International Journal of Applied Research 2016; 2(6): 1025-1027

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2016; 2(6): 1025-1027
www.allresearchjournal.com
Received: 27-04-2016
Accepted: 28-05-2016

Arumugam Indira
Principal, Narayana College of Nursing, Nellore, Andhra Pradesh, India.

Katari Kantha
Department of Community Health Nursing, Narayana College of Nursing, Nellore, Andhra Pradesh, India.

Dr. G Subramanyam
Director, Narayana Medical College and Hospital, Nellore, Andhra Pradesh, India.

Dr. P Ram Mohan
Deputy Director of research, Narayana Medical College and Hospital, Nellore, Andhra Pradesh, India.

Correspondence
Katari Kantha
Department of Community Health Nursing, Narayana College of Nursing, Nellore, Andhra Pradesh, India.

Can body mass index can be replaced by mid upper arm circumference

Arumugam Indira, Katari Kantha, Dr. G Subramanyam and Dr. P Ram Mohan

Abstract
Background: Body-mass-index (BMI) is widely accepted as an indicator of nutritional status in adults. Mid-upper-arm-circumference (MUAC) is another anthropometric-measure. The present study attempted to evaluate the correlation between BMI and MUAC.
Aim: To assess Nourishment Using Body Mass Index and Mid Upper Arm Circumference in Apparently Healthy Population and its Correlation.
Setting and Design: The study was conducted in rural and urban areas of Nellore by using a descriptive design.
Materials and Methods: A total of 1527 samples were included in this study. Among this, 1232 samples belongs to rural area and 292 samples belongs to urban area by using convenience sampling technique.
Statistical Analysis Used: The collected data was organized, tabulated, analyzed and interpreted by using descriptive data like mean, standard deviation, actual numbers and percentages. Chi-square test, ANOVA with Bonferroni post hoc test was used appropriately. A p value less than 0.05 were considered statistically significant.
Results: Shows that with regard to nutritional status assesed by mid upper arm circumference versus urban and rural areas in rural areas out of 1235 adults 378(95.94%) are malnourished, 857(75.64%) are normal and in urban areas out of 292 adults 16(4,06%) are malnourished and 276(24.36%) are normal. The correlation between mid upper arm circumference and body mass index value is 1. It shows a Perfect positive correlation between MUAC and BMI.
Conclusion: The results show a strong correlation between BMI and MUAC. This finding lays the ground for the suitability of MUAC as an indicator of nutritional status in adult.

Keywords: BMI, Mid-upper arm circumference, Nutritional status.

1. Introduction
Anthropometric measurements are well established and widely used as indicators of health and nutritional status in both children and adults [1]. Despite some limitations, anthropometry remains the most practical tool for the assessment of nutritional status among members of the community in developing countries such as India. Body mass index (BMI) is widely accepted as one of the best indicators of nutritional status in adults [2]. Mid-upper arm circumference (MUAC) is another anthropometric measure used to evaluate adult nutritional status that has been found to be particularly effective in determining malnutrition among adults in developing countries [3]. It is a simpler measure than BMI, requiring minimum equipment and has been demonstrated to predict morbidity and mortality as accurately as underweight [4]. An extensive study using data from 8 countries (Mali, India, Senegal, Zimbabwe, Somalia, Ethiopia, Papua New Guinea and China) suggested that MUAC could be used for the simple screening of nutritional status.

2. Objective of the Study
To assess Nourishment Using Body Mass Index and Mid Upper Arm Circumference in Apparently Healthy Population and its Correlation.

3. Detailed Research Plan

3.1 Research Approach: Quantitative Approach.

3.2 Research Design: Descriptive design.

3.3 Research Setting: The study was conducted in rural and urban areas of Nellore by using a descriptive design.

3.4 Sampling Technique: Convenience sampling technique
Sample Size: A Total of 1527 participants were evaluated, there were 1232 rural and 292 urban populations.

3.5 Data collection procedure: This study was conducted by the advanced research team of Narayana Medical Institutions which includes subject interview and clinical examination for one time to collect the following. Participants were included if they were free of diabetes, hypertension and any other diseases and declared healthy based on clinician's judgment.
Detailed interview was done and data collection forms were used to collect Demographic (area of living, age and gender), Height was measured using Stature meter. Weight with calibrated weighing machine. Body mass index (BMI) was calculated using formula weight (kg)/height (m2). Mid upper arm circumference was measured using a Non-stretch MUAC tapes, known as Shakir's tape, were used to measure MUAC. The adult's right arm and left arm were flexed to 90 degrees at the elbow. The midpoint of the arm (between the lateral acromion and distal olecranon) was identified and marked. The arm was then relaxed and the measurement taken and recorded to the nearest 0.1 cm. (MUAC<22 mm is malnourished).
BMI was categorized according to the international standards (Haslett *et al*., 2000) into four groups, < 18.5 kg/m² (Underweight), 18.6 – 24.9 kg/m²(Normal), 25.0 – 29.9 (Overweight) and >30 kg/m² (obesity).

3.6 Statistical Analysis
Descriptive data was mean, standard deviation, actual numbers and percentages. Chi-square test, ANOVA with Bonferroni post hoc test was used appropriately. A p value less than 0.05 were considered statistically significant.

4. Results and Discussion

A Total of 1527 participants were evaluated, there were 1232 rural and 292 urban populations. 709/1527 were males and 818/1527 were females.

Table 1: Age and area wise distribution across study population

Age	N&%	Rural	Urban	Total
20-30	n	299	22	321
	%	24.21%	7.53%	21.02%
31-40	n	218	63	281
	%	17.65	21.58	18.40
41-50	n	278	81	359
	%	22.51	27.74	23.51
51-60	n	440	126	566
	%	35.63	43.15	37.07
Total	n	1235	292	1527

Table-1 shows age and area wise distribution across study population in rural areas out of 1235 adults 299(24.21%) are between 20-30 years, 218(17.65%) are between 31-40 years, 278(22.51%) are between 41-50 years, and 440(35.63%) are between 51-60 years. In urban areas out of 292 adults 22(7.53%) are between 20-30 years, 63(21.58%) are between 31-40 years, 81(27.74%) are between 41-50 years, and 126(43.15%) are between 51-60 years.

Table 2: Gender and area wise distribution across study population

Area	Males		Females		Total	
	n	%	n	%	n	%
Rural	591	83.36	644	78.73	1235	80.88
Urban	118	16.64	174	21.27	292	19.12
Total	709	100.00	818	100.00	1527	100.00

Table-2 shows Gender and area wise distribution across study population in rural areas out of 1235 adults 591(83.36%) are males, and 644(78.73%) are females. In urban areas out of 292 adults 118(16.64%) are males and 174(21.27%) are females.

Table 3: Cross tabulation of nutritional status asses by mid upper arm circumference versus urban and rural areas

MUAC	Malnourished		Normal		Total	%
Area	n	%	n	%		
Rural	378	95.94	857	75.64	1235	80.88
Urban	16	4.06	276	24.36	292	19.12
Total	394	100.00	1133	100.00	1527	100.00
MUAC<22 mm is malnourished						

Table-3 shows Cross tabulation of nutritional status asses by mid upper arm circumference versus urban and rural areas in rural areas out of 1235 adults 378(95.94%) are malnourished, 857(75.64%) are normal and in urban areas out of 292 adults 16(4,06%) are malnourished and 276(24.36%) are normal.

Table 4: Cross tabulation of nutritional status asses by mid upper arm circumference versus body mass index

Group	BMI	%	MUAC	%	% difference	Pearson correlation
Normal	1326	89.89	1084	73.49	16.40	1***
Malnourished	149	10.10	391	26.50	-16.40	
Total	1475	100	1475	100		

*** Perfect positive correlation

Table-4 Shows Cross tabulation of nutritional status asses by mid upper arm circumference versus body mass index. The Pearson correlation value is 1. It shows a Perfect positive correlation between MUAC and BMI.

The results show a strong correlation between BMI and MUAC. This finding lays the ground for the suitability of MUAC as an indicator of nutritional status in adult. It is being increasingly recognized as an effective measure of screening

for poor nutritional status in adults [5], and shown as a valuable alternative to BMI in identification of malnutrition [6]. MUAC is particularly suitable for large scale studies and surveys, as it can be measured with limited resources for human population surveys, especially among rural populations of developing countries. It can be used as a substitute alternative to BMI, because a MUAC cut-off of 22 cm was found useful in determining malnutrition among adults in developing countries [7].

As the measurement of MUAC requires minimal equipment and is easy to perform even on the most debilitated individuals it is appropriate for nutritional status screening during famine and emergencies. Major determinants of MUAC, arm muscle and subcutaneous fat, are both important determinants of survival in starvation [8]. MUAC is less affected than BMI by the localized accumulation of excess fluid (edema, ascites) common occurrences during famines and similar situations [9]. The relationship between overall adiposity (e.g. measured by BMI) and regional adiposity, measured as body circumferences (waist, MUAC) and skinfold thickness, was also shown to vary according to the population [10]. However, the recommended MUAC cut-off value of <25.1 cm and 23.5 (for male and female respectively) to define undernutrition in population but it may vary according to ethnic groups. A cut-off point of 24.0 cm was reported to be suitable in a recent study from the south of India [11].

The assessment of MUAC requires no equipment apart from a tape measure. As the index is the actual measurement itself, mathematical manipulation of the measurement obtained is not necessary. Despite the convenience and superiority over height-weight dependent indices, the observer should be aware of artifacts, which can result in an erroneous estimate and some degree of intra-observer variability. Careful training and supervision should be maintained in order to prevent wrapping the measuring tape too tightly or too loosely etc.

We conclude that MUAC correlates closely with BMI and appears to accurately detect adult under nutrition as defined by BMI.

5. References

1. World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organ Technical Report Series. Geneva: WHO, 1995.
2. Khongsdier R, Varte R, Mukherjee N. Excess male chronic energy deficiency among adolescents: a cross-sectional study in the context of patrilineal and matrilineal societies in Northeast India. European Journal of Clinical Nutrition. 2005; 59:1007-1014.
3. James WP, Mascie-Taylor GC, Norgan NG, Bistrian BR, Shetty PS, Ferro-Luzzi A. The value of arm circumference measurements in assessing chronic energy deficiency in Third World adults. European Journal of Clinical Nutrition. 1994; 48:883-894.
4. Briend A, Garenne M, Maire B, Fontaine O, Dieng K. Nutritional status, age and survival: the muscle mass hypothesis. European Journal of Clinical Nutrition. 1989; 43:715-716.
5. Bose K, Ganguli S, Mamtaz H, Mukhopadhyay A, Bhadra M. High prevalence of undernutrition among adult Kora Mudi tribals of Bankura District, West Bengal, India. Anthropological Sciences. 2006; 114:65-68.
6. Chakraborty R, Bose K, Bisai S. Use of mid-upper arm circumference as a measure of nutritional status and its relationship with self-reported morbidity among adult Bengalee male slum dwellers of Kolkata, India. Anthropol Anz. 2009; 67(2):129-137. PMID: 19739464
7. James WP, Mascie-Taylor GC, Norgan NG, Bistrian BR, Shetty PS, Ferro-Luzzi A *et al.* The value of arm circumference measurements in assessing chronic energy deficiency in Third World adults. Eur J Clin Nutr. 1994; 48(12):883-894. PMID: 7889897
8. Powell-Tuck J, Hennessy EM. A comparison of mid upper arm circumference, body mass index and weight loss as indices of under nutrition in acutely hospitalized patients. Clinical Nutrition 2003; 22:307-312.
9. Ohlson MA, Biester A, Brewer WD, Hawthorne BE, Hutchinson MB. Anthropometry and nutritional status of adult women. Hum Biol. 1956; 28:189-202. PMID: 13345359
10. Bose K. The interaction of waist-hip ratio and conicity index with subcutaneous adiposity in two ethnic groups: native British and migrant Pakistani men. Anthropol Anz. 2001; 59(3):275-282. PMID:11591053
11. Rodrigues VC, Rao RS, Lena A. Utility of arm circumference as an instrument to identify women at nutritional risk. Trop Doct. 1994; 24(4):164-166. PMID: 7801359
12. Arumugam Indira, Katari Kantha. Nutritional Status of Antenatal and Postnatal Mothers in Selected Rural Areas at Nellore. International Journal of Recent Scientific Research. 2015; 6(2):2796-2800.
13. Pathri, Mary Vineela, Katari Kantha, Arumugam Indira. Nutritional Status of Infant Children in Selected Rural Areas at Nellore, 2015.
14. Katari Kantha the Knowledge Regarding Eating Disorders among Adolescent Girls International Journal of Applied Research. 2016; 2(5):864-866.