ASSESSMENT OF KNEE PROPRIOCEPTION AMONG POSTMENOPAUSAL TYPE II DIABETIC FEMALES

Nida Naveed[*], Hamna Afzal[**], Momna Asad[*], Ahsan Javed[**], Faizan Hamid[**]

[**] Faculty of Department of Allied Health Sciences, University of South Asia, Cantt Campus, Lahore, Pakistan
[*] University of South Asia, Lahore cantt campus, Lahore Pakistan

ABSTRACT

Background: It has become a global issue due to the rapid rise in frequency of diabetes mellitus. Falling is more common among individuals who suffer from type II Diabetes Mellitus (T2DM). This might be brought on by neuropathy's impairment of sensory function. Diabetes problems including heart disease, blindness, renal disease, and depression are more common in women with diabetes than in males. For accurate neuromuscular control when making movements, proprioception is required. The proprioceptive feedback of the lower extremities, in addition to the ocular and vestibular senses, offer the essential sensory information required to maintain and manage posture. Proprioception, which includes sense of location, the vibratory perception, the sensorimotor input is lost, and improper motor response, is decreased in peripheral neuropathy due to diabetes.

Objective: The purpose of this study was to evaluate knee proprioception among post-menopausal type II diabetic females

Materials and Methods: This cross-sectional observational study has opted to assess knee proprioception among post-menopausal type II diabetic females. A total of 369 participants were assessed through the joint position sense (JPS) technique. The frequency and cross-tabulation tests were analyzed through IBM SPSS**. Results:** This study was conducted on 369 post-menopausal females belonging to various professions with their consent to assess knee proprioception among post-menopausal type II diabetic females. The population's mean age was found to be 57.15 years old. The population's mean weight was found to 73.99 kg. The population's mean height was 5.2144. The BMI of most females were overweight. 138 females have normal JPS of right knee while 231 females have abnormal (JPS) of right knee, 143 females have normal JPS of left knee and 226 females have abnormal JPS of left knee.

Conclusion: The observational cross-sectional study concluded that post-menopausal type II diabetic females have greater ratio of decrease knee proprioception in both right and left knee which can be due to degenerative changes.

Index Terms- Proprioception, Physiotherapy, Type II Diabetes Mellitus, Post-menopausal Females, Joint Position Sense (JPS)

I. INTRODUCTION

Diabetes mellitus type II (T2DM) is a disorder of metabolism illness appertaining by insulin resistance and beta-cell dysfunction that can cause a wide range of diabetic complications and morbidities and have a destructive impact on patient's aspect or condition of life.(1) Diabetes mellitus prevalence is rising at an alarming rate, making it a global issue. Glycated hemoglobin (HbA1c), a commonly used measurement, is used to assess glycemic management. It is regarded as a key indicator of how likely diabetes people are to develop problems. Individuals suffering from diabetic mellitus type II (T2DM) had higher risk of falling, according to recent research. This might be brought on by neuropathy's impairment of sensory function. A decline in proprioception increases the chance of falling since proprioception is crucial in maintaining body stability.(2) Type 2 Diabetes Mellitus individuals typically have poorer control of balance during activity than people who are not affected with diabetes. In comparison to non-diabetics, patients with Diabetes have worse quiet stance balance may become more unbalanced during fluctuations. Additionally, closing one's eyes while in a quiet stance makes it harder to maintain balance. Additionally, these patients exhibit decreased clearance of toes during walking, which could lead to the elevated risk of slips.(3) A joint or extremity's location and motion in space are perceived, consciously or

unconsciously, through proprioception. Mechanoreceptor disruption in diseased joint structures or modifications to muscle receptors resulting from muscle alterations brought on by osteoarthritis may act as mediating mechanisms for proprioception deficiencies.(4) Proprioception may be impacted by sensory-motor impairments brought on by Type 2 diabetes. Proprioception, which is derived from receptors for sensory information within the muscles, joints as well as skin, are perception of movement and position of different body segments. For precise neuromuscular control to be achieved when moving, proprioception is required.(5) The primary Sensational information needed to maintain and manage posture is provided by the ocular and vestibular senses in combination with the proprioceptive feedback of the lower extremities. In actuality, diabetic people have a significant risk of falling. Falls have negative effects on mobility, activity avoidance, institutionalization, mortality, and increased social and financial burden.(6) The most crucial pillars of the family and society are women. Menopause is one of the most significant stages in a woman's life. Numerous physiological changes are brought about by it, and the changes in hormonal levels—particularly the low levels of estrogen—have a significant impact on bone health. Women typically reach menopause between the ages of 46 and 52.(7) Twelve months of amenorrhea in a row, the menopause is defined as the confirmed menstrual cycle discontinuation permanently. Signs of menopause include vasomotor symptoms dysfunction like flashes of heat and nocturnal sweats, as well as urogenital ones like vaginal dryness, bladder and sexual dysfunctions, physical and mental exhaustion, and sleep issues. The changes during menopause are linked to an increase in body weight and modifications to body composition. According to reports, women over 40 had a higher chance of falling if they had more co-morbidities, and women over 60 had an even higher risk if they had more co-morbidities. Falling is a major cause of fractures and fall-related injuries in postmenopausal women due to the increased risk of falling and the development of a decline in bone mineral density and strength correlated with menopause. Fall risk is correlated with postural instability, as well as stability-based measures has been demonstrated to anticipate postmenopausal women's falls between the ages of 50 and 65. Increases in intra-abdominal fat, overall body weight, and the acceleration of age-related muscle mass and strength loss are all factors that may have an impact on functional mobility during the menopause. Mobility that is functional is an effective way to evaluate Stability in motion when carrying out regular tasks, making it a crucial part of reducing falls as well as impairment and dependency.(8) Proprioceptive receptors can be found in muscle, and joint tissues, and postmenopausal women experience many hormonal changes in these tissues. These tissues appear to be deteriorating after menopause, and may impair proprioception. High blood sugar harms nerves, and concerns with proprioceptive sharpness may be brought on by afferent nerve degeneration. The study aims to assess proprioception among post-menopausal type II diabetic females

II. MATERIAL AND METHODS

Observational cross-sectional study was conducted in Mayo Hospital, Fauji Foundation Hospital, Lady Aitchison hospital, Musarrat Razzaq Hospital, The government school for boys and girls bhogiwal road, Lahore, The government school for girls singhpura, Lahore. And data was collected over 6 months with a sample size of 369. The participants included were the menopausal females aged between 50 to 65 years, participants pre-diagnosed with type II diabetes Mellitus females and participants willing to participate. The participants excluded were mentally deficit patients, patients with peripheral vascular disease, and cerebrovascular disease.(9) participants with recent history of knee surgery(9) , participants with a history of or on treatment with any intraarticular injection to the knee joint(9), participants with diabetic neuropathy, participants with neurological or musculoskeletal disease and participants with lower extremity fractures and dislocation last 6 months and participants with lower extremity amputation.(10) Sampling technique were non-probability convenient sampling. Tool used to assess knee proprioception was joint position sense (JPS) with a help of universal goniometer. In a quiet environment, the participants were blindfolded and seated on a high chair with their lower legs relaxed over the edge of the seat. A Universal Goniometer (360 degrees) was attached to the lateral aspect of the participant's knee using double-sided sticky tape. The fulcrum, the fixed arm of the goniometer and the movable arm were aligned. 90-degree of knee

flexion considered as 0˚ (starting position). The participants were instructed to slowly straighten their knee and told to stop when 30-degree knee extension angle was reached. At this 'test angle' for approximately five seconds the participants were asked to maintain and mentally visualize the position of their knee. They were then told to relax, and after three seconds the patients were asked to reproduce the test angle. The 'reproduced angle' was recorded.(11) The interpretation was as the joint position sense the value more than 4.5 degrees denotes abnormal knee proprioception whereas the value less than 4.5 degrees denotes normal knee proprioception

III. RESULTS

The data analysis was done on SPSS, v22, after analysis of the socio demographic data the population's mean age was found to be 57.15 years old. The population's mean weight was found to be 73.99 kg. The population's mean height was 5.2144. The total population of 369 females out of which the BMI of 5 females was underweight (<18.5), 81 females were in the range of normal weight (18.5-24.9), 106 females were in the range of overweight (25.0-29.9), and 106 females were in the spectrum of obese class I (30.0- 34.9), and 46 females was in the spectrum of obese class II (35.0-39.9), and 25 were in obese class III (>40). From the total population, the occupation of 289 females were housewives, 29 females were teachers, 30 females were housemaids, 13 females were cooks, and 8 females were retired nurses. From the total population, 138 females have normal joint position sense of the right knee and 231 females have abnormal joint position sense (JPS) of the right knee. From the total population, 143 females have normal joint position sense of left knee and 226 females have abnormal joint position sense (JPS) of left knee. The total population of 369 females out of which overweight and obesity class I has greater ratio of joint position sense on the bases of BMI on both the right and left knee. The findings of the study indicated that post-menopausal females with type II diabetes have higher abnormal ratios of knee proprioception

Table 1: Frequency table of Right and Left knee Joint Position Sense

Joint Position Sense (JPS)			
		Frequency	Percent
Right Knee	Normal	138	37.4
	Abnormal	231	62.2
Left Knee	Normal	143	38.8
	Abnormal	226	61.2
Total		369	100.0

This table shows that the total number of participants are 369, out of which 143 females have normal joint position sense of left knee and 226 females have abnormal joint position sense (JPS) of left knee and138 females have normal joint position sense (JPS) of right knee and 231 females have abnormal joint position sense (JPS) of right knee.

IV. DISCUSSION

Researchers in past studies find out the effects of proprioception of lower limb on blood sugar levels in diabetics during both fasting and after meals. 30 individuals both male and females with a diabetic history of 5-10years of age 45-59years participated in the study. An isokinetic dynamometer was used to test lower limb proprioception. This study was in contrast to the current study as in this study results showed that reduced blood sugar levels can cause poor proprioception of lower limb.(12)

In current study data was collected from post-menopausal females having type II diabetes with a mean age 57.15 ±4.618 years. The joint position sense in post-menopausal females was measured with the help of universal goniometer and the results show that that right knee has 62.2% and left knee has 61.2% higher abnormal values. In comparison to previous study, investigated differences in proprioception in the lower extremities in people with type 2 diabetes (T2DM). 23 healthy adults (16 females, 7 males) with a mean age of 65 ± 8 years and 23 individuals with T2DM (16 females, 7 males) with a mean age of 63 ± 10 years participated in this study. Joint position sense was measured with an iPod touch, using a custom made JPS application. The study result showed that proprioceptive accuracy was lower in the diabetic group than in the control group at all target angle levels. The diabetic group's inaccuracy was 46% higher than the control group's at all goal position levels.(3)

A study in the past investigated proprioception in the knee and ankle joint among pregnant women during third trimester and postpartum period. 36 primiparous females of the age 21-35years participated in the study. Proprioception was examined using the joint reposition test. This study was in contrast to the current study as in the results showed significant improvement in knee proprioception during the third trimester of pregnancy with mean of 7.13±1.96 and postpartum period 6th with mean of 4.64±1.47 and 12th week with mean of 3.23±1.20 and ankle proprioception during the third trimester of pregnancy with mean of 6.41±2.23 and postpartum period 6th with mean of 5.01±1.42 and 12th week with mean of 3.65±1.67.(13)

V. CONCLUSION

The observational cross-sectional study concluded that post-menopausal type II diabetic females have greater ratio of decrease knee proprioception in both right and left knee which can be due to degenerative changes.

LIMITATIONS of the Study involved post-menopausal women were found to have additional physical conditions, such as postural sway and decreased balance, which can contribute to falls, these conditions were also not evaluated in this study. Females were not very aware of the condition, proprioception. It was a barrier as they needed to be explained about this and guided to perform the questionnaire. the study's time frame was short.

RECOMMENDATIONS are awareness should be created about knee proprioception among females at a globallevel. Females of different age groups could also be included in the study to make it a wider study. Females with a history of past 10 years diabetes could also be included in the study.

Conflict of Interest

There was no conflict of interest.

Financial Statement

No funding's were given by any authorities; it was a project thesis of bachelor's in Physical therapy (DPT).

Data availability

Data will be provided on the demand by corresponding author.

REFERENCES

1. Choi D, Kim B-Y, Jung C-H, Kim C-H, Mok J-O. Association between sleep quality and painless diabetic peripheral neuropathy assessed by current perception threshold in type 2 diabetes mellitus. Diabetes & Metabolism Journal. 2020;45(3):358-67.

2. Khah J, Kumar T, Sharan A, Kumar A. Relation of glycated hemoglobin with nerve conduction study and

proprioception in patients with type 2 diabetes mellitus. Journal of Indira Gandhi Institute Of Medical Sciences. 2021;7(1):39.

3. Ettinger LR, Boucher A, Simonovich E. Patients with type 2 diabetes demonstrate proprioceptive deficit in the knee. World journal of diabetes. 2018;9(3):59.

4. Gohil M, Shukla Y. Effect of proprioceptive training using biofeedback (equiboard) on pain, function and proprioception in osteoarthritic knee-an interventional study. population. 2020;2(3).

5. Gulley Cox LI. Motor Unit Characteristics and Proprioceptive Deficits of the Upper Limb in Patients with Type II Diabetes 2020.

6. Jung J, Kim M-G, Kang Y-J, Min K, Han K-A, Choi H. Vibration perception threshold and related factors for balance assessment in patients with type 2 diabetes mellitus. International Journal of Environmental Research and Public Health. 2021;18(11):6046.

7. Bandyopadhyay N, Ghosal A. Effect of Progressive Resistance Training on Selected Physical Fitness Components of Post-Menopausal Women with Special Reference to Bone Health.

8. Espírito Santo J, Aibar-Almazán A, Martínez-Amat A, de Loureiro NEM, Brandão-Loureiro V, Lavilla-Lerma ML, et al. Menopausal Symptoms, Postural Balance, and Functional Mobility in Middle-Aged Postmenopausal Women. Diagnostics. 2021;11(12):2178.

9. Viswas S, Vaidya VK, saffar Aneja P, Saha S, Rai P. Impact of Strengthening and Proprioceptive Exercises on Balance and Activities of Daily Living (ADLS) In Knee Osteoarthritis Patients from West Delhi, Indianpopulation. International Journal of Pharmaceutical and Bio Medical Science. 2021;1(8):144-50.

10. Ravand M, Ghasemi M, Rahimi A, Mohajeri-Tehrani MR, Baghban AA. Dynamic balance and neuropathic changes following ankle proprioceptive training in type II diabetic patients with peripheral neuropathy. Iranian Red Crescent Medical Journal. 2021;23(5).

11. Macwan N, Parmar LD. Proprioceptive Impairments in OA Knee Patients. 2015.

12. Tiwari P, Siddiqui ZA. Effect of blood sugar level on lower limb proprioception in diabetes. Int J Phys Educ Sport Health. 2018;5:214-6.

13. Wakkar A, Patil SP. Assessment of knee and ankle proprioception during the third trimester of pregnancy and postpartum period among primiparous women: An observational longitudinal study. Journal of Education and Health Promotion. 2022;11(1):241.

Authors

First Author –Nida Naveed, Doctor of physical therapy, University of South Asia,cant campus, Lahore, Pakistan
Second Author. – Hamna Afzal, Masters in orthopedic manual therapy, University of South Asia,cant campus,Lahore, Pakistan
Third Author –Momna Asad, Doctor of physical therapy, University of South Asia,cant campus, Lahore, Pakistan
Fourth Author-Dr. Ahsan Javed, Head of department Allied Health Sciences, University of South Asia, Cantt Campus, Lahore, Pakistan.

Correspondence Author – Hamna Afzal, Masters in orthopedic manual therapy, University of South Asia,cant campus,Lahore, Pakistan