

Table 1 shows the Kuppuswamy socioeconomic status of the head of the family. The SES of the head of the family was calculated by adding up the education, job and income score of the head of the family. Majority of both the case and control group attained secondary level and intermediate level of education. The combined proportion of secondary and intermediate level of education of both the case (n=131) and control (n=167) group were 76.6% and 76.9% respectively. The occupation of the head of family of both the case and control group belongs to elementary type and was 71.9% and 63.6% for case and control group respectively.

Table 1: Kuppuswamy socioeconomic status (2022 version) of the head of the family of the study groups.

Variables	Case n=171 N (%)	Control n=217 N (%)
Education of head of the family with score		
Illiterate (1)	2 (1.2)	1 (0.5)
Primary school certificate (2)	8 (4.6)	3 (1.4)
Middle school certificate (3)	10 (5.8)	11 (5.1)
High School certificate (4)	62 (36.3)	90 (41.4)
Intermediate/Diploma (5)	69 (40.4)	77 (35.5)
Graduate (6)	14 (8.2)	30 (13.8)
Profession/Honours (7)	6 (3.5)	5 (2.3)
Occupation of head of the family with score		
Unemployed (1)	0	1 (0.5)
Elementary occupation (2)	123 (71.9)	138 (63.6)
Plant-machine operators and assemblers (3)	14 (8.2)	11 (5.1)
Craft and related trade workers (4)	10 (5.8)	18 (8.3)
Skilled agriculture and fishery workers (5)	0	1 (0.5)
Skilled workers, shop and market sale workers (6)	8 (4.7)	20 (9.2)
Clerks (7)	10 (5.8)	8 (3.7)
Technicians and associate professionals (8)	2 (1.2)	8 (3.7)
Professionals (9)	4 (2.3	12 (5.5)
Legislators, senior officials and managers (10)	-	-
Income (in Rupees) of head of the family with score		
≤9,226 (1)	21 (12.3)	15 (6.9)
9,232-27,648 (2)	115 (67.3)	137 (63.1)
27,654-46,089 (3)	16 (9.3)	40 (18.4)
46,095-68,961 (4)	9 (5.3)	14 (6.4)
68,967-92,185 (6)	4 (2.3)	0
92,191-184,370 (10)	3 (1.7)	4 (1.8)
≥184,376 (12)	3 (1.7)	7 (3.2)
Socioeconomic status of the family		
I (Upper)	0	4 (2.0)
II (Upper middle)	13 (7.6)	21 (9.6)
III (Lower middle)	23 (13.5)	49 (22.6)
IV (Upper lower)	133 (77.7)	142 (65.4)
V (Lower)	2 (1.2)	1 (0.4)

Table 2: Comparison of maternal risk factors of the study groups.

Variables	Case (n=171) N (%)	Control (n= 217) N (%)	P value
History of disease			
No	148 (86.5)	190 (87.6)	0.879
Yes	23 (13.5)	27 (12.4)	
Parity			
Primigravida	82 (48.0)	85 (39.2)	0.254
Multiparity	86 (50.3)	127 (58.5)	
Grand multiparity	3 (1.8)	5 (2.3)	
Gestational hypertension			
No	154 (90.1)	208 (95.9)	0.026*
Yes	17 (9.9)	9 (4.1)	
Systolic blood pressure			
No	138 (80.7)	191 (88.0)	0.063
Yes	33 (19.3)	26 (12.0)	
Diastolic blood pressure			
No	155 (90.6)	210 (96.8)	0.016*
Yes	16 (9.4)	7 (3.2)	
Complications in pregnancy			
Yes	101 (59.1)	70 (32.3)	<0.001***
No	70 (40.9)	147 (67.7)	

*** and * represent significance p<0.001 and p<0.05

The income range of both in the case (n=115; 67.3%) and in the control (n=137; 63.1%) groups was in the score 2 of the 2022 version of the Kuppuswamy income range (i.e. between Rs. 9,232/- and Rs. 27,648/-). Moreover, majority of the case (n=133; 77.7%) and control (n=142; 65.4%) group represents the socio-economic status of the family belongs to class IV (upper lower).

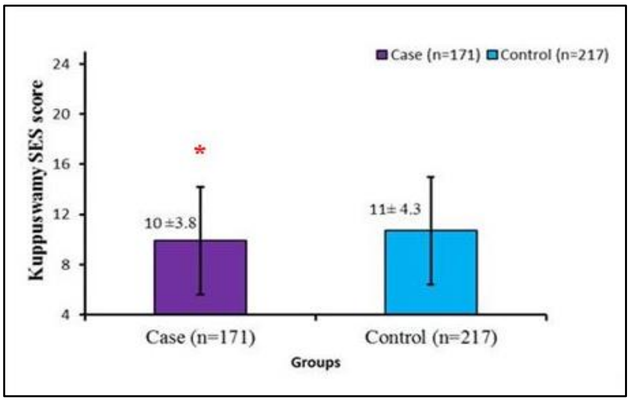

Figure 5: Comparison of the Kuppuswamy SES scores of the study groups.

SES-socioeconomic status and *-significance (p<0.05*).

Figure 5 shows the comparison of the Kuppuswamy SES scores of babies of low birth weight and normal birth weight groups. The score was expressed mean±SD (standard deviation). The mean scores were 10 and 11 for LBW and normal birth weight groups respectively. Case group SES score was 10±3.8 and control group was 11±4.3. The SES scores between 11 and 15 belongs to class III (lower middle class) and 5-10 belongs to class IV (upper lower class) respectively. From the analysis the p value was obtained 0.04, it is less than 0.05 (p<0.05*). Therefore, the result was found statistically significance between the groups.

Maternal risk factors

Table 2 shows the comparison of maternal risk factors in case and control groups. Gestational hypertension proportion was higher among the case (n=17, 9.9%) group than the control (n=9, 4.1%) group. Gestational hypertension in mothers' (OR=2.55; 95% CI, 1.11-5.87; p=0.026*) had a higher risk of low birth weight and was found statistically significant in this study. This study also showed diastolic blood pressure of mothers was higher in the case group (9.4%) compared to that of control group (3.2%). So, mothers with a higher diastolic blood pressure during pregnancy increases the risk of having low birth weight babies (OR=3.09; 95% CI, 1.24-7.71; p=0.016*). Compared to mothers in the control group who had no complications (67.7%) in pregnancy, mothers in the case group with complications (59.1%) in pregnancy had a higher risk of having low birth weight babies (OR=3.03; 95% CI; 1.99-4.59; <0.001***).

Newborn characteristics

Table 3 represents the comparison of mean value of new born baby characteristics including birth weight, birth length and occipito-frontal circumference of the case and control group. Table 4 shows the relationship of new born general clinical characteristics in each groups. Variables were expressed as frequency and percentage. Female baby has increased risk of low birth weight (OR=1.76; 95% CI; 1.17-2.64; 0.008**). Low birth weight babies have poor APGAR score (OR=3.53; 95% CI; 1.43-8.66; 0.006**) at 5 minute. Low birth weight babies have a higher risk for newborn intensive care unit (NICU) admission (OR=6.65; 95% CI; 2.20-19.95; 0.001***).

Table 3: Comparison of newborn characteristics of the study groups.

Variables	Group	N	Mean±SD
Birth weight	Case	171	2.23±0.26
	Control	217	3.05±0.34
Birth length	Case	171	45.31±2.25
	Control	217	47.43±2.21
OFC	Case	171	32.10±1.17
	Control	217	33.61±1.69

OFC-occipitofrontal circumference and SD-standard deviation.

Table 4: Comparison of new born clinical characteristics of the study groups.

Variables	Case (n=171) N (%)	Control (n=217) N (%)	P value
Sex of baby			
Male	66 (38.6)	114 (52.5)	0.008**
Female	105 (61.4)	103 (47.5)	
Birth order of baby			
1st	85 (49.7)	85 (39.2)	0.350
2nd	40 (23.4)	57 (26.3)	
3rd	33 (19.3)	48 (22.1)	
4th	10 (5.8)	22 (10.1)	
5th	2 (1.2)	3 (1.4)	
6th	1 (0.6)	2 (0.9)	
5'APGAR score			
Abnormal	18 (10.5)	7 (3.2)	0.006**
Normal	153 (89.5)	210 (96.8)	
Baby status			
Unhealthy	19 (11.1)	4 (1.8)	<0.001 ***
Healthy	152 (88.9)	213 (98.2)	

p- probability, 5'APGAR- 5 minutes APGAR, ** and *** - significance p<0.01** and p<0.001 ***.

DISCUSSION

Socio-demographic factors

In our study the mean age of the mothers at the time of hospital admission were 26.20±4.8 years and 26.69±4.5 years for low-birth-weight group and the normal birth weight group respectively. But this study did not reveal a statistical association between the age of the mothers and low birth weight, which is in agreement with the study of Thapa et al in Nepal. They have reported that the mean age of the study participants was 25.7±4.8 years.[10] Other socio-demographic factors were also documented. The proportion of Hindu religions was higher among in the case group (n=102, 59.6%) compared to other religious groups [Muslim (n=63, 36.8%) and Christian (n=6, 3.5%)]. A similar response has been revealed in the study of Banerjee et al.[11] However, the present study did not reveal a statistically significant difference between religion and term low birth weight. The study was done at the tertiary care center in Kozhikode district. It is a major referral center under the government of Kerala. The majority of the mothers were admitted in both the case group and control group from Kozhikode district (case; n=105, 61.4% and control; n=156, 71.9%). The percentage of mothers in other nearby districts as distributed in the case group was (n=66) 38.6% and the percentage of mothers in the control group was (n=61) 28.1%, but the result was not statistically significant difference between the groups. Rural and urban differences among the groups were also obtained in this study, but no significant association was reflected between region and low birth weight. In this study, rural and urban participants among the case group were (n=114) 66.6% and (n=33) 19.4%, and the control group was (n=153) 70.5% and (n=42) 19.5%, respectively. Other regions, including hilly and coastal sides, represented (n=15) 8.8% and (n=9) 5.3% for low-birth-weight groups, and (n=14) 6.5% and (n=8) 3.7% for normal birth weight groups. The proportion indicates that the majority of the rural population was admitted to the tertiary care center for health care facilities at the government level, but this could not be revealed statistically. This finding has not been consistent with the findings that the LBW is significantly higher in rural areas than in urban areas in India.[12] Mothers belonging tribal population were distributed as (n=15) 8.8% for the case and (n=8) 3.7% for control group respectively, but this proportion was not statistically significant. This finding is in agreement with the study of Dey et al, where they documented regions with a higher concentration of tribal populations, which had a lower prevalence of LBW.[13]

In this study, we had opted for mothers in both groups who were matched at some of their basic clinical features, including pulse rate, haemoglobin level, random blood sugar and thyroid stimulating hormone level for avoiding confounders of LBW. So, this study showed that these variables were not directly involved in the birth weight of babies.

Anthropometric factors of mothers

Women's general health is an important factor before preconception; it promotes a favourable effect on the health of the next generation. Of these, the women's weight before pregnancy predicts the pregnancy outcome. It is clear from our study that the weight before pregnancy is a significant factor that predicts the birth weight of babies. During pregnancy, maternal weight gain increases proportionately, depending on the nutritional requirements of the mother and the need for fetal growth. In this study, there were 10.3±4.6 kg and

12.1±4.7 kg body weight differences obtained in the mothers of the case and control groups, respectively.

As per the Institute of Medicine (IOM) guidelines, women with underweight (BMI<18.5 kg/m^2) before pregnancy should gain between 12.5 and 18 kg, normal weight women (BMI: 18.5-24.9 kg/m^2) before pregnancy is between 11.5 and 16 kg, overweight women (BMI: 25-29.9 kg/m^2) before pregnancy is between 7 and 11.5 kg [14] and obese women (BMI>30 kg/m^2) before pregnancy should only gain between 5 and 9 kg during pregnancy.[15] In our study, it was shown that women's preconception mean BMI in both the case group and control group was normal. During pregnancy, the mean BMI increased. According to the IOM, the BMI for normal level weight gain should be 11.5-16 kg. In our study, case group mothers weight gain reached 10.3 kg, but it did not meet the criteria. Hence, the ultimate result was a risk of low-birth-weight babies at their term. Moreover, mothers in the case group (n=5) 2.9% had underweight during pregnancy, which was strongly correlated with babies having low birth weight. The same result was reported in an earlier study, the incidence of low-birth-weight babies was significantly higher in women with lower weights than the recommended weight gain.[16] A study by Devaguru et al suggested that the mothers weight gain proportionally increases during pregnancy, which reduces the risk of low birth weight in newborns.[17] Often, a higher pre-pregnancy BMI or excessive gestational weight gain (GWG) has negative implications for pregnancy outcomes.[18] A recent study reported by Patel et al, suggested that factors influencing excessive weight gain during pregnancy can be multifaceted. They proposed that the higher pre-pregnancy BMI is due to an unhealthy diet, insufficient physical activity, psychological factors, social inequality and cultural barriers.[19]

In this study, the percentage of women who were underweight before pregnancy was 38% and 20.3% for the case and control groups, respectively. This result is consistent with the study of Wei et al, documented that mothers' pre-pregnancy underweight was associated with a higher risk of LBW and a lower risk of extremely LBW.[20] Moreover, our study also showed that the mothers in the case group who had been underweight before pregnancy did not achieve target weight gain according to the gestational age compared to that of the control group mothers. This result is consistent with the report that the risk of having low birth weight babies is more common in mothers who were underweight.[4]

Socioeconomic factors

The socioeconomic status of a community is a tool to measure the morbidity and mortality of that community. It explains and monitors the social distribution of diseases and health status and also influences health policy.[5] In the state of Kerala, the poverty rate is lower, according to the baseline report of the National Multidimensional Poverty Index (NMPI) published by Niti Aayog.[21] Moreover, due to the high inflation rate in the present situation, the modified Kuppuswamy SES scale 2022 version was more suitable for our study. Poor education and low socioeconomic background are important risk factors for low birth weight. Several reports have already been proven, but the socioeconomic scale Kuppuswamy updated version is an excellent tool for the present study settings. Illiterate mothers only represented in the case group of about 0.6%, while in the fathers' education illiterate fathers represented both in the case and control group as 1.2% and 0.5% respectively. But it was not statistically significant. Therefore, our study is not consistent with the result that there is a positive relationship between a mothers' education and the child's health.[22] Another study finding was that women with primary level education had a higher risk of LBW than women with higher levels of education, which is not consistent with our result.[23] But the present study abides the criteria of Kuppuswamy classification of socioeconomic status based on the basis of education, occupation and income of the head of the family. However, fathers' education has no significant association with low birth weight. One study report is consistent with this report that paternal unemployment is strongly a relative risk of LBW.[24]

The poor economic background of the family is well-documented evidence of the lowest birth weight prevalence. Socially and economically weaker were higher among the case group when compared with the control group by means of their education, job and ration card status. The proportion was (n=25) 14.6% for the case and (n=20) 9.2% for the control group, respectively. This proportion was calculated according to the ration card status of the fathers provided by the public distribution system (PDS). Simultaneously, considering the income of the head of the family, the present study showed a relationship between family income and birth weight. As an updated monthly family income in the Kuppuswamy SES 2022, the maximum limit was rupees ≥184,376/-, and the minimum limit was rupees ≤9226/-.[5] In this study, the majority of cases and control group's income of head of the family were distributed in the range between Rs. 9,232/- and Rs. 27,648/-.

The updated Kuppuswamy SES scale 2022 version is the composite score of education, occupation and total income of the family, which yields a score of 5 to 29 instead of 3 to 29 as in the previous version.[25] The present study revealed that the mean Kuppuswamy score was highly significant among the groups. According to the mean scores from this study indicated that the case group belonged to socio-economic class IV, or upper lower, and the control group belonged to class III, or lower middle. This result is highly consistent with the earlier study which reported that socioeconomic factors do affect the pregnancy outcome, including lack of education, low family income and a larger number of family members, leading to the low birth weight of the newborn.[26]

Maternal risk factors

The proportion of mothers with hypertension was presented higher in the case group (9.9%) when compared with the control group (4.1%). This result is consistent with the recent study, which reported that hypertension in mothers was more prevalent in the low-birth-weight group compared to the normal birth weight group.[27] Abnormal elevations in blood pressure in pregnant women may be closely related to poor pregnancy outcomes. Gestational hypertension and pre-eclampsia are the most common hypertensive disorders of pregnancy, which occur after 20 weeks of gestation with or without proteinuria.[28] The result of this study suggested that gestational hypertension increases the risk of having a low birth weight. One study has reported that low birth weight showed a significant effect on hypertension, specifically with high systolic blood pressure (SBP), but not with high diastolic blood pressure (DBP).[29] Conversely, in this study there was an effect was found in the diastolic blood pressure. It was higher in the case group (9.4%) compared with the control group. Hypertensive disorders of pregnancy, especially gestational hypertension and pre-eclampsia, have been related to offspring birth size also, however, they may play an important role in infants born with LBW or small for gestational age (SGA).[30,31]

Maternal parity is a well-documented predictor of infant birth weight. A study report suggests that women with higher gravidity are more likely to experience LBW compared with their lower gravidity counterparts due to malnutrition, which is highly related to frequent pregnancy with a short inter-pregnancy interval.[32] Simultaneously, this study did not find a statistical association between the types of parity of mothers and low birth weight. Full-term birth is the birth at gestational age of 37 weeks or greater, while a birth less than 37 weeks is preterm birth. This study was conducted only considering term births, which is 37 weeks or more.

Newborn characteristics

The average normal birth length is defined as the full-term length of a newborn measuring 49-50 centimetres and a length of around 47-53 centimetres is also considered normal birth length.[33] The present study was compared body length, occipital frontal circumference (OFC) of newborns and birth weight. In addition to these, newborn clinical characteristics such as the sex of the baby, APGAR score and baby status were used for analysis. The APGAR score system offers a standardized, effective and convenient assessment for newborns, including five easily identifiable components: heart rate, respiratory effort, muscle tone, reflex irritability and colour.[34] This general and quick assessment measures the well-being of the newborn immediately after birth. One study reported that low birth weight is a major determinant factor that is significantly associated with a low APGAR score.[35] In this study, a significant proportion of newborns had a lower APGAR score belongs to the case group (10.5%) when compared to the control group (3.2%). This finding is consistent with the study of Abdallah et al.[36] In this study, the percentage of male babies was 52.5% in the control group. This was higher when compared to the case group 38.6%. There was an association between the sex of the baby and birth weight, which was statistically significant. Female babies were more presented in the case group compared with the control group. This result supports the findings of the studies that female newborn babies have a greater probability of being LBW than male newborn babies.[4,37]

The Kuppuswamy SES is an updated scale depending on the inflation rate; the scoring categories are complicated and could not be easily defined in this study setting itself. Future research is needed using a multi-center study to understand the relationship between socioeconomic status and the occurrence of LBW in our community.

CONCLUSION

Adverse social determinants of health, including reduced literacy, poor income, and lower socioeconomic status, were independently associated with low birth weight. Low BMI before pregnancy is the direct cause of the LBW and it depends on the socioeconomic status. In the light of the study tool Kuppuswamy SES Scale 2022 version, suggests that the probability of low-birth-weight babies is higher among the upper lower class than the lower middle class.

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