Sleep Quality and its various correlates: A community-based study among geriatric population in a community development block of Purba Bardhaman district, West Bengal

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ABSTRACT

Background: In the elderly population, sleep problems are prevalent and have known to be associated with many factors. There are many adverse consequences of decreased sleep such as heart disease, diabetes, depression, accidents, impaired cognition, and poor quality of life. Correlates of poor sleep quality have not been well explored in Indian research. Objectives: The present study aimed to measure prevalence of poor sleep quality among elderly and its association with different factors. Methods: A cross-sectional study was conducted during June-November 2018 in a randomly selected block of Purba Bardhaman district. Cluster random sampling was applied to select required sample of 180 elderly people (≥60 years) from 30 villages. Study tools used were Pittsburgh Sleep Quality Index (PSQI), 5-Item Geriatric Depression Scale (GDS), Generalized Anxiety Disorder 7-item scale (GAD-7), Global Physical Activity Questionnaire (GPAQ), and a pretested schedule for sociodemographic and other variables. The study had approval from Institutional Ethics Committee. Chi-square tests and multivariable logistic regression were performed using SPSS V16. Results: Prevalence of poor sleep quality (GPSQI ≥5) was 68.89%. Median Global PSQI (GPSQI) score was 7.00 (4.00–11.00). Multivariable logistic regression revealed that marital status, vital events in past one month, anxiety status, and depression were significantly associated with sleep quality. Those who were unmarried/widowed, having vital events in past one month in the family, and severe anxiety and depression were having significantly higher odds of developing poor sleep quality. Conclusion: Poor sleep quality is high among elderly and measures toward the significant correlates are thus emphasized.

Keywords: Geriatric, physical activity, sleep quality

Introduction

Sleep is a reversible phase of perceptual detachment from, and inattention to, one's surroundings. (defined behaviorally).⁶ It is an important physiological process with many restorative functions and is essential in maintaining the body’s circadian rhythm. There are many adverse consequences of decreased sleep such as heart disease, diabetes, depression, accidents, impaired cognition, and poor quality of life. The geriatric population are more prone to decreased sleep and its adverse consequences.

Insomnia is defined as difficulty in falling or staying asleep. In the elderly population, sleep problems are prevalent and have known to be associated with physical and psychological factors.⁹ In patients with depression, various alterations of sleep...
architecture (e.g., decreased deep sleep, impaired sleep continuity, and duration) can be identified.[30] It has been hypothesized that relationship between depression and sleep disturbance is bidirectional, i.e., depression is increasing the risk of poor sleep and poor sleep is increasing the risk of depression.[44] Excessive daytime sleepiness can occur as a result of reduced sleep quality and may lead to impaired daytime function and impaired quality of life. For these adverse consequences, poor sleep quality is a primary concern for health professionals.

A number of studies have shown the association of older age with increased problem in sleeping. A substantive literature base exists to describe and evaluate the diversity of variables associated with poor sleep in geriatric population. However, the previous studies have not investigated the relationship between depression and physical activities and sleep quality among community-dwelling geriatric population. In this context, the present study was planned to determine the prevalence of poor sleep quality among elderly population and to explore its association with demographic, physical activity pattern, and psychosocial variables.

**Materials and Methods**

A Community-based cross-sectional study was conducted from June-November, 2018 in Bhatar block, randomly chosen from a total 23 community development blocks of Purba Bardhaman district, West Bengal. It contains 14 Gram Panchayats and 107 villages. All elderly people (aged ≥60 years) who reside in the households of the study area at least for 6 months prior to actual conduction of the study were included. Those who were not found even after two visits, not willing to participate in the study, unable to respond to the questions, and were seriously ill were excluded.

In spite of extensive PubMed search, no published literature was available regarding the prevalence of poor sleep quality in Purba Bardhaman district or any other district of West Bengal. However, a study in the rural coastal area of Kerala, India by George et al.[7] revealed poor sleep quality among 72.4% of the respondents.

Accordingly, considering 72.4% prevalence (P = 0.724), 95% confidence interval, absolute error of 10% (L = 0.1), design effect (f = 2), and 5% drop outs, using the formula \( \frac{Z^2(p)(1-p)f(1.05)}{L^2} \), the minimum effective sample size was 162. Using 30 cluster technique for Cluster Random Sampling, cluster size was \( \frac{162}{30} = 5.4 \approx 6 \). Thus, final sample size was 180.

The required number of study subjects were selected by cluster random sampling technique. Village was considered as cluster. Applying the principles of population proportion to size and methodologies of cluster sampling, 30 clusters were identified for the study.

In the second stage, six elderly people were selected from each of these selected 30 clusters. At first, the location of center of each village was identified. Then, from this center point, any one of the lanes was selected randomly in any direction. All the households in this direction were visited and all the elderly individuals fulfilling the eligibility criteria were included till the desired six subjects were found.

Study tools used were a pretested questionnaire for sociodemographic and other descriptive variables related to sleep, Pittsburgh Sleep Quality Index (PSQI), 5-Item Geriatric Depression Scale (GDS), Generalized Anxiety Disorder 7-item (GAD-7) scale, and Global Physical Activity Questionnaire (GPAQ). PSQI is an effective instrument to measure the quality and patterns of sleep in older adults,[8] differentiating “poor” from “good” sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction over the last month. Answer scoring is based on a 0 to 3 scale. 3 reflects the extreme negative on the Likert scale. A global sum of “5” or greater can be stamped as a “poor” sleeper.

5-Item GDS is used as a screening tool for identifying depression in older adults.[9] It consists of five items and two or more answers in bold are suggestive of depression.

There are seven questions in the GAD-7 item scale with a scoring of 0–3 for each question which deals with problems by which the respondents might have been bothered over the last 2 weeks.[10] The total score is calculated and cut-off values are <5 denotes no anxiety, 5–9 mild, 10–14 moderate, and ≥15 denotes severe anxiety.

WHO developed GPAQ for physical activity surveillance.[11] It covers several components of physical activity such as intensity, duration, and frequency. It assesses three domains in which physical activity is performed: occupational physical activity, transport-related physical activity, and physical activity during leisure time. MET is the ratio of a person’s working metabolic rate relative to the resting metabolic rate. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour. 4 METs get assigned to the time spent in moderate activities, and 8 METs to the time spent in vigorous activities. In the present study, physical activity was categorized into three categories:

- **High**: vigorous-intensity activity on ≥3 days, achieving ≥1500 MET min/week; or ≥7 days of any combination of walking, moderate or vigorous intensity activities, achieving ≥3000 MET min/week
- **Moderate**: not meeting the criteria for “high” activity, but meeting any of: ≥3 days of vigorous-intensity activity of ≥20 min/day; ≥5 days of moderate-intensity activity or walking of ≥30 min/day; or ≥5 days of any combination of walking, moderate or vigorous intensity activities achieving ≥600 MET min/week
- **Low**: Not meeting criteria for high or moderate activity.

Study participants were interviewed with the help of above-mentioned questionnaires. Any medical record, if available,
were also reviewed. Participants were briefed about the purpose and nature of the study before data collection. Consent was obtained before data collection. Confidentiality was duly considered. The study was approved by Institutional Ethics Committee of Burdwan Medical College in the meeting held on 27/07/2018.

Chi-square test and multivariable binary logistic regression were performed using Statistical Package for Social Sciences (SPSS) 16.0 version software. (SPSS, Inc, Chicago, IL, USA).

Results

Sociodemographic profile and different descriptive variables related to sleep quality:

A total of 180 elderly people was studied. Among them, the majority were males (60.6%). The majority belonged to Hinduism (60%), 102 (56.6%), 14 (7.8%), 5 (2.8%), and 59 (32.8%) study subjects belonged to General, SC, ST, and OBC caste category, respectively. 33 (18.3%) were illiterate and 77 (42.7%) were educated up to primary. 48 (26.6%) belonged to occupational category “at home.” 21 (11.7%) were farmer and 37 (20.5%) were agricultural laborer. 27 (15.0%), 31 (17.2%), 44 (24.5%), 31 (17.2%), and 47 (26.1%) study subjects belonged to upper, upper-middle, middle, lower-middle, and lower socioeconomic status families, respectively, as per Modified BG Prasad Scale [CPI (IW): 301 (September 2018)]. 94 (52.2%) study subjects belonged to nuclear families. 58 (32.2%) study subjects had self-reported MSK disorders in past one month. 53 (29.4%), 20 (11.1%), and 107 (59.5%) study subjects were involved in high, moderate, and low physical activity, respectively. 101 (56.1%), 39 (21.7%), 18 (10.0%), and 22 (12.2%) had no anxiety, mild, moderate, and severe anxiety, respectively. 95 (52.8%) had symptoms suggestive of depression.

Assessment of sleep quality of the study participants on the basis of PSQI scoring:

Distribution of subjects according to PSQI has been described in Table 1. Subjective sleep quality (C1) was reported to be fairly good for 46.6%, while 18.9% rated as very good. During past one month, 47.2% of the study subjects experienced sleep disturbances less than once a week, 21.7% used sleep medication once or twice a week, and 23 (12.8%) study subjects experienced daytime dysfunction as a very big problem. The global PSQI was 5 or more (poor sleep quality) for 68.9% of the respondents. The global PSQI (GPSQI) scores of the study participants were not distributed normally as evident from the significant result of Kolmogorov‑Smirnov test. The median (IQR) GPSQI score of the study participants was 7.00 (4.00–11.00).

Significant difference [H (4) = 37.768, P < 0.01] was found for total GPSQI scores across different age groups. Median ± IQR of total GPSQI scores in different age groups is shown in Figure 1.

Association of sleep quality with different factors:

Sleep quality was significantly associated with age group, religion, caste, marital status, occupation, type of family, tobacco consumption in preceding months, vital events in past one-month in the family, self-reported MSK disorders, anxiety status, depression, and physical activity as evident from significant results of Chi-square test [Table 2]. But, it was not significantly associated with sex ($\chi^2 = 0.396, Df = 1, P = 0.529$), educational status ($\chi^2 = 3.625, Df = 6, P = 0.727$), socioeconomic status ($\chi^2 = 5.199, Df = 4, P = 0.268$), and alcohol consumption in preceding month ($\chi^2 = 2.400, Df = 1$, Fisher’s Exact $P = 0.152$).

Those variables which were found to be significantly associated with poor sleep quality in Chi-square test were put into analysis in the final multivariable logistic regression model [Table 3]. The model was significant as evident from the omnibus Chi-square statistics.
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\( \chi^2 = 112.205, P < 0.05 \). This model was a good fit as evident from nonsignificant Hosmer–Lemeshow statistics \( (P = 0.988) \). All independent variables could explain between 46.4% and 65.3% variance of dependent variable using Cox and Snell and Nagelkerke R\(^2\). Overall, our model correctly predicted 87.8% of outcomes, as shown by the classification table. Marital status, anxiety status, depression, and vital events in past one month were found to be significantly associated with poor sleep quality in logistic regression. Those who were unmarried/widowed had vital events in past one month, and severe anxiety and depression were having significantly higher odds of developing poor sleep quality [Table 3].

**Discussion**

Prevalence of poor sleep quality was found to be high among the study participants (68.9%). In this study, the mean GPSQI was

| Table 2: Association between sleep quality and different variables \( n=180 \) |
|---------------------------------|-----------------|---------------|-----------------|
| Total number | Sleep quality | \( \chi^2 \), Df and \( P \) |
| Age (in years) | Good (%) | Poor (%) |
| 60-64 | 58 | 35 (60.3) | 23 (39.7) |
| \( \geq 65 \) | 122 | 21 (17.2) | 101 (82.8) |
| | | | | \( \chi^2 = 34.123, \text{ Df}=1 \) | \( P<0.05^* \) |
| Sex | | | |
| Male | 109 | 32 (29.4) | 77 (70.6) |
| Female | 71 | 24 (33.8) | 47 (66.2) |
| | | | | \( \chi^2 = 0.396, \text{ Df}=1 \) | \( P=0.529 \) |
| Religion | | | |
| Hindu | 108 | 42 (38.9) | 66 (61.1) |
| Muslim | 72 | 14 (19.4) | 58 (80.6) |
| | | | | \( \chi^2 = 7.621, \text{ Df}=1 \) | \( P=0.006^* \) |
| Caste | | | |
| General | 102 | 40 (39.2) | 62 (60.8) |
| SC/ST/OBC | 78 | 16 (20.5) | 62 (79.5) |
| | | | | \( \chi^2 = 7.214, \text{ Df}=1 \) | \( P=0.007^* \) |
| Type of family | | | |
| Nuclear | 94 | 40 (42.6) | 54 (57.4) |
| Joint | 86 | 16 (18.6) | 70 (81.4) |
| | | | | \( \chi^2 = 12.018, \text{ Df}=1 \) | \( P<0.05^* \) |
| Marital status | | | |
| Married | 70 | 38 (54.3) | 32 (45.7) |
| Unmarried/widowed | 110 | 18 (16.4) | 92 (83.6) |
| | | | | \( \chi^2 = 28.704, \text{ Df}=1 \) | \( P<0.05^* \) |
| Occupational status | | | |
| Farmer/agricultural laborer | 58 | 32 (55.2) | 26 (44.8) |
| At home/home-maker/unemployed/business/others | 122 | 24 (19.7) | 98 (80.3) |
| | | | | \( \chi^2 = 23.116, \text{ Df}=1 \) | \( P<0.05^* \) |
| Tobacco consumption in preceding month | | | |
| Yes | 110 | 24 (21.8) | 86 (78.2) |
| No | 70 | 32 (45.7) | 38 (54.3) |
| | | | | \( \chi^2 = 11.397, \text{ Df}=1 \) | \( P=0.001^* \) |
| Vital events in past one month | | | |
| Yes | 50 | 4 (8.0) | 46 (92.0) |
| No | 130 | 52 (40.0) | 78 (60.0) |
| | | | | \( \chi^2 = 17.253, \text{ Df}=1 \) | \( P<0.05^* \) |
| Self-reported MSK disorders | | | |
| Yes | 58 | 8 (13.8) | 50 (86.2) |
| No | 122 | 48 (39.3) | 74 (60.7) |
| | | | | \( \chi^2 = 11.975, \text{ Df}=1 \) | \( P=0.001^* \) |
| Physical activity | | | |
| High | 53 | 32 (60.4) | 21 (39.6) |
| Moderate/low | 127 | 24 (18.9) | 103 (81.1) |
| | | | | \( \chi^2 = 30.020, \text{ Df}=1 \) | \( P<0.05^* \) |
| Anxiety status | | | |
| No/mild anxiety | 140 | 53 (37.9) | 87 (62.1) |
| Moderate to severe anxiety | 40 | 3 (7.5) | 37 (92.5) |
| | | | | \( \chi^2 = 13.377, \text{ Df}=1 \) | \( P<0.05^* \) |
| Depression | | | |
| No depression | 85 | 36 (42.4) | 49 (57.6) |
| Symptoms suggestive of depression | 95 | 20 (21.1) | 75 (78.9) |
| | | | | \( \chi^2 = 9.497, \text{ Df}=1 \) | \( P=0.002^* \) |
found to be 8.59 ± 5.35. A study in Kerala[7] revealed prevalence of poor sleep quality among the elderly was 72.4% and mean GPSQI score was 8.04 ± 4.59. A study done by Daglar et al[12] in Turkey revealed a PSQI of 7.28 ± 3.97. A study done by Wu et al[13] in Taipei reported a PSQI of 6.3 ± 4.40 and 49% of the study participants had poor sleep quality. A study on sleep quality and associated factors among elderly living in rural Chiang Rai, Northern Thailand by Thichumpa et al.[14] reported poor sleep quality among elderly 44%. Mean ± SD T-PSQI global score was 5.68 ± 2.47. The difference in the GPSQI may be due to the different cultures and lifestyles of people in different countries.

An institution-based study by Farazdaq et al[15] revealed that the factors which showed an increased risk of insomnia among the elderly included: increasing age, being divorced/widowed, consuming caffeine and smoking cigarettes 2 h before bedtime, and having co-morbidities such as GERD and depression. In our study, bivariate analysis revealed that poor sleep quality was significantly associated with age group, religion, caste, marital status, occupation, type of family, tobacco consumption in preceding month, vital events in past one-month, self-reported MSK disorders, anxiety status, depression, and physical activity. Though, in the final multivariable logistic regression model, after adjusting with all these variables, marital status, vital events in past one month in the family, anxiety status, and depression were found to be significantly associated with poor sleep quality. In the Taipei study,[13] higher level of physical activity was associated with better sleep quality when independently considering physical influence on sleep; however, it was confounded by depression, which was significantly associated with poor sleep quality after adjusting for age, sex, education, marital status, and chronic illnesses. A study done in Malaysia showed that sleep quality

| Predictors of poor sleep quality | OR (95% CI) | AOR (95% CI) |
|---------------------------------|------------|-------------|
| **Age (years)**                 |            |             |
| 60-64                           | 1          | 1           |
| ≥65                             | 7.319 (3.614-14.820) * | 2.299 (0.136-38.826) |
| **Sex**                         |            |             |
| Female                          | 1          | 1           |
| Male                            | 1.229 (0.647-2.334)  | 1.447 (0.459-4.559) |
| **Religion**                    |            |             |
| Hindu                           | 1          | 1           |
| Muslim                          | 2.636 (1.309-5.310) * | 2.547 (0.642-10.102) |
| **Type of family**              |            |             |
| Nuclear                         | 1          | 1           |
| Joint                           | 3.241 (1.642-6.396) * | 1.327 (0.289-6.093) |
| **Caste**                       |            |             |
| General                         | 1          | 1           |
| SC/ST/OBC                       | 2.500 (1.269-4.926) * | 1.257 (0.348-4.542) |
| **Marital status**              |            |             |
| Married                         | 1          | 1           |
| Unmarried/widowed               | 6.069 (3.044-12.103) * | 6.007 (2.183-16.532) * |
| **Occupational status**         |            |             |
| Farmer/agricultural labourer    | 1          | 1           |
| At home/home-maker/unemployed/business/others | 5.026 (2.537-9.954)* | 1.856 (0.367-9.381) |
| **Vital events in past one month** |            |             |
| No                              | 1          | 1           |
| Yes                             | 7.667 (2.603-22.582) * | 10.936 (2.153-55.542) * |
| **Self-reported MSK disorders** |            |             |
| No                              | 1          | 1           |
| Yes                             | 4.054 (1.768-9.298) * | 2.905 (0.867-9.737) |
| **Tobacco consumption in past month** |        |             |
| No                              | 1          | 1           |
| Yes                             | 3.018 (1.571-5.795) * | 2.401 (0.816-7.060) |
| **Depression**                  |            |             |
| No                              | 1          | 1           |
| Yes                             | 2.755 (1.432-5.301) * | 4.007 (1.362-11.789) * |
| **Anxiety status**              |            |             |
| No anxiety                      | 1          | 1           |
| Mild anxiety                    | 3.823 (1.544-9.468) * | 3.108 (0.854-11.313) |
| Moderate anxiety                | 6.691 (1.462-30.630) * | 4.134 (0.644-26.525) |
| Severe anxiety                  | 17.564 (2.275-135.610)* | 34.645 (2.761-434.715)* |
| **Physical activity**           |            |             |
| High                            | 1          | 1           |
| Moderate or low                 | 6.540 (3.224-13.266) * | 1.883 (0.106-33.488) |
was associated with age.[14] A study done by Gouthaman and Devi in urban population of Tamil Nadu,[15] India reported that there was significant association between sleep quality and sex, dependency in doing daily activities, health problems, and marital status. However, it was also shown that sleep quality was not significantly related to age, employment status, literacy status, and physical activity. A study done by Cybulski et al.[18] in Białystok, Poland reported that there were no significant associations with sex, age, marital status, and level of education and sleep disorders.

A significant positive association was found in our study between poor sleep quality and depression and anxiety status. Similar results were obtained from a study by George et al.[7] In the Taipei study,[13] depression was the only factor when considering related factors to be associated with sleep quality, making mental health assessment an important strategy in alleviating sleep problems. Notably, 21.7% of patients reporting psychoactive medication use once or twice a week for sleep in the past month was consistent with other studies.[19,20]

This study had some limitations. Self-report of health variables such as sleeping problem and duration, depression symptoms, and tobacco or alcohol use should be interpreted with caution, as well as there may be recall and information bias. Finally, the data were collected in a cross-sectional survey. Therefore, we cannot ascribe causality to any of the associated factors. There is an urgent need to conduct longitudinal studies to investigate the determinants of poor sleep quality.

Conclusion

Poor sleep quality is high among elderly and measures toward the significant correlates are thus emphasized. The early detection of poor sleep quality in primary care settings not only helps the elders to prevent the adverse health outcomes in advance but also gives our society a group of healthy elders who will contribute to the advancement of the nation.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the participants have given their consent for their images and other clinical information to be reported in the journal. The participants understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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