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"AN ASSOCIATION BETWEEN FUNCTIONAL FITNESS, ABDOMINAL OBESITY AND TYPE 2 DIABETES IN MIDDLE AGED FEMALES"

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Abstract

Background; Functional fitness is defined as the development of functional training began with rehabilitation. This method is frequently used by chiropractors, physical and occupational therapists, and patients with movement impairments. Body mass index (BMI) 30 kg/m2 is used to determine obesity, which is described as an abnormal or excessive fat buildup that may be harmful to one's health. The six-minute walk distance (or 6MWD) is a widely used indicator of functional exercise capacity in both clinical practice and academic research. Performance assessments, such the six-minute walking test (6MWT), can reveal the restrictions in the cardiovascular and motor systems underlying the obesity-related disability. Low functional fitness level and abdominal obesity may lead to type 2 diabetes.

Methodology; This study was a observational study in which within subject design was used. The height , weight, BMI, hip waist circumference were recorded after this subjects were asked to perform plank for 30 seconds and, then subjects were asked to perform 6 min walk test and it was recorded. The data were analyzed by MS excel 2010 data analysis tool pack, excel analysis tool pack 2019. The dependent variables were summarized by mean , standard deviation , and the independent variables summarized by percentage and age is summarized by mean value.

Conclusion;In conclusion, according to the results of this study, core balance and flexibility are associated with abdominal obesity the most among the women elderly population. Other muscular strength performances had limited effects on abdominal obesity. Development of muscle strength in the elderly people should be emphasized and encouraged to maintain their functional abilities.

Keywords: Body mass index, waist-hip ratio, waist circumference, 6 minute walk test, diabetes mellitus

INTRODUCTION

Functional fitness is defined as the development of functional training began with rehabilitation. This method is frequently used by chiropractors, physical and occupational therapists, and patients with movement impairments. With the overarching goal of functional independence, interventions are created to include task and context specific practice in areas significant to each patient. In order to help patients get back to their lives or careers after an injury or surgery, for instance, treatments may involve activities that mirror what they did at home or at work. Therefore, rehabilitation would focus on heavy lifting if the patient had a job that required it frequently; moderate lifting and endurance would be the focus if the patient was a parent of young children; and endurance would be the focus of training if the patient was a marathon runner. However, after carefully considering the patient's condition, what he or she would like to accomplish, and making sure the treatment's objectives are reasonable and doable, remedies are created.Functional training is to modify or create workouts that make it easier and less risky for people to carry out daily tasks [1].Functional training combines multiple joint, dynamic tasks, constant base of support changes, and seeks to train muscles in coordinated, multiplanar movement patterns with the goal of enhancing function [2,3].

Body mass index (BMI) 30 kg/m2 is used to determine obesity, which is described as an abnormal or excessive fat buildup that may be harmful to one's health [4]. The BMI threshold for obesity in the Asian population is lower(27.5 kg/m2) [5]. Adipose tissue is anatomically distributed unevenly and in varied amounts throughout the human body [6].Abdominal or central obesity is characterized by an excessively large distribution of adipose tissue around the internal viscera of the abdomen [7]. Obesity and abdominal obesity both increase the risk of morbidities like chronic inflammation, insulin resistance, and lipid abnormalities, which can result in a number of noncommunicable diseases like cancer, cerebrovascular and cardiovascular (CVD) diseases, and both mortality and cancer [8,9,10]. In addition, regardless of BMI category, individuals with abdominal obesity have a higher risk of lifetime impairment and poor long-term survival [11,12].Due to an increase in sedentary behaviors, physical inactivity, and bad eating patterns, the prevalence of abdominal obesity is rising quickly [13]. In 2016, there were roughly 13% of adult people worldwide who were obese. According to estimates, roughly 41.5% of adults worldwide are abdominally obese [13]. It is a significant public health hazard in both upper-income and low-and-middle-income countries (LMICs), but it continues to be one of the least discussed health topics.

One of the earliest diseases that humans have ever known is possibly diabetes mellitus (DM). About three thousand years ago, an Egyptian book was the first to mention it [14]. The difference between type 1 and type 2 DM was made crystal obvious in 1936 [15]. In 1988 [16], type 2 diabetes mellitus was first identified as a part of the metabolic syndrome. Type 2 diabetes mellitus, formerly known as non-insulin dependent diabetes mellitus, is the most prevalent type of the disease and is characterized by hyperglycemia, insulin resistance, and relative insulin insufficiency [17].The interplay of behavioral, environmental, and genetic risk factors leads to type 2 diabetes [18,19].People with type 2 DM are more prone to a variety of short- and long-term problems, which frequently result in early death. Due to type 2 DM's prevalence, subtle start, and late identification, particularly in resource-poor developing nations like Africa, patients with this condition likely to have greater morbidity and mortality [20].

For the purpose of assessing functional ability, Balke created the 6MWT in 1963. The 6MWT is an easy-to-use test that only needs a 100-foot-long (30-meter) straightaway. It doesn't require any special equipment for exercise or technician training. A person's ability to walk the greatest distance possible in six minutes is measured using the 6MWD. A quick and affordable way to assess physical function and a key factor in determining quality of life is the ability to walk for a distance. This ability represents the capacity to carry out daily tasks. The Six-minute Walk Test is an illustration of a practical, straightforward functional walk test that simply requires the ability to work. It involves a

sub-maximal effort and is a type of clinical examination. The six-minute walk distance (or 6MWD) is a widely used indicator of functional exercise capacity in both clinical practice and academic research. Performance assessments, such the six-minute walking test (6MWT), can reveal the restrictions in the cardiovascular and motor systems underlying the obesity-related disability[21]. The test is increasingly used in clinical practice because it offers useful data on daily physical performance and can be used to evaluate any issue that affects walking ability (ATS, 2002). The reliability and validity of the 6MWT have been established in people with obesity in recent study, and it is a safe, straightforward, well-standardized test that is simple to apply in clinical settings [23,24]. Children with congenital cardiac disease, cystic fibrosis, and healthy children have all been observed to respond favorably to the 6MWT[25]. 39% of persons 18 years and older who were overweight in 2016 (39% of men and 40% of women). 11% of males and 15% of women make up the global adult population, or roughly 13%.

The Timed Forearm Plank Test, sometimes referred to as the Prone Bridge Test, is an affordable, quick, and easy fitness test of core muscle power. It is also a great method for boosting the strength of the weak core muscles. [26] The plank test evaluates the back/core stability muscles' capacity for control and endurance. [26,27] This test has a number of advantages, including the fact that it is inexpensive, simple to do, and aids in the development of strength by comparing results to the individuals' normal levels.

MATERIALS AND METHODS

This study was a observational study in which within subject design was used. Ethical approval was obtained from the ethical board of integral university integral institute of allied health science and research, department of physiotherapy . all the patients were informed about the objectives and agreed to voluntarily participate in the study.

Subjects :

Seventy subjects (females) were selected for this study .these subjects were abdominal obese that were found from lucknow local area.

Inclusion Criteria:

inclusion criteria was based on patient able to walk without any support , female patient, patient should meet the criteria of abdominal obese and type 2 diabetes..

Exclusion Criteria:

Exclusion criteria includes any kind of medical emergency , any kind of injury or disease within past two weeks , other factor which may effect the efficacy of test , any lower limb injury, hypertension.

Variables:

Independent variables
Functional fitness
Back scratch test
Chair sit and reach test
Hip –waist circumference
6-mint walk test
Plank (30 sec)
Dependent variables
Abdominal obesity
Type 2 Diabetes

Procedure:
The subjects were taken on the basis of selection criteria that is the subject should be abdominal obese that was measured using the inch tape if the subject was meeting the selection criteria . subjects were explained the procedure of the study as well as protocols of the study. The height , weight, BMI, hip waist circumference were recorded after this subjects were asked to perform plank for 30 seconds and, then subjects were asked to perform 6 min walk test and it was recorded . the subjects were asked to perform two tests to check their functional fitness back scratch test and chair sit and reach test was recorded for both upper limb and lower limb simultaneously. Before all this subjects were asked to sign consent form and everything was explained.

Data collection:
Prior to study , all participants had height , weight , BMI , hip waist circumference was measured . Each subjects was given consent to be signed .At the conclusion of the test 6-minute walk test, plank for 30 sec, back scratch test and chair sit and reach test was recorded.

Outcome measures
Hip –waist circumference
Back scratch test
Chair sit and reach test
Plank (30 sec)
6-mint walk test

Equipments
Pen
Chair
Ruler

Data Analysis
All statistical data were analyzed by the professional statesian. The data were analyzed by MS excel 2010 data analysis tool pack, excel analysis tool pack 2019. The dependent variables were summarized by mean, standard deviation, and the independent variables summarized by percentage and age is summarized by mean value

Result
Among the 150 participants in this study 70 females were selected for further study on the basis of inclusion criteria, with mean age of participants was (47years).the two sample T-test revealed that there were significant difference of functional fitness in abdominal obesity. There is significant difference in plank holding time in abdominal obesity. There is weak significant difference of 6-mint walk test on hip waist circumference. There is no significant difference back scratch test [rt&lt both] in abdominal obesity. There is significant difference in chair sit and reach test.The association of multidimensional functional fitness score with type 2 diabetes was significantly stronger than obesity parameters in samples.

	BMI		**HIP-WAIST CIRCUMFERENCE (cm)**	
	r- value	**p- value**	**r- value**	**p- value**
6-MINT WALK TEST	-0.801713	0.01432	-0.632446	0.06789
PLANK (30 SEC)	-0.732546	0.04932	-0.713224	0.00135
BACK SCARTCH RT (cm)	-0.121449	>0.05	0.10966246	>0.05
BACK SCARTCH LT (cm)	0.08949389	>0.05	0.1259753	>0.05

CHAIR SIT AND REACH TEST RT (cm)	-0.0858869	0.051342	0.09070188	0.04986
CHAIR SIT AND REACH TEST LT (cm)	-0.0726812	>0.05	0.11996172	>0.05

Table1: Showing correlation between r-values and p-values were statistically significant.

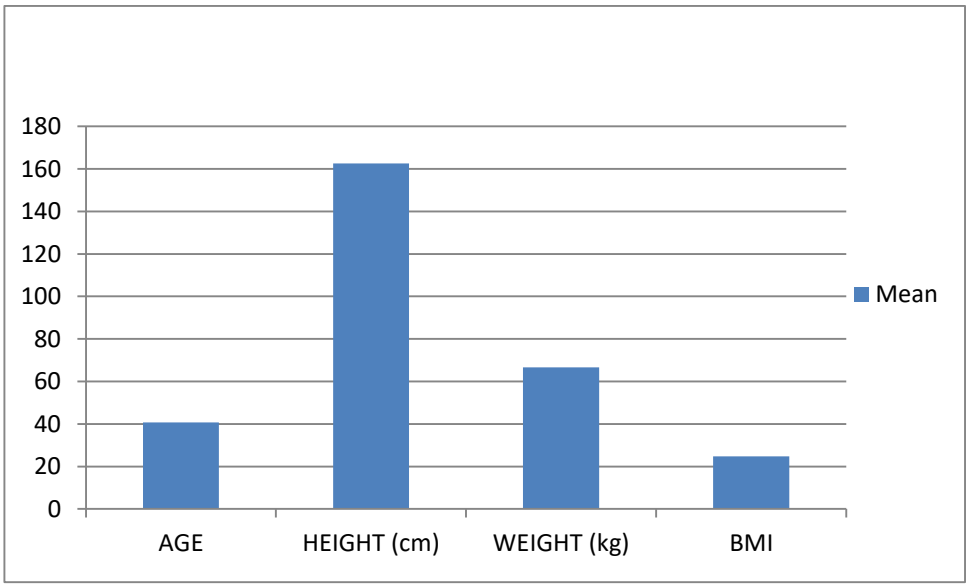
Demographic data

Table2: Comparison of mean and standard deviation of demographic data

Age	Height	Weight	BMI
Mean ± SD	Mean +/- SD	Mean +/- SD	Mean +/- SD
40.74±6.73	162.6±7.81	66.6±11.2	24.8±4.54

Table 3: Mean and standard deviation representing demographic data

demographic data	age	Height	weight	BMI
Mean	40.74	162.58	66.61	24.77



Graph 4.1: the bar graph showing the mean of demographic

Discussion

This study synthesized the relationship between functional fitness test performance and abdominal obesity risk among healthy middle age females. our result contained the data from 70 females and indicated that there is intercomparison between functional fitness test and age of female firstly, the results shows significance difference in lower limb flexibility test (chair sit and reach test).mean is 2.34 which shows significance difference in test because females are more flexible than males and can do activities without any stress. It is understandable that physically untrained populations commonly perform lower-limb and core muscle strength exercises, which are fundamental for body balancing. Some studies have implied that functional fitness exercise training is positively associated with body balance abilities among elderly people. Moreover, studies have indicated that body balance ability is negatively associated with abdominal obesity[13].There is no significantdifference in upper limb flexibility test (back scratch) the upper extremity muscular endurance scores of older adults with poor activity and physical fitness scores revealed obesity as a critical indicator of health-related physical fitness performance.

But the subjects were early middle age and females are flexible so they can perform test.6 MWT and lipid profile are frequently used to assess the severity of obesity and level of physical fitness,

which are less expensive and easy to perform. In this study, we evaluated the exercise capacity in different groups of obesity and compared it with healthy controls. In the present study, there was a decrease in 6 MWD in obese compared to controls, and this decrease in walk distance was statistically significant. where the 6 MWD correlated significantly ($P < 0.05$) with age, height, and BMI. Our study shows that increase in BMI leads to decrease in 6 MWD covered or there occurs less exercise performing capability with increasing body weight. This decrease is due to increase in work of breathing and decreased respiratory compliance leading to further complications. Physiological cost of walking is directly associated with weight, BMI, 6 MWD in overweight individuals [28].There is impact of 6-mint walk test on abdominal obesity. The major findings are first that there was significant difference between the weight groups in 6-mint walk test Third, walking pattern parameters were significantly associated with anthropometric, health and socio-economic variables. There is significant effect of walking on abdominal obesity. There is no significant effect of determinants of gait on abdominal obesity. There is no effect on step length and stride length on abdominal obesity. Overweight participants had similar gait patterns with normal weight participants for all mechanical energy usages, while elongated gait phases such as ankle 1st plantar flexion duration and stance duration were more similar between overweight and obese participants in maximum-speed walking [29].

This study shows that the correlation is negative, i.e., as the Body Mass Index increases the plank holding time i.e., the core muscle stability decreases and vice versa. As weight status increased, children and adolescents had more difficulty performing tests that involved moving their body mass or holding it in position. Correlation between body mass index and plank holding time in rural children has a negative impact on postural stability. Ervin et al. studied the relationship of core, upper and lower body strength with body mass status in children and adolescents.Despite routine fitness testing, being overweight and obese is prevalent in the U.S. military, law enforcement, and firefighter populations. Individuals classified as overweight or obese may display decreased athletic performance. Obese firefighters displayed 27% lower back and core endurance scores than their non-obese counterparts in a study by Mayer et al. . In the current study, 82% of the sample were categorized as overweight and 10% were considered obese per BMI standards. Additionally, negative correlations were observed by Mayer et al. between BMI and body fat percent with core and back endurance [30].

There are significant changes in holding plank position for 30 seconds. Obese subjects cannot hold the plank position for 30 seconds because of core weakness and abdominal obesity. Moreover, studies have indicated that core balance ability is negatively associated with abdominal obesity.

The association of functional fitness score and abdominal obesity with type 2 diabetes was significantly strong. Females with type2 diabetes demonstrate low functional capacity and abdominal obesity that shows significant relationship between functional fitness type2 diabetes and obesity in females.Regular training increases muscle capillary density, oxidative capacity, lipid metabolism, and insulin signaling proteins, which are all reversible with detraining. Both aerobic and resistance training promote adaptations in skeletal muscle, adipose tissue, and liver associated with enhanced insulin action, even without weight loss. Regular aerobic training increases muscle insulin sensitivity in individuals with prediabetes and type 2 diabetes in proportion to exercise volume. This may help to increase the functional capacity and manage the type2 diabetes. [31].

Limitation of the study

The study is limited to small sample size which only includes female population, further studies can be performed on large sample size including both gender, also this study only included hip-waist circumference, other indicators of abdominal obesiy like skin fold measurements could be taken for more accuracy in results.

CONCLUSION

The result of this study suggests that core balance and flexibility are associated with abdominal obesity, most common among the elderly female population. Other muscular strength performances had limited effects on abdominal obesity. Development of muscle strength in the elderly people should be emphasized and encouraged to maintain their functional abilities.

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