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Correlation between the Middle Upper Arm Circumference and Body Mass Index in Young Adult Males and Females

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ABSTRACT
Background:
Undernourished people have an increased risk of premature mortality from both infectious and non communicable diseases. Aside from screening purposes, assessment of nutritional status is a useful tool in management and evaluation of various chronic diseases. Body-Mass-Index (BMI) is today the most commonly used marker of nutritional status however, this method presents a challenge in many low resource settings and immobile patients. Mid-upper arm circumference (MUAC) is another anthropometric measure that requires minimal equipment and little training. So far, MUAC cutoffs for under nutrition are well established in children < 5 years but there is still no consensus for a specific cutoff in adults. The objective of this study was to compare MUAC with BMI and suggest a MUAC cut-off corresponding to a BMI of 18.5 kg/m2 to identify underweight in adults.
Methods:
50 subjects were selected from the healthy young males and females between the age group (18-25). BMI,MID UPPER ARM CIRCUMFERENCE were measured by using inch tape ,weigh machine, stadiometer.Collected data were compared and analysed by using correlation method. **Results**:
In my study there was a significant positive correlation between BMI and mid upper arm circumference .(Correlation coefficient) (ϒ) = 0.751 This implies that there is a" FAIRLY HIGH DEGREE OF CORRELATION " between body mass index and middle upper arm circumference .
Conclusion: From the data presentation and analysis its evident that ,The middle upper arm circumference and body mass index is positively correlated .

KEYWORDS: Anthropometry, Body mass index, Epidemiology, Mid-upper arm circumference, Public health, Nutrition,

I. INTRODUCTION

Nutrition related issues are often neglected in adults living in low- income countries.A suitable indicator of nutritional status in adults in needed .body mass index (BMI) has been widely used as an indicator of nutritional status in adults. Body mass index is an object indicator of generalized adiposity and is the most widely used anthropometric indicator for assessing nutritional status of adults. It is a non-invasive technique used for nutritional survey , and can also provide insight in to the socioeconomic status of a population , particularly in developing countries.

Body mass index <18.5 kg/m^2 is considered indicator of under nutrition and it predicts an individual 's morbidity or other physiological and functional impairments .however ,body mass index has some draw backs and practical limitation as a measurement tool in the quick assessment of individuals (e.g .debilitated disabled or acutely ill patients .). it is not always possible to measure weight or height , particularly in debilitated and immobile patient . the reason is nearly always that patients cannot be taken out of their beds to be weighed and or cannot stand for height measurements . body mass index particularly inappropriate for pregnant women .Due to the extra weight of the fetus , other product of conception ,and add maternal tissue.

Further,more in resources limited health setting and population – based surveys .accurate measurements of height and weight require reasonably large logistical mobilization . In such

situation, a reasonable alternative would be mid-upper arm circumference (MUAC), The most common anthropometric measure to evaluate the nutritional status of children .mid-upper arm circumference has been shown to be very useful in the assessment of nutritional status in commonly setting .

It is a simpler measure than body mass index ,requiring minimum equipment and has been demonstrated to predict morbidity and mortality in 6- 59 months older senegalese Children such measurement have recently been used in the diagnosis of adults malnutrition in hospital and it found that low mid- upper arm circumference better predicts mortality than low body mass index in dutch older adults .

Vlaming et al reported than mid- upper arm circumference has the advantages of being easier to measure than body mass index or any other height – weight derived indices. A reasonably a close relationship between mid-upper arm circumference and body mass index has been demonstrated in normal adult population from a number of developing countries. It is a simplicity and ease of use make it a candidate for using in adult nutritional assessment.

In view of this , the early screening of hospitalised patients at risk of malnutrition becomes of great importance . nutrition risk screening aims to early detect the presence of nutritional risk in hospitalized patients in the first 24-72 h of their admission. Several tools have been developed to detect nutritional risk in hospitalisedpatients .

Among these instruments the malnutrition in universal screening tool mid-upper arm circumference developed by the british association of parental and enteral nutrition. Has been considered as a screening method of easy application ,high reproducibility and reliability . it is assesses nutritional status body mass index (BMI) and weight loss .and disease related dysfunction aiming to identify patient at low .Medium or high risk of malnutrition .initially the instrument was validated for use of communities . and later the use of hospital studies have shown that mid – upper arm circumference has a satisfactory performance in predicting clinical out comes , such as length of hospital stay and morality .

As a result of difficulty in measuring weight and height at hospital admission of patients and in community setting and consequently , calculating body mass index (BMI)and mid- upper arm circumference (MUAC) Proposes of the measurement of mid upper arm circumference (MUAC) as a simpler , easier to alternative to body mass index (BMI) of the assessment of the current nutritional status . mid –upper arm circumference cut of point for identification of malnutrition and over weight are <23.5 and >32 cm respectively.

Nutrition is one of the key determinants of the quality of life both among children and adults is associated with a variety of subsequent illness that lead to increased rick of morbidity and mortality and affect of the countries economy by increasing burden on state- founded and out- of pocket expenditure and also by affecting productive life years.

Obesity is defined is an inappropriate growth of the adipose tissue because of an increasing size of fat cell (hypertrophic obesity) or an increasing number of fate cell (hyper plastic obesity) or a combination of both .On the basis of the distribution of fat , obesity is of two types ; android and gynoid obesity . in first , there is deposition of fat in abdominal region .and in gynoid obesity , fat is more evenly and peripherally distributed trough out the body . Android type is more danger than gynoid obesity. Prevalence of obesity is increasing in both developed and developing countries . Obesity has reached epidemic proportion globally ,with more than one billion people in the world are over weight adults , and there are around 300 million people who are obese .

According to world health organisation(WHO), about 2.8 million individuals loss their life each year as a result of being over weight or obese . In addition , 44% of diabetes , 23% of ischemic heart disease , and 7- 40 % of certain cancer are attributable to over- weight and obesity.

In the 21thcentury , obesity has reached epidemic proportions in india , with morbid obesity affecting 5% of the country population . india also moving fast towards the condition of other developing countries that are steadily becoming more obese .According to the national family health survey (NFHS) the overall prevalence of over weight / obesity in india was 18.7% is men and 20.7?% women which is more than that of in national family health survey (NFHS) The body mass index corresponding to weight in kg , height in m^2 and is a good marker of malnutrition , present in the majority of existing nutritional screen . for calculating the BMI one not only have to measure the height and weight of individuals but also have to do mathematical calculation .

Measuring the height and weight in the field visits in rural areas cumbersome job.BMImeasurementrequire a trained work staff .carryinginstruments such as weighting scale and stadiometer in the field survey are also not smooth

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in terms of logistics .MUAC is a simple measurement which has been used for many years in nutritional evaluation .being the indicator of protein and energy reserves of the individuals . diverse studies was employed MUAC as a nutritional parameter in different population groups (as elderly , inpatients , infants , preschool age children , school children , pregnant women or lactating women).Further disease like scoliosis make further difficulty to measure BMI for those , and also with an increasing age . some people fail to follow the command necessary for height and weight measurement and hence BMI estimation.

AIM OF THE STUDY

The aim of the study was to assess the relationship betweenmiddle – upper arm circumference and body mass index.

OBJECTIVES OF THE STUDY

To find the correlation between the middle upper arm circumference and body mass index in young adult's females and males.

II. MATERIALS AND METHODOLOGY

STUDY DESIGN

- cross-sectional, correlated study.

STUDY SETTING

- Cherraan's college of physiotherapy.

STUDY SAMPLES

- 50 subject including male and female college students.

SAMPLING

- Convenience sampling.

MEASUREMENT TOOL

- BODY MASS INDEX.
- MIDDLE UPPER ARM CIRCUMFEENCE.

MATERIALS

- Pen / pencil , to note down the measurement.
- Paper with measurement table
- Inch tape
- Stadiometer
- Class 3 electronic weight measuring machine
- calculator

RITERIA FOR SELECTION OF SUBJECTS

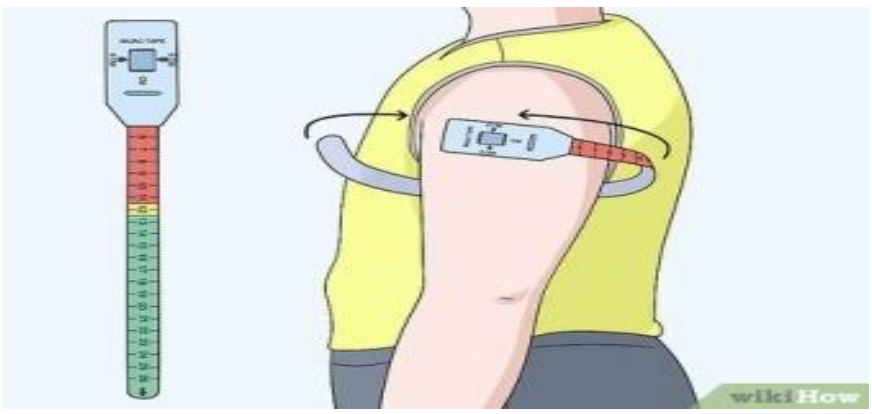
- **INCLUSION CRIETIRIA**
  - Subjectare willing to participate.
  - Healthy young adult female and male included.
  - Age between18 – 25 included.
- **EXCLUSION CRITERIA**
  - Low back pain were excluded
  - Spinal / trunk deformities such as scoliosis and kyphosis were excluded
  - Cushing disease were excluded
  - Thyroid disease were excluded
  - Using medication were excluded
  - Neurological disease were excluded

PROCEDURE

50 subjects were selected from the healthy young males and females between the age group (18-25).BMI ,MID ARM CIRCUMFERENCE were measured by using inch tape ,weigh machine, stadiometer. Collected data were compared and analysed by using correlation method.

MID-UPPER ARM CIRCUMFERENCE

- The mid – upper arm circumference measuring in inch tape and find the mid-point of the upper middle arm and point the acromial process of the shoulder and olecranon process of the elbow of hand . find and mark point the mid -point of the middle upper arm and the circumference measure the mid -point of the non- dominant arm .



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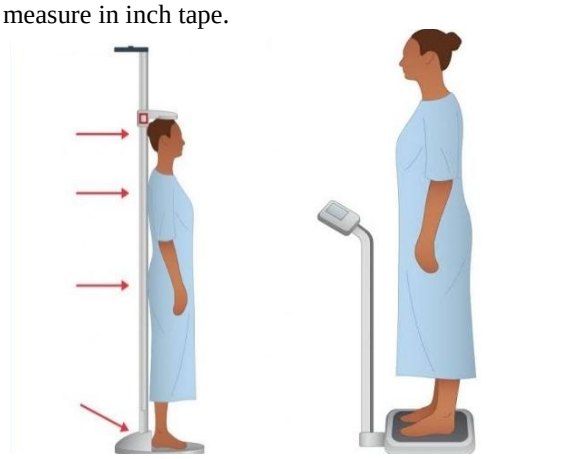
BODY MASS INDEX

- Body mass index is calculating the weight in kg and height in meter square
- Weight ; remove heavy cloth and shoes and weight using class 3 electronic scale in metric setting
- Height ; height is recorded in millimetre, and correctly installed a stadiometeror a wall , and measure in inch tape.

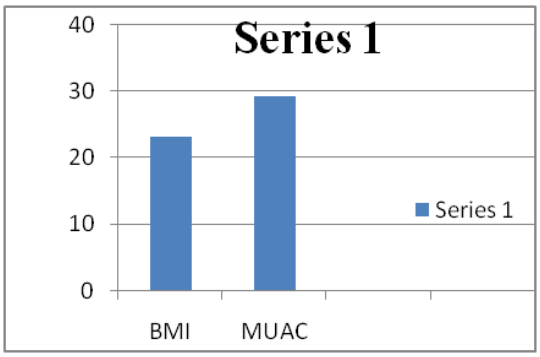


III. DATA PRESENTATION AND ANALAYSIS

Statistical analysis were done by using correlation method. Mean values of body mass index and mid-upper arm circumference in healthy males and females (age group between 18-25)

Table 1

SN	PARAMETERS	MEAN VALUE
	Body mass index	23.082
2	Mid-upper arm circumference	29.210



Graph 1

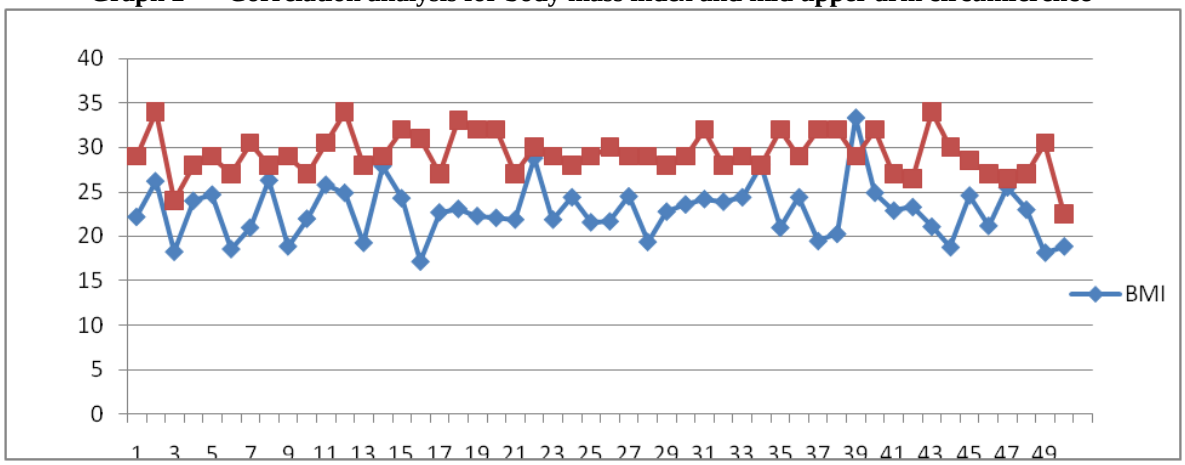
CORRELATION BETWEEN THE BODY MASS INDEX (BMI) AND MID UPPER ARM CIRCUMFERENCE (MUAC) IN YOUNG ADULT MALES AND FEMALES (AGE GROUP BETWEEN 18- 25)

Table 2

SN	BMI (X)	MUAC (Y)	SN	BMI (X)	MUAC (Y)
1	22.2	29	**26**	21.7	29
2	26.2	34	**27**	24.5	33
3	18.3	24	**28**	19.4	28
4	429	28	**29**	22.8	29
5	24.7	29	**30**	23.6	28
6	18.6	27	**31**	24.2	32
7	21	30.5	**32**	23.9	29
8	26.3	34	**33**	24.4	32
9	18.9	28	**34**	28	29
10	22	29	**35**	21	32
11	25.8	32	**36**	24.4	32
12	24.9	31	**37**	19.5	27
13	19.3	27	**38**	20.3	26.5
14	27.9	33.5	**39**	33.3	34
15	24.3	32.5	**40**	24.9	30
16	17.9	32	**41**	22.9	28.5
17	22.7	27	**42**	23.3	27
18	23.1	30	**43**	21.1	26.5
19	22.3	29	**44**	18.8	27
20	22.1	28	**45**	24.8	30.5

21	21.9	29	**46**	21.2	30
22	28.8	33	**47**	25.5	28.5
23	21.9	29	**48**	23	27
24	24.4	29	**49**	18.2	24
25	21.6	28	**50**	18.9	22.5

Graph 2- Correlation analysis for body mass index and mid upper arm circumference



Correlation analysis for body mass index and mid upper arm circumference**(Correlation coefficient)ϒ = 0.751**Which implies that there is a"**FAIRLY HIGH DEGREE OF CORRELATION** " between body mass index and middle upper arm circumference . Null hypothesis is rejected ,alternative hypothesis is accepted .

IV. RESULTS:

The result concluded that middle upper arm circumference fairly correlated with body mass index in young adult males and females

V. DISCUSSION:

LENETHORUP AND ASHISH TRIPATHEE.

A cross-sectional study was conducted at two urban public hospital in Nepal .the following variables where collected : MUAC weight and height ,sex ,age, and self -reported medical history . exclusion criteria :<19 years of age, pregnancy, and oedema. A total of 302 people between 18- 86 age , 197 women and 105 men ,were included . MUAC was correlated with BMI in both women ϒ=0.889 and men ϒ=0.846.MUAC strongly correlated with BMI in adult in Nepal.

TANIA SULTHANA AND MD NAZMUL KAREEM.

A cross –sectional study in 650 adult attendant of the patient of Dhaka hospital ,of the international centre of diarrheal disease of research .Bangladesh (icddr,b) was conducted during 2012 . Height and weight and MUAC of 260 males and 390 females aged 19 to 65 age group were measured . Our data shows strong significant positive correlation (linear) between MUAC and BMI for males ϒ=0.81 ,(p<0.001)and for females ϒ=0.828,(p<0.001).

ANIL KUMAR GOSWAMI,MANI KALAIVANI

Community based cross-sectional study was done in a resettlement colony in Delhi . Persons aged 60 years and above were selected by cluster random sampling . 711 elderly persons have recruited positive correlation was seen between BMI , MUAC in men and women (ϒ=0.76), with 0.67 in men and 0.76 in women (p<0.001).The study authenticates that MUAC correlate positively and significantly with BMI.

A.FEKIR AND G PETRO

we conducted a cross sectional study of women booking at four midwife obstetric units .anthropometric measurement (height weight and MUAC) were carried out on pregnant women at their first antenatal booking visit. The result showed a strong correlationbetweenMUAC AND BMI in pregnant women up to 30 weeks gestation The correlation was calculated at the 0.92 for the entire group .the MUAC cut-offs for obesity (BMI>30) and malnutrition (BMI<18.5) were calculated as 30.57 cm and 22.8 cm,respectively .MUAC correlated that strongly with BMI in pregnancy up to gestation of 30 weeks in women attending metro west maternity services .in low resources setting .

the simpler MUAC measurement could reliably be substituted for BMI to assess nutritional status.

In this study there was a significant positive correlation between BMI and mid upper arm circumference .(**Correlation coefficient)(ϒ) = 0.751** This implies that there is a" **FAIRLY HIGH DEGREE OF CORRELATION** " between body mass index and middle upper arm circumference Null hypothesis is rejected , alternative hypothesis is accepted .

CONCLUSION

From the data presentation and analysis its evident that ,**The middle upper arm circumference and body mass index is positively correlated .**

Ethical clearance- Taken from.ETHICAL committee,CHERAN COLLEGE OF PHYSIOTHERAPY.

Source of funding- Self.

Conflict of Interest – Nil.

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