DOI: https://doi.org/10.47391/JPMA.296

# Poor sleep quality: a wake up call for the elderly at a tertiary care centre in Islamabad, Pakistan

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## Abstract

**Objectives:** To assess the burden of sleep disorders in the elderly, and the effects of various co-morbidities linked with sleep disorders.

**Method:** The longitudinal cross-sectional study was conducted in different outpatient departments at a tertiary care centre in Islamabad, Pakistan, from June 2014 to June 2015, and comprised patients of either gender aged 60 years or above. Pittsburgh sleep quality index and Epworth sleepiness scale were used to measure the quality and patterns of sleep and daytime sleepiness in the elderly. Data was analysed using SPSS 21.

**Results:** Of the 1000 subjects, 638(63.8%) were males, and 362(36.2%) were females. The overall mean age was 66.96±7.05 years. Epworth sleepiness scale >10 was found in 265(26.5%) subjects, while Pittsburgh sleep quality index score in

516(51.6%) was >5. Sleep quality score in 578(57.8%) women was statistically significant compared to 478(47.8%) males ($p<0.05$).

**Conclusions:** There was a significant burden of sleep-related disorders in the subjects.

**Key Words:** Sleep disorders, ESS, PSQI, Pakistan, Elderly.

## Introduction

Sleep disturbance is a common complaint among patients of all ages, but research suggests that older adults are particularly vulnerable.[1] Nearly half of older adults' report difficulty initiating and maintaining sleep. Sleep disorders are conditions that result in alteration in sleep which can affect one's quality of life, for example obstructive sleep apnoea, narcolepsy, rapid eye movement (REM) behavioural disorders etc. They are among the most common non-motor symptoms, with a prevalence of 60-90%.[2] There are several changes that occur with age that can place one at risk for sleep disturbances, including increased prevalence of medical conditions, increased medication use, age-related changes in various circadian rhythms, and environmental and lifestyle changes, and all of these have significant impact on sleep quality.[1]

Studies have shown lower glucose tolerance, elevated blood pressure (BP) and increased incidence of stroke and psychiatric illness in individuals suffering from sleep disorders compared to those receiving good-quality sleep.[3-6]

Studies conducted among Pakistani population have assessed the prevalence of insomnia and use of sleep medicine, frequency of snoring and emergence of symptoms of sleep apnoea, but these may be insufficient to deliver a valid assessment of sleep quality.[7,8] To the best of our knowledge, there has not been no study about sleep disorders in the elderly in our country. The current study was planned to assess the burden of sleep disorders in the elderly and the effects of various co-morbidities linked with them.

## Subjects and Methods

The longitudinal cross-sectional study was conducted in different outpatient departments (OPDs) at a tertiary care centre in Islamabad, Pakistan, from June 2014 to June 2015. Permission was obtained from the institutional ethics review board.

The sample was raised using non-probability convenience sampling. with the target being to get a minimum 100 subjects to detect the minimum effect size of 20% in Epworth sleepiness scale (ESS) (10/24), and minimum effect size of 384 for Pittsburgh sleep quality index (PSQI) (5/21)[10,11]. Additional subjects were enrolled to increase the accuracy of the findings.

Those included were individuals of either gender aged 60 years or above. Seriously ill mute, aphasic, comatose, mentally impaired individuals and those who were not sure about their age were excluded.

All potential subjects were interviewed about their respective co-morbidities. Demographic information, like age, ethnicity, education, occupation, socioeconomic status (SES), were noted, and so was clinical history of chronic diseases and neurological disorders, as well as medication history.

The main questionnaire consisted of the standard ESS and PQSI scales[10,11] which were administered by the investigators in the local language through one-on-one interviews after taking informed consent. The investigators were trained medical doctors who were briefed about the use of the two scales by a practising neurologist.

In predominantly middle-aged adults with and without poor sleep, PSQI has good internal consistency, test-retest reliability, and diagnostic validity.[9]

PSQI and ESS have been demonstrated as stable measures over time in early middle-aged adults, and have been recently validated in older men.[10, 11]

Data was analysed using SPSS 21. Data rows were analysed for outliers, missing data and data entry errors. Cases with missing data points were

excluded from the final analysis. Errors like mistypes were corrected from the original data sheets. Outliers were kept in the final model as their omission from the analysis did not affect the results much.

Descriptive analysis was used for all variables. PSQI and ESS scores were compared for age, educational level, co-morbidities and smoking. Independent sample t-test was used to find statistically significant mean differences among different demographic variables, co-morbidities and smoking. $P<0.05$ was considered statistically significant.

**Results**

Of the 1000 subjects, 638(63.8%) were males, and 362(36.2%) were females. The overall mean age was 66.96±7.05 years; mean ESS was 8±4; and mean PQSI score was 6±3 (Table 1). Hypertension (HTN) was the most common co-morbidity found in 439(43.9%) subjects (Table 2). ESS >10 was found in 265(26.5%) subjects, while PQSI score in 516(51.6%) was >5 (Figure). PQSI showed a female preponderance 209(57.7%) compared to 305(47.8%) males ($p<0.007$). Daytime sleepiness scores on ESS had no significant association with gender ($p>0.05$). A positive and significant relationship for PSQI score was found with quality and patterns of sleep and coronary artery disease (CAD) ($p=0.037$), and renal disease ($p<0.002$). A paradoxical relationship was observed for ESS 7.33 for non-asthmatics compared to 7.59 for asthmatics ($p=0.031$).

Logistic regression analysis of the same data-set was showed predictor variables, like age, gender, years in education, presence of co-morbidities like diabetes mellitus (DM), HTN, dyslipidemia, CAD, asthma etc. The predictors were analysed against the total scores obtained for each individual on ESS and PSQI. The first model used a PSQI score >5 to generate a dummy variable against the reference of zero for those who had a score of 5 or less. This was

done because PSQI score >5 depicts the presence of sleep disorders. This binary variable was used as a response variable against the predictors to generate a logistic regression model. The results thus obtained showed omnibus tests of model coefficients with a significance value of 0.01. The Nagelkerke R Square was 0.170, thus, the model was able to explain only 17% of the variation seen in PSQI scores. As for the individual variables, only the presence of renal disease was significant for a high PSQI score (p=0.04). Odds of having sleep disorder were 3.8 to 1 if PSQI score was >5 in a given patient, when adjusted for other covariates. Other interesting associations which were statistically non-significant ( included non-smokers having 0.49 to 1 odds of developing sleep disorders and 4 to 1 odds of a sleep disorder in patients with dementia. Patients with Chronic obstructive pulmonary disease (COPD) had 0.43 to 1 odds of having a higher PSQI score (p=0.72) (Table 3).

The second model was generated for ESS score >10 as the response variable using the same set of predictor variables. The model had level of significance 0.057 and the Nagelkerke R Square was 0.139, thus, the model was able to explain only 13.9% of the variation in ESS score being >10. Patients with COPD had 0.93 to 1 odds of having sleep disorder (p=0.026). Age was associated with greater sleep problems, but the findings were statistically non-significant (p=0.052) (Table 4).

## Discussion

Sleep quality, as also suggested by the current study, reflects significant deterioration if coupled with other co-morbid conditions.

Our possible explanation for female preponderance in this age group is physiological and psychological changes which are coupled with menopause. A study conducted to explore this specific association found peri-menopausal and post-menopausal women as having frequent sleep disorders.[12] The physiological

mechanisms for these observations need more exploration to ascertain factors which may play a pivotal role in future sleep research.[13]

Psychiatric disorders, like major depression, panic disorder and generalised anxiety disorder, are strongly linked with sleep problems.[14] These results are consistent with the findings of the current study.

Obesity is associated with increase in the neck circumference, and fat deposition narrows the upper airway which is responsible for higher incidence of airway collapsibility in obese compared to normal-weight individuals.[15] Fortunately, weight reduction has been proven to be effective in the reduction of sleep apnoea severity; 10-15% of body weight reduction decreases sleep apnoea up to 50%.[16] This compliments our findings of increased mean scores on ESS in obese population.

The relationship between dementia and sleep disorders linked with aging is thought-provoking. Alteration in circadian rhythm is the cause sleep disturbances in the elderly suffering from dementia. Melatonin therapies have proven to be beneficial in the treatment of both dementia and sleep disorders.[17] Higher ESS mean scores were observed in the current study in subjects with dementia.

The prevalence of sleep disorders was higher in CAD patients, indicating poor sleep quality in such subjects, as suggested by various studies.[18] An interesting observation of frequent sleep disorders among the elderly with Ischemic heart disease (IHD) and CAD further augmented the result of a trial which found sleep disorders to be a risk factor for coronary artery calcification, especially when coupled with obstructive sleep apnoea (OSA).[18] Sleep studies and polysomnography are the cornerstones for identifying OSA to offer continuous positive airway pressure (CPAP) for minimising potentially reversible cardiac events.

A study conducted in Florida indicated that majority of the patients who had moderate to severe chronic kidney disease (CKD) had sleep disturbances[19],

which correlates with the current findings of poor sleep in subjects with chronic renal disease.[19] More advanced studies[20] in patients with CKD and end-stage renal disease (ESRD) have found sleep disorder to be directly linked to deterioration in renal function measured by glomerular filtration rate (GFR). Patients prone to these adverse renal outcomes may benefit from improvement in their sleep quality. Physiological mechanisms which have been linked to the effect of CKD on sleep quality has been due to sympatho-vagal imbalance, resulting in sympathetic hyperactivity and decreased vagal tone.[21] Another hypothesis suggests disturbances in plasma renin activity and aldosterone peaks to be the reason of sleep disorders in CKD.[22] Interestingly, CKD patients have problems in stages III and IV of sleep which is responsible for nocturnal dip in BP disturbances, further disrupting normal sleep with CKD progression.[23] Mean scores for those with renal disease on PSQI were found to be higher in the current study.

Majority of the participants with arthritis reported a poor-quality sleep on PSQI with a statistically significant correlation. This is consistent with a study conducted in T according to which, 64.1% subjects with rheumatoid arthritis scored >5 on PSQI.[17]

The quality of life of participants, as indicated by ESS, had a paradoxical relationship with asthma, which suggests that asthmatics had better quality of life, which is in variance with a recent study.[13] The possible explanation for this significant inference can be the use of anti-asthmatics in this subgroup of subjects which may have confounded the findings.

The observation that the smokers and ex-smokers had a better PQSI score and a significantly good sleep quality is a paradoxical finding. The effects of smoking on quality of sleep have been the object of conflicting reports. At variance with an earlier epidemiologic study[24], more recent studies showed that smoking was associated with lesser sleep problems.[13,25] The current study also found a

seemingly protective effect of smoking habit against sleep complaints. This finding should be interpreted in the light of the high prevalence of patients with co-morbidities, including respiratory and cardiovascular problems in the study population. It means that in such a population, the persistence of smoking habit is an indicator of lesser susceptibility to the hazardous effect of tobacco, so that this sub-sample of smokers likely included a selection of survivors with better-preserved health.

All the chronic illnesses cited above not only compromise the physical health of an individual, affecting their quality of life, but also have an impact on the mental health, leading to depression and other psychiatric illnesses. The relationship of depression with sleep disturbances might be responsible for affecting the quality of sleep in the elderly with co-morbidities. Further studies are needed to find out which of these factors exactly affect the sleep of the elderly with chronic illnesses.

In terms of limitations, the current study was a screening survey comprising the elderly who were already attending medical clinics, and, as such, generalisation of data may not be a true depiction of what the burden of sleep disorders may actually be in the generally healthy elderly population. Besides, medical conditions included were extracted from past medical histories and chart reviews without using any particular diagnostic criterion to establish the presence of these co-morbidities.

**Conclusions**

Strong associations were observed for CAD, arthritis, renal disease on PSQI, while ESS showed significant conditions to be dementia, psychiatric illnesses and obesity. PSQI score >5 was associated with patients with renal disease, dementia and smokers.

**Disclaimer:** The ethics approval from the institutional review board was taken on June 7, 2016, which amounts to post-research approval.

**Conflict of Interest:** None.

**Source of Funding:** None.

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**Table 1: Demographic characteristics of the population – continuous variables**

| Variables | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Mean | SD[1] | Mean | SD | Mean | SD |
| Age | 67 | 7 | 67 | 7 | 67 | 7 |
| ESS | 7 | 4 | 8 | 4 | 8 | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| GPSQ Index | 6 | 3 | 7 | 4 | 6 | 3 |

SD: Standard deviation
ES: Epworth scale score
GPSQI: Global Pittsburgh Sleep Quality Index

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**Table 2: Demographic characteristics of the population – categorical variables**

| | | Male | | Female | | Total | |
|---|---|---|---|---|---|---|---|
| **Variables** | | **Count** | **%age** | **Count** | **%age** | **Count** | **%age** |
| Obesity | Yes | 68 | **10.7** | 78 | 21.7 | 146 | **14.6** |
| | No | 569 | **89.3** | 282 | 78.3 | 851 | **85.4** |
| Diabetes | Yes | 207 | **32.4** | 157 | 43.5 | 364 | **36.4** |
| | No | 431 | **67.6** | 204 | 56.5 | 635 | **63.6** |
| Hypertension | Yes | 262 | **41.1** | 177 | 49.0 | 439 | **44.0** |
| | No | 375 | **58.9** | 184 | 51.0 | 559 | **56.0** |
| Dyslipidemia | Yes | 88 | **13.8** | 72 | 19.9 | 160 | **16.0** |
| | No | 548 | **86.2** | 290 | 80.1 | 838 | **84.0** |
| CAD[1] | Yes | 108 | **17.0** | 49 | 13.7 | 157 | **15.8** |
| | No | 528 | **83.0** | 309 | 86.3 | 837 | **84.2** |

[1] Coronary Artery Disease

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**Table 3: Coefficients table for model**

| | | | | 95% C.I of β-coefficient | |
|---|---|---|---|---|---|
| **Variables** | **β-coefficient** | **P** | **EXP(β)** | **95% C.I Lower** | **95% C.I Upper** |
| Renal disease | 1.361 | 0.04 | 3.9 | 1.062 | 14.317 |
| COPD | -0.831 | 0.072 | 0.44 | 0.176 | 1.077 |
| Dementia | 1.398 | 0.099 | 4.05 | 0.769 | 21.319 |
| Sex | -0.43 | 0.145 | 0.65 | 0.365 | 1.16 |
| Obesity | 0.517 | 0.152 | 1.68 | 0.827 | 3.4 |
| CAD | 0.484 | 0.203 | 1.62 | 0.77 | 3.418 |
| Dyslipidemia | 0.512 | 0.206 | 1.67 | 0.755 | 3.688 |
| Smoking | -0.541 | 0.214 | 0.58 | 0.248 | 1.367 |
| Education (years) | -0.019 | 0.266 | 0.98 | 0.948 | 1.015 |
| Age | 0.023 | 0.302 | 1.02 | 0.98 | 1.068 |
| Hypertension | 0.145 | 0.574 | 1.16 | 0.697 | 1.917 |
| Arthritis | -0.155 | 0.601 | 0.86 | 0.479 | 1.53 |
| Stroke | -0.142 | 0.744 | 0.87 | 0.372 | 2.027 |
| Diabetes | -0.068 | 0.802 | 0.93 | 0.548 | 1.591 |
| Constant | 20.783 | 1 | 106 | | |
| **Dependent Variable:** | | | | | |
| 1= PSQI score > 5 | | | | | |
| 0=PSQI score <= 5 | | | | | |

CAD: Coronary Artery Disease; COPD: COPD: **Chronic obstructive pulmonary disease.**; PSQI: Pittsburgh Sleep Quality Index; CI: Confidence interval.

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**Table 4: Coefficients table for model 2.**

| Variables | β-coefficient | P | EXP(β) | 95% C.I of β-coefficient 95% C.I Lower | 95% C.I Upper |
|---|---|---|---|---|---|
| COPD | -2.37 | 0.026 | 0.093 | 0.012 | 0.754 |
| Age | 0.05 | 0.052 | 1.046 | 1 | 1.094 |
| Arthritis | -0.63 | 0.101 | 0.534 | 0.252 | 1.13 |
| CAD | 0.47 | 0.221 | 1.594 | 0.755 | 3.362 |
| Obesity | 0.42 | 0.261 | 1.522 | 0.731 | 3.169 |
| Renal | 0.6 | 0.261 | 1.822 | 0.64 | 5.193 |
| Stroke | -0.53 | 0.336 | 0.589 | 0.201 | 1.73 |
| Sex (male) | -0.29 | 0.386 | 0.748 | 0.388 | 1.442 |
| Education (years) | -0.01 | 0.498 | 0.986 | 0.948 | 1.026 |
| Smoking | -0.28 | 0.558 | 0.754 | 0.293 | 1.94 |
| Diabetes | -0.18 | 0.583 | 0.836 | 0.442 | 1.583 |
| Dyslipidemia | 0.17 | 0.693 | 1.183 | 0.514 | 2.723 |
| Hypertension | 0.09 | 0.777 | 1.089 | 0.604 | 1.964 |
| Dementia | -0.17 | 0.842 | 0.841 | 0.154 | 4.585 |
| Constant | 20.53 | 1 | 0 | | |
| **Dependent variable:** | | | | | |
| 1= ESS score > 10 | | | | | |
| 0=ESS score <= 10 | | | | | |

CAD: Coronary Artery Disease; COPD: COPD: Chronic obstructive pulmonary disease.; ESS: Epworth scale score; CI: Confidence interval.

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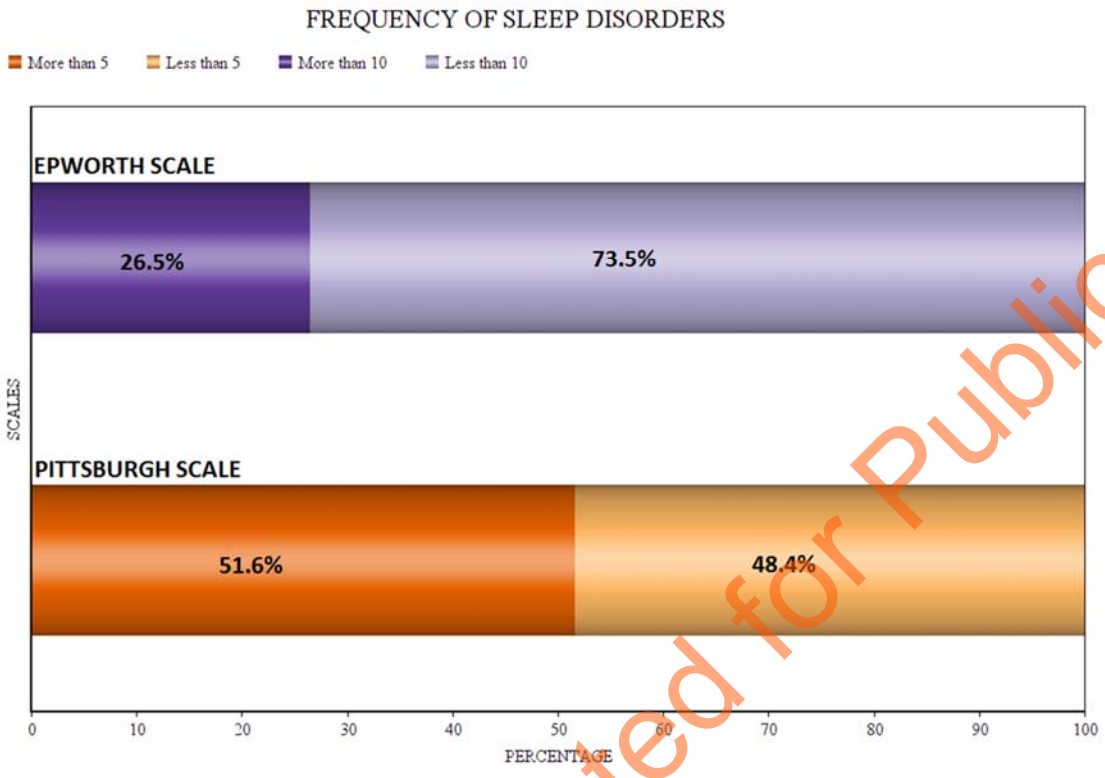
Figure: Frequency of sleep disorders.




327
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