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Association of Socio-economic Variables with Nutritional Status of Mid-Day Meal Beneficiaries

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ABSTRACT The present study was planned to assess and analyse the association of socioeconomic variables and nutritional status of the mid-day meal beneficiaries. An analytical cross-sectional study was carried out in a government primary and middle school in south Delhi. A total of 600 students were selected randomly. A questionnaire cum interview schedule was used to collect information. Age was recorded from the classroom register. Modified Kuppuswamy scale was used to analyse socio-economic class. Height and weight were measured with standard techniques. Body mass index was calculated and a WHO criterion was used to categorise nutritional status. The result found was that majority of the subjects lived in a nuclear set up (73.23%) and most of the parents of MDM beneficiaries were not even qualified till higher secondary (76%). Most of the children belonged to upper lower (52%) and lower middle (41.47%) class. As per weight for age, 84.8 percent children were normal and 15.13 percent were underweight (8.76% moderately and 6.37% severely underweight). As per height for age, 41.30 percent were found to be stunted (11.37% moderately and 29.93% severely). For BMI for age, 67.16 percent subjects were normal, and 19.33 percent were overweight. Prevalence of underweight and stunting significantly (p d" 0.0001) increased with age. Result revealed non-significant higher prevalence of severely underweight (16.66%) in upper middle class. Stunted children were found more in upper middle class (31.25% moderately and 43.75% severely). As per BMI for age, higher prevalence of underweight (71.42%) was in lower class. The conclusion was that results revealed association of age of mid-day meal beneficiaries with nutritional status

INTRODUCTION

A child's nutritional status in developing countries is usually a consequence of poverty and its attributes like low family income, large family size, poor education, poor environment and housing, and inadequate access to foods, safe water and healthcare services (Gopalan 2000).

Socio-economic inequalities can be responsible for childhood malnutrition. However, measuring health inequality on the basis of household economic status may pose limitations in terms of identifying and reaching disadvantaged subpopulations (Mihrete et al. 2014). As per the fourth round of National Family Health Survey (2015-2016), in India, about thirty-eight percent of the children under the age of five years are stunted (low height for age), thirty-six percent of the children are underweight (low weight for age), and eighteen percent children are wasted (weight for height).

Various studies have highlighted the relationship between socioeconomic status and nutritional status of primary school children (Longo et al. 2007; Deaton 2008). The nature of the children's growth depends upon nutritional status and environmental condition, which interacts with other socioeconomic, bio-physiological, and physical environmental factors. The children from households with a low or very low socioeconomic status had 2.5 times the risk of being underweight relative to children who came from households with middle to upper socioeconomic status. Children from better socioeconomic classes would naturally have better nutrition and better environment (Arora et al. 2014).

Poor nutritional status of children is associated not only with impaired development but is also reflected in their school performance. Children spend more than 6 hours a day in school. School lunch becomes a necessity and an important determinant of overall nutrition in these children. School feeding programs can serve much more than just feeding children. It may contribute to a child's readiness to learn and the ability to participate in his or her own educational process. Along with "quality education", it may promote human capital development in the long run and help break inter-generational cycles of poverty and hunger (Graham et al. 2017).

Many programmes and schemes have been planned and implemented over the past few decades in India for reducing child malnutrition. Mid-day meal (MDM) programme is one of the biggest programmes, which have been implemented throughout the country with the three objectives to increase enrolment of children and simultaneously improving nutritional status of the primary and upper primary school children. MDM with the name "National Programme of Nutritional Support to Primary Education (NP-NSPE)" was launched on 15th August 1995 as a centrally sponsored scheme, initially in 2,408 blocks in the country and afterwards in all blocks of the country. This scheme, commonly known as mid-day meal (MDM) scheme, has catered to the nutritional needs of low-income groups in both rural and urban areas (Planning Commission 2007).

Objectives of the Study

The objectives of the study were to assess the nutritional status of mid-day meal beneficiaries and analyse the association of socio-economic variables with nutritional status.

MATERIALS AND METHOD

Research Settings

An analytical cross-sectional study was conducted in government primary and middle schools of New Delhi Municipal Corporation (NDMC) in Delhi. There was a total of 78 NDMC schools in Delhi, out of which, 10 schools in South Delhi were selected randomly to recruit the subjects for the study. A total of 600 students (355 boys and 245 girls) from primary and upper primary classes in the age group of 5 years to 14 years were selected randomly from each of the 10 selected schools. From every school 60 subjects were selected. Two children did not provide complete information, and hence, the responses of 598 subjects were used for analysis.

A self-prepared and pretested questionnaire cum interview schedule was used for collecting data on socio-demographic profiles. Content validity of the tool was ascertained from experts in related fields and modified based on their suggestions and opinions. Modified Kuppuswamy Socio-economic Status Scale (KSSS 2012) by Bairwa et al.(2013), was used to analyse the socio-economic status of the subjects. Nutritional status of the subjects was assessed using anthropometric measurements, that is, height and weight and BMI for age was calculated with suitable formula. These measurements were taken with standard techniques. WHO growth standard and cut offs were used for assessing nutritional status.

Subjects were categorised for their nutritional status using WHO's (2006) multi-centric growth standard and z-score classifications. Weight for age (underweight), height for age (stunting) and BMI for age indices were used for nutritional assessment. After calculating the z-score, the nutritional status of children was classified as normal (-2SD to + 1 SD), moderately malnourished (-2 SD and -3 SD) and severely malnourished (<-3SD). BMI for age indicator was classified as underweight (<-2sd), normal (-2SD to + 1 SD) and overweight (>+1SD). All the analysis was performed using STATA (STATA 15.0 version) and significance level was at $p \leq 0.05$.

RESULTS

Socio-economic Status of the Subjects

Results revealed that majority of the subjects lived in a nuclear set up and most of the parents of the subjects (MDM beneficiaries) were not even qualified up to higher secondary.

Majority of the parents were either casual labourers or unskilled/semiskilled workers. Kuppuswamy's SES scale (KSSS 2012) was used to categorise the subjects for their socioeconomic class that considers education, occupation, and family income. It groups subjects as upper class, upper middle, lower middle, upper lower and lower class. As per this scale (KSSS, 2012), most of the subjects belonged to upper lower and lower middle class (52% and 41.47%, respectively) (Table 1).

Nutritional Status of the Subjects

All of the subjects (5 years to 14 years of age) were categorised to assess nutritional status for all the indicators, that is, weight for age, height for age and BMI for age. Table 2 illus-

Table 1: Categorisation of the subjects as per their socio-economic class*

*Socio-economic class**	*Frequency*	*Percentage*
Upper class	01	0.16
Upper middle	16	2.67
Lower middle	248	41.47
Upper lower	311	52.00
Lower class	22	3.67
Total	598	99.97

*As per Modified Kuppuswamy Socio Economic Status Scale (KSSS 2012)

trates the nutritional status of the subjects for their weight for age and height for age as per WHO cut-offs. Data revealed that for weight for age, 84.8 percent children were normal and 15.13 percent were underweight out of which, 8.76 percent were moderately underweight and 6.37 percent were severely underweight. Only 58.69 percent children were normal as per height for age and as high as 41.30 percent were found to be stunted (11.37% were moderately and 29.93% were severely stunted). As per BMI for age, 67.16 percent subjects were normal, 13.16 percent were underweight and 19.33 percent were found to be overweight (Table 2).

Association of Socio-economic Variables with Nutritional Status

Socio-economic variables were analysed to assess and analyse the association of age and socio-economic class with nutritional status of subjects availing mid-day meals (MDM).

Age: The age range of selected subjects was 5 years to 14 years. Subjects were grouped for their age for all the indices (weight for age, height for age and BMI for age) to analyse the association of age on nutritional status.

Weight for Age (WAZ): Table 3 depicts age wise nutritional status of the subjects for weight for age. Results revealed that prevalence of underweight increased with age of the subjects and was found to be statistically significant at p

Table 2: Categorisation of the subjects for nutritional status (N=598)

Indicator	*Nutritional status N (%)*			
	Normal	*Moderately underweight*	*Severely underweight*	*Total*
Weight for age (N=251)#	213 (84.86)	22 (8.76)	16 (6.37)	251 (100)
	Normal	*Moderately stunted*	*Severely stunted*	*Total*
Height for age (N=598)	351 (58.69)	68 (11.37)	179 (29.93)	598 (100)
	Normal	*Underweight*	*Overweight*	*Total*
BMI for age (N=598)	403 (67.16)	79 (13.16)	116 (19.33)	598 (100)

WHO reference data for weight for age is available only till 10 years of age, hence N=251 in this category.

Table 3: Nutritional status of the subjects for weight for age (N=251)

Age in years	*N*	*Normal N (%)*	*Moderately underweight N (%)*	*Severely underweight N (%)*	*Total N (%)*
5	20	18 (90.00)	01 (5.00)	01 (5.00)	20 (100)
6	63	55 (87.30)	6 (9.52)	2 (3.17)	63 (100)
7	59	54 (91.52)	4 (6.77)	1 (1.69)	59 (100)
8	54	48 (88.88)	5 (10.41)	1 (3.70)	54 (100)
9	44	29 (65.90)	7 (15.90)	8 (18.18)	44 (100)
10	11	6 (54.54)	2 (18.18)	3 (27.27)	11 (100)
Total	251	210 (83.03)	25 (9.9)	16 (6.74)	251 (100)

< 0.0001 (Table 6). As the age increases, percentage of normal children decreases and there was a prominent increase in the percentage of severe underweight children at the age of 9 and 10 years.

Height for Age (HAZ): Results revealed that 40.16 percent of the children were stunted (moderately and severely) and 59.00 percent subjects were normal (Table 4). Prevalence of stunting increased significantly (p =0.0001) with age (Tables 4 and 6). Data showed sharp decrease of percentage of normal children from 90.00 percent at the age of 5 years to 20.83 percent at the age of 14 years. Severely stunting went up as high as 70.83 percent at the age of 14 years.

BMI for Age (BAZ): As per BMI for age, there were 13.15 percent of underweight children, 67.6 percent were normal and 19.16 percent were found to be overweight (Table 5). Prevalence of underweight as per BMI for age significantly increased with age (p<0.0001) (Table 6). Percentage of underweight children increased from 10.00 percent at the age of 5 years to 16.66 percent at the age of 14 years. Percentage of overweight children decreased from 35.00 percent to 4.16 percent.

Socio-economic Class (SEC) and Nutritional Status: Subjects were categorised as per their socio-economic status (KSSS, 2012) and further each group of the subjects were categorised for their nutritional status for all the indicators (weight for age, height for age and BMI for age) to analyse the association.

Weight for Age (WAZ): Data revealed higher prevalence of severely underweight (16.66%) in upper middle class (Table 7). However, no significant association was found between weight for age and SES when ANOVA was applied (Table 7).

Height for Age (HAZ): Table 7 depicts that stunted children were more in upper middle class (31.25% moderately stunted and 43.75% severely stunted), however socio-economic class and nutritional status for HAZ did not show any significant association (p=0.0616) (Table 8).

BMI for Age (BAZ): Results revealed higher prevalence of underweight (71.42%) in lower class (Table 7). However, no significant association was found (p=0.45) (Table 8).

Table 7: Nutritional status of the subjects as per their socio-economic class

Indicator	*Nutritional status*	*Socio-economic class*					*Total N (%)*
		Upper class N (%)	*Upper middle N (%)*	*Lower middle N (%)*	*Upper lower N (%)*	*Lower class N (%)*	
Weight for Age	Normal	0	03 (1.18)	98 (38.73)	110 (43.47)	0	208 (83.38)
	Moderately underweight	0	02 (0.79)	08 (3.16)	12 (4.74)	0	24 (8.69)
	Severely underweight	0	01 (0.39)	06 (2.37)	12 (4.74)	0	19 (7.50)
	Total N (%)	0	06 (2.36)	112 (44.26)	133 (52.96)	0	251 (100)
Height for Age	Normal	1(0.16)	04 (0.66)	174 (29.09)	194 (32.44)	06 (1.00)	379 (63.35)
	Moderately stunted	0	05 (0.83)	20 (3.34)	39 (6.52)	0	64 (10.70)
	Severely stunted	0	07 (1.17)	56 (9.36)	93 (15.55)	01 (0.16)	157 (26.25)
	Total N (%)	1(0.16)	16 (2.67)	248 (41.47)	326 (54.51)	07 (1.17)	598 (100)
BMI for Age	Normal	01(0.16)	13 (2.17)	166 (27.75)	211 (35.28)	02 (0.33)	396 (66.22)
	Underweight	0	02 (0.33)	32 (5.35)	46 (7.69)	05 (0.83)	81 (13.50)
	Overweight	0	01 (0.16)	52 (8.69)	69 (11.53)	0	122 (20.50)
	Total N (%)	01(0.16)	16 (2.67)	248 (41.47)	326 (54.51)	07 (1.17)	598 (100)

Table 4: Nutritional status of the subjects for height for age (N=598)

Age in years	*N*	*Normal N (%)*	*Moderately underweight N (%)*	*Severely underweight N (%)*	*Total N (%)*
5	20	18 (90.00)	01 (5.00)	01 (5.00)	20 (100)
6	63	56 (88.88)	04 (6.34)	03 (4.76)	63 (100)
7	59	50 (84.74)	07 (11.86)	02 (3.38)	59 (100)
8	54	42 (77.77)	10 (18.51)	02 (3.70)	54 (100)
9	54	38 (70.37)	06 (11.11)	10 (18.51)	54 (100)
10	72	43 (59.72)	12 (16.66)	17 (23.61)	72 (100)
11	131	66 (50.38)	05 (3.81)	60 (45.80)	131 (100)
12	78	27 (34.61)	12 (15.38)	39 (50.00)	78 (100)
13	45	09 (20.00)	06 (13.33)	30 (66.66)	45 (100)
14	24	05 (20.83)	02 (8.33)	17 (70.83)	24 (100)
Total	598	352 (59)	65 (10.8)	181 (30.16)	598 (100)

Table 5: Nutritional status of the subjects for BMI for age (N=598)

Age in years	*N*	*Normal N (%)*	*Moderately underweight N (%)*	*Severely underweight N (%)*	*Total N (%)*
5	20	11 (55.00)	02 (10.00)	07 (35.00)	20 (100)
6	63	43 (68.25)	04 (6.34)	16 (25.39)	63 (100)
7	59	41 (69.49)	01 (1.69)	17 (28.81)	59 (100)
8	54	36 (66.66)	02 (3.70)	16 (29.62)	54 (100)
9	54	36 (66.66)	08 (14.81)	10 (18.51)	54 (100)
10	72	48 (66.66)	05 (6.94)	19 (26.38)	72 (100)
11	131	95 (72.51)	18 (13.74)	18 (13.74)	131 (100)
12	78	47 (60.25)	16 (20.51)	15 (19.23)	78 (100)
13	45	30 (66.66)	09 (20.00)	06 (13.33)	45 (100)
14	24	19 (79.16)	04 (16.66)	01 (4.16)	24 (100)
Total	598	404 (67.6)	79 (13.15)	115 (19.16)	598 (100)

Table 6: Association of age of the subjects with WAZ, HAZ and BAZ*

		Age in years										
Indicators		*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*Total*
Weight for Age	Frequency	19	55	59	54	55	09	-	-	-	-	251
	Median	2.09	1.26	.77	.765	-.52	-.24	-	-	-	-	
	Min	-3.16	-3.74	-3.84	-4.86	-5.33	-4.7					
	Max	7.25	7.44	3.33	5.38	3.83	2.7					
	p value				0.000***							
Height for Age	Frequency	19	63	59	54	55	72	131	77	45	23	598
	Median	2.99	1.77	1.16	.97	-.50	-1.31	-2.27	-3.04	-4.02	-3.71	
	Min.	-1.44	-3.73	-3.58	-3.58	-6.07	-7.41	-7.21	-7.27	-7.15	-7.09	
	Max.	8.4	8.76	6.62	6.62	3.84	2.89	1.51	.85	-.32	-.73	
	p value				0.000***							
BMI for Age	Frequency	19	63	59	54	55	72	131	77	45	23	598
	Median	.33	.1	.14	.36	-.22	-.195	-69	-.66	-.97	-.9	
	Min.	-3.39	-5.34	-3.9	-5.53	-4.52	-3.83	-6.39	-6.15	-6.02	-4.62	
	Max.	4.19	5.83	4.72	2.78	2.93	2.45	2.62	2.62	1.72	1.36	
	p value				0.000***							

*** Significant at P ≤0.001, *WAZ-weight for age z score, HAZ-height for age z score, BAZ-BMI for age z score.

Table 8: Association of socio-economic class with WAZ, HAZ and BAZ[**]

Indicators		*Upper class*	*Upper middle*	*Lower middle*	*Upper lower*	*Lower class*	*Total*
Weight for Age	Frequency	0	6	112	133	0	251
	Median	0	-1.3	.98	.495	1.51	.65
	Min-Max	0	-3.55-1.19	-4.7-7.25	-5.33-7.44	.92-2.79	-5.33-7.44
	p value			0.05NS[*]			
Height for Age	Frequency	01	16	248	326	07	598
	Median	-4.84	-2.86	-1.31	-1.42	1.18	-1.41
	Min-Max	-4.84-4.84	-5.67-1.07	-7.41-8.46	-7.27- 8.79	-5.87-7.08	-7.41-8.76
	p value			0.06NS			
BMI for Age	Frequency	01	16	248	326	07	598
	Median	-.86	-.76	-.27	-.32	1.13	-.31
	Min-Max	-.86-.86	-4.89-1.19	-6.1-4.51	-6.36-5.83	-1.65-1.82	-6.36-5.83
	p value			0.45 NS			

[*]NS: not significant at P≤0.05, [**]WAZ-weight for age z score, HAZ-height for age z score, BAZ-BMI for age z score.

DISCUSSION

Nutritional status of all the subjects were assessed and categorised for all the indicators, that is, weight for age, height for age and BMI for age. As per the classification of WHO for weight for age, 84.8 percent children were normal and 15.13 percent were underweight. Similar findings have been reported by Shalini et al. (2014) and Goyal and Chavan (2012). Goyal and Chavan (2012) in his study found that malnutrition among Ahmed Nagar school children was twenty percent, with 6.8 percent having severe malnutrition. A study conducted by Galgamuwa et al. (2017) on nutritional status correlated socio-economic factors among preschool and school children in plantation communities in Sri Lanka. A total of 547 children (aged 1-15 years, mean 7.0 ± 3.6 years, 53% female) participated in the study. 35.6 percent, 26.9 percent and 32.9 percent of children were underweight, stunted and wasted, respectively. Under nutrition was more common in primary school children.

As per height for age, 58.69 percent children were normal and as high as 41.30 percent were found to be stunted in the present study. Many of the studies have shown similar results ranging from thirty-three percent to fifty-one percent stunting (Sireesha and Kusuma 2014; Bhargava et al. 2014; Thakur 2013). A study was conducted by Bisai and Mallick (2011) in West Bengal on 119 children, aged 2-13 years. Stunting was found to be 49.6 percent and 1.7 percent of the children were found to be severely stunted.

The present study reports 67.16 percent subjects as normal, 13.16 percent underweight and 19.33 percent overweight as per BMI for age. Many studies have reported similar findings (Akshaya Patra Foundation 2017; Shalini et al. 2014; Thakur 2013; Kamath et al. 2012). A study was conducted by Rewal et al. (2002) using three indices of weight for age, height for age and weight for height, and they showed that a larger number of children fall into the category of "normal" in high-programme efficiency schools compared to low-programme-efficiency schools. There was no significant difference found between boys and girls in their nutritional status for any of the indicators and also in any of the age groups in the present study.

The present study revealed that higher prevalence of underweight (71.42%) was in lower class. Arora et al. (2014) also reported that nutritional status of children from lower socio-economic class was poor as compared to their counterparts who came from upper socio-economic class. Children with BMI < 5th percentile were 30.9 percent in low class while in high class it was only 12.1 percent.

Looking at the results of the different studies over the years, it can be inferred that the MDM programme is helping to improve the nutritional status of the children. Porter et al. (2010) conducted a study in India and reported average change between 2002 and 2006-2007 for children who were receiving and not receiving a meal. They showed that MDM had a positive effect in increasing children's nutritional status.

Sharma et al. (2010) reported a significant improvement in height and weight after one year's use of MDM services. Minj et al. (2014) and Gopaldas (2005) also reported an improvement in height and weight of MDM beneficiaries. In the present study, results showed that prevalence of underweight and stunting significantly increased with age of the subjects. Similar observation has been reported by Adair (1999) and Vella et al. (1994). They reported that severity and prevalence of underweight and stunting increases with age. Vella et al. (1994) conducted a study in Northwest Uganda on 1,072 children aged less than 5 years. They found that socioeconomic deprivation is associated with unhealthy living conditions and insufficient nutrient intake, which affects linear growth and are the major risk factors, which influence stunting. A community-based study conducted by Adair (1999) identifies age-specific factors related to new cases of stunting in Filipino children from birth to 24 month of age. Results of the present study showed higher prevalence of severely underweight and stunted children in upper middle class and lower class. However, socio-economic class and nutritional status of the subjects did not show any significant association. Similar findings have been reported by Thakur (2013). Samantary and Jena (1995) reported that the anthropometric status increased with increase in economic status. Chen et al. (2018) also reported that parent's socio-economic status played an important role in improving the learning ability and nutritional status of the children.

CONCLUSION

Younger children showed significantly better nutritional status than older children. Prevalence of underweight and stunting significantly increased with age of the subjects. The study did not find a significant association of socio-economic class and nutritional status of beneficiaries.

RECOMMENDATIONS

To improve educational and nutritional status of children, there is a need to create awareness among parents and community about various aspects of foods and nutrition and also regarding government programmes at different levels addressing related issues. Concern regarding nutrition should be focussed in all age groups of the children.

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