

# Assessment of Dependency in Activities of Daily Living (ADL) and its Predictors: A Cross-Sectional Study among the Elderly Rural Population in a Sub-Himalayan UT of India

Rashmi Kumari, Rajiv Kumar Gupta, Shalli<sup>1</sup>, Rakesh Bahl, Bhavna Langer

Department of Community Medicine, GMC Jammu, <sup>1</sup>Department of Community Medicine, AIIMS Jammu, Jammu and Kashmir, India

## Abstract

**Background:** With an increase in life expectancy over the last few decades, there has been a parallel increase in the prevalence of disabilities among the elderly population. To estimate the prevalence of dependency in activities of daily living (ADL) and its predictors among the rural elderly population. **Material and Methods:** This was a cross-sectional study carried out in the community among the rural geriatric population in the field practice area of PG Department of Community Medicine, Government Medical College Jammu. The Barthel Scale Index was used to measure ADL dependency. PSPP software was used to analyze the data. **Results:** The mean age of study participants was  $68.31 \pm 7.9$  years. ADL dependency was observed in 46.3% of the subjects, with the majority demonstrating mild to moderate dependence. Only 2.5% of the respondents reported a severe degree of ADL dependence. The mean ADL score was  $94.47 \pm 8.98$ . On multivariate logistic regression analysis, age, educational status, the presence of stress in the family, personal history, and the presence of co-morbidities emerged to be independent predictors of ADL dependence. **Conclusion:** High prevalence of physical disability in the geriatric population is now an area of major concern. This emphasizes the significance of setting up geriatric care centers especially in rural areas preferably integrating with health and wellness centers.

**Keywords:** Activity of daily living (ADL), Barthel index, elderly, rural areas

## INTRODUCTION

Aging is a physiological phenomenon that is both inevitable and predictable. This being a natural process of dynamic biological changes, is influenced by variables other than chronological aging such as social construction, which defines its reality and meaning.<sup>[1]</sup> It is a known fact that elderly people in India are growing rapidly as life expectancy is increasing. According to the 2011 census, elderly population constitute about 8.6% of the total Indian population which is likely to grow further to about 20% by 2050.<sup>[2,3]</sup> Therefore, India's public health system is prioritizing the country's aging population in order to safeguard their health. The maintenance of functional ability is of paramount importance for most of the older people. Functional status is typically defined in terms of the limitation of one's ability to independently perform activities in terms of basic ADL (ability to execute daily living activities) and instrumental ADL (IADL).<sup>[4]</sup> It is not only that the performance in this area is related to mental and physical health but it also

has an impact on social well-being of the elderly. Increased life expectancy leads to chronic diseases that impair functionality, jeopardizing the capacity to pursue the daily routine, and necessitating the need for assistance. The quality of life can be improved by reducing severe disability. Nursing home care, meals on wheels, health insurance, and other kinds of aged care have evolved in the developed world. Because such type of model for elderly people is not existing in India, there is an opportunity for the health system to provide the best quality health-care (both physical and mental) services. To alleviate the pain and impairments of the aged, eliciting the factors of

**Address for correspondence:** Dr. Bhavna Langer,  
Department of Community Medicine, GMC Jammu, Jammu and Kashmir  
180 001, India.  
E-mail: dr.bhavnalanger@yahoo.in

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Kumari R, Gupta RK, Shalli, Bahl R, Langer B. Assessment of dependency in activities of daily living (ADL) and its predictors: A cross-sectional study among the elderly rural population in a Sub-Himalayan UT of India. *Indian J Community Med* 2024;49:398-403.

**Received:** 23-12-22, **Accepted:** 09-11-23, **Published:** 07-03-24

### Access this article online

Quick Response Code:



**Website:**  
www.ijcm.org.in

**DOI:**  
10.4103/ijcm.ijcm\_1001\_22

their functionality will aid in the development of appropriate programs at both domiciliary and facility levels.

According to the literature, several socio-demographic characteristics, lifestyle choices, and physical illnesses have an impact on ADL among the aged people. Evidence suggests that female gender, advanced age, and the presence of chronic diseases increase the likelihood of disability or dependency.<sup>[5-8]</sup> Considering the lack of literature on ADL dependency in the North zone in general and UT of J and K in particular, this research was conceived with the objectives of estimating the prevalence of ADL dependency among the elderly in Jammu's rural population and determining its predictors.

## METHODOLOGY

### Study settings and design

The current cross-sectional research has been carried out in a rural health block, affiliated as a field practice area to the Postgraduate Department of Community Medicine GMC Jammu [Figure 1]. The research was undertaken after seeking approval from the Institutional Ethical Committee (IEC/GMC/2019/761).

### Sample size calculation

The sample size for the current study was estimated based on the formula  $n = Z^2pq/d^2$  at 95% confidence interval. Considering the prevalence of ADL dependency to be 23%,<sup>[9]</sup> absolute precision of 5%, the sample size was calculated as 272. The final sample size arrived at 299, based on 10% non-response rate.

### Sampling technique

To provide efficient health-care services, the rural health block has been divided into eight zones. One of the zones was chosen by a simple random sampling method. Further, one of the villages in that zone was picked by lottery method after acquiring the list of all the villages falling under that zone. A house-to-house survey was done to collect data from the elderly population in that village. Then adjacent villages were covered until the requisite sample size was achieved.

### Data collection

The information was gathered over a three-month period, from February to April 2020. Before the data collection

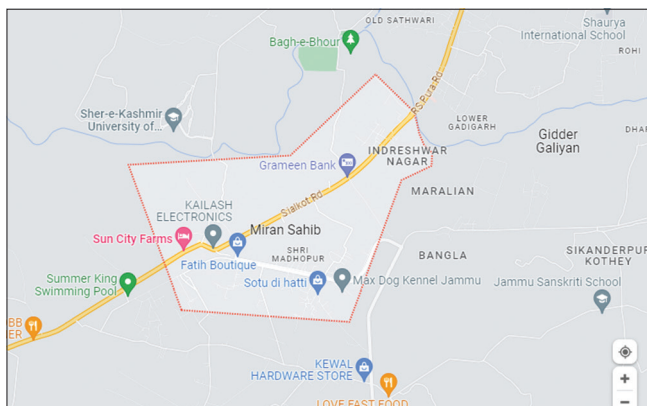


Figure 1: Map of the study area

was started, the local leaders of the selected villages were approached and informed about the objectives of the research. The sampling frame consisted of all the elderly aged 60 years and above in the designated area. A house-to-house survey was conducted to gather the data. Upon reaching the house, a standard procedure was followed which included knocking on the door, introducing oneself and exchange of greetings, and explaining the rationale for the visit and intent of the study. After that, a list of eligible subjects in that house was compiled. In addition, the eligible participants were requested to read the consent form which was developed in local language and in few cases, it was read out to them if they suffered from poor eyesight or illiteracy. Those who answered affirmatively were included in the study. The interview was conducted in a separate room to preserve privacy. To maintain participant anonymity, no question about the participant's name was included in the questionnaire.

**Inclusion criteria:** All elderly people whose duration of stay in the study area was >6 months and those who consented to participate.

**Exclusion criteria:** Subjects who had not given consent and those with terminal illness or serious mental issues.

### Study instrument

The following tools were used in this study

1. A pre-tested, semi-structured, questionnaire including information on socio-demographic characteristics like age, gender, educational status, occupation, marital status, family type, any source of stress in the family, financial dependence, personal history, and presence of one or more co-morbidities.
2. Barthel Scale/Index (BI)<sup>[10,11]</sup>

Barthel index is an ordinal scale used to evaluate the patient's ability to perform and function independently in ADL. It includes ten variables that describe ADL and mobility. The more the number, the greater the chances of the patient to be able to function independently. The Barthel index is a simple instrument that health-care professionals can use. The original index had a three-item rating scale. Feeding, personal toileting, bathroom, dressing and undressing, getting on/off a toilet, control of bladder, control of bowel, moving from a wheelchair to a bed and back, walking on a level surface, and propelling a wheelchair (if unable to walk) are the ten personal activities specified in the Barthel Scale. By multiplying the final score by 5, a 100-point score is obtained

The Barthel index has a score range of 0–20 (total dependency), 21–60 (severe dependency), 61–90 (moderate dependency), and 91–99 (slight or mild dependency).<sup>[12]</sup>

### Statistical analysis

PSPP (free open-access software)<sup>[13]</sup> was used for analyzing the data collected. The prevalence of ADL dependency was expressed as percentages (%). Descriptive data with

categorical variables were analyzed with percentages while continuous data were analyzed using mean ( $\pm$  standard deviation). The normality of the data was assessed using the Shapiro–Wilk test. Chi-square/Fisher exact test was employed to compare the socio-demographic variables with different grades of severity of ADL dependence. Bivariate logistic regression analysis was performed to assess the strength of association of different variables with ADL dependence by calculating the unadjusted odds ratio. Further, to determine the independent predictors of ADL dependence, multivariate logistic regression analysis was done. A *P* value of  $<0.05$  was taken as statistically significant. All the *P* values reported were two-tailed.

## RESULTS

In total, 299 elderly people were questioned, out of which 14 were unable to answer all the questions. As a result, after eliminating the incompletely filled questionnaires, the final analysis was carried out on 285 subjects. The mean age of study participants was  $68.31 \pm 7.9$  years, with most of them ( $n = 173$ , 60.7%) being 60–70 years old. Males represented 54.03% of the study population while females constituted the remaining 45.96% and higher dependency was seen in females than males as shown in Table 1. Nearly half of the participants were illiterate. Two-thirds of the participants were married and were living in joint families. Another two-thirds (67.7%) of those surveyed had one or more chronic co-morbidities.

**Table 1: ADL dependence and its association with socio-demographic variables**

Variables	Total No. (%)	ADL				Chi square/Fisher exact test ( <i>P</i> )
		No dependence No. (%)	Slight dependence No. (%)	Moderate dependence No. (%)	Severe dependence No. (%)	
Age (years)						
60–70	173 (60.7)	112 (64.7)	34 (2.5)	24 (13.8)	3 (1.7)	35.12
70–80	73 (25.6)	30 (41.1)	21 (28.7)	21 (28.7)	1 (1.4)	(<0.001)
$\geq 80$	39 (13.7)	11 (28.2)	7 (17.9)	18 (46.1)	3 (7.7)	
Gender						
Males	154 (54.1)	92 (59.7)	33 (21.4)	29 (18.8)	0	12.16
Females	131 (45.9)	61 (46.6)	29 (22.1)	34 (25.9)	7 (5.3)	(0.007)
Education						
Illiterate	138 (48.4)	63 (45.6)	33 (23.9)	35 (25.4)	7 (5.1)	22.11
Primary	38 (13.3)	20 (52.6)	6 (15.8)	12 (31.6)	0	(0.009)
Secondary	90 (31.6)	58 (64.4)	16 (17.7)	16 (17.7)	0	
Hr. Sec & above	19 (6.6)	12 (63.1)	7 (36.8)	0	0	
Occupation						
Employed	25 (8.7)	21 (84)	4 (16)	0	0	11.84
Unemployed	260 (91.2)	132 (50.7)	58 (22.3)	63 (24.2)	7 (2.7)	0.007
Financial dependence						
Fully dependent	116 (40.7)	60 (51.7)	18 (15.5)	32 (27.6)	6 (5.2)	13.95
Partially dependent	85 (29.8)	43 (50.6)	25 (29.4)	16 (18.8)	1 (1.2)	(0.03)
Independent	84 (29.5)	50 (59.5)	19 (22.6)	15 (17.8)	0	
Marital status						
Married	200 (70.2)	116 (58)	42 (21)	40 (20)	2 (1.0)	9.64
Single*	85 (29.8)	37 (43.5)	20 (23.5)	23 (27.1)	5 (5.9)	(0.022)
Type of family						
Nuclear	88 (30.8)	50 (56.8)	19 (21.6)	15 (17.0)	4 (4.5)	3.97
Joint	197 (69.1)	103 (52.3)	43 (21.8)	48 (24.4)	3 (1.5)	(0.26)
Stress in the family						
Present	78 (27.4)	34 (43.6)	14 (17.9)	29 (37.2)	1 (1.3)	14.39
Absent	207 (72.6)	119 (57.5)	48 (23.2)	34 (16.4)	6 (2.9)	(0.002)
Personal Habits						
No Smoking or alcohol	224 (78.6)	128 (57.1)	45 (20.1)	45 (20.1)	6 (2.6)	23.97
Smoking only	17 (5.9)	10 (58.8)	0	7 (41.2)	0	(0.004)
Alcohol only	32 (11.2)	14 (43.7)	12 (37.5)	6 (18.7)	0	
Both smoking & alcohol	12 (4.2)	1 (8.3)	5 (41.6)	5 (41.6)	1 (8.3)	
Any chronic medical co-morbidity						
Present	193 (67.7)	86 (44.5)	51 (26.4)	49 (25.4)	7 (3.6)	21.52
Absent	92 (32.3)	67 (72.8)	11 (11.9)	14 (15.2)	0	(<0.001)

\*Single included unmarried, divorced, and widow

Almost half (53.7%) of the participants in our study were fully independent. ADL dependency was seen in 46.3% of the participants, with the majority of them showing slight to moderate dependence. Severe dependence was seen in only 2.5% of the participants. No participant was suffering from total dependence on AD. The mean ADL score was  $94.47 \pm 8.98$ .

On further analysis, it was revealed that advanced age group, female gender, illiteracy, house making as occupation, living single, presence of stress in the family, poor personal habits, and presence of co-morbidities were associated with ADL dependence [Table 1].

Multivariate logistic regression analysis revealed that age, educational level, stress in the family, personal history, and presence of any chronic co-morbidity had an independent significant association with ADL dependence [Table 2].

## DISCUSSION

The current study was conducted to assess the ADL dependence among older people living in rural Jammu. In our study, we observed that the level of dependence rate was 43.3% with severe dependency at 2.5% which is consistent with the findings of Puteh *et al.*<sup>[1]</sup> in Malaysia where the prevalence of severe and total dependency was at 1.1% each. According to a study carried out in two randomly selected urban wards of Dibrugarh city, Assam, 34.7% of participants had limitations in one or more ADL items.<sup>[14]</sup> Another study, conducted by Usha *et al.*,<sup>[15]</sup> found that over a quarter of the elderly were dependent on others for their daily activities, with two-thirds having moderate to severe dependency. Another study conducted by Chauhan *et al.*<sup>[12]</sup> also reported prevalence of 3% in severe dependency which is similar to ours. However, few studies like those conducted by Anandaraj *et al.*<sup>[16]</sup> and Carmona-Torres *et al.*<sup>[17]</sup> in Spain

**Table 2: Predictors of ADL dependence using bivariate and multivariate logistic regression analysis (n=285)**

Variables	ADL dependence		Unadjusted		Adjusted	
	Absent (153) n (%)	Present (132) n (%)	Odds ratio (95%CI)	P	Odds ratio (95%CI)	P
Age (Years) <sup>#</sup>						
<70	112 (64.7)	61 (35.2)	Reference			
≥70	41 (36.6)	71 (63.3)	3.18 (1.93–5.23)	<0.001	3.936 (2.90–5.97)	<0.001*
Gender						
Males	92 (59.7)	62 (40.2)	Reference			
Females	61 (46.5)	70 (53.4)	1.7 (1.06–2.73)	0.01	1.001 (0.42–2.37)	0.999
Educational status <sup>#</sup>						
Literate	90 (61.2)	57 (38.7)	Reference			
Illiterate	63 (45.6)	75 (54.3)	1.88 (1.17–3.01)	0.008	1.567 (1.14–2.14)	0.005*
Occupation						
Unemployed	132 (50.7)	128 (49.2)	Reference			
Employed	21 (84)	4 (16)	0.19 (0.06–0.58)	0.001	0.589 (0.31–1.12)	0.108
Financial Dependence <sup>#</sup>						
Dependent	60 (53.0)	56 (49.5)	Reference			
Independent	93 (55.0)	76 (44.9)	0.87 (0.54–1.41)	0.582	0.813 (0.53–1.23)	0.331
Marital Status						
Single	37 (43.5)	48 (56.4)	Reference			
Married	116 (58.0)	84 (42.0)	0.55 (0.33–0.93)	0.025	0.887 (0.46–1.68)	0.713
Type of Family						
Nuclear	50 (56.8)	38 (43.1)	Reference			
Joint	103 (52.2)	94 (47.7)	1.2 (0.72–1.99)	0.478	1.228 (0.67–2.24)	0.503
Stress in the family						
Absent	119	88 (57.4)	Reference			
Present	34	44 (56.4)	1.75 (1.03–2.96)	0.036	2.392 (1.29–4.43)	0.006*
Personal Habits <sup>#</sup>						
H/o Smoking or Alcohol	25 (40.9)	36 (59.0)	Reference			
Present				0.024	0.503 (0.36–0.70)	<0.001*
Absent	128 (57.1)	96 (42.8)	0.52 (0.29–0.92)			
Chronic morbidity						
Absent	67 (72.8)	25 (27.1)	Reference			
Present	86 (44.5)	107 (55.4)	3.33 (1.94–5.77)	<0.001	4.564 (2.36–8.82)	<0.001*

<sup>#</sup>For the purpose of calculating odds ratio, all the independent variables have been categorized into two categories. Dependent variable: ADL dependence. Independent variables: Age, gender, educational status, occupation, financial dependence, marital status, type of family, stress, personal habits, and chronic morbidity. \* $P < 0.05$  considered as significant. CI: Confidence interval



reported comparatively a lesser prevalence of 13.9% and 11.1%, respectively.

In the present study, higher age group, stress in the family, chronic morbidity, and personal habits were positively associated with higher dependency, and these findings are consistent with those reported by authors in a study conducted in Malaysia.<sup>[18]</sup>

Female elderly were more likely to have the risk of ADL limitation than male elderly, in the present research, which was supported by prior research.<sup>[9,19-21]</sup> Gender inequality makes females more vulnerable to the danger of being disabled in a male-dominated society like India. Further, Indian females are more inclined to overlook their health and do not seek suitable medical attention at the right time. A study in Puducherry, on the other hand, found that males were highly dependent.<sup>[22]</sup> In contrast to these findings, few studies have mentioned that older individuals of both genders are equally vulnerable to functional disability.<sup>[14,23,24]</sup>

The current study found an inverse educational relationship with the prevalence of functional disability, which is consistent with prior research.<sup>[14,24]</sup> One possible explanation might be that people with different degrees of education possess varying levels of health awareness and health practices. Chronic illness decreases the functional status and reduces physical activity, leading to more illnesses and a vicious cycle. Similar to our findings, multiple authors have reported that the presence of chronic illness increases the probability of activity limitation, thus increasing the dependency.<sup>[25,26]</sup> Given the enormous influence of morbidity on functional disability, an urgent need arises to reduce the likelihood of chronic diseases by improving the access to health-care services and financing among the elderly in India.<sup>[27]</sup>

## CONCLUSION AND RECOMMENDATIONS

The study concluded that a considerable proportion of our study population was suffering from ADL dependency (46.3%), with the majority demonstrating a mild to moderate degree of dependence. Furthermore, increasing age, low educational status, family stress, history of smoking and alcohol consumption, and the presence of any chronic co-morbidity were found to be significant predictors of ADL dependency. The functional disability among this group has become a major problem for the community's health affecting the quality of life of individuals and their families. It is recommended that provisions be made for community-based comprehensive geriatric health assessment, which allows the elderly population to avoid the illness at initial stage, postpone the onset of disabling diseases, and provide domiciliary care and rehabilitation services at the facility level. A better understanding of the precursors of functional decline of older people will aid in enhancing their quality of life.

## Limitations

One of our study's limitations is that we exclusively studied homebound elderly persons in a specific rural area of Jammu,

omitting the elderly from hospitals and those living in old age homes. This limits the generalizability of our findings. Furthermore, the study's cross-sectional design limits our capacity to explore any temporal associations.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Puteh SEBW, Bakar IMA, Borhanuddin B, Latiff K, Amin RM, Sutan R. A prevalence study of the activities of daily living (ADL) dependency among the elderly in four districts in Selangor, Malaysia. *J Epidemiol Prev Med* 2015;1:1-8.
2. Elderly in India. Government of India: Ministry of Statistics and Programme Implementation, Central Statistics Office (Social Statistics Division): 2016.
3. United Nation. Department of Economic and Social Affairs, Population Division. New York: World Population Ageing; 2015.
4. World Health Organization. What are the Main Risk Factors for Disability in old Age and how can Disability be Prevented? 2003. Available from: <http://www.euro.who.int/document/E82970.pdf>. [Last accessed on 2022 Oct 23].
5. Ng TP, Niti M, Chiam PC, Kua EH. Prevalence and correlates of functional disability in multiethnic elderly Singaporeans. *J Am Geriatr Soc* 2006;54:21-9.
6. Tas U, Verhagen AP, Bierma-Zeinstra SM, Hofman A, Oding E, Pols HA, *et al.* Incidence and risk factors of disability in the elderly: The Rotterdam Study. *Prev Med* 2007;44:272-8.
7. Yoshida D, Ninomiya T, Doi Y, Hata J, Fukuhara M, Ikeda F, *et al.* Prevalence and causes of functional disability in an elderly general population of Japanese: The Hisayama study. *J Epidemiol* 2012;22:222-9.
8. Gupta P, Mani K, Rai SK, Nongkynrih B, Gupta SK. Functional disability among elderly persons in a rural area of Haryana. *Indian J Public Health* 2014;58:11-6.
9. Gupta S, Yadav R, Malhotra AK. Assessment of physical disability using Barthel index among elderly of rural areas of district Jhansi (U.P.), India. *J Family Med Prim Care* 2016;5:853-7.
10. Wade DT, Collin C. The Barthel ADL Index: A standard measure of physical disability? *Int Disabil Stud* 1988;10:64-7.
11. Shah S, Vanclay F, Cooper B. Improving the sensitivity of the Barthel Index for stroke rehabilitation. *J Clin Epidemiol* 1989;42:703-9.
12. Chauhan S, Kumar S, Bharti R, Patel R. Prevalence and determinants of activity of daily living and instrumental activity of daily living among elderly in India. *BMC Geriatr* 2022;22:64.
13. gnu.org [Internet]. [www.gnu.org](https://www.gnu.org/software/pspp/). Available from: <https://www.gnu.org/software/pspp/>. [Last accessed on 2022 Oct 23].
14. Medhi GK, Sarma J, Pala S, Bhattacharya H, Bora PJ, Visi V. Association between health related quality of life (HRQOL) and activity of daily living (ADL) among elderly in an urban setting of Assam, India. *J Family Med Prim Care* 2019;8:1760-4.
15. Usha P, Kishore S, Singh M, Aggarwal P, Jain B, Gawande K. Assessment of activities of daily living (ADL) in elderly population. *Indian J Community Health* 2020;32:447-9.
16. Anandaraj R, Prakash M, Vasudevan K. Prevalence of disability in activities of daily living among elderly in a rural community of Puducherry. *Int J Community Med Public Health* 2018;5:4403-7.
17. Carmona-Torres JM, Rodríguez-Borrego MA, Laredo-Aguilera JA, López-Soto PJ, Santacruz-Salas E, Cobo-Cuenca AI. Disability for basic and instrumental activities of daily living in older individuals. *PLoS One* 2019;14:e0220157.
18. Shahar S, Ibrahim Z, Fatah AR, Rahman SA, Yusoff NA, Arshad F, *et al.* A multidimensional assessment of nutritional and health status of rural elderly Malays. *Asia Pac J Clin Nutr* 2007;16:346-53.
19. Veerapu N, Praveen Kumar BA, Subramaniyan P, Arun G. Functional dependence among elderly people in a rural community

- of Andhra Pradesh, South India. *Int J Community Med Public Health* 2016;3:1835-40.
20. Nagarkar A, Kashikar Y. Predictors of functional disability with focus on activities of daily living: A community based follow-up study in older adults in India. *Arch Gerontol Geriatr* 2017;69:151-5.
  21. Burman J, Sembiah S, Dasgupta A, Paul B, Pawar N, Roy A. Assessment of poor functional status and its predictors among the elderly in a rural area of West Bengal. *J Midlife Health* 2019;10:123-30.
  22. Sudarshan BP, Chethan TK. A study to assess the prevalence of anemia and activities of daily living among elderly population residing in a South Indian rural community. *Int J Community Med Public Health* 2016;3:437-41.
  23. Vaish K, Patra S, Chhabra P. Functional disability among elderly: A community-based cross-sectional study. *J Family Med Prim Care* 2020;9:253-8.
  24. Medhi GK, Visi V, Bora PJ, Sarma J, Borah P, Mahanta J, *et al.* A community-based study on functional disability and its associated factors among elderly individuals in a rural setting in Northeastern India. *Cureus* 2021;13:e13309.
  25. Peter RM, Logaraj M, Ramraj B. Association of comorbidities with activity of daily living (ADL) in a community-based sample of older adults in Tamil Nadu, India. *Clin Epidemiol Glob Health* 2022;15:101068.
  26. Malik MA. Functional disability among older adults in India; A gender perspective. *PLoS One* 2022;17:e0273659.
  27. Khan MR, Malik MA, Akhtar SN, Yadav S, Patel R. Multimorbidity and its associated risk factors among older adults in India. *BMC Public Health* 2022;22:746.