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Evaluation of Sleep Disorders in Wartime Chemically Injured Veterans with Sleep-Related Complaints: Self-report vs. Polysomnographic Measures

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ABSTRACT

Background: Sleep disorders are among the most common problems experienced by chemically injured veterans, affecting their quality of life and their general health. Therefore, we aimed to compare Polysomnography indices with data derived from the PSQI in chemically injured veterans in Iran in order to study the relationship between or independence of subjective complaints (self-reports) and objective data.

Methods: In this study, 70 veterans were selected among chemically injured veterans who had referred to our clinic during 2012-2013 using the convenience sampling method. Objective and subjective sleep qualities were measured using the in-laboratory diagnostic Polysomnography method and the Pittsburg Sleep Quality Index (PSQI), respectively. The two measured were then compared.

Results: All the 70 assessed veterans in this study were male with a Mean±S.D age of 50.2±9.97. The Mean±S.D total score for the PSQI was 12.38±4.34. We found no significant relationship between the total PSQI score and age ($r=-0.045$, $P=0.80$), marital status ($r=0.14$, $P=0.437$), and occupational status ($r=0.242$, $P=0.175$). However, a negative significant relationship was found between the total PSQI score and educational status ($r=-0.464$, $P=0.007$). Moreover, we found a significant relationship between sleep quality according to Polysomnography and age ($r=0.254$, $P=0.039$). However, no such relationship was found with respect to marital status ($r=0.2$, $P=0.1$), occupational status ($r=0.02$, $P=0.863$), and educational status ($r=0.047$, $P=0.71$). We found no significant relationship between any of the parameters measured by Polysomnography with the scores obtained in the 7 subscales of the PSQI or its total score.

Conclusion: An individual's dissatisfaction with sleep quality does not necessarily indicate an objective sleep disorder. Objective evaluations alongside reports provided by friends and relatives play a key role in the correct diagnosis of sleep disorders in chemically injured veterans.

KEYWORDS: chemically injured veterans, sleep quality, pittsburg sleep quality index, polysomnography

INTRODUCTION

During the Iran-Iraq war (1983-1988), more than 100 000 Iranians were exposed to sulfur mustard gas. Sulfur mustard is a toxic alkylating gas that can cause serious early or late complications [1]. Currently, there are 3400 known chemically injured veterans in Iran, most of which suffer from various physical and mental disorders which could potentially result in decreased sleep quality [2-4].

Sleep disturbance is the second most common symptom for psychological distress [5]. More than one third of the adult population report complications during sleep [6-10]. Moreover, reduced sleep quality could be an important sign of many medical and sleep disorders. Research shows that people reporting sleep disturbance are possibly more prone to current or prolonged health issues or emotional distress [10,11]. Moreover, sleep deprivation can also contribute to the suppression of the immune system [12], and people with short sleep duration are at a higher risk of morbidity and mortality [13].

Anxiety and stress are among the most important factors related sleep complaints in the general public [8]. On the other hand, sleep quality is a complex phenomenon whose definition and measurement is difficult. Sleep quality varies at different ages and between the sexes [14]. Age is positively related to sleep quality [15].

Other than sleep-related factors that can be quantified easier (such as frequency of waking up during sleep, sleep latency, sleep duration as recorded in Polysomnography) [16], sleep quality consists mainly of subjective sleep indices such as depth of sleep, feelings of having a good night's sleep after waking up, and sleep satisfaction [17]. Therefore, researchers evaluate sleep disturbance at objective and subjective levels. One of the topics that have gained increased attention in the field of sleep research is comparing the relationship and correlation between

objective measurements of sleep quality (Polysomnography and ectography data) and subjective measurements (such as self-report tools) [18,19].

In order to quantify sleep quality, researchers have devised sleep quality inventories that consist of scores related to sleep quantity, time needed to go to sleep, number of awakenings during the night, time needed to go back to sleep again, feeling tired or relaxed upon waking up in the morning, and general sleep satisfaction [20,21]. Inconsistencies between objective and subjective sleep parameters is common among people experiencing sleep disorders and insomnia, so that difference expressions have been devised to differentiate between objective and subjective measures. For example, for indicating the difference between an individual's perception of his/her sleep problems and the information received from objective measurements, the expression “misinterpretation of sleep status 1” is used, an expression that is also currently known as “paradoxical insomnia 2” [19,22]. Some studies have shown good validity of self-report measures of sleep quality using the Pittsburgh Sleep Quality Index (PSQI) compared with Polysomnography data [20,23], but not in all components [24,25]. In support of this issue, Woodward and colleagues (1996) assessed 25 Vietnam combat veterans hospitalized for post-traumatic stress disorder (PTSD) and found a significant correlation between some self-report findings (such as time of going to bed and getting out of bed) and Polysomnography indices, while no relationship was found between the total ratings between the two [26].

Since sleep disorders are among the most common problems experienced by chemically injured veterans [3,4], affecting their quality of life and their general health [27], and considering that the large population of chemically injured veterans in Iran [28], and the fact that these veterans experience more sleep disorders than non-chemically injured veterans [29], it is important to study sleep issues in this group. Therefore, we aimed to compare Polysomnography indices with data derived from the PSQI in chemically injured veterans in Iran in order to study the relationship between or independence of subjective complaints (self-reports) and objective data.

METHODS AND MATERIALS

Participants

This study was a cross-sectional observational study to assess sleep/wakening patterns in chemically injured veterans with sleep complaints using the in-laboratory diagnostic Polysomnography standard all-night method and to investigate their relationship with selected clinical and demographic variables [30]. Seventy Iran-Iraq War Veterans who were selected among chemically injured veterans who had referred to the Clinic during 2012-2013 using the convenience sampling method. The study was approved by the Ethics Committee of Baqiatollah University of Medical Sciences, Tehran, Iran. Written informed consent was obtained from all patients and all evaluations were done under the supervision of the Psychiatry and Clinical Psychology Department of the University.

All the participants, slept at the University's Sleep Clinic for one night to undergo the mentioned method. Data were recorded and then reviewed by a pulmonologist for suitable diagnostic and treatment measures.

We included veterans that were chemically injured, complained of at least one sleep disorder, and did not have a notable history of neurological disorders, alcohol or substance abuse, psychotic psychiatric disorders, or any mental or history of medical complication and treatment for sleep disorders that would interfere with effective collaboration with the researchers.

MEASURES AND PROCEDURE

Demographic and Clinical Data

The demographic and clinical data, medications, and laboratory findings were collected by a registered nurse using medical records obtained by interviewing the patient and the family members, and reviewing hospital records when available. To ensure the reliability and accuracy of assessments, all the assessments was reviewed by the experts in respiratory diseases and psychiatric disorders presented in the study.

The Subjective Measure of Sleep Quality

The subjective measurement of sleep quality was done 24 hours before Polysomnography using the PSQI. The PSQI is a self-report questionnaire that assesses sleep disturbances and quality during the past month [31]. It has 19 items and 7 subscales (subjective sleep quality, sleep latency, sleep disturbances, use of sleep medications, and daytime dysfunction, the habitual sleep efficiency, and the sleep duration) that add up to create a total score, also cut-off point for differentiating “good sleep” from “bad sleep” in many studies was a score of 5 [20]. Moreover, the Persian version of the PSQI has been previously validated yielding a sensitivity and specificity of 89.6 and 86.5, respectively [32].

Objective Measure of Sleep Quality

Objective sleep assessment was done using the in-laboratory diagnostic all-night polysomnography method. Polysomnography evaluation consisted of: total sleep time (TST), sleep adequacy, TST percentage during sleep stages 1, 2, 3, 4, and rapid eye movement (REM), latency at the initial 60 secs of continuous sleep, and latency in the initial REM cycle.

Statistical Analysis

Data were analyzed using SPSS software, version 19. Data were presented as Mean±S.D. Descriptive statistics were used for the patients’ demographic variables. The normality of continuous variables was assessed using one s-Sample Kolmogorov–Smirnov Normality Test. For continuous and categorical variables, independent t and Chi-square tests were respectively used. Pearson and Spearman’s correlation coefficients were calculated. For evaluating the relationship between age and PSQI scores, logistic regression analysis was used. Since most variables did not conform to parametric hypotheses, non-parametric analyses were also used. The significance level was set at 0.05.

RESULTS

All the 70 assessed veterans in this study were male with a Mean±S.D age of 50.2±9.97. The demographic characteristics of the patients are shown in table 1. The Mean±S.D total score for the PSQI was 12.38±4.34 (table 2). We found no significant relationship between the total PSQI score and age ($r=-0.045$, $P=0.80$), marital status ($r=0.14$, $P=0.437$), and occupational status ($r=0.242$, $P=0.175$). However, a negative significant relationship was found between the total PSQI score and educational status ($r=-0.464$, $P=0.007$) which it is showing that sleep quality decreased when educational level increased.

Table 3 shows the evaluated indices measured by Polysomnography. The studied veterans slept for 6.90 hours on average most of their sleep occurred respectively in the second stage of non-REM sleep (48.83%), stage 3 on non-REM sleep (19.41%), stage 4 of non-REM sleep (16.82%), and stage 1 of non-REM sleep (16.22%). Table 3 shows the parameters measured by Polysomnography. The studied veterans slept for 6.90 hours on average. Most of the night's sleep in the participants was respectively in stage 2 non-REM sleep (47.55%), stage 3 non-REM sleep (19.41%), stage 4 non-REM sleep (16.82%), and stage 1 non-REM sleep (16.22%). The amount of sleep latency was in the abnormal range (<30 minutes) and the mean of latency period in REM sleep was 104.36 minutes, suggestive of nocturnal sleep fragmentation. Moreover, we found a significant relationship between sleep quality according to Polysomnography and age ($r=0.254$, $P=0.039$). However, no such relationship was found with respect to marital status ($r=0.2$, $P=0.1$), occupational status ($r=0.02$, $P=0.863$), and educational status ($r=0.047$, $P=0.71$).

Table 4 shows the relationships between objective nocturnal sleep measurements based on Polysomnography with subjective sleep quality scores based on PSQI. We found no significant relationship between any of the parameters measured by Polysomnography with the scores obtained in the 7 subscales of the PSQI or its total score. Therefore, the selected sleep variables measured by Polysomnography could not significantly predict subjective sleep quality.

DISCUSSION

It can be stated that our findings are consistent with previous reports with respect to weak sleep continuation, reduced sleep quality, difficulty in going to sleep and continuing it [3,4,26,31].

Moreover, among the studied demographic variables, age had a significant relationship with objective sleep quality measured by Polysomnography. Previous reports have also shown a positive relationship between increased sleep-related symptoms and age [33,34], as well as difficulty in going to sleep [35]. Inconsistent with other studies [7,36], marital status did not significantly affect sleep quality. Moreover, we found that educational status significantly affected sleeplessness on Polysomnography, consistent with a previous study on the effect of low income and educational status on sleeplessness [36]. Our studied veterans suffered from subjective sleep quality, so that 68 (97.14%) of the 70 chemically injured veterans stated that they did not have a good sleep, considering a cut-off ≤ 5 . Only two (2.86%) veterans had desirable sleep. This finding is consistent with similar studies on chronically ill patients such as those with progressive pulmonary cancer [12,19,37], Such a similarity in findings can be attributed to the similar spectrum of symptoms these groups of patient's experience. On the other hand, we found no

significant relationship between objective sleep measurements by Polysomnography and subjective sleep quality measured by the PSQI. According to Polysomnography most of the veterans (over 80%) had a desirable sleep quality.

To discuss these finding, several points should be kept in mind. Firstly, it seems that the perception of sleep is a complex phenomenon, and is possibly something more complex than cortical stimulus measured by Polysomnography. In fact, the difference between objective and subjective measures has been reported in most studies on chemically injured veterans [4,38].

Secondly, it seems that the inconsistencies between objective and subjective measures is not specifically limited to injured veterans and such inconsistencies are also seen in other studies on chronically ill patients. For example, in one study on patients with traumatic brain injury also experiencing sleeplessness, the patients estimated greater difficulty in sleeping in self-reports compared to objective measurements by Polysomnography [39]. Similar findings were seen in another study on patients with Parkinsonism [40], and those with progressive pulmonary cancer [36,41]. In this regard, when evaluating subjective estimations of sleep quality compared with EEG during in-laboratory sleep, researchers have found that people with sleep deprivation not only overestimate their sleep latency and underestimate their sleep duration, but also underestimate the number of times they awaken from sleep with complete consciousness [2,42,43].

It should also be noted that all mentioned studies have confirmed the existence of sleep disorders, despite their overestimation. One possible interpretation for the findings on sleep duration and latency could be that people with sleep deprivation are genetically susceptible to risk factors and distress that in-laboratory sleep environments reduce. It seems that during self-reports on in-laboratory sleep quality, they estimate the sleep quality on the basis of what they experience at home [13], Considering that most studies on sleep complaints are done using subjective screening tools [44,45]. Moreover, evidence suggests that sleep quality in people with sleep deprivation differs from night to night. Therefore, it is possible that people with sleep complaints that objective data do not confirm are in fact those that subjectively experience a good night's sleep in the laboratory [46,47].

CONCLUSION

Considering that most studies on sleep complaints are done using subjective screening tools, recent research suggests that patients with chronic illness are weak in monitoring their sleeplessness levels at the subjective level. Therefore, their history should be taken on the basis of accounts provided by their friends and relatives.

COMPETING INTERESTS STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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