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Original Research Article

Functional dependence in later life: a cross-sectional study in a village of Bangladesh

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ABSTRACT

Background: Functional dependence is a major concern in ageing populations, yet evidence from rural Bangladesh is limited. This study aimed to examine functional dependence in basic and instrumental activities of daily living (BADL and IADL) among rural older adults in Bangladesh.
Methods: A community-based cross-sectional study was conducted in a village of Mymensingh District, Bangladesh. Of 118 older adults selected through simple random sampling, 112 were analysed. Interviews used a semi-structured questionnaire, with BADL and IADL items adapted from the Katz and Lawton-Brody scales. Multiple linear regression examined the effects of sociodemographic characteristics on functional dependency.
Results: Findings reveal that while 76.8% of older people remain independent in BADL, only 29.5% were independent in IADL, indicating higher dependency on instrumental activities of daily living. The regression analysis indicated a moderate correlation (R=0.535) between sociodemographic variables and BADL dependence, accounting for 28.6% of the variation in functional dependency, with age and occupation as statistically significant predictors of BADL dependence. In contrast, a more substantial relationship is observed between sociodemographic characteristics and IADL dependence (R=0.787, R^2=0.620), suggesting that 62% of the variation in IADL dependency can be explained by such factors as age, sex, occupation, and health status.
Conclusions: The findings support a critical perspective on the disengagement theory of ageing, suggesting that disengagement is not a linear process driven solely by age. Given the influence of age, sex, occupation, and health conditions on everyday functioning, specific interventions should support older people.

Keywords: Basic activities of daily living, Elderly well-being, Functional dependence, Instrumental activities of daily living, Population ageing

INTRODUCTION

Population ageing has emerged as one of Bangladesh's most important societal issues.[1] The World Population Ageing Report of the United Nations (2017) suggests that nearly two-thirds of older people now live in developing countries, with an unprecedented increase in their numbers.[2] It is also expected in this report that 8 out of 10 elderly persons around the world will be living in developing countries by 2050.[2] The World Health Organization's fact sheets predict that between 2015 and 2050, the percentage of adults over 60 would almost double, from 12% to 22%. Additionally, by 2050, 80 per cent of the world's elderly population will live in countries with low or middle incomes.[3]

In Bangladesh, more than 15.3 million people are aged 60 years old or more, accounting for 9.28 per cent of the overall population, up from 7.48 per cent in 2011, according to the Census, 2022.[4,5] By 2050, the number of persons aged 60 years or older is predicted to reach 36 million, or 21.9 per cent of the population. One in every

five Bangladeshis will be an older person if the number of older adults rises in this manner.[6] Bangladesh is among the top twenty developing countries in the world in terms of the number of its elderly citizens. Furthermore, by 2025, Bangladesh and four other Asian countries were projected to house roughly half of the world's senior population.[1]

As the number of elderly individuals is steadily increasing, we need to be more cautious about this group of people because increasing age is often associated with a decrease in the independent status of older adults. Their ability to carry out everyday tasks gradually deteriorates.[7] At present, the dependency rate for older people (age 65+/age 15-64) is 7.7 per cent.[6] This dependency ratio would triple between 2000 and 2050.[7] Indeed, loss of functional capability creates dependence among older adults, and they often require special care that may be formal or informal, such as physical and mental support from their family members or others.[8] The World Health Organization stated in its "World Report on Ageing and Health Summary" that maintaining functional ability is paramount to most elderly individuals.[9]

However, care for older adults is becoming more vulnerable in modern societies than in traditional ones because older people are increasingly separated from their children. In this state, their inability to participate in economic activities because of physical inactivity, isolation from their children, and other factors leads them to face social, health, and economic insecurity.[7,10] While the majority of older adults live in rural areas, they often face more insecurity in their lives than their urban counterparts. According to HelpAge Asia statistics, the proportion of older people living in rural regions of the total population is 3.46 per cent, while the proportion of urban older people is 1.4 per cent.[11]

This study, therefore, aimed to examine the well-being of rural older adults by focusing on their functional ability to perform their daily living activities. It has specifically examined the prevalence of functional dependence in basic activities of daily living (BADL) and instrumental activities of daily living (IADL) among older adults living in rural areas and the relationship between rural older adults' sociodemographic traits and their functional dependence in BADL and IADL. Through a critical engagement with theoretical perspectives like the disengagement theory of ageing and an examination of functional dependence in rural Bangladesh's sociocultural and economic realities, this study will contribute to our understanding of ageing and to the development of proper social support programs and policies for elderly care.

METHODS

Study design and setting

A community-based cross-sectional study design was adopted to assess functional dependence in basic activities of daily living (BADL) and instrumental activities of daily living (IADL) among older adults in their usual living environment. The study was conducted in Kholabari village, Bhaluka Upazila, Mymensingh District, Bangladesh, from May to June 2021. The community-based approach was used to capture the wider rural older population rather than only those attending health facilities, while the cross-sectional design enabled the estimation of the prevalence of dependence at a single point in time and the examination of its association with sociodemographic characteristics within the same sample.

Inclusion criteria

Older adults were eligible for inclusion if they were aged 60 years or above, were residents of Kholabari village, Bhaluka Upazila, Mymensingh District, Bangladesh, and were registered in the latest voter list obtained from the Uthura Union Parishad, the lowest tier of rural local government. Eligible individuals were included if they were selected through simple random sampling and were willing to participate voluntarily in the study.

Exclusion criteria

Older adults who were unable to speak or communicate clearly were excluded, as they could not reliably respond to the interview-based questionnaire. Those who had taken part in the pre-test were excluded from the main survey to avoid familiarity with the questionnaire items, and those who declined to participate voluntarily were also excluded.

Sample size

According to the latest voter list collected from Union Parishad, the number of older adults aged 60 or above living in this village is 169. Cochran's sample size formula is one of the well-known formulas for drawing sample sizes from large population sizes. Assuming an expected population proportion of 50% and at a 5% level of significance, the sample size is:

$$Z^2pq/e^2 = \{(1.96)^2\ (0.5)\ (0.5)\}/\ (0.05)^2 = 385$$

However, since the population size in this study (n=169) was less than 10,000, the sample size was adjusted using the following formula:

$$n = n_0\ /\ \{1+\ (n_0\text{-}1)/N\} = 385/\ \{1+\ (384/169)\} = 118$$

Sampling technique

This study employed a simple random sampling technique to identify participants from this single study area. As the list of all people aged 60 or above living in this village or area was available, it was possible to draw a simple random sample. The random numbers were generated from people's voter serial numbers using the RANDOM formula in Microsoft Excel version 10.

Data collection instrument

Semi-structured questions were used in a personal interview survey to collect the data. There were two sections of the questionnaire: respondents' sociodemographic information and information about their functional status on "basic activities of daily living (BADL)" and "instrumental activities of daily living (IADL)". The questionnaire was prepared through a literature review.[13,18]

Measurement of functional dependence among older adults

Several scales have been developed to measure the extent of the ability to perform necessary daily activities independently. The most commonly used scales include "the Katz index of independence in activities of daily living", "the Barthel index" and "the Lawton instrumental activities of daily living scale". Wallace and Shelkey (2007) argue that the Katz index is one of the best instruments to measure the health status and older people's ability to perform daily activities.[12] This scale consists of six types of activities: "bathing, dressing, toileting, transferring, continence and feeding".[13] This scale was initially introduced in the 1950s as an instrument for objective evaluations of chronically ill and ageing populations. All the activities on this scale are suitable for assessing the primary and psychosocial functions.[14] One of the earliest standardized instruments to measure the degree of functional status of older adults with chronic disability is the Barthel index. This is an ordinal scale in which functional status is measured at the activity level of International Classification of Functioning, Disability and Health (ICF). This index assesses transfers, toileting, bathing, eating, dressing, continence and ambulation.[15,16] The Lawton Instrumental Activities of Daily Living is one of the most used tools to measure the dependency of older adults on complex activities rather than simply on basic activities of daily living. This index consists of eight categories of function: ability to use the telephone, shopping, food preparation, housekeeping, laundry, mode of transportation, responsibility for own medications, and ability to handle finances.[17,18] Only the Katz index was employed by Mahmud, Rahman, and Mandal in their investigation of the degree of functional reliance among senior citizens residing in old care homes in the country.[7]

Functional dependence in this study is defined as the need for help performing daily activities. It was measured in terms of two sets of activities of daily living: a) basic activities of daily living and b) advanced activities of daily living. The items for basic activities of daily living were adapted from the "Katz index of independence in activities of daily living". The items for advanced activities of daily living were adapted from the "Lawton index of instrumental activities of daily living". The participants were asked to say "yes (independent) or no (dependent)" for each activity. The response 'yes' means they do not need assistance, while 'no' means they need assistance and supervision of others in performing these activities. Then, the participants who said 'no' were given 1 point, and those who said 'yes' were given 0 points for each activity. For Katz's index of activities of daily living, the highest possible score was 6. Those who scored from 1 to 6 were categorized as functionally dependent, while those whose score was zero were defined as functionally independent in everyday activities. In the case of the Lawton index of IADL, the highest possible score was 8. Those who scored from 1 to 8 were categorized as functionally dependent, while those whose score was zero were defined as functionally independent in daily activities.

Informed consent and pre-test

Six older people from the selected study area were asked the same questions in a pre-test to ensure the questionnaire items were clear. Participants in the pre-test were not included in the main survey. They were asked to participate voluntarily. Verbal informed consent was obtained from each participant before the interview.

Data analysis

Data were analysed using IBM SPSS Pro 26.0. As noted earlier, a total of 118 older adults were randomly selected from the voter list. Of these, three were unable to communicate effectively and were therefore excluded in line with the exclusion criteria, and three could not be located after repeated visits. Consequently, 112 participants were included in the final analysis. Descriptive statistics were used to estimate the prevalence of dependence, and multiple linear regression was used to examine the effect of sociodemographic characteristics on BADL and IADL dependence. Statistical significance was set at $p<0.05$.

RESULTS

Table 1 summarizes the socio-demographic characteristics of the 112 rural older adults included in the study, including their age, sex, education, occupation, monthly family income, marital status, family structure and health status.

As per Table 4 multiple linear regression was used to observe the impact of sociodemographic characteristics on the state of functional dependency of rural older adults in basic activities of daily living. Initial tests were conducted to ensure that the assumptions of normality, linearity, and homoscedasticity were not violated. To begin, boxplots showed that each variable in the regression had a normal distribution and no univariate outliers. A significant relationship was found between the age and occupation of the older adults and their dependency on performing basic activities of daily living, as the p values (0.003 and 0.021) are less than the level of significance (0.05).

Table 1: Sociodemographic characteristics of the respondents (n=112).

Variables	Categories	Frequency	Percentage
Age (in years)	60-64	26	23.2
	65-69	22	19.6
	70-74	15	13.4
	75-79	19	17.0
	≥80	30	26.8
Sex	Male	63	56.2
	Female	49	43.8
Educational Level	No formal education	90	80.4
	Primary	14	12.5
	Secondary	5	4.5
	Above secondary	3	2.7
Occupation	Retired employee	4	3.6
	Business	18	16.1
	Farmer	15	13.4
	Day labor	6	5.4
	Housewife	30	26.8
	Others	39	34.8
Family Monthly Income	Less than 5000	30	26.8
	5000-10000	21	18.8
	10001-15000	20	17.9
	15001-20000	26	23.2
	Above 20000	15	13.4
Marital Status	Married	83	74.1
	Widow/widower	29	25.9
Family Structure	Nuclear family	48	42.9
	Joint family	64	57.1
Health Status	Suffering from disease	77	68.8
	No disease	35	31.3

Table 2: Prevalence of functional dependence in BADL and IADL.

Prevalence of dependency	Frequency	Percentage
Independent in BADL	86	76.8
Dependent in BADL	26	23.2
Independent in IADL	33	29.5
Dependent in IADL	79	70.5

[a]Predictors: (constant), health status, educational level, family pattern, sex, age, marital status, monthly family income, occupation.

Table 3: Model summary 1-socio-demographic characteristics and functional dependence in BADL.

Model summary 1: socio-demographic characteristics and functional dependence in BADL.				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. error of the estimate**
1	0.535[a]	0.286	0.230	1.375

The values of R and R^2 are shown in this table. The basic correlation is shown by the R value. The R^2 value shows the extent to which the independent variables (socio-demographic traits) could account for the entire variation in the dependent variable (functional dependency in IADL). A high degree of correlation is indicated by the value of R in this case, which is 0.787 (the "R" column).

Table 4: Relationship between sociodemographic characteristics and level of functional dependency for basic activities of daily living (BADL).

Variables	Categories	Functionally independent	Functionally dependent	P value	Unstd. Coeff. B	Std. Coeff. Beta
Age (in years)	60-64	26	0	0.003*	0.302	0.297
	65-69	19	3			
	70-74	12	3			
	75-79	15	4			
	≥80	14	16			
Sex	Male	53	10	0.471	-0.252	-0.080
	Female	33	16			
Educational level	No formal education	66	24	0.686	0.104	0.045
	Primary	13	1			
	Secondary	5	0			
	Above secondary	2	1			
Occupation	Retired employee	4	0	0.021*	0.267	0.276
	Business	18	0			
	Farmer	15	0			
	Day labor	5	1			
	Housewife	25	5			
	Others	19	20			
Monthly family income	<5000	22	8	0.811	-0.030	-0.027
	5000-10000	19	2			
	10001-15000	11	9			
	15001-20000	22	4			
	Above 20000	12	3			
Marital status	Married	68	15	0.132	0.558	0.157
	Widow/widower	18	11			
Family pattern	Nuclear family	39	9	0.325	-0.319	0.323
	Joint family	47	17			
Health status	Suffering from disease	52	25	0.427	-0.258	-0.077
	No disease	34	1			

*[a]Predictors: (constant), health status, educational level, family pattern, sex, age, marital status, monthly family income, occupation.

Table 5: Model summary 2-socio-demographic characteristics and functional dependence in IADL.

Model Summary 2: Socio-demographic Characteristics and Functional Dependence in IADL				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	0.787[a]	0.620	0.590	1.450

Table 6: Relationship between Socio-demographic characteristics and level of functional dependency for instrumental activities of daily living (IADL).

Variables	Categories	Functionally independent	Functionally dependent	P value	Unstd. Coeff. B	Std. Coeff. Beta
Age (in years)	60-64	16	10	0.000*	0.557	0.380
	65-69	9	13			
	70-74	4	11			
	75-79	1	18			
	≥80	3	27			
Sex	Male	25	38	0.022*	0.857	0.188
	Female	8	41			
Educational Level	No formal education	17	73	0.217	-0.337	-0.101
	Primary	10	4			
	Secondary	4	1			
	Above secondary	2	1			

Continued.

Variables	Categories	Functionally independent	Functionally dependent	P value	Unstd. Coeff. B	Std. Coeff. Beta
Occupation	Retired employee	2	2	0.002*	0.389	0.278
	Business	16	2			
	Farmer	4	11			
	Day labor	1	5			
	Housewife	7	23			
	Others	3	36			
Monthly family income	<5000	4	26	0.774	0.039	0.024
	5000-10000	5	16			
	10001-15000	7	13			
	15001-20000	11	15			
	Above 20000	6	9			
Marital status	Married	29	54	0.625	0.190	0.037
	Widow/widower	4	25			
Family pattern	Nuclear family	19	29	0.575	0.191	0.042
	Joint family	14	50			
Health status	Suffering from disease	12	65	0.008*	-0.916	-0.188
	No disease	21	14			

As per Table 6, multiple linear regression was used to observe the impact of socio-demographic characteristics on the state of functional dependency of rural elderly people in instrumental activities of daily living (IADL). To ensure that the assumptions of normality, linearity, and homoscedasticity were not violated, initial testing was conducted. First, boxplots demonstrated that there were no univariate outliers and that every variable in the regression had a normal distribution. A significant correlation was found between the age, sex, occupation and health status of the elderly people and their dependency in performing instrumental activities of daily living, as p values (0.000, 0.022, 0.002 and 0.008) are less than the level of significance (0.05).

DISCUSSION

This study examined the prevalence of functional dependency of older adults aged 60 or above living in rural areas in two types of activities, using the Katz index and Lawton index. One is concerned with the basic activities of daily living, while the other is concerned with the instrumental or advanced activities. The frequency of functional dependence in the study population's instrumental activities of daily living (IADL) and basic activities of daily living (BADL) is shown in Table 2. The results show that while 23.2% of people need help performing BADL, the majority (76.8%) can do BADL independently. IADL, on the other hand, shows a different pattern, with only 29.5% of people maintaining their independence and a far higher percentage (70.5%) displaying dependency. These findings imply that although most people can still carry out basic self-care tasks, a sizable fraction struggle with challenging instrumental tasks necessary for independent living.

The observed pattern of functional dependence among rural elderly individuals in Bangladesh is consistent with findings from earlier research. In Bangladesh, for example, Mahmud, Rahman, and Mandal found that among 144 older adults living in five care homes, 26.4% (n = 38) were fully functional, 38.9% (n = 56) had moderate impairment, 27.8% (n = 40) had severe functional impairment, and 6.9% (n = 10) were totally dependent.[7] Contextual variations in living arrangements and the availability of support networks may cause a discrepancy between the results of older populations living in institutions and those living in the community. In a similar vein, Veerapu et al found that IADL dependency was more common than BADL dependency in a rural community in Andhra Pradesh, South India, with 57.1% of the aged population having functional dependence on IADL and 21.8% of BADL.[8] These results are consistent with the current study's findings, supporting the view that instrumental activities are more difficult for older people than simple self-care activities.

In addition to exploring the prevalence, this study investigated the relationship between functional dependency and the sociodemographic traits of senior citizens living in rural regions. The results show that while IADL dependency is impacted by age, sex, occupation, and health status, BADL dependency is substantially correlated with age and occupation. These findings are consistent with earlier study by Mahmud, Rahman, and Mandal, who showed that functional dependence in BADL is more noticeable in women and increases with age.[7] Similarly, Veerapu et al found that the leading causes of functional dependence were advancing age, a lower level of education, and a lower socioeconomic status.[8]

Furthermore, Vieira et al showed that cognitive decline, chronic health disorders, poor nutrition, lower socioeconomic status, and occupational activities are all independently associated with functional impairment.[19] In addition, older age, female sex, low literacy, chronic disease, depression, eyesight and cognitive impairment, physical inactivity, smoking, and restricted social contact were all recognized by Doubova et al as the main risk factors for functional dependence.[20] Together, these results highlight the complex interaction between health, socioeconomic position, and ageing in influencing functional independence in older populations.

Revisiting the disengagement theory of ageing

One of the first theories of ageing is disengagement theory, which reflects the functionalist sociological perspective that was popular during Talcott Parsons' time in the 1950s and 1960s. This theoretical framework was devised by Elaine Cumming and William Earl Henry in their 1961 book "Growing Old". According to this theory, older adults experience physical and psychological decline as they age, and it is essential to consider their changing social roles to make their lives easier and create room for subsequent generations.[21-23] According to Cumming and Henry, "aging is inevitable, mutual withdrawal or disengagement, resulting in decreased interaction between the ageing person and others in the social system he belongs to".[22]

According to this study's findings, disengagement in terms of declining functional activities is not an inevitable linear process, as suggested in disengagement theory. Multiple intervening variables play a key role in the process of disengagement rather than just age as an independent variable. From the study's findings, several factors or variables are revealed, which can be categorized into three categories, namely: a) life situations: they include includes health conditions (poor health), widowhood and mental strengths; b) socioeconomic status: it includes gender role, occupation, education, class status (relations to mode of production and income); c) socio-cultural situations: they include family structure, cultural practices, religious values and norms.

Life situations affecting the disengagement process

Disengagement theory overlooks life situations and socioeconomic and cultural situations as contributing factors to the disengagement process. As the findings of the study show, life situations play a crucial role in disengagement, asserting that people with poor health or diseases are functionally more dependent than people with good health for BADL, as 34 out of 35 respondents who have good health were functionally independent and 52 out of 77 who were in poor health are functionally independent (Table 4). For IADL, 65 out of 77 participants who were suffering from diseases were functionally dependent, and only 14 out of 35 who were in good health were dependent (Table 6). Similarly, widowhood affects the disengagement process as the findings show that people who were widows or widowers are functionally more dependent than married people for both BADL and IADL (Tables 4 and 6). Tallmer also suggests that disengagement theory failed to acknowledge widowhood, poor health and gender as independent phenomena mediating the relation between disengagement and age.[24]

Socioeconomic status and the disengagement process

Disengagement theory overlooks socioeconomic aspects as contributing factors to the disengagement process. As the findings show, class status is a key factor in the disengagement process. Those who had better income (e.g., retired officers, business people, landowners) were functionally more independent and engaged in different social activities than those who had lower income (e.g., day labourers, homemakers, workers) for both BADL and IADL (Tables 4 and 6). The findings resemble those of Frankel that the disengagement process is significantly influenced by one's access to work and relations to the mode of production.[25] Landowners and business people usually remain engaged in social and economic activities and remain functionally independent. The findings also suggest that gender role plays a crucial role in disengagement or dependency for both BADL and IADL. In both cases, men are functionally more independent than women. However, women usually engage in emotionally supportive activities rather than being disengaged.

Sociocultural situations and disengagement

Sociocultural situations, including family structure, cultural practices, religious values and norms, can affect the disengagement process and these are factors that disengagement theory overlooks. People with less age may feel disengaged because of their beliefs and values. Family structure is another aspect that affects the process of disengagement. As Rosow argued, people in nuclear families are more isolated and disengaged than those in joint families.[26] The study's findings show similar results, as people in joint families are functionally more independent and engaged in social and cultural activities (e.g., child care, religious practice, cultural practices) than people in nuclear families.

Our findings show that though ageing naturally leads to gradual disengagement, the process is influenced by other factors, including life situations, socioeconomic status, and sociocultural situations. Therefore, formulating policies to ensure better life situations, socioeconomic conditions, and a healthy sociocultural environment may ensure healthy and happy ageing.

Some limitations of this study are important to acknowledge. The cross-sectional design captures functional dependence at a single point in time, so causal

or temporal relationships between sociodemographic characteristics and dependence cannot be established. Data were collected from a single village, which limits generalizability to other rural and urban areas of Bangladesh. Interview-based data are also subject to recall and social desirability bias. However, these limitations are offset by the use of simple random sampling from a complete voter list and a pre-tested questionnaire. Future studies with larger, multi-site and longitudinal designs are recommended.

CONCLUSION

This study aimed to examine the functional dependence of rural elderly individuals in Bangladesh, focusing on their ability to perform basic and instrumental daily living activities (BADL and IADL). The findings reveal that most participants remain independent in performing basic activities. Dependency in IADL, however, is notably higher, demonstrating either partial or complete reliance on others for tasks like managing finances, transportation, and medication. The study also identifies significant sociodemographic factors influencing functional dependence. Age, occupation, and health status emerged as critical determinants of dependency in BADL, while age, sex, occupation, and health status significantly impacted dependency in IADL. The higher prevalence of functional dependence in IADL suggests the need for targeted interventions, such as community-based support programs, health education, and regular medical check-ups, to address the challenges faced by the rural elderly population. Additionally, the strong association between sociodemographic factors and functional dependence highlights the importance of the need to address specific vulnerabilities, such as gender disparities and occupational backgrounds.

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