



Correlation of Berg Balance Scale, Time Up and Go and Dynamic Index Scale in Community dwelling ambulatory Elderly

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Original Article

ARTICLE INFORMATION

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ABSTRACT

Objective: To compare the Berg balance scale, Time up and go and Dynamic gait index in Community dwelling elderly.

Materials and method: This Study has been registered on clinicaltrial.gov with clinical trial number NCT05122156. This research was comparative cross-sectional survey. Data was collected from the community. The study was completed within the time duration of 6 months after approval of the synopsis. In this study 125 individuals were recruited. Convenient sampling Technique was used to collect data. In this study Ruler, Two standard chairs (one with armrest other without arm rest), footstep, stop watch, 15 feet walkway, stairs, cones and shoe Box were used for data collection.

Results: In this study out of 125 participants 46.40% (58) male and 53.60% (67) females respectively. Mean age with S.D was 70.57 ± 5.457 . The Pearson correlation coefficient between Mini-mental state examination scales with Age was $-.30$ showed Negative correlation and having $.000$ P value showed significant Association. Pearson correlation coefficient of BBS and DGI with Age was $-.48, -.47$ shows Negative correlation and having $.000$ P value showed significant Association. As age increases Dynamic gait index decreases. Pearson Correlation coefficient between Time up and go with Age was $.600$ showed positive correlation and having $.000$ P value showed significant association.

Conclusion: This study concluded that with increasing age balance deteriorates and it leads to fall risk. Due to this upon assessment Berg balance scale and Dynamic gait index value decreases and Time up and go take more time for completion because of aging and fragility. These scale help the clinicians and researchers to note early equilibrium impairments to make early implication to prevent falling in community dwelling ambulatory elderly. To make precise measurement of gait deviation future researchers can use 3D analysis, motion sensors.

Introduction:

The world population is aging in this era in industrialized and developing nations. Health issues rises in the aged(1). One of the biggest problem in seniors is falls. According to statistics, older adults over 65 are 30% more likely to experience at least one fall annually, and for those above 80, the risk increases to 50%(2). Aged persons who experienced fall more than one time are called recurrent fallers and they are more prone to diseases(3). Additionally, as people age, their postural stability declines, which impacts their capacity to plan conscious bodily movements, as well as gait balance. Because of this, aged population struggle more to sense external stresses on their bodies, plan body stability techniques, and instruct their extremities to generate modifications in position(4).

There are many different factors that contribute to falls, but two prominent inherent risk factors weakness in the muscles and poor balance have been found. It is well established that fallers have weaker lower limb muscles and worse balance than those who don't fall(5). The best strategy to stop unintentional falls is to implement a fall prevention program that includes to control the possibility and screening for personal risk factors. Thus, the first step is to employ a fall risk screening instrument that can

identify the causing factor of falls and is sensitive and specific in predicting fall possibility(6).

The Berg Balance Scale, the Timed Up and Go test, and gait speed assessment, such as the dual-task gait test, are some of the methods that have been created to evaluate gait, balance, and functional mobility. Despite being widely used in clinical practice, there doesn't seem to be much standardization, and choosing the best instrument might be challenging(7).

In clinical practice, performance-oriented functional mobility tests like the TUG and the BBS are frequently used as an objective way to quantify fall risks and assess the decline in postural stability in older persons(8). An extensively used and validated tool for evaluating elderly people's balance and accurately estimating their risk of falling is the Berg Balance Scale. This 14-item measure of balance performance takes a long time to administer (around 20 to 30 minutes), which limits its applicability for normal clinical use. Thus, it would seem that a straightforward and effective test to assess older patients balance(9). It is helpful in forecasting fall risk and outcomes, as well as determining how long patients will stay in inpatient rehabilitation. It is used to assess dynamic and static balance by performing 14 tasks(10).



When assessing basic mobility, the TUG provides information about older people's balance and fall risk(11). TUG is a regularly utilized end result measurement tool that looks at the patient's ability to walk and transfer to evaluate task restrictions in the ICF guide. If a sufferer is unable to participate in their societal roles due to a deficiency in these task, it might have an effect on their overall contribution in life. The TUG was established to estimate the risk of falling in geriatric individuals(12). Previous study suggest that seniors who receive early intervention with an organized exercise program may experience fewer falls and have fewer risk factors for falls. This could lessen the fear of falls as well as the financial and physical strain that falls' co-morbidities have on caretakers(13). There was a moderate correlation between frailty and both functional and dynamic balance, indicating that frailty syndrome raises the risk of falls(14). Physical activities are useful for increasing mobility, strength in the lower extremities, balance, and lowering the risk of falls and injuries from them(15).

This research was conducted to check the balance and fall risk in ambulatory elderly. Proprioception declines in elderly which ultimately change the biomechanics of joint and neuromuscular control, results in decreased balance and increase risk of fall. This research proved that these three scales were beneficial for quick screening of balance and fall risk issues in elder population.

Methodology:

Study design: This study was comparative cross-sectional survey. This Study has been registered on clinicaltrial.gov with clinical trial number NCT05122156. **Study setting:** Data was collected from the community. **Sample size:** 125 Older people will be recruited by assuming the attrition rate 10% and sample size 111 is measured by G power analysis software 3.1.9.2 with margin of error 5% is 1.96 and 80% power.(16) Variable was risk of fall and balance issues. **Inclusion criteria:** 1) people having age 65 or more. 2) Both genders were included. 3) Living autonomously. 4) Can walk without assistance. 5) A score of more than 25 on the MMSE. **Exclusion Criteria:** 1) Neurological issue has been identified. 2) Cardiopulmonary issue that have been diagnosed. 3) Understanding issue has been identified. 4) Having any sight and hearing issue. **Materials:** In this study Ruler, Two standard chairs (one with armrest other without arm rest), footstep, stop watch, 15 feet walkway, stairs, cones and shoe Box were used for data collection.

Measures:

In this study demographic of participants, Correlation of DGI, BBS and TUG with age and also the significance of these scales were measured.

Data collection method:

Before the starting of the study, the ethics committee gave its approval. All member were informed about the study and they gave their permission. Demographic information was gathered from all participants through Questionnaires. Members perform MMSE to check whether the person fulfill the eligibility standard or not.

MMSE is broadly used in scientific settings to evaluate mental state. It is a 30-component screening instrument. It takes 10 minutes for expert for completion.(17)

BBS is action based test to measure equilibrium having 14 unit. Every item is classify with 0-4 numbers. 0 means the lowest capacity to maintain equilibrium and 56 means the highest capacity to maintain equilibrium(18).

Figure 1 Berg Balance Scale



The time up and go test is an effective screening procedure for determining the likelihood of tumble. It is recommended as a main indicator of functional assessment by geriatric organizations(20).

DGI is used to measure various walk related actions to evaluate equilibrium in moving position and fall off hazards. It is also used to evaluate older peoples walking impairments.(21)

Table 1 Tools Validity and Reliability

| Outcome Measure | Outcomes | Validity and Reliability |
|-------------------------------------|--------------------|--------------------------|
| Mini-mental state examination scale | Cognition | V=0.86 (22) |
| Berg balance scale | Balance impairment | V=0.679-0.957 (23) |
| Dynamic Gait Index | Balance impairment | R=0.90-0.92 (24) |
| Time Up and Go | Balance impairment | R=0.99 (25) |

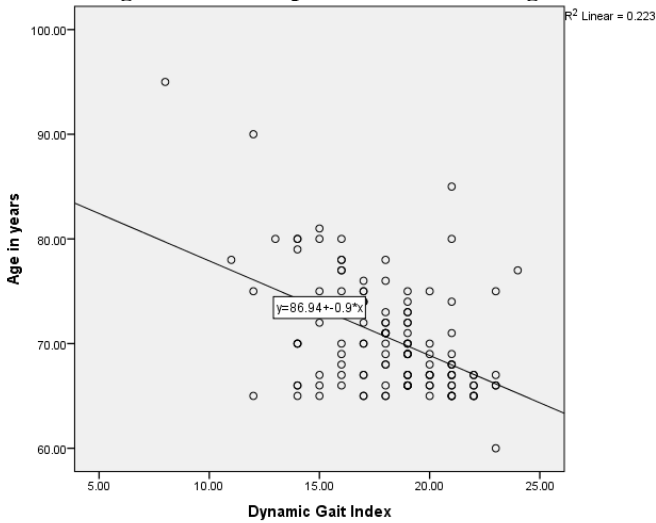
Data Analysis:

The data is presented as a mean and a percentage. SPSS.23 (Statistical Package for Social Science) was used for analyses of the data. The qualitative factors were represented by mean and standard deviation, whereas the quantitative variables were represented by figures and graphs, as well as a frequency table. The Pearson coefficient of correlation was used to test the hypotheses.



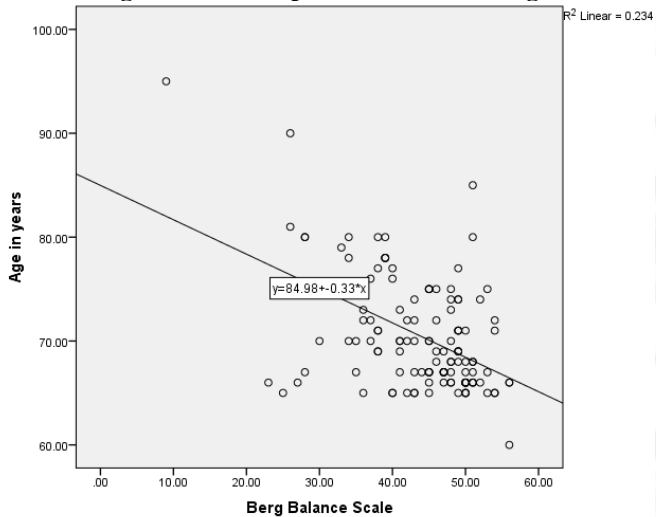
RESULTS:

Figure 2: Linear plot of DGI versus Age



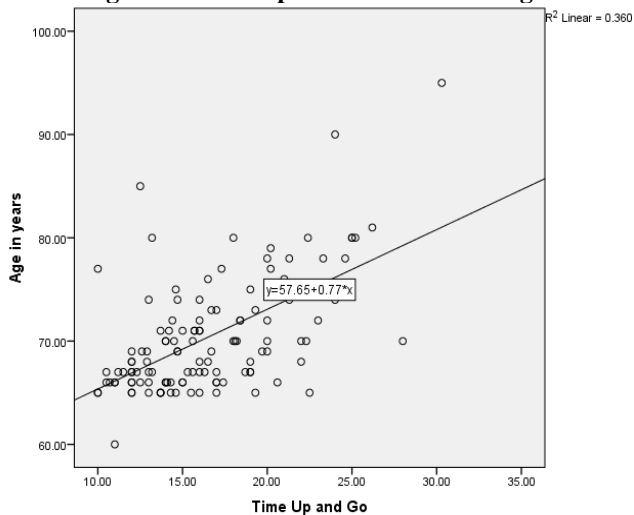
Above linear plot showed that age and DGI have inverse relation to each other. As age increases DGI value decreases.

Figure 3: Linear plot of BBS versus Age



Above linear plot showed that Age and BBS were inversely proportional to each other. As age increases BBS value decreases.

Figure 4: Linear plot of TUG versus Age



Above linear plot showed that Age and TUG were directly proportional to each other. As Age increases TUG value also increases.

Table 2 Demographics of Participants (N= 125)

| Mean ± Std deviation | |
|----------------------------------|---------------|
| Age(years) | 70.52 ± 5.51 |
| Weight(kg) | 68.04 ± 10.18 |
| Height(m) | 1.63 ± .09 |
| BMI(kg/ms ²) | 25.44±4.02 |
| N(%) of Male and Female in study | |
| Females | 67(53.60%) |
| Males | 58(46.40%) |
| Occupation | |
| Employed | 43 (34.4%) |
| Un employed | 82 (65.6) |

Demographics of participants were included in table 1, showed that mean age of the participants was 70.52 with S.D 5.51, Height was 1.63 with S.D .09, BMI was 25.44 with 4.02 SD, and 67 (53.60%) Females and 58(46.40) Males were included. About 43 (34.4%) were working and 82(65.6%) were nonworking respectively.

Table 2: Correlation of BBS, TUG and DGI with Age:

| | Pearson correlation | P value |
|-----------------------|---------------------|---------|
| BBS Versus Age | -.48 | .000 |
| DGI versus Age | -.47 | .000 |
| TUG versus Age | .60 | .000 |

Above table showed concluding result proved that Pearson correlation coefficient between BBS and DGI with age was -.48,-.47 and showed Negative correlation and having .000 P value shows significant association. Pearson correlation coefficient between TUG with Age was .60 showed moderate positive correlation and having .000 P value showed significant association.

Conclusion:

This study concluded that with increasing age balance deteriorates and it leads to fall risk. Due to this upon assessment Berg balance scale and Dynamic gait index value decreases and Time up and go take more time for completion because of aging and fragility. These scale help the clinicians and researchers to note early equilibrium impairments to make early implication to prevent falling in community dwelling ambulatory elderly. To make precise measurement of gait deviation future researchers can use 3D analysis, motion sensors.

Discussion:

This study was conducted to find the correlation of BBS, TUG and DGI in community Dwelling Ambulatory elderly. Following parameters Age, weight, height, BMI, Socio economic status, Occupation and P value of three scale to find the correlation. Intention of this research to find the correlation these scale on mobility, Balance issues and Gait impairments with increasing age in community dwelling elderly. On individual basis current study found the correlation of BBS, DGI and TUG with age.

Previous study they looked back at the victim of 88 stroke patients aged 50 or above who had previously been assessed using the Mini-BESTest and the BBS to determine their walking at a relaxed pace. The two scales demonstrated a relationship with speed of gait along the ability to distinguish between fast and slow walkers(26). It only conclude the



relationship of gait in differentiating fast and slow walkers. Present study find the association of BBS with age and concluded that it has significant association. In elder population balance issues occur due to that mobility compromises and they may experience falling.

Study was conducted to compare Performance oriented mobility assessment test and TUG. They took 340 elderly people. Result showed that in POMA test showed negative correlation with falls and TUG positive correlation. It concluded that Time up and Go test showed better specificity and sensitivity to predict future falls. TUG can be applied in both research and therapeutic contexts and is a valuable tool to assess an older person's risk of falling(1). This study is in the favor of proposed work. Proposed work does not include POMA but it concluded that TUG showed a significant association with age. With increasing age elderly individual face lot of problems, they have more risk for fall as compare to young due to fear of falling their mobility also compromises.

Research was conducted on stroke patients by comparing BBS, TUG and six-minute walk test. Interviews with individuals were used to document the history of falls. They perform Berg balance scale, Time up and go and 6 Minute Walk test. Sensitivity, specificity, and predictive values were described using Receiver Operating Characteristic curves. They concluded that BBS outperformed TUG and 6MWT in predicting stroke patients' likelihood of falling (27). Previous work was conducted on stroke patients and this ongoing work is conducted on healthy elderly. It showed partial agreement to the present research because present work showed that BBS and TUG are equally beneficial for measuring risk of fall in community dwelling ambulatory elderly.

Research was conducted to measure balance and fall in seniors. It was a cross-sectional survey and 174 participants with gait impairment was included. They found that modified TUG Test is related to whether falls occur or not. When assessing the danger of falling, time is a crucial factor, and a 15-second threshold is a useful value for identifying older individuals who are at a high risk of falling(28). This work study demonstrate the importance of time for predicting falls. It does not nullify or accept the results of present work. Present work is novel from the previous one because it assesses the association of DGI with age. It concluded DGI showed significant association with age as age increasing DGI value decreases, their dynamic mobility compromises due to age increasing age factor.

In another study they concluded that in community-dwelling ambulatory elderly there is a powerful negative relationship between the DGI and the FES-I.(29) current study shows low negative correlation of the scales with age so this study is against the previous study. This study has some limitations that need to be addressed by future researchers, e.g proprioception was not measured, does not include rural population. Researchers may also compare the effect of these three scales on urban and rural population.

Conclusion:

This study concluded that with increasing age balance deteriorates, it leads to increases fall risk. Due to this upon assessment Berg balance scale and Dynamic gait index value decreases and Time up and go take more time for completion because of aging and fragility. These scales help the clinicians and researchers to note early equilibrium issues make early

implication to prevent falling in community dwelling ambulatory elderly. To make precise measurement of gait deviation future researchers can use 3D analysis and motion sensors.

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Conflict of Interest:

Authors report there are no competing interests to declare.

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CONFLICT OF INTEREST

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DATA SHARING STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request



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