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RESEARCH ARTICLE

"IMPACT OF SOCIOECONOMIC STATUS ON ANTHROPOMETRIC MEASUREMENTS OF PATIENTS WITH CEREBRAL PALSY

Dr. Arshee Pattu[1] and Dr. Syed Tariq[2]

1. Post Graduate Resident, Department of Pediatrics, Government Medical College, Srinagar.
2. Professor, Department of Pediatrics, Government Medical College, Srinagar.

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Abstract

Introduction: Cerebral palsy is disorder of movement and posture caused by non-progressive disturbances in developing brain caused by number of factors. [1,2] Prevalence of malnutrition among children with cerebral palsy is higher than that in normal children [4-7]. Some studies suggest an association between socioeconomic status and cerebral palsy whereas others refute it. Our study will discuss the impact of socioeconomic status on various anthropometric indices.

Objectives: To study the relation between socioeconomic status and anthropometric indices in patients with cerebral palsy.

Materials And Methods: This was a cross sectional observational study conducted in a tertiary care hospital of Srinagar from January 2021 to November 2022 which enrolled inpatient cerebral palsy children aged 1-18 years old. Height for age (stunting), weight for age (underweight), weight for height (wasting), BMI for age were derived and z scores were assessed through WHO Anthroplus and WHO anthro 3.2 softwares. Socioeconomic status was assessed by modified kuppuswamy scale updated for the year 2019. The data was analyzed with Jamovi 2.3.21. Nutritional status of children was classified as per WHO standards for z scores (i.e., -2 SD to +2 SD : Normal; -2 SD to -3 SD : Moderately undernourished and <-3 SD : Severely undernourished). Relation between categorical variables was analyzed by chi square test. Statistical significance was assessed and p values < 0.05 were considered significant. The study was approved by ethical committee of our institute

Results: 35 out of 102 participants (34.3%) belong to upper lower socioeconomic class. 25 out of 102 participants (24.5%) patients belong to lower middle socioeconomic class. 19 out of 102 participants (18.6%) belong to upper middle class. 14 out of 102 participants (13.7%) belong to lower class and 9 out of 102 participants (8.8%) belong to upper class.

Introduction:-

Cerebral palsy encompasses disorders of movement and posture that cause limitation in activities and are caused by non-progressive disturbances in developing brain. [1,2] Cerebral palsy is one of the leading causes of childhood

Corresponding Author:- Dr. Arshee Pattu
Address:- Post Graduate Resident, Department of Pediatrics, Government Medical College, Srinagar.

disability. As per Center For disease control and prevention (CDC) reports, the incidence of cerebral palsy is 3.6 per 1000 children and male to female ratio is around 1.4:1. Incidence in India is reported to be around 3 per 1000 children.

Cerebral palsy can be caused by number of factors which may be – infectious (intrauterine infections with Cytomegalovirus, syphilis, Zika virus, Varicella, Toxoplasmosis); ischemic (perinatal hypoxic ischemic injury); acquired causes (neonatal sepsis, post meningitis), post kernicterus sequelae; neonatal seizure, multiple pregnancies, low birth weight and prematurity.

Prevalence of malnutrition ranges from around 25% to 95% among children with cerebral palsy which is higher than that in normal children [4-7]. Undernutrition in these patients can be attributed to many factors ranging from poor dietary intake to gastroesophageal reflux diseases [4], and psychosocial factor [3,8-10].

The exact relation between socioeconomic status and cerebral palsy has not been clear. Some studies do suggest an association between two whereas others refute it [11]. Increased prevalence of cerebral palsy in developing countries compared to developed countries may be a testament to the relation between two variables. Not only that cerebral palsy patients of developing country have higher prevalence of malnutrition than their counterparts in developed countries. Socioeconomic status affects the health of a population in terms of resource availability and accessibility to health care, food and other determinants of health. Kuppuswamy scale has been widely used for a long duration of time to assess socioeconomic status of a family [12] and it was used in our study as well, as an indicator of socioeconomic status of study participants.

Prevalence of malnutrition in cerebral palsy patients has been established beyond doubt by various studies done in the past however our study will discuss the impact of socioeconomic status on various anthropometric indices which is one of the less studied aspects of cerebral palsy.

Objectives:-

To study the relation between socioeconomic status and anthropometric indices in patients with cerebral palsy.

Materials and Methods:-

This study was a cross sectional observational study conducted in a tertiary care hospital of Srinagar from January 2021 to November 2022. The study enrolled children aged 1-18 years old with cerebral palsy seeking medical services from pediatric inpatient department of this hospital.

{Cerebral Palsy was defined as a non-progressive disorder that manifests as motor and postural abnormality, and results from central nervous system insult sustained during the early period of brain development, usually defined as the first three years of life. [15]}

However critically sick children and children with other underlying chronic disorder which may be contributing to malnutrition were excluded from the study. History and examination was done according to preset proforma. Nutritional status was assessed through four anthropometric indices – Height for age (stunting), weight for age (underweight), weight for height (wasting), BMI for age which were derived from the data collected and z scores were assessed through WHO Anthroplus and WHO anthro 3.2 softwares.Child was weighed with minimal clothing to nearest 100 grams on a digital weighing scale. If child couldn't stand tared weight was calculated. Standing height was measured for children aged >2 years using a stadiometer. If the child was unable to stand straight, recumbent length was measured in centimeters. For children less than 2 years recumbent length was measured using an infantometer. If the child was unable to stand erect or recumbent length couldn't be calculated because of contractures knee height was measured from proximal edge of patella to bottom of heel with both the knee and ankle at 90-degree flexion. Full height was further derived from this knee height through the STEVENSON FORMULA that is - Height = (2.69 X knee height) + 24.2 cm

Socioeconomic status was assessed by modified kuppuswamy scale updated for the year 2019.

Statistical Analysis

All the relevant data was collected and entered in Microsoft excel spreadsheet. The data was analyzed with Jamovi 2.3.21. All the discrete variables were expressed as numbers and percentages and all the continuous data was

expressed as mean, standard deviation and z scores. Z scores for anthropometric measurements that is weight for age, height for age, weight for height, BMI for age was calculated with the help of WHO anthroplus software and WHO anthro 3.2 software. Nutritional status of children was classified as per WHO standards for z scores (i.e., -2 SD to +2 SD : Normal; -2 SD to -3 SD : Moderately undernourished and <-3 SD : Severely undernourished). Bar charts was used for representation of data. Relation between categorical variables was analyzed by chi square test. Statistical significance was assessed and p values < 0.05 were considered significant. The relation between socioeconomic class and z score class (classes of nourishment) was assessed through chi-square.

Ethical Considerations:
The study was approved by ethical committee of our institute

Results and Observations:-

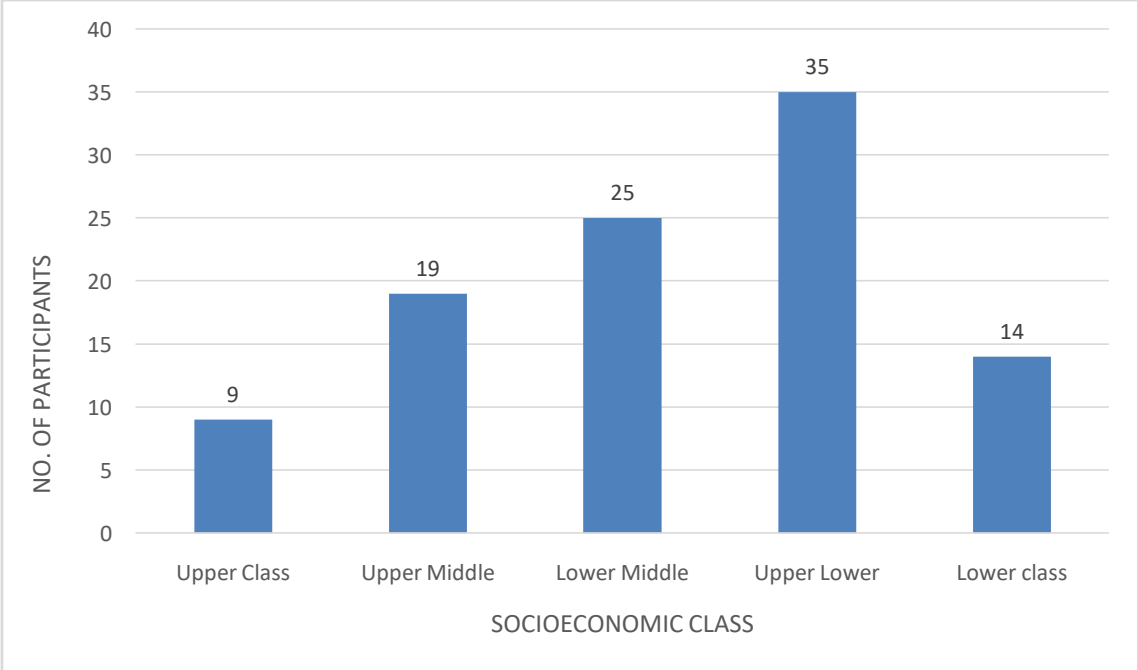

Figure 1:- Bar Diagram Showing Distribution Of Study Participants According To Socioeconomic Class.

35 out of 102 participants (34.3%) belong to upper lower socioeconomic class. 25 out of 102 participants (24.5%) patients belong to lower middle socioeconomic class. 19 out of 102 participants (18.6%) belong to upper middle class. 14 out of 102 participants (13.7%) belong to lower class and 9 out of 102 participants (8.8%) belong to upper class. Figure 1 shows socioeconomic class distribution of study participants. Thus, 49 of 102 participants (48%) belonged to upper lower and lower class.

Table 1 shows distribution of height for age z score according to socioeconomic class. It shows that 33 out of 41 (80.5%) severely stunted patients belonged to upper lower and lower socioeconomic class. 6 out of 15 (40%) moderately stunted patients belonged to upper lower class. The results were statistically significant with p value of <0.001 and chi square of 51.2 with degree of freedom 12, showing an association between height for age z scores and socioeconomic class.

Table 2 shows distribution of weight for age z score according to socioeconomic class. It shows that 24 out of 33 (72.7%) severely underweight patients belonged to upper lower and lower socioeconomic class. And all 9 (100%) moderately underweight patients belonged to upper lower socioeconomic class. The results were statistically significant with p value of <0.001 and chi square of 80.1 and degree of freedom 12, showing an association between weight for age z scores and socioeconomic class.

Table 3 shows that 11 out 17 (64.7%) severely wasted children belonged to upper lower and lower socioeconomic class. 3 out of 6 (50%) moderately wasted children belonged to upper lower class. The results were statistically

significant with p value of <0.05, chi square of 29.7 and degree of freedom 12, showing an association between weight for height z scores and socioeconomic class.

Table 4 shows distribution of BMI for age z scores according to socioeconomic status. It shows that 26 out of 32 (81.3%) patients with BMI for age z score < -3 and 13 out of 17 (76.47%) patients with BMI for age z score between -2 and -3 belonged to upper lower and lower socioeconomic class. The results were statistically significant with p value of <0.001, chi square of 56.6 and degree of freedom 12, showing an association between BMI for age z scores and socioeconomic class.

Table 1:- Distribution Of Height For Age Z Score According To Socioeconomic Class.

		HEIGHT FOR AGE Z SCORE				
SOCIOECONOMIC CLASS		>2	2 TO -2	-2 TO -3	<-3	TOTAL
UPPER	OBSERVED % WITHIN COLUMN	0 0%	9 21.4%	0 0%	0 0%	9 8.8%
UPPER MIDDLE	OBSERVED % WITHIN COLUMN	0 0%	14 33.3%	3 20%	2 4.9%	19 18.6%
LOWER MIDDLE	OBSERVED % WITHIN COLUMN	0 0%	13 31%	6 40%	6 14.6%	25 24.5%
UPPER LOWER	OBSERVED % WITHIN COLUMN	3 75%	4 9.5%	6 40%	22 53.7%	35 34.3%
LOWER	OBSERVED % WITHIN COLUMN	1 25%	2 4.8%	0 0%	11 26.8%	14 13.7%
TOTAL		4 100%	42 100%	15 100%	41 100%	102 100%
χ^2 = 51.5 df = 12 p = <0.001						

Table 2:- Distribution Of Weight For Age Z Score According To Socioeconomic Class.

		WEIGHT FOR AGE Z SCORE				
SOCIOECONOMIC CLASS		>2	2 TO -2	-2 TO -3	<-3	TOTAL
UPPER	OBSERVED % WITHIN COLUMN	0 0%	9 23.1%	0 0%	0 0%	9 10.7%
UPPER MIDDLE	OBSERVED % WITHIN COLUMN	0 0%	19 48.7%	0 0%	0 0%	19 22.6%
LOWER MIDDLE	OBSERVED % WITHIN COLUMN	3 100%	10 25.6%	0 0%	9 27.3%	22 26.2%
UPPER LOWER	OBSERVED % WITHIN COLUMN	0 0%	1 2.6%	9 100%	17 51.5%	27 32.1%
LOWER	OBSERVED % WITHIN COLUMN	0 0%	0 0%	0 0%	7 21.2%	7 8.3%
TOTAL		3 100%	39 100%	9 100%	33 100%	84 100%
χ^2 = 80.1 df = 12 p = <0.001						

Table 3:- Distribution Of Weight For Height Z Score According To Socioeconomic Class.

		WEIGHT FOR HEIGHT Z SCORE				
SOCIOECONOMIC CLASS		>2	2 TO -2	-2 TO -3	<-3	TOTAL
UPPER	OBSERVED % WITHIN COLUMN	0 0%	6 25%	0 0%	0 0%	6 11.8%
UPPER MIDDLE	OBSERVED % WITHIN COLUMN	0 0%	6 25%	0 0%	0 0%	6 11.8%
LOWER MIDDLE	OBSERVED % WITHIN COLUMN	3 75%	9 37.5%	3 50%	6 35.3%	21 41.2%
UPPER LOWER	OBSERVED % WITHIN COLUMN	0 0%	3 12.5%	3 50%	5 29.4%	11 21.6%
LOWER	OBSERVED % WITHIN COLUMN	1 25%	0 0%	0 0%	6 35.3%	7 13.7%
TOTAL		4 100%	24 100%	6 100%	17 100%	51 100%
χ^2 = 29.7 df = 12 p = 0.003						

Table 4:- Distribution Of Bmi For Age Z Score According To Socioeconomic Class.

		BMI FOR AGE Z SCORE				
SOCIOECONOMIC CLASS		>2	2 TO -2	-2 TO -3	<-3	TOTAL
UPPER	OBSERVED % WITHIN COLUMN	0 0%	9 20.9%	0 0%	0 0%	9 8.8%
UPPER MIDDLE	OBSERVED % WITHIN COLUMN	3 30%	15 34.9%	1 5.9%	0 0%	19 18.6%
LOWER MIDDLE	OBSERVED % WITHIN COLUMN	7 70%	9 20.9%	3 17.6%	6 18.8%	25 24.5%
UPPER LOWER	OBSERVED % WITHIN COLUMN	0 0%	7 16.3%	9 52.9%	19 59.4%	35 34.3%
LOWER	OBSERVED % WITHIN COLUMN	0 0%	3 7%	4 23.5%	7 21.9%	14 13.7%
TOTAL		10 100%	43 100%	17 100%	32 100%	102 100%
χ^2 = 56.6 df = 12 p = <0.001						

Discussions:-

Our study showed highest number of participants in upper lower class (34.3%) and lowest number of participants in upper class (8.8%). This is consistent with study by R sundrum Et al. [16] which showed that the prevalence of cerebral palsy is higher in all groups compared to the most advantaged. Our study showed that cerebral palsy was prevalent across all socioeconomic groups and this is further emphasized by the fact that cerebral palsy is not a

disease of developing countries only. It occurs in developed countries too. However, prevalence of cerebral palsy in upper class was 50% that of other classes. 49 of 102 participants (48%) belonged to upper lower and lower class.

Our study showed that as the socioeconomic status of patients fell, degree of malnutrition increased. This is because the patients from low socioeconomic class don't have enough resources to provide adequate nutrition and care to these patients. 80.5% severely stunted, 72.7% severely underweight and 64.7% severely wasted children belonged to class upper lower and lower according to modified kuppuswamy scale. This is same as previous studies by Caram ALA Et al. [13] and Okeke IB Et al.[14] ,in Brazil and Nigeria respectively on cerebral palsy patients, which showed higher prevalence of malnutrition in patients from lower socioeconomic group. Further study by Srishti Aggarwal Et al. [3] showed that cerebral palsy patients in developing countries have poor nutritional status as compared to those in developed countries. Prevalence of underweight (weight for age z score below -2 SD) in cerebral palsy children is 48% in Greece, 29% in North America, and 20% in Norway, compared to 35% in Turkey and 51% in Brazil. Study done by Tasneem Karim Et al. [1] in Vietnam showed that rates of both underweight and stunting were highest among children whose monthly family income was low.

Conclusions:-

Our study concludes that socioeconomic status is a non-nutritional factor which impacts the presence and degree of all the anthropometric indices of malnutrition. We all conclude the presence of malnutrition in all socioeconomic groups with higher prevalence in lower strata of society.

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