Prevalence and predictors of cognitive impairment among the elderly in Bangladesh

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Acknowledgements Authors would like to acknowledge Sir William Beveridge Foundation (SWBF) and Aging Support Forum (ASF), Bangladesh for conducting this survey and giving access to use their data.

Declarations:

Funding Authors received no specific funding for this work.
Conflicts of interest/Competing interests Authors have declared that no conflict of interests exist.
Ethics approval The study protocol was approved by the ethics committee of the Sir William Beveridge Foundation (SWBF) and Aging Support Forum (ASF), Bangladesh.
Consent to participate All participants gave informed consent before taking part in the survey.
Consent for publication Not applicable
Availability of data and material All data are available upon request.
Code availability Not applicable
Author's contribution: ZH and MK conceptualized the idea and designed the study; JKD, NFF and HA involved with conducting the survey and also contributed in the data collection and management; ZH wrote the draft manuscript; ZH and MK analysed the data; MK provided critical comments on important intellectual contents and jointly contributed in revising the manuscript with ZH. All authors approved the final version of manuscript.

Abstract

Aim: To investigate the prevalence of cognitive impairment and its predictors among the elderly in Bangladesh.
Subject and Methods: We use a cross-sectional survey of 1015 older people (≥60 years) in Bangladesh collected jointly by Sir William Beveridge Foundation (SWBF) and Aging Support Forum (ASF), Bangladesh. The Mini-mental State Examination (MMSE) scale, adapted in Bengali language, was used for assessing cognitive impairment which was available for 111 participants. Logistic regression analysis was used to identify predictors of cognitive impairment. Multiple imputation under Missing at Random (MAR) mechanism was used for dealing with missing data.
Results: Overall 31 out of 111 (27.9%) participants were mild, moderate or severely cognitively impaired with a higher proportion among female (33.3%, 17 out of 51) than male (23.3%, 14 out of 60). More precisely, 24 out 111 (21.6%) and 7 out of 111 (6.3%) had mild/moderate and severe cognitive impairment respectively, with a higher percentage among female (mild/moderate: 25.5%, severe: 7.8%) than male (mild/moderate: 18.3%, severe: 5.0%). Age (odds ratio, OR=1.06, p=0.046, 95% CI: 1.001 to 1.119) and social engagement (OR=0.25, p=0.033, 95% CI: 0.072 to 0.898) were found to be statistically significant predictors of cognitive impairment in this group of people. The effect of physical disability fell short of statistical significance at 5% level but was significant at 10% level (OR=2.89, p=0.099, 90% CI: 0.999 to 8.370).
Conclusion: The prevalence of cognitive impairment is alarming and comparatively higher among female elderly in Bangladesh, which seems to increase with presence of any physical disability and their age. Also, prevalence appears to be lower in people who are more socially engaged or active.

Keywords: Cognitive impairment, MMSE, old age, dementia, multiple imputation, MAR.

Introduction

Cognitive impairment leading to dementia is one of the main causes of disability among the elderly people. It is also a leading cause of dependency among older people in low, middle and high income countries (WHO 2019). The mild cognitive impairment (MCI) is an intermediate phase between dementia and normal cognitive function (Hugo and Ganguli 2014), and people with MCI are more likely to develop dementia (Alzheimer's Society 2020). There is a huge impact of the burden of cognitive impairment on the patients, family, society and the country as a whole in terms of their quality of life and health care cost. It affects the memory, thinking, behaviour and emotion of the patients. For example, people with dementia and severe cognitive impairment may become lost at home and in familiar places, forgetful of recent events, names of familiar people and close relative (WHO 2020). Cognitively impaired patients also face difficulty with communication and daily activities, and occasionally they also react aggressively. For cognitively impaired or dementia patients, currently there is no cure and available symptom modifying treatments are not very effective. Thus, care and support are necessary to improve the lives of such patients including their care-givers and families. The life style of patients is totally dependent on family, friends and others for which care is needed. There are economic, social, physical, and psychological impacts of cognitive impairment not only on the patients, but also on their families, society and care-givers at large (WHO 2020).

One new case of dementia develops around the world every 3 seconds and approximately 10 million new cases occur each year (ADI 2018). In 2018, there was an estimated 50 million people globally living with dementia and this figure is projected to be nearly 82 million in 2030 (ADI 2018). Moreover, the estimated number of dementia people will be more than triple to 152 million by 2050 (ADI 2018). In 2018, the total predicted cost of dementia worldwide was $1 trillion US dollars and this value will increase to $2 trillion by 2030 (ADI 2018). Based on data in 2017, it was reported by World Health Organization (WHO) that 7.0% of total population in Bangladesh were over the age of 60 years and the estimated proportion of dementia prevalence was 3.7% within the global burden of disease (GBD) regions (WHO 2017). The approved strategies and standards for the dementia care or support, economic benefits or social safety for dementia carers, individual or integrated research agenda for dementia and the scope of dementia reporting are not available in Bangladesh (WHO 2017). The government investments targeting specifically the cognitively impaired or dementia patients are not yet initiated adequately due to lack of policy guidance from relevant research activities. However, some non-government organizations (NGOs) have initiated some research for the elderly care and support to dementia patients in Bangladesh (WHO 2017), which need to be further strengthened with support from the government and academic researchers.

There is a very limited research on social and healthcare need of older people in Bangladesh, and existing research has many limitations. Particularly, the extent of cognitive impairment and dementia are literally unknown in this group of people. So, there is no specific treatment, management or care plan in place to support this vulnerable group of people in Bangladesh. Based on data published by WHO (2018), it was reported that approximately 1.9% of total deaths occurred due to Alzheimer's disease or dementia in Bangladesh. In 2011, it was reported that 58.0% of dementia patients globally were living in low-and middle-income countries like Bangladesh and this was projected to reach 71.0% by 2050 (Parry and Weiyuan 2011; Sultana 2019). Palmer et al. (2014) reported that the prevalence of questionable and definite dementia among rural elderly in Bangladesh were 11.5% and 3.6%, respectively. It was also reported that age, education, malnutrition and participation in social activities of older people were significantly associated with the occurrence of dementia. The cognitive impairment of 65+ years elderly was measured by the MMSE and it was found significantly higher among diabetic patients (Muqit and Ferdous 1998).

A cross-cultural comparative study on memory performance of elderly (≥60 years) between Bangladesh and Sweden was conducted by Sternäng et al. (2012). The study reported that differences in age did not have a considerable effect on cognitive performance among the older people in Bangladesh. Instead, gender of elderly found to be a significant predictor for memory performance among older people whereas this scenario was completely reversed in Sweden. Sternäng et al. (2019) investigated the relationship between cognitive ability and functional biological age (fBIOAge) of elderly which was constructed by using four functional attributes: grip power, forced expiratory lung capacity, visual awareness and hearing. They reported that fBIOAge was accounted for the cognitive impairment among the elderly in rural Bangladesh.

A study on cognitively impaired and dementia patients among the elderly visiting to the national institute of mental health hospital (NIMHH) of Dhaka in Bangladesh reported that 11.5% of elderly had mild, moderate or severe levels (MMSE score ≤ 23) of cognitive impartment and 5.1% respondents also had dementia (Haq et al. 2015). Another study on cognitive impairment and dementia considered 390 older persons of age group 60-70 years in Bangladesh and reported that 58.7% (229 out of 390) had MCI (Uddin et al. 2018). This study found no significant association between social status (or occupation) and cognitive impairment. The study on cognitive impairment among the 150 stroke survivors aged 23 to 87 years in Bangladesh reported that the prevalence of cognitive impairment was 40.0%, among them 30.7% had severe and 9.3% had mild cognitive impairment based on the Bangla adapted MMSE scale (Nayan et al. 2016).

The developed countries are always preparing to face this burden of cognitive impairment or dementia prioritizing the research in this area to improve diagnosis, management, prevention and care of elderly people (ADI 2018). The countries like United Kingdom, Australia and European countries use diverse approaches to improve the quality of life for the older people and their caregivers. They also have specific policies, plans, strategies or frameworks such as the UK Prime Minister's Challenge on Dementia which aims for England to become the best country in the world for dementia care and support (Prime Minister's challenge on dementia 2020) for health care, social and legal support of the elderly people. However, in comparison with the preparation of developed countries to face this burden, the developing countries particularly Bangladesh is lagging behind in addressing this issue (WHO 2017). In fact, Bangladesh is going to face this challenge of the huge burden of cognitively impaired or dementia affected people. With the growing life expectancy, the cognitive impairment or dementia is increasing at an alarming rate in Asia including Bangladesh (Sultana 2019). Although this is a significant national health problem associated with an aging population, which is not yet getting priority from the concerned authority in Bangladesh as the country has so many other priorities. Elderly care has got least priority to health management policy makers in Bangladesh and most often people living with cognitive impairment or dementia go undiagnosed (Sultana 2019).

There is a lack of government policies directly targeting the burden of cognitively impaired or dementia patients partly due to lack of credible research to guide or inform the government's policy makers, health professionals and associated authorities. There is also very limited research on cognitive impairment among the older people and this again has not been paid much attention to the researchers in Bangladesh. The precise epidemiological data on cognitive impairment, Alzheimer disease or dementia are not available in Bangladesh and the consciousness about this issue is now at the initial stage. Currently, most of the people in Bangladesh belong to the young age-group however, there will be a much higher proportion of elderly in the country within the next 20 to 30 years (Rahman et al. 2017). Therefore, it is very important to promote research on health and wellbeing of elderly to facilitate implementing necessary measures for improving health and social care of this vulnerable group. This study is an initial attempt towards mitigating this need with the main aims being to estimate the current prevalence of cognitive impairment, and to investigate its potential predictors among the elderly in Bangladesh.

Materials and methods

Data and study design

A cross-sectional survey was conducted to collect data from people aged 60 years and over in Bangladesh during November to December, 2014 jointly by SWBF and ASF, Bangladesh. A total of 1015 older people were randomly selected from Kulla union consisting of 27 villages in Dhamrai upzila, a rural area located 35 kilometers away from the capital city, Dhaka. A team of 26 data collectors, including community care assistants, doctors and gerontologists, were trained for the data collection. The training team included psychiatrists and statisticians in order to equip the data collectors with necessary skills on data collection and cognitive impairment & dementia of elderly people. Participants were interviewed at their home during the survey period.

Variables included in the study

The presence of cognitive impairment, assessed via MMSE scale adapted in Bengali language (Kabir and Herlitz 2000), was considered as the main outcome variable. The MMSE scores were used out of total 30 for the assessment of different levels of cognitive impairment, defined as normal: 25-30; mild: 21-24; moderate: 10-20 and severe: 0-9 (Willacy 2017). For the analysis purpose, the cognitive impairment of elderly was considered as a binary response variable and categorized as: yes (mild, moderate or severe cognition) or no (normal cognition). A binary indicator of cognitive impairment, coded as 0 = normal (MMSE score 25 or above) and 1 = mild to severe (MMSE score 24 or less) was used as the outcome variable, available for 111 participants. A number of socio-demographic, behavioral and community engagement variables including gender, age, place of residence, occupation, whether living alone or with family, caregiver, social engagement, physical disability, whether visits doctors' surgery, relationship quality with caregiver, habit of smoking/eating betel leaf, and whether loses temper were considered as the explanatory variables in this study. In addition, chronic diseases such as diabetes, heart disease, hypertension, arthritis, constipation, peptic ulcer and other health problems were also considered to examine the potential effect of multimorbidity (two or more diseases) on cognitive impairment among the 60+ years older people in Bangladesh.

Statistical analyses

We used univariate, bivariate and multivariate statistical methods for the data analysis via SPSS (version 20) and Stata (version 12). The socio-demographic and behavioral characteristics were summarized with descriptive statistics e.g., mean and standard deviation (SD) for continuous variables, and frequency and percentage (%) for categorical variables. In bivariate analysis, the chi-square (χ^2) or Fisher's exact tests were used to test the statistical significance of association between selected categorical variables. The multivariable analysis was carried out via logistic regression to find out the potential predictors of cognitive impairment. We used odds ratio (OR) and the corresponding confidence interval for interpretation of model parameters in the logistic regression analysis. Missing data on covariates were dealt with via multiple imputation under the Missing at Random (MAR) mechanism (Fraser and Yan 2007; Rubin 1976). Logistic regression was used to identify observed predictors of missingness and some of these (physical disability) were associated with the likelihood of missingness, which justifies the plausibility of MAR assumption. We used multiple imputation using chained equations to impute the missing values via the user contributed Stata package '*ice'* (Royston 2004, 2005). We created 35 imputed datasets, the number of imputed datasets was decided using the rule that this should be at least equal to the percentage of incomplete cases, which was 33.3% in our data (White et al. 2010). The estimates obtained from the analysis of multiple imputed datasets were combined using Rubin's rule (Rubin 1987).

Results

The descriptive statistics of background characteristics of respondents are presented by gender in Table 1. It was observed that the proportion of female (51.0%) and male (49.0%) participants was almost the same. The mean age of male respondents was 69.14 years (SD=9.27) which is slightly higher than that of female (mean=67.28 years, SD=8.82) participants. Most of the respondents (96.1%) were living in rural areas and among them the percentage of male (48.6%) and female (51.4%) were similar. It was also observed that a significant portion of respondents was housewife (46.7%). Among 40.1% of respondents who were engaged with agricultural work, most were male (93.7%) and only a small proportion were involved with business (5.0%) and employment (1.4%).

Out of total 964 respondents, 61.9% of elderly were living with their sons. However, 30.8% were living alone by their own arrangements. Family carers i.e., son, daughter or daughter-in-law were found to take care 70.4% of older people, 43.1% of whom were male and the rest of them were female. It is also noted that 29.6% of respondents did not have any particular or specific care givers. From Table 1, it can be seen that 82.6% of older people were getting invitation to attend social gathering events such as marriage ceremony, religious festival and other cultural programs or activities. The percentage of social engagement for male (53.1%) was higher than that of female (46.9%).

Table 1: Frequency and percent (%) distributions with descriptive statistics of socio-demographic and behavioural characteristics among the elderly (≥60 years) in Bangladesh

Variables (available sample size)	**Mean (SD) or n (%) by gender**		
	Male	Female	Total
Age (n=1015, male: 49%, female: 51%)	69.14 (9.27)	67.28 (8.82)	68.19 (9.09)
Place of residence (n=1006)			
Urban (3.9%)	22 (56.4)	17 (43.6)	39 (100)
Rural (96.1%)	470 (48.6)	497 (51.4)	967 (100)

Occupation (n=786)			
Agriculture (40.1%)	295 (93.7)	20 (6.3)	315 (100)
Business (5.0%)	36 (92.3)	3 (7.7)	39 (100)
Housewife (46.7%)	-	367	-
Employment (1.4%)	10 (90.9)	1 (9.1)	11 (100)
Others (6.8%)	44 (81.5)	10 (18.5)	54 (100)
Living with (n=964)			
Son (61.9%)	267 (44.7)	330 (55.3)	597 (100)
Daughter (5.0%)	8 (16.7)	40 (83.3)	48 (100)
Self (30.8%)	188 (63.3)	109 (36.7)	297 (100)
Others (2.3%)	8 (36.4)	14 (63.6)	22 (100)
Caregiver (n=931)			
Family carer (70.4%)	282 (43.1)	373 (56.9)	655 (100)
Others (29.6%)	170 (61.6)	106 (38.4)	276 (100)
Social engagement (n=926)			
Yes (82.6%)	406 (53.1)	359 (46.9)	765 (100)
No (17.4%)	51 (31.7)	110 (68.3)	161 (100)
Physical disability (n=969)			
Yes (68.8%)	289 (43.3)	378 (56.7)	667 (100)
No (31.2%)	182 (60.3)	120 (39.7)	302 (100)
Visiting doctor (n=957)			
Yes (56.9%)	268 (49.2)	277 (50.8)	545 (100)
No (43.1%)	202 (49.0)	210 (51.0)	412 (100)
Relation with caregiver (n=889)			
Positive (82.5%)	384 (52.4)	349 (47.6)	733 (100)
Negative (17.5%)	59 (37.8)	97 (62.2)	156 (100)
Habit (n=750)			
Betel leaf (56.5%)	160 (37.7)	264 (62.3)	424 (100)
Smoking (20.3%)	141 (92.8)	11 (7.2)	152 (100)
Others (16.7%)	61 (40.9)	88 (59.1)	149 (100)
None (3.3%)	13 (52.0)	12 (48.0)	25 (100)
Loosing temper (n=406)			
Yes (52.0%)	114 (54.0)	97 (46.0)	211 (100)
No (48.0%)	84 (43.1)	111 (56.9)	195 (100)
Multimorbidity (n=917)			
Two or more diseases (46.5%)	184 (43.2)	242 (56.8)	426 (100)
No or one diseases (53.5%)	251 (51.1)	240 (48.9)	491 (100)

It was observed that 68.8% of respondents had some level of physical disability (mild, moderate or severe). The proportion of physically disabled elderly in Bangladesh was found to be higher for female (56.7%) than for male (43.3%). It can also be

seen that 56.9% of older people in Bangladesh visit doctor's surgery regularly for health check-up and among them the percentage was almost the same for male (49.2%) and female (50.8%). We also observed that 82.5% of elderly had positive relationship with their caregivers among whom 52.4% and 47.6% were male and female, respectively.

It was observed that 56.5%, 20.3% and 16.7% of older people were used to eating betel leaf, smoking and other habits, respectively while only 3.3% of them did not have any such habits. The proportion of consumption of betel leaf was substantially higher for female (62.3%) than that for male (37.7%). However, this was found to be the opposite for smoking with 92.8% male and 7.2% of female being used to smoking. Out of 406 respondents providing information on their temperament, 52.0% older people were found to often lose their temperament and, comparatively more male (54.0%) were found to be high-tempered than female (46.0%) respondents. It was also observed that 46.5% of the elderly suffered from two or more chronic diseases and this proportion was substantially higher within female (56.8%) than within male (43.2%). The presence of cognitive impairment among the survey participants, data available for 111 respondents, was estimated using MMSE scale and the results are summarized in Table 2.

Table 2: Frequency (%) distribution of different levels of cognitive impairment by gender among the 111 elderly (≥60 years) in Bangladesh

Gender	Cognitive impairment			
	Normal	Mild/moderate	Severe	Mild/moderate/severe
Male (n=60)	46 (76.7%)	11 (18.3%)	3 (5.0%)	14 (23.3%)
Female (n=51)	34 (66.7%)	13 (25.5%)	4 (7.8%)	17 (33.3%)
Total (n=111)	80 (72.1%)	24 (21.6%)	7 (6.3%)	31 (27.9%)

It was observed that overall 27.9% (31 out of 111) survey participants in Bangladesh were mild, moderate or severely cognitively impaired with a higher proportion among female (33.3%, 17 out of 51) than that of male (23.3%, 14 out of 60). We observed that 21.6% (24 out of 111) respondents had mild or moderate level of cognitive impairment and this proportion was also higher among female (25.5%, 13 out of 51) than male (18.3%, 11 out of 60). It can also be seen that 6.3% (7 out of 111) of participants were severely impaired with also a higher percentage among female (7.8%, 4 out of 51) than that of male (5.0%, 3 out of 60). The results obtained from the bivariate analysis are summarized along with frequency and percentage distributions for different categories of variables in Table 3.

Table 3: Frequency and percent (%) distribution of variables by cognitive impairment of respondents and results from bivariate analysis along with corresponding *p*-values for the chi-square (χ^2) or Fisher's exact test

Variables (available sample size)	n (%) by cognitive impairment			*p*-value
	Yes	No	Total	
Gender (n=111)				
Male (54.1%)	14 (23.3)	46 (76.7)	60 (100)	0.242
Female (45.9%)	17 (33.3)	34 (66.7)	51 (100)	
Place of residence (n=110)				
Urban (8.2%)	1 (11.1)	8 (88.9)	9 (100)	0.441*
Rural (91.8%)	30 (29.7)	71 (70.3)	101 (100)	
Caregiver (n=103)				0.074
Family carer (70.9%)	25 (34.2)	48 (65.8)	73 (100)	
Others (29.1%)	5 (16.7)	25 (83.3)	30 (100)	

Relation with caregiver (n=107)				
Positive (86.9%)	22 (23.7)	71 (76.3)	93 (100)	0.053*
Negative (13.1%)	7 (50.0)	7 (50.0)	14 (100)	
Social engagement (n=106)				
Yes (83.0%)	16 (18.2)	72 (81.8)	88 (100)	<0.001*
No (17.0%)	12 (66.7)	6 (33.3)	18 (100)	
Visiting doctor (n=105)				
Yes (69.5%)	15 (20.5)	58 (79.5)	73 (100)	0.131
No (30.5%)	11 (34.4)	21 (65.6)	32 (100)	
Loosing temper (n=38)				
Yes (57.9%)	8 (36.4)	14 (63.6)	22 (100)	0.111
No (42.1%)	10 (62.5)	6 (37.5)	16 (100)	
Multimorbidity (n=90)				
Two or more diseases (87.8%)	9 (42.9)	12 (57.1)	21 (100)	0.354
No or one disease (12.2%)	22 (31.9)	47 (68.1)	69 (100)	
Physical disability (n=108)				
Yes (61.1%)	27 (40.9)	39 (59.1)	66 (100)	<0.001
No (38.9%)	4 (9.5)	38 (90.5)	42 (100)	

Note: *Fisher's exact test

Out of 111 respondents with available data on cognitive impairment, there were 54.1% male and 45.9% female. It is seen that comparatively higher percentage of female (33.3%) were cognitively impaired than that of male (23.3%), although the association between gender and cognitive impairment of respondents was not statistically significant (p=0.242). Among 110 participants, most of them were living in rural (91.8%) areas. The percentage of cognitive impairment was higher among rural elderly (29.7%) than urban (11.1%). The association between place of residence and cognitive impairment of older people was also found to be statistically insignificant (p=0.441). The older people who do not visit doctor (34.4%) for regular health check-up and having two or more diseases (42.9%) were more likely to have cognitive impairment than others, although these associations were not statistically significant: visiting doctor (p=0.131) and multimorbidity (p=0.354). In addition, loosing temper (p=0.111) was not found to be associated with cognitive impairment. Out of 38 respondents with data available on temper, 36.4% and 62.5% were cognitively impaired within those who does and does not loss temper, respectively.

From bivariate analysis in Table 3, it is observed that cognitive impairment was associated with caregiver (p=0.074) at 10% level of significance. The results show that 70.9% of the older people were living with support from a family carer, and 34.2% of them were cognitively impaired. Moreover, relationship quality (p=0.053, Fisher's exact test) with the caregiver was also statistically significant at 10% level. The older people having the positive or good relationship with their caregiver were less likely (23.7%) to be cognitively impaired than those having the negative relationship (50.0%). Social engagement (p<0.001) and physical disability (p<0.001) of elderly in Bangladesh were found to be strongly associated with cognitive impairment status in the bivariate analysis. The older people who were not invited to or engaged in social gatherings, such as marriage ceremony, religious festival and other cultural programs were more likely (66.7%) to be cognitively impaired than those who were socially engaged (18.2%). It can also be seen that the older people having any kind of physical disability were more likely (40.9%) to be cognitively impaired than their no disability counterparts (9.5%).

The unadjusted logistic regression analysis for covariates: age, gender, caregiver, relation with caregiver, social engagement, physical disability, visiting doctor and multimorbidity with the binary response variable (cognitive impairment) was conducted and the results obtained from this analysis were mostly similar to those obtained in the bivariate analysis. The summary results are given in the left panel of Table 4. The final model with selected variables in adjusted multivariable analysis is given in Table 4 (right hand side panel). It is evident from the estimated OR and *p*-values from the final (adjusted) model (right panel of Table 4) that age (OR=1.06, *p*=0.046, 95% CI: 1.001 to 1.119) was statistically significant predictor of cognitive impairment status among the elderly in Bangladesh. As expected, the cognitive performance of elderly declines as age increases. Social engagement (OR=0.25, *p*=0.033, 95% CI: 0.072 to 0.898) was also significantly associated with cognitive impairment. It can be seen that the older people in Bangladesh who are socially engaged or active were significantly less likely to be cognitively impaired. The older people having involvement with social programs are 75.0% less likely to be cognitively impaired than their socially not engaged counterpart. Physical disability (OR=2.89, *p*=0.099, 90% CI: 0.999 to 8.370) of 60+ years older people was also found to be statistically associated with cognitive impairment status at 10% significance level. The elderly in Bangladesh having any kind of physical disability were 2.89 times as likely to be cognitively impaired compared with elderly without any physical disability.

Table 4: Socio-demographic and behavioural predictors of cognitive impairment among the elderly in Bangladesh along with estimates, standard errors (SE), *p*-values, estimated odds ratios (OR=exp($\hat{\beta}$) and their confidence intervals (CI) obtained from fitting binary logistic regression model

Variable	Unadjusted					Adjusted				
	$\hat{\beta}$	SE	*p*-value	OR	95% CI for OR	$\hat{\beta}$	SE	*p*-value	OR	95% CI for OR
Age	0.088	0.025	<0.001	1.09	(1.040, 1.148)	0.057	0.028	**0.046**	1.06	(1.001, 1.119)
Gender										
Male*										
Female	0.496	0.426	0.244	1.64	(0.713, 3.786)	0.352	0.506	0.487	1.42	(0.527, 3.837)
Caregiver										
Others*										
Family carer	0.957	0.548	0.081	2.60	(0.889, 7.630)					
Relation with caregiver										
Negative*										
Positive	-1.172	0.588	0.046	0.31	(0.098, 0.980)					
Social engagement										
No*										
Yes	-2.197	0.571	<0.001	0.11	(0.036, 0.340)	-1.371	0.644	**0.033**	0.25	(0.072, 0.898)
Visiting doctor										
No*										
Yes	-0.706	0.472	0.135	0.49	(0.196, 1.244)					
Multi-morbidity										
No or one disease *										
Two or more diseases	0.471	0.511	0.356	1.60	(0.588, 4.363)					
Physical disability										
No*										
Yes	1.884	0.582	0.001	6.58	(2.101, 20.588)	1.062	0.644	**0.099**	2.89	(0.999, 8.370)**

Note: *reference category, ** 90% confidence interval for Physical Disability, to be consistent with 10% level of significance.

Discussion and conclusion

Like other developing countries, a significant part of the total population is elderly in Bangladesh and this proportion is increasing because of improved life expectancy in the recent decade. The older people are experiencing many cognitive or neurological problems which are highly linked to dementia. This study mainly focuses on estimating the prevalence of cognitive impairment among the elderly and its predictors in Bangladesh.

Our findings based on MMSE scale reveal that overall 27.9% of older people aged 60 years or over were mild, moderate or severely cognitively impaired. However, this proportion is much lower than that (58.7%) obtained by another study using the Takeda Three Colours Combination (TTCC) test conducted among the elderly of age group 60-70 years (Uddin et al. 2018). This variation may arise because of using different scales for assessing the prevalence of cognitive impairment. More precisely, 21.6% of older people had mild or moderate level of cognitive impairment and 6.3% of elderly were severely cognitively impaired in our study. The proportion of cognitive impairment was higher among women elderly in Bangladesh.

The older people do not always get the opportunity to participate in social activities in low-income countries like Bangladesh which is very important for their health, mental peace, happiness and wellbeing (Barikdar et al. 2016). Our findings also reveal that the older people having invitation or engagement to attend social programs such as marriage ceremony, birthday celebrations, religious festival and other cultural activities were less likely to be cognitively impaired. The cognitive performance among the elderly declines as their age increases and also the older people having any kind of physical disability were more likely to be cognitively impaired.

The elderly care is not yet the prioritized health management issue in Bangladesh (Sultana 2019) whereas this issue should be focused immediately by the concerned authority in Bangladesh like other developed countries. Government and non-government health management organizations, policy makers, family and society, and other associated authorities should come forward to take necessary measures and for giving elderly care as one of the top priorities in Bangladesh.

Like many other studies, this study has limitations. Although 1015 older people (60 years or over) participated in this cross-sectional survey, however data on cognitive impairment were available only for 111 participants. This study was also conducted in a specific area of Bangladesh, purposively selected as the local authorities of union and district administrations agreed to extend their support. To overcome these limitations, further studies are necessary with more comprehensive sampling design to collect representative sample covering different areas of Bangladesh. Despite these limitations, this study is an important step in an under-researched area towards better understanding of the extent of cognitive impairment and its predictors among the elderly in Bangladesh. This will hopefully encourage further studies and lay the foundation for more rigorous future studies in this urgently needed area of cognitive impairment leading to dementia in Bangladesh.

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