Correlation of Socio-economic Factors in Pregnant Mothers with Newborn Anthropometry (Birth weight ,Length ,Head Circumference and Chest Circumference)

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ABSTRACT:
Objective: Among several factors in the mother, nutrition and socioeconomic factors play a significant role in the growth of the fetus and ultimately in the newborn. Surat city urban population consists of a variety of people with varying socioeconomic factors. This study was conducted in a tertiary care hospital to find out the influence of socioeconomic factors in mother that affects the newborn anthropometry. **Material and Methods:** A total of 166 primigravida mothers with uncomplicated pregnancies delivered at Surat Municipal Institute of Medical Education and Research from February 2021 to August 2022 were included in the study. Socioeconomic status of mothers and their categorization were determined by Modified Kuppuswamy classification. Anthropometric parameters of newborns including weight, length, head circumference, and chest circumference. Data entry was carried out in MS Excel analyzed by EPI info version 7 and subjected to an ANOVA test to check the statistical significance between means of quantitative variables. **Result:** Socioeconomic status, employment and level of education in mothers had significant influence on newborn's anthropometry (birth weight, length, head circumference and chest circumference (p-value<0.05). Whereas ,active married life ,religion ,consanguinity and type of family did not influence newborn anthropometry (p-value>0.05). **Conclusion:** Newborn birth weight ,length, chest circumference, head circumference was lower in mothers with low socioeconomic status ,low level of education and unskilled and unemployed mothers as compared to high socioeconomic status ,higher education ,employed and skilled mothers (p-value<0.05)

Keywords: anthropometry, birth weight, newborn, socio-economic.

INTRODUCTION:

In humans, including embryo transfer, the size at birth is primarily determined by the mother, whose influence acts more through the intrauterine environment and is transmitted to her newborn. Various factors such as the body physique of the mother, nutritional status, hemoglobin levels, socioeconomic class and exposure to passive smoking during pregnancy, and intrauterine growth and birth size of her neonate. Significant positive correlations between maternal anthropometric parameters and neonatal birth dimensions were observed. These effects were more evident in female babies than male babies as regards Body Mass Index and head circumference[1]. Pregnancy outcomes such as birth weight, length, and head circumference are vital indicators of a newborn's general health. Low birth weight (LBW) has been found to contribute to around 60–80% of neonatal deaths. Accordingly, one promising method for reducing and preventing LBW is to increase the optimum weight gain during pregnancy[2].

MATERIAL AND METHODS:

This study was a cross-sectional study conducted at Surat municipal institute of medical education & research, (tertiary care hospital) for 18 months. The study was approved by the Institutional Ethical committee. Informed consent was obtained.. A total of 166 cases were included in the study. Primigravida with uncomplicated, singleton pregnancies consenting to participate in the study were included. At the time of their registration information on age, religion, education, and occupation of women, information on family income per month, and menstrual and obstetrical history was recorded. Information about personal habits such as tobacco use and smoking among women was also noted down. Kuppuswami[3] method of socio-economic status was used to determine the social class to which woman belonged.

Newborns with any obvious congenital anomalies, deformities, syndromes, or birth injuries like limb fractures/cephalohematoma/ brachial palsy, skull anomalies, chest anomalies, critically ill & required oxygen therapy and ventilator support were excluded. The Newborn was weighed on an electronic weighing scale with an accuracy of ± 1 gm. Length with infantometer, head & chest circumference with nonstretchable standard tape. The sample size was calculated considering the proportion of normal delivery out of total deliveries, which is 19.34% from the previous 3 months' data records. Data entry was carried out in MS Excel analyzed by EPI info version 7 and subjected to an ANOVA test to check the statistical significance between means of quantitative variables.

RESULT:
Most of the mothers belong to the age group of 21-30 years (68.67%) followed by mothers belonging to the age < 20 years (27.71%). Equal gender of Newborns 83 male & 83 female (50.0%) was observed in a total of 166 newborns.

DISCUSSION:
Third world and developing countries in Africa and Asia have large number of population which falls under undernutrition. Nutrition and Socioeconomic factors influence the build and built of the population. Mother plays an important role in determining the nutrition of the generation and hence population. Surat is an urban and industrial city in the western part of India. The population consists of a variety of people from different parts of the country and with different kinds of occupations and education. Surat municipal institute of medical education & research is a tertiary care hospital that caters to a large portion of the population for delivery and health services. This study was an effort to correlate and observe the influence of socioeconomic factors on newborn anthropometry. Modified kuppuswamy classification was used to classify or categorize families into different socio-economic groups based on income, education, occupation, and other factors. Birth weight is an important parameter indicating the nutrition and health status of a community, low birth weight contributes significantly to neonatal morbidity & mortality as indicated by the current Neonatal mortality rate of 24.9 /1000 live births[4]. Various studies have concluded that improper education in women, poverty, and poor nutritional status are at increased risk of adverse generative outcomes including Low birth weight and premature birth[5]. LBW is prone to decreased neuro-development, diabetes mellitus, and hypertension in later life[6]. As depicted in Table:1, Out of a total (of 166) newborns,42.0% (70) newborn fall under the category of low birth weight and a majority of these newborns(62 out of 70) belonged to the mothers in the low socio-economic categories of the kuppuswamy classification. Being an urban city frequency of mothers falling in the category of diploma or higher level of education constituted around 38.0% of the group, however, the frequency of low birth weight was the maximum (75.0%) in most illiterate mothers table 2). As seen in Table 3, the maximum number of mothers (20), who had low birth weight newborns were unemployed. Other anthropometric parameters besides birth weight, such as length, chest circumference, and head circumference also correlated well (p-value<0.05) with the socioeconomic status, education, and occupation of the mother, as seen in Tables 4,5, and 6. Thus socioeconomic status, education, and occupation influence anthropometry and the growth of the newborn. Other social factors such as religion Table no.7 , active married life, type of family , consanguinity Table no. 8 did not influence the birth weight, length, chest, and head circumference of a newborn as (p-value>0.05) . Research studies about the correlation between socioeconomic status and newborn anthropometry are available. In a study by Johrapurkar M[7] per capita income (r = 0.164, p-value < 0.01; r = 0.201, p-value < 0.01 and mother education (r=0.169, p-value< 0.05 had a positive & significant correlation with newborn birth weight. In a study conducted in Bangladesh by Asaduzzaman M[8] on the effect of family income and a mother's education on newborn birth weight, it was found that those mothers, who had a family income of fewer than 10,000 takas had the highest no. of low birth weight newborn(33.0%) and those mothers, whose education was secondary level or below it, had 16.7% of lbw (higher than in those whose education exceeded secondary level). The relationship between socioeconomic status and birth weight were studied by Vijay N[9], it was concluded that as the socioeconomic status increased the weight of Newborn increased in both Tribal and nontribal women (In lower Socioeconomic class women weight of the newborn 2580 gms to the 2930 gms in the upper class. Studies by Eltahir M et al[10] , Kheir M et al[11] and Geeta K[12] also had similar results. Kumar C[13] in a study also found that illiterate mothers had the lowest birth weight (2362.97± 597.83 gm) and as the education level increased to graduate, the weight also increased (2763.27± 693.11gm). A study by Choudhary V[14] also concluded that the lower the education of the mother, the more the frequency of low birth weight. In their study 43-47% of women had low birth weight newborns in mothers who were either illiterate and had education up to primary or high school level. A study by Okui T[15] was conducted to find out the correlation between maternal occupation and low birth weight newborns in Japan from 1995 to 2015,9 types of occupations were compared, the highest frequency of low birth weight was found among unemployed 5,36,683 followed by clerical workers12,598 and

manual workers 2163 in the year 2015 concluding that occupation of mother did influence the birth weight of a newborn. However, we could not find relevant studies, that correlated, religion, active married life, type of family, and consanguinity with that of length, head circumference, and chest circumference in the newborn.

CONCLUSION:

Socio-economic factors in mother influences newborn anthropometry outcome. Improvement in economic status, higher education, and opportunities employment opportunities the health status and health indicators of the newborn(Birth weight and other parameters). Active married life, religion, consanguinity, and type of family did not influence newborn anthropometry in this study.

Limitations: Only 166 singleton primipara mothers and they are newborns were included in this study, influences of socio-economic factors in mothers on newborn anthropometry in multipara cannot be commented on.

Tables:

Table 1: Correlation of Socioeconomic status (Kuppuswami 2021) and Newborn Birth Weight

Socio Economic Status	Number of Mothers			
	>2.5kg	<2.5kg LBW	Total	Percentage of mother in each category
Upper	0	0	0	0
Upper Middle	14	2	16	9.8
Lower Middle	11	6	17	10.1
Upper Lower	49	27	76	45.8
Lower	22	35	57	34.3
Total	96	70	166	100

As depicted in Table 1, out of a total of 166 newborns 70 (42.0%) newborns belong to the Low birth weight category. (kg =Kilogram ,LBW = Low birth weight)

Table 2: Correlation between Maternal Education with Newborn Birth Weight

Education Status of Mother	>2.5kg	LBW (<2.5kg)	Number of Mothers	Percentage of mother in each category
Profession	4	1	5	3.0
Graduate	15	8	23	13.9
Diploma	21	15	36	21.7
High School	28	17	45	27.0
Middle School	11	8	19	11.4
Primary School	12	6	18	10.8
Illiterate	5	15	20	12.1
Total	96	70	166	100

Table 3: Distribution of mothers according to Occupation and newborn birth weight.

Occupation	>2.5kg	LBW (<2.5kg)	Number of Mothers	Percentage of mothers in each category
Professional	4	0	4	2.4
Semi-Professional	5	2	7	4.2
Clerical-Shop-owner	23	3	26	15.1
Skilled Worker	19	17	36	22.2

Semi-Skilled Worker	18	12	30	18.1
Unskilled Worker	23	16	39	23.5
Unemployed	4	20	24	14.5
Total	96	70	166	100%

From Table-3 it can be seen that the maximum no. of low birth weight newborns (24) belongs to unemployed mothers. (kg =Kilogram ,LBW = Low birth weight)

Table 4: Correlation between socio -economic of the family (Kuppuswami classification 2021) and newborn anthropometry.

Socio Economic Status	Number of Mothers	Birth Weight kg		Length cm		Head Circumference cm		Chest circumference cm	
		Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Upper	0	0	0	0	0	0	0	0	0
Upper Middle	16	3.05	0.54	50.93	2.01	33.12	1.64	31.18	1.66
Lower Middle	17	2.47	0.56	50	4.62	34	3.2	32	3.07
Upper Lower	76	2.55	0.54	49.79	1.99	32.90	1.71	31.20	1.69
Lower	57	2.30	0.53	48.77	1.99	32.03	1.72	32.28	1.70
p-value		0.00002		0.0007		0.001		0.002	

Table no.4 shows the correlation between the socio-economic status of mother and newborn anthropometry parameters, birth weight, length, head circumference, and chest circumference were statistically significant. (p-value<0.05) . None of the mothers belong to the upper class in this study.(S.D. = Standard Deviation, kg=kilogram, cm=centimeter, HC =Head Circumference ,CC = Chest Circumference)

Table 5: Correlation between Mother's Education and Newborn Anthropometry

Education Status of Mother	No. of Mothers	Birth Weight kg		Length cm		HC cm		CC cm	
		Mean	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**	**Mean**	**S.D.**
Profession	5	2.78	0.47	50.6	1.79	33.2	1.41	31.2	1.40
Graduate	23	2.87	0.54	50.91	1.99	33.26	1.71	31.26	1.69
Diploma	36	2.56	0.53	49.63	1.98	32.72	1.72	30.94	1.70
High school	45	2.73	0.51	50.2	1.93	33.44	1.64	31.73	1.69
Middle school	19	2.50	0.51	49.68	1.91	32.84	1.59	30.86	1.61
Primary school	18	2.13	0.53	48.38	1.99	31.5	1.75	29.83	1.73

Illiterate	20	1.84	0.53	47.05	1.99	30.6	1.72	29.35	1.70
p-value		0.000001		0.000001		0.00001		0.00004	

Table-5 depicts the correlation between the mother's education and birth weight, length, head circumference, and chest circumference, which is statistically significant (p-value<0.05). (S.D. = Standard Deviation kg=kilogram, cm=centimeter, HC =Head Circumference ,CC = Chest Circumference)

Table 6: Correlation between Occupation of mothers with Newborn Anthropometry

Occupation	Number Of Mothers	Birth Weight kg		Length cm		HC cm		CC cm	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Professionals	4	2.77	0.36	50	1.42	32.5	0.87	30.62	0.97
Semi professionals	7	2.56	0.53	50.85	1.94	33.42	1.61	31.28	1.6
Clerical-shop keeper	25	2.83	0.54	50.76	1.99	33.28	1.71	31.46	1.69
Skilled	37	2.64	0.53	49.91	1.98	33.16	1.71	31.28	1.69
Semi-skilled	30	2.52	0.53	49.93	1.98	32.7	1.69	30.96	1.68
Unskilled	39	2.48	0.53	49.61	1.99	32.58	1.75	30.79	1.73
Unemployed	24	1.95	0.53	47.33	1.99	30.91	1.72	29.66	1.70
p-value		0.000003		0.000005		0.00002		0.007	

As in Table 6, All the anthropometric parameters correlates significantly (p-value<0.05) with the occupation/type of employment(S.D.= Standard Deviation ,kg=kilogram, cm=centimeter, HC =Head Circumference ,CC = Chest Circumference)

Table 7: Correlation of Religion with Neonatal Anthropometry

Religion	Number Of Mothers	Birth Weight kg		Length cm		HC cm		CC cm	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Hindu	118	2.50	0.54	49.49	1.99	32.63	1.71	30.88	1.69
Muslim	48	2.54	0.53	49.70	1.97	32.63	1.70	30.90	1.71
p-value		0.66		0.53		0.97		0.94	

Only mothers of two religions were included in the study and there was no significant correlation between religion and newborn anthropometry (p-value>0.05) (S.D.=Standard Deviation, kg=kilogram, cm= centimeter , HC =Head Circumference ,CC = Chest Circumference) in Table-7

Table 8: Correlation of Active Married Life , Type of family ,Consanguinity with newborn Anthropometry

Active Married Life	Number Of Mother	Birth Weight kg		Length cm		HC cm		CC cm	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
10month-3years	135	2.52	0.54	49.54	1.98	32.6	1.71	30.86	1.69
3-5year	26	2.52	0.50	49.53	1.86	32.84	1.55	31.01	1.53
>5 year	5	2.41	0.52	49.8	1.93	32.4	1.60	30.8	1.60
p-value		0.90		0.95		0.56		0.9	

Correlation between Type of family with a newborn Anthropometry

Type of Family	Number Of mother	Birth Weight		Length		HC		CC	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Joint	142	2.50	0.54	49.45	1.99	32.54	1.71	30.80	1.69
Nuclear	24	2.59	0.53	50.12	1.98	33.16	1.73	31.35	1.72
p-value		0.34		0.29		0.36		0.97	

Correlation of Consanguinity with newborn Anthropometry

Consanguinity	Number Of Mothers	Birth Weight		Length		HC		CC	
		Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
No	142	2.50	0.54	49.45	1.99	2.50	0.54	49.45	1.99
Yes	24	2.59	0.53	50.12	1.98	33.16	1.73	31.35	1.72
p-value		0.45		0.12		0.10		0.14	

There was no correlation between Active married life ,Type of family ,Consanguinity with neonatal anthropometry as seen in Table 8 (p-value>0.05). (S.D. = Standard Deviation, kg=kilogram, cm=centimeter ,HC =Head Circumference ,CC = Chest Circumference)

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