Original Article

Functional Mobility Problems and Cognitive Decline in Institution-Based Older Adults In Leyte: A Correlational Study

Gwynth Kaye Villacorte Sudario[1], Donald Lipardo[2]

[1]Department of Physical Therapy, College of Biomedical Sciences, Doña Remedios Trinidad Romualdez Medical Foundation, Tacloban City, Leyte, Philippines; [2]Department of Physical Therapy, College of Rehabilitation Sciences, University of Santo Tomas, Manila, Philippines

Correspondence should be addressed to: Gwynth Kaye Villacorte Sudario[1]; gwynthkayesudario@yahoo.com

Abstract

Background: With the increase of life expectancy, the number of nursing homes accommodating institution-based older adults has also increased. It is important to determine the link between functional decline and cognition among elderlies to assist health care professionals in providing the necessary care to ameliorate the living conditions of elderlies in home institutions. **Methods:** This descriptive observational study with correlational design recruited 30 institution-based older adults from three nursing homes in Leyte, Philippines. The researchers used Montreal Cognitive Assessment (MoCA), Timed-Up, and Go Test (TUG) and 10-Meter Walk Test (10MWT) to assess the functionality of the participants and Pearson Product Moment Coefficient Correlation to determine the association between functional mobility and cognitive function. Simple linear regression analysis was employed to determine the level of significance of functional mobility and cognitive function while multivariate linear regression analysis was used to examine the relationship of adjusted covariates. Statistical significance was set at ($p<0.05$). **Results:** The prevalence of probable cognitive impairment was 90%, which was predominant in ≥ 70 years old and male (91.6%). The common functional problems were impairment in dynamic balance and mobility at 70% and gait speed at 73.3%. The result showed significant correlation between the cognition and functional mobility. **Conclusion:** Cognitive impairment is highly prevalent in nursing homes. Institution-based older adults showed impaired dynamic balance and slow speed. Significant correlation between functional mobility problems and cognitive decline in institution-based older persons was established.

Keywords: institution-based older adults, functional decline, cognitive impairment.

INTRODUCTION

Older adult refers to a person aged 60 years or above.[1] Globally, the proportion of older adult population ranges from 10% to 20%.[2] In Northern America, the growth rate is 41%, Europe has 23%, while Asia is projected to have 66% growth rate in the next 15 years.[3] In the Philippines, older adults account for 6.8% based on the 2010 demography.[4] This increase in the number of older adults is due to increasing life expectancy. As older adults live longer, the issue of improving their overall health and function becomes pressing and socially relevant. With this projected increase, the demand for proper health care in this growing population will also increase proportionally.[5]

Considering the data and statistics, it is paramount for health care professionals, regular staff, and even volunteers in nursing homes to take cognizance of the issues confronting the elderlies, particularly the institution-based older adults, as they were abandoned by their families or are homeless and therefore, unable to perform daily activities independently and they require assistance from others.[6]

The researchers opted to focus on institution-based older adults in Leyte, Philippines, due to high prevalence of decline in functional mobility

and cognition among the group compared to community-dwelling older adults. Leyte nursing homes are operated by charitable institutions, supervised by the Department of Social Welfare and Development (DSWD) Regional Office VIII. The programs and services include residential, nursing, dietary, recreational, and spiritual services. The regular staffs who manage and provide care for older adults are health care professionals, nuns, and volunteers from the community.

At present, there are no formal studies conducted in Leyte that present the current state of functional mobility and cognition of institution-based older adults. In the absence of such data, it is challenging to determine whether the programs in nursing homes are actually sufficient to ensure that older adults in home cares are reaching their maximum potential in terms of functional dependence.

METHODS

Ethical Consideration. The study procedure and informed consent were reviewed and approved by the Ethics Review Committee of the Graduate School, University of Santo Tomas, Manila, with protocol number GS-2017-PN 108. Permission to conduct the study was obtained from each nursing home. The information about the study purpose, process, benefit, risks and the right to withdraw were given to all participants. Participants gave their written informed consent to participate in the study. The legal guardian from the institution co-signed the consent form prior to participation.

Research Design. A descriptive-correlational design was utilized in this study.

Participants and Study Site. The researchers utilized purposive sampling in choosing the respondents of the study. The participants were the senior citizens from three nursing homes in Leyte who possess the following inclusion criteria: older adults aged 60 years or older, ability to understand written or verbal instruction in English and Filipino languages or "waray", the vernacular of people living in Eastern Visayas region in the Philippines, where Leyte is a part of. The participants should also be

able to walk with or without assistance or assistive device. Residents who were bed-bound and wheelchair-bound older adults due to terminal disease and dependent on supplemental oxygen, uncontrolled hypertension, and severe paralysis, major surgery in the previous six months, significant visual and/or auditory impairment, and severe mental health illness such as dementia were excluded.

The total sample size requirement was derived by using G-power, assuming a two-tailed alternative hypothesis with assumed 89% power and with medium effect size of .30. Therefore, 30 participants of the three nursing homes were statistically significant in this study.

Data Gathering Procedures. Demographic information included age, sex, height, weight, years of education, and length of stay in nursing homes. The information was gathered through interviews and from residents' records in nursing homes. The present illnesses, diagnosed diseases, number of medications used and functional abilities were obtained through physical examination and medical history by a physician commissioned for the study. The Montreal Cognitive Assessment (MoCA) was used to evaluate cognition. Timed-up and Go Test (TUG) and 10 Meter Walk Test (10MWT) were used to measure functional mobility. Both cognitive and functional mobility assessment were conducted by trained physical therapists and all assessment tools were made available in English or "Winaray" languages. Safety of the walking pathway through standby assistance, regular monitoring of participants blood pressure and rate of perceived exertion, rest periods in between trials of TUG and 10MWT, and presence of a physician were provided at all times during gait activities in TUG and 10MWT.

Data Analysis. Statistical Package for the Social Sciences (SPSS), version 17 was used for statistical analyses of the study. Participant characteristics were examined with descriptive statistics (mean ± SD, frequency and percentage). The Pearson Product Moment Coefficient Correlation was used to determine the association between functional mobility and cognitive function. Simple linear regression analysis was employed to determine the

intensity and direction of association and level of significance of functional mobility (dependent variable) and cognitive function (independent variable). Multivariate linear regression analysis was used to examine relationship of adjusted covariates that may influence functional mobility and cognitive function such as age, sex, BMI, years of education, medication use, and disease co-morbidity. Statistical significance was set at ($p<0.05$).

RESULTS

Demographic. A total number of 30 older adults with mean age of 73.9 ± 9.07 with 60% females participated in this study. Thirty-four percent (34%) of were young- old (60-69 y/o), 40% were middle -old (70-79 y/o), and 26% were oldest- old (>80 y/o). The initial participants consisted of 53 older- adults. However, 23 were excluded as they did not meet the inclusion criteria. It could be noticed that 53% of the participants have normal BMI (20.5 ± 1.4), 96.7% had formal education; (9 ± 4.5), 60% lived in nursing home for 1-3 years (22.7 ± 8.4); 80% had at least one diagnosed disease (1.46 ± 0.51); 33% uses assistive device, and 63% had at least two medications intake (1.53 ± 0.51).

Validation and reliability test of MoCA. The validation of MoCA followed the procedure according to the World Health Organization (WHO) process of translation and adaptation of instruments. The translated MoCA to Winaray was pilot tested to six older adults in the identified nursing homes, which consisted of 3 females and 3 males. The respondents were at different age range categories and with different socioeconomic status. Two raters were assigned to do the reliability test. The same raters conducted the MoCA during the actual conduct of the study. There was no significant difference found on the results of test-retest reliability.

Cognitive Impairment. The prevalence of mild cognitive impairment among the participants was 90% with predominance among ≥ 70 years old. In terms of sex, the study found that 91.6% of the males and 88.8% of the females had MCI.

Functional Mobility Problems. The common functional problems observed and measured among participants in this study were problems in balance and gait as reflected on TUG and 10MWT results which accounted to 70% and 65.4% respectively. The TUG test results were 20.5 ± 16.1 seconds for TUG alone; 24.1 ± 14.9 seconds for TUG cognitive; and 20.7 ± 11.7 seconds for TUG manual. Whereas, the 10MWT results were 0.9 ± 0.6 m/s for preferred speed and 1.2 ± 0.7 m/s for fastest speed. Balance and gait problems among males were 66.7% and 41.7% higher than their female counterparts having 38.7% balance problem and 38.7% slow gait. Three participants withdrew from the tests due to fatigue.

Association of Functional Mobility and Cognition. Pearson Product Moment Correlation was employed in the study and significant relationships were found among these variables: (1) Between cognition (MoCA) and TUG manual ($r=-0.731$, $p= 0.00$); (2) 10MWT preferred speed ($r=0.629$, $p= 0.00$) and fastest speed ($r= 0.573$, $p= 0.00$);(3); (4) TUG alone and TUG manual ($r= 0.980$, $p= 0.00$); (5) the two 10MWT (preferred speed ($r= -0.724$, $p= 0.00$) and fastest speed ($r= -0.717$, $p= 0.00$); (6) TUG cognitive and TUG manual ($r= 0.983$, $p= 0.00$) and the two 10MWT (preferred ($r=-0.431$, $p= 0. 01$) and fastest speed ($r= -0.427$, $p= 0.01$); and (7) TUG manual and the two 10MWT (preferred speed ($r= -0.846$, $p= 0.00$) and fastest speed ($r= -0.841$, $p= 0.00$).

On the other hand, no significant relationship were found: (1) Between cognition (MoCA) and TUG alone ($r= -0.350$, $p= 0.05$); (2) cognition (MoCA) and TUG ;cognitive ($r= -0.281$, $p= 0.13$); (3) TUG alone and TUG cognitive ($r= 0.043$, $p= 0.82$); (3) preferred speed and TUG cognitive ($r= -0.431$, $p= 0.01$); and (4) fastest speed of 10MWT and TUG cognitive ($r= -0.427$, $p= 0.01$).

In Multivariate Regression Analysis, there was a significant effect on the length of stay ($p= 0.01$) and education ($p= 0.03$) in MoCA score. For each cognitive domain, education was significantly correlated to visuospatial ($p= 0.04$), attention ($p= 0.00$), language ($p= 0.01$), and abstraction ($p= 0.01$). BMI was the predictor of orientation ($p= 0.04$) while there were no variables associated with naming and delaying recall domain.

The length of stay was significantly correlated to preferred speed ($p= 0.00$) and fastest speed ($p=

0.00) after multivariate regression analysis. There was 100% scored less than the normative value of preferred and fastest speed of 10MWT in participants who stayed <1 year in nursing home. While the 60% participants who stayed 1-3 years, 27% of them scored within the normative value of preferred and 22% in fast speed. The 20% of participants who stayed >3 years, 50% scored within normative value of preferred speed and 83% in fast speed.

Regression Analysis between MoCA and the participants' demographics including TUG and 10MWT. The regression analysis between the MoCA and TUG alone was not significant since the p-value was 0.058 and is greater than 0.05. This implies that the prediction of TUG alone to the MoCA results of the participants was not significant. MoCA and TUG cognitive was significant at 5% level of significance since the p-value was 0.01. This finding could mean that the prediction of TUG alone to the MoCA result of the participants was significant.

The regression analysis between the MoCA and TUG manual was significant at 1% level of significance since the p-value was 0.00 while the regression analysis between the MoCA and preferred Gait Speed of 10MWT was significant at 1% level of significance since the p-value was 0.00. The regression equation was given as $y=$ 7.364 + 8.051 x where y (dependent variable) was the MoCA and this was predicted using x variable which was the preferred gait speed of 10MWT (independent variable). This implies that the prediction of fastest gait speed of 10MWT to the MoCA results of participants was significant.

On the regression analysis between the MoCA and age, it was found to be significant at 5% level of significance since the p-value was 0.039 which was less than 0.05 but greater than 0.01. On the other hand, the regression analysis between the MoCA and sex, height, weight, and BMI were not significant.

On the MCI and education regression analysis, the difference was significant at 1% level of significance since the p-value was 0.00. This implies that the prediction of education to the MoCA result of participant was significant. The regression equation is given as $y=$ 8.543 + 0.723 x where y (dependent variable) was the MoCA and this was predicted using x variable which was education (independent variable). The equation explained that education directly predicted the MoCA result which means that participants who have high degree of educational attainment had higher MoCA result.

The regression analysis between MoCA and participants' length of stay was significant at 1% level of significance since the p-value was 0.006. This implies that participants who stayed longer at the nursing home had higher MoCA result. Moreover, the regression analysis between MoCA and participants' number of diseases was significant at 1% level of significance since the p-value was 0.00. This implies that the prediction of participants' number of diseases to the MoCA result of participant was significant. The equation explained that participants, who have more diseases, tend to have MCI. While the MoCA and number of medication intake was not significant based on the regression analysis.

DISCUSSION

This study aimed to explore the prevalence of cognitive impairment, common functional problems, and the association of functional mobility and cognition in institution-based older adults. Findings show that the prevalence of cognitive impairment was high (90%) among the participants. The result was higher than the previous study, which only accounted 67% among 4831 residents in a nursing home.[7] The severity of cognitive impairment was not determined in this study. However, it is expected that some of the residents may be suffering from dementia.

The study showed that cognitive impairment was high in ≥ 70 y/o men. The result is consistent with another study among community dwelling older adults stating that cognitive function often declines with aging, specifically the executive functioning.[8] This finding is supported by the results of regression analysis which presents that increasing age tends to have low MoCA scores. Executive function is an important aspect to the ability of an older adult to perform activities of daily living.[9] Sedentary

lifestyle was observed among the participants in this study. This may have contributed to the participants' poor cognitive function.[10] Regarding sex, the present study supports the findings of another study, which found that men had more cognitive impairment than women.[11] Women in this study often spend time with close friends in the nursing homes, thereby having more time to engage in social connections compared to men.

Furthermore, the study found out that education and length of stay predict MoCA score after multivariate analysis. The prediction of education and length of stay to cognitive function was significant in regression analysis. A better result in MoCA test was found among those who had more than six years (11.3 ± 2.3) of education. This finding was consistent with the result of a similar study, which found that education greatly influence MoCA scores.[12] Participants who lived in nursing homes for more than three years performed better in MoCA test. Furthermore, those who have stayed in the nursing home longer also performed better in relation to normative value. This may imply that older adult who have stayed longer in nursing homes are more adjusted to the nursing home situation and this may also contribute to their personality and well-being. Emotionally stable older adults are more proactive and participative in activities, which can be associated to better cognition.[13]

Another finding is that participants who had normal BMI in this study accounted to 53%. 93.8% were found to have cognitive impairment and all of them were underweight. Therefore, low BMI may contribute to the decline in cognition in older adults.

Other characteristics that were observed in this study that influenced MoCA scores were visual and hearing impairment. The visual and hearing problems in older adults in this study were under treatment but the severity was undetermined. There were 47% of participants with visual problem and 23% with auditory issues. Participants with visual impairment had a mean score of 11.1 ± 5.6 in MoCA and those with auditory impairment had a mean score of 6.9 ± 5.4. Self-reported hearing loss had been associated to cognitive decline in older adults in

another study.[14] In a related study by Hong[15] and colleagues, they found high percentage of participants with visual impairment that scored low in cognitive test but found no association of visual impairment and cognition.

Furthermore, this study also aimed to determine the common functional problems in institution-based older adults. Impairment in balance and gait were the functional problems noted in this study. This finding is supported by another study which established that functional decline was age-related and associated with decrease in muscle performance.[16] Older adults with functional problems in this study were predominant among ≥70 y/o, which accounted to 60%.

TUG and 10MWT were the functional assessments used in this study for the evaluation of balance and gait. The TUG results were consistent with a related study wherein impaired performance was observed in older adults with cognitive impairment.[17] In TUG test, female participants walked slower than male. However, balance problem was found higher among males in this study. There were four female participants who used walker; two had visual impairment, one with dyspnea, and one with vertigo.

In this study, 65% of the participants in preferred speed and 73% participants in fastest speed walked with slow gait. Four participants including two females and two males refused to performed 10MWT due to fatigue. Impaired gait was observed among older adults in this study, thereby suggesting their difficulty in performing daily activities and their high risk for falling. Older adults who stayed longer in nursing homes were found to have poor functional mobility.

The third objective in this study was to investigate the association between functional mobility and cognitive function. The result showed significant correlation between the cognition and functional mobility.

The time to plan a movement during TUG test was observed to be prolonged in participants with cognitive impairment. Dual task performance was poor in participants with cognitive impairment as reflected on TUG cognitive and manual results. This finding was

consistent with another study stating that dual task that was executed faster is associated with better cognition.[18] The association between cognition and 10MWT was also evident in this study. In regression analysis, both preferred and fastest speed of 10MWT predicted cognitive function. Slow gait was observed in participants with cognitive impairment and this was also noted in the study of Tian[19] and company. Self-reported functional problems and other health issues were gathered in this study that may have affected the functional mobility performance. Previous studies found that self-reported functional problems in activities in daily living may determine future cognitive decline.[20] In regression analysis, participants who have more diseases predict cognitive function. Sedentary lifestyle or immobility was observed along with disease co-morbidities which may be related to poor physical function.[21] Poor performance in both functional mobility and cognitive tests revealed future development of falls and severe cognitive impairment.[22] Thus, this study suggests activities that can enhance both physical and cognitive function must be an integral part of the daily activities in nursing homes.[23] The results of this study also suggests for nursing homes, particularly in Leyte, to provide facilities that will ensure the safety of institution-based elderlies considering that they have functional problems and are already suffering from cognitive impairment. Structural safety such as installing physical support and handles in areas where they converge and in their bedrooms and comfort rooms can also support the elderlies physically. To address the mobility and cognitive needs of adults in home care facilities, such facilities should have more health care workers who can provide dedicated or a more focused care and attention to institution-based adults in Leyte.

CONCLUSIONS

Findings showed that there was 90% prevalence of cognitive impairment in institution-based older adults. The common functional mobility problems were balance and gait speed. Older men population was at high risk for falling and had abnormal gait speed compared to older women. Moreover, it revealed the association between functional problems and cognitive impairment among older adult in nursing homes in Leyte.

Limitation of the study. Although the study was able to determine the prevalence of probable cognitive impairment and the common functional problems of institution-based older adults, it must be noted that the study was only conducted in the three nursing homes found in Leyte with only 30 participants. Nevertheless, the study was able to establish the correlation between functional mobility and cognition, as part of its objectives. However, the study would have been able to draw a more diverse and well-enriched analysis and more substantial conclusion if the sample size was bigger. Due to the constrained number of nursing homes and participants of the study, the findings may not be generalized as representation of the whole population of institution-based older adults.

Individual author's contributions

G. K. V. Sudario; Designed and performed experiments, analysed data and co-wrote the paper. D.S. Lipardo; Supervised the research and co-wrote the paper.

Disclosure statement

Conflicts of interest

The authors of this paper declare no conflicting interest.

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