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RELATIONSHIP BETWEEN MID UPPER ARM CIRCUMFERENCE (MUAC) AND BODY MASS INDEX (BMI) OF CHILDREN AGED 7-12 YEARS IN GANUKUL VILLAGE, RAMANAGARA DISTRICT, BENGALURU RURAL.

Paediatrics

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ABSTRACT

Background: In India and worldwide overweight or obesity in paediatric age group has become one of the most important health problems. Overweight / obesity is a proved risk factor for several significant complications and tracks in adulthood. Body mass index (BMI) is used as a clinical assessment of overweight and obesity in children and mid-upper arm circumference (MUAC) is used as an assessment for nutritional status. I would like to compare Mid upper arm circumference and Body mass index. **Objective:** To compare the mid upper arm circumference (MUAC) with that of body mass index (BMI) of the study population 7-12 years in Ganukul village, Ramanagara district, Bengaluru rural. **Materials And Methods:** This is a study done in children aged 7-12 years in Ganukul village, Ramanagara district, Bengaluru rural. Following ethical clearance from the institutional ethical committee, the study was conducted in schools belonging to the study area. The children were visited in the school and after consent being obtained from the parents by visiting their house. Base line data including age, gender, demographic data, socioeconomic status was noted. Following this standard anthropometric measurement including weight in Kilogram, Height in centimeters, mid upper arm circumference in centimeter, body mass index was measured using standard measurement protocols. Weight was measured without shoes with the help of digital machine to the nearest 500 grams. Height was measured with stadiometer to the nearest completed centimeter or child standing against the wall with the bare foot should look straight, standing in relaxed manner with arms hanging by the side, they should stand with both feet and knees closes together, head kept in Frankfurt plane (the line joining the lower margin of the orbit and upper margin of the external auditory canal should be parallel to ground). Age was calculated from date of birth. MUAC was measured with non-stretchable measuring tape to nearest millimeter. BMI was measured by weight in KG / height in m2 **Results:** Compared to MUAC and BMI, BMI was the best predictor for overweight and obesity compared to MUAC as evidenced by statistically significant adjusted odd's ratio. On the other hand MUAC was a better predictor of underweight compared to BMI but the adjusted odd's ratio was not statistically significant. **Conclusion:** BMI is a better predicator for over weight , MUAC is a better predictor for underweight.

KEYWORDS

MUAC,BMI,UNDERNUTRITION,OBESITY

INTRODUCTION:

In children, MUAC is used for the assessment of nutritional status. It is a good predictor of undernutrition. Measurements of adult MUAC are known to reflect changes in adult body weight. Undernutrition is either due to protein energy wasting or micronutrient deficiencies. It adversely effects physical and mental functioning and growth. Undernutrition is a major health problem, causing the highest mortality rate in children.

Malnutrition denotes impairment of health either from deficiency or imbalance of nutrients in the body. Adolescence is an important period in the individual's life. Adolescents represent around 20% of the global world's population and around 84% of them are in developing countries.

In India Stunting has declined from 38% to 36% from 2015-2016 to 2019 -2021.Prevalence of wasting has declined from 21% to 19% from 2015-2016 to 2019-2021.

Paediatric obesity is becoming more common both in developing and developed countries. Obesity increases the risk for type 2 diabetes, hypertension and hyperlipidaemia, coronary heart disease, respiratory disease psychosocial complications. It also has adverse effects on adult health. The risk of adult overweight is twofold greater for individuals who were overweight in childhood compared with individuals who are not overweight .

The BMI is plotted against WHO - BMI centile chart.

1. The BMI between the fifth and 85th percentiles is considered normal and healthy.
2. Falling below the fifth percentile is considered underweight.
3. Falling between the 85th and 95th percentiles is considered overweight
4. BMI 95th percentile is considered obesity.
5. BMI more than the 120th percentile, it is considered excessive obesity .

Prevalence of childhood and adolescent obesity and overweight from different parts of India (Punjab, Maharashtra, Delhi and South India) that range from 3% to 29%, and also indicate that the prevalence is higher in urban than in rural areas. The aim of this study is to determine a tool that will be easier and more appropriate for screening of adolescent malnutrition and obesity.

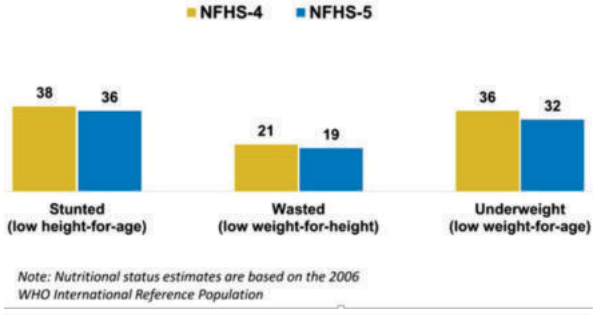
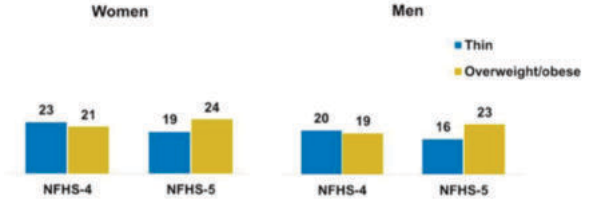


Figure 10.7 **Trends in Nutritional Status**

Percentage of women and men age 15-49



MATERIALS AND METHODS :

This is a study done in children aged 7-12 years in Ganukul village, Ramanagara district, Bengaluru rural. With time period of 6 months from March 2022 to August 2022, Sample size of 207. The data is analyzed in statistical software – SPSS version 26.

METHODOLOGY:

Following ethical clearance from the institutional ethical committee, the study was conducted in schools belonging to the study area in Ganukul village, Ramanagara district, Bengaluru rural.

Weight was measured with minimal clothing (school uniform) and

with the help of digital machine to the nearest 500 grams.

Height was measured with stadiometer to the nearest completed centimeter or child standing against the wall with the bare foot should look straight, standing in Frankfurt plane.

MUAC was measured in right arm with non-stretchable measuring tape to nearest millimeter at midway plane between the acromion and olecranon process with the arm hanging by the side of body. BMI was calculated.

RESULTS AND OBSERVATION:

Age wise distribution of study subjects

Age group	Frequency	Percent
7-10 years	98	47.3
11 and above	109	52.7
Total	207	100.0

From the above able it can be observed that, 52.7% of subjects were 11 years and above and 47.3% were between the age of 6 -10 years.

Gender wise distribution of study subjects

Age group	Frequency	Percent
Female	94	45.4
Male	113	54.6
Total	207	100.0

From the above table it can be observed that, majority 54.6% of subjects were males and 45.4% were females.

Distribution of study subjects according to their socioeconomic status

Socio economic Class	Frequency	Percent
I	76	36.7
II	95	45.9
III	31	15.0
IV	3	1.4
V	2	1.0
Total	207	100.0

From the above table it can be observed that majority, 45.9% of subjects were belonging to class II socioeconomic status followed by 36.7% in class I socio economic status.

Descriptive Information of Participants in this Study

Variable	Minimum	Maximum	Mean	Std. Deviation
AGE	7	12	10.14	1.47
WEIGHT	16.80	66.60	32.43	8.82
HEIGHT	110	167	134.40	9.90
BMI	11.83	29.00	18.09	3.80
MUAC	12	29	19.71	2.85

From the above table, it can be observed that
mean age of study subjects was 10.14 ± 1.47 years.
Mean weight was 32.43 ± 8.82 Kgs
Mean height was 134.40 ± 9.90 CM,
Mean BMI was 18.09 ± 3.80 Kg/m2
Mean MUAC was 19.71 ± 2.85cms.

Interpretation of Weight Based on Body Mass Index by Gender

Gender	Category	Frequency	Percent
Male	Underweight	4	3.5
	Normal	93	82.3
	Overweight	14	12.4
	Obese	2	1.8
Female	Underweight	6	6.4
	Normal	73	77.7
	Overweight	7	7.4
	Obese	8	8.5

From the above table it can be observed that:
Among males, prevalence of overweight and obesity were was 12.4% and 1.8% respectively. Among females, prevalence of overweight and obesity were was 7.8% and 8.5% respectively.

The Average Height, Weight, Mid-upper Arm Circumference, and Body Mass Index in the Same Age Category by Gender

Variable	SEX	Minimum	Maximum	Mean	Std. Deviation	p
WEIGHT	M	16.80	58.00	32.30	8.70	0.809
	F	18.00	66.60	32.60	8.99	
HEIGHT	M	110	155	134.36	10.440	0.958
	F	112	167	134.44	9.264	
BMI	M	13.020	26.160	17.54	3.00	0.760
	F	11.830	29.000	17.68	3.62	
MUAC	M	12	28	19.75	2.789	0.817
	F	15	29	19.66	2.950	

From the above table it can be observed that

Mean weight and BMI were higher among males compared to the female participants.

On the other hand, height and MUAC were higher among females. None of the difference in any of these parameters were statistically significant.

Predictive ability of BMI and MUAC for Underweight, overweight and obesity

Category	Variable	B	Adjusted odd's ratio	95% CI for Adjusted Odd's Ratio		p
				Lower	Upper	
Underweight	BMI	3.914	3.214	0.889	7.129	0.945
	MUAC	1.291	3.643	0.156	5.345	0.891
Overweight	BMI	5.672	5.562	1.002	10.674	0.001
	MUAC	1.291	3.638	0.992	6.335	0.459
Obesity	BMI	1.573	4.820	1.283	18.102	0.020
	MUAC	0.096	1.002	0.381	2.167	0.829

The above table describes predictive ability of BMI and MUAC for underweight, overweight and obesity.

Compared to MUAC, BMI is the best predictor for overweight and obesity compared to MUAC as evidenced by statistically significant adjusted odd's ratio.

On the other hand MUAC is a better predictor of underweight compared to BMI but the adjusted odd's ratio was not statistically significant.

DISCUSSION:

In my study it is observed that total number of participants being 207 and that, 52.7% of subjects were 11 years and above and 47.3% were between the age of 7 -10 years, majority 54.6% of subjects were males and 45.4% were females, of which majority 45.9% of subjects are belonging to class II socioeconomic status followed by 36.7% in class I socio economic status.

Among males, prevalence of overweight and obesity were was 12.4% and 1.8% Among females, prevalence of overweight and obesity were was 7.8% and 8.5%.

Mean weight and BMI were higher among males compared to the females. Height and MUAC were higher among females. Compared to MUAC, BMI is the best predictor for overweight and obesity compared to MUAC as evidenced by statistically significant adjusted odd's ratio. On the other hand MUAC is a better predictor of underweight compared to BMI but the adjusted odd's ratio was not statistically significant.

CONCLUSION:

This study contributes to the literature on adolescent nutrition – undernutrition and obesity in a low-resource setting and to the evidence on MUAC assessments as an indicator for nutritional status in adolescents. It can be stated that the mid arm circumference measurement is a reliable and a feasible method for assessment of nutritional status of adolescents. However, I feel that there are some aspects of MUAC that should be kept in mind that is MUAC changes substantially with age during adolescence. BMI and MUAC are correlated in this population of adolescents, MUAC offers a promising method for simple, low resource nutrition screening when BMI is not possible. More studies will be needed in adolescents who are identified as having non- normal nutritional status to understand the relationship between BMI and MUAC on a more nuanced level.