ORIGINAL RESEARCH ARTICLE

Prevalence and Determinants of Functional Disability Among Elderly in Rural Goa, India

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ABSTRACT

Background: Functional disability in older adults, defined as the inability to perform essential daily activities, is categorized into Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). Understanding these limitations is key for informing health policies and services. The aim was to estimate the prevalence and identify factors associated with functional disability among the elderly in rural Goa.

Methodology: A community-based cross-sectional study was conducted among the elderly residing in the field practice area of the Rural Health and Training Centre, Mandur, Goa. Data were collected from 300 elderly participants using the Katz ADL Index and Lawton Brody's IADL Scale. Participants were selected through systematic random sampling.

Results: ADL disability prevalence was 13.7%, while IADL disability was 38.7%. ADL disability was associated with sex, education, financial dependence, co-morbidities, alcoholism, and sensory impairments. IADL disability was linked to age, sex, education, financial dependence, co-morbidities and visual impairment.

Conclusions: The study emphasizes the need for comprehensive geriatric assessments in rural communities, highlighting the importance of evaluating functional status at the primary healthcare level to improve elderly care policies.

Key-words: ADL, Elderly, Functional disability, IADL, Rural

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INTRODUCTION

The global population is aging at an unprecedented rate, with the number of adults aged 60 and above projected to reach 2 billion by 2050.[1] This trend is more pronounced in developing countries like India, where the elderly population is growing faster than children and the working-age group.[2] According to the 2011 Census, 8.6% of India's population was elderly, a proportion expected to nearly double to 19.1% by 2050. This significant demographic shift highlights the need to focus not just on extending life expectancy but also on ensuring that these additional years are lived in good health, with the ability to lead productive and functional lives.[3,4]

India's life expectancy has risen dramatically from 40 years in 1951 to 67 years in 2015. However, these added years often come with an increased burden of chronic diseases that can impair an individual's ability to perform daily activities.[5] This decline in functional capacity is a critical aspect of aging, as it directly impacts the quality of life and increases the need for care. Functional status defined as the capacity to perform essential activities for independent living is a key indicator of healthy aging.[6] It includes Activities of Daily Living (ADL) such as feeding, walking, bathing, and dressing, which indicate the need for external assistance, as well as Instrumental Activities of Daily Living (IADL), like shopping, managing finances, cooking, and taking medications, which reflect an individual's ability to manage their environment independently.[7]

Functional disability among the elderly is influenced by a complex set of factors, including health conditions, limitations in daily activities, and broader social and environmental influences.[4] This disability not only reduces quality of life but also increases the risk of mortality, making it a pressing public health issue. Studies have identified various factors associated with functional disability, such as age, gender, education, socioeconomic status, living conditions, physical activity, and chronic illnesses like diabetes, hypertension, and arthritis.[8,9,10,11]

As India's elderly population continues to grow, addressing functional disability is becoming increasingly vital. The natural aging process leads to a decline in physical stamina and immunity, making older adults more prone to health issues and dependence on others.[12] These functional limitations, often exacerbated by multiple health problems, can severely hinder an older adult's ability to live independently, thereby increasing their reliance on care and support services.[13]

Addressing functional disability is not only essential for the well-being of the elderly but also crucial for achieving broader public health and development goals.[1] For instance, the second Sustainable Development Goal (SDG-2) aims to eradicate hunger by 2030, yet elderly individuals with functional limitations may struggle to access nutritious, affordable food, worsening their vulnerability. Similarly, the third Sustainable Development Goal (SDG-3) focuses on "good health and well-being," which is fundamental to enhancing the functional capacity and overall quality of life for the elderly.[4]

Given these challenges, it is crucial to identify and mitigate the factors contributing to functional disability among India's elderly population. This issue is particularly pressing in Goa, where research on the subject is limited. Therefore, this study seeks to address this gap by investigating the prevalence and associated factors of functional disability among the elderly in rural Goa, providing insights that could inform targeted interventions and policies.

The study was conducted with objectives to estimate the prevalence of functional disability amongst elderly population in the rural area of Mandur, Goa and to study factors associated with functional disability amongst elderly population in the area.

METHODOLOGY

Study Design and Setting: This community-based cross-sectional study was conducted among elderly individuals aged 60 years and above in the villages covered by the Rural Health and Training Centre, Mandur, Goa.

Study Participants and Sampling: The study included 300 elderly participants. The sample size was calculated based on a study by Peter RM et al.,[14] which reported a 23% prevalence of dependency in Activities of Daily Living (ADL). With this prevalence, a 95% confidence interval (CI), and a margin of error of 0.05, the ideal sample size was calculated to be 271. To ensure a more robust analysis, the sample size was rounded up to 300. Participants were selected using a systematic random sampling technique from the study area.

Individuals aged 60 years and above who were permanent residents of the study area were included in the study..

Individuals aged 60 years and above residing in old age homes, those who were seriously ill with malignancies, required tube feeding, or were unavailable during three consecutive visits were excluded from the study.

Data Collection: Data were collected on sociodemographic factors, medical history, personal habits, and overall health using a semi-structured questionnaire. The study assessed dependency levels using the Katz Index of Activities of Daily Living (ADL) and the Lawton-Brody Instrumental Activities of Daily Living (IADL) scale. Data collection took place over five months, from September 2023 to January 2024.

Katz Index of ADL: This index evaluates independence in six areas: bathing, dressing, toileting, transferring, continence, and feeding. Each task is scored as 1 for "independent" and 0 for "dependent," with a

total score from 0 to 6. The participants were categorized into three groups: "severe ADL disability"(score of 0), "moderate ADL disability" (score of 1 – 5) and "no ADL disability" (score of 6). Severe ADL disability was defined as the inability to perform any of the six activities, moderate ADL disability as the inability to perform fewer than six activities, and no ADL disability as the ability to perform all six activities.[15,16]

Lawton-Brody IADL Scale: This scale measures the ability to function independently in eight domains, including telephone use, shopping, food preparation, housekeeping, laundry, transportation, medication management, and financial management. Each domain is scored as 1 for "higher function" and 0 for "lower function," with scores ranging from 0 to 8 for women and 0 to 5 for men. Women were assessed across all eight domains, while men were typically assessed in five, excluding food preparation, housekeeping, and laundry. Participants were classified into "severe IADL disability" with score of 0, "moderate IADL disability" with score of 1-4 for men and 1-7 for women and "no IADL disability" with score of 5 for men and 8 for women.[16,17]

Data Analysis: Data were cleaned and organized using Microsoft Excel, and further analysis was conducted using IBM SPSS Statistics version 22.0. Descriptive statistics, including means, frequencies, and percentages, were calculated. Chi-square analysis and binary logistic regression were used to explore associations. Variables that showed significance in the Chi-square tests with p value < 0.05 were included in the binary logistic regression model.

Outcome variables were functional disability as measured by the Katz Index, with covariates including sex, diabetes mellitus, hypertension, visual impairments, and hearing impairment.; functional disability as measured by the Lawton-Brody IADL scale, with covariates including age, sex, education, arthritis, and visual impairments.

RESULTS

Among the 300 elderly participants, 180 (60%) were female. The majority, 206 (68.7%), were aged 60–69 years, while 84 (31.3%) were 70 years and older. Most participants were Hindu, 190 (63.3%), and 186 (62%) were married. Regarding education, 115 (38.3%) had completed only primary schooling, and 127 (42.3%) belonged to socioeconomic Class III based on the modified BG Prasad classification 2023[18]. Financial dependence was reported by 203 (67.7%) participants. (Table 1)

The prevalence of functional disability, as measured by the Katz ADL index, was 13.7%, with 11% of participants having a moderate disability and 2.7% having a severe disability (Figure 1).

A statistically significant association was found between functional disability and sociodemographic variables such as sex, education and financial dependence. Men were 3.04 times more likely to have a functional disability than women. (Table 2)

Table 1: Distribution of study participants according to sociodemographic characteristics (n = 300)

Type of variable	Participants (%)
Age (in years)	
60-69	**206(68.7)**
70-79	84(28)
80 and above	10(3.3)
Sex	
Male	120(40)
Female	**180(60)**
Religion	
Hindu	**190(63.3)**
Christian	82(27.3)
Muslim	28(9.4)
Education	
Illiterate	102(34)
Primary	**115(38.3)**
Middle	25(8.3)
Secondary	36(12)
Higher secondary and above	22(7.4)
Financial dependence	
Yes	**203(67.7)**
No	97(32.3)
Marital status	
Married	**186(62)**
Unmarried	11(3.6)
Widow/widower/separated	103(34.4)
Socioeconomic scale	
Class 1	26(8.7)
Class 2	103(34.3)
Class 3	**127(42.3)**
Class 4	26(8.7)
Class 5	18(6)

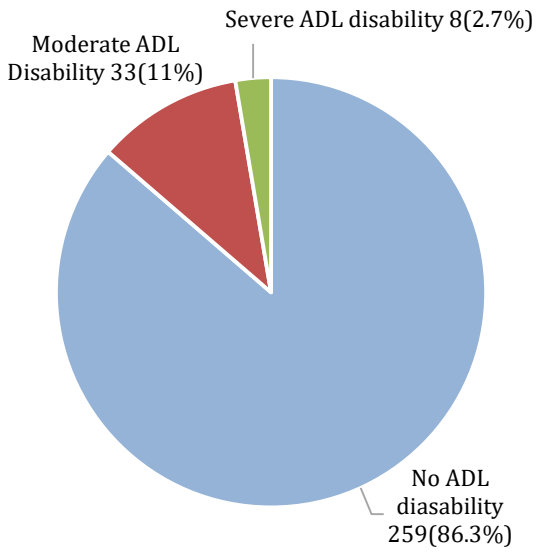

Figure 1: Prevalence of ADL disability among the elderly according to Katz index (n = 300)

Table 2: Association of selected sociodemographic factors for functional disability according to Katz ADL index among the elderly (n=300)

Variable	Katz ADL		χ2	OR	*P* – value	95% CI
	Dependent (%)	Independent (%)				
Age (in years)						
≥75 years	11(19.3)	46(80.7)	1.89	1.69	0.169	0.793-3.633
<75 years	30(12.3)	213(87.7)		Ref		
Sex						
Male	26(21.7)	94(78.3)	10.8	3.04	0.0014*	1.535-6.030
Female	15(8.3)	165(91.7)		Ref		
Education						
Illiterate	8(7.9)	93(92.1)	4.26	0.43	0.03*	0.192-0.976
Literate	33(16.6)	166(83.4)		Ref		
Financial dependence						
Yes	20(9.9)	183(90.1)	7.74	0.39	0.005*	0.203-0.771
No	21(21.6)	76(78.4)		Ref		

*Denotes statistically significant association according to the Chi-square test of association

Table 3: Association of selected risk factors for functional disability according to Katz ADL index among the elderly (n=300)

Variable	Katz ADL		χ2	OR	*P* – value	95% CI
	Dependent (%)	Independent (%)				
Diabetes mellitus						
Yes	27(18.8)	117(81.3)	6.06	2.34	0.014*	1.173-4.668
No	14(9)	142(91)		Ref		
Hypertension						
Yes	28(20.9)	106(79.1)	10.7	3.10	0.001*	1.539-6.278
No	13(7.8)	153(92.2)		Ref		
Arthritis						
Yes	11(35.5)	20(64.5)	13.9	4.38	0.0005*	1.914-10.027
No	30(11.2)	239(88.8)		Ref		
Visual impairment						
Yes	11(44)	14(56)	21.3	6.41	0.001*	2.672-15.408
No	30(10.9)	245(89.1)		Ref		
Hearing impairment						
Yes	9(60)	6(40)	28.7	11.8	0.001*	3.961-35.503
No	32(11.2)	253(88.8)		Ref		
Alcohol status						
Alcoholic	23(21.9)	82(78.1)	9.29	2.75	0.002*	1.411-5.390
Non-alcoholic	18(9.2)	177(90.8)		Ref		

*Denotes statistically significant association according to the Chi-square test of association

Table 4: Binary logistic regression model on the association of selected risk factors and functional disability according to Katz ADL index among the elderly (n = 300)

Variables in the model	OR	Sig.	AOR	95.0% CI for AOR	
				Lower	Upper
Male Sex	1.207	0.002	3.342	1.538	7.261
Diabetes mellitus	1.026	0.021	2.790	1.171	6.645
Hypertension	1.043	0.012	2.839	1.257	6.413
Visual impairment	1.697	0.009	5.458	1.537	19.390
Hearing impairment	2.796	0.000	16.382	3.412	78.646

Table 3 showed statistically significant association between functional disability and diabetes mellitus, hypertension, arthritis, visual impairments, hearing impairments, and alcohol consumption. Elders with diabetes were at 2.3 times higher risk, while hypertension increased the risk by 3.1 times. The presence of arthritis raised the risk by 4.38 times, visual impairment by 6.4 times, and hearing impairment by 11.8 times. Alcohol consumption was associated with a 2.75 times higher risk.

Binary logistic regression (Table 4) confirmed the significance of male sex (OR = 3.34), diabetes mellitus (OR = 2.79), hypertension (OR = 2.83), visual impairment (OR = 5.45), and hearing impairment (OR = 16.38) as independent risk factors for functional disability based on the Katz ADL index. The regression model was statistically significant (χ^2 = 53.94, P < 0.05), explaining 29.9% of the variance (Nagelkerke R^2 = 0.299), with an overall prediction accuracy of 89.3%.

The prevalence of functional disability according to the Lawton-Brody IADL scale was 38.7%. Of this, 32.3% of participants had a moderate disability and 6.4% had a severe disability (Figure 2).

Table 5 shows a significant association between functional disability and sociodemographic factors such as age, sex, education and financial dependence. Elderly participants aged 75 years or older had 3.49 times higher odds of functional disability compared to those younger than 75 years. Men were 2.07 times more likely to experience functional disability than women. Illiterate participants had 1.63 times higher odds.

Table 6 shows a significant association between functional disability and selected risk factors such as arthritis, and visual impairment while arthritis increased the risk by 3.27 times, and visual impairment by 7.45 times.

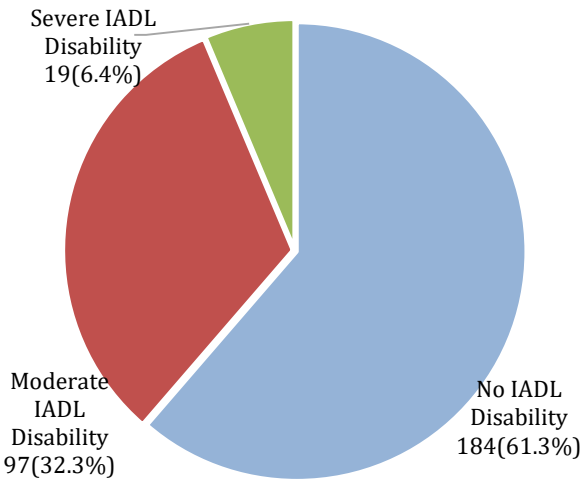

Figure 2: Prevalence of IADL Disability among the elderly according to Lawton Brody's scale (n = 300)

Table 5: Association of selected sociodemographic factors for functional disability according to Lawton Brody's IADL scale among the elderly (n=300)

Variable	LAWTON BRODY IADL		χ2	OR	*P* – value	95% CI
	Dependent (%)	Independent (%)				
Age (in years)						
≥75 years	36(63.2)	21(36.8)	17.7	3.49	0.0001*	1.915-6.370
< 75 years	80(32.9)	163(67.1)		Ref		
Sex						
Male	65(28.1)	70(51.9)	9.30	2.07	0.002*	1.294-3.328
Female	51(30.9)	114(69.1)		Ref		
Education						
Illiterate	47(46.5)	54(53.5)	3.97	1.63	0.04*	1.006-2.671
Literate	69(34.7)	130(65.3)		Ref		
Financial dependence						
Yes	65(32)	138(68)	11.6	0.42	0.001*	0.258-0.697
No	51(52.6)	46(47.4)		Ref		

*Denotes statistically significant association according to the Chi-square test of association

Table 6: Association of selected risk factors for functional disability according to Lawton Brody's IADL scale among the elderly (n=300)

Variable	LAWTON BRODY IADL		χ2	OR	*P* – value	95% CI
	Dependent (%)	Independent (%)				
Diabetes mellitus						
Yes	56(38.9)	88(61.1)	0.006	1.01	0.939	0.639-1.621
No	60(38.5)	96(61.5)		Ref		
Hypertension						
Yes	55(41)	79(59)	0.577	1.19	0.447	0.751-1.911
No	61(36.7)	105(63.3)		Ref		
Visual impairment						
Yes	20(80)	5(20)	19.6	7.45	0.0001*	2.714-20.495
No	96(34.9)	179(65.1)		Ref		
Arthritis						
Yes	20(64.5)	11(35.5)	9.74	3.27	0.002*	1.506-7.125
No	96(35.7)	173(64.3)		Ref		
Hearing impairment						
Yes	9(60)	6(40)	3.03	2.49	0.08	0.8641-7.2058
No	107(37.5)	178(62.5)		Ref		
Alcohol status						
Alcoholic	38(36.2)	67(63.8)	0.418	0.85	0.518	0.521-1.389
Non-alcoholic	78(40)	117(60)		Ref		

*Denotes statistically significant association according to the Chi-square test of association

Table 7: Binary logistic regression model on the association of selected risk factors and functional disability according to Lawton Brody's IADL scale among the elderly (n = 300)

Variables in the model	OR	Sig.	AOR	95.0% CI for AOR	
				Lower	Upper
Age group	1.188	0.000	3.279	1.742	6.173
Male Sex	0.604	0.021	1.829	1.096	3.051
Education	0.564	0.037	1.758	1.034	2.991
Arthritis	1.028	0.017	2.795	1.204	6.491
Visual impairment	1.852	0.001	6.371	2.224	18.250

Binary logistic regression for the Lawton-Brody IADL scale (Table 7) identified older age (≥75 years, OR = 3.27), male gender (OR = 1.82), illiteracy (OR = 1.75), arthritis (OR = 2.79), and visual impairment (OR = 6.37) as significant independent risk factors for functional disability. The regression model was statistically significant (χ^2 = 51.98, P < 0.05), explaining 21.6% of the variance (Nagelkerke R^2 = 0.216), with a prediction accuracy of 73.7%.

DISCUSSION

In the present study, the prevalence of ADL disability was 13.7%, which is comparable to the 13.9% prevalence reported by Anandaraj R et al[19] in Puducherry. This similarity reflects common regional health patterns, such as comparable socio-economic conditions, healthcare access, and lifestyle factors. However, the prevalence is higher than that reported by Devi et al[20] in rural Manipur. The lower prevalence in Manipur can be attributed to factors such as stronger community support networks, predominantly rural lifestyles, and potentially lower rates of chronic health conditions, contributing to better overall functional health among the elderly. Additionally, differences in the scoring methods used for disability assessments may also account for this variation. In contrast, our finding was lower than findings from other studies conducted across different regions of India.[1,5,14,16] This difference may be from diverse healthcare infrastructures, levels of urbanization, and demographic characteristics, as well as variations in functional disability scoring tools and the criteria used for defining "elderly" age groups. The prevalence of IADL disability was found to be 38.7%, which is lower than the rates reported by Burman et al[5], Veerapu et al[12], Chauhan et al[16], and Chalise et al[1]. This discrepancy may be influenced by differences in the age thresholds used to define elderly populations and the specific inclusion criteria applied in these studies. In populations with higher IADL disability rates, individuals may face greater socioeconomic stressors or limited access to assistance, leading to higher rates of disability.

Advancing age was significantly associated with functional disability, as assessed by both the Katz Index and Lawton-Brody's scale. This finding aligns with previous studies by Sowmiya et al[21], Veerapu et al[12], Devi et al[20], and Pengpid et al[22], which also reported a similar relationship between increasing age and functional decline. This proves, Aging is universally linked to decline in both physical and cognitive health, leading to increased difficulties in performing daily activities. Additionally, males in the present study were at a higher risk of functional disability, similar to findings by Peter et al[14]. This may be due to gender-specific health behaviours, or differences in health-seeking practices. Educational level was found to be a significant factor, with lower education levels being associated with higher functional disability, consistent with studies by Sowmiya et al[21], Burman et al[5], Veerapu et al[12], and Devi et al[20].

Comorbidities, including hypertension, diabetes mellitus, and arthritis, were significantly associated with ADL disability, similar to findings from previous research.[5,14,21,22] These chronic conditions impair mobility and overall physical function, directly impacting the ability to perform basic self-care activities. Sensory impairments, particularly visual and hearing impairments, were also significantly associated with functional disability identical to a study done by Peter et al[14]. Alcohol consumption among the elderly was also significantly associated with an increased risk of functional disability[14].

LIMITATIONS AND FUTURE RESEARCH

This study has several limitations. First, the use of self-reported data for both ADL and IADL disabilities may introduce recall bias, which can affect the accuracy of the findings. Subjective bias is also a concern due to the reliance on self-reporting for morbidities, comorbidities, and self-rated health status. Additionally, the study's cross-sectional design limits the ability to establish causal relationships between the variables, as it captures data at a single point in time. Another limitation is that the study sample was restricted to community-dwelling older adults, excluding those under institutional care. This may have resulted in an underestimation of the true prevalence of functional disability, as individuals in institutional settings often exhibit higher rates of disability. Future research should address these gaps by incorporating longitudinal designs and objective measures to provide a clearer understanding of the factors influencing functional disability in older adults.

CONCLUSION

This community-based study reveals a considerable

prevalence of functional disability among the elderly in rural Goa, with 13.7% experiencing ADL disability and 38.7% being affected by IADL disability. Significant associations were identified between functional disability and factors such as sex, age, education, financial dependence, comorbidities like diabetes and hypertension, as well as sensory impairments and lifestyle habits such as alcohol consumption. The findings underscore the need for targeted interventions at the primary healthcare level to assess and address functional limitations in elderly individuals.

RECOMMENDATIONS

Early detection and management of the associated risk factors, including sensory impairments and chronic conditions, are essential for improving the quality of life and promoting healthy aging. Comprehensive geriatric care should be integrated into public health policies to support the growing elderly population, ensuring they maintain their independence and functionality in their later years.

Data availability statement

The data can be obtained on request to the corresponding author via email.

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