ORIGINAL RESEARCH

An observational study of effects of maternal socioeconomic status on birth outcome in western Rajasthan

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ABSTRACT

Aims and Objectives: The aim of present study to find out the effects of maternal social status on birth outcome in western Rajasthan, India.

Methods: Present observational study was carried out on 1019 mothers and their newborn. Mothers were divided according to social status in three group upper, middle and lower according to Revised Kuppuswamy socioeconomic status scale (2021). Birth outcome included the weight, length, head, mid arm, chest, thigh, calf circumferences and skin fold thickness of neonates.

Results: Percentage of low birth weight, very low birth weight, congenital anomalies were highest in newborns of middle social status mothers and lowest in upper social class mothers. Maternal social status had highly significant ($p<0.01$) effects on birth weight, mid arm, chest, and calf circumferences, and significant ($p<0.05$) effects on length of neonates.

Conclusion: Socio economic status and augmentation are the key components of good pregnancy outcome and thus there is an urgent need to provide special nutritional inputs and better monitoring facilities during pregnancy to such under nourished mothers. Thus, these types of studies were needed furthered, for improving the maternal and neonatal health.

Keywords:maternal social status, birth weight, LBW.

Introduction

There is a large body of literature showing that the world-wide problem of low birth weight (LBW) i.e., infants weighing, is among the strongest determinants of infant mortality and morbidity. While in industrialized countries the majority of LBW infants do well, thanks to the advances of modern obstetric and neonatal care (1-2) Socioeconomic status is indicators of complex linkages among environmental events, psychological states, and physiologic factors which may lead to low birth weight or preterm delivery. It is very well known that a woman's social and economic status will influence her general health and access to resources. Low birth weight and infant mortality are closely related to socioeconomic disadvantage (3).

The critical place that pregnancy occupies in the chain of life has health and social importance for individuals, families and society as a whole. Socio economic status of the families plays a crucial role in determining the health status newborn and Scientific evidence proved that the nutritional status of the mother also significantly influence the course and outcome of pregnancy (4 and 5). Maternal nutrition and health are considered as the most important regulator of human foetal growth. Improved maternal nutrition has been associated with increased foetal growth and a reduction in adverse birth outcomes in developing countries and in populations with nutrient deficiencies. However, if women are not well nourished, they are more likely to give birth to weak babies resulting in high infant mortality rate (6-8).

Beside biological factors like gestational age, maternal weight and height, life style factors such as dietary habits, tobacco, alcohol or caffeine consumption can influence birth weight. An example is the work by Wasunna*et al*. who found that maternal education and household income were important factors affecting birth weight (9-11). In western Rajasthan there are much higher percentages of women with low education, poverty and poor nutritional status who are therefore at increased risk of adverse reproductive outcomes including LBW and preterm birth. The identification during pregnancy of such mothers is therefore important in order to determine the level of care and priorities for referral to centres where reasonable obstetric and neonatal care are available. Therefore, the aim of this study was to evaluate the influence of maternal socio-economic status on newborn anthropometry in a sample of mothers and infants from this area. No such comprehensive study was performed before in this area.

Materials and Methods

Present study was carried out on 1019 mothers and their newborns. The study design was hospital based observational study. To conduct this research, a comprehensive review of existing literature on maternal social status and newborn anthropometry was carried out. Additionally, quantitative data analysis was performed using a dataset comprising information on maternal social status and newborn anthropometric measurements. The hospital data (obstetric history) and clinical condition were recorded from the tickets of mother and their newborns. Mothers were divided on the basis of social status in three group upper, middle and lower according to modified score mainly from The Kuppuswamy scale (12) as shown in table 1 and 2.

Calculation of Socioeconomic Status

Table 1: Revised Kuppuswamy socioeconomic status scale (updated for January 2021)

Education of Head of the Family	**Score**
Professional degree	7
Graduate or Postgraduate	6
Intermediate or Post-high school diploma	5
High school certificate	4
Middle school certificate	3
Primary school certificate	2
Illiterate	1
Occupation of Head of the Family	
Professional	10
Semi-Professional	6
Clerical, Shop owner, farmer	5
Skilled worker	4
Semi-skilled worker	3
Unskilled worker	2
Unemployed	1
Monthly Income of Family (as per CPI-IW January 2021)	
≥18229	12
9115-18229	10
6836-9114	6
4557-6835	4
2734-4556	3
921-2733	2
≤920	1

Table 2: Revised Kuppuswamy socioeconomic status class classification, 2021

Total ScoreClass	**Socioeconomic Status**
26-29	Upper Class
16-25	Upper Middle Class
11-15	Middle Class
5-10	Lower Middle Class
<5	Lower Class

For the convenience of calculation, we included upper middle class in upper class group and lower middle class included in the lower-class group. The study was performed by measuring the length, weight, head circumference, mid arm circumference, chest circumference, thigh circumference, calf circumference and skin fold thickness of the neonates. In order to exclude inter-observer variation, the

measurements were taken within 24 hours of birth. Birth weight was obtained by digital scale with 10-gram subdivision with naked neonate in supine position. Other anthropometric variable including chest, head circumferences, thigh circumference, calf circumference were measured by non-extendable measuring tape, with a width of 1.0 cm and subdivisions of 0.1 cm. and birth length was measured by infentometer, head circumference was obtained by placing tape along the largest occipito-frontal diameter along over the occiput and eyebrow. The chest circumference was measured by placing measuring tape along the point of nipples. The length was measured with the newborn in supine position with full extension of knee and distance between top of head and heel when pressed against a vertical surface and role on a stabilizing board was measured.Mid-arm circumferencewas measured from the circumference perpendicular to the long axis of the upper arm midway between shoulder and elbow (13).

The data were analysed on Graph Pad Prism software and expressed as mean ± S.D (n=6). Statistical multivariate analysis was performed by ANOVA test. The results were considered statistically significant, if $p<0.05$. The level of significance was considered as under:

*Significant $p<0.05$, **Highly significant $p<0.001$, Non-significant $p>0.05$.

Observation andResults

The analysis of existing literature revealed a consistent pattern: maternal social status is positively correlated with newborn anthropometric measurements. Mothers with higher income, education, and access to healthcare tend to have infants with better birth outcomes, including higher birth weight, longer length, and larger head circumference. These findings suggest that socio-economic advantages provide pregnant women with better access to nutrition, healthcare, and prenatal support, resulting in improved fetal growth and development.

The study employs a combination of quantitative data analysis and literature review to explore the complex relationship between maternal social status and newborn anthropometry. The findings of this research shed light on the critical role socio-economic factors play in shaping early childhood health and development. Observations were shown in the figure 1 and table number 3and 4.

Table 3: Effects of Maternal Social Status on New Born Distribution

S.No.	Distribution of New Born	Newborns of Upper Class Mothers		Newborns of Middle Class Mothers		Newborns of Lower Class Mothers	
		N	%	n	%	n	%
1	Normal	68	71.57%	439	67.12%	180	66.66%
2	Low Birth Weight	20	21.05%	169	21.85%	65	24.04%
3	Very Low BirthWeight	2	2.1%	27	4.12%	12	4.44%
4	Extremely Low Birth Weight	0	0%	0	0%	9	3.33%
5	High Birth Weight	1	1.05%	1	0.15%	0	0.37%
6	Still Born	2	2.1%	8	1.22%	15	5.55%
7	Incidence ofCongenitalAnomalies	2	2.1%	10	1.52%	16	5.59%
Total		95		654		270	

Table 4: Effects of Maternal Social Status on New Born Anthropometry

S. No.	New Born parameters	Newborns of Upper Class Mothers		Newborns of Middle Class Mothers		Newborns of Lower Class Mothers		Statistical Analysis(ANOVA Test)	
		Male Mean±SD	Female Mean±SD	Male Mean±SD	Female Mean±SD	Male Mean±D	Female Mean±SD	F value	p value
1	Weight (kg)	2.65±0.72	2.6±0.53	2.59±0.64	2.51±0.61	2.45±0.59	2.57±0.67	3.07	0.00**
2	Length (cm)	47.32±3.67	47.8±4.37	47.14±3.9	46.58±4.14	46.6±3.76	46.57±3.37	2.14	0.05*
3	Head Circumference (cm)	34.4±3.26	34.87±2.8	34.42±5.44	33.9±2.99	34.34±3.74	33.08±2.83	2.14	0.00**
4	Mid Arm Circumference (cm)	9.84±2.84	9.96±2.15	9.99±4.28	9.48±1.96	9.83±1.7	9.42±2.04	2.77	0.01*
5	ChestCircumf	30.92±4.07	31.07±3.04	30.49±7.6	3.26±3.94	30.99±10.	30.08±3.82	658.22	0.00**

	erence(cm)					4			
6	Thigh Circumference (cm)	13.48±2.99	14.14±3.15	13.77±3.18	13.9±3.01	13.78±3	13.18±2.96	1.03	0.39
7	Calf Circumference (cm)	9.35±2.24	9.63±3.87	9.15±1.68	8.92±2.11	8.9±1.54	9.34±1.97	3.81	0.00**
8	Skin Fold Thickness (mm)	2.92±1.38	3.14±1.71	3.1±1.56	2.98±1.36	2.89±1.48	3.1±1.2	0.70	0.62

Note: p>0.05 (Non significant), * p<0.05 (Significant), **p<0.01(Highly Significant)

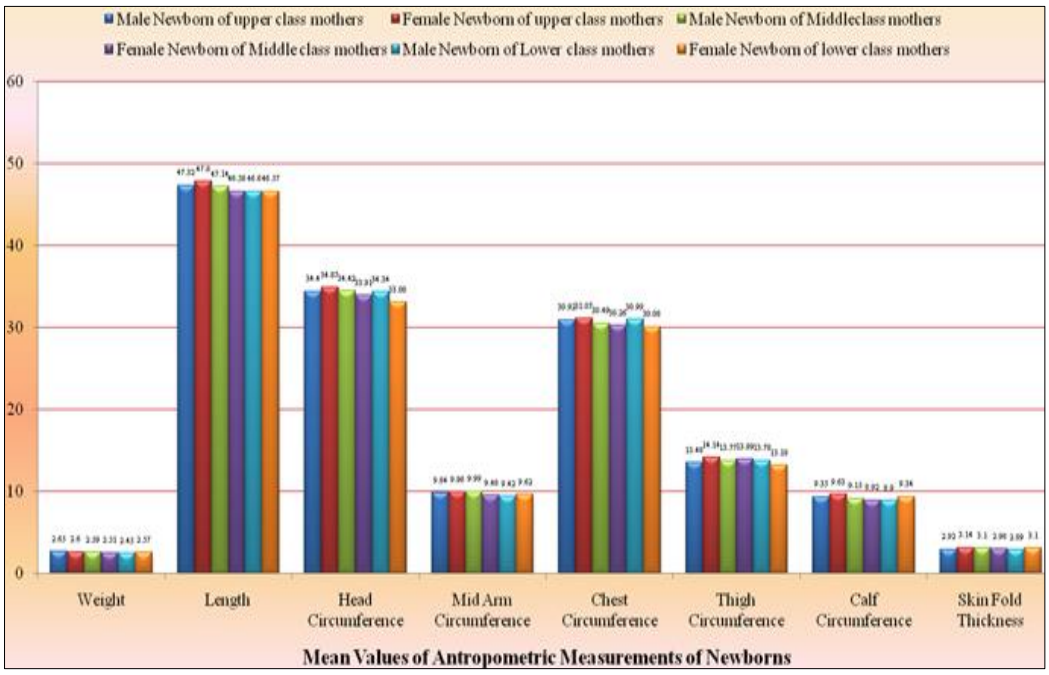

Fig 1: Showing the Effects of Maternal Social Status on New Born Anthropometry.

The status of the mother nutrition and socio-economic variables have long been known to influence the reproductive performance and outcome and the condition of the infant at birth. Results of present study shows that out of 1019 mothers, 95(9.32%) were belong to upper class, 654 (64.18%) to middle and 270 (26.5%) to lower class. Newborn distribution was in newborn of upper social status mothers, there were 68(71.57%) having normal birth weight, 20(21.05%) were with low birth weight, 2(2.1%) with very low birth weight, 1(1.05%) was having high birth weight, 2(2.1%) still born and 2(2.1%) were born with congenital anomalies. Newborn distribution in new born of middle social status mothers, there were 439(67.12%) having normal birth weight, 169(21.85%) were low birth weight, 27(4.12%) with very low birth weight, there is no one with extreme low birth weight, 8(1.22%) were still born and 10(1.52%) were born with congenital anomalies. Newborn distribution in newborn of lower social status newborn there were 180(66.66%) having normal birth weight, 65(24.07%) were low birth weights, 12(4.44%) having very low birth weights, 9(3.33%) were extremely low birth weight, there is no one with extreme high birth weight, 15(5.55%) were still born and 16(5.95%) were born with congenital anomalies (Table No. 3). On the multivariate analysis by ANOVA test, maternal social status had highly significant (p<0.01) effects on birth weight, mid arm, chest, and calf circumferences, and significant (p<0.05) effects on length of neonates (Table No. 4).

In the quantitative analysis, similar associations were observed. Income, maternal education level, and access to prenatal care services were all significant predictors of newbornanthropometry. For instance, infants born to mothers with higher income levels were more likely to have a healthier weight at birth, while those born to mothers with lower income levels exhibited a higher risk of low birth weight.

Discussions

The findings of this research emphasize the critical role of maternal social status in shaping newborn anthropometry. Socio-economic advantages enable expectant mothers to access better nutrition and healthcare, which positively influence fetal growth and development. However, it is essential to recognize that disparities in maternal social status can lead to

health inequalities among newborns. Addressing these disparities through policies that promote equitable access to education, healthcare, and economic opportunities is crucial for improving newborn health outcomes.

Present study found number of mothers of middle social status was highest and upper social status was lowest. Percentage of low birth weight, very low birth weight, congenital anomalies were highest in newborns of middle social status mothers and lowest in upper social class mothers. As we compare with previous studies it was similar (Table no. 5) Incidence of still born was highest in lower social class mother and lowest in upper social status mothers. Anthropometric measurements were highest in upper and middle class mother and lowest in lower class mother which were also similar to other studies (Table No. 6). Ashwaq A *et al* (2009) reported in his study that mean value of weight and head circumference was higher in new born of lower social status mother than the middle and upper social status mothers and mean value of chest and mid-thigh circumference was higher in new born of upper social status mothers than middle and lower social status mothers, and length has significant difference as we compared this with present study it was similar.

Table 5: Comparison of Incidence of Low Birth Weight (%) and Socioeconomic Status in Previous studies

Studies	Class I	Class II	Class III
Guvande (1994)	28.7%	28.7%	67.8%
Jaya(1995)	10.1%	16.3%	17.9%
Kiran A (2000)	12.8%	20.6%	27.2%
Nair (2000)	11.5%	16.3%	17.9%
Lohitha (2012)	45%	36%	41%
Present study (2023)	21.05%	21.85%	24.07%

Table 6: Comparison of mean Birth Weight (kg) and Socioeconomic Status in Previous studies

Studies	Class I	Class II	Class III
Leela R (1981)	2.87	2.83	2.72
Jaya D S (1995)	2.89	2.81	2.80
Lohitha (2012)	2.62	2.77	2.56
Present study (2023)	2.62	2.55	2.52

Conclusion

The present study conclusively showed significant associations between socio economic factors and neonatal anthropometry except thigh circumference and skin fold measurement. This research highlights the significant impact of maternal social status on newborn anthropometry. Socio-economic advantages are associated with improved birth outcomes, while disadvantages can lead to adverse effects on infant health. Recognizing these disparities and implementing policies aimed at reducing them is essential for ensuring that all newborns have the best possible start in life. Further research is needed to explore the mechanisms through which maternal social status influences newborn anthropometry and to develop targeted interventions to address these disparities.

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Conflicts of interest

There are no conflicts of interest.

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