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Prevalence and correlates of total sleep time among the older adults during COVID-19 pandemic in Bangladesh

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ABSTRACT

Purpose: The present study was aimed to identify inappropriate sleep duration and its correlates among the Bangladeshi older adults during the COVID-19 pandemic.

Material and methods: This cross-sectional study was carried out among 1030 older adults aged 60 years and above in Bangladesh. Information was collected through telephone interviews using a pretested semi-structures questionnaire installed in SurveyCTO mobile app. Sleep duration was defined as total sleep time (TST) in last 24 h including day and nighttime sleep. TST was further categorized into shorter (<7 h), recommended (7–8 h), and longer sleep (>8 h) according to 2015 National Sleep Foundation guideline. The multinomial logistic regression model identified the factors associated with sleep duration.

Results: Mean TST was 7.9 h (SD=1.62). Of the total participants, 28.2% had longer and 17.8% shorter sleep duration. In the regression model, participants' age of ≥80 years (OR: 3.36, 1.46–7.73), monthly family income of <5,000 Bangladeshi Taka (OR: 3.50, 1.79–6.82), difficulty in getting medicine during COVID-19 (OR: 1.72, 1.05–2.82), lack of communication during the pandemic (OR: 2.20, 1.43–3.40) and receiving COVID-19 related information from friends/family/neighbours (OR: 1.83, 1.11–3.01) were significantly associated with shorter TST. On the other hand, monthly family income of < 5,000 Bangladeshi Taka (OR: 2.00, 1.13–3.53), difficulty in getting medicine during COVID-19 pandemic (OR: 2.01, 1.33–3.03) and receiving COVID-19 related information from radio/TV (OR: 2.09, 1.22–3.59) were associated with longer TST.

Conclusions: The study findings suggest implementing sleep management program for older adults in Bangladesh, particularly during emergencies like COVID-19.

1. Introduction

The COVID-19 pandemic has emerged as the most remarkable global public health challenge of this century. As of 26th October 2020, there were over 3.5 million reported COVID-19 confirmed cases and nearly fifty thousand COVID-19 deaths worldwide [1]. Although almost every person of this planet has been impacted, certain population groups are more vulnerable than others to the detrimental effect of COVID-19. Older adults are particularly at risk of severe morbidities and death due to COVID-19 because of the presence of co-morbidities among many of them [2]. Evidence suggests that COVID-19 related mortality was 15% among the older adults aged 80 years and above compared to that of only 0.2% among the people aged less than 20 years [3].

Similar to that of many other countries [4], population is rapidly aging in Bangladesh. In 2019, the total number of people aged 60 years and above was 13 million (8% of total population) in Bangladesh, and is projected to reach around 36 million in 2050 (21.9% of the total estimated population) [5]. It is also reported that the prevalence of non-communicable chronic conditions such as hypertension, obesity, diabetes, cardiovascular disease, and chronic lung disease, are higher among older adults in Bangladesh [6]. Therefore, age being a critical determinant of COVID-19, Bangladeshi older adults are at increased risk

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of morbidities and mortality due to COVID-19. It is also crucial that Bangladesh is one of the top countries of the world in terms of the number of COVID-19 cases. As of 26th October 2020, there were over ten thousand reported COVID-19 confirmed cases and 138 COVID-19 deaths in Bangladesh [1].

Sleep is a biological phenomenon which helps to maintain cognitive functioning by daily removal of metabolic wastes [7]. A good amount of quality sleep is predictor of better mental well-being and sleep deprivation can cause cognitive impairment and longitudinal cognitive decline [8]. Nonetheless, sleep disorders are prevalent among older adults and epidemiological evidence suggests 50% of older adults suffer from at least one of several sleep disorders [8]. Different sleeping patterns evolve across the human life span and as individuals get older both men and women tend to have lower sleep quality [9]. The risk of sleep disturbances increase with age [10] as observed via the decreased rapid eye movement sleep and sleep efficiency and increased sleep latency. Sleep becomes more fragmented and lighter with an increase in the number of arousals and awakenings as people ages. Deeper stages of sleep becomes completely absent after the age 90 and the decrease in Rapid Eye Movement (REM) sleep is proportional to the decrease in total sleep time [11]. These sleep related problems are further exacerbated by the health problems, psychiatric problems, and psychosocial issues commonly associated with old age. Sleep complaints are also frequently observed among females than males irrespective of age. These differences could be due to hormonal changes related to menopause symptoms which are associated with physical, physiological and psychological changes that increase the problems of sleep [12].

It has been reported that 7–8 h of sleep in 24 hour is sufficient for older adults [13]. Inappropriate sleep duration in the form of both short sleep (<7 hr) and long sleep (>8 hr) has been identified as a significant risk factors of diabetes, obesity and cardiovascular diseases [14]. While there is limited available evidence on the sleep duration among the older adults in Bangladesh, a recent nationwide cross-sectional study found that 15.5% of older adults tended to sleep less than their recommended sleeping hours while 28.2% had a longer sleeping hours than recommended [15].

A high psychological cost was induced by COVID-19 among older adults [16] as it has been impeding daily life which can subsequently impact the sleep duration. Physical illness, financial uncertainty among the family members and other socioeconomic factors can induce anxiety which negatively affects sleep duration and sleep quality. Even staying home all the time during the pandemic can affect the duration of sleep and can alter the duration as well as quality of sleep which can ultimately adversely affect the quality of life, particularly in the older adults [17]. Some of the recent systematic reviews [18,19] also pointed about the sleep problems faced by the people during COVID-19 pandemic. In order to find a solution to appropriate sleep schedule for older adults, it is warranted to find the factors that are affecting the sleep time. However, we did not find any study that reports the sleep time and socioeconomic factors associated with the inappropriate sleep duration among older adults during COVID-19 pandemic in Bangladesh. Therefore, the present study investigated the total sleep time and the factors that are associated with shorter and longer sleep duration amid the COVID-19 pandemic in Bangladesh.

2. Materials and methods

2.1. Study design and participants

We carried out a cross-sectional study with participants aged 60 years and above regardless gender. Data were collected remotely through telephone interviews in October 2020. We utilized a pre-established registry, developed through merging the contact information of households from ten different community-based studies accomplished by Aureolin Research, Consultancy and Expertise Development (ARCED) Foundation during 2016–2020 as sampling frame, which included households from all eight administrative divisions of Bangladesh.

By considering 50% prevalence with a 5% margin of error to be tolerated at the 95% level of confidence, 90% power of the test, and 95% response rate, the study requires a total of 1096 people aged 60 years or above. A total of 1032 older adults responded to the study with the overall response rate of approximately 94%. Based on the population distribution of older adults by geography in Bangladesh, we adopted a probability proportionate to the number of older adults to ensure representative selection of older adults from each division [20]. We excluded participants who had mental health problems (diagnosed with schizophrenia, bipolar mood disorder, dementia/cognitive impairment), a hearing disability, or inability to communicate.

2.2. Data collection tools and techniques

A pre-tested semi-structured questionnaire in Bengali language installed in SurveyCTO mobile app (https://www.surveycto.com/) was used to collect the information. The interviews were administered by ten research assistants with their own mobile phones usually in the morning and took around half an hour for each participant. The research assistants were trained extensively for three days before the data collection by SKM, AMI and UNY through Zoom meeting.

The English version of the questionnaire was first translated to Bengali language and then back translated to English by two researchers to ensure the contents' consistency. The questionnaire was then piloted among a small sample (n = 10) of older adults to refine the language into the final version. The age of the pilot sample ranged between 63 and 78, male female ratio was 6:4 and 60% of them were literate.

The data quality was assured by the investigators by accompanying some of the interviews through conference calls. Data quality control measures also included high frequency checks, automatic progress reporting to control phone call protocols and random audio monitoring of the interviews.

2.3. Measures

2.3.1. Outcome measure

The outcome of this study was the total sleep time (TST) which was measured though asking the participants about their total hour of sleep in last 24 h from the time of the interview counting both day and nighttime sleep. Operational definition of the sleep time was *"the difference between the time at which the participant switches off the light and the time at which they wake up, discounting the time needed to fall asleep plus the time to wake up"* [15,21] . We further categorized the TST into short sleep (<7 h), recommended sleep (7–8 h) and long sleep (>8 h) as per the National Sleep Foundation (NSF) guidelines [22].

2.3.2. Explanatory variables

Explanatory variables were age (categorized as 60–69, 70–79, and ≥80 years), sex (male/female), marital status (currently married/widow), literacy (illiterate/literate), family size (≤4/more than 4), monthly family income in Bangladeshi Taka (1 Bangladeshi Taka~0.012 United States Dollar) (<5000, 5000–10,000, >10,000), place of residence (urban/rural), current occupation (employed, unemployed or retired), living arrangements (living alone or with family), financial dependence on other family members (no/yes), walking distance to the nearest health center (<30 min/≥30 min), presence of pre-existing non-communicable chronic conditions (yes/no), concerned about COVID-19 (hardly, sometimes/often), overwhelmed by COVID-19 (hardly, sometimes/often), difficulty in getting food during COVID-19 (no/yes), difficulty in earning during COVID-19 (no/yes), difficulty in getting medicine during COVID-19 (no/yes), difficulty in receiving routine medical care during COVID-19 (no/yes), frequency of communication with friends and family during COVID-19 (less than previous/same as previous), family members not responsive to their needs during COVID-19,

and source of COVID-19 related information (TV/radio, health workers, and friends/family/neighbors).

2.4. Statistical analysis

The distribution of the variables was assessed through descriptive analysis. The Chi-square tests were performed to compare the prevalence of shorter, recommended and longer sleep duration among different categories of explanatory variables with a 5% level of significance. To explore the factors associated with shorter and longer sleep, we used the multinomial logistic regression model with recommended sleep time as base outcome. We ran the initial model with all potential covariates (Table 1), followed by the backward elimination criteria with Akaike information criterion (AIC) to select the final model (Table 4). We reported the adjusted odds ratio (aOR) and associated 95% confidence interval (95% CI). All analyses were performed using the statistical software package Stata (Version 14.0).

2.5. Ethical approval

The study protocol was approved by the institutional review board of Institute of Health Economics, University of Dhaka, Bangladesh (Ref: IHE/2020/1037). Verbal informed consent was sought from the participants before administering the survey. Participation was voluntary, and participants did not receive any compensation.

3. Results

3.1. Participants' characteristics

Table 1 presented the socio-demographics and economic characteristics of the participants. Majority of the population were male (65.4%), illiterate (58.4%) and residing in the rural areas (73.9%). Around 92.3% older were living with other family members and were financially dependent (68.1%). More than half of the participants had pre-existing non-communicable chronic conditions (58.9%) and often concerned about COVID-19 (71.0%). Around 69.6% of the study participants had not faced difficulty getting routine medical care during COVID-19 and radio/television was the prime source of COVID-19 information.

3.2. Sleep duration

Table 2 shows the sleeping duration among the study participants according to their age category. Mean TST was 7.9 h (SD=1.62). We found that longer sleep duration was prevalent than shorter sleep among all age groups. Overall, 15.4% of the population slept 10 h or longer, while around 5% of the participants aged 60–69 years and 9.3% of those aged ≥80 years slept up to five hours in 24-hours.

Based on the NSF recommended age-specific sleep hours category, we found that 17.8% of the participants had shorter TST and 28.2% had longer TST compared to their age-specific recommended TST (Table 3). Although male participants slept longer time than their counterpart, but it was not significantly different. Furthermore, we noted an inappropriate sleep duration among the ≥80 male participants i.e., higher prevalence of both shorter TST and longer TST.

3.3. Factors associated with inappropriate sleep duration

Participants' demographic and lifestyle characteristics and COVID-19 related factors (Table 1) those were deemed to be associated with shorter and longer TST were included in the full model. The final model was selected based on the lowest AIC and is shown in Table 4. In the adjusted regression model, shorter TST was higher among the participants who were aged 80 years and above (aOR: 3.36, 1.46–7.73); had a family income of less than 5000 in Bangladeshi Taka (aOR: 3.50, 1.79–6.82); had some difficult in getting medicine during the COVID-19 pandemic (aOR: 1.72, 1.05–2.82); had fewer communication compare to pre-COVID time with others during the pandemic (aOR: 2.20, 1.43- 3.40); and received COVID-19 related information from friends/family/neighbours (aOR: 1.83, 1.11- 3.01). Shorter TST was lower among the participants who had Financial dependence on other family members (aOR: 0.58, 0.38- 0.88) and who received COVID-19 related information from health worker (aOR: 0.06, 0.01- 0.48). On the

Table 1
Characteristics of study participants (N = 1030).

Characteristics	n	%
Total	1030	100.0
Age (year,%)		
60 – 69	802	77.9
70–79	174	16.9
≥80	54	5.2
Sex		
Male	674	65.4
Female	356	34.6
Marital status		
Currently married	839	81.5
Widow	191	18.5
Literacy		
Illiterate	601	58.4
Literate	429	41.6
Family size		
≤4	317	30.8
>4	713	69.2
Family monthly income in Bangladeshi Taka		
<5000	144	14.0
5000–10,000	331	32.1
>10,000	555	53.9
Place of residence		
Urban	269	26.1
Rural	761	73.9
Current occupation		
Employed	448	43.5
Unemployed or retired	582	56.5
Living arrangement		
Living with other family members	951	92.3
Living alone	79	7.7
Financial dependence on other family members		
No	329	31.9
Yes	701	68.1
Walking distance to the nearest health center		
<30 min	507	49.2
≥30 min	523	50.8
Pre-existing non-communicable chronic conditions		
No	423	41.1
Yes	607	58.9
Concerned about COVID-19		
Hardly	299	29.0
Sometimes/often	731	71.0
Overwhelmed by COVID-19		
Hardly	369	36.4
Sometimes/often	646	63.6
Difficulty getting food during COVID-19		
No	552	55.3
Yes	447	44.7
Difficulty earning money during COVID-19		
No	339	37.3
Yes	570	62.7
Difficulty getting medicine during COVID-19		
No	732	75.3
Yes	240	24.7
Difficulty receiving routine medical care during COVID-19		
No	643	69.6
Yes	281	30.4
Frequency of communication during the COVID-19		
Same as previous	596	57.8
Less than previous	434	42.1
*Source of COVID-19 related information		
Radio/Television	856	83.1
Health workers	96	9.3
Friends/family/neighbours	733	71.2

Table 2
Sleeping hours among the participants.

Variables	TST* (mean ± SD)	<4 hN (%)	[4–5 h]N (%)	[6–7 h]N (%)	[8–9 h]N (%)	>= 10 hN (%)	p-value
Overall	7.9 (±1.62)	5 (0.5)	47 (4.6)	323 (31.4)	496 (48.2)	159 (15.4)	
Age (years)							
60–69	8.0 (±1.60)	3 (0.4)	34 (4.2)	239 (29.8)	393 (49.0)	133 (16.6)	0.038
70–79	7.6 (±1.51)	2 (1.2)	8 (4.6)	62 (35.6)	85 (48.9)	17 (9.8)	
≥ 80	7.7 (±2.14)	0 (0.0)	5 (9.3)	22 (40.7)	18 (33.3)	9 (16.7)	

* Total sleep time.

Table 3
Sleeping duration according to the NSF guidelines.

Age category	Sex	Shorter TSTN (%)	Recommended TSTN (%)	Longer TSTN (%)	Total	p-value
Overall		183 (17.8)	557 (54.1)	290 (28.2)		
60	Male	77 (14.3)	299 (55.7)	161 (30.0)	537 (100.0)	0.489
–	Female	46 (17.4)	146 (55.1)	73 (27.5)	265 (100.0)	
70–	Male	20 (19.4)	57 (55.3)	26 (25.2)	103 (100.0)	0.285
79	Female	21 (29.6)	36 (50.7)	14 (19.7)	71 (100.0)	
≥80 years	Male	15 (44.1)	9 (26.5)	10 (29.4)	34 (100.0)	0.135
	Female	4 (20.0)	10 (50.0)	6 (30.0)	20 (100.0)	

Table 4
Factors associated with shorter TST and longer TST in comparison to recommended TST.

Characteristics	Shorter TST (<7 hr)			Longer TST (>8 hr)		
	aOR	p-value	95% CI	aOR	p-value	95% CI
Age (year)						
60–69	Ref			Ref		
70–79	1.74	0.039	1.03, 2.95	1.05	0.830	0.67, 1.66
≥ 80	3.36	0.004	1.46, 7.73	1.28	0.538	0.58, 2.83
Family monthly income in Bangladeshi Taka						
>10,000	Ref			Ref		
<5000	3.50	<0.001	1.79, 6.82	2.00	0.017	1.13, 3.53
5000–10,000	1.71	0.020	1.09, 2.69	0.84	0.354	0.58, 1.22
Living arrangement						
Living with other family members	Ref			Ref		
Living alone	1.86	0.077	0.93, 3.70	1.13	0.717	0.59, 2.17
Financial dependence on other family members						
No	Ref			Ref		
Yes	0.58	0.011	0.38, 0.88	0.90	0.556	0.64, 1.27
Difficulty in earning during COVID-19						
No difficulty	Ref			Ref		
Some difficulty	1.13	0.609	0.71, 1.81	0.43	<0.001	0.30, 0.62
Difficulty in getting medicine during COVID-19						
No difficulty	Ref			Ref		
Some difficulty	1.72	0.033	1.05, 2.82	2.01	0.001	1.33, 3.03
Frequency of communication during COVID-19						
Same as previous	Ref			Ref		
Less than previous	2.20	<0.001	1.43, 3.40	0.97	0.886	0.68, 1.39
Received COVID-19 related information from radio/TV						
No	Ref			Ref		
Yes	0.95	0.870	0.51, 1.76	2.09	0.007	1.22, 3.59
Received COVID-19 related information from health worker						
No	Ref			Ref		
Yes	0.06	0.008	0.01, 0.48	0.93	0.812	0.53, 1.65
Received COVID-19 related information from friends/family/neighbours						
No	Ref			Ref		
Yes	1.83	0.018	1.11, 3.01	0.93	0.727	0.62, 1.40

Ref: reference group; aOR: Adjusted Odds Ratio, CI: Confidence Interval.

other hand, longer TST was higher among the participants whose family income was less than 5000 in Bangladeshi Taka (aOR: 2.00, 1.13–3.53); had some difficult in getting medicine during the COVID-19 pandemic (aOR: 2.01, 1.33–3.03) and who received COVID-19 related information from radio/TV (aOR: 2.09, 1.22- 3.59).

4. Discussion

In this study we investigated the inappropriate sleep time among the Bangladeshi older adults amid this COVID-19 pandemic and factors associated with the shorter sleep and longer sleep duration. The study revealed that a significant proportion of the older adults were short sleepers, while a large proportion of them were also long sleepers. This would mean that this inappropriate sleep duration likely have a significant impact on the health status among older adults. Several studies indicate that both shorter sleep and longer sleep can act as risk factors for several chronic diseases such as hypertension, coronary heart disease, and stroke [23,24]. It has been well documented that COVID-19 related morbidities and deaths are higher among the people who are suffering from chronic diseases [25], therefore sleep

disturbances could further deteriorate the condition through aggravating the chronic diseases. However, the study is failed to explain the reverse causality or bidirectional relations which would mean what causes what: is it the inappropriate sleep causes chronic disease, or is it the chronic disease resulted adequate sleep among the of older adults [26]?

The present study found that the prevalence of short sleepers was relatively higher among the older adults than that of previous large scale study conducted in Bangladesh (15.5%) before pandemic [27]. This variation may explain the adverse effect of COVID-19 on sleep duration among the older adults in Bangladesh. A recent study reported a higher proportion of short sleepers among the general population of Bangladesh during the pandemic period [28]. The possible reasons behind the increase of short sleepers during the pandemic are perceived fear of death, panic, and stress among them, which might have affected their sleeping duration [29,30]. Another study also reported a positive association between COVID-19 related loneliness and sleep problems among the older adults [31].

We found that the participants from the relatively poor households, who were financially independent of their family members and those who faced difficulty in getting medicine during the pandemic were more likely to have shorter sleep duration. This is probably because of the fact that these unfavorable circumstances amid this overwhelming condition might have created an additional psychological pressure on the participants [32], resulting inappropriate sleep duration [33]. We also found that prevalence of shorter TST increased with age. Evidence suggests that COVID-19 related morbidities and deaths increased with age due to the increased episodes of chronic diseases among the aged population [3], which might have exacerbated their psychological conditions and concomitant sleep duration. Studies carried out in Bangladesh also reported an adverse psychological impact of COVID-19 among older population [34,35] which could be a possible reason for shorter TST among them. Previous study reported death fear among the older aged people as a factor of sleeping problem [36]. We also found that older people who had less communication with others during the pandemic had higher risk of being short sleeper. This may indicate a less social support towards the older people particularly during this crisis moment. Previous studies reported an association between social support and depressive symptoms [37], which might resulted in short sleep time.

It is notable to mention that longer sleep duration was significantly higher among the participants who received COVID-19 related information radio/television and friends/family/neighbours. On the other hand, inappropriate sleep duration was lower among the participants who received COVID-19 related information from health workers. This indicates that receiving COVID-19 information from popular media like Television/radio and close contacts did not help to calm the mind of the participants regarding the deadly effect of COVID-19 which might have resulted in inappropriate sleep duration. Recent research also identified that excessive media use during COVID-19 can promote psychological disturbances [38]. Contrary, research has documented the significant roles of health workers in assuaging the mental stress during the COVID-19 pandemic [39]. Health workers are essentially from the same community they serve and therefore can promote social engagement and thereby can contribute to promote appropriate sleep duration through alleviating stress and anxiety [40].

The implications of the study are three folded. First, this study generated novel knowledge about the sleep duration among the older population in Bangladesh during the COVID-19 pandemic. This may indicate that older people require immediate need for mental health support. Secondly, the study identified COVID-19 factors that are associated with inappropriate sleep duration. Public health programs, policy maker donors may encourage/include mental health support for adequate sleep into their existing program or agenda. Thirdly, this study shed light on the magnitude of inappropriate sleep duration among the Bangladeshi older population. This may encourage public health researchers to carry out further studies on sleep and policy maker may allocate more resources on sleep research in Bangladesh.

Our study is not out of limitations. Firstly, we do not have pre-pandemic sleep data; therefore, it is hard to confer that this inappropriate sleep duration is related to COVID-19. Second, temporal association cannot be stated due to the nature of the study design. Third, while we reported about the inappropriate sleep duration, other sleep attributes such as sleep quality, napping, and sleep disorders were not measured. Fourthly, we measured the TST over the last 24 h of a particular survey day that may be systematically different across participants. We could have measured sleep duration over the past month or past week, but this could have subjected to more recall bias. Finally, total sleep time in the last 24-hours were self-reported, which can be influenced by recall bias. However, from the practical viewpoint, it was not feasible to verify their sleep data through technologically or those who shared the same sleeping environment.

5. Conclusion

Older population aged 60 years and above have been experiencing inappropriate sleep duration in Bangladesh during the COVID-19 pandemic. Older the age, living alone, financial dependency on other family members, and lack of communication likely to reason their shorter sleep; however, responsiveness of the family members and COVID-19 information from radio/TV and health workers likely to increase their sleep duration. Some difficulty in earning during COVID-19 and COVID-19 related information from health worker likely to reduce the longer sleep duration among the older in Bangladesh.

Declarations of Competing Interest

None

Data sharing statement

The data is available upon reasonable request from the corresponding author.

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