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Socio-economic Demographics and Anthropometric Profiling for Assessment of Nutritional Status of Rural School Age Children of 7-9 Years of Rural Kanpur District of Uttar Pradesh, India

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ABSTRACT

Despite recent achievements in economic progress in India, the fruit of development has failed to secure a better nutritional status among all children of the country. Growing evidence suggests the existence of a socio-economic gradient of childhood malnutrition in India. In many countries, including India, there is a clear socio-economic gradient in childhood malnutrition. For example, children from the poorest households are more likely to experience chronic malnutrition than those from wealthier families. Children from lower SES households often face higher risks of malnutrition, including undernutrition and stunting, compared to those from higher SES households. This is due to several factors, such as limited access to nutritious food, inadequate healthcare, and poor living conditions. Other variables, such as the mother's educational attainment and access to sanitary facilities, greatly influence a child's nutritional health. Children's socioeconomic position (SES) also significantly influences their nutritional status. The present paper is an attempt to measure the impact of socio-economic factors on childhood malnutrition in rural areas of the Kanpur district and to identify the role of household socioeconomic status (SES) as the determinant of the nutritional status of children. In the present study, the socioeconomic status is determined by three indicators, i.e. educational status, occupational status and income of the family. The findings indicated that the majority of families (57.31%) belonged to the upper lower class followed by the lower middle class (22.69%) and lower class (18.08%) of the socioeconomic scale used in the present study. Whereas, the anthropometric data of the children's body measurements revealed that the majority of boys and girls were stunted and undernourished as they were not meeting the WHO standard for height and weight for the 7-9 years of age group. The study supported that socioeconomic factors of the family are determinants of the nutritional status of children.

Keywords: *School-age children, Demographics, Nutritional status, Anthropometric Profiling, Rural Kanpur, socio-economics, Malnourishment.*

1. Introduction

Nutrition is essential in all ages of life. The school-age period is one of them, which is an important stage of life as it is regarded as the 'latent time of growth'. The growth and maturation rate vary from age to age because neither growth nor development occurs at a uniform rate. During childhood, gradual modification in physical, biochemical, mental and emotional development takes place, which is all connected to the nutrition provided to the child. Good early nutrition helps to prevent chronic diseases during later life. The rate of physical growth during school age is slow. Resulting in a decline in food requirement per unit body weight, therefore, more nutrient-dense food should be given to children without bulk food intake. Effective or adequate nutrition during childhood helps in developing healthier adolescents in the future.

The nutritional needs of this group are important to store nutrients in the nutrient reserves of the body to meet the requirements of the adolescent age, such as calories, calcium, fat and iron. An increase in protective foods enhances immunity as they are more susceptible to infection. Good immunity helps school-age children to be ready for the 'growth spurt' in the adolescent stage. Therefore, we can say that school-age is also requires care and maintenance in terms of food intake, physical activity, dietary patterns and personal hygienic practices.

The health and nutritional status of underprivileged children in India are exacerbated by a lack of proper health education, poverty, poor feeding habits, and irrational beliefs[1]. Children are the nation's wealth; they not only make up a large portion of the population, but they are also a "vulnerable" or at-risk group. The nurturing and care of our children is not only the responsibility of the family but also of the community and the state as a whole. Therefore, the importance of frequent nutritional screening or assessment of the nutritional status of children at different ages by community health workers to monitor their growth according to the standard parameters is important. The deviation in their growth parameters depicts their nutritional status.

Anthropometric measurements are reliable indicators for assessing growth or change in the body composition of the individual.

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The pattern of growth and the physical state of the body, though genetically determined, are strongly influenced by nutrition, so anthropometric measurements are useful criteria for assessing nutritional status (WHO, 1963).

Nutritional anthropometry is defined as "Measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition"[2]. It has been widely used as a sensitive indicator of nutritional status. Nutritional anthropometry is concerned with the measurement of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition. Growth is influenced by biological determinants including sex, intrauterine environment, birth order, birth weight in single and multiple pregnancies, parental size and genetic constitution, and by environmental factors, including climate, season, and socio-economic level.

Anthropometric measurements are commonly used to determine the prevalence of protein energy malnutrition because they provide the most valid and reliable data for determining nutritional status. These techniques are readily available, non-invasive, relatively simple, can be carried out and interpreted without requiring professional expertise and are based on well-adopted classification[3].

Childhood is a period of continuous growth and development. Physical growth is an increase in size, its progress is mainly structural and can be measured with some degree of reliability in terms of height, weight, age *etc*. Growth assessment has been identified as the most important measure for evaluating the health and nutritional status of under-five-year-old children through anthropometric measurements[4].

Anthropometric indicators of growth provide information on health and nutritional status and indirectly measure the quality of life. It is suitable for school-age children as they are in a steady growth period[5]. The anthropometric measurements that are considered while assessing nutritional status are weight, height, mid-upper arm circumference (MUAC), head circumference, waist and hip circumference, skinfold thickness at triceps, biceps sub-scapular and supra-iliac sites, *etc*.

1.1 Impact of Socio-economic status and malnutrition at the global level

Here are a few reports that highlight how socioeconomic status (SES) affects children's nutritional status:

According to the National Family Health Survey (NFHS) 2019-21, the 5th in the series, India has seen no significant improvement in health and nutritional status among its population. Child Nutrition Report by UNICEF, 2021 entitled "Fed to Fail? The Crisis of Children's Diets in Early Life," explores the crisis of children's diets in early life and how SES plays a crucial role in determining nutritional outcomes. Child Nutrition Report, 2024 by UNICEF emphasizes the severe level of Child Food Poverty (CFP) globally, highlighting that children from lower SES backgrounds are more likely to experience malnutrition. A study entitled Nutritional Status of Children in India: Household Socioeconomic Condition as the Contextual Determinant published in 2010 examines the socioeconomic gradient of childhood malnutrition in India and finds that children from poorer SES backgrounds are more likely to be malnourished. A similar study on changes in socio-economic inequality in nutritional status among children in EAG States, India investigates the changes in socio-economic inequality in nutritional status among children under 5 years of age in the Empowered Action Group (EAG) states of India.

These reports provide valuable insights into how socioeconomic factors influence children's nutritional status and highlight the need for targeted interventions to address these disparities. Socioeconomic status is one of the critical factors responsible for high mortality and morbidity. Lower socioeconomic class is highly associated with a high risk of poor health and poor dietary habits[6].

The reviewed literature related to nutritional status indicated that childhood is an important period in the development process. Different research studies and statistics show that many children of school-going age were malnourished and required immediate action as well as care for their health. There are sufficient official reports and research available targeting children 0-5 years of age, but there are no follow-up statistics for children over 5 years of age. Therefore, it is very important to pay attention to their nutritional status during childhood, this will help to take correct action for treatment and prevention of malnutrition by providing counselling and guidance.

The present study aimed to record the socio-economic demographics and anthropometric parameters denoting the physical growth of school-age children of 7-9 years old, especially in rural Kanpur district areas. The main objective of the study was to study the socio-economic demographics and to assess the nutritional status based on anthropometric measurement (Height, Weight and BMI) of rural school children of 7-9 years.

2. METHODOLOGY

2.1 Location of the study: The present study was conducted in the year 2019 in the Kanpur Dehat District of Uttar Pradesh. Kanpur Dehat district is divided into 5 sub-divisions, 12 towns, 1032 villages and 10 blocks. Four blocks were selected and taken under consideration for the research study from the Kanpur Dehat district named Malasha, Amraudha, Derapur, and Rajpur blocks. Blocks were selected through the simple random method.

2.2 Participants of the study: Five Government schools were selected from different villages from each block for the study. 13 respondents were selected from each school in each block. 5 schools were selected randomly from the total 4 blocks.

2.3 Methods involved in the study: The present study is a descriptive cross-sectional study, where the nutritional status of 7-9-year-old rural school children has been assessed based anthropometric measurements. To assess the socioeconomic status of the children's family under the study, Kuppuswamy's scale 2019. The primary data was collected and analyzed to show the effect of independent variables (Age, education, caste, types of family, size of family, occupation, income etc.) on the dependent variables (Height, Weight, BMI, Nutritional status, etc.) taken under consideration in the study.

2.4 Anthropometric parameters: For school-age children of 7 – 9 years old, the measurements to be taken were height and weight.

2.4.1 Weight: Weight is measured in kilograms to the nearest 0.1 kg as the weight of the child for age is referred to as the 'index of malnutrition'**.** Weight indicates body mass and it involves all body components such as protein mass, bone mass, body fat and body water. The weight can be recorded using mechanical scales or a digital weighing machine.

Weight indicates body mass and is a composite of all body constituents like water, minerals, fat, protein and bone. Serial measurements of weight are a more sensitive indicator of changes in nutritional status.

2.4.2 Height: The height of the child is measured in centimeters as height for age is referred to as 'the indicator of duration of malnutrition'. Height is a reliable measure that indicates an adequate nutritional status. Recording the height would, therefore, help us to know whether the child is growing normally and is in good health or not. It can be recorded by stadiometer as per the steps given below.

NCHS (National Centre for Health Statistics) and WHO (World Health Organization) provide standards of weight and height for school-age children. Using this data, the resulting BMI (Body Mass Index) indicates the health status in terms of the severity of malnutrition: underweight, normal, overweight, and obese.

2.4.3 Body Mass Index (BMI): Body Mass Index is an indicator used to assess body composition by recording the weight-for-height, commonly used to classify underweight, overweight and obesity. Weight for height is an age-independent indicator of malnutrition and an index of current nutritional status. The BMI is computed by dividing the weight (in kilograms) of the individual by the square of the individual's height (in meters) and is expressed in units of kg/m2. It is an estimate of body fatness and leanness. It is also called the Quetlet Index. BMI is computed by using the formula given by Garrow (1987).

$$\text{Body Mass Index} = \frac{Weight\ (Kg)}{Height\ (m^2)}$$

2.4.4 Statistical Methods: The data was tabulated and analyzed for the results using the statistical package for social sciences (SPSS) IBM SPSS 22 and MS-Excel software. The recorded data was compared with the standards with the help of relation analysis, rank, descriptive statistics, and percentiles. The results were presented with the help of suitable tables and figures.

3. RESULTS

3.1 Demographic profile of children

It is important to record the demographics of the interested population to identify individuals or population groups at risk of becoming malnourished and to identify the ecological factors that are directly or indirectly responsible.

Table 1. Demographic profile of children

S,no.	Variable	Category	Frequency(n)	Percentage(%)
1.	Sex	Boys	123	47.31
		Girls	137	52.69
Total			**260**	**100.0**
2.	Age Group	7-8 years	92	35.38
		8-9 years	112	43.08
		9-10 years	56	21.54
Total			**260**	**100.0**
3.	Religion	Hindu	234	90.00
		Muslim	26	10.00
		Sikh	0	0.00
		Christian	0	0.00
Total			**260**	**100.0**
4.	Caste	General	11	4.23
		Other Backward Caste	101	38.85
		Schedule caste/tribes	148	56.92
Total			**260**	**100.0**
5.	Family Type	Nuclear	165	63.46
		Joint	95	36.54
Total			**260**	**100.0**
6.	Mother's education	Illiterate	114	43.85
		Class 1-5	45	17.31
		Class 6-8	47	18.08
		Class 9-10	35	13.46
		Class 11-12	14	5.38
		Graduation/Post Graduation	5	1.92
Total			**260**	**100.0**
7.	Father's education	Illiterate	46	17.69
		Class 1-5	23	8.85
		Class 6-8	45	17.31
		Class 9-10	92	35.38
		Class 11-12	34	13.08
		Graduation/Post Graduation	20	7.69
Total			**260**	**100.0**

The distribution of respondents or children based on different independent variables is given in Table 1. Out of a total of 260 school-going children, 112 children (43.08%) belonged to the 8-9 years of age group, 92 children (35.38%) belonged to the 7-8 years of age group and 56 children (21.54%) belonged to 9-10 years of age group.

The distribution of the respondents according to their age and sex is given in Fig. 2 which depicts that out of a total of 260 school-going children, 112 children (39.84%) were boys and 45.99% were girls belonged to the 8-9 years of age group, 92 children (35.77%) were boys and 35.04% were girls belonged to 7-8 years of age group and 56 children (24.39%) were boys and 18.98% were girls belonged to 9-10 years of age group.

Among the 260 samples, 137 were girls and 123 were boys. 49 boys (39.84%) and 63 girls (45.99%) were found at 8-9 years, 44 boys (35.77%) and 48 girls (35.04%) were found at 7-8 years and 30 boys (24.39%) and 26 girls (18.98%) were found 9-10 years.

Based on their religion, 90.00% (n=234) of children in the study belonged to the Hindu religion whereas, 10.00% (n=26) belonged to the Muslim religion. No children were of Sikh or Christian religion in the study.

According to caste categorization, it was found that 56.92% (n=148) of children belonged to the SC/ST category, 38.85% (n=101) of children belonged to the OBC category, and only 4.23% (n=11) of children came from the general category who participated in the study. The caste of the children shows the social pattern of the population within the selected geographical area. In the selected rural area, the majority of the people (56.2%) belonged to SC/ST Category.

According to the data, it was observed that 63.46% (n=165) of children belonged to the nuclear family whereas the rest 36.54% (n=95) belonged to the joint family.

Based on the educational status of the mothers of rural school-going children. It was found that 43.85% (n=114) of mothers were illiterate, 17.31% (n=45) of mothers were qualified up to the secondary level, and 18.08% (n=47) of the mothers were qualified up to the primary level. The 13.46% (n=35) mothers were high school pass and 5.38% (n=14) were higher secondary pass. Only 1.92% (n=5) of mothers had a graduation or post-graduation. Since the literature shows that the education of the mother affects the health status and nutritional status of the child, therefore, in the present study mother`s education was assessed the results of the analysis show that the majority of mothers (114 out of 260) of rural school going children were found illiterate followed by primary and high school education. The same figures show the distribution of the children based on their father`s educational status. It was found that 35.38% (n=92) of the fathers belonged to the category of class 9-10. 17.69% (n=46) of children`s fathers were Illiterate. 17.3% of children`s fathers were educated up to class 6-8, 13.08% (n=34) children`s fathers passed intermediate, i.e. Class 11-12, 8.85% (n=23) children`s fathers were educated up to primary level. Only 7.69% (n=20) of fathers were educated up to graduation level. It was observed that 82.31% of fathers were educated and the remaining 17.69% were found illiterate.

3.2 Socio-economic Status of the Family of Children

In the present study, Kuppuswamy's Scale 2019 was used for assessing the socio-economic status with three scales, and each category of each scale has scores to finally categorize the socio-economic status.

Table 2. Socio-economic status of the family of children

A.	Education of Head of the Family	Maximum Score	Frequency (n)	Percent (%)
1.	Professional	7	0	0.00
2.	Graduate	6	20	7.69
3.	Intermediate/ Diploma	5	34	13.08
4.	High School Certificate	4	92	35.38
5.	Middle School Certificate	3	35	13.46
6.	Primary School Certificate	2	35	13.46
7.	Illiterate	1	44	16.92
		Total	260	100.00
B.	**Occupation of the Head**	**Max. Score**	**Frequency (n)**	**Percent (%)**
1.	Legislators, Senior Officials & Managers	10	0	0.00
2.	Professionals	9	1	0.38
3.	Technicians and Associate Professionals	8	0	0.00
4.	Clerks	7	4	1.54
5.	Skilled Workers and Shop & Market Sales	6	33	12.69
6.	Skilled Agricultural & Fishery Workers	5	26	10.00
7.	Craft & Related Trade Workers	4	3	1.15
8.	Plant & Machine Operators and Assemblers	3	12	4.62
9.	Elementary Occupation	2	87	33.46
10.	Unemployed	1	94	36.15
		Total	260	100.00
C.	**Updated Monthly Family Income in Rupees**	**Max Score**	**Frequency (n)**	**Percent (%)**
1.	≥ 78063	12	0	0.00
2.	39033-78062	10	0	0.00
3.	29200-39032	6	0	0.00
4.	19516-29199	4	12	4.62
5.	11708-19515	3	40	15.38
6.	3908-1707	2	99	38.08
7.	≤ 3907	1	109	41.92
		Total	260	100.00

D.	Total Score	Socio-economic Class	Frequency (n)	Percent (%)
1.	26-29	Upper Class	0	0.00
2.	16-25	Upper Middle	5	1.92
3.	11-15	Lower Middle	59	22.69
4.	5-10	Upper Lower	149	57.31
5.	< 5	Lower	47	18.08
		Total	260	100.00

Table 2 shows the socioeconomic status of the families of children. The data is collected from the family of the children for the educational status of the head of the family. Data on the educational status of the head of the family is taken based on the categories given in Table 2. Results show that 35.38% (n=92) of respondents scored 4 for the high school category. Whereas, 16.92% (n=44) of respondents scored only 1 for the illiterate category. 13.46% (n=35) respondents in two categories, *i.e*. middle school and primary school certificates, scored 2 and 3 respectively. 13.08% (n=34) respondents scored 5 for the intermediate or Diploma level education. Only 7.69% (n=20) of respondents scored 6 on the scale for graduation level. No respondent scored for the professional category.

For the occupational status of the head of the family. 36.15% (n=94) respondents scored 1 for the unemployed category; 33.46% (n=87) respondents scored 2 for the elementary occupation; 12.69% (n=33) respondents scored 6 for the skilled worker category. Whereas, 10.00% (n=26) respondents scored 5 for skilled agricultural & fishery workers. 4.62% (n=12) respondents scored 3 for plant & machine operators and assemblers; 1.54% (n= 4) respondents scored 7 for the clerk category; 1.15% (n=3) respondents scored 4 for craft & related trade workers while 0.38% (n=1) respondents scored the highest 9 on the scale for the professionals.

No respondents from the category of legislators, senior officials & managers.

According to the income status data, it was found that 41.92% (n=109) respondents scored 1; 38.08% (n=99) respondents scored 2; 15.38% (n=40) respondents scored 3 on the scale. Whereas, only 4.62% (n=12) of respondents scored 4 on the scale.

The socioeconomic status of the families of the respondent children based on their total obtained score from the mentioned three indicators: educational status, occupational status and income status of the family of children found that the majority of 57.31% (n=149) families scored between 5-10 which indicates their socio-economic status as upper lower class. 22.69% (n=59) of families scored between 11-15 which indicates a lower middle class. 18.08% (n=47) families scored below 5 which indicates their class is lower. Whereas only 1.92% (n=5) come under the upper middle class.

3.3 Anthropometric Assessment

Anthropometric measurements are one of the major criteria to assess the nutritional status of children. Based on the data collected from rural school children of 7-9 years of age group, the Z-test is applied to test the mean difference. The observed mean value of both height and weight is compared against reference values of height and weight by WHO standards.

Table 3. Height of school-age children of 7-9 years

Age Group (Years)	Frequency (n)	Percent (%)	Boys' Height (cm)		Zvalue	Frequency (n)	Percent (%)	Girls' Height (cm)		Z value
			Reference Value of Height	Mean ± SD				Reference Value of Height	Mean ± SD	
7 – 8	44	35.77	124.3	116.7 ± 6.2	8.131**	48	35.04	123.6	115.4 ± 5.0	11.362**
8 – 9	49	39.84	130.1	120.2 ± 6.1	11.361**	63	45.99	129.2	120.5 ± 6.6	10.463**
9 – 10	30	24.39	134.6	124.0 ± 6.3	9.216**	26	18.98	135.0	123.0 ± 6.1	10.031**
Total	127	100.0				137	100.0			

*Value is mean ±SD. Reference value-World Health Organization (WHO, 2007), **Values were highly significant at 1% level of significance*

Table 3 presents the data of the height of boys (7-9 years). It was analyzed that out of 127 boys, 35.77% (n=44) boys of 7-8 year gained height of 116.7 cm against 124.3 cm of reference height, followed by 39.84% (n=49) boys 8-9 years attained height of 120.2 cm against the reference value of 130.1 cm. similarly, 24.3% boys (n=30) of 9-10 years gained height of 124.0 cm against 134.6 cm of reference height as per WHO. For girls, it was analyzed that out of 137 girls, 35.04% (n=48) girls of 7-8 year gained height of 115.4 cm against 123.6 cm of reference height, followed by 45.99% (n=63) girls 8-9 years attained height of 120.5 cm against the reference value of 129.2 cm. Similarly, 24.3% boys (n=30) of 9-10 years gained height of 123.0 cm against 135.0 cm of reference height as per WHO. All the categories scored below the standard reference height value The statistical analysis showed that for both the genders the difference in their actual height to the reference height value were significant at 1% level of significance.

Table 4: Weight of school age children of 7-9 years

Age Group (Years)	Frequency (n)	Percent (%)	Boys' Weight (Kg)		Z value	Frequency (n)	Percent (%)	Girls' Weight (Kg)		Z value
			Reference Value of Weight	Mean ± SD				Reference Value of Weight	Mean ± SD	
7 – 8	44	35.77	22.7	19.1 ± 3.0	7.960**	48	35.04	22.3	18.9 ± 3.1	7.599**
8 – 9	49	39.84	25.2	20.6 ± 2.8	11.500**	63	45.99	25.0	20.1 ± 3.5	11.112**
9 – 10	30	24.39	28.0	22.1 ± 3.7	8.734**	26	18.98	27.6	21.8 ± 2.7	10.953**
Total	127	100.0				137	100.0			

Value is mean ±SD. Reference value-World Health Organization (WHO 2007),
***Values were highly significant at 1% level of significance*

Table 4 presents the data of weight of boys (7-9 years). It was analyzed that out of 127 boys, 35.77% (n=44) boys of 7-8 years gained the weight of 19.1 Kg against 22.7 Kg of reference height, followed by 39.84% (n=49) boys 8-9 years attained weight of 20.6 Kg against the reference value of 25.2 Kg. Similarly, 24.3% boys (n=30) of 9-10 years gained weight of 22.1 Kg against 28.0 Kg of reference height as per WHO. For girls, it was analyzed that out of 137 girls, 35.04% (n=48) girls of 7-8 year gained weight of 18.9 Kg against 22.3 Kg of reference weight, followed by 45.99% (n=63) girls 8-9 years attained weight of 20.1 Kg against the reference value of 25.0 Kg. Similarly, 24.3% boys (n=30) of 9-10 years gained weight of 21.8 Kg against 27.6 Kg of reference weight as per WHO. All the categories scored below the standard reference weight value. The statistical analysis showed that for both the genders, the difference in their actual height to the reference height value was significant at 1% level of significance.

Weight is another important anthropometric indicator. The data relating to the weight of the boys of each age group shows that the reference values were below the WHO standards. The Z-values for the weight of rural school-age girls and boys of 7-8, 8-9 and 9-10 years were statistically significant at the 1% level of significance. Thus, it can be concluded that since the weight was found lower than the recommended value by WHO standards.

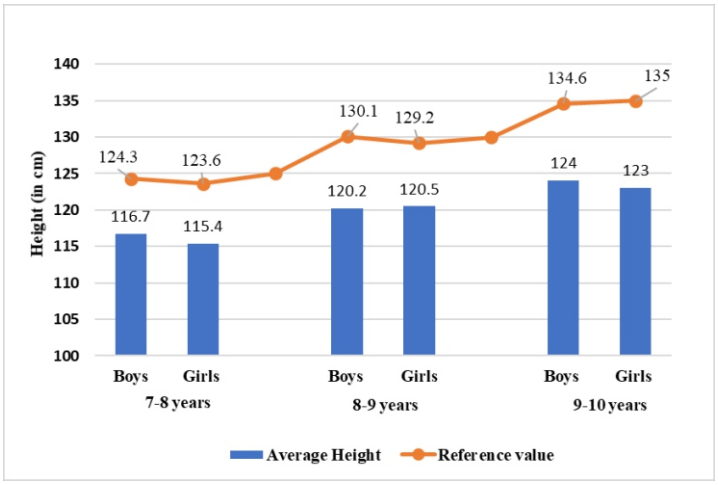

Figure 1. Comparative analysis of height of school age boys and girls (7-9 Years)

Figure 1 depicts the data relating to the height of the children showing that the mean value of the height of girls of each age group was found below the reference values of WHO standards for 7-9 year-old girls. This deviation shows that the girls were not gaining the desirable height according to their age. The Z-value for the height of rural school-going girls of 7-9 years shows that the mean of observed height and natural height is significantly different from the reference value. Thus, it can be said that rural school-going 7-9-year-old girls were considered undernourished in terms of their height parameters. Therefore, the study revealed that the boys and girls were not attaining a height equal to or more than the standard reference heights given by the WHO as per their age group.

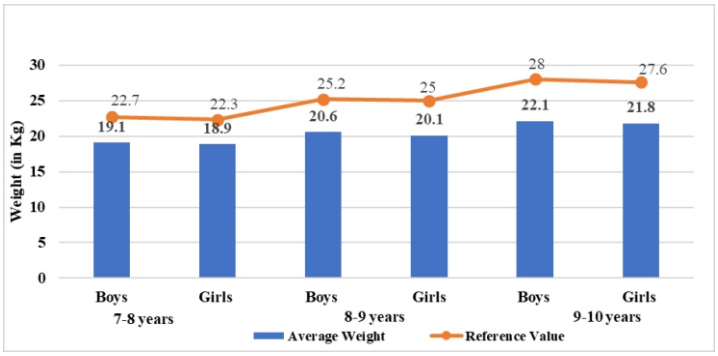

Figure 2. Comparative analysis of the weight of school-age boys and girls (7-9 Years)

Figure 2 depicts the comparison of the weight of school-going boys and girls of 7-9 years along with the comparison of the reference value for the weight given by WHO, 2007. The graph represents that the boys as well as the girls were falling below the standard reference value for their age group.

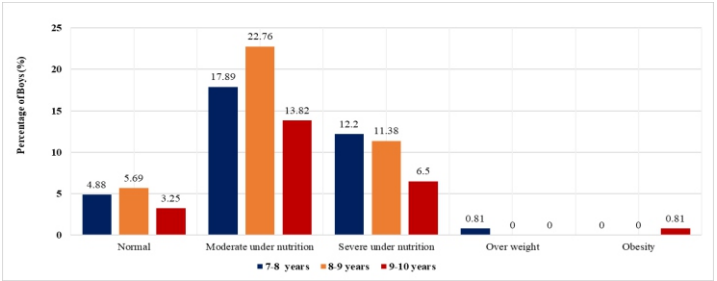

Figure 3. Distribution of the boys based on their BMI for Age

Figure 3 presents the data distribution of the boys based on their BMI for age which is classified according to the WHO standard (2007). It has categorized the boys under normal, moderate undernutrition, severe undernutrition, overweight and obesity.

The above data shows that the maximum percentage of boys 7-9 years of age, that is 67 boys (54.47%) out of 123 were found in the category of moderate undernutrition, followed by severe undernutrition (30.08%) and (13.82%) were falling under the normal category. Only 1 boy (0.81%) was 7 years old and was found in the overweight category. Among 123 boys, only 1 boy (0.81%) was 9 years old and was found in the obese category.

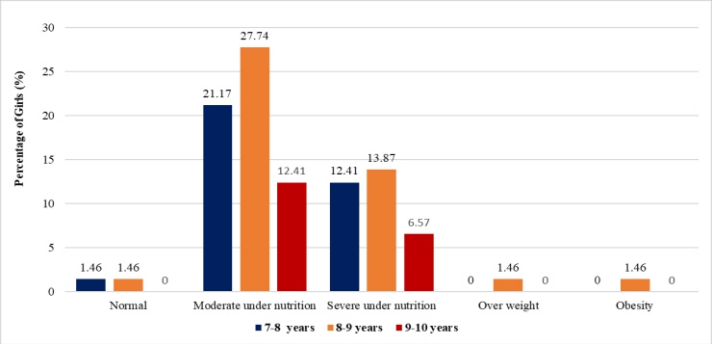

Figure 4. Distribution of the girls based on their BMI for Age

Figure 4 presents the data distribution of the girls based on their BMI for age which is classified according to the WHO standard (2007). It has categorized the girls under normal, moderate undernutrition, severe undernutrition, overweight and obesity.

The above data shows that the maximum percentage of girls 7-9 years of age, that is 84 girls (61.32%) out of 123 were found in the category of moderate undernutrition, followed by 32.85% severe undernutrition and 2.92% were falling under the normal category. Only 2 girls (1.46%) were found in the overweight category. Among 123 girls, only 2 girls (1.46%) were 8 years old and were found in the obese category

4. Discussion

It was reported by a study that an association between maternal education and childhood malnutrition in Karnataka, and the study suggested that to combat the condition of malnutrition in rural areas, an effort should be made to associate factors[7]. Whereas, another study found a decrease in the frequency of stunting among children with an increase in the maternal education level[8]. Low maternal education was found associated with the prevalence of higher underweight among children whereas overweight/obesity was more prevalent in children of mothers with a high education level[9]. The study concluded that there was a strong relationship between a child's nutritional status and the literacy of both parents and family size. Maternal education and knowledge about nutrition and child-rearing practices are important for the good rearing of children. Whereas, the father's education plays an important role in the occupation status and income status, which will affect the socioeconomic status and purchasing power of the family

It is realized from various studies that educated parents can provide their children with better facilities care and opportunities, in different areas which affect a child's growth and development. The study also focused on the education level of the head of the family and the findings show that the maximum literacy level was high school among the studied population (92 out of 260). Whereas some respondents (44 out of 260) were found illiterate. Thus, it is observed from the data that low literacy may lead to a lower nutritional status of the child, the reason being no proper knowledge and awareness of various parameters[10].

It is found from similar studies that a better occupation of the head of the family may facilitate the family members for better opportunities, and facilities for physical and mental health and nutrition[11]. It was found in the study that the majority of family heads (94 out of 260) were unemployed and they had no regular income for their family. Which may impact the nutritional status of the family members, especially the children of the family.

It was observed from Table 2 that the maximum families had low income, which may affect the health, especially the nutritional status of the family members. The money spent on food for the family is mainly dependent on the level of income. Money helps to purchase healthy and nutritious food items like fruits, milk and milk products, meat and poultry and nuts which are comparatively costly and difficult to afford by the lower-income families of rural areas. A balanced diet leads to the improvement in the health and nutritional status of the person but lacking that leads to deterioration of health.

The socio-economic status of a family represents the family in a social setting based on education, occupation and income. The socioeconomic conditions of the family affect the health of each individual in the family. The socioeconomic status of the family affects the nutritional status of children. Therefore, it is very important to assess their socioeconomic status before assessing their nutritional status. The socio-economic status of a family represents the family in a social setting based on education, occupation and income. The socioeconomic conditions of the family affect the health of each individual in the family.

The above data shows that the majority of the studied population (149 out of 260) belonged to the upper lower class of socioeconomic status, followed by the lower middle, lower and upper middle class.

The nutritional status of children has a direct impact on their cognitive abilities. Socioeconomic status and the mother's qualification have a direct impression on children's nutrition, health status, school performance and hygiene[12]. Poverty was the responsible factor for malnutrition among children of 5-10 years in Maharashtra[13]. The nutritional status is directly associated with various socioeconomic factors[14]. The BMI of children 6-12 years old in Bihar was found associated with the age, socioeconomic status of the family and the mother's literacy[15].

A study in Kerala, the tribal and scheduled caste children had poorer nutritional status (including stunting, underweight and anaemia) than the other caste children basically because of low nutritional intake, poor nutritional perception and due to deprivation of basic needs and environmental factors[16]. Socioeconomic variables such as caste, family size, family type, family income, mother's education and father's occupation had a significant effect on the food and nutrient intakes of school children[10]. The socioeconomic environment is responsible for the poor nutritional status of preschool children of scheduled caste in Bihar[17].

The prevalence of stunting (10%), wasting (14%), underweight (11%), overweight (0.5%) and obese (0.5%) were found among children[18]. The study states that stunting was considerably associated with family size, monthly income and pocket money. Wasting was associated with decision-making power, the mother's education and occupation.

Height is an anthropometric indicator to show the nutritional growth as the stature of the children. The data relating to the height of the children shows that the Z-value for the height of boys 7-9 years rural school children was found significant with the reference value at 1% level of significance. Thus, it can be concluded that the height of boys was less than the recommended height by WHO standards. Hence, the boys may be considered undernourished looking at their height parameter.

BMI is a simple weight-for-height index commonly used to classify underweight, overweight and obese. When a comparison was made between the number of girls and boys

falling in the moderate undernutrition category BMI range, the data revealed that the number of girls (n=84) was higher than the number of boys (n=67). Similarly, in the Severe undernutrition category, the number of girls (n=45) was higher than the number of boys (n=37). Among only (n=02) boys, and only (n=04) girls, every 2 cases have been observed as overweight & obese category according to the BMI classification.

The study revealed that the majority of the rural population of school-age children of 7-9 years have moderate undernutrition & severe undernutrition status, whereas very few children were found in the normal nutrition and overweight category.

5. Conclusion

The present study will be helpful for the further investigation of the nutritional status of children using other direct or indirect methods to get a more insightful view of the nutritional status of children. The data of the present study help to enrich the scientific literature on the nutritional condition of children, especially in rural areas of the Kanpur district of Uttar Pradesh. As it was previously discussed a country needs to assess the nutritional status of its population of different age groups to obtain information about the prevalence and geographical distribution of nutritional deficiencies within a community or a specified population group, for policy-making or modification in the existing policies or programmes for mitigation of risk factors from the vulnerable groups. Supporting this fact, the current study reported that there is an impact of the socioeconomic status of the children's family on their nutritional status. This shows the need for improvement in the socioeconomic status of the family, which will allow them to ensure the availability of good nutritious food in their daily lives and other health facilities.

Future scope of the study

• In-depth biochemical assessment for nutrient deficiency can be done for a more insightful view of the nutritional state of school-going children.

• Nutritional supplementation studies can be carried out on the same population for the better nutritional security.

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Conflict of Interest

The authors do not have any conflict of interest.

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