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Assessment of Anthropometry and Health Status of School Children with and Without Mid Day Meal Programme

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Abstract:
Background/Objectives: This cross sectional study was carried out to assess anthropometry and health status among children of 14- 16 years age of three different sets of schools.
Methods/Statistical analysis: *The study was cross sectional in nature and the subjects were selected through random sampling procedure. Research was conducted at Private High School Campus (PHSC) without mid day meal programme, Govt. High School Hebbal (GHSH) with ISCKON mid day meal programme and Govt. High School Bashettahalli (GHSB) Doddaballapur, with Govt. mid day meal. Height, weight, body mass index (BMI), mid-arm circumference (MAC) and triceps skin fold thickness (TSFT) were measured.*
Findings: *It was observed that as age increased anthropometric measurements also increased with a range of height 143 to 150 cm, weight at 35.4 to 43.2 kg and Mid Upper Arm Circumference (MUAC) at 19.7 to 21.8 cm in the adolescent subjects. Whereas, Triceps skin fold thickness (TSF) decreased with the age. It was found to be with the range of 8.5 ± 4.6 to 9.6 ± 4.2 in case of male subjects. Among three schools PHSC without MDM showed higher per cent of normal nutritional status at 46.0 and 47.0 per cent of mildly malnourished subjects in GHSB with Govt. MDM. Prevalence of anemia, flurosis, phrynoderma, vitamin B and C clinical deficiency were found to be high in subjects of GHSB with Govt. MDM at 17.8, 1.1, 1.4, 10.9 and 7.3 per cent respectively when compared to subjects in other two schools. Comparatively PHSC without MDM subjects had better health status compared to other two schools.*
Applications/Improvements: *Provision of MDM would have contributed to the improved nutritional status of under privileged population in the study group substantially. There is still a large gap to be filled towards better nutritional status by providing nutri rich meals.*
Keywords: *Anthropometry assessment, health status, school children, Mid Day Meal, school children.*

I. Introduction

Children are the wealth of any country. Special attention should be paid to meet the needs of this group, constituting one fifth of the country's population **6.** The physical growth of children is reflected by different anthropometric measurements especially weight and height. The physical dimensions of the body are much influenced by nutrition in growing period of school age. Poor health and nutritional status will affect work capacity as well as cognitive functions. And it is this age group that is a dynamic period of growth and development as children undergo physical, mental, emotional and social changes. School age children and parents have insufficient knowledge on their own health and nutrition and are not aware of the importance of health and thus select foods on the basis of preference without proper judgment to aggravate unbalanced diets **1.** Such dietary habits increase the intake of calorie and thus increase the incidence of overweight, obesity, and juvenile diabetes. On the other hand, some of the nutrients such as calcium, vitamin A, thiamine and riboflavin are deficient because of unbalanced diet, eating out, and overflowing processed foods results in the state of nutritional imbalance with over-nutrition and nutrition deficiency at the same time **4.** Hence the present investigation was undertaken with the objectives to assess the nutritional and health status of school children with and without mid day meal programme and to categorize the children into different degrees of malnutrition.

II. Material and Methods

A total of 1092 school children from three different schools formed the sample. The samples drawn were cross sectional and included both male and female subjects. Data collection was carried out based on random sampling procedure. The age was recorded as indicated in the school records. Height was measured using portable height rod and weight by personal weighing balance with minimum clothing. Mid Upper Arm Circumference (MUAC) was recorded with the help of flexible non-stretchable steel measuring tape to the nearest 0.1cm. TSF was measured with the Harpenden skin fold caliperse. The site was carefully selected, half way down the arm, between the tip of the acromion process of the scapula and the olecranon process of the ulna. The measurement was made with the arm hanging relaxed at the side. The skin fold parallel to the long axis was

picked up between the thumb and fore finger of the left hand, cleaned away from the underlying muscle, and measured at this point **3.**

Under health status assessment subjects in the current investigation were assessed for different clinical symptoms like anaemia, goiter, flurosis, phrynoderma, viamin A, B-comlpex, vitamin C and Vitamin D, under chronic ailments subjects were investigated for the presence or absence of the chronic ailments for the past one year Viz, Jaundice, T.B, hypothyroidism, malaria, chicken pox, measles, dental caries.

III. Results

Table 1. represented the sample size of 324, 438 and 330 respectively. Age wise classification showed that 286, 468 and 338 subjects belonged to 14, 15 and 16 years respectively; whereas, gender wise segregation revealed that 567 male and 525 female subjects.

From **Table 2** it was observed that as age increased anthropometric measurements also increased with a range of height 143 to 150 cm, weight at 35.4 to 43.2 kg and Mid Upper Arm Circumference (MUAC) at 19.7 to 21.8 cm in the adolescent subjects. Whereas, Triceps skin fold thickness (TSF) decreased with the age. Although there are a lot of variations in the collected anthropometric measurements, subjects belonging to PHSC without MDM had higher mean height and weight in all the age groups as compared to other two schools with MDM. Mean BMI and TSF were found to be better in all the age groups of GHSH with ISCKON MDM. Whereas, average values for MUAC were found to be on par in all the three schools for all age groups.

Among three schools under the investigation overall results revealed that, subjects in PHSC without MDM showed higher per cent of normal nutritional status at 46.0 whereas 47.0 per cent of mildly malnourished subjects in GHSB with Govt. MDM. Whereas subjects in GHSH with ISCKON MDM were found to be moderately and severely malnourished at 18.0 and 2.5 per cent respectively as compared to other schools **(Table 3)**.

It can be seen from **Table 4** that among different clinical symptoms, anemia seems to be more prevalent as it has indicated by higher percentage of deficiency across the schools with prevalence rate of 11.3 followed by B-complex (6.5%) and vitamin C (3.2%) and per cent prevalence of the remaining clinical deficiency symptoms found to be low. Prevalence of anemia, flurosis, phrynoderma, vitamin B and C clinical deficiency were found to be high in subjects of GHSB with Govt. MDM at 17.8, 1.1, 1.4, 10.9 and 7.3 per cent respectively when compared to subjects in other two schools.

Table 5 reveals the chronic ailments suffered by the subjects in the previous one year. Higher dental caries was found at 11.4 per cent followed by Jaundice and chicken pox at 1.9 and 1.5 per cent respectively in all the three schools studied. Among the ailments under the investigation, tendency of dental caries was found high in all the three schools with range of 6.7 to 15.8 per cent. Whereas Jaundice was observed in higher percentage in GHSB subjects with Govt. MDM at 3.0 per cent compared to two other schools. Around 4.0 per cent of subjects spotted to have chicken pox in PHSC without MDM provision

IV. Discussion

The mean anthropometric measurements viz. height, weight and MUAC were found to increase in the adolescent subjects with the successive increase in the age group. Similar findings were also obtained by **7** who observed that there was a linear increasing trend in height and weight of the study population whereas, TSF was found to decrease with increase in age. Similar trend for TSF was observed for the 50^{th} percentile values of various anthropometric standards in the present study too.

The probable reason for PHSC subjects to have better nutritional status compared to subjects with MDM in GHSB and GHSH could be that basically PHSC subjects were from private school with better socioeconomic background, better nutrition knowledge, education, occupation status of parents and cent per cent food security might have influenced their better nutritional status compared to subjects with low socioeconomic status of other two schools of the study**. 2 and 8** also reported that non- nutritional factors like economic status, family size, educational status (especially of mother), nutrition awareness, exposure to nutrition programme, food habits, customs in the family, food availability influence the nutritional status of children.

Observations of clinical symptoms**.** Across three schools anemia was found to be more prevalent (11.3%), followed by B-complex (6.5%) and vitamin C (3.2%) deficiency. Among three schools GHSB spotted to have higher issues with clinical observation for anemia (17.8), B-complex (10.9%) and vitamin C (7.3%) and phrynoderma (1.4%). Reason for GHSB subjects to show more of clinical symptoms compared to other two schools could be their low socioeconomic status, insufficient knowledge of parents about nutrition, food insecurity, poor hygiene and sanitation. Similar results were observed by **5** where in 26.28 per cent adolescents had shown B-complex deficiency and 57.28 per cent were anemic.

Among chronic ailments higher per cent of subjects were noted to have dental caries (11.1%) whereas other ailments showed very less counts. Among three schools under the study PSHC (10.2%) and GHSH (15.8) had shown more of subjects for dental caries compared to GHSB (6.7%). Probable reason could be that, subjects in GHSH and PSHC belonged to Bangalore urban area where the school children had higher tendency to consume chocolates and bakery sweet items and this might have resulted in the dental caries. Whereas on the other hand GHSB with Govt. MDM had fewer cases of dental caries, reason for this could be that, GHSB subjects were from rural area and they belonged to low socioeconomic class, Children would not get pocket money to buy chocolates and other sweet stuffs and this might be the reason for fewer cases of dental caries in GHSB. Jaundice is caused by virus called Hepatitis A or E. Drinking contaminated water is one of the main causes or route of infection, and also due to poor hygiene and sanitation. These might be the cause for higher prevalence of jaundice in GHSB subjects.

V. Conclusion

Based on the results of this study, it can be concluded that majority of the subjects from all the three schools belonged to below the defined anthropometric standards. However, comparatively PHSC without MDM subjects showed better nutritional status compared to schools with MDM. Nutritional and health status appear to be mainly influenced by socioeconomic factors like family income, education of the parents and knowledge level of nutrition. But there appears need for improving their nutritional status through improving the knowledge of nutrition through information, education and communication (IEC)

Provision of MDM would have contributed to the improved nutritional status of under privileged population in the study group substantially. There is still a large gap to be filled towards better nutritional status by providing nutri rich meals.

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Table 1: Age and gender wise distribution of the subjects

	PHSC without MDM (n=324) Age (Years)				**GHSH with ISKCON MDM (n=438)** Age (Years)				**GHSB with Govt. MDM (n=330)** Age (Years)				**Total (N=1092)** Age (Years)			**Grand total**
Gender	**14**	**15**	**16**	**Total**	**14**	**15**	**16**	**Total**	**14**	**15**	**16**	**Total**	**14**	**15**	**16**	
Boys	62	65	66	193	44	104	64	212	52	66	44	162	158	235	174	**567**
Girls	39	54	38	131	44	109	73	226	45	70	53	168	128	233	164	**525**
Total	101	119	104	**324**	88	213	137	**438**	97	136	97	**330**	**286**	**468**	**338**	**1092**

PHSC – Private High School Campus, Hebbal, Bangalore
GHSH – Government High School Hebbal, Bangalore
GHSB– Government High School Bashettihalli, Doddaballapur

Table 2: Age wise mean and SD of the subjects anthropometric measurements

Parameters	**Age (Years)**	**Sex**	**PHSC**	**GHSH**	**GHSB**	**Overall**
			Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Height (cm)	14	M	146.8 ± 8.2	146.2 ± 10.2	144.1 ± 7.4	145.8 ± 8.6
		F	146.4 ± 6.1	139.1 ± 7.3	145.5 ± 5.6	143.5 ± 7.3
	15	M	153.9 ± 6.1	150.2 ± 9.0	149.8 ± 8.0	150.5 ± 8.5
		F	151.8 ± 8.2	145.5 ± 7.4	149.6 ± 6.0	148.7 ± 7.5
	16	M	158.5 ± 7.7	154.0 ± 8.5	156.1 ± 9.3	156.2 ± 8.7
		F	153.3 ± 7.3	147.8 ± 6.4	151.7 ± 8.4	150.5 ± 6.8
Weight (Kg)	14	M	35.8 ± 8.3	36.5 ± 8.8	34.1 ± 7.5	35.4 ± 8.2

		F	38.2 ± 9.3	35.0 ± 8.0	36.4 ± 8.6	36.4 ± 8.7
	15	M	38.5 ± 9.4	41.0 ± 9.7	36.4 ± 7.3	39.0 ± 9.0
		F	41.1 ± 9.3	40.9 ± 7.4	40.4 ± 7.1	40.8 ± 7.8
	16	M	42.8 ± 8.6	43.3 ± 9.3	43.3 ± 9.5	43.2 ± 9.1
		F	44.3 ± 9.2	43.2 ± 9.3	41.9 ± 7.6	43.2 ± 8.2
BMI	14	M	16.5 ± 2.7	16.9 ± 2.6	16.3 ± 2.7	16.5 ± 2.7
		F	17.7 ± 3.6	17.9 ± 3.1	17.1 ± 3.5	17.6 ± 3.6
	15	M	16.6 ± 2.9	18.1 ± 3.6	16.1 ± 2.4	16.6 ± 2.9
		F	17.3 ± 3.1	19.3 ± 2.9	18.0 ± 2.6	17.3 ± 3.1
	16	M	17.8 ± 2.7	18.2 ± 2.8	17.6 ± 2.4	17.0 ± 2.7
		F	18.9 ± 3.7	19.8 ± 4.2	18.3 ± 3.7	18.9 ± 3.7
MUAC (cm)	14	M	20.1 ± 2.7	19.5 ± 2.7	19.5 ± 2.7	19.7 ± 2.7
		F	20.7 ± 3.3	19.8 ± 2.3	20.2 ± 3.0	20.2 ± 2.8
	15	M	20.4 ± 3.0	20.9 ± 2.9	19.9 ± 2.0	20.5 ± 2.7
		F	21.1 ± 2.8	21.3 ± 2.6	21.8 ± 2.4	21.4 ± 2.6
	16	M	21.5 ± 3.2	21.2 ± 2.7	21.5 ± 2.6	21.4 ± 2.9
		F	22.4 ± 3.1	21.3 ± 2.4	21.9 ± 2.6	21.8 ± 2.7
TSF (mm)	14	M	8.6 ± 3.0	10.7 ± 6.0	9.8 ± 3.4	09.6 ± 4.2
		F	10.3 ± 2.9	12.9 ± 4.1	13.1 ± 4.6	12.2 ± 4.1
	15	M	8.5 ± 3.5	9.8 ± 5.6	6.5 ± 2.7	08.5 ± 4.6
		F	10.3 ± 3.1	13.4 ± 4.9	10.2 ± 3.9	11.7 ± 4.5
	16	M	9.9 ± 3.8	9.7 ± 3.7	5.3 ± 2.5	08.6 ± 3.7
		F	12.0 ± 3.4	11.3 ± 4.4	8.8 ± 3.4	10.6 ± 4.1

PHSC – Private High School Campus, Hebbal, Bangalore
GHSH – Government High School Hebbal, Bangalore
GHSB – Government High School Bashettihalli, Doddaballapur

School	Type/degree of Malnutrition	Stunting (%) H/A	Wasting (%) W/A	Age in Years			Gender		Total
				14	15	16	Male	Female	
PHSC without MDM	Normal: Grade 0	>95%	>90%	44 (43.6)	55 (46.2)	50 (48.1)	81 (42)	68 (51.9)	149 (46.0)
	Mild: Grade I	87.5-95%	80-90%	35 (34.7)	38 (31.9)	39 (37.5)	69 (35.8)	43 (32.8)	112 (34.6)
	Moderate: Grade II	80-87.5%	70-80%	20 (19.8)	25 (21.0)	13 (12.5)	45 (23.3)	13 (09.9)	58 (17.9)
	Severe: Grade III	<80%	<70%	02 (02.0)	01 (00.8)	02 (01.9)	02 (01.0)	3 (02.3)	05 (01.5)
GHSH with ISKCON MDM	Normal: Grade 0	>95%	>90%	36 (40.9)	94 (44.1)	65 (47.4)	85 (40.1)	110 (48.7)	195 (44.5)
	Mild: Grade I	87.5-95%	80-90%	26 (29.5)	77 (36.2)	50 (36.5)	76 (35.8)	77 (34.1)	153 (34.9)
	Moderate: Grade II	80-87.5%	70-80%	24 (27.3)	35 (16.4)	20 (14.6)	42 (19.8)	37 (16.4)	79 (18.0)
	Severe: Grade III	<80%	<70%	02 (02.3)	07 (03.3)	02 (01.5)	07 (04.2)	04 (00.9)	11 (02.5)
GHSB with Govt. MDM	Normal: Grade 0	>95%	>90%	31 (32.0)	47 (34.6)	43 (44.3)	45 (27.8)	76 (45.2)	121 (36.7)
	Mild: Grade I	87.5-95%	80-90%	46 (47.4)	66 (48.5)	43 (44.3)	79 (48.8)	76 (45.2)	155 (47.0)
	Moderate: Grade II	80-87.5%	70-80%	18 (18.6)	21 (15.4)	09 (09.3)	33 (20.4)	15 (8.9)	48 (14.5)
	Severe: Grade III	<80%	<70%	02 (02.1)	02 (01.5)	02 (02.1)	03 (03.1)	03 (00.6)	06 (01.8)
Grand Total	Normal: Grade 0	>95%	>90%	111 (38.8)	196 (41.9)	158 (46.7)	211 (37.2)	254 (48.4)	465 (42.6)
	Mild: Grade I	87.5-95%	80-90%	107 (37.4)	181 (38.7)	132 (39.1)	224 (39.5)	196 (37.3)	420 (38.5)
	Moderate: Grade II	80-87.5%	70-80%	62 (21.7)	81 (17.3)	42 (12.4)	120 (21.2)	65 (12.4)	185 (16.9)
	Severe: Grade III	<80%	<70%	06 (02.1)	10 (02.1)	06 (01.8)	12 (02.8)	10 (01.1)	22 (.2.0)
TOTAL				286	468	338	567	525	1092

Table 3: Age and gender wise degree of malnutrition according to Waterlow classification

PHSC – Private High School Campus, Hebbal Bangalore H/A – Height for Age
GHSH – Government High School Hebbal, Bangalore W/A – Weight for Age
GHSB – Government High School Bashettihalli, Doddaballapur

Table 4: Clinical symptoms of subjects

Deficiency symptoms	PHSC without MDM (n=324)	GHSH with ISKCON MDM (n=438)	GHSB with Govt. MDM (n=330)	Total (N=1092)
	n (%)	n (%)	n (%)	n (%)
Anemia	13 (4.01)	32 (7.3)	78 (17.8)	123 (11.3)
Fluorosis	0 (0.00)	0 (0.00)	5 (1.1)	5 (0.5)
Phrynoderma	1 (0.3)	2 (0.6)	6 (1.4)	9 (0.8)
Deficiency of B-Complex vitamin	10 (3.08)	25 (5.70)	36 (10.90)	71 (6.5)
Deficiency of Vitamin C	3 (0.9)	0 (0)	32 (7.3)	35 (3.2)

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GHSH – Government High School Hebbal, Bangalore
GHSB – Government High School Bashettihalli, Doddaballapur

Table 5: Health status of subjects

Chronic ailments	PHSC without MDM (n=324)	GHSH with ISKCON MDM (n=438)	GHSB with Govt. MDM (n=330)	Total (N=1092)
	n (%)	n (%)	n (%)	n (%)
Jaundice	1 (0.3)	10 (2.3)	10 (3)	21 (1.9)
T.B	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Hypothyroidism	1 (0.3)	3 (0.7)	0 (0.0)	4 (0.4)
Malaria	0 (0.0)	1 (0.2)	3 (0.9)	4 (0.4)
Chicken pox	13 (4.0)	3 (0.7)	0 (0.0)	16 (1.5)
Measles	0 (0.0)	1 (0.2)	3 (0.9)	4 (0.4)
Dental Caries	33 (10.2)	69 (15.8)	22 (6.7)	124 (11.4)
Any other	8 (2.5)	1 (0.2)	0 (0.0)	9 (0.8)

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