Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jptcp.v30i3.3276

SLEEP QUALITY IN COVID 19 PATIENTS AND ITS ASSOCIATION WITH SEVERITY OF COVID

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Submitted: 12/02/2023, **Accepted:** 28/02/2023, **Published:** 15/03/2023

Abstract

Introduction: Bad sleep quality is associated with deregulated immune response; therefore an individual is prone to develop various viral infections.

Aim: of the study was to assess quality of sleep in COVID 19 patients and its association with severity of disease.

Methods: this was a prospective questionnaire based study. One hundred and twenty three subjects with microbiologically confirmed COVID 19 were administered Pittsburgh Sleep Quality Index (PSQI) questionnaire. Disease severity was assessed with HRCT thorax. Demographic data and co morbidities were noted. Correlation between quality of sleep parameters and disease severity determined.

Results: Analysed data of 123 subjects**.** Mean age was 51.69 ± 13.17 years. Male: Female ratio was 2.1:1. Co-morbidities were found in 41%; among which Diabetes mellitus, Hypertension, combined DM and HTN, CAD, Hypothyroidism and Airway diseases were 39%, 37%, 22%, 23%, 14% and 10% respectively. Out of 118 patients with HRCT, based on CT Severity Index, subjects with mild, moderate and severe disease were 46% (54), 37% (44) and 17% (20) respectively. Based on global PSQI, 51% (62) had bad quality of sleep. Good or bad quality of sleep doesn't have association with age and gender. Bad subjective sleep quality was reported in 21% subjects and it's not related to disease severity grades. Insomnia (Sleep latency of >30 min) reported in 22% of the subjects and it's correlated with severe COVID disease (P value: 0.095; <0.10).

Conclusion: In this study we observed severe COVID is associated with bad quality and reduced sleep duration. Global PSQI can be used as a screening instrument to predict severity of COVID 19.Validation of global PSQI as a screening instrument for development of severe COVID 19 is recommended**.**

Keywords: COVID 19, High-resolution computed tomography (HRCT), Pittsburgh Sleep Quality Index (PSQI) questionnaire, Sleep Hygiene Index (SHI).

INTRODUCTION

Sleep is a physiological process that shows recuperative and regulatory characteristics. Immune system response is regulated by three physiological events such as wakefulness, non-rapid eye movement (NREM) sleep, and rapid eye movement (REM) sleep[1]. Various pathogens constantly attacking living organisms are destroyed or checked by the immune system which is composed of complicated networks of physical and biochemical components. In case of severe and persistent loss of sleep, the immunological response is either dysregulated or suppressed[2]. Thus, poor quality sleep due to any reason makes an individual prone to developing viral infections. So, there is a fair possibility of such individuals developing COVID 19 and landing in a cytokine storm.

Objective

To assess the quality of sleep and sleep hygiene practices in COVID 19 positive patients.

MATERIALS AND METHODS

This was a prospective observational study that included patients with SARS CoV – 2 RT PCR positive, age ≥18 years diagnosed between August 2021- and November 2021 in Department of Pulmonary Medicine, Government Medical College and Superspecialty Hospital, Nagpur, Maharashtra in Central India. Approval from the Institutional ethics committee was obtained.

Clinical details were recorded in a predesigned structured proforma, comprising demographical and socio-economic characteristics, symptomatology, and radiological and biochemical parameters. Sleep quality and sleep hygiene were assessed with two questionnaires, Pittsburgh Sleep Quality Index (PSQI) and Sleep Hygiene Index (SHI) respectively.

Statistical analysis

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS, Version 23.0) and Microsoft Excel 2019. Continuous data were presented as mean ± standard deviation (SD), if normally distributed, and median if data were non-normal. Categorical variables were presented as frequency and percentage. Comparability of groups were analysed by Chi square test, student's t test or Mann-Whitney test as appropriate.

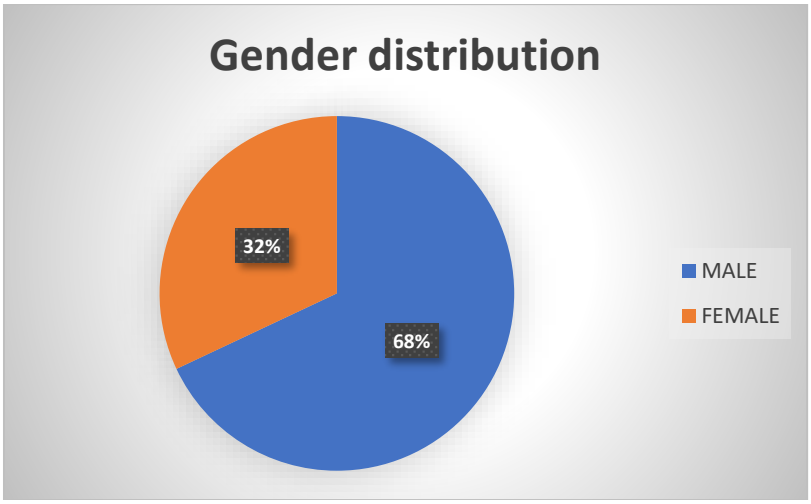

Figure 1: Gender distribution of study subjects

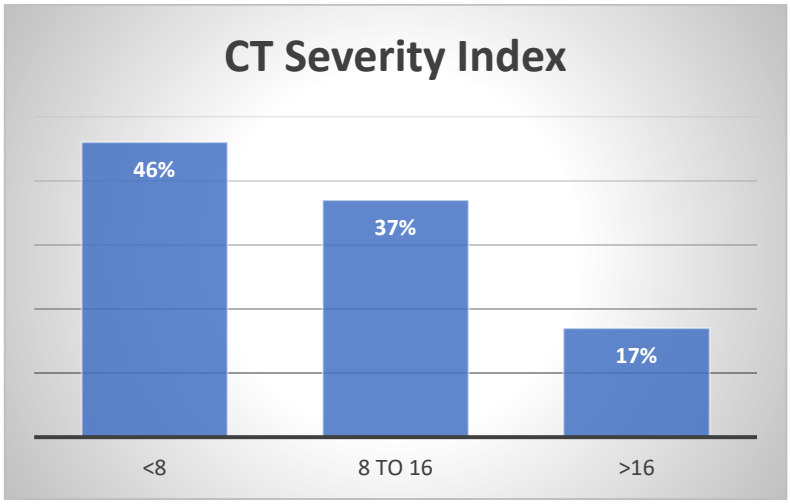

Figure 2: Distribution of subjects according to CTSI.

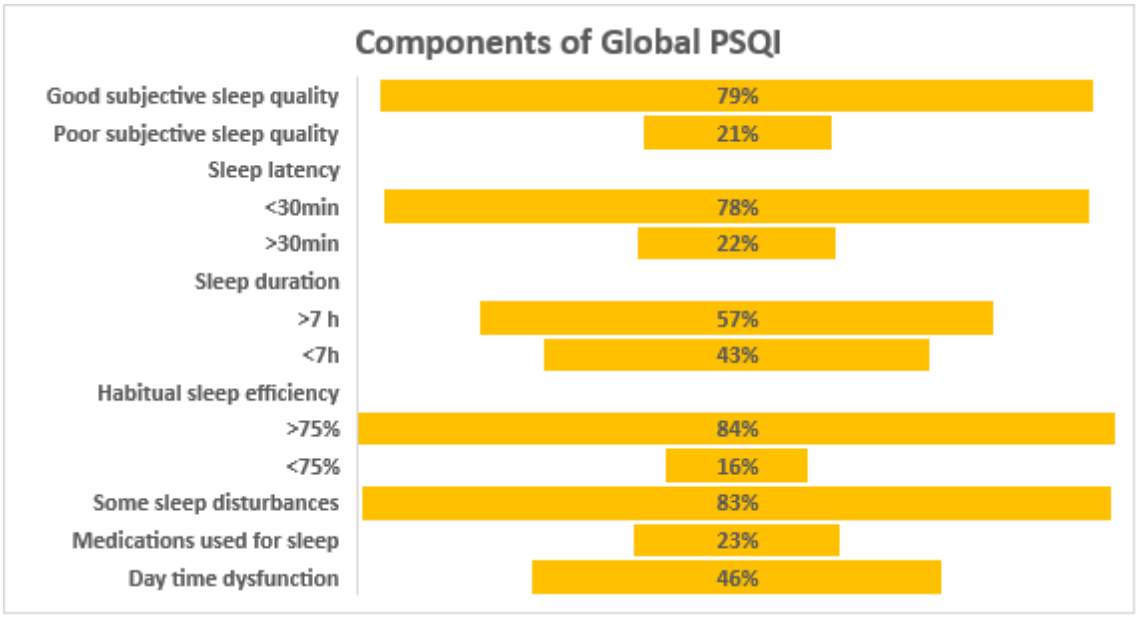

Figure 3: Components of global PSQI

Table 1: Comparison of PSQI parameters with healthy population.

Variable	Current study (n=123)	Panda et.al[8] (n=)
Subjective sleep quality Good Poor	 79% 21%	 97% 3%
Sleep latency <30min >30min	 78% 22%	 85% 15%
Sleep duration >7 h <7h	 57% 43%	 94% 6%
Habitual sleep efficiency >75% <75%	 84% 16%	 99.9% 0.1%
Some sleep disturbances	83%	34.2%
Medications used for sleep	23%	0.5%
Day time dysfunction	45.5%	3.3%

RESULTS

A total of 123 patients with SARS CoV -2 RT PCR positive were included in the study.
The majority of patients were males (68%) with an M: F ratio of 2:1, aged between 19-87 years, with a mean (SD) age of 52±10 years. 56% of patients were in the age group of 40-60years.
The most common symptoms were fever (60.16%), breathlessness (59.3%), cough (54.47%), anosmia (43.90%), and myalgia (40.65%). Comorbidities were present in 41% of patients and the most common co-morbidities were diabetes mellitus (39.21%), Hypertension 37%, Combined DM and hypertension (22%), Coronary artery disease (23.52%), Hypothyroidism (13.72%), Airway diseases (9.80%) and others (5.88%).

HRCT thorax was done for 118 patients, based on CT severity index (CTSI), 46% subjects had CTSI <8(mild disease), 17% subjects with >16(severe disease), and 37% between 8 to16(moderate disease).
Based on global PSQI, 51% (62) had bad quality of sleep. Good or bad quality of sleep doesn't have association with age and gender (p: 0. 72 and 0.22 respectively). Poor subjective sleep quality was reported in 21% subjects and it's not related to disease severity grades. Insomnia (Sleep latency of >30min) reported in 22% of the subjects and it is correlated with severe COVID disease (P value: 0.095; <0.10). Sleep duration of less than 7 hours were noted in 43% of the subjects and not correlated with severity grades. Poor habitual Sleep efficiency noted in 16% of subjects. Sleep disturbances were noted in 83% of subjects and it is not correlated with severity grades. Use of medications for sleep were noted in 23% of subjects. Day time dysfunction noted in 45% of the patients. Among subjects with good quality sleep and bad quality sleep, 10% and 23% were having severe disease respectively. Out of twenty subjects with severe disease 70% had bad sleep quality (global PSQI) and less than 7hours sleep duration.

DISCUSSION

To the best of our knowledge, this was the first study assessing the sleep quality and sleep hygiene practices among COVID 19 patients. We reported the clinical demographic, radiological, and sleep parameters of 123 patients admitted to a tertiary care centre in central India.
The mean age(52 yrs) of subjects in our study is comparable with other studies assessing clinical characteristics of COVID 19 subjects reported by Chen et. al[3] (55.5 yrs), Huang et. al[4] (49 yrs), and Wang et. al[5] (56 yrs); whereas it is higher than the Indian studies by Mohan et. al[6] (40 yrs) and Soni et al[7] (35yrs). Male preponderance was comparable with other studies. Symptomatology was also comparable with global and Indian studies, where the fever was the most common symptom. Comorbidities were present in 41% of patients in the present study, similar to the study by Wang et. al[5](46%).

Comparison of parameters of PSQI with a study by Panda et al[8] shows significantly poor subjective sleep quality, insomnia, <7 hours sleep duration, poor habitual sleep efficiency, disturbed sleep, daytime dysfunction, and medications used for sleep in COVID 19 patients as compared to healthy population. Table1.
Sleep exerts a significant influence on the numbers of leukocytes in the blood. Studies related to number and distribution of leukocytes and leukocytes subset showed that leukocytes exhibit a strong migratory capacity between various tissues and organs, which has a very pronounced circadian component[9].

Ruiz et al[10] showed that the number of total T cells, CD4 T cells, and CD8 T cells in the lymph nodes and spleen were increased after undisturbed sleep than after prolonged sleep restriction. So, during partial or total sleep deprivation leukocytes which are the primary immune cells will not be redistributed to the sites of action, where there were supposed to do immune surveillance. It has been observed that the number of B cells and NK cells were increased in the murine spleen after normal sleep.[11]

Studies regarding the functional activity of NK cells and lymphocyte proliferation suggest that during total sleep deprivation or restriction (both the night of and the morning thereafter), NK-cell activity was reduced in healthy humans suggesting a supportive effect of sleep on this functional immune parameter.[12,13]

Ruiz et al reported that following four days of selective REM sleep deprivation, circulating IgA, but not IgG and IgM, levels were reduced.[14] The complement factors C3 and C5 were increased after acute sleep deprivation in one human study, whereas Reis et al found no change in C3, C4, or the receptors C3aR and C5aR after either acute total sleep deprivation or prolonged REM sleep deprivation.[15] Cell adhesion molecules are essential for cell-to-cell contacts, for example, between circulating immune cells and endothelial cells, which is an essential step in the migration process of leukocytes. E-selectin and ICAM-1 levels were increased following one night without sleep, whereas VCAM-1 level remained unchanged. The increases were interpreted as indicators of enhanced pro-inflammatory processes and endothelial activation. So, it is evident that bad quality of sleep is associated with immune dysregulation. Therefore bad quality sleep may make an individual prone to develop viral infections.

CONCLUSION

In this study, we observed severe COVID is associated with bad quality sleep and reduced sleep duration. Also, sleep quality (global PSQI) in COVID 19 subjects compared to the general Indian population reported in other studies is significantly bad. Global PSQI can be used as a screening instrument to predict the severity of COVID 19. Further studies are recommended to validate the global PSQI as a screening instrument for predicting the development of severe COVID 19**.**

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