

**A STUDY TO FIND OUT THE PREVALENCE OF BALANCE
IMPAIRMENTS AMONG PATIENTS OF DIABETES MELLITUS
(TYPE II): A CROSS-SECTIONAL SURVEY**

MARYAM SULEMAN

UMBER FATIMA

SUPERVISOR: UMBER FATIMA

ABSTRACT: This cross sectional study aims to determine the prevalence of balance impairments among patients with diabetes mellitus type 2 and also to find out gender specificity with balance impairments among diabetic patients. Data is collected from DHQ hospital, Abbottabad, Physiotherapy Clinic, Women Institute of Rehabilitation Sciences, Abbottabad, Jinnah International hospital, Abbottabad and from general population of Abbottabad, general population of Rawalpindi, Double Dispensary No.4 P.O.F hospital WahCantt, Pakistan. Study is carried out at Women Institute of Rehabilitation Sciences, Abbottabad. This study is done within the period of 6 months. Data was collected with the help of a questionnaire and was analyzed using SPSS.200 diabetic subjects were included in this study; among them 56.5 %were females and 43.5% were males,50% belonged to Abbottabad and 50% belonged to Rawalpindi. 49% used insulin to control their hyperglycemic levels and 51% did not use insulin. 40% (80) used to have hyperglycemic level between 170-250mg/dl and 60%(120) used to have hyperglycemic level above 250 mg/dl. 67.5 % had numbness in legs,59% had trouble walking up or down inclined surface,34.5%had problem while standing still, 64% had balance lost while walking, 40.5% had fallen more than once in past year. 74% had light headedness or dizziness. 31% knocked down to unconsciousness. 73% suffered from frequent headaches. 46.5% had dizziness while watching moving object. Sudden changes in position worsened symptoms in 39.5% of the subjects. 31% suffered from head / neck trauma in past. 19.5% ever suffered from stroke. Total 128 subjects had balance lost while walking among them 73 were females, 55 males had balance lost while walking.35 females had balance lost while standing still and 34 males

had balance lost while standing still. 200 patients included in study, in which there were 80 people with hyperglycemic levels between 170-250mg/dl; out of which 50 had balance lost while walking, which 30 had balance lost while standing still. 120 people were with hyperglycemic level above 250 mg/dl; out of which 78 had balance lost while walking, 50 did not lose balance while standing still. It is concluded that most of diabetic subjects had balance lost while walking or standing still. Frequent headaches, numbness in legs and falls were common among diabetics. Majority of the population complained of difficulty getting up from chair, balance lost while walking or standing still, frequent headaches, numbness in legs and falls. Diabetic patients with hyperglycemic levels above 250mg/dl had higher prevalence of balance lost while standing still or walking. Females had higher prevalence of fall and balance problems than men.

Key Words: Diabetes Mellitus, Balance, Impairments, Fall, Gender,

INTRODUCTION:

Diabetes is a metabolic disease characterized by hyperglycemia ensuing from defects in insulin secretion, insulin action, or both. The chronic hyperglycemia is linked with long-term damage, dysfunction and failure of different organs especially the eyes, kidneys, nerves, heart, and blood vessels. Hyperglycemia is caused due to impairment of insulin secretion or defects in insulin action or often both coexist in the same patient. ⁽¹⁾Diabetes mellitus type 2 occurs in persons usually after forty years. It is characterized by mild onset. This is due to partial lack of insulin, so the patients are not always insulin dependent. ⁽²⁾Type 1 diabetes or juvenile diabetes is also known as insulin-dependent diabetes. ⁽³⁾Diabetes Mellitus patients develop primary symptoms such as polyuria, polydipsia, polyphagia and complications due to higher hyperglycemic levels such as visual disturbances, muscular weakness, neuropathy, retinopathy, early fatigue leading to fall and balance problems. ⁽⁴⁾

Balance Impairment is a disturbance in balance that causes an individual to feel unsteady, for example, when standing or walking. It may be accompanied by feelings of spinning, or floating or having a sensation of movement. ⁽⁵⁾Balance impairment can develop as a result of damage or deficit in following systems, as these are main components which help in maintaining balance by visual system (eyes), vestibular system (ears), Proprioceptive system (the body's sense of where it is in space). Degeneration or loss of function in any of these systems can lead to balance deficits. ⁽⁶⁾Balance can be either static or dynamic Balance. Static balance is maintaining equilibrium when body is in stationary position. Dynamic balance is

maintaining equilibrium when body is moving. Dynamic balance requires coordination which is a complex skill that requires not only good balance, but good levels of other fitness components such as strength and agility. Balance and coordination can be improved through practice and training with definite exercises. ⁽⁷⁾ Signs and Symptoms include sensation of dizziness or vertigo, Lightheadedness, Problem reading and difficulty seeing, disorientation, Nausea, Changes in blood pressure, Decreased attentiveness, Anxiety, Fatigue and Depression. ⁽⁸⁾ Causes of Balance impairments in diabetics include inner ear disorders, changes in blood pressure, impaired blood glucose levels causing nerve damage and neuropathies, degenerative diseases, age related decline in balance function and vitamin deficiencies such as vitamin B12 deficiency. ^(9,10) Increased risk of fall is present in patients who have developed diabetic neuropathy. Vestibular system is equally important in providing orientation information. Long standing uncontrolled hyperglycemic levels lead to fall and balance problems through multiple ways including Diabetic neuropathy, Diabetic retinopathy, autonomic neuropathy, diabetic foot ulcer. Nerve fiber loss is the cause of insensitivity in DPN. ^(11, 12) Diabetes is common and its complication of balance impairment can cause severe problems and disabilities.

OBJECTIVES OF STUDY:

- To find out the Prevalence of Balance Impairments among Patients of Diabetes Mellitus (Type II)
- To find out the Gender Specificity of Balance and Fall Problems in Patients of Diabetes Mellitus Type 2

MATERIALS AND METHODOLOGY:

Study Design:

Descriptive Cross-Sectional Study

Source of Data:

DHQ hospital, Abbottabad, Physiotherapy Clinic, Women Institute of Rehabilitation Sciences, Abbottabad, Jinnah International hospital, Abbottabad and from general population of Abbottabad and Rawalpindi, Double Dispensary No.4 P.O.F hospital WahCantt, Pakistan.

Setting: Study is carried out at Women Institute of Rehabilitation Sciences, Abbottabad.

Duration of Study:Six months

Sample Size:200.

Sample Selection:

Inclusion Criteria:

- Patients having Type 2 Diabetes
- Patients with age from 40 years and above
- Both genders

Exclusion Criteria:

- Type I Diabetic patients
- People of age below 40 years
- Gestational Diabetes

Data Collection Procedure:

Informed consent was taken from the subjects. Topic of study was approved by ETHICAL COMMITTEE of WOMEN INSTITUTE OF REHABILITATION SCIENCES, ABBOTTABAD. Data was collected with the help of Questionnaire. The questionnaire contained close-ended questions. Data is primary that is researcher collected the data.

Questionnaire:

Self-designed Questionnaire derived from In-Balance Balance Scale.

Data Analysis Procedure:

Data has been entered and analyzed using SPSS 20.0. Frequencies are calculated to determine the prevalence and gender specificity of fall and balance problems among patients of diabetes mellitus.

STATISTICAL ANALYSIS:

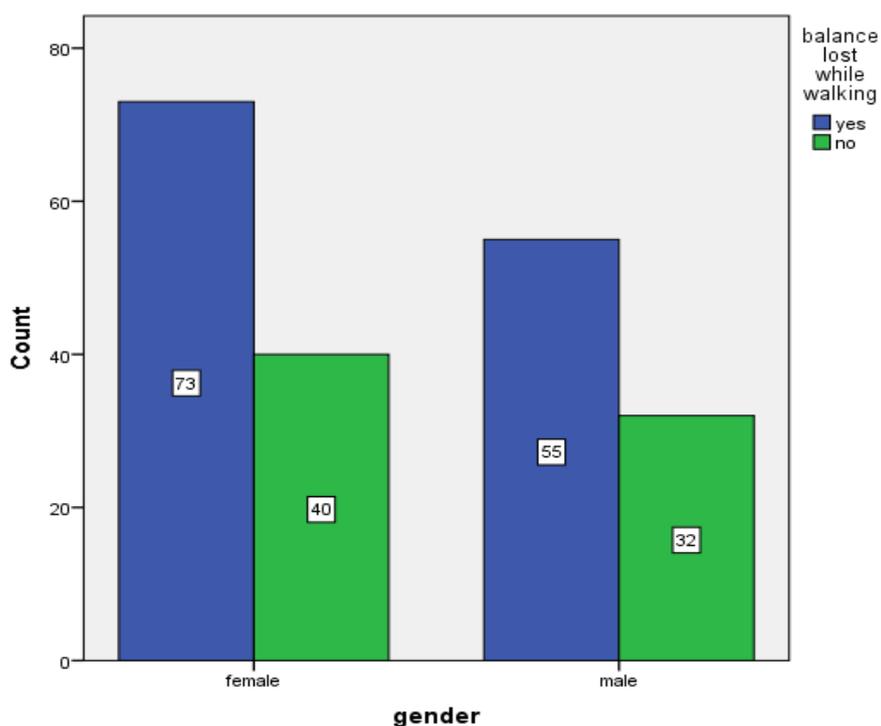
CROSS TAB. 1: BALANCE LOST WHILE WALKING * GENDER

There were total 200 patients in this study among which 128 subjects complained of losing balance while walking. Out of 128, 73 were females and 55 were males. 72 subjects did not

lose balance while walking among them 40 were females and 32 were males. This is also shown in the following cluster bar chart.

Balance Lost While Walking	Gender		Total
	Female	Male	
Yes	73	55	128
No	40	32	72
Total	113	87	200

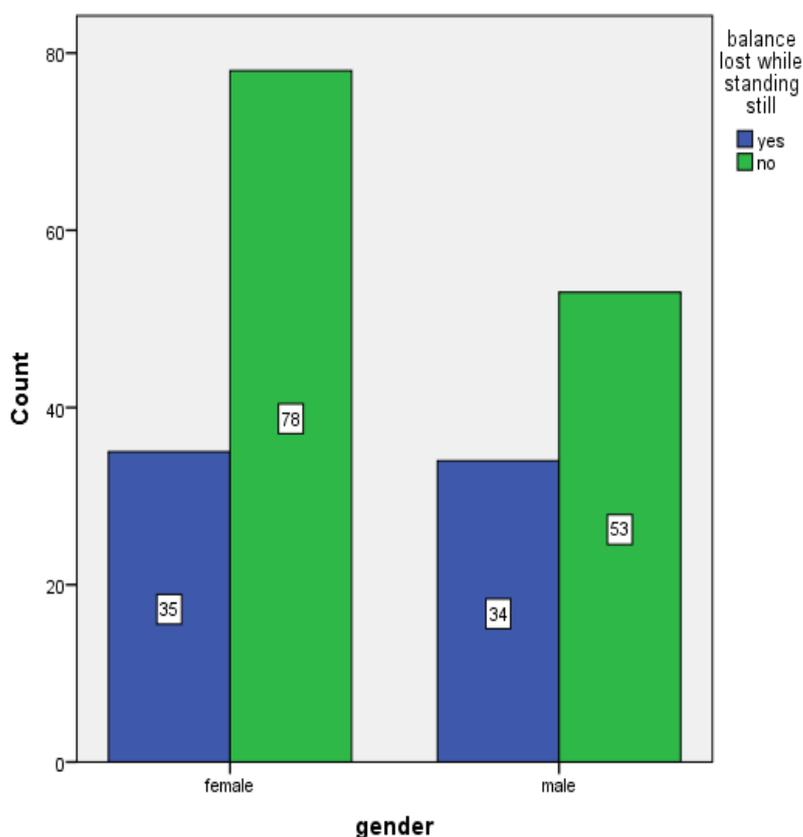
CLUSTER BAR CHART 1: BALANCE LOST WHILE WALKING * GENDER:



CROSS TAB. 2: BALANCE LOST WHILE STANDING STILL * GENDER:

There were total 200 patients in this study among which 69 subjects; 35 females and 34 males, complained of losing balance while standing still. There were 131 subjects; 78 females and 53 males did not lose balance while standing still.

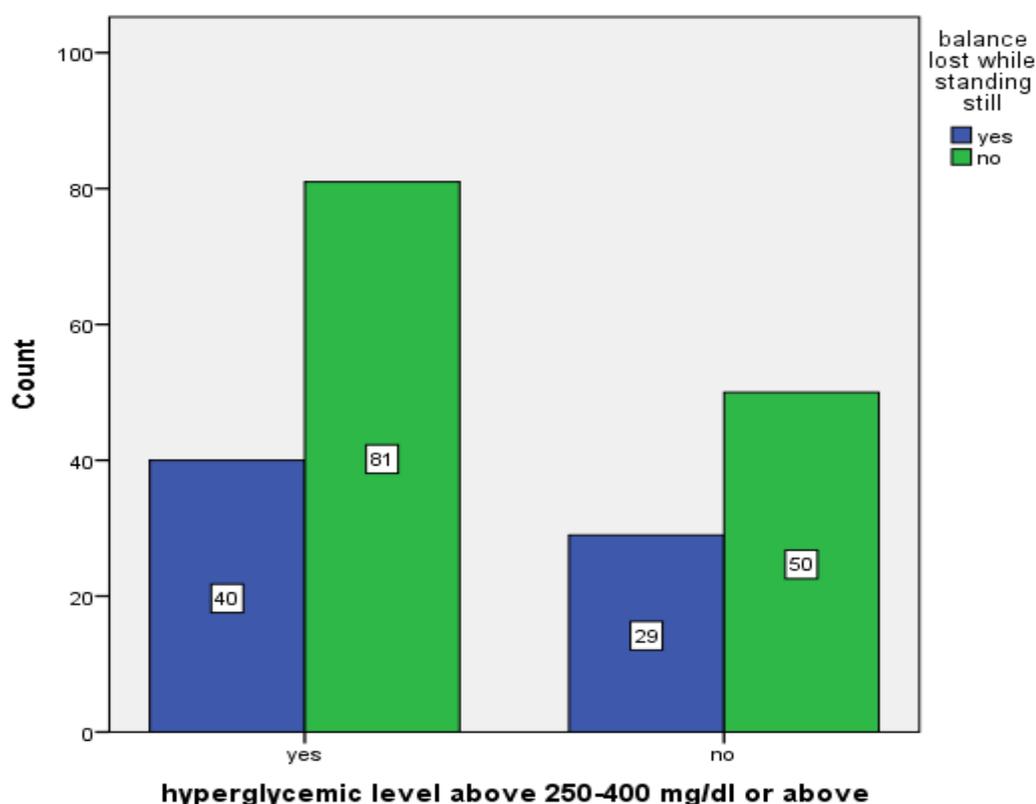
Balance lost while standing still	Gender		Total
	female	Male	
yes	35	34	69
no	78	53	131
Total	113	87	200

CLUSTER BAR 2: BALANCE LOST WHILE STANDING STILL * GENDER**CROSS TAB. 3: BALANCE LOST WHILE STANDING STILL * HYPERGLYCEMIC LEVEL BETWEEN 250-400 mg/dl:**

There were total 200 patients in this study among which 120 patients who had hyperglycemic levels above 250-400mg/dl or above, among them 39 had balance lost while standing still and 81 did not lose balance while standing still. 80 patients who had hyperglycemic level below 250, among them 30 had balance lost while standing still and 50 did not lose balance while standing still.

balance lost while standing still	hyperglycemic level above 250-400 mg/dl or above		Total
	Yes	No	
yes	39	30	69
no	81	50	131
Total	120	80	200

CLUSTER BAR CHART 3 : BALANCE LOST WHILE STANDING STILL * HYPERGLYCEMIC LEVEL BETWEEN 250-400 mg/dl:

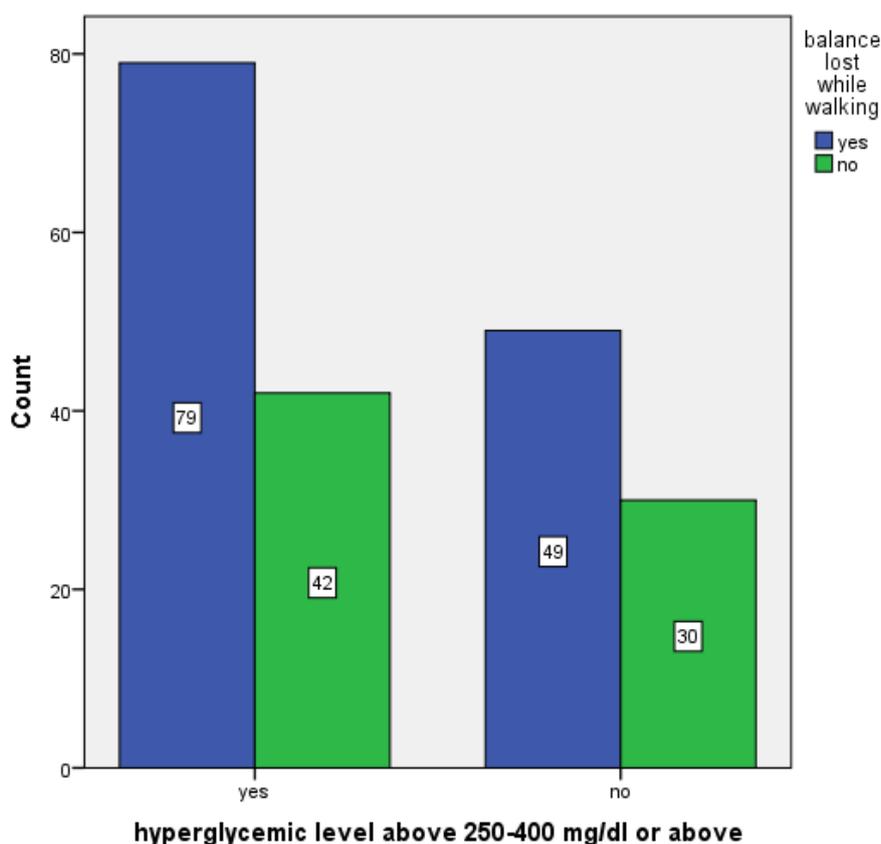


CROSS TAB. 4: BALANCE LOST WHILE WALKING * HYPERGLYCEMIC LEVELS ABOVE 250-400 mg/dl:

There were total 200 patients in this study among which 120 patients had hyperglycemic levels above 250-400mg/dl or above. Among whom 78 had balance lost while walking and 42 did not lose balance while walking. 80 patients had hyperglycemic levels below 250 out of which 50 had balance lost while walking and 30 did not lose balance while walking.

balance lost while walking	hyperglycemic level above 250-400 mg/dl or above		Total
	Yes	No	
yes	78	50	128
no	42	30	72
Total	120	80	200

CLUSTER BAR NO. 4: BALANCE LOST WHILE WALKING * HYPERGLYCEMIC LEVELS ABOVE 250-400 mg/dl:



RESULTS:

Study reveals the prevalence of fall and balance problems among patients of diabetes mellitus type 2 and their gender specificity. According to the results obtained; 200 diabetic type 2 subjects were included in this study; among them 56.5 % were females and 43.5% were males, 50% belonged to Abbottabad and 50% belonged to Rawalpindi. 49% used

insulin to control their hyperglycemic levels and 51% did not use insulin. 40%(80)used to have hyperglycemic level between 170-250mg/dl and 60%(120) used to have hyperglycemic level above 250 mg/dl. 67.5 % had numbness in legs, 59% had trouble walking up or down inclined surface, 34.5% had problem while standing still, 64% had balance lost while walking, 40.5% had fallen more than once in past year. 74% had light headedness or dizziness. 31% knocked down to unconsciousness. 73% suffered from frequent headaches. 46.5% had dizziness while watching moving object. Sudden changes in position worsened symptoms in 39.5% of the subjects. 31% suffered from head / neck trauma in past. 19.5% ever suffered from stroke. Total 128 subjects had balance lost while walking among them 73 were females, 55 males had balance lost while walking(more females with hyperglycemic levels had balance impairment). 35 females had balance lost while standing still and 34 males had balance lost while standing still. 200 patients included in study, in which there were 80 people with hyperglycemic levels between 170-250mg/dl; out of which 50 had balance lost while walking, which 30 had balance lost while standing still.120 people were with hyperglycemic level above 250 mg/dl; out of which 78 had balance lost while walking, 50 did not lose balance while standing still.

DISCUSSION:

The study is conducted to find out fall and balance problems among patients of diabetes mellitus type 2. This study shows that females had more fall and balance problems than males and also high level of hyperglycemia causes increased fall and balance problems.

Maurer S. M., et.al conducted research in year 2005 on topic, “Diabetes Mellitus is Associated with an Increased Risk of Falls in Elderly, Residents of a Long-Term Care Facility.” Over the follow-up period (mean 299 days), 49 participants (35%) experienced a fall. The fall incidence rate for the participants with and without diabetes mellitus was 78% and 30% respectively. The significant unadjusted hazard ratios of fall risk factors included diabetes mellitus, Berg Balance Scale score <45, number of medications, angiotensin-converting enzyme (ACE) inhibitors, hypertension, use of assistive device, inability to independently move a wheelchair, and use of antidepressants with the latter two factors being protective. In multivariate analysis, only diabetes and gait and balance were significantly and independently associated with an increased risk of falls. ⁽¹³⁾

David Bruce, et.al conducted a research in year 2015 on topic “Fear of falling is common in patients with type 2 diabetes and is associated with increased risk of falls”. Compared to normal glycaemic levels those with diabetes had worse mobility (slow timed Up and Go test times: 16.2 versus 4.9%), more fear of falling (24.2 versus 15.1%) and more activity

restriction from fear of falling (indoors: 14.0 versus 4.8%), but there was no increase in reported recent falls.⁽¹⁴⁾

Timar B., et.al conducted a study, ‘The Impact of Diabetic Neuropathy on Balance and on the Risk of Falls in Patients with Type 2 Diabetes Mellitus: A Cross-Sectional Study’ The presence of DN was associated with significant decreases in the BBS score and FES-I score. In the multivariate regression model, they observed that patient’s age, DN severity and depression symptoms acted as independent, significant predictors for the risk of falls in patients with T2DM.⁽¹⁵⁾

Walley M., et.al conducted research in year 2014 on topic, “Dizziness and Loss of Balance in Individuals with Diabetes: Relative Contribution of Vestibular Versus Somatosensory Dysfunction.” According to its results, Clinical examinations identified 1 subject with no sign of neuropathy, 21 with mild neuropathy, 12 with moderate neuropathy, and 3 with severe neuropathy. Twenty-six patients displayed clinical signs of vestibular dysfunction on one or more tests. Quantitative dynamic platform posturography (DPP) revealed 27 patients with overall substandard equilibrium scores. Of those 27, 25 individuals were substandard in vestibular-derived conditions with normal somatosensory scoring. Five patients were substandard in somatosensory conditions and three of the five were also deficient in vestibular scores indicating a multisystem stability disorder.⁽¹⁶⁾

A. K. Azidah, et.al conducted a research in year 2012 on topic “Prevalence of Falls and Its Associated Factors among Elderly Diabetics in a Tertiary Center, Malaysia” A total 316 subjects that fulfilled the inclusion and exclusion criteria were approached during study period. However, only 288 subjects consented. Thus, the response rate of the study was 91.1%. The mean age of the study participant was 66.9. Total balance and gait scores among faller group were lower compared to non-faller. Hypertension, retinopathy, peripheral neuropathy, orthostatic hypotension, polypharmacy and hypoglycemia episodes were more common in the fallers compared to non-fallers.⁽¹²⁾

Fabiana Magalhães, et.al conducted a research in year 2016 on topic “Differences between genders in relation to factors associated with risk of diabetic foot in elderly persons: A cross-sectional trial.” They included 174 elderly people who had no history of stroke and peripheral vascular disease. Risk factors for diabetic foot were older age, presence of calluses and claw toes, insulin use, presence of sensory comorbidities, ulcers, numbness, and stiffness in the feet. Most (58.6%) were female and among them.⁽¹⁷⁾

CONCLUSIONS:

It is concluded that most of subjects with type 2 diabetes mellitus had balance lost while walking or standing still. Frequent headaches, numbness in legs and falls were common among the diabetics. Majority of the population complained of difficulty getting up from chair, balance lost while walking or standing still, frequent headaches, numbness in legs and falls. Diabetic patients with hyperglycemic levels above 250mg/dl had higher prevalence of balance lost while standing still or walking. Females had higher prevalence of fall and balance problems than men.

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