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Original Research Article

Functional status and mental health among the elderly in rural South India: a cross sectional study

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ABSTRACT

Background: Functional status assessment in the elderly helps to improve quality of life and prognosticate chronic disease. Literature on the status of functional ability of the elderly in rural India is limited.
Methods: A cross-sectional study was done among 164 rural elderly persons in eight villages from Vellore, Tamil Nadu, to assess the prevalence of poor functional status, mental and physical health.
Elderly aged 60 and above were selected by systematic random sampling, from eight villages which were selected by simple random sampling from a single rural block. A semi structured questionnaire on disability, health status, activities of daily living and functional assessment (Katz Index), depression (Geriatric Depression Scale-5) and cognition (Dementia Assessment by Rapid Test) was administered.
Results: Out of 164 participants, 6.7% (11, 95% CI: 2.8%-10.6%) had a dependent functional status. While 68.9% (n=113) reported a chronic condition, 21.9% (n=36) reported multiple comorbidities and 37.2% (n=61) screened positive for depression. All those with a dependent functional status had a chronic condition. Female gender (OR: 8.33, 95% CI: 1.04-100.00), living alone (OR: 11.60, 95% CI: 1.58-85.34) and depression (OR: 11.29, 95% CI: 2.00-63.70) were found to be significantly associated with dependent functional status.
Conclusions: Although majority of the community dwelling rural elderly had normal functional status, given the high burden of chronic diseases, it is important to routinely assess functional status to identify elderly at risk of disabilities.

Keywords: Activities of daily living, Elderly, Chronic disease, Depression, Cognitive dysfunction

INTRODUCTION

The elderly population globally is expected to double by 2050 as the group reaches 2.1 billion individuals, accounting for 23% of the global burden of disease.[1] Important causes of morbidity in this group include cardiometabolic, respiratory and oncological pathologies, as well as falls, depression, visual impairment and neurodegenerative disorders.[2]

These conditions are associated with population ageing are well established contributors of financial burden on

the economy by merit of the disability brought about downstream, rather than the mortality that they cause.[2]

Functional impairment, which refers to a limitation in Activities of Daily Living (ADL), is often proximal to the onset of disability, which is an impairment of bodily, mental, or emotional function.[6,7] Assessment of functional impairment provides an objective measure for investigating the consequences of disease and impairment, even before onset of disability.[4] Commonly assessed faculties include bathing, dressing, continence, eating, transfers, and toileting which are used to generate an ADL score. While these activities affect the quality of life, a drop in ADL score, (functional decline), also has a bearing on lifespan and health. [5] The effect of functional decline is by no means restricted to the individual alone. Right from the physical and emotional fatigue of caregivers to the heavy financial burden on the health system, the effects of poor functional status make their mark downstream. [6]
Functional status assessment helps to identify preventable diseases at early stages, prognosticate chronic disease and determine the amount of financial investment and human resource allocation needed at the individual level.[7] Functional ability has been studied extensively in the geriatric community from high income countries, but literature from India is limited. A study from rural Haryana revealed a functional disability prevalence of 21.4% and 18% using Barthel and Katz indices respectively, with a significant positive correlation with age, while another report from Haryana reported a functional disability rate of up to 37.4%.[8,9] The objective of this study was to assess the functional ability, physical and mental health status (disease status, depression, cognitive impairment) of the elderly population (aged 60 years and above) in rural Vellore, Tamil Nadu, South India.

METHODS

This community based cross sectional study was done in Kaniyambadi block, Vellore district, Tamil Nadu, with 82 villages, a population of around 116,000 and an elderly population of 17163 (≥60 years), in 2019. Inclusion criteria included any individual ≥60 years from Kaniyambadi block. However, those with active mental illness rendering them unable to participate in an interview were excluded. Sample size, assuming a functional dependence prevalence of 37.4%, relative precision of 20%, and a design effect of 1.1, was calculated to be 176. [9] A two staged cluster sampling method was carried out. In the first stage, eight villages (clusters) were selected by simple random sampling method from the list of 82 villages in Kaniyambadi block. In the second stage, a list of 28 elderly 60 years and above were selected by systematic random sampling from each of the selected villages (extra 25% selected from the list to account for difficulties in contacting participants), using the census data maintained in the health information system of the department of community health of a medical college situated in the area. Out of a total of 224 randomly selected participants, 166 participants (74.1%) were approached for the study, out of which two participants were not willing to give consent (Figure 1), yielding a final sample size of 164.

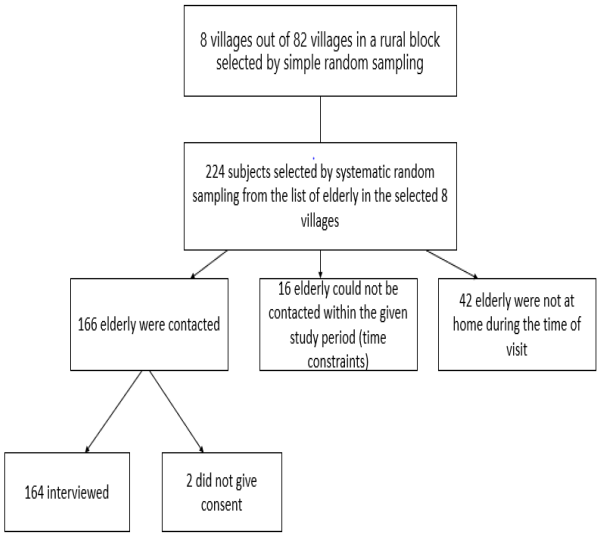

Figure 1: Flowchart of sample selection and participation in the survey.

Functional status was assessed using the Katz Index for ADL. A score of 5 and 6 corresponds to independence, 3 and 4-moderate independence, 1 and 2-moderate dependence and 0-very dependent. Scores 0-4 were grouped as dependent (loss of independence) and 5-6 were considered completely independent.[10] The Geriatric depression scale (GDS-5) was used to screen for depression, and cognitive impairment was measured using the dementia assessment by rapid test tool.[11,12] A score of 2 or more out of 5 in the GDS-5 tool was considered suggestive of depression.[11] DART score was used as a measure of cognitive impairment, with a score of 1 or more considered as cognitive impairment.[12,13] Nutritional status was assessed by body mass index (BMI) using the WHO Asia-Pacific classification, with height in centimetres and weight in kg measured using a stadiometer and an analogue weighing machine respectively.[14] Data collection was carried out using a structured questionnaire with the above tools, translated into Tamil and administered by trained interviewers. Data entry was done using Epidata v3.1 and analysed using SPSS v23. Categorical variables were presented as frequency, percentages and 95% Confidence Intervals (CI), while continuous variables were presented as mean and standard deviation (SD) or median and interquartile range. Bivariate analysis was done using Pearson's chi square test and odds ratios with 95% CI, for factors such as age, sex, education, occupation, social class (BG Prasad scale 2019), [15] presence of acute/chronic disease, depression (GDS-5), cognitive function score (DART) and overweight/obesity defined as BMI ≥ 23 kg/m^2 (WHO Asia Pacific definition). [14] Multivariable analysis

of functional dependence adjusting for age and gender was also carried out. The study complied to the terms of the Helsinki Declaration 2013.

RESULTS

The mean age of the 164 study participants was 69.24 years (SD: 8.86), with 43.3% (n = 57) above 70 years. Among the study participants 44.5% (n=73) were males, while 55.5% (n=91) were females, with more than half having a low socioeconomic status (Table 1). Using the KATZ ADL Index for functional status, 11 (8 females, 3 males) out of 164 participants (6.7%, 95% CI: 2.8-10.6%) were found to be dependent for one or more domains of ADL (score of 0-4).

Out of these 11 individuals, 9 had scores between 3-4 (moderately independent) while 2 individuals had scores between 0-2 (0 indicating very dependent and 1 to 2 indicating moderately dependent). Acute illness in the previous two weeks was reported by 31 participants (18.9%), of which respiratory illnesses (13, 7.9%) and febrile illnesses (9, 5.5%) were the most common.

The prevalence of reported chronic conditions was 68.9% (113, 95% CI: 61.8-75.9%), of which hypertension; 68, 41.5% (95% CI: 33.9-49.0%) and diabetes mellitus; 60, 36.6% (95% CI: 29.2-43.9%) were most prevalent (Table 2, Figure 2), with 22.0% (36, 95%CI: 15.66 - 28.34%) having both these conditions.

Table 1: Baseline demographics and characteristics of the study population (n=164).

Characteristic	Categories	N (%)
Age (years)	≤70	107 (56.7)
	>70	57 (43.3)
Education (years)	0-5	106 (64.6)
	6-12	51 (31.1)
	>12	7 (4.2)
Occupation	Unskilled	56 (34.1)
	Skilled	70 (42.7)
	Clerical/ Semi-professional	38 (23.1)
Marital Status	Married	91 (55.5)
	Divorced/ Separated/ Widowed	72(43.9)
	Single	1(0.6)
Family type	Nuclear	74 (45.1)
	Joint/Extended	81 (49.4)
	Lives alone	9(5.5)
Living with	Spouse with/without children	94 (57.3)
	Children	47 (28.7)
	No one	13 (7.9)
	Others	10 (6.1)
Social class*	Upper	38 (23.2)
	Middle	17 (10.4)
	Lower	94 (57.3)

*Data available only for 149 individuals

Chronic conditions other than diabetes and hypertension were seen in 39.6% (65, 95% CI: 32.1-47.1%), with chronic musculoskeletal disorders reported by 20.7% (34, 95% CI: 14.5-26.9%).

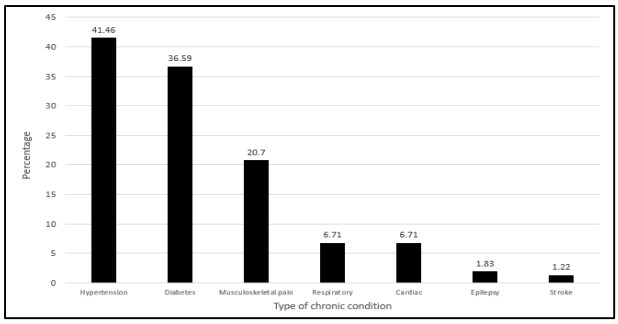

Figure 2: Prevalence of chronic conditions in rural elderly aged 60 years or greater (n=164).

The prevalence of overweight/obesity (BMI ≥ 23 kg/m^2) was 57.6% (91/158, 95% CI: 49.9-65.3%) among this rural elderly population (Table 2). Depression was seen in 37.2% (61, 95% CI: 29.8-44.6%) based on a GDS-5 score of 2 or more. The mean DART score was 1.37 (SD: 1.01), while 79.3% (n=130) had some degree of cognitive impairment (score of 1 or more). Functional dependence was significantly associated with chronic illness, with 9.7% of those with chronic illness being functionally dependent, compared to none among those without chronic illnesses (Table 3). Those with multimorbidity had higher prevalence of poor functional status (7, 11.1%) compared to those without multimorbidity (4, 4.0%) (Table 3). There was a significant association between functional dependence and depression, with 81.8% (9/11) of those with dependent functional status having symptoms of depression compared to 33.9% (52/153) in those with normal functional status (Chi-

square p value<0.001). While none of those with normal cognitive status were functionally dependent, 8.4% (11) with cognitive dysfunction had poor functional status. After adjusting for age and sex, females (adjusted OR: 8.33, 95% CI: 1.04-100.00), living alone (adjusted OR: 11.60, 95% CI: 1.58-85.34), and depression (adjusted OR: 11.29, 95% CI: 2.00-63.70) were found to be significantly associated with functional dependence (Table 3).

Table 2: Description of functional status, health status, depression and cognitive function.

Health status	Categories	N (%)
Functional status (Katz Index)	Dependent (score 5-6)	11 (6.7)
	Independent (score 0-4)	153 (93.3)
Acute illness in the last two weeks	Yes	31 (19)
	No	133 (81)
Chronic conditions (self-reported)	Yes	113 (68.9)
	No	51 (31.1)
Depression (GDS score)	Yes (score ≥ 2)	61 (37.2)
	No (score < 2)	103 (62.8)
DART score for cognitive status (higher score indicates greater impairment)	0	33 (20.1)
	1	62 (37.8)
	2	50 (30.5)
	3	13 (7.9)
	4	6 (3.7)
BMI (in kg/m^2) *	Underweight (< 18.5)	20 (12.10)
	Normal (18.5 -22.9)	49 (29.94)
	Overweight/Obese (≥ 23.0)	95 (57.96)

*WHO Asia-Pacific guidelines[14]

Table 3: Factors associated with dependent functional status.

Factor	Categories	Dependent (N=11)	Independent (N=153)	P value*	OR (95% CI)	Adjusted OR** (95% CI), p value
Age (in years)	≤70	6 (5.6)	101 (94.4)	0.440	0.62 (0.18-2.10)	0.56 (0.15- 2.13), 0.39
	>70	5 (8.8)	52 (91.2)			
Gender	Female	8(8.8)	83 (91.2)	0.234	2.22 (0.57-9.09)	8.33 (1.041-100), 0.045
	Male	3 (4.1)	70 (95.9)			
Socioeconomic class ***	Middle/upper	8 (8.5)	86 (91.5)	0.49	0.62 (0.16-2.44)	-
	Lower	3 (5.4)	52 (94.6)			
Living alone	Yes	4 (14.3)	24 (85.7)	0.078	3.07 (0.83-11.30)	11.60 (1.58-85.34), 0.016
	No	7 (5.1)	129 (94.9)			
Employment Status	Unemployed	4 (7.1)	52 (92.9)	0.872	1.11 (0.31-3.97)	-
	Employed	7 (6.4)	101 (93.6)			
Recent acute illness	Yes	2 (6.4)	29 (93.6)	0.950	0.95 (0.19-4.63)	-
	No	9 (6.7)	124 (93.3)			
Presence of chronic Illness	Yes	11 (9.7)	102 (90.3)	0.021	-	-
	No	0 (0)	51 (100)			
Multi-morbidity (≥ 2 chronic conditions)	Yes	7 (11.1)	56 (88.9)	0.075	3.03 (0.56-10.86)	-
	No	4 (4.0)	97 (96.0)			
Depression	Yes	9 (14.8)	52 (85.2)	0.002	8.74 (1.82-41.90)	11.29 (2.00-63.70), 0.006
	No	2 (1.9)	101 (98.1)			
Cognitive impairment (DART score ≥ 1)	No impairment	0 (0.0)	33 (100.0)	0.085	-	-
	Impaired cognition	11 (8.4)	120 (91.6)			

*Chi-square/Fisher's exact test. **Adjusted for age and sex ***missing data N=15

DISCUSSION

The prevalence of poor functional status was only 6.7% (95% C.I.-2.8-10.6%), which was lower than reports from other Indian studies on community-dwelling elderly. A study from Haryana among rural elderly with a mean age of 67.8 years (SD: 7.41), reported a functional impairment prevalence of 17.6% (based on the Barthel index).[9] Another community study from Andhra Pradesh on a similar population demonstrated a functional impairment prevalence of 21.8% using the Katz index.

While the study from Andhra Pradesh had a similar mean age of 67.7 years (SD: 7.30) comparable to ours, partial independence for each ADL was assessed in that study. This is not traditionally measured using the Katz index and serves as a point of difference between the definitions of functional dependence which could partly explain the lower prevalence of dependence in our study.[16] Chronic disease prevalence in our study population was 68.7%, indicating that two out of three elderly persons were living with chronic conditions such as hypertension, diabetes mellitus and chronic musculoskeletal pain. This was similar to another community-based, cross-sectional study on elderly from a rural block in Varanasi which showed that around 85% of elderly were suffering from at least one chronic condition, out of which musculoskeletal problems ranked highest (56%), followed by hypertension (34.1%) and cataract (25.4%).[17] In addition, our study showed that the presence of a chronic condition was significantly associated with poor functional status, as 9.7% of those with a chronic condition had poor functional status, compared to none of those without a reported chronic condition. Sharma et al, reported an odds ratio of 2.16 (OR: 1.71-2.72) for dependence among those with at least three chronic diseases, analysing data from the Longitudinal Ageing Survey of India (2020) in individuals ≥ 60 years of age. [18]

Our data also showed that those with multimorbidity (two or more chronic diseases) had at least two times greater prevalence of functional dependence. Our study also reported a significant association between female gender and functional dependence (OR: 8.33, 95% CI: 1.04-100.00). While Gupta et al (using the Barthel index) found no significant association between functional dependence and gender, our results are in line with Khan et al and Veerapu et al who found similar odds ratios of 2.03 (95% CI: 1.13-3.62) and 2.01 (95%CI:1.53-2.49) respectively, between functional dependence and female gender.[8,9,16] A study among 7200 community-dwelling elderly from three rural districts in Tamil Nadu reported a prevalence of depression of 67.5% using the Geriatric Depression Scale 15 (GDS-15) among those ≥60 years.[19] However, a systematic review on geriatric depression in India reported depression prevalence to be 34.4%, similar to our estimate.[20] Our data showed that an elderly person was more than eleven times likely to be depressed if functionally dependent. A community-based study among Swedish elderly demonstrated independent association (p=0.008) between depression (measured using GDS-15) and functional capacity using the Bergs Balance Scale (unstandardized b: -0.03, 95%CI: -0.05- [-0.01]). However, the mean age in that study was 86.2±3 years and ADL assessment simultaneously measured using the Barthel index showed no significant association with depression.[21] A cohort study from San Francisco on urban elderly demonstrated a 1.59 times greater risk of functional decline and death among elderly who were lonely. One of the tested components of loneliness included living alone.[22] Within India, loneliness among rural elderly has been poorly studied. One report from rural South India among community dwelling participants ≥ 60 years of age, used a three-point scale to assess loneliness but did not investigate its association with functional ability.[23] Our study demonstrated that those with poor functional status were 11 times more likely to be living alone. These individuals with difficulty in carrying out their ADL were living alone, probably because of difficulties for poor rural families to take care of them in the same house as other family members. They were reported to receive assistance from neighbouring family members and friends in order to carry out their ADL. Cognitive decline measured by the DART screening tool was also found to have significant association with functional disability as all those with poor cognition had functional dependence. This is in agreement with a rural Spanish study on 600 community dwelling elderly above 65 years of age, which showed independent association between cognitive decline measured by the Mini Mental Status Examination (MMSE) and functional impairment using Katz index, odds ratio: 4.1 (95% CI: 2.7-6.1).[24] Differences in outcomes could be explained on the basis of different tools for measurement. The strengths of this study include the inclusion of a representative sample of community dwelling elderly from a rural south Indian community in Vellore, Tamil Nadu and use of standard tools for assessing dependence and risk factors. Limitations include the small sample size and geographical restriction to a single community development block in Tamil Nadu.

CONCLUSION

The majority of the rural community dwelling geriatric population aged 60 years and above in this study sample in which more than half were below 70 years, were functionally independent. However, two-thirds reported one or more chronic conditions. Our study also highlights the significance of chronic disease conditions and its presence among those who were functionally dependent, as well as the higher prevalence of functional dependence in elderly women. A detailed assessment of various chronic conditions could serve to identify specific diseases that strongly contribute towards impaired ADL. The prevalence of geriatric depression and its significant association with functional status warrants further study on interventions to alleviate burden. Cohort studies are needed to assess functional status progression in those with chronic diseases, to understand causal factors.

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