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# Tandem Stance for Fall Prevention in Elderly with Type 2 Diabetes Mellitus : a Case Study

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**A B S T R A C T S**

A Tandem Stance is a therapy for fall prevention in the elderly, especially with type 2 diabetes mellitus. People with diabetes mellitus have a risk of forming wounds that are difficult to heal if they have an accidental fall. The purpose of this study was to analyze the implementation of tandem stance therapy as fall prevention for the elderly with T2DM. The research design used an evaluative design is a case study with data analysis using descriptive-analytic. The case study was carried out on the elderly aged 62 years with diabetes mellitus. Tandem walking exercises are carried out for approximately 10-15 minutes and are carried out for 7 days. Evaluation on the 7th-day intervention showed that the client has been able to adjust the balance to stand, walking is normal, and the balance of the body, especially when walking has increased. The patient says she doesn't feel stiff in the joints, only sometimes feels achy and easily tired. It was concluded that tandem stance therapy is recommended for fall prevention in the elderly. Community nurses can implement this intervention to reduce the risk of falls in the elderly group.

**A R T I C L E  I N F O**

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## 1. INTRODUCTION

The International Diabetes Federation said that DM in the world has experienced a very large increase. The International Diabetes Federation (IDF) noted that around 366 million people worldwide, or 8.3% of adults, were estimated to have DM in 2017. (IDF, 2015). In Indonesia, it showed an increase of 6.9% in 2013 to 8.5% in 2018. In 2015 the seventh rank in DM diagnosed by a doctor was in Central Sulawesi (3.7%), North Sulawesi (3.6%), South Sulawesi (3.4%), and East Nusa Tenggara (3.3%) (Kemenkes, 2018)

The impact of diabetes mellitus on the elderly will experience a setback in their physiological systems such as wrinkled skin, weight loss, reduced muscle strength function, reduced vision and hearing power, and reduced ability to taste. Diabetes mellitus in the elderly occurs due to insulin resistance in the elderly caused by 4 factors: the first due to changes in body composition, body composition changes to 53% water, 12% solid cells, 30% fat, while bones and minerals decrease by 1% so it's only 5%. The second factor is a decrease in physical activity which will result in a decrease in the number of insulin receptors that are ready to be administered with insulin so that the rate of GLUT-4 (glucose transporter-4) transcription also decreases. The third factor is changes in diet in the elderly caused by reduced teeth so that the protanse of carbohydrate foods will increase. The fourth factor is neurohormonal changes, specifically Insulin-Like Growth Factor-I (IGF-1) and plasma dehydroepiandrosterone (DHTAS) (Leung et al., 2018).

Changes in the visual (visual) system cause the light transmitted to the retina to decrease so that the visual threshold increases and the light-dark adaptability decreases, visual acuity, and field of view contribute to falls. Research conducted by Anindita et al., (2018) shows that 50% of elderly people with hearing loss are at risk of falling due to anxiety related to environmental hazards. While the risk factor for pharmacological factors is drug consumption in the elderly with diabetes mellitus which is more than 3 to 4 types. This is in accordance with the research by Mettelinge (2013) which states that the elderly with diabetes mellitus consume an average of nine types of drugs, whereas the elderly without diabetes usually consume four types of drugs. The elderly who consume drugs of many types will experience a decrease in walking speed and a decrease in cognitive abilities where these two things are factors that cause falls in the elderly(Darmawati & Dulgani, 2019; Hewston et al., 2018)

Nurses can prevent falls in the elderly who have diabetes mellitus by knowing the

determinant factors that can cause falls. If these determinants are identified, nurses can design programs to reduce the incidence of falls in the elderly with diabetes mellitus in a community so that there will be an increase in health rates for the elderly (Darmawati, 2018; Miller, 2021). Based on the above background, the author is interested in writing a scientific paper on gerontic nursing care for clients with diabetes mellitus with tandem walking exercise therapy for body balance to reduce the risk of falling.

A Tandem stance is a test as well as an exercise performed by walking in a straight line with the heel of the foot touching the toes of the other for 3-6 meters (Joo et al., 2022). This exercise can improve lateral postural balance, which plays a role in reducing the risk of falling in the elderly, is a type of balance exercise that involves proprioception of body stability. Tandem walking exercises aim to train posture or body position, control balance, muscle coordination, and body movements, tandem walking exercises are also used to train parameters related to individual balance, absolute control over mobility, and mobility accuracy. Tandem walking exercises use a technique that stimulates the pronator and supinator muscles of the foot (training proprioceptive coordination and ankle stabilizing muscles). Tandem walking exercises are carried out 3 times a week for 10 minutes with a distance of 3-6 meters (Siregar et al., 2020; Vincenzo & Patton, 2021)

In the research of Siregar et al., (2020) this exercise was carried out for 8 weeks. Before doing the tandem walking exercise, the elderly body balance was measured and after the tandem walking exercise, the elderly body balance was measured again. This exercise was carried out one by one by the respondent under the supervision of the researcher for 8 weeks. After doing the tandem walking exercise, the results of this study showed that the balance of the elderly body before the tandem walking exercise had a moderate risk of falling. Meanwhile, after doing tandem walking exercises for 8 weeks, 3 times a week, statistical test results showed that there was an effect of tandem walking exercises on the balance of the elderly body to reduce the risk of falling. This means that tandem walking can improve muscle coordination and body movement so that the risk of falling caused by a decrease in musculoskeletal strength in the elderly can be minimized (Astriani et al., 2020; Siregar et al., 2020).

## 2. METHODS

### Patient Information

The intervention was carried out on the elderly aged 62 years with diabetes mellitus. Lives in

Tangerang, West Java, religion is Islam, their last education in elementary school, now work as a housewife and opens a food stall at home. The family history of the elderly said that they had never had a serious illness before, but had experienced high blood pressure, high blood pressure was inherited from their late parents. The client said he had surgery on his right leg because of a gangrenous scar 3 years ago. The client's current medical history says that it is often difficult to walk because there are scars on the legs, can't walk as fast, as usual, limping, often has difficulty getting up when trying to stand up, and gets tired easily. Clients also often complain of difficulty concentrating and often fall due to lack of balance, and vision has begun to blur. The client also said that he often experienced joint stiffness. The client has no history of food allergies and no eating disorders. The client eats 3 times a day, one portion that he has cooked every day. Defecate and urinate smoothly without any disturbance. The client's sleep pattern likes to wake up to urinate occasionally.

**Clinical Findings**

The results of the fall risk assessment based on the Morse Falls scale obtained a value of 90, which means that the risk of falling experienced by the client is high. The client's balance value is obtained from 9 interpretations of the results, namely the client has a moderate risk of falling and the client's muscle strength value is 3, which means it can fight gravity but cannot withstand or resist the examiner's pressure. The results of the cognitive assessment showed mild intellectual damage because of the 10 questions, the other 3 were answered incorrectly. While the results of the MMSE study showed mild cognitive impairment. In the study of psychology, the client has an emotional state, the client is easily offended and sad when there is something unpleasant said to him, and when the client is angry, usually the client just stays in his room. The results of the TTV examination showed: Temperature: 36.8º C, Pulse: 105 x/minute, Blood pressure: 140/90 mmHg, Breathing: 20 x/minute, GDS: 178 mg/dL. On examination, the musculoskeletal part of the left leg is longer than the right leg and the client feels that his walk is limp. Assessment of the client's integument there is a wound from gangrene surgery on the right leg, the skin is rough and elastic, and dry. The client also said that after doing a routine check-up at the hospital and the results of the GDS increased, the client took the medicine that had been prescribed by the doctor once a month and had to be spent.

**Diagnostic Assessment**

The purpose of planning a nursing diagnosis of impaired physical mobility is after 60 minutes of action for 1 week, a decreased risk for fall with the outcome: increased lower body strength (2 to 5), increased ability to rise from a sitting position (2 to 5), Improved standing balance (2 to 5), Improved walking balance (2 to 5), Improved posture (2 to 5)

**Therapeutic Intervention**

The tandem walking intervention was preceded by the provision of active ROM to increase muscle strength and provide physical health for the elderly. The tandem walking exercise is done by walking straight in a straight line with the heel of the foot touching the toes of the other 5-6 meters for approximately 10-15 minutes and is carried out for 1 week.

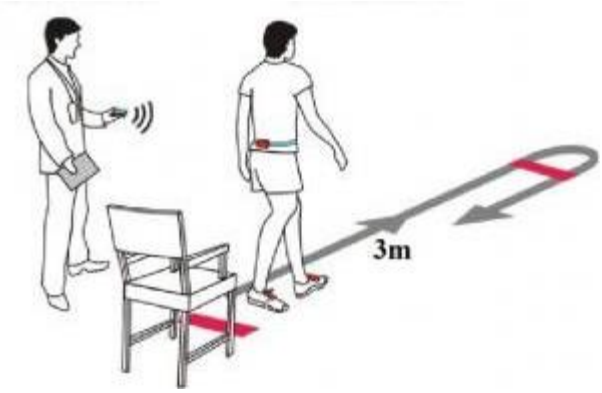
**Follow-up and Outcomes**

Evaluation on $7^{th}$-day intervention: The client has been able to adjust the balance to stand, walking is normal, the balance of the body, especially when walking has increased to a value of 5, and the patient says he doesn't feel stiff in the joints, only sometimes feels achy and easily tired. This shows a significant development compared to the initial condition of the patient who often falls when trying to stand because the body is unbalanced, and also often stumbles when walking.

## 3. RESULTS AND DISCUSSION

Based on the description of the case above, the therapy carried out in this nursing care is ROM (range of motion) exercises and tandem walking exercises. client is very enthusiastic about participating in all exercises based on predetermined nursing diagnoses, namely impaired physical mobility and the risk of falling. ROM exercises are range of motion exercises for all joints within their normal range that need to be done intensively to maintain muscle tone and function, prevent joint disability, and help improve motor function. Active ROM exercises in the elderly are guiding the elderly in carrying out movements independently by normal joint ranges of motion. Giving active ROM is done for 30 minutes for 1 week to increase muscle strength and provide physical health to the elderly. The tandem walking exercise is done by walking straight in a straight line with the heel of the foot touching the toes of the other 5-6 meters for approximately 10-15 minutes

and is carried out for 1 week.




Picture 1. Tandem Stance Exercise

The results of the evaluation on the first day after the tandem stance exercise, the client said that he still felt stiffness in the joints and then the feeling of feeling sore in the legs after doing tandem walking exercises. The client is still easy to falls when getting up to stand and even when walking the client is easily careless and falls. The client looks tired easily if the activity is too much. At the time of the tandem walking exercise, the client was assisted by a nurse to walk because the client's body balance was unstable. On the second day the client said there was no change, the same as on the first day, the pain and joint stiffness were still felt. On the third day of tandem walking practice, the client was able to walk independently even though he was often assisted by nurses because he was easily tired.

Results on the fourth day the client said that he still felt achy, especially after doing the tandem walking exercise, the joint stiffness had begun to decrease and the tandem walking exercise had also started to be done independently even though he often took short breaks. The results of the fall risk monitoring calculation based on the Morse Falls Scale (MFS) obtained a value of 55, which means the risk of falling is high. On the fifth day after the tandem walking exercise, the client began to be able to adjust the balance when getting up from sitting or when walking, the way of walking was better than on the first day of the assessment. Clients can do tandem walking exercises independently as far as 4 meters without the help of nurses and rest. On the sixth day of evaluation, the client said that he no longer felt stiff in his joints but still had aches. On the seventh day of the tandem walking exercise, the client can run smoothly from start to finish as far as ±7 meters without the help of nurses and surrounding objects. The client is running smoothly. The client said that he did not feel stiff in his joints, especially when he often did tandem walking

exercises, he was just tired after the exercise. The client feels more refreshed and happy because it is not easy to fall if he wants to stand up.

After nursing interventions were carried out based on the journal provided, tandem stance exercise therapy for 7 days, a client said he was able to walk normally and smoothly, and he didn't fall easily when he wanted to stand up or when he walked. No longer feel stiff in the joints. Based on nursing care interventions that have been carried out by the authors for 7 days, the authors conclude that tandem walking exercise therapy can reduce the risk of falling in the elderly.

Based on research on tandem stance exercises can improve muscle coordination, and body movements so that the risk of falling caused by a decrease in musculoskeletal strength in the elderly can be minimized (Siregar et al., 2020). Meanwhile, according to other studies, tandem walking exercises can improve balance to reduce the risk of falling in the elderly. While the measurement uses a leg dynamometer, the significance value of the Chi-Square difference test is 0.009 so it is less than 0.05 (Dzakirah, 2021)

A study at Panti werdha dharma bhakti Surakarta showed that tandem exercise did not affect improving balance in the elderly. However, there was an increase in the average TUG value of the intervention group by 2.13 seconds and the control group by 0.22 seconds. Researchers concluded that there was a significant effect in doing tandem walking exercises on body balance to reduce the risk of falling in the elderly (Suadnyana et al., 2019).

The findings revealed that the elderly who have impaired balance can be corrected through muscle strengthening exercises that are starting to weaken, such as tandem walking exercises. The tandem walking method can improve muscle strength in the quadriceps muscle area, which is a part of the body that is responsible for straightening the knee and bending the hip. However, this study excluded elderly people with chronic diseases such as diabetes mellitus (DM), hypertension, rheumatoid arthritis (RA), and osteoarthritis (OA). While the elderly are particularly vulnerable to degenerative diseases such as RA, OA, diabetes, and hypertension. This exercise can help to improve lateral postural balance, which helps to reduce the risk of falling in the elderly. It is a type of balance exercise that requires proprioceptive to body stability and the independence of elderly (Astriani et al., 2020; Darmawati & Kurniawan, 2021).

## 4. CONCLUSION

Tandem stance exercises can be used as an intervention in nursing care for the elderly with type 2 diabetes mellitus in regulating balance to reduce the risk of falling to the results of previous studies which also said it was effective in reducing the risk of falling in the elderly.

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