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Predictors of functional status among community dwelling elderly

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Abstract
A differential design study to analyze the influence of personal and familial factors of community dwelling elderly on functional status was conducted in Ranebennur Taluk of Haveri district of Karnataka on a sample of 180 (90 rural and 90 urban) elderly. A self-structured schedule, Katz Index of Independence in Activities of Daily Living (ADL), Lawton Instrumental Activities of Daily Living (IADL), Geriatric Depression Scale-short form (GDS), Mini Mental State Examination (MMSE), Mini Nutritional Assessment (MNA), Aggarwal socioeconomic status scale (SES) and anthropometric measurements were assessed. The results revealed that marital status, cognitive status and nutritional status were the important predictors of activities of daily living among rural elderly, while age, gender, cognitive status and working status were the significant predictors of instrumental activities of daily living. With regard to urban elderly, depression, health problems, nutritional status and type of family were the significant predictors of activities of daily living, whereas gender, depression, education, working status and living arrangement were the important predictors of instrumental activities of daily living. Identification of these determinants is necessary to facilitate the development of interventions to prevent or delay the onset of further decline in these groups.

Keywords: Elderly, functional status, activities of daily living, instrumental activities of daily living, localit

Introduction
Globally, population ageing is recognized as a significant trend. The number and proportion of older people in society is increasing worldwide. This increase is especially notable in the India and rest of the Asian countries. As per Census 2011, out of a total population of 1210 million, 103.9 million (8.6%) are above the age of 60 and 11 million are over 80 years of age and it is projected to rise 173.2 million by 2026. With increasing age, people are more likely to become multimorbid and lose the abilities necessary for functional independency. Increasing use of primary and secondary healthcare medication and institutionalized (in the end) care are the consequence of decreasing functional independency.

Functional disability can be defined by the individual's difficulty or need of help concerning the execution of basic or more complex daily tasks that are necessary for an independent life in the community like, for example, mobility related tasks. The functional status of the elderly can be determined by activities of daily living, instrumental activities of daily living and physical mobility (Alves *et al.* 2008) [2]. Activities of daily living refers to a range of common activities whose performance is required for personal self-maintenance and independent community residence like bathing, dressing, toileting, transferring, continence and feeding. Instrumental activities of daily living is concerned with more complex activities needed for independent living in a person's immediate environment. This type of activities measure competence in functions that are less bodily oriented than physical self-maintenance like using telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications and ability to handle finance (Dolai and Chakrabarty, 2013) [3].

Individual factors have been viewed as responsible for the functional disability process. The decline in functional status in older adults may also be associated with a number of multidimensional factors like biological or physiological impairment, nutrition, mood, health status, social relationships, physical environment and the demographic, socioeconomic, cultural and psychological conditions. It is also likely to be influenced by health perceptions.

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The older population puts a large burden on the Indian health care system as compared to young and middle adults. The rising number of older persons with multi-morbidity is associated with the increasing healthcare costs in the India. Therefore, it is important to know which factors are associated with activities of daily living and instrumental activities of daily living functioning in the rural and urban elderly population. Based on these backgrounds the present study was carried out with an objective to analyse the influence of personal and familial factors on functional status (activities of daily living and instrumental activities of daily living) of community dwelling elderly in urban and rural areas of Ranebennur Taluk.

Materials and Methods
Research design
Differential design was used to compare the functional status among rural and urban elderly group.

Locale
The present research study was carried out exclusively in Ranebennur Taluk of Haveri district of Karnataka state, India. The city area and two villages were selected for the study.

Population and Sample
The group of elderly from Ranebennur city and selected villages of Ranebennur Taluka aged 60 and above formed the population of study. The sample of the study included 180 elderly (90 from urban and 90 from rural) who were selected by snow ball technique of sampling.

Research tools used for the study
General information schedule
The self-structured general information schedule was used to collect demographic information of the respondents like age, gender, locality, religion, education, type of family, size of the family, marital status, living arrangement, working status, health problems, lifestyle, hobbies and factors affecting health.

Katz Index of Independence in Activities of Daily Living (ADL)
Daily living activities of elderly was assessed by using Katz Index of Independence in Activities of Daily Living (ADL) by Katz *et al.* (1963) [7]. The scale consisted of 6 activities with 2 statements in each activity. Each activity has to be answered as 'independence' and 'dependence' with a score of '1' and '0' respectively. The scale includes activities like bathing, dressing, toileting, transferring, continence, and feeding. The score ranges from 0-6 and is classified into full function (5-6), moderate impairment (3-4) and severe functional impairment (0-2).

Lawton Instrumental Activities of Daily Living (IADL)
The independent living skills of elderly was assessed by using the Lawton Instrumental Activities of Daily Living (IADL) scale by Lawton and Brody (1969). It contains 8 categories with 3 to 5 statements in each category. Each statement has to be answered as 'yes' or 'no' with a score of '1' and '0' respectively. The items such as ability to use telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications and ability to handle finance. The maximum score is 8 and minimum is 0 and the scores are classified as high (5-8) and low function (0-4).

A pilot study was conducted to test the reliability of the tools. The reliability for Katz index of independence in activities of daily living was found to be 0.87 and for Lawton instrumental activities of daily living scale was 0.86.

Geriatric Depression Scale-short form (GDS)
The Geriatric Depression Scale developed by Sheikh and Yesavage (1986) [] was used to assess the depression among elderly. It consists of 15 statements. Each statement has to be answered as 'yes' or 'no' and is scored as '1' and '0' respectively. The maximum score is 15 and minimum is 0 and the scores are classified as normal (0-4), mild (5-8), moderate (9-11) and severe (12-15). The scale consists of both positive and negative statements. The reliability of the scale was found to be 0.84.

Mini Mental State Examination (MMSE)
The scale originally developed by Folstein *et al.* (1975) [4] and modified by Tombaugh and McIntyre (1992) was used to assess the cognitive abilities such as orientation, registration, attention and calculation, recall, and language. It consists of 11 questions. The maximum score is 30 and minimum is 0. The scores are categorized into no cognitive impairment (24-30), mild cognitive impairment (18-23) and severe cognitive impairment (0-17). The reliability of the tool is 0.61.

Mini Nutritional Assessment (MNA)
Mini nutritional assessment developed by Guigoz *et al.* (1994) was used to assess the nutritional status. The scale comprised of 18 items related to body mass index, mobility, nutritional aspects, psychological and neurological problems, drug intake and anthropometric measurements. The reliability of the scale was found to be 0.60. The score ranges from 0-30 and are classified as normal nutritional status (24-30), at risk of malnutrition (17-23.5) and malnourished (less than 17).

Socio Economic Status (SES)
Socio Economic Status (SES) was measured by Aggarwal *et al.* (2005) [1] scale and the data was computed by IBM SPSS Statistics version 21 software.
The anthropometric measurements of the respondents were taken by the researcher. The anthropometric rod to measure height, and standard weighing machine to assess weight was used. A single measuring tape was used to assess the mid upper arm circumference and calf circumference.

Data collection procedure
A household survey was conducted and data collection tools were administered individually. The elderly were briefed about the purpose of the study and oral consent was obtained to conduct the study. The caregiver's opinion was also sought in cases wherever available in order to substantiate the responses given by the elderly, especially for physical functioning. It took about 40-50 minutes to collect the data from each sample. The information of respondents was gathered through personal interview method by researcher.

Results

Table 1: Demographic characteristics of the respondents

Characteristics	Category	Rural (n=90)	Urban (n=90)	Total (N=180)
Age	Young old (60-74 years)	62 (68.90)	75 (83.33)	137 (76.11)
	Old old (75-84 years)	18 (20.00)	13 (14.44)	31 (17.22)
	Oldest old (≥ 85 years)	10 (11.10)	2 (2.23)	12 (6.67)
Gender	Male	39 (43.30)	37 (41.10)	76 (42.22)
	Female	51 (56.70)	53 (58.90)	104 (57.78)
Religion	Hindu	85 (94.40)	87 (96.70)	172 (95.55)
	Muslim	5 (5.60)	3 (3.30)	8 (4.45)
Caste	Upper caste	5 (5.60)	20 (22.20)	25 (13.88)
	OBC	83 (92.20)	52 (57.80)	135 (75.00)
	Dalits	2 (2.20)	18 (20.00)	20 (11.12)
Education	Illiterate	43 (47.78)	37 (41.11)	80 (44.45)
	Higher primary	37 (41.11))	23 (25.56)	60 (33.33)
	PUC	9 (10.00)	8 (8.89)	17 (9.44)
	Graduation and above	1 (1.11)	22 (24.44)	23 (12.78)
Type of family	Nuclear	32 (35.60)	48 (53.30)	80 (44.44)
	Joint	58 (64.40)	42 (46.70)	100 (55.56)
Size of the family (Members)	Small (≤ 4)	37 (41.10)	47 (52.20)	84 (46.66)
	Medium (5-7)	38 (42.20)	28 (31.10)	66 (36.67)
	Large (≥ 8)	15 (16.70)	15 (16.70)	30 (16.67)
Marital status	Married	52 (57.78)	61 (67.78)	113 (62.78)
	Widow/ widower	38 (42.22)	29 (32.22)	67 (37.22)
Living arrangement	With spouse and children	46 (51.10)	44 (48.90)	90 (50.00)
	Only with spouse	5 (5.60)	17 (18.90)	22 (12.22)
	Only with children	30 (33.30)	20 (22.20)	50 (27.78)
	Alone	7 (7.80)	5 (5.60)	12 (6.67)
	Others/ Relatives	2 (2.20)	4 (4.40)	6 (3.33)
Working status	Working	50 (55.60)	35 (38.90)	85 (47.22)
	Non-working	40 (44.40)	55 (61.10)	95 (52.78)
Socio-Economic Status	Upper middle (46-60)	22 (24.40)	35 (38.89)	57 (31.67)
	Lower middle (31-45)	59 (65.60)	48 (53.33)	107 (59.44)
	Poor (16-30)	9 (10.00)	7 (7.78)	16 (8.89)
Number of health problems	No health problems	20 (22.22)	11 (12.22)	31 (17.22)
	1-2	57 (63.33)	65 (72.22)	122 (67.78)
	3-4	13(14.45)	14 (15.56)	27(15.00)

Figures in parenthesis indicate percentages

Demographic characteristics of the respondents
The demographic characteristics of the sample selected for the study is presented in the Table 1. It is apparent from the table that equal proportion of sample (90 each) is selected from rural and urban area. With respect to age, in rural area 68.90 per cent belonged to 'young old', 20 per cent were 'old old' and 11.10 per cent were in 'oldest old' category. In urban area, 83.33 per cent were 'young old', 14.44 per cent 'old old' and 2.23 per cent belonged to 'oldest old' category.

With regard to gender 43.30 per cent were males and 56.70 per cent females from rural area, whereas 41.10 per cent were males and 58.90 per cent were females in urban area.

Majority of the subjects were Hindus in both rural (94.40%) and urban (96.70%) sample. With respect to caste, majority of the rural (92.20%) and urban (57.80%) respondents belonged to other backward class.

In rural area 47.78 per cent were illiterates, 41.11 per cent completed higher primary, 10 per cent PUC and only 1.11 per cent were graduates. In urban area 41.11 per cent were illiterates, 25.56 per cent completed higher primary, 8.89 per cent completed PUC and 24.44 per cent were graduates.

Regarding family type, 64.40 per cent respondents in rural area were from joint family and 53.30 per cent urban respondents belonged to nuclear family. With regard to family size, among rural sample 42.20 per cent and 41.10 per cent of subjects belonged to medium and small families respectively.

In urban area, 52.20 per cent of subjects belonged to small and 31.10 per cent to medium size families.

With regard to marital status, 57.78 per cent of respondents were married and 42.22 per cent widowed in rural area. Among urban respondents 67.78 per cent were married and 32.22 per cent were widow/widower.

With respect to living arrangement 51.10 per cent were living with spouse and children, 33.30 per cent with children, 5.60 per cent with spouse, 7.80 per cent living alone and only 2.20 per cent were living with others or relatives in rural area. Among urban elderly, 48.90 per cent were living with spouse and children, 22.20 per cent with children, 18.90 per cent with spouse, 5.60 per cent living alone and only 4.40 per cent were living with others or relatives.

In rural area 55.60 per cent of subjects were currently working and 44.40 per cent non-working and in urban area 61.10 per cent of subjects were non-working and 38.90 per cent of them were working.

With regard to socioeconomic status of the rural families, 65.60 per cent of the respondents belonged to lower middle class followed by 24.40 per cent in upper middle and 10 per cent in poor category. Most of the urban respondents (53.33%) belonged to lower middle class, followed by upper middle (38.89%) and poor (7.78%) category.

In rural area, most (63.33%) of the subjects reported 1 to 2 health problems (hypertension and diabetes) followed by no health problems (22.22%) and 3 to 4 (cataract, arthritis, heart

disease and joint pain) health problems (14.45%). With respect to urban elderly, majority of the respondents (72.22%) reported 1 to 2 health problems, followed by 3 to 4 health problems (15.56%) and no health problems (12.22%).

Table 2a: Predictor variables of activities of daily among rural elderly N=90

Predictors	Model-1			Model-2		
	Beta	t-value	Sig.	Beta	t-value	Sig.
Personal factors						
Age	-0.134	-1.459	0.149	-0.117	-1.212	0.229
Gender	-0.106	-0.967	0.336	-0.099	-0.886	0.378
Marital status	0.205	2.089	0.040	0.120	0.619	0.538
Depression	-0.099	-1.127	0.263	-0.123	-1.230	0.223
Cognitive status	0.241	2.095	0.039	0.245	2.080	0.041
Health problems	-0.002	-0.022	0.982	0.062	0.639	0.525
Nutritional status	0.542	5.899	0.000	0.551	5.703	0.000
Education	-0.057	-0.515	0.608	-0.058	-0.507	0.614
Working status	0.076	0.790	0.432	0.056	0.520	0.605
Familial factors						
Type of family				0.154	1.416	0.161
Size of the family				-0.090	-0.846	0.400
Living arrangement				0.133	0.704	0.484
Socioeconomic status				-0.048	-0.442	0.660
F-value	8.89**			6.25**		
R	0.707			0.719		
R^2	0.500			0.517		

**Significant at 1 per cent level

Table 2b: Predictor variable of instrumental activities of daily living among rural elderly N=90

Predictors	Model-1			Model-2		
	Beta	t-value	Sig.	Beta	t-value	Sig.
Personal factors						
Age	-0.236	-2.566	0.012	-0.202	-2.084	0.041
Gender	0.280	2.539	0.013	0.289	2.566	0.012
Marital status	-0.103	-1.050	0.297	-0.246	-1.259	0.212
Depression	-0.027	-0.301	0.764	-0.078	-0.775	0.440
Cognitive status	0.321	2.787	0.007	0.319	2.688	0.009
Health problems	-0.012	-0.136	0.892	0.015	0.154	0.878
Nutritional status	-0.049	-0.533	0.595	-0.025	-0.254	0.800
Education	0.032	0.290	0.773	0.059	0.508	0.613
Working status	-0.365	-3.788	0.000	-0.335	-3.106	0.003
Familial factors						
Type of family				-0.010	-0.091	0.928
Size of the family				-0.017	-0.156	0.877
Living arrangement				0.125	0.652	0.516
Socioeconomic status				-0.093	-0.846	0.400
F-value	8.85**			6.08**		
R	0.706			0.714		
R^2	0.499			0.510		

**Significant at 1 per cent level

Predictor variables of activities of daily among rural and urban elderly

Table 2a and 3a depicts the predictors of activities of daily living of rural and urban elderly. Simple regression analysis was performed to study the effect of personal and familial factors on activities of daily living. In model-1, when the effect of personal factors (age, gender, marital status, depression, cognitive status, health problems, nutritional status, education and working status) was observed. The results indicate that the personal factors significantly influenced activities of daily living and accounted for 50 per cent of variance on activities of daily living. Within the model-1 person's marital status, cognitive status and nutritional status were the significant factors predicting activities of daily living.

In model-2 when familial factors (type of family, size of the family, living arrangement and socioeconomic status) were added to personal factors the results indicated a significant influence on activities of daily living and accounted for 51.70 per cent variance adding only 1.70 per cent to personal factors. In model-2 when familial factors were added, the effect of marital status was negated on the activities of daily living, but cognitive status and nutritional status were still found to be the predicting factors. Therefore, it can be concluded that cognitive and nutritional status of rural elderly were the most important predictors of activities of daily living.

In model-1, results indicated that the personal factors significantly influenced activities of daily living and accounted for 37 per cent of variance on activities of daily living. Within the model-1 depression, health problems and nutritional status were the significant factors predicting activities of daily living.

In model-2, when familial factors were added to personal factors, ANOVA results indicated a significant influence on activities of daily living and accounted for 43.80 per cent variance adding 6.80 per cent to personal factors. Within model-2, when familial factors were added along with depression, health problems and nutritional status, type of family was found to significantly predict the activities of daily living of urban elderly.

Therefore, it can be concluded that the personal factors like depression, health problems and nutritional status as well as familial factor like type of family as the important predictors of activities of daily living.

Table 3a: Predictor variables of activities of daily among urban elderly N=90

Predictors	Model-1			Model-2		
	Beta	t-value	Sig.	Beta	t-value	Sig.
Personal factors						
Age	-0.061	-0.568	0.572	-0.032	-0.288	0.774
Gender	-0.074	-0.592	0.556	-0.111	-0.858	0.393
Marital status	-0.020	-0.172	0.864	-0.232	-0.961	0.339
Depression	-0.390	-3.393	0.001	-0.426	-3.544	0.001
Cognitive status	0.175	1.052	0.296	0.173	1.027	0.308
Health problems	-0.396	-3.950	0.000	-0.347	-3.323	0.001
Nutritional status	-0.429	-3.314	0.001	-0.424	-3.178	0.002
Education	0.058	0.325	0.746	-0.171	-0.819	0.415
Working status	-0.082	-0.802	0.425	-0.068	-0.623	0.535
Familial factors						
Type of family				-0.353	-2.348	0.021
Size of the family				0.205	1.442	0.153
Living arrangement				0.231	0.899	0.371
Socioeconomic status				0.180	1.332	0.187
F-value	**5.21****			**4.56****		
R	**0.608**			**0.662**		
R²	**0.370**			**0.438**		

**Significant at 1 per cent level

Table 3b: Predictor variables of instrumental activities of daily among urban elderly N=90

Predictors	Model-1			Model-2		
	Beta	t-value	Sig.	Beta	t-value	Sig.
Personal factors						
Age	-0.078	-0.792	0.431	-0.023	-0.216	0.829
Gender	0.332	2.876	0.005	0.375	3.087	0.003
Marital status	0.099	0.943	0.349	-0.305	-1.342	0.183
Depression	-0.284	-2.693	0.009	-0.279	-2.463	0.016
Cognitive status	0.037	0.241	0.810	0.078	0.494	0.623
Health problems	-0.131	-1.431	0.156	-0.133	-1.352	0.180
Nutritional status	-0.063	-0.535	0.594	-0.010	-0.076	0.939
Education	0.393	2.413	0.018	0.436	2.215	0.030
Working status	-0.369	-3.916	0.000	-0.444	-4.317	0.000
Familial factors						
Type of family				0.073	0.511	0.611
Size of the family				0.127	0.949	0.346
Living arrangement				0.483	1.996	0.050
Socioeconomic status				-0.082	-0.644	0.521
F-value	7.91**			5.86**		
R	0.686			0.708		
R²	0.471			0.501		

**Significant at 1 per cent level

Predictor variables of instrumental activities of daily living among rural and urban elderly

Table 2b and 3b represents the predictors of instrumental activities of daily living of rural elderly. Simple regression analysis was performed where two models (personal and familial factors) were tested on instrumental activities of daily living. Personal factors were found to significantly influence the instrumental activities of daily living and accounted for 49.90 per cent of variance. Within the model-1 person's age, gender, cognitive status and working status were the significant factors predicting instrumental activities of daily living.

In model-2, when familial factors were added to personal factors, a significant influence on instrumental activities of daily living was found accounting for 51 per cent variance adding only 1.10 per cent to personal factors. Within model-2, when familial factors were added, the personal factors like age, gender, cognitive status and working status were still found to be the predicting factors.

Therefore, it can be concluded that personal factors age, gender, cognitive status and working status are the important predictors of instrumental activities of daily living of rural elderly.

In model-1, ANOVA results indicate that the personal factors significantly influenced instrumental activities of daily living and accounted for 47.10 per cent of variance on instrumental activities of daily living. Within the model-1 person's gender,

depression, education, working status were the significant factors predicting instrumental activities of daily living.

In model-2 when familial factors were added to personal factors, ANOVA results indicated a significant influence on instrumental activities of daily living and accounted for 50.10 per cent of variance adding only 3 per cent to personal factors. Within model-2, when familial factors were added, along with the personal factors (person's gender, depression, education, working status), living arrangement was the significant factor predicting instrumental activities of daily living of urban elderly.

Therefore, it can be concluded that personal factors like gender, depression, education, working status and familial factor like living arrangement are the important predictors of instrumental activities of daily living.

Discussion
The predictors of ADL (Table 2a) were marital status, cognitive status, nutritional status and accounted for 50 per cent and predictors of IADL (Table 2b) were age, gender, cognitive status, working status and accounted for 49.90 per cent among rural elderly.

With regard to urban elders, depression, health problems, nutritional status, type of family were predictors of ADL (Table 3a) and contributed to 43.80 per cent. Gender, depression, education, working status and living arrangement (Table 3b) were predictors of IADL and accounted for 50.10 per cent.

The above results are in line with the study conducted by Lestari *et al.* (2019) [9] they concluded that, older age, female gender, not partnered marital status, low education, access to social capital (only cognitive), wealth status, body mass index, low physical activity, depression, presence of chronic conditions were the predictors of ADL among rural and urban elderly. Another study by Liu *et al.* (2012) [10] revealed that the factors important for ADL functioning are education, living arrangements, number of illness, caregiver-patient relationship, care burden and household size in Taiwan.

Graciani *et al.* (2004) [5] identified the predictors of IADL limitation were female gender, older age, no formal education, little physical activity, poor perceived health status, at least two comorbidities, hospital admission in preceding year and deteriorated cognitive status among Spain elderly. Another study by Storeng *et al.* (2018) [12] conducted on 5,050 individuals aged 60-69 years in Norway. It revealed that poor self-rated health, depression, prolonged sleep and sitting, physical inactivity, poor life satisfaction, daily smoking, anxiety, alcohol consumption and no social participation these factors contributed to IADL disability. The present study revealed that age, gender, marital status, cognitive status, nutritional status, working status, depression, health problems, type of family, education and living arrangement were the significant predictors of functional status among rural and urban elderly. Therefore, identification of these determinants is necessary to facilitate the development of interventions to prevent or delay the onset of further decline in these groups.

Acknowledgement

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