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The relationship between physical performance and quality of life and the level of physical activity among the elderly

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Abstract:

BACKGROUND: Loss of physical function during the process of aging might affect the quality of life. Physical function assessment tests predicts outcomes such as falls, institutionalization, and death. Studies assessing the association of physical function with quality of life and physical activity level of elderly population in India is scarce. Hence we aimed to assess the physical function of community dwelling older adults and to determine its association with physical activity levels and quality of life.

MATERIALS AND METHODS: This was a cross-sectional analytical study. 89 community dwelling older adults between 60 and 80 years of age were recruited. Physical function was assessed by standing balance, walking speed, and grip strength. Quality of life was assessed by WHO QOL BREF questionnaire and physical activity level was assessed by International Physical activity Questionnaire.

RESULTS: Standing balance was reduced in 24% and walking speed was decreased in 33% of the participants. Males had higher walking speed, and grip strength. Quality of life was better among males. Standing balance, walking speed and grip strength was significantly higher in moderate – heavy activity levels. There was positive correlation between physical function and quality of life. There was also positive correlation between physical activity level and quality of life.

CONCLUSION: Physical function, quality of life and physical activity level were decreased. Males had better physical function and quality of life. Physically active individuals had better physical function and quality of life. Early detection of decreased physical function and increase in physical activity level could result in better quality of life among elderly.

Keywords:

Older adults, physical activity level, physical function, quality of life

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Introduction

The population of older adults (>60 years of age) in India has increased in recent decades. 2011 census in India reported that 8.2% of the population was elderly, and it is estimated to increase to around 19% in 2050. These rising proportions of older adults reflect the increase in longevity of the population. This has led to the discussion of health maintenance and the general well-being of this vulnerable population.^[1]

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Poor muscle strength, reduced flexibility, and limited exercise capacity are some of the health issues that manifest during the aging process. These physiological changes might lead to loss of physical function and disability.^[2] Poor functional ability, increasing dependence, and requirement of hospital services affect their quality of life (QOL).^[3]

The World Health Organization (WHO) defines the QOL as “an individual’s perception of life in the context of culture and value system in which he or she lives

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and in relation to his or her goals, expectations, standards, and concerns.”^[4] The assessment of QOL and physical function reflects the general well-being and health status of the geriatric population. WHOQOL-BREF questionnaire is the commonly used questionnaire that is validated and standardized across many countries for assessing the QOL of an individual. Physical, psychological, environmental, and social relationships are the four domains assessed through this questionnaire.^[5] Many studies have assessed the determinants of QOL and reported sociodemographic factors such as age, education, marital status, family structure, and lifestyle factors such as physical activity are related to QOL. QOL assessment among older adults has a wide range of usage in clinical practice to monitor any disease progression and evaluate treatment.^[6]

The prevalence of psychosomatic disorders and motor function disorders was found to be negatively associated with the QOL among the elderly.^[7] Physical activity has beneficial impacts on physical, psychological, and spiritual well-being.^[8] Regular physical activity not only helps as preventive but also as a rehabilitative measure of many health hazards encountered in this age group. Functional evaluation is a necessary part of traditional clinical examination in the geriatric population. The assessment of functional status using simple physical function assessment tests helps to measure physical performance and also has been shown to predict outcomes such as falls, institutionalization, and death.^[9] Standardized physical performance tests such as gait speed, standing balance, and grip strength help in assessing the physical function in the elderly.^[10] With the current trend in the increase in the geriatric population in India, there is a need to highlight the problems and give solutions regarding the health-related issues faced by the elderly population. While most of the studies assessed the QOL alone among the elderly population in rural and urban India, studies assessing the physical performance, physical activity level, and its association with QOL are less among the Indian population. Hence, in this study, we aimed to assess the physical function of community-dwelling older adults between 60 and 80 years of age and to determine its association with physical activity levels and QOL.

Materials and Methods

This was a cross-sectional analytical study. The study was approved by the Institutional Research Committee and the Institutional Human Ethics committee (IHEC No: ICMR Project/08/2019/03). The Declaration of Helsinki and National Ethical Guidelines for Biomedical and Health Research 2017 by the Indian Council of Medical Research were followed throughout the study. The details of the procedure were explained to the

participants, and written informed consent was obtained before taking up for the study. About 89 older adults between 60 and 80 years of age living in the community were recruited by convenience sampling method. Older adults who had a history of recent myocardial infarction, stroke, locomotor disabilities, gross visual impairment, cervical or lumbar peripheral neuropathy, postural giddiness, and terminal illness such as cancer and end-stage renal failure were excluded from the study.

Physical Function assessment

Physical function was assessed by measuring standing balance, walking speed, and grip strength.^[10] These physical functions tests were assessed by a single investigator at the participant’s home.

Standing balance test

The participants were asked to stand and attempt to maintain their feet in the side-by-side, semi-tandem (heel of one foot beside the big toe of the other foot), and tandem (heel of one foot directly in front of the other foot) positions for 10 s each. Adapted from previous publications,^[10] the performance of the participants was scored [Table 1].

Walking speed

Participants’ normal pace of walking for 8 feet was timed, and the participants were scored according to quartiles for the length of time required. The time of the faster of two walks was used for scoring. Score 1 for ≥ 5.7 s, 2 for 4.1–5.6 s, 3 for 3.2–4.0 s, and 4 for ≤ 3.1 s.^[10]

Grip strength

Grip strength was assessed using a handgrip dynamometer (Camry, China) on the dominant hand. The participants were asked to stand, extend the forelimb, and hold the handgrip dynamometer. The participants were asked to hold the dynamometer as tight as possible, and the maximum value was taken as the grip strength. The best of the three trials was taken as the grip strength.

Quality of life

QOL was assessed by administering the WHOQOL BREF questionnaire. This questionnaire contains 26 questions. The first question assessed the self-perception of overall QOL and the second question assessed their satisfaction with health. The remaining 24 questions were divided

Table 1: Scores of standing balance test

Score	Performance
1	The subject holds the side-by-side standing position for 10 s but unable to hold a semi-tandem position for 10 s
2	The subject could hold a semi-tandem position for 10 s but unable to hold a full tandem position for more than 2 s
3	The subject could stand in the full tandem position for 3–9 s
4	The subject could stand in the full tandem position for 10 s

into four domains such as physical health, psychological, social relationships, and environment. Each of the facets was rated based on a 5-point Likert scale. The mean score of each domain and the total score were calculated.^[5,11] A cutoff point of <60 is considered as poor QOL.^[12] Previous studies have assessed the psychometric properties and reported good internal consistencies (0.72–0.85) and acceptable convergent validity (0.61–0.77) with WHO QOL BREF.^[13–15]

Physical activity level assessment

The physical activity level of the participants was assessed by administering the International Physical Activity Questionnaire-short form. This questionnaire provided information on the time spent walking, in vigorous and moderate intensity activity and in sedentary activity. Participants were instructed to refer to all domains of physical activity.^[16,17] This IPAQ was proved to be a reliable and valid questionnaire which can be utilized for research studies and health programs.^[17,18]

Statistical analysis

Continuous data were represented as mean and standard deviation. Discrete data were represented as frequencies and percentages. Parametric data were analyzed by independent *t*-test, and nonparametric data were analyzed by Mann–Whitney U-test. The correlation was done by Pearson’s correlation for parametric data and Spearman’s rank correlation for nonparametric data. $P < 0.05$ was considered as statistically significant. Data were analyzed using SPSS Statistics for Windows, Version 17.0 (SPSS Inc., Chicago, Illinois, USA).

Results

Out of 89 participants, there were 38 male and 51 female participants. Table 2 summarizes the baseline characteristics of the participants. The mean age of the participants was 70 years. About 38% of them were hypertensives and 21% of the participants had diabetes on regular medications. Considering the cutoff value as 60 for QOL, 18% of the participants had poor QOL in general. About 67% of them were sedentary and the remaining 34% were moderate to heavy active. About 24% of the participants had a score of <3 in standing balance. Walking speed was scored <3 in 33% of the participants.

Table 3 summarizes the gender differences in the physical function and QOL. There was no significant difference in the mean standing balance score between both the genders. The mean score of walking speed and grip strength was significantly higher in male participants compared to female participants. Among the domains of QOL, social relationship was the lowest of all the domains. Physical domain, psychological domain, and

environmental domain were significantly higher in males compared to female participants. Even though the social domain was higher among males, it was not significantly different. The total score of QOL was significantly higher among males compared to females.

Table 4 compares the physical function and QOL of the participants between low activity and moderate-high activity levels. All the parameters of physical function such as standing balance, walking speed, and grip strength were significantly higher in moderate-heavy activity levels.

Table 5 summarizes the correlation of physical function and physical activity levels with QOL. In general, there was a strong positive correlation between physical function and different domains of QOL. There was no significant correlation of standing balance and grip strength with social relationship domain. There was a strong positive correlation between all the physical function tests and total QOL score. There was also a positive correlation between physical activity level and different domains of QOL except for social relationship.

Discussion

The assessment of QOL is essential in understanding the health status and well-being of an individual. Several researchers and geriatricians have emphasized the use of QOL measures in assessing the overall health status of the elderly population in the clinical setting.^[6] Silva *et al.* assessed the QOL of older adults in Brazil and proposed a cutoff value of <60 to identify the poor QOL among older adults with a sensitivity of 95%.^[12] Considering the cutoff value of QOL as 60, 18% of the participants had poor QOL in our study population. Among the domains of QOL, the score of the social relationship domain is found to be less than physical health, psychological, and environmental domain. Similar results were reported by Kumar and Majumdar that social relationship domain

Table 2: Baseline characteristics of the participants

Variable	Frequency (%)
Total number of participants	89
Male	38
Female	51
Age in years (mean±SD)	70.0±6.2
Hypertension	34
Diabetes	19
Quality of life	
Good (total score ≥ 60)	73 (82)
Poor (total score <60)	16 (18)
Physical activity levels	
Low activity	59 (66.3)
Moderate activity	21 (23.6)
Heavy activity	9 (10.1)

SD=Standard deviation

Table 3: Gender differences in physical function and quality of life of the participants (Mean±SD)

Parameters of Physical function and Quality of Life	Total	Male	Female	P
Physical function parameters				
Standing balance (score)	3.2±1.1	3.2±1.1	3.2±1.1	0.773
Walking speed (score)	3.2±1.1	3.1±0.8	2.7±0.7*	0.007
Grip strength (kg)	16.2±7.2	21.3±7.9	12.4±3.4*	0.000
Quality of life				
Physical domain	20.4±4.5	21.6±4.7	19.4±4.1*	0.022
Psychological domain	17.7±3.9	18.9±3.7	16.8±3.7*	0.008
Social relationship	9.5±2.0	9.8±9.2	9.2±2.3	0.160
Environmental	24.9±3.8	25.9±3.6	24.2±3.8**	0.017
Total score	72.5±12.3	76.3±11.9	69.6±11.9**	0.010

SD=Standard deviation, *To determine gender difference, data were analyzed by independent t-test. $P<0.05$ was considered as statistically significant, **To determine gender difference, data were analyzed by Mann-Whitney U-test. $P<0.05$ was considered as statistically significant. SD=Standard deviation

Table 4: Comparison of physical function and quality of life between different levels of physical activity (Mean±SD)

Parameters of Physical function and Quality of Life	Low activity	Moderate- heavy activity	P
Physical function parameters			
Standing balance (score)	3.0±1.2	3.6±0.9*	0.025
Walking speed (score)	2.7±0.7	3.1±0.7*	0.013
Grip strength (kg)	14.5±4.5	19.5±8.9*	0.005
Quality of life			
Physical domain	19.1±4.1	22.3±4.7*	0.002
Psychological domain	16.9±3.5	19.3±4.1*	0.007
Social relationship	9.2±2.1	9.9±1.9	0.161
Environmental	24.5±3.4	25.8±4.4**	0.025
Total score	70.0±10.9	77.3±13.6**	0.007

SD=Standard deviation, *Data were analyzed by independent t-test. $P<0.05$ was considered as statistically significant, **Data were analyzed by Mann-Whitney U-test. $P<0.05$ was considered as statistically significant

Table 5: Correlation between physical function and domains of quality of life

Physical function	Physical domain	Psychological domain	Social relationship	Environmental	Total score
Physical function					
Standing balance					
<i>r</i>	0.355	0.363	0.204	0.253	0.345
<i>P</i>	0.001*	0.001*	0.056	0.012*	0.001*
Walking speed					
<i>r</i>	0.279	0.261	0.754	0.397	0.315
<i>P</i>	0.008*	0.014*	0.034*	0.000*	0.003*
Grip strength (Kg)					
<i>r</i>	0.426	0.409	0.166	0.377	0.423
<i>P</i>	0.000*	0.000*	0.121	0.000*	0.000*
Physical activity level					
Total METS min per week					
<i>r</i>	0.405	0.310	0.162	0.238	0.361
<i>P</i>	0.000*	0.003*	0.132	0.026*	0.001*
Physical activity level					
<i>r</i>	0.279	0.261	0.754	0.397	0.315
<i>P</i>	0.008*	0.014*	0.034*	0.000*	0.003*

*Pearson's correlation was done for parametric data and Spearman's correlation was done for nonparametric data. $P<0.05$ was considered as statistically significant

of QOL was more affected when compared to physical health, psychological and environmental domains among older adults in Puducherry.^[19] In general, QOL was significantly higher among males compared to females. Physical, psychological, and environmental domains were significantly higher in males. Similar results were reported in previous studies that among the

elderly population, QOL among males were higher than females which suggests that gender plays a crucial role in the QOL of older adults.^[15,20] QOL was less among people who had low physical activity compared to moderate to heavy physical activity. Rétsági *et al.*^[21] and Puciato *et al.*^[7] in their study among older adults reported a positive relationship between physical activity level and QOL.

Rétsági *et al.* also reported a negative correlation between sedentary behavior and QOL among older adults.^[21]

The maintenance of physical function is an essential aspect of successful aging. The decline of physical function with age is associated with several risk factors such as low physical activity.^[22] In our study, physical function parameters like standing balance were reduced in 24%, and walking speed was reduced in 33% of the participants. Males had better physical function compared to females. Wood *et al.* assessed the physical function among the elderly between 60 and 98 years of age and reported that there was a decline in physical function as age advances and females had poor physical function than males. The reason being attributed to larger muscle mass among males.^[23] Physical function parameters such as standing balance, walking speed, and grip strength were significantly higher in moderate to heavy active participants than sedentary counterparts. Lower physical function among older adults leads to disability and frailty in subsequent years. In a prospective study for 8.8 years by Hillsdon *et al.*, there was preservation of high physical function among participants who adopted a physically active lifestyle at middle age.^[24] A longitudinal study by Metti *et al.* reported a bidirectional relationship between physical function and physical activity. A person with low physical function had decreased physical activity in later part of life, and a person with low physical activity during the initial part of life had declined physical function in later part of life.^[24] Even though the loss of physical performance is inevitable as age advances, initiation of regular physical activity at an earlier age reduces the age of development of disability.^[25] There was a significant positive correlation between physical function and different domains of QOL. Several studies performed long-term interventional programs of aerobic exercise and resistance exercise^[26] and reported improvement of physical performance among the elderly and decreased incidence of disability. Recommendation by the American College of Sports Medicine insists upon the performance of multiple modes of exercise such as aerobic, strength training, and flexibility such that the flexibility is maintained or increased and balance is preserved to prevent from fall and reduce morbidity.^[27]

The present study confirms the positive relationship between physical activity level, physical function, and QOL. Sedentary behavior, especially among older adults, should be considered as an important public health issue, and awareness of the necessity of increased physical activity level should be emphasized. Physical function assessment in regular clinical settings for the geriatric population ensures better health and helps in preventing frailty, thereby ensuring a better QOL. While several guidelines are proposed for the physical activity,^[28] exercise prescription for older adults based on physical

function assessment would improve the health status of older adults. We suggest conducting community-based health programs for improving the physical activity level, which could improve the physical function and hence improve the QOL of the elderly population.

Conclusion

We conclude that there was a decrease in physical function, QOL, and physical activity level in general in the older age group. Females had lesser physical function and QOL compared to males. There was a positive correlation of QOL with physical function and physical activity level. Older adults prefer QOL to longevity. The common side effects of aging can be mitigated by increasing physical activity which not only reduces risk factors but also delays the onset or decreases the side effects of aging and improves QOL. Early screening by assessing the physical function and QOL will help in early intervention that can be implemented to attenuate the progression of frailty.

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Conflicts of interest

There are no conflicts of interest.

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