Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 1, 2021, Pages. 4176 - 4184

Received 15 December 2020; Accepted 05 January 2021.

Anthropometric Indices and Their Correlation with Obesity

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Type of Article- Original Article

Conflict of Interest: **None**

Funding: Indian Council of Medical Research .

Abstract:

Background: Due to lot of health risks involved obesity leads to highly public health concern.The health survey services are costly to decrease the life expectancy of an individual and the health issues associated with being obese.

By encouraging physical activity and improving lifestyle behaviors through workplace approaches that can reach a wide variety of populations, a growing body of evidence points towards reducing obesity. Most time spent by adults is at work, so occupational participation in the treatment and prevention of obesity is successful and desirable.

By introducing environmental improvements and multiple policy initiatives in workplaces to facilitate healthy decisions, habits can be modified.

Objectives: Study of various anthropometric indices to estimate obesity and to assess sensitivity of various anthropometric indices in estimating obesity across various age groups.

Methods: The study will be carried out in AVBRH, Sawangi (Meghe) associated to DMIMS, Wardha, and it will be a Cross sectional study.Subjects to be included in study will be explained regarding the study & proper consent will be obtained.The subjects selected will be enquired regarding history of DM ,HTN, CKD, HF, further they will be clinically examined for signs of heart failure, CVS examination and few investigations carried out serum creatinine, ECG, LFT and urine albumin.

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Expected Results: This study aims at estimating obesity of various age groups by using various anthropometric indices. As previous calculations of obesity have just focused on calculation of BMI which is a narrow approach. This study is being done to for better understanding and application of new and upcoming indices of obesity estimation in an Indian setup.

Conclusion: It will help in estimating risk of cardiovascular diseases using new external indices.

Key words: Conicity index, obesity, weight height ratio**.**

INTRODUCTION:

Obesity is characterized as a disorder in which the body accumulates excess fat that may have a negative health impact.(1,2)When their body mass index is determined by dividing the weight of a person by the square of the height of the person, most of them are usually considered obese; the range is over 30 kg/m2 and 25to 30 kg/m2 is defined as overweight.(3)
Obesity is associated with many other disorders and conditions, often associated with cardiac diseases, diabetes mellitus type2, OSA, cancer types, and OA .For diseases caused by diet, physical activity, and other environmental factors, higher BMI is a risk predictor, which is not known to be a direct cause. A reverse correlation between obesity and depression has been identified, with obesity contributing to an increased risk of clinical depression and also leading to a greater risk of depression.(4)

As the field of preventive medicine evolved, there was a continuous research for prognostic/diagnostic markers for identifying at risk population .so along the way, various anthropometric parameters evolved indices such as BMI, waist hip ratio, neck circumference, weight height ratio, conicity index and so on.Those indices are supposed to be forerunners of various risks, such as diabetes mellitus,hypertension, coronary artery disease, atherosclerosis .Hip circumference and other derived measures such as waist to hip ratio also studied.Main deficiencies of body mass index which does not differentiate between fat mass and fat free .Proportions of body fat differs from across ethnic populations ,age and sex.Distribution of excess fat has larger influence on health risks such as cardiovascular diseases.(5)
After an overnight quick, all measurements were performed. Without shoes and with light clothing, the participants were measured. Using a fixed wall-scale measuring device, the height was measured to the nearest 0.1 cm. For each subject, a weight of 0.1 kg was calculated using an electronic scale, adjusted before each measurement session. The BMI per height was measured as weight (kg) (m2). With a measuring tape, the waist circumference was determined at the largest circumference place between the landmarks .(6)

DEFINITION AND EPIDEMIOLOGY

Excessive abnormal fat accumulated in the body that may have negative effect on health is defined as obesity or over weight. Body mass index a very simple weight-for-height calculation that is widely used in adults to identify overweight and obesity. BMI is known as

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the weight divided by height in kg in square meters around (kg/m2).(7)Factors such as age,ethnicity,sex and muscle mass and alter relationship between body mass index and body fat.Some specific causes like genetic,older age,loss of sleep,pregnancy,poly cystic ovary syndrome ,hypothyroidism etc.As a direct consequence of anthropometric tests, very few problems occur .One potential issue is a mix-up in estimations. There is proof to recommend a blunder in estimations of weight, and stomach corpulence happening in higher extents in the obese population. In obese patients, this may be due to difficulty measuring bony landmarks. In a non-uniform manner, measurements are taken, another common cause of measurement error. Anthropometric scales are useful in measuring physical health data for a broad spectrum of groups, from youngsters to professional athletes to older people. These estimations may be used either as a benchmark or as a marker of development, including height, weight, circumferences, and skin folds. One analysis of Australian volleyball players found that with increases in level of playing, anthropometric knowledge improves.Obesity is diagnosed by calculation of persons weight in relation to their height.For men and women, World Heath Organisaton defines overweight and obesity as follows-

1. Overweight is a BodyMassIndex>_ to 25
2. Obesity is a BodyMassIndex >_ to 30.

About 1.8 billion people aged 19 years old and older were overweight in 2016.Among those, more than 660 million were obese adults.In 2016, 40 percent (39 percent of men and 40 percent of women) of adults aged 18 years and over were overweight (8). Overall, in 2016, about 12% of the world's total adult population (11% of males and 15% of females) was obese. Between 1975 and 2016, the worldwide incidence of obesity almost doubled.

BACKGROUND/RATIONALE :

Because of the unnecessary health risks involved, obesity is a significant public health issue. This primarily leads to reducing the life expectancy time of an individual and the health issues associated with obesity that have cost the health survey programs.Social movements which have potential to influence policies of public through gathering of families ,government organisations,civil society .These type of movements are more useful in evolving new guidelines.The community oriented core setting is encouraging because it depends on socio political framework that helps to identify faults and facilitates sustainable actions for the future use(9). Several possible indicators for anthropometric measurements are available. Stunting, wasting, and becoming underweight are signs in infants. Stunting- is when kids are low-stature-for-age, wasting is low-weight-for-height, and underweight is low-weight-for-age. As a marker of nutritional status, mid- arm circumference (upper arm) is animportant measurement in children or pregnant ladies. BMI is another nutritional status index widely used and used as a malnutrition gauge.(10)

OBJECTIVES:

- Study of various anthropometric indices to estimate obesity.
- To assess sensitivity of various anthropometric indices in estimating obesity across various age groups.

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METHODS:

The study will be carried out in AVBRH, Sawangi (Meghe) associated to DMIMS, Wardha, and it will be a Cross sectional study.

Study Setting:
The study will be conducted after ethical clearance from Institutional ethics committee, DMIMS. The study will be conducted in AVBRH, JNMC, DMIMS, Sawangi Wardha. which is a 1700 Bedded +tertiary care centre in Wardha, Maharashtra, India.
Study Design: A Cross sectional study
Study Duration :August 2020 to August 2023
Study Group: Study was divided based on age in to three groups as follows

18to39 years
40to59 years
- 60 years of male & female age groups

Sample Size : 200 subjects were taken in each group.
- Calculation: Sample size formula with desired error of margin n=Zα/2.p.(1-p)/d2
- Where Zα/2 is the level of significance at 5 % i.e 95% confidence interval=1.96
- Prevalence of obesity=11.8%=0.118
- d= desired error of margin=5%=0.05
- n= 1.96*2 X0.118X(1-0.118)/0.05*2
- = 200 patients in each group

Controls : All male and female age groups of non-obese patients .
Inclusion Criteria – All subjects above 18 years old.
Exclusion Criteria –Subjects on long-term corticosteroid therapy (medical reasons.
Chronic kidney disease, heart failure, nephrotic syndrome.
Chronic liver disease.
Non consenting subjects.

METHODOLOGY
Subjects to be included in study will be explained regarding the study & proper consent will be obtained.
The subjects selected will be enquired regarding history of DM ,HTN, , heart failure, further they will be clinically examined for signs of heart failure, CVS examination and few investigations carried out serum creatinine, ECG, LFT and urine albumin.(11)
In medicine OPD, the subjects will undergo examination for measurement of anthropometric indices. The values of the same will be recorded in designated proforma. Relevant history regarding liver disease, long term steroid consumption, diabetes and hypertension medications will be enquired as well as any other chronic ailments & entered in proforma.

ANTHROPOMETRIC MEASUREMENTS
The following parameters will be studied:

1.Body mass index
2.Waist circumference

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3.Weight
4. Height
5.Hip circumference
6.Waist hip ratio
7.Neck circumference
8.Waist height ratio
9.Conicity index

WEIGHT- weight in kilograms will be recorded with the subject standing on the standing weighing scale without foot wear with light clothes using weight scale and measuring inflexible bars with high accuracy.(12)

HEIGHT-- measured in centimeters (nearest 0.5cm) with the subject standing in an

upright position against the vertical scale without wear of the foot and the head

situated in such a way that the upper part of the external auditory meat would level

with the margin of the bony orbit (Frankfurt plane).

BMI:A value derived from the mass (weight) and height of a person is the body mass index (BMI) or Quetelet index. The weight of the person is divided into square meters by height. Generally, a person with a BMI of 30 or more is considered obese. An individual is considered overweight with a body mass index of 25 or more.

According to WHO: (13)
Significantly underweight: BMI less than 15 kilogram/m2
BMI: 15to 16 kg/m2 Seriously Underweight:
BMI: Underweight: 16to18.5 kilogram/m2
Plain: BMI: 18.5-25 kilogram/m2
Surplus weight: BMI: 25-30 kg/m2
Class I Obese (Moderately Obese):BMI: 30-35 kg/m2
Class II (Severe Obese) Obese: BMI: 35-40 kg/m2
Obese (very seriously obese class III: BMI: 40-45 kgm2
Obese Class IV : (Morbidly Obese) BMI : 45-50 kg/m2
Obese Class V (Super Obese) BMI : 50-60 kg/m2
Obese Class VI (hyper obese) : BMI : > 60 kg/m2

WHO criteria for BMI for Asia-pacific region will be used in this study
Underweight (<18.0525kg/m2)
Normal or lean (18.5-22.925kg/m2)
Overweight (>25kg/m2)
Obesity-(>30kg/m2)

BMI Range Table:

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Category	BodyMass Index Range kg/m^2
Underweight	less than 18.5
Normal Weight	18.5 - 22.9
Overweight	23 - 24.9
Obese	greater than 25

Waist Circumference:

The WHO stepwise waist circumference measurement procedure instructs measurements to be carried out at an estimated midpoint between the margin of the last palpable rib and the top of the iliac crest.

Hip Circumference:

Hip circumference should be measuredaround the widest portion of the hip.

Waist to Hip Ratio:

It is measured by dividing the waist circumference by hip circumference

Neck circumference:

By sticking a measuring tape directly on the skin just below the larynx, also known as the Adams apple, and stretching the tape horizontally all the way around the body.

Waist height ratio :

The waist to stature ratio is also known as the division of their waist circumference by their height, both measured in the same units.

Conicity index: (14)

waist circumference divided by 0.109 (weight in kg /height in metres)*1/2

WHO cut off points:

Measure	Cutoff points	metabolic complications risk
Circumfeence of waist	greaterthan94cm[MALE]>80cm[FEMALE]	Raised
Circumference of hip	greaterthan102cm[MALE]>88cm[FEMALE]	Raised significantly
Waist Hip ratio	greaterthan0.90cm[MALE]>0.85cm[FEMALE]	Raised significantly

Expectedresults:

The Conicity index demonstrated the one of the unequal power in the estimate of a 10-year Cardio Vascular risk among the 5 core obesity indices. The areas under the curve in men were 0.6, based on theAmerican Heart Association tool.The most ideal approach to enhance the consequences of anthropometric information is to increase measurement precision. To get estimations, the most proficient approach to help exactness is frequently to receive similar

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uniform techniques. An interprofessional group of medical attendants, nurse practitioners, doctor associates, and doctors can cooperate together to continuously empower a more beneficial way of life for patients to prevent the unfavourable impacts of obesity and memory in order to increase long-term patient outcomes.

DISCUSSION:

Results have shown that the key indices of obesity have unequal power to predict the risk of vascular cardio disease. Conicity index and Waist hip ratio have the highest discriminatory power in males and females among all core obesity indices. This research also reveals that most of our respondents, mainly men, are at risk of experiencing cardio-vascular events. Additional data showed a high level of understanding between the approaches of Framingham and ACC/AHA, mainly for the 10-year risk.In the 21st century, Obesity has reached epidemic proportions in India, with morbid obesity affecting 5% of the population of the country. A number of related studies were reviewed. Sagar et. al. conducted echocardiographic assessment in various obesity phenotypes (15). Sratasaet. al. assessed prevalence of non-alcoholic fatty liver disease in different phenotypes of obesity (16). Few of the related studies were reviewed (17-20). Singh and Lohkare assessed association of leptin and carotid intima-media thickness in overweight and obese individuals (21). Some interesting studies were also reported by Acharya et. al. (22), Alaghet. al. (23) and Nagraleet. al. (24).

India follows the pattern of other developed nations that are becoming more obese slowly. Since India's entry into the global food markets, packaged food that is unhealthy has become much easier to access. The average caloric intake per person among middle class and high-income households is growing in combination with rising middle-class incomes. Obesity is the main risk factor for cardiovascular disease and NGOs such as the Indian Heart Association have become more conscious of this current issue.

The most ideal approach to optimize the results of anthropometric information is to increase measurement exactness. In order to obtain estimations, the most effectiveapproach to boost precision is often to adopt the similar uniform techniques. An interprofessional approach with a team of nurses, nurse practitioners, doctor assistants, and doctors can cooperate together to continuously encourage a healthier way of lifestyle for patients to prevent the well estimated adverse effects of obesity and memory in order to increase long-term patient outcomes.

CONCLUSION:

Compared to other obesity indices, the discriminatory accuracy of cardiovascular events for the conicity index is high. Clinically, the conicity index can be calculated using very easy and regular measurements. Compared to other obesity indices, the waist hip ratio is the second highest index of discriminatory accuracy using few simple measurements.

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