



## PREVALENCE OF KNEE JOINT PROPRIOCEPTION AFFECTION IN OBESE MIDDLECLASS HOUSEWIVES

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Obesity, proprioception, objective joint position sense test(OJPS)

### ABSTRACT

**Aim:** To assess the knee joint proprioception affection in obese middleclass housewives.

**Background:** Proprioception is the sensory feedback contributing to muscle sense, postural equilibrium, and joint stability. It is one of the most important components of sensorimotor system that contributes to postural control. Obesity is commonly seen in obese middleclass housewives within 30-45 years of age group because of less household and physical activity and more sedentary lifestyle. Obesity causes overloading on joint which affects the proprioceptors which causes postural instability and displacement of centre of pressure (COP). This causes impaired balance and risk of fall is thus seen to increase.

**Methodology:** Primary data collection was done using convenient sampling. 50 obese housewives with BMI 30-39.9 kg/m<sup>2</sup> and belonging to middleclass socioeconomic group (kuppu-swamy score: 11-25) were screened using Objective joint position sense test(OJPS).

**Results:** Objective joint position sense test showed proprioception deficit in obese middleclass housewives.

**Conclusion:** The study concluded that there is proprioception affection in obese middleclass housewives.

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### INTRODUCTION

Obesity is characterised by an increase in total body fat and is defined by a body mass index (BMI)>30 kg/m<sup>2</sup>, based on definition used by WHO. Obesity is one of the major health problems in many parts of the world due to rapid urbanization and its incidence is rising at an alarming rate. It itself is not an acutely lethal disease, but is a significant risk factor associated with range of serious non-communicable diseases.

Presently, the incidence of obesity and its co-morbidities are increasing rapidly in India. It is observed that increased levels of obesity are primarily associated with transformation from rural to urban lifestyle. In 2014; overall about 13% of world's adult population (11% of men and 15% of women) were obese. Worldwide prevalence of obesity is more than doubled between 1980 and 2014. According to WHO report on global epidemic, an estimated 300 million are clinically obese.

Obesity is commonly seen in housewives belonging to middleclass socioeconomic group within age ranging from 30-45 years. This is because of less household and physical activity and more sedentary lifestyle.

Proprioception is defined as the sensory feedback contributing to muscle sense, postural equilibrium, and joint stability.

Proprioceptors are mechanoreceptors located in the skin, muscle, tendon, ligament and joint capsule. Proprioception is one of the most important components of sensorimotor system that contributes to postural control. Proprioception is important for generating coordinated movements, such as reaching, grasping, maintenance of static balance and locomotion. The proprioceptive mechanism is part of a feedback-feed forward system initiated by the activation of mechanoreceptors. If joint proprioception is impaired, it may lead to defect in goal directed movements, prehension, accurate aiming tracking movements.

It was observed in the previous studies that proprioception is majorly affected in obese population. Obesity causes overloading on joint which affects the proprioceptors which causes postural instability and displacement of centre of pressure (COP). This causes impaired balance and risk of fall is thus seen to increase.

### MATERIALS AND METHODS

#### Study Design

Type of study – observational study

Duration of study – 1 year

Location – metropolitan city

#### SAMPLE DESIGN

Sample size – 50

Sample population – obese middleclass housewives

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Sampling – convenient sampling  
 MATERIALS USED  
 Universal goniometer  
 Pen  
 Notepad

**Inclusion Criteria**

(1)Age – 30 to 45 years (2) Socioeconomic status – middle class (According to Kuppu Swamy Scale – score should be between 11 to 25)(3) Obese housewives with BMI 30 to 39.9kg/m<sup>2</sup> (BMI: grade 1 and 2)(4)Patients willing to participate

**Exclusion Criteria**

(1) Knee osteoarthritis (2) Diabetes mellitus (3) Hypertension (4) Neuropathy (5) Lower limb fractures (6) Varicose veins and DVT

**Procedure**

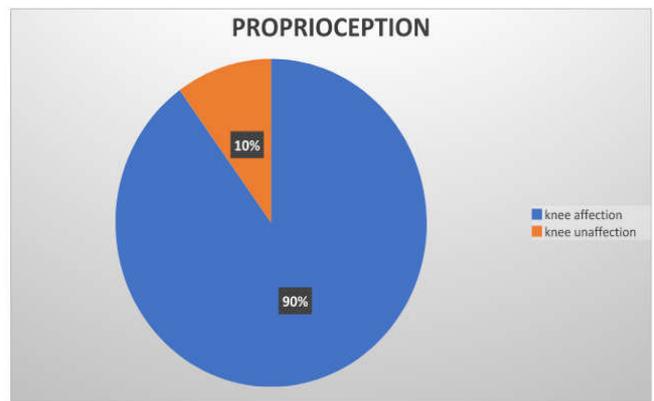
Screening of participants was done as per the inclusion criteria. The procedure of the study was explained to the participants in detail. A written consent was taken from the subject in the language best understood by them.

**Objective Joint Position Sense Test (OJPS)** – The individuals were asked to lie prone with feet out of the plinth. The subject was asked to flex the knee of testing limb to the predetermined target angle/position and let him feel that angle or position for 5sec. Then the knee to target angle passively. The angle was measured using universal goniometer. The subject was asked to move the limb to that target angle and the perceived angle was measured. The angular difference was recorded.



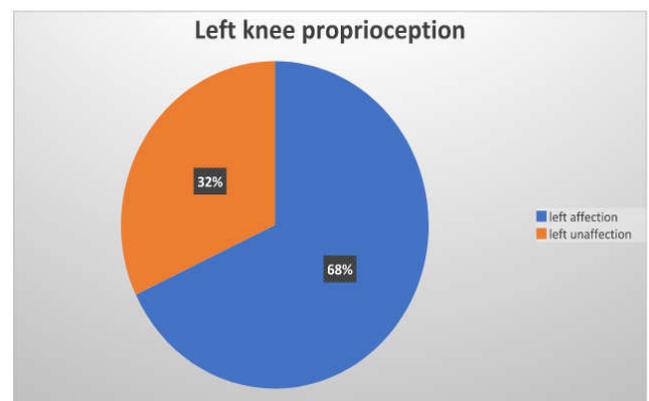
**RESULT**

The study concluded that there was high prevalence of knee joint proprioception affection in obese middleclass housewives within age group of 30-45 years. Obesity causes overloading of knee joint in females which alters the sensitivities of mechanoreceptors surrounding the joint resulting in affection of proprioception.

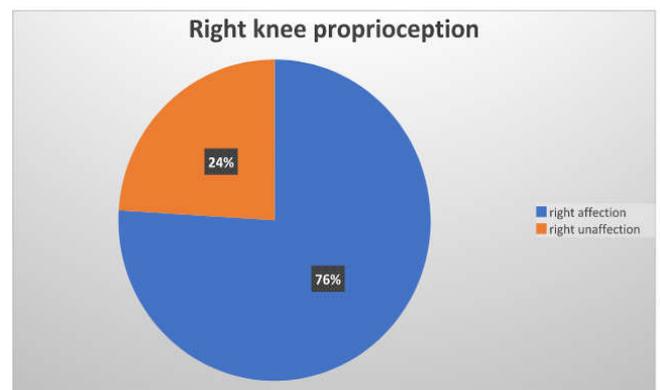


The above diagram shows about 90% knee proprioception affection in obese housewives.

The below diagram shows about 68% knee proprioception affection on left side in obese housewives.



The below diagram depicts 76% right knee proprioception affection among obese housewives.



**DISCUSSION**

The study aimed to assess the prevalence of knee joint proprioception affection in obese middleclass housewives by OJPS test.

This study documented that there was 90% knee joint proprioception affection among obese middleclass housewives of which 76% was observed affection in right knee and 68% affection in left knee.

Age specific evaluation of obesity was found to be higher in age group 30-45 years than below 30 years and between 40-60. The study by Yuan He *et al.* (2016) has shown the prevalence of overweight and obesity to be more among females of

reproductive age (20-49 years) than the adolescents females as per the WHO criteria.

The prevalence of obesity is increasing world-wide and this is likely to be associated with an increasing prevalence of diabetes mellitus and cardiovascular disease. Changes in life-style, in particular a reduction in physical activity and increasing consumption of foods of high energy density are likely to account for these changes. Meanwhile, increasingly sedentary life-styles have affected most societies. Due to which there is high prevalence of obesity and overweight in middleclass housewives compared to other groups.

The findings of this study suggest that there is more proprioceptive deficit in dominant lower limb (right) than the non-dominant limb (left) indicating more sensitivity of mechanoreceptors of dominant limb. But the study done by Mutlu Cug *et al.* (2016) showed that proprioceptive and postural control symmetries doesn't exist between the limbs.

Wang *et al.* (2008) showed a relationship between obesity and proprioception deficit. The result of our study confirms the findings of the Wang *et al.* report and suggests that similar to the poorer proprioception acuity observed in obese children, there is a proprioception deficit in the knee joint movements of obese housewives. Hannah C. Del Porto *et al.* (2012) showed that increased body weight and mass modify how the limbs and whole body create and react to forces. Excess adiposity also interferes with the interaction of functional capacity and postural balance. The propensity toward increased fatness contributes to the anterior shift of the body's COM. This modification threatens stability by placing the line of gravity closer to the boundary of the body's BOS.

The exact mechanism underlying the observed deficit in postural stability and proprioception acuity in obese is unknown; however, it has been suggested that the change in stability is primarily affected by an excess body size and weight (Hills & Parker, 1991; McGraw *et al.*, 2000) It has been hypothesized that dysfunctional articular mechanoreceptors, which are prevalent in severe OA knees, may lead to impaired proprioceptive accuracy. However, there is no evidence to confirm this hypothesis. Muscle weakness or atrophy may decrease muscle spindle sensitivity, thereby possibly impairing proprioceptive accuracy.

The role of proprioception is fundamental in maintaining postural stability and joint stabilization during both dynamic and static postures. Fitzpatrick R. *et al.* (1994) explained that signals from proprioceptive receptors located in the lower extremities are essential for detecting the postural sway (Fitzpatrick *et al.*, 1994) Joint receptors include Pacinian corpuscles, Ruffini endings, and free nerve endings are distributed throughout the articular structure. It is believed that muscle spindles are the most important proprioceptive receptors of the knee (Lephart *et al.*, 1997; Sharma, 1999). Mechanical deformation resulted by the movements activate these receptors to give information concerning joint angles, joint motion velocity and the limb relative movements. Different mechanoreceptors demonstrate adaptive properties depending on a particular stimulus. They provide the CNS with continuous feedback as to the instantaneous status of each muscle and also serve as a protective function by inducing relaxation in that muscle that is being overstretched through polysynaptic inhibitory pathway.

According to the recent studies put forward mechanoreceptors sensitivities may vary possibly differ in heavier subjects. Greater body mass in heavier individuals result in hyperactivation of mechanoreceptors leading to diminished sensitivity.

It is unknown whether the alteration in postural stability in obese people is a consequence of excessive joint loading that affects the proprioceptors in the joints of the lower extremities, or the observed instability in obese individuals is the mere influence of larger body mass.

The decline in proprioception may be an important contributing factor to the change of postural control or an adaptation to lower extremity biomechanics in obesity. Therefore, a decreased postural control capacity in obese housewives may not only be related to the alterations in their excess body size and weight but may also be related to the alterations in their proprioception of contributing to postural control capacity.

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