



ASSESSMENT OF BALANCE IN OBESE WOMEN WITH RESPECT TO GRADES OF OBESITY

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ABSTRACT

Background: Obesity have direct impact on balance. High BMI results in postural sway disabilities. Deposition of fats in joints or muscles changes the body’s structure and hence requires additional efforts to maintain the correct posture and balance. Various studies show effects of obesity on balance but very few were taken to show its effects with respect to grades of obesity.

Materials and Methods: In this study, effects of static and dynamic balance with respect to grades of obesity were studied. 60 samples were collected for the study with 20 in each group i.e Grade 1 ,Grade 2 , Grade 3 obesity and both static and dynamic balance were checked in each group. Single limb stance was used for static balance and time up and go test was used for dynamic balance.

Result : The results showed that time taken to maintain static balance by grade 3 obese women was less as compared to grade 1 and grade 2 obese women.

And time taken to maintain dynamic balance was more than grade 3 women that grade 1 and grade 2 obese women

Conclusion : Therefore the above study showed that as the BMI increase the risk of postural disabilities also increases and grade 3 obese women are at high risk for instability than grade 1 and grade 2 obese women.

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INTRODUCTION

Balance is a generic term used to describe the dynamic process by which body’s position is maintained in equilibrium. Equilibrium means that the body is either at rest or in steady state motion. Balance is greatest when body’s centre of mass or centre of gravity is maintained over the base of support.It is complex motor control task involving the detection and integration of sensory information to assess the position and motion of the body in space and execution of appropriate musculoskeletal responses to control body position .¹

Types of balance control are

Static balance is ability to maintain the body in some fixed posture .Static balance is ability to maintain postural stability and orientation with centre of mass over the base of support and body at rest. ²Dynamic balance is ability to maintain postural stability and orientation with centre of mass over the base of support while body parts are in motion.³

Obesity

According to the World Health Organization (WHO), obesity is one of the most common, yet among the most neglected,

public health problems in both developed and developing countries.³ According to the WHO World Health Statistics Report 2012, globally one in six adults is obese and nearly 2.8 million individuals die each year due to overweight or obesity⁴ India, with 1.2 billion people is the second most populous country in the world and is currently experiencing rapid epidemiological transition. Under nutrition due to poverty which dominated in the past, is being rapidly replaced by obesity associated with affluence⁵. Industrialization and urbanization also contribute to increased prevalence of obesity. Studies from different parts of India have provided evidence of the rising prevalence of obesity.⁴

Table 1 Grades of obesity

Classification	BMI kg/m ²
Underweight	<18.5
Normal Weight	18.5 – 24.9
Overweight	>25
Obese	>30
Grade 1	30 – 34.9
Grade 2	35 – 39.9
Grade 3	>40

Obesity is associated with increased risks for atherosclerotic cerebrovascular disease, coronary heart disease, colorectal cancer, hyperlipidemia, hypertension, gallbladder disease, and diabetes mellitus, as well as a higher mortality rate.⁶ In the last

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half century obesity has become an epidemic within the developed world, where it is estimated that over 1.5 billion adults are overweight. Nearly 300 million women are now thought to be clinically obese⁷. Being too fat (adiposity) causes significant health problems not only for individuals but also for families and communities who have to bear the cost of managing the associated medical conditions, often utilising a major portion of the total health budget (WHO, 2014). Adiposity has particular consequences for women and for reproductive health.

MATERIALS AND METHODS

60 obese women participants were selected and grouped in 20 each in group according to their BMI in grade 1, grade 2 and grade 3 obesity

Inclusion Criteria

1. Participants who are willing to participate
2. Age group 35 - 45 year old women
3. BMI more than 30kg/m²

Exclusion Criteria

1. Acute Musculoskeletal disorder
2. Neurological disorders
3. Vestibular disorders
4. Acute Cardiovascular disorders

Procedure

1. Women willing to participate were included in the study and were screened as per inclusion and exclusion criteria.
2. Women with BMI more than 30kg/m² were taken using convenient sampling method.
3. Before starting the study a written informed consent form was taken of each subject in the language best understood.
4. Demographic data was taken. Procedure of performing all the two test had been explained.

To assess static balance

One-Legged Stance Test was examined for 45 healthy females 55 to 71 years old and found to have “good” intraclass correlations coefficients (ICC range = .95 to .099). Within raters ICC ranged from 0.73 to 0.93.

Single limb stance test

Patients were asked to stand on one leg without shoes with arms placed across the chest without letting legs touch each other.



To assess dynamic balance

Time up and go test

Intratester and intertester reliability (ICC) have been reported as high, in elderly populations, from 0.92-0.99. Construct validity has been shown by correlating TUG scores with gait speed (Pearson r = 0.75), postural sway (Pearson r = -0.48).

In this test, the participants were asked to stand up from sitting on a chair that was 45 cm high without using their arms, then walk fast in a straight line for 3m, go around a cone, return and then sit again.

Subjects were asked to perform the test three times and best of the three reading was taken.



Interpretation -Ten seconds for the test is considered as a normal healthy adult performance; between 10.01 and 20 seconds is considered normal for frail elderly or disabled; however, a period above 20 seconds indicates the need to observe the level of functional impairment of subject.²

Accordingly readings were taken for each subject with each test. The data was collected and analysed and result was prepared.

RESULT

Table 2 Assessment of static balance using single limb stance test

	Grade 1	Grade 2	Grade 3
Single Limb Stance Test Mean	21.1	22.2	12.1
Standard Deviation	9.8	7.6	7.27

Inference – The above results showed that time take for single limb test time was more in grade 1 > grade 2 > grade 3.

Table 3 Assessment of dynamic balance using time up and go test.

	Grade 1	Grade 2	Grade 3
Time UP and go Test Mean	11.04	12.4	13.2
Standard Deviation	1.14	2.47	1.78

Inference - The above results showed that time taken for time up and go test was more in grade 3> grade 2> grade 1

DISCUSSION

Balance is a generic term used to describe the dynamic process by which body's position is maintained in equilibrium. Equilibrium means that the body is either at rest or in steady state motion. Balance is greatest when body's centre of mass or centre of gravity is maintained over the base of support¹. Maintaining balance involves a complex interaction of multiple intrinsic and extrinsic factors.¹⁶

Obesity identified as a nutritional disorder, thirty years ago, still continues to be one of the most important, yet preventable health hazards. According to the World Health Organization (WHO), obesity is one of the most common, yet among the most neglected, public health problems in both developed and developing countries³.

The aim of the study was to assess both static and dynamic balance with respect to grades of obesity in women between age of 35 – 45 years. Individuals were assessed and divided according to their BMI in 3 groups i.e. Grade 1 obese, Grade 2 obese and Grade 3 obese. Both static and dynamic balance was assessed using single limb stance test and time up and go test respectively. Total 60 samples were collected, and according to BMI participants were divided in 20 samples in each group i.e. Grade 1, Grade 2 and Grade 3. Mean was calculated for both the test for each group and results were interpreted.

The result showed that static balance was more affected in grade 3 obese women than grade 2 and grade 1. Similarly, dynamic balance was more affected in grade 3 than grade 2 and grade 2 more than grade 1.

These would be because obesity changes the way body moves by changing body's anthropometry which interferes with integration of joints and muscles. It increases need for attentional resources to maintain postural stability. This may lead to compromised balance that is used to maintain stability in different tasks.

Del Porto H *et al* (2012) undertook a study showed increases in body weight can cause changes in body structure and posture therefore resulting in change in position of centre of gravity¹⁷. It shifts anterior to base of support due to additional mass causing difficulty to maintain balance. Therefore, there is direct relation of obesity and balance. So, as the BMI increases there is change in body structure which affects the balance.

Martin Simoneau *et al* (2012) undertook a study to see impact of obesity on balance control in community dwelling older women having normal weight, overweight and obese population, results suggested that obesity has negative impact on the capacity of older woman to adequately use of proprioceptive information for postural control.

Therefore, grade 3 women has greater instability in both static and dynamic balance as compared to grade 2, and grade 2 women has more balance instability a compared to grade 1 obese women.

CONCLUSION

The present study concluded that both static and dynamic balance is more affected in grade 3 than grade 2 than grade 1.

Limitation

The limitation of this study was that the sample size was small.

Clinical Implication

The result of this study showed that there is more balance instability in both static and dynamic balance in grade 3 obese women than grade 2 and grade 1, therefore grade 3 obese women should undergo more vigorous balance training protocols for improving their balance and stability.

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