ORIGINAL RESEARCH PAPER

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ASSOCIATION BETWEEN BODY MASS INDEX AND CORE MUSCLE ENDURANCE IN YOUNG ADULTS- A CROSS SECTIONAL STUDY

KEY WORDS: BMI; Fitness; core, plank test, core endurance

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ABSTRACT

Background Body mass index (BMI) is an indirect measure of body composition that is frequently used as an efficient test in fitness settings. Core muscles are meant for endurance to deliver their function of stabilizing trunk and transferring the forces across the limb. They are among the most important prerequisite for optimum posture, back and pelvis health but due to changes in lifestyle in present scenario most of young adults are spending time being sedentary which impacts the core muscle strength and endurance adversely. The relationship between BMI and core endurance has not been studied with any constant results and also very few studies talk about young adults. So present study aims to find association between BMI and core muscle endurance in young adults.

INTRODUCTION

After two decades in 20th century we are facing heightened trend of non-communicable diseases. Some estimates from developed countries indicate that only 15% of the population older than 18 years of age get regular vigorous activity (three times a week for at least 20 min), and 60% report no regular leisure time activity at all, with 25% not active at all. (1) There is also evidence that habits developed in younger ages are likely to track through to later life leading to obesity and other life style diseases(2,3). One of the methods to measure obesity or body composition is by estimating body mass index (BMI). WHO defines body mass index (BMI) as a person's weight in kilograms divided by the square of the person's height in metres (kg/m2)(4,5). It was developed as a risk indicator of disease and is an indirect measure of body composition that is frequently used as an efficient test in fitness settings (5). If adiposity increases, as it can be in individuals with higher BMI values, it causes occurrence of visceral or ectopic adiposity and results in increases free fatty acid (FFA) in circulation and disturbed liver's metabolism which will impair the energy supply for muscle work. This could be the possible effect of adiposity or obesity on muscular fitness (6,7). Core muscles show the greatest fatty infiltration affecting their normal functioning in overweight and obese people (7,8). Core endurance has been defined as body's ability to control the trunk in response to internal and external disturbances. It is important for carrying out daily activities without chances of injury (8,9). The relationship between BMI and strength measures has not been studied with any consistent results. Generally obese people have been seen to performed worse in tests regarding propulsion or lifting body mass (10).

The study of association between body mass index and strength measure can help to better understand the effect of obesity on core muscle endurance which will help in more effective exercise prescription for risk factor modification in subjects with various body mass index.

The present study aimed to find the relationship between body mass index and core muscle endurance. Many studies from many different countries have dealt with the prevalence of overweight, the risk factors for it, and the morbidity it causes, but no more than few have addressed the effects of unhealthy lifestyle on core muscle endurance.

So the current study was designed in order to find if a correlation exists between BMI and core muscle endurance in young adults.

MATERIALS AND METHODS:

A total of 80 Healthy individuals both males and females within the age group of 18-21 years subjects between the ages of 18 to 25 years were included for the study. Exclusion criteria for the study were low back pain, congenital anomalies, recent upper or lower limb injuries or inability to perform plank. Participants were explained about the significance and the purpose of the study and were asked to sign the informed consent form stating the voluntary acceptance to participate in this study. Complete physiotherapy assessment was taken before the study. Participants were evaluated using the following outcome measures;

BMI

BMI was evaluated using formula weight in kilograms divided by square of height in meters and individuals were categorized in various health status categories using quetelet index.

Plank Test:

Core muscle endurance was evaluated by plank test which was proven to reliable and valid test for assessing the core muscle endurance (11). Test was started with upper body supported off the ground by the elbow and forearms and the legs straight with the weight taken by the toes. The hip was lifted off the floor creating a straight line from head to toe. As soon as the subject was in the correct position, the stop watch was running. The test was over when the subject was unable to hold the back straight and the hip had lowered, time was documented with the help of stopwatch.

RESULT

Descriptive statistics was used to find out the frequency, percentage, mean and standard deviation from demographic data and variables studied. Data was tabulated using Microsoft office excel and analysed by Statistical Package for Social Science (SPSS) version 17. SPSS was used to create graphs and tables etc. Pearson's correlation was used to find out the correlation between BMI, aerobic fitness and strength measures in young adults. Probability values less than 0.005 were considered statistically significant and probability values less than 0.001 were considered highly significant.

A total number of 80 young individuals formed the study population. Out of the 80 subjects studied, 56 were male and 24 were female as shown in table 1

Table 1:-

TOTAL	MALE	FEMALE
80	56	24

TABLE 1:- shows total number of participants which was 80 with 56 males and 24 females.

Table 2:-

	N	Minimum	Maximum	Mean	Std. deviation
BMI(Kg/m^2)	80	13.50	28.20	21.19	2.85
Core muscle endurance(Sec)	80	12.00	220.00	55.93	32.17

TABLE 2 shows descriptive values of BMI and core muscle endurance values. The mean BMI was 21.19±2.85 kilograms/meter squares and mean core muscle endurance 55.93±32.17seconds.

Table 3:-

	N	Minimum	Maximum	Mean	Std. deviation
AGE(male)	56	18	21	19.60	1.05
BMI (Kg/m^2)(male)	56	15.60	28.20	21.91	2.62
Core muscle endurance(sec)(male)	56	12.00	220.00	64.46	34.74

TABLE 3 shows descriptive values for male participants.

Total number of 56 males with mean age 19.60±1.05 years, mean BMI 21.91±2.62 kilograms/meter square and mean core muscle endurance 64.46±34.74 seconds.

Table 4:-

	N	Minimum	Maximum	Mean	Std. deviation
AGE(female)	24	19	21	19.66	0.86
BMI (Kg/m^2)(female)	24	13.50	25.90	19.52	2.71
Core muscle endurance (sec)(female)	24	20.00	58.00	36.04	8.88

TABLE 4 shows descriptive values for female participants.

Total 24 females with mean age 19.66±0.86 years, mean BMI 19.52±2.71 kilograms/meter square and mean core muscle endurance was 36.04±8.88 seconds.

Table 5:- Correlation between BMI and core muscle endurance.

	BMI		RESULTS
Core muscle endurance	r	-0.018	NOT SIGNIFICANT
	P	0.875	
	N	80	

Table number 5 shows correlation between BMI and core muscle endurance which was statistically not significant with r=-0.018 and p=0.875.

DISCUSSION

Over a period of 1 ½ years (total study duration), a total number of 100 subjects were screened for the study out of which 80 subjects fulfilling inclusion criteria and willing to participate in the study were enrolled for the study. In present study, mean BMI was 21.1987 ± 2.85380. Mean BMI for males in present study was 21.91 ± .62 and for females 19.52 ± 2.71kg/m2. In a study done by S.C. Sindhu et al found mean BMI for males 21.24±4.06 and for females 20.72±4.09 among same age group that is 18-21 years (12). Mean value for core muscle endurance in current study was 55.93±32.17seconds with the mean values for male participants 64.46±34.74 seconds and 36.04±8.88 seconds for females, showing marked difference in male and female core muscle endurance values contributing to difference in structure.

The finding of the present study was that core muscle function negatively correlated with BMI which was statistically not significant. Ervin et al. studied the relationship of core, upper and lower body strength with body mass status in children and adolescents. They reported that increasing body mass negatively impacted on front bridge times in children and adolescent boys and girls. Though, their study was performed on a younger subjects (6-15 years old), their results were aligned with our findings (13). Study of Hazheer Rasif et al, observed a stronger correlation between the sum of skinfolds and core muscle function, compared with those of body mass and BMI (14). A previous study facilitates our finding in which the authors reported the negative impact of increased fat mass on postural stability. Core muscles play a vital role in postural stability. As the subjects of our sample comprised 70 percent of male participants and only 30 percent females, the test results could not draw significant results. This study also noticed a marked difference between mean values of males and females core muscle endurance time which may have resulted from the difference in trunk and lower limb muscle mass. Marras and colleagues found that males generally had larger trunk and lower limb muscle cross-sectional area as compared to females by using magnetic resonance imaging scan (15). More body fat mass in women would be another reason for this gender difference (14,15). As data from male and female subjects were not analysed separately, which is one of the limitation, our study could not draw significant findings.

There are limitations in the present study. As it is a cross-sectional study it cannot answer the cause-and-effect questions, such as whether decreased body fat mass would improve core muscle function. Also as there is marked difference in body structure and function in males and females, while analysing such data these differences must be considered with appropriate statistical solutions.

CONCLUSIONS

Present study concludes that BMI does not impact core muscle endurance in young adults.

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