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Original Research Article

Correlation of anthropometric indices by cardio vascular index in young adult having obesity

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ABSTRACT

Background: The aim of this study is to correlate anthropometric indices with hemodynamic vascular changes in young adult obese patients.
Methods: It is case-control study, 140 patients were recruited. Which were divided into two group i.e., study group=70 and control group=70. Anthropometric measurement waist circumference (WC) and total body fat percentage (TBF%) of each patient is compared with right brachial pulse wave velocity (PWV) (dominant hand).
Results: Obese individuals had high levels of PWV as compared with non obese patients. Study suggested that cardiovascular parameter levels were significantly increased in obese patients, these same patients gradually progress towards the hypertensive condition.
Conclusions: Changes in cardiac function are common in obese patients, hence, there is need for periodical assessment of the cardiac function and anthropometric measurement and PWV as cardiac markers in obese patients proves to be an early and simple tool to give warning signal for the patients to take early preventive measures.

Keywords: PWV, WC, TBF %

INTRODUCTION

Recent theories of ageing suggest that the changes that occur in the vasculature that essentially determine the fate of the entire organism. Despite the overwhelming research effort that has taken place in the fields of vascular biology, the intrinsic importance of vascular function has been recognized for centuries.[1] Obesity, a metabolic disorder characterized by the accumulation of excess body fat is closely related with diseases related to metabolic disorders and can also causes cardiovascular diseases, diabetes and joints problems. Early postmortem findings that mostly revealed atheromatous calcified plaques and obstructive lesions in the intima of blood vessels gave rise to the concept of "hardening of arteries."[2] The more current definition of "arterial stiffening" refers to changes in medial characteristics that result in reduced arterial wall distensibility, which lowers the arteries' ability to the absorb pulsatile cardiac ejection.[3]

Studies into the underlying processes that translate morphological alterations and modifications of artery wall constituents are now possible because to the molecular biology field's recent growth and the biophysical principles in arterial hemodynamics. Increased PWV and arterial pulse pressure are considered to be two very important risk factors for cardiovascular disease and end-organ damage. Arterial wall can be altered by passive stimuli such as increased mechanical stress tightening pressure. They cause structural failure, fatigue and fragmentation of elastic fibers.[4] Blood pressure is affected by the contraction of the heart. Large arteriosclerosis and peripheral vascular reflexes wave. During systole, the heart contracts Due to blood flow

through the arterial system, A pressure wave spreads through everyone arteries in the body. When the pressure wave arrives Branch points, points with impedance differences and pressure vibrations are reflected back to your heart. What is reflected usually the waves reach the heart during diastole and merges with the diastolic blood pressure wave.[5]

A precise determination of fat content can be given clinically useful guidelines for clinicians in disease assessment risks in obese patients and to optimize preventive or therapeutic drugs for these patients. Measurement of body fat has traditionally been limited to simple procedures, such as WC and the waist-to-hip ratio.[6]

In this study, we determined the correlations in body fat percentage, WC and cardiovascular risk indices such as PWV. In addition, we evaluated the predictive values of body fat percentage, WC and PWV for the cardiovascular risk factors obese young adults.

METHODS

Study design

Study design was of case-control study.

Place of study

The present study was conducted in department of anatomy, Mayo institute of medical sciences, Barabanki, (UP) and department of physiology, index medical college, Indore (M.P).

Study period

Study conducted from Dec-2021 to Dec-2022.

Sample size

Participants are divided into 2 groups. Group I: (study group) obese n=70, group-II: control group, n=70.

Participants

Study group: Obese adult of age (18-30 years), BMI should be >30 kg/m^2 and control group: adult of age (18-30 years), BMI should be 18.5-24.9 kg/m^2.

Exclusion criteria (study group)

Participants having history of diabetes mellitus, history of hypertension, history of cardiovascular disease, history of peripheral vascular disease, gestational diabetes, any current and past aspirin or hormone replacements therapy, autoimmune disease, acute and chronic infections, hepatic diseases was also excluded. Any disease that can alter the cardio vascular health.

Exclusion criteria (control group)

Participants having history of diabetes mellitus, history of hypertension, history of cardiovascular disease, history of peripheral vascular disease. Any current and past aspirin or hormone replacements therapy, autoimmune disease and smokers, alcoholic, acute and chronic infections, hepatic diseases were also excluded.

Procedure

Patient preparation: After explaining exact experimental procedure. After taking consent, filling all documents and questionnaire. Firstly all anthropometric measurement will be taken. After 5 min rest, PWV (right brachial PWV) is tested by using periscope.

BMI assessment: height and weight were measured with participants wearing light-weight clothes and without shoes. BMI was calculated as: BMI=weight (kg)/ height (m)^2

WC: Stand and place a tape measure around your middle, just above your hipbones. Make sure tape is horizontal around the waist. Keep the tape snug around the waist, but not compressing the skin.

TBF %

Grab a fold of skin and the digital caliper used to measure thickness of the skin fold. The areas that can be used are abdomen (Take a vertical skinfold 2cm to the right of the umbilicus), biceps (Take a vertical skinfold over the belly of the muscle), calf (take a vertical skinfold in the middle of the calf muscle at the point of largest girth), subscapular (take a diagonal skinfold measured 1-2 cm below the inferior angle of the scapula right hand side), thigh (take a vertical skinfold in the middle of the right thigh. body weight should be shifted to left) and triceps (take a vertical fold on the back of the upper arm, halfway between the elbow and top).

The sum of three skin folds will be used in age and gender specific equation to obtain an estimate of body fat percentage (Edwards et al).

Body fat percentage=0.29 SF*+ 3.9 (Weight in kg.)

(SF*: sum of Skin Fold thickness)

Table 1: Normal range of body fat % in female in different age group.

Upto 30 year	30-50 year	Above 50 years
14-21%	15-23%	16-25%

Statistical analysis

The result is presented in mean ± SD. All the physiological parameters were compared by using

independent t test between cases and control. All the analysis was carried out by using statistical package for social sciences (SPSS) version 22.

RESULTS

Table 2 show that compare between obese and non-obese patients in arterial stiffness by evaluation of augmentation index and PWV in young adult. There were statistical significance difference obese and non-obese patients in BMI with p=0.001 and right brachial PWV with p=0.001; heart rate with p=0.001; systolic as well as the diastolic BP with the p=0.001. Obese patients had greater mean value than the non-obese patients (Figure 1 and 2).

Table 3 shows that comparison between obese and non obese group in anthropometry variables in young adult. There was statistical significant difference between obese and non obese group in anthropometry variables like BMI with p=0.001, WC with p=0.001, body fat percenatges with p=0.001 (Figure 3 and 4).

Table 2: Investigation the changes in arterial stiffness by evaluation of arterial stiffness index and PWV in young adult obese and compare with the non obese subject.

Arterial stiffness	Obese group, (Mean ± SD)	Non-obese group, (Mean ± SD)	P value*
BMI (kgm^2)	33.545±1.069	24.195±1.584	0.001
RT BAPWV	1338.347±197.203	1152.987±114.374	0.001
Heart rate	90.58±8.196	77.94±9.002	0.001
Systolic BP	137.74±3.777	126±5.874	0.001
Dystolic BP	101.80±6.933	91.98±8.344	0.001

*Independent t test used for two group comparison.

Table 3: Study of effect of anthropometric indices in young adult obese and healthy young adults.

Anthropometry variables	Obese, (mean ± SD)	Non obese (mean ± SD)	P value
BMI (kgm^2)	33.545±1.069	24.195±1.584	0.001
WC	89.56±7.117	77.188±5.011	0.001
Body fat %	24.68±4.688	19.56±5.605	0.001

*Independent t test used for two group comparison.

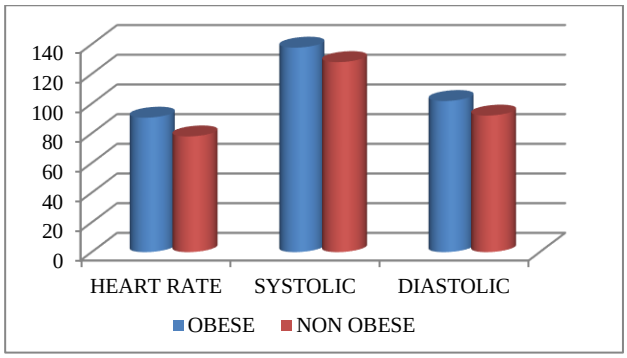

Figure 1: Comparison between heart rate, systolic, diastolic in obese and non obese.

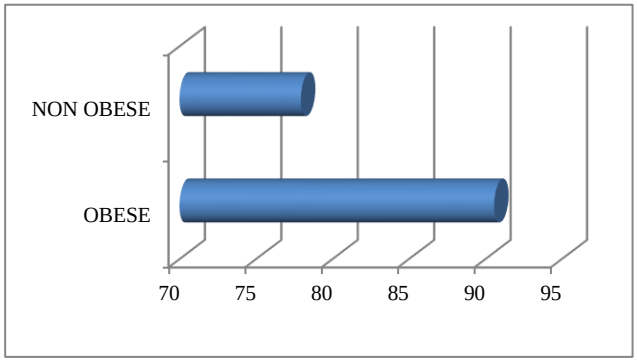

Figure 2: PWV.

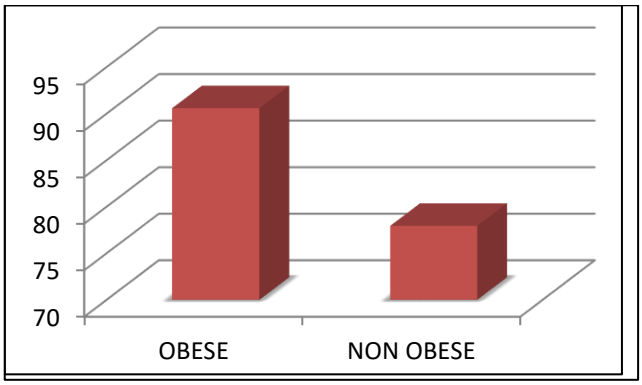

Figure 3: WC.

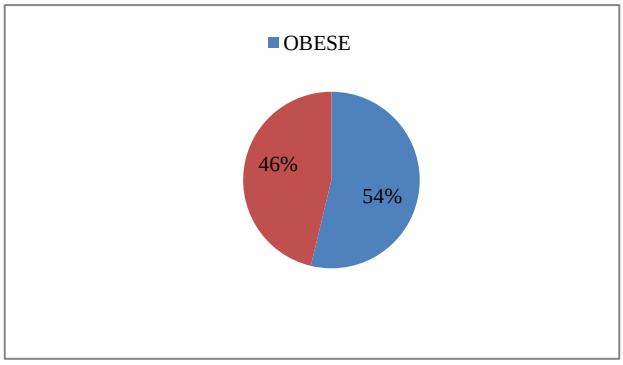

Figure 4: Body fat percentage.

DISCUSSION

The capacity of an artery to expand and contract in reaction to the compression and relaxation of the heart is known as arterial compliance. This permits blood to move from a pulsatile and irregular shape to a consistent laminar stream. A more prominent AS (Arterial stiffness) comes about in more blood stream resistance and a heavier burden for the cleared-out ventricle. Blood weight went raised as a result, and atherosclerosis development was quickened. Age and atherosclerosis are the two primary causes of AS. The blood vessel wall's expanded collagen substance and diminished elastin tissue cause the supply route to harden. Beside auxiliary modifications, AS may too be caused by an increment in nearby vasoconstrictors like endothelin-1 (ET-1) or a diminish in vasodilators like nitric oxide (NO). These modulators have a pivotal part within the control of vascular movement and are discharged by vascular endothelial cells. An fundamental characteristic of endothelial brokenness (ED) is destitute NO production.[7]

In this consider it was found that in the event that a individual having abundance fat in more youthful age, they are having higher hazard of blood vessel firmness. There are a number of components that might account for this affiliation. To begin with off, an increment in AS may diminish basal appendage blood stream, which might result in less oxygen and supplements being conveyed to the muscles and a diminish in muscle mass. Along the blood vessel framework, AS is additionally connected to raised reflected wave, systolic blood weight, and beat weight, which might result in little vessel damage. Besides, the sum of muscle itself may have an affect on AS. This comprises lipid invasion causes the release of endorphins within the muscles cytokines of inflammation.[8]

In present study it was found those Augmentation indexes in obese subject have a positive relationship with the non obese subject. It is altogether higher in stout. Arterial stiffness and endothelial dysfunction might serve as go between of the relationship interface cardiovascular occasions and muscle quality. The solidifying of the supply routes the vanishing of the courses flexible qualities of the aorta could be a characteristic of typical vascular maturing, but may be quickened in a number of ways. PWV, which is respected as the gold standard parameter of non-invasively decided blood vessel firmness, can be utilized to degree arterial stiffness.[9]

Pathological arterial stiffness has been connected in various thinks about, counting metanalyses and orderly reviews to maturing, cognitive decay, cardiovascular illness and both ordinary and novel CV hazard components. PWV may be a effective indicator of cardiovascular occasions and all-cause mortality, comparative to handgrip strength.[10] In this consider too it was found that PWV have a essentially higher esteem in stout subject whereas comparing with the non obese subjects.

Later discoveries from the Wakayama Ponder in community-dwelling more seasoned grown-ups (72 years) without show cardiovascular illness appeared that HGS dynamically diminished with an increment in brachial-ankle PWV (baPWV) level. Same result was found in this think about moreover that anthropromatric indiceslike WC, body fat percentage is increased in obese patient with increment in PWV.[11] Another think about that included 1002 Chinese community-dwelling grown-ups over the age of 65 found a considerable relationship between handgrip quality and PWV, but as it were in men. Other considers that looked at hypertension patients were incapable to affirm this correlation.[12]

Limitations

For better understanding of arterial stiffness follow up of obese subject can be done. As the sample size is small obtained from the hospital, it may not reflect all the population in India. This study could not compare different types of medication taken for obesity.

CONCLUSION

The present study shows positive correlation with BMI, PWV, heart rate, body fat % and blood pressure in obese young adult as compared with non obese. Obese young adult have higher systemic vascular resistance and have higher level of arterial stiffness compared to non obese. This study helps the clinician to understand the prognostic effect of arterial stiffness in obese adult by using arterial stiffness marker such as PWV.

The inverse relationship between anthropometric measurement and PWV suggests that arterial stiffness is related to BMI, WC and TBF %. The missing link between obesity and higher cardiovascular morbidity and mortality may be early cause of vascular stiffness.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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