

Original article

Association of comorbidities with Activity of Daily Living (ADL) in a community-based sample of older adults in Tamil Nadu, India

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ABSTRACT

Background: Ageing is a normal, natural, unavoidable and a widespread phenomenon. As an outcome of ageing, there are physical, functional, and structural changes taking place in various parts of the human body, hence an aged person is found to be more vulnerable.

This study was conducted to assess the activities of daily living and the association between the socio-demographic variables, and co-morbidities among the elderly from the selected areas of Tamil Nadu.

Materials and methods: A cross-sectional study was conducted among the homebound aged category in Tamil Nadu. A list of rural block details were obtained from the selected districts, and by using the lottery method, one rural block was selected from each district and a complete enumeration sampling strategy was employed to obtain the study subjects from the selected study area. Through extensive literature reviews, the study tool was structured.

Result: About seven thousand two hundred participants over the age of 60 years from the households were interviewed. About 71.36% of the subjects belonged to the 60–69 age group. The majority of the study population was conducted among the females (61.76%) and the rest of the 38.24% constituted the males. A significant statistical association was noted between age, good sleep, and activity limitation. An individual who is aged 70 and above had 4.1 times higher risk of activity limitation than an elder person under 70. The elders who had sufficient good sleep were found to be a protective factor for activity limitation. There is no significant association between gender, smoking, tobacco, alcohol consumption, good sleep, with activity limitation.

Conclusion: This study shows that the prevalence of activity limitation is 4.1% among the rural elderly of Tamil Nadu. Disability is one of the major factors among the elderly to result in an activity of daily living dependence; Activity of Daily Living (ADL), and Instrumental Activities of Daily Living (IADL) is becoming a big challenge for the community residing elderly, irrespective of whether their needs are met or unmet. As the elderly population continues to grow, the challenges involved in addressing disability and unmet needs also tend to grow.

1. Introduction

Ageing is a normal, natural, unavoidable, and widespread phenomenon.¹ World Health Organization (WHO), indicates the number of 60 plus in the world is about to double in their share from 12% to 22% between the year 2015–2050.^{1,2} In the year 2002, it is estimated that 605 million elderly people are living in the world, of which 400 million belonged to Low-Income Countries.³ India is poised to become home to the second largest number of older persons in the World.⁴ As a result of this demographic transition, the current healthcare system be required to deal with the health challenges of the elderly who are more

vulnerable to numerous comorbidity conditions.^{5,6} As an outcome of aging, there is physical, functional, and structural changes are taking place in various parts of the human body, so the elderly person is found to be more vulnerable.^{3,7} The elderly population in India faces different types of challenges in their day-to-day life. Around 80% of the elderly person are from rural India,¹ therefore making health service in their footstep a major challenge. The old-age dependency ratio is 9.38% for the year 2018.⁸ Literature reveals that comorbidity conditions may lead to disabilities. Understanding the elderly person's functional status is an important aspect of health. Because of comorbidity conditions, studying the functional status information and activity limitation among the

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elderly is gaining major attention and becomes the basic object of the health system. By using the functional status details, the health care providers can help the individual to maximize their abilities, thus providing the best of health care to them.³

All of the Indian states have seen a growth in the senior population. Tamil Nadu, along with Kerala and Goa, has the highest proportions of senior people in the country. According to the 2011 Census, the elderly account for 10.4% of the total population of the state.⁹ The study area was selected from northern districts of Tamil Nadu namely Thiruvannamalai, Chengelpet, and Kancheepuram.

1.1. Objectives

In the existing literature studies on functional status and activity limitation among the elderly were found to be limited.¹⁰ This study was conducted to assess the prevalence of activity limitation and the association between the activity limitation and socio-demographic, co-morbidities variables among the elderly from the selected areas of Tamil Nadu, India.

Null Hypothesis: There is no statistically significant association between activity limitation and socio-demographic, co-morbidities variables among the elderly from the selected areas of Tamil Nadu, India.

Alternative Hypothesis: There is a statistically significant association between activity limitation and socio-demographic, co-morbidities variables among the elderly from the selected areas of Tamil Nadu, India.

2. Methodology

2.1. Study design

A cross-sectional study was conducted among 7200 elderly from the selected study areas, during the year 2018–19. The study area was selected from northern districts of Tamil Nadu namely Thiruvannamalai, Chengalpattu, and Kancheepuram.

2.2. Study setting and sampling

A list of rural block details was obtained from the selected districts and by using the lottery method one rural block was selected from each district. From selected rural blocks in all three districts, all the Primary Health Centers (PHCs) were listed and one primary health centre was randomly selected. Padalam PHC from Madurantakam block, Kancheepuram district; Reddy palayam PHC from Chengalpattu Health district; Akkur PHC from Thiruvannamalai district were studied.

Each PHC approximately covered around 30,000 populations. Taking the average geriatric population as 8%¹¹ according to the 2011 census, about 2400 geriatric people above the age of 60 were present in each area respectively. A complete enumeration sampling strategy was used to obtain the samples from the study area, which makes a sample size of 7200.

2.3. Data collection and Participant's recruitment

The data were collected using nine data collectors from the rural blocks after getting consent from the respondent within six months duration. The data collection process was coordinated and supervised by the project coordinator. The collected data were entered by the data entry operator and analyzed by the statistical analyzer. Data collection was done by the faculty/interns of community medicine. A brief orientation was given to the entire faculty involving data collection. The data was collected by tracking the elderly by a household visit during the six months. Data collection was done three days a week. Each data collectors covered 180 geriatric persons per day.

2.4. Study tool

The material used was the WHO geriatric instrument with modifications including the Prasad scale of Socio Economic Scale (SEC), Katz dependency ADL index for the study after the pilot study has been done.¹²

Katz Index of Independence in Activities of Daily Living (ADL) commonly known as Katz ADL and this tool helps to assess the level of ADL among the older population.¹³ Katz ADL has been validated among many countries.^{11,14,15} The Katz ADL has six different variables which include toileting, bathing, continence, feeding, transferring, and dressing. It is a binary answer (Yes/No). If the elderly score 6 which shows full function, the score of 4 shows moderate impairment, and 2 or less than 2 shows severe functional impairment. In our study, we combined moderate impairment and severe functional impairment into one category to draw a meaningful conclusion and further inferential statistical analysis.¹⁶

2.5. Data analysis

Raw data were cleaned in excel and imported to IBM SPSS Statistics for Windows, Version 20.0., IBM Corp., Chicago, IL for further analysis. Both univariate and multivariate analysis has been performed. Under descriptive statistics, frequency percentages was done for categorical variables, Chi-Square (Z^2) to find the association. Mean, median and range was calculated along with standard deviations for continuous variable, and binary logistic regression was done with 5% as a level of significance.

The covariates included in the model were selected based on the literature that these variables are already proven in related to the outcome variable. And these covariates are considered the cause of the exposure, and the outcome. And based on the chi-square test results and their significance level (P-Value) also these variables are included in the binary logistic regression model. The Activity Limitation (AL) is considered as an outcome and the covariates includes Demographic, Personal Behaviour and co-morbidities.

2.6. Ethical considerations

This study was approved by the institutional ethics committee of SRM MCH & RC, SRM IST.

3. Results

The primary sampling unit was elderly. About seven thousand two hundred participants over the age of 60 years from the households were interviewed. As mentioned in [Table 1](#), 71.36% of the subjects belonged to 60–69 years, 22.72% of them belonged to 70–79 and only 5.91% of them were aged 80 and above. The majority of the study population were female (61.76%) and 38.24% of them were male. Among study participants, the majority of them were married (78%), followed by a widow (7.1%), unmarried and widow contribute 2.4% each. In education majority of the elderly were illiterate (74.4%), followed by primary schooling (6.2%), and only 8.8% of the study participants were in secondary school. About 37% of the study participants were unemployed, nearly 25% of the participants were Clerical, Shop owner & farmer, followed by the semiskilled worker (18%), and unskilled worker (16%).

The prevalence of dependency among the elderly aged 60 years and above was found to be 4.1% and this dependency indirectly measures the activity limitation (see [Fig. 1](#)).

[Table 2](#) found there is a significant statistical association between age, good sleep, and dependency level. The individual who is aged 70 and above has a 4.1 times higher risk of dependency than the elderly who is aged less than 70. The elders who have good sleep were found to be a protective factor for a dependency. There is no significant association between gender, smoking, tobacco, alcohol consumption, good

Table 1
Demographic profile of the respondent (n = 7200).

Demographic profile of the respondent (n = 7200)	
Age	
60–69 Years	5112 (71.3%)
70–79 Years	1656 (22.7%)
80 and above	432 (5.9%)
Gender	
Male	2736 (38.2%)
Female	4464 (61.8%)
Marital status	
Married	5624 (78.1%)
Unmarried	173 (2.4%)
Widow	1231 (17.1%)
Widower	172 (2.4%)
Education	
Illiterate	5360 (74.45%)
Primary	1168 (16.22%)
Secondary	640 (8.89%)
Graduate	32 (0.44%)
Occupation	
Unemployed	2680 (37.2%)
Unskilled worker	1171 (16.3%)
Semiskilled worker	1302 (18.1%)
Skilled worker	127 (1.7%)
Clerical, Shop owner & farmer	1819 (25.3%)
Semi professional	99 (1.4%)
Professional	2 (0.02%)

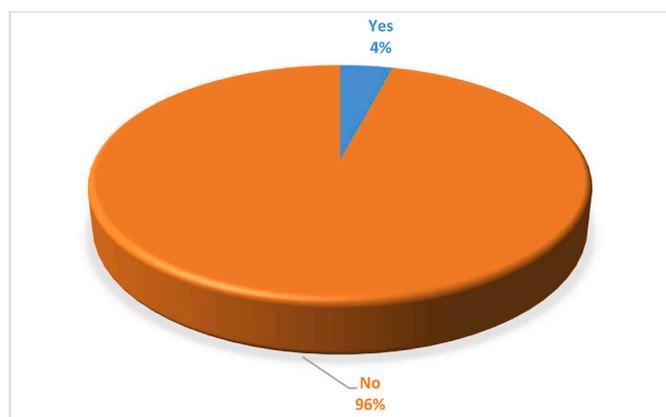


Fig. 1. Prevalence of activity limitation among the elderly (n = 7200).

sleep, and dependency.

Table 2 found that there is a significant statistical association of hypertension, Diabetes Mellitus (DM), impaired vision, depression, anaemia, arthritis, Chronic Kidney Disease (CKD), leprosy, filariasis, cataract, Parkinson’s disease, dementia & urinary incontinence with dependency. The elders with hypertension and arthritis were found to be about 2 times at higher risk for dependency in each. The diabetes patients were 2 times at higher risk of dependency compared to those who do not have diabetes. The impaired vision was found to be increasing the risk by 3 times. Individuals who had depression were found to be 4.6 times higher risks when compared to people who are not depressed, anaemia was found to be 1.3 times increase the risk of dependency. The elderly with CKD had a 5.3 times higher risk of dependency compared to an individual without CKD. The elderly with leprosy has a 3.8 times higher risk of dependency compared to an individual without leprosy. The elderly with cataract had a 1.8 times higher risk of dependency compared to an individual without cataract. The elderly with dementia had a 3.3 times higher risk of dependency compared to an individual without dementia. The elderly with urinary incontinent had a 4.4 times higher risk of dependency compared to an individual without urinary incontinent. There is no statistically significant association between

Table 2
Association of Demographic, Personal Behaviour and other Selected Risk Factors for Activity Limitation (AL) among the Elderly (n = 7200).

Variable	OR	Chi-Square Value	95% CI	P value
Age (70 and above)	4.1	1.56	(3.253–5.242)	0.000*
Gender	1.2	2.92	(0.970–1.551)	0.087
Smoking	1.1	0.40	(0.749–1.761)	0.491
Tobacco	1.1	0.68	(0.829–1.586)	0.336
Alcohol consumption	1.2	0.93	(0.824–1.766)	0.334
Good sleep	0.7	5.14	(0.581–0.962)	0.023*
Hypertension	2.3	47.21	(1.832–3.027)	0.000*
DM	2.1	34.37	(1.659–2.805)	0.003*
Impaired Vision	3.0	91.59	(2.372–3.795)	0.000*
Depression	4.6	1.46	(3.550–6.113)	0.000*
Anaemia	1.3	7.20	(1.094–1.790)	0.007*
Arthritis	2.0	27.37	(1.538–2.615)	0.000*
CKD	5.3	14.12	(2.007–14.191)	0.000*
TB	2.9	3.32	(0.873–9.733)	0.068
Leprosy	3.8	3.63	(0.864–17.405)	0.055*
Filariasis	2.0	1.47	(0.627–6.727)	0.224
Cataract	1.8	18.62	(1.391–2.446)	0.000*
Parkinson’s Disease	20	95.26	(8.570–46.675)	0.000*
Dementia	3.3	32.01	(2.148–5.212)	0.000*
Urinary Incontinent	4.4	31.77	(2.510–7.739)	0.000*

filariasis, and dependency.

The binary logistic regression found adjusted odds ratios with 95% confidence intervals for selected risk factors. The analysis found age (OR = 3.38), good sleep pattern (OR = 0.7), vision impairment (OR = 1.79), depression (OR = 2.99), and arthritis (OR = 1.4) are the significant independent risk factors for dependency. Test of full model against constant was statistically significant, indicating that the predictors as a set reliably distinguished between presence of dependency and absent of dependency (see Table 3).

The logistic regression model was found to be statistically significant with a $z^2(7) = 250.4$, with p -value less than 0.05. The prediction success was overall 95.9%.

4. Discussion

The current study describes the epidemiology of dependency level among the elderly persons in a rural area of Tamil Nadu and the current study aims to study the association dependent variable (activity limitation) and independent factors (socio-demographic variables and self-reported comorbidities). The study population was elderly people who are aged 60 years and above residing in a rural area of Tamil Nadu. Katz dependency ADL index was used to find the activity limitation among the elderly. The prevalence of dependency among the elderly aged 60 years and above was found to be 4.1% and this dependency indirectly measures the activity limitation.

The prevalence of disability among the elderly in Malaysia was reported to be 9.5%; the same study found the prevalence of functional limitation increase with age, female has the highest share of activity limitation than male.¹⁷ The current study shows age has a significant

Table 3
Logistic model on association of selected risk factors and activity limitation among the elderly (n = 7200).

Variables in the Model	OR	Sig.	AOR	95% C.I	
				Lower	Upper
Age	1.219	0.000	3.385	2.647	4.328
Gender	0.192	0.124	1.211	0.949	1.547
Sleep pattern	-0.263	0.048	0.769	0.593	0.997
Visual impairment	0.586	0.000	1.796	1.382	2.334
Depression	1.097	0.000	2.996	2.216	4.049
Osteoarthritis	0.371	0.010	1.449	1.093	1.921
Asthma	-0.229	0.632	0.795	0.312	2.03
Constant	1.118	0.026	3.059		

association between age and Activity Limitation (AL) but gender does not have a significant association. Studies from developing nations report the higher prevalence of activity limitation among the elderly. Several studies reported that aging is a significant determinant of functional limitation and ADL among the elderly in India.^{18,19}

A study conducted by Geetu Malhotra et al. reports that age is an important determinant of activity limitation ($p = 0.002$); the current study also found that age (70 and above) and activity limitation are statistically associated and elderly who are aged 70 years above have 4 times higher risk of having activity limitation.^{20,21}

A study conducted by Geetu Malhotra et al. states that Severe Activity Limitation (AL) was found to be 32% and in our study Activity Limitation (ADL) was reported to be 4%.²⁰ A scoping review conducted by Petra Maresova et al. established those disabilities as a significant problem related to the elderly's activities of daily living and dependence.¹⁸ A study conducted by Shama et al. found that the average age of the elderly was found to be 69.0 years with the Standard Deviation (SD) of ± 6.9 , and elderly age was ranging from 60 to 90 years and about 21.8% of the elderly required more than one assistant for IADL and 5.5% of the elderly required one assistant for the activity of daily living, which is an agreement with our study findings as well.²²

5. Conclusion

This study shows that the prevalence of activity limitation is 4.1% among the rural elderly of Tamil Nadu. Disability is one of the major among the elderly which will result in the activity of daily living dependence; Activity of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL) is becoming a big challenge for the community residing elderly, irrespective of whether their needs are met or unmet. As the elderly population continues to grow, the challenges involved in addressing disability and unmet needs will also grow. So our current study suggests that comprehensive health services to the elderly at various levels of health care delivery are essential to meet their need and health problem. There is a need to strengthen our family system because the family plays a major role as financial security and primary caregiver when it comes to elderly care. Strengthening the healthcare system needs to be addressed in the aspect of the elderly. National Program for the Health Care for the elderly was launched and the above-listed health issues can be solved by the program. If the program is properly implemented, this program can pave way for the 'healthy aging' of our elderly population.

5.1. Limitations

Our study is limited by involving only homebound elderly people in the selected community areas of rural Tamil Nadu, excluding elders from institutions (hospitals), and those residing in old age homes. Also, we used complete enumeration so there may be the potential risk of interviewer bias. Since they were aware of study objectives.

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Declaration of competing interest

None.

List of abbreviations

ADL	Activity of Daily Living
AL	Activity Limitation
IADL	Instrumental Activities of Daily Living
Z ²	Chi-Square
CKD	Chronic Kidney Disease
DM	Diabetes Mellitus
OR	Odds Ratio
PHCs	Primary Health Centers
SES	Socio Economic Scale
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
SRM MCH & RC	SRM Medical College Hospital and Research Centre
SRM IST	SRM Institute of Science and Technology
WHO	World Health Organization

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