



The Impact of Sleep Deprivation on Symptoms of Anxiety, Depression, Stress, and Quality of Life in Medical Staff

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Abstract

Background: The study aims to examine the impact of sleep deprivation on medical staff, who work night-shifts and / or 24 hours on the symptoms of anxiety, depression, stress and quality of life. **Methods:** This is a quantitative, cross-sectional study. The research instruments used are the DASS-42 questionnaire for measuring the level of symptoms of anxiety, depression, stress and the quality of life questionnaire (WHOQOL-Bref). In the study sample participated N = 199 medical staff from several specialties. Inclusive criteria are: medical staff, who work night-shifts and / or 24 hours; age 23 - 67 years; have not been previously diagnosed with anxiety disorder and episodes of depressive disorder. **Results:** Referring to the DASS-42 scoring, the symptoms of depression in the medical staff are: normal 64.8%, mild 8.5%, moderate 21.1%, severe 4.5% and extremely severe 1%. Symptoms of anxiety results: normal 53.3%, mild 8%, moderate 17.1%, severe 14.1%, extremely severe 7.5% and stress symptoms results: normal 54.3%, mild 18.6%, moderate 17.1%, severe 9% and extremely severe 1%. Total WHO- Quality of life ($F = 3.447$, $p \leq .05$) and physical health ($F = 6.482$, $p \leq .05$) show significant differences between the educational level. **Conclusions:** Working night- shifts and / or 24-h affects the mild and moderate onset of symptoms of anxiety, depression and stress. The level of stress symptoms is perceived higher in women. Quality of life and physical health are considered the best in medical staff with postgraduate education.

keywords: sleep deprivation, quality of life

1. Introduction

Sleep deprivation and chronic sleep disruption are common among healthcare workers. Sleep loss is so pervasive that it interferes with daily activities (Pressman, 1997). It also knows no cultural, economic, religious, ethnic, racial, gender, or age boundaries. (Abad & Vivien, 2005). Sleep deprivation is studied in healthcare workers because they are a target group more exposed to chronic sleep deprivation than the general population (Pinel, 1999; Riemann et al., 2001).

According to the International Sleep Organization, sleep deprivation among healthcare workers should be of concern due to its serious, life-threatening consequences and impact on productivity. (Altevogt, 2006; Boivin, 2000; Knutson & Van Cauter, 2008; Wulff et al., 2010) The body is denied vital time to rest, repair, and grow, which is provided by sleep. (Altevogt, 2006; Spiegel et al., 2004; Aschoff, 1965; Carskadon, 1997; Mignot, 2008). Chronic sleep deprivation causes endocrinological changes that affect metabolic processes such as weight gain, obesity, and related diseases. (Björntorp, 1995; Knutson et al., 2007; Leproult et al., 1997; Mullington et al., 2009; Van Cauter et al., 2008). Another potential long-term side effect of persistent sleep deprivation is an increased risk of cardiovascular disease. (Bryant et al., 2004; Culebras, 1996; Orem et al., 2012; Schenck et al., 1986) Chronic sleep deprivation is associated with decreased immunological efficacy, due to decreased production of anti-inflammatory cytokines, particularly natural killer (NK) cells, and decreased functionality. (Cipolli et al., 2010; Imeri & Opp, 2009; McEwen, 1998; Nagai et al., 2010) Previous studies have shown a correlation between anxiety, depressive episodes, depressed mood, pessimistic thoughts, and sleep deprivation. (Belmaker, 2004; Drake, 2004; Eddy, 2005; Harvey & Allison, 2008; Rosekind, 1996; Webb, 1975)

Lack of sleep affects the individual in several ways (APA Journal, 2010):

1. Problem-solving skills are impaired.
2. Communication skills are reduced.
3. Learning and memory skills are reduced.
4. Motor skills are impaired.

2. Methodology

2.1 Type of research

This is a quantitative, cross-sectional study, which began on 09.12.2021 with the validation of the WHO-Quality of Life-Bref instrument. The validation process of the instrument was completed on 27.01.2022. The second phase of the study consisted of the distribution of the DASS-42 and WHO-Quality of Life questionnaires. The distribution and collection of the questionnaires lasted from 03.02.2022 – 16.03.2022. The third phase of the study was followed by data collection, processing and the process of writing the study from 17.03.2022 – 08.04.2022.

2.2 Sampling Technique and Size

The size of the study sample is N=199 individuals. The selection of the sample is intentional, not random, according the inclusion and exclusion criteria. The selection criteria are: medical personnel, who work night shifts and/or 24 h, not having been previously diagnosed with anxiety, depression and stress disorders, the minimum age is 23 years, while the maximum is 67 years. 25 primary care physicians, 40 residents and 134 nurses participated in the study

2.3 Procedures and Definition of Variables

Two instruments were used in this study, the DASS-42 questionnaire and the WHO-Quality of Life. The DASS-42 instrument is composed of 3 self-report scales, which measure negative emotional states such as anxiety, depression and stress. The second questionnaire used in the study is the WHO-Quality of Life-Bref, which is a shortened version of the WHO-Quality of Life-100, both developed by the World Health Organization in 1995. The answers to the questions are constructed with a Likert scale, where 1 represents “I disagree” and 5 “I completely agree”. The WHO-Quality of Life includes 4 domains with specific aspects:

Physical health; Psychological well-being; Social relationships; Surrounding environment. There are also 2 separate questions on the individual's general perception of health and quality of life.

The method of distributing the WHO-Quality of Life and DASS-42 questionnaires was enabled through manual distribution of the questionnaires and through the Google Form platform.

2.4 Statistical Analysis

After the questionnaires were collected, the data were entered into SPSS 25. The following techniques were used in the paper:

Cronbach's Alpha, which represents the internal consistency of the instrument to see how closely or closely the questions are related to each other. It is considered a measure of the reliability of the scale since our questions are scaled according to the Likert scale. It takes the following values:

$\alpha \geq 0.9$ - excellent;

$0.8 \leq \alpha < 0.9$ - good;

$0.7 \leq \alpha < 0.8$ - acceptable;

$0.6 \leq \alpha < 0.7$ - questionable;

$0.5 \leq \alpha < 0.6$ - poor;

$\alpha < 0.5$ - unacceptable.

Mean, Standard Deviation, Minimum, Maximum, Frequency, Percentage which serve to present us with a more accurate picture of the questionnaire results in tabular and graphical form.

The T-test was used to see if there are significant differences in the mean, for example between two independent groups such as (have contact with the convict or not), regarding the level of DASS-42 and Quality of Life.

The ANOVA test was used to determine whether there were statistically significant differences between 3 or more groups of an independent variable (age group, etc.) versus a dependent variable (DASS-42 and Quality of Life.)

2.5 Validity of the Instruments

Questionnaire reliability coefficients

The study used questions that were constructed with a Likert scale from 1-5. Given this fact, we used the Cronbach's Alpha reliability coefficient to see the internal consistency of the instrument. 64 individuals were surveyed in the piloting phase.

Table 1: Cronbach's Alpha reliability coefficient

Questionnaire	Cronbach's Alpha n=64	Cronbach's Alpha n=64	Number of questions
Physical health	.818	.822	7
Psychological wellbeing	.858	.865	6
Social relationships	.766	.789	3
Environment	.755	.756	8
Quality of life	.926	.912	26

The reliability coefficient of the questionnaires used in the case study is greater than 0.7, which is the lower limit accepted in the literature for the validity of questionnaires. This indicates that the questionnaire was understood by the users and there is no problem with the reliability of the data.

3. Results

Table 2: Demographic data (N=199)

		N	%
Gender	Female	140	70.4
	Male	59	29.6
	Total	199	100.0
Age	under 35 y.o	74	37.2
	35 -45 y.o	66	33.2
	46 -55 y.o	41	20.6
	over 55 y.o	18	9.0
	Total	199	100.0
Education	High school	11	5.5
	Bachelor	127	63.8
	Postgraduate	61	30.7
	Total	199	100.0
Civil status	Sinle	41	20.6
	Engaged	13	6.5
	Divorced	12	6.0
	Married	117	58.8
	Domestic Partnership	14	7.0
	Widow	2	1.0
	Total	199	100.0

Table 3: Frequency of depression level

	n	%
Normal	129	64.8
mild	17	8.5
moderate	42	21.1
severe	9	4.5
extremely severe	2	1.0
Total	199	100.0

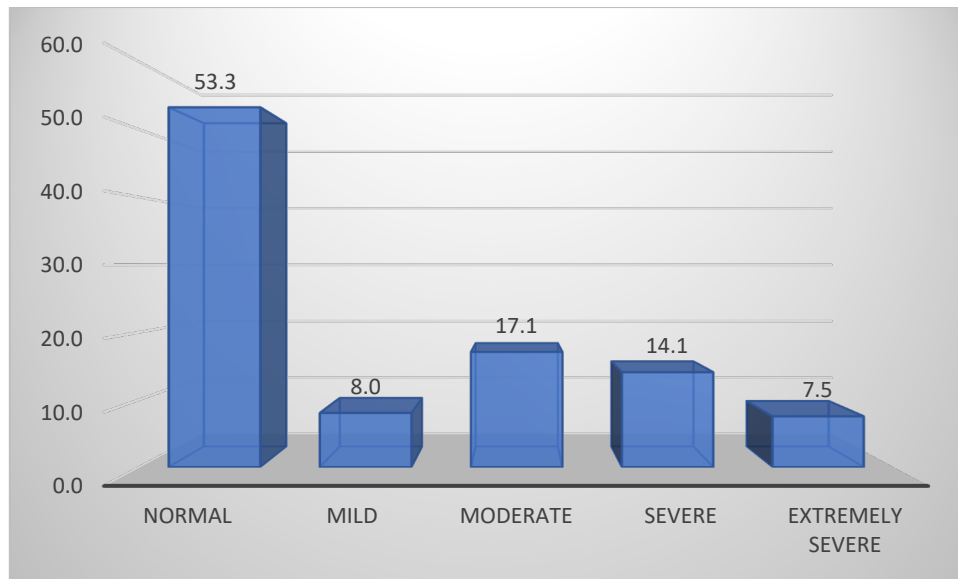


Figure 1: Frequency of anxiety level

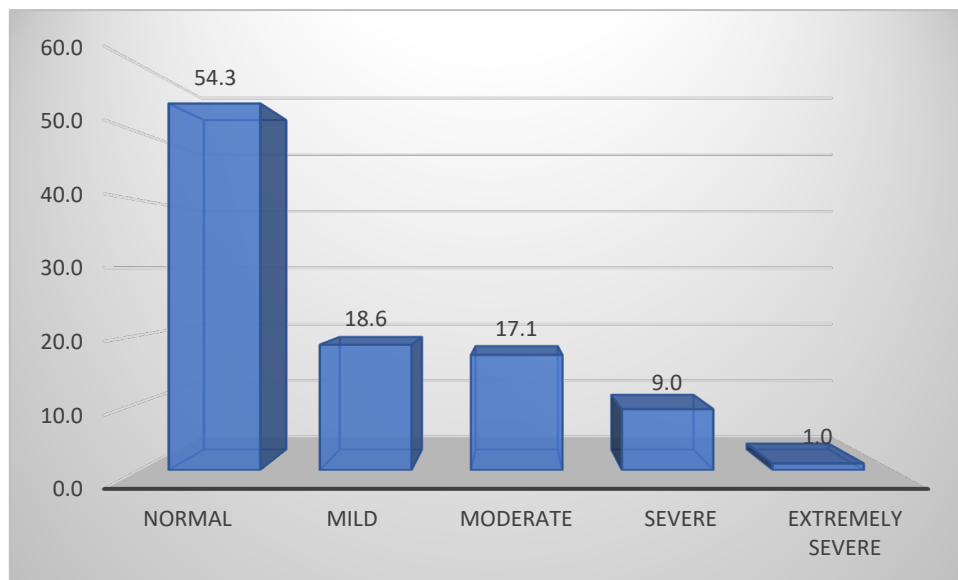


Figure 2: Frequency of stress level

Table 4: Descriptive data of the WHO Quality of Life dimensions

	N	Minimum	Maximum	Mean	Standart deviation
WHO Quality of life	199	1	5	3.75	0.45
Physical health	199	1	5	3.83	0.61
Psychological wellbeing	199	1	5	3.90	0.49
Social relationships	199	1	5	3.94	0.63
Environment	199	1	5	3.44	0.54

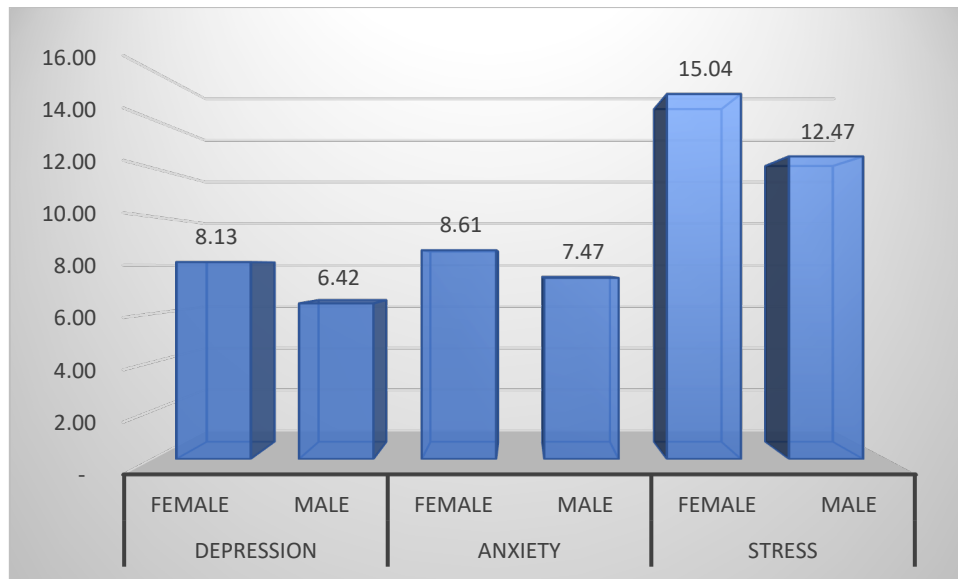


Figure 3: DASS-42 according gender

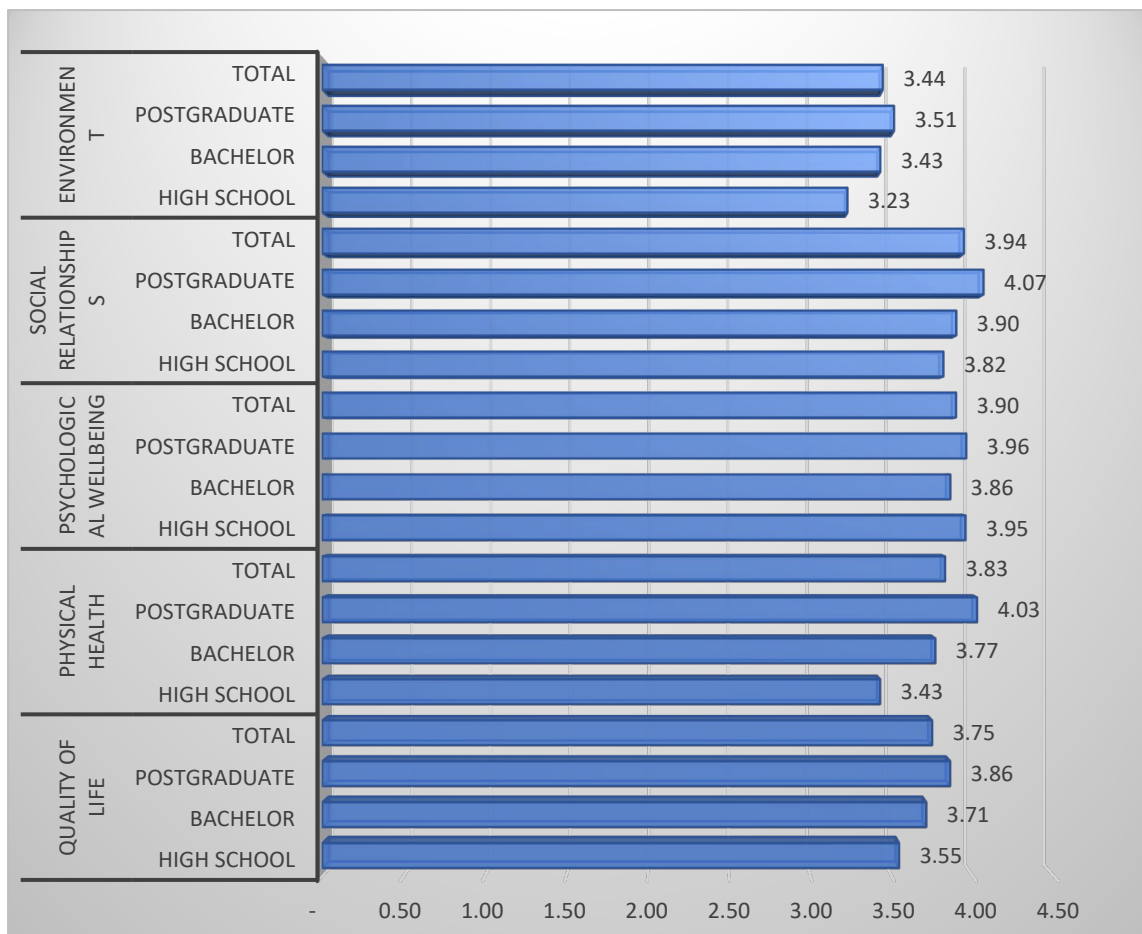


Figure 4: WHO- Quality of life according the level of education

4. Discussion

Increasing evidence supports the fact that physiological and cognitive functions in humans are strongly dependent on circadian rhythms. (Altevogt, 2006; Mignot, 2008; Reynolds & Banks, 2010; Rusak & Zucker, 1979; Van Dongen, 2003). The ability to perform complex mental and psychomotor tasks is a function of homeostatic factors of the sleep-wake cycle. (Klein et al., 1991; Talbot et al., 2010). These factors may include sleep duration, sleep quality, and wakefulness. (Drake, 2004) Some authors describe the shift work system as a chronic partial sleep deprivation. (Klara et al., 2019; Selvi et al., 2020) This type of continuous sleep deprivation is considered by medical personnel as a necessary sacrifice for their careers. Although this may be perceived as affecting quality of life, medical staff strive to meet the maximum demands of their work. (Banks & Dinges, 2007; Demir, 2005)

This study included medical personnel with different hierarchical positions (primary physician, resident and nurse), from different hospital institutions, who work night shifts and/or 24-hour shifts. The predominant age is under 35 years old and the participation is predominantly female.

The DASS-42 instrument was used to measure the level of anxiety, depression, and stress symptoms, which for most of the medical staff resulted in a norm referred to the DASS-42 score. This result is contrary to our expectations. Based on previous studies on the effects of sleep deprivation on the level of anxiety, depression, and stress symptoms is above the normal range in residents at a university hospital center in Chicago (Selvi et al., 2020) and in medical staff working on shifts at a tertiary hospital center in the eastern Anatolia region, Turkey. (De Salvo, 2020). Also, according to a study conducted at a hospital in Florida, the presence of sleep deprivation increases anxious and depressive thoughts, which have an impact on daily life. (Demir, 2005).

Another earlier study conducted at Ankara University Hospital Center highlights similar results to our study, citing that only anxiety features are present, which may not be as a result of working with shifts. (Kahn-Greene et al., 2007) The higher the level of anxiety symptoms, the higher the level of depression and stress symptoms. Sleep deprivation has been reported to cause temporary symptoms of anxiety, depression, and somatic symptoms, due to decreased blood flow in the prefrontal cortex region. (De Salvo, 2020; Miller & Cohen, 2001). Normalizing sleep deprivation and the attitude during specialization influences behaviors, which will be used continuously. This determines the development of identity as a doctor, as well as influences further formation as a human being. (Campos-Morales et al., 2005; Demir, 2005)

Regarding the levels of anxiety and depression symptoms, no significant differences were observed between the two genders, in age, at different educational levels and at different civil statuses. These results are similar in the aforementioned studies, specifying the fact that age, gender, educational level and civil status do not have an impact on the levels of anxiety and depression (Demir, 2005; De Salvo, 2020; Kahn-Greene, 2007; Selvi et al., 2020). The results probably correspond, due to the same prevailing age, gender, educational level and marital status as in our study and in the above studies. Referring to studies, risk factors for the development of anxiety and depression are personality characteristics. (APA Journal, 2010; Frijda, 1986; Levenson, 1992) The results of our study highlight the fact that the levels of moderate anxiety and depression symptoms are higher compared to mild symptoms. This is an indication that we have a significant presence of symptoms related to anxiety and depression. During the time of completing the questionnaires, the medical staff considered the number of questions to be too many to answer. For this reason, loss of attention and lack of concentration have caused the questionnaires to be not completely accurate. In some cases, distrust has also been manifested by the medical staff.

This study highlights differences in the level of stress symptoms between the two genders, with women experiencing higher levels of perceived stress compared to men. This conclusion is also supported by the results of a study published by the APA (American Psychiatric Association) in 2012, which found that 49% of women surveyed had higher levels of stress symptoms compared to 39% of men. According to the APA, women report more physical and emotional stress symptoms such as headaches, stomach pain, difficulty swallowing, and the urge to cry. (Craske et al., 2011; Mohring, 2015; Hirshkowitz et al., 2015) Also based on a 2021 study conducted at a hospital center in Central London, the level of stress symptoms is greater in women compared to men, also due to the difficulty of managing their traditional role in the family and performing a high-load job such as the health field. (Perotta et al., 2017) The results of the stress level in our study do not depend on age, educational level and marital status. Regarding the quality of life, measured quantitatively by the WHO-Quality of Life-Bref (built according to the Likert scale), it results that the domain, which is assessed as less satisfactory, is the surrounding environment, which includes the work environment, the daily physical environment, access to information, the opportunity to practice leisure activities, economic resources, transportation and living conditions.

This conclusion is related to the long working hours, which prevent the performance of leisure activities. Also, working conditions are considered by medical personnel to be unsuitable, unsafe. Long working hours are considered to be poorly paid, resulting in unsatisfactory income and living conditions. Psychological well-being, which includes the ability to work, level of concentration, energy, self-acceptance, presence of feelings of anxiety, low mood, and the social sphere, which includes interpersonal relationships, sex life, and support from friends, were rated as satisfactory based on the highest score, according to the Likert scale, by medical personnel.

Compared to the study conducted in the Eastern Anatolian region hospital, the most problematic area was physical health. Somatic symptomatology, impairment of physical functioning and pain reduced the quality of life. (Bonnet & Arand, 2003; De Salvo, 2020). According to a study conducted by O.B.Sh in 14 countries, in 5438 patients, somatic symptoms were associated in most cases with emotional distress (Benca et al., 1992). According to another study on sleep deprivation conducted in residents, chronic sleep loss has an impact on work performance, energy level, leisure activities, interpersonal relationships, not functioning at an optimal level. (Horne, 1993; Killgore, 2010; McCarthy, 1997; Selvi et al., 2020). Furthermore, it should be emphasized that quality of life depends on many factors and lack of sleep is not an isolated factor in the deterioration of quality of life. (De Salvo, 2020; Reynolds et al., 2010; Selvi et al., 2020).

The results of this study show that age and gender do not affect quality of life. This conclusion is similar to the above studies in the group of residents in Chicago (Selvi et al., 2020), in the medical staff at the Eastern Anatolia Hospital (Kahn-Greene et al., 2007) and in the medical staff in Florida (Demir, 2005). Age and gender did not appear to have an impact on the quality of life of medical staff in a 2021 study conducted in one of the hospitals in São Paulo, Brazil. (Perotta et al., 2017). A significant correlation is observed between symptoms of anxiety, depression, stress and quality of life. The lower the level of symptoms of anxiety, depression and stress, the higher the quality of life is considered. This represents the direct impact of the above symptoms on all areas of quality of life. (Physical health, psychological well-being, social relationships and the environment)

Regarding the educational level, the quality of life is perceived as better among participants with postgraduate education. This conclusion is also consistent with the studies considered above. (Perotta et al., 2017; Demir, 2005; De Salvo, 2020; Selvi et al., 2020). The higher

educational level creates the opportunity for better use of information, its easier accessibility, more opportunities, social life is richer thanks to the organizations of academic collectives (Porter et al., 2015; Wirz-Justice et al., 1999). Also, personal and spiritual development at several levels creates a culture of life where different problems can be faced with more flexibility. (APA Journal, 2010; Hartmann, 1973; Scherer & Peper, 2001) Physical health, which includes: energy to perform daily activities, need for medications to function, physical mobility, level of physical pain, quality of sleep, ability to perform at work and in other activities during the day, is considered better referred to the Likert scale score among medical personnel with postgraduate education. This is a similar result to the aforementioned studies. (Perrota et al., 2017; De Salvo, 2020; Selvi et al., 2020) Higher awareness of health problems at this educational level compared to other educational levels (secondary, university) affects more efficient care of personal health and early diagnosis of problems (Lim & Dinges, 2008; Pigeon et al., 2012). Easier access to health services provides more appropriate prevention and treatment of issues related to physical health (Tian et al., 2015).

5. Conclusion

Night shift and/or 24-hour work affects circadian rhythm disorder. Chronic lack of quality sleep affects anxiety and depression symptoms.

The level of stress is perceived higher among women.

The overall quality of life is considered to be moderately good based on the Likert scale, as a result, physical health, psychological well-being, social relationships, and the surrounding environment are perceived as moderately satisfactory.

Sleep deprivation reduces free time.

The work environment is also considered by participants to be unsuitable, affecting the quality of life.

The level of symptoms of anxiety, depression and stress directly affects the quality of life.

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