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Abstract

IMPACT OF SHIFT WORK ON DIETARY HABITS AND HEALTH OF MEDICAL WORKERS. LITERATURE REVIEW.

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Introduction. Medical workers who work on a shift schedule belong to the group with one of the highest psycho-emotional burdens. They are at high risk of developing professional burnout: professional responsibility related to patients' lives, physical stress related to unnatural working conditions, highly intellectual stress related to new technologies in medicine. Numbers of studies have been carried out on both the psychological and physiological state of this group of medics, while in Kazakhstan the correlation of shift work mode and eating habits have not been studied.

Aim of this literature review is to search for and analyze studies on the relationship between eating disorders and work patterns in medical workers.

Search strategy: A literature search was performed in the PubMed, Cochrain, The Lancet databases. 323 published papers were found. The search strategy consisted of searching the databases using keywords: medical workers "eating disorders", "endogenous circadian system", "anxiety", "shift work disorders", "burnout", "dietary, eating habits, behavior", "Metabolic syndrome", "Sleep patterns of shiftworkers", "stress", "physicians". Duplicates and articles not related to the topic of the literature review were excluded. Of the remaining 122 articles, the following were excluded: Clinical trials, Meta-analysis, Randomized Controlled Trial (RCT), and Systematic review. Seventy-one articles were selected for the final review.

Inclusion criteria: studied published articles on the dietary habits of medical workers working on a shift schedule, experiencing physical and psycho-emotional stress. Study type: Clinical trials, Meta-analysis, RCTs (Randomized controlled trials), Systematic review, articles published in 1st and 2nd quartile journals. **Exclusion criteria:** articles published in journals in the 3rd quartile and below.

Results and Conclusions. The analysis of the available studies has allowed to reveal, that the doctors working on the shift schedule in the night shift have manifestations of shift work disorders (SWD), manifested by eating disorders, sleep disorders and circadian rhythms, risk of insulin resistance and metabolic syndrome development, hypertension, vigilance and fatigue disorders, burnout and chronic fatigue syndromes, suicides, changes in immune status and subsequent changes in gut microbiota, bad habits such as smoking, drinking alcohol, seizing problems. Summarizing the findings of the analyzed studies, the relationship between eating disorders and shift work regime in physicians is shown, consequently, the development of effective recommendations on nutrition and work organization is essential.

Key words: Medical workers, eating habits, shift work disorders, stress, burnout, metabolic syndrome, circadian system, sleep disorders, suicides, bad habits.

Резюме

ВЛИЯНИЕ СМЕННОЙ РАБОТЫ НА ПИЩЕВЫЕ ПРИВЫЧКИ И ЗДОРОВЬЕ МЕДИЦИНСКИХ РАБОТНИКОВ. ОБЗОР ЛИТЕРАТУРЫ

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Введение. Медицинские работники, работающие по сменному графику, относятся к группе с одной из самых высоких психоэмоциональных нагрузок, и находятся в условиях высокого риска развития профессионального выгорания: профессиональная ответственность, связанная с жизнью пациентов, физическое напряжение, связанное с неестественными условиями труда, высокоинтеллектуальное напряжение, связанное с новыми технологиями в медицине. Проведены множество исследований как психологического, так и физиологического состояния медиков, в то время как в Казахстане исследования по взаимосвязи сменного режима работы и пищевыми привычками не проводились.

Цель: Поиск и анализ исследований по вопросу связи нарушений пищевого поведения и режима работы у медицинских работников.

Стратегия поиска. Поиск литературы был осуществлен с использованием баз данных PubMed, Cochrain, The Lancet. Стратегия поиска заключалась в поиске в базах данных, по ключевым словам, таким как: «eating disorders», «endogenous circadian system», «anxiety», «shift work disorders», «burnout», «dietary, eating habits, behavior», «Metabolic syndrome», «sleep patterns of shiftworkers», «stress», «physicians». Было найдено 323 статьи. Были исключены дубликаты и статьи, не относящиеся к теме литературного обзора. Из оставшихся 122 статей были исключены статьи, не соответствующие типу: Клинические исследования, Метаанализ, Рандомизированое контролируемое испытание (РКИ), Систематический обзор. Для финального обзора отобрано 71 статья.

Критерии включения: исследовались опубликованные статьи о пищевых привычках медицинских работников, работающих по сменному графику, испытывающих физические и психоэмоциональные нагрузки. Тип исследования: Клинические исследования, Метаанализ, Рандомизированое контролируемое испытание (РКИ), Систематический обзор, статьи, опубликованные в журналах, входящих в 1 и 2 квартили. **Критерии исключения:** статьи, опубликованные в журналы, входящие 3 квартиль и ниже.

Результаты и выводы. Анализ имеющихся исследований позволил выявить, что медицинские работники, работающие по сменному графику в ночную смену имеют проявления (расстройства посменной работы (SWD - shift work disorders), проявляющихся нарушением пищевого поведения, расстройством сна и циркадных ритмов, риском развития инсулинорезистентности и метаболического синдрома, повышением артериального давления, нарушением бдительности и переутомления, синдромами выгорания и хронической усталости, суицидами, изменением иммунного статуса и последующих изменений микробиоты кишечника, вредными привычками, такими как курение, прием алкоголя, заедание проблем.

Резюмируя выводы анализируемых исследований, показана связь между нарушениями пищевого поведения и режимом сменной работы у медицинских работников, вследствие чего крайне необходима разработка действенных рекомендаций по питанию и организации труда.

Ключевые слова: Медицинские работники, пищевые привычки, расстройства сменной работы, стресс, выгорание, метаболический синдром, циркадная система, расстройства сна, суициды, вредные привычки.

Түйіндеме

АУЫСЫМДЫҚ ЖҰМЫС РЕЖИМІНІҢ МЕДИЦИНА ҚЫЗМЕТКЕРЛЕРДІҢ ТАМАҚТАНУ ӘДЕТІ МЕН ДЕНСАУЛЫҒЫНА ӘСЕРІ. ӘДЕБИ ШОЛУ

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Кіріспе. Ауысымдық кесте бойынша медицина саласындағы жұмыс істейтін қызметкерлері ең жоғары психоэмоционалды жүктемесі бар топқа жатады және пациенттердің өміріне байланысты кәсіби жауапкершілік, табиғи емес еңбек жағдайларымен байланысты физикалық стресс, медицинадағы жаңа технологиялармен байланысты жоғары интеллектуалдық стресс болғандықтан олардың арасында кәсіби шаршаудың даму қаупі жоғары. Бұл топтағы қызметкерлердің психологиялық және физиологиялық жағдайына көптеген зерттеулер жүргізілген. Қазақстанда ауысымдық жұмыс пен тамақтану тәртібінің байланысы туралы зерттеулер жүргізілмеген.

Мақсаты: Осы әдеби шолудың мақсаты медицина қызметкерлердің тамақтану мен жұмыс режимінің бұзылуының байланысы туралы зерттеулерді іздеу және талдау.

Іздеу стратегиясы: Мәліметтер PubMed, Cochrain, Lancet деген базалардан алынды. 323 мақала табылды. Іздеу "тамақтанудың бұзылуы", "эндогендік циркадиялық жүйе", "мазасыздық", "ауысымдық жұмыстың бұзылуы", "жану", "диета, тамақтану әдеті, мінез-құлық", "метаболикалық синдром", "ауысымдық жұмысшылардың ұйқысы", "стресс" медицина қызметкерлері кілт сөздерін іздеуден тұрады. Әдеби шолу тақырыбына қатысы жоқ

телнұсқалар мен мақалалар алынып тасталды. Қалған 122 мақаланың ішінен типке сәйкес келмейтін мақалалар алынып тасталды: клиникалық сынақтар, мета-анализ, рандомизацияланған бақыланатын сынақ. Соңғы мақалаға 71 мақала таңдалды.

Қосу критерийлері: ауысымдық кесте бойынша жұмыс істейтін, физикалық және психозмоционалдық жүктемелерді бастан кешіретін медицина қызметкерлерінің тағамдық әдеттері туралы жарияланған мақалалар зерттелді. Зерттеу түрі: клиникалық зерттеулер, мета-анализ, Рандомизацияланған бақыланатын сынақ (РБС), жүйелі шолу, 1 және 2 квартал журналдарында жарияланған мақалалар. **Шеттеу критерийлері:** 3 квартал және одан төмен журналдарда жарияланған мақалалар.

Нәтижелер: Әдебиеттерге шолу көрсеткендей, медицина саласындағы жұмыс істейтін қызметкерлерінің тамақтанудың бұзылуы, ұйқының бұзылуы, инсулинге төзімділік пен метаболкалық синдромның даму қаупі, қан қысымының жоғарылауы, ұйқының жоғалуы мен циркадиялық ығысудың салдарынан сергектік пен өнімділіктің бұзылуы, шамадан тыс жұмыс, күйіп қалу синдромы және созылмалы шаршау синдромы, суицид, ұйқының бұзылуы салдарынан ішек микробиотасының өзгеруі және циркадиялық ырғақтар, темекі шегу, алкоголь, проблемаларды басу, иммундық жағдайдың өзгеруі сияқты жаман әдеттер. ауысым жұмысының бұзылуы, түнгі ауысымдағы жұмыстың созылмалы әсері.

Қорытынды: Ауысым жұмысының медицина саласындағы жұмыс істейтін қызметкерлердің физикалық және психикалық денсаулығына үлкен әсерін ескере отырып, тамақтану және еңбекті ұйымдастыру бойынша ұсыныстар жасау үшін олардың денсаулығындағы өзгерістерді зерттейтін ұзақ және терең зерттеулер қажет.

Түйінді сөздер: медицина қызметкерлері, тамақтану әдеттері, ауысымдық жұмыстың бұзылуы, стресс, күйзелу, метаболкалық синдром, циркадиялық жүйе, ұйқының бұзылуы, өзіне-өзі қол жұмсау, жаман әдеттер.

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Ыдырышева К.К., Магзумова Р.З., Сазонов В. Г. Влияние сменной работы на пищевые привычки и здоровье медицинских работников. Обзор литературы // *Наука и Здравоохранение*. 2022. 2 (Т.24). С. 140-148. doi:10.34689/SH.2022.24.2.017

Ыдырышева К.К., Магзумова Р.З., Сазонов В.Г. Ауысымдық жұмыс режимінің медицина қызметкерлердің тамақтану әдеті мен денсаулығына әсері. Әдеби шолу // *Ғылым және Денсаулық сақтау*. 2022. 2 (Т.24). Б. 140-148. doi: 10.34689/SH.2022.24.2.017

Introduction.

Medical workers who work on a shift schedule belong to the group with one of the highest psycho-emotional burdens. They are at high risk of developing professional burnout: professional responsibility related to patients' lives, physical stress related to unnatural working conditions, highly intellectual stress related to new technologies in medicine. Numbers of studies have been carried out on both the psychological and physiological state of this group of medics, while in Kazakhstan the correlation of shift work mode and eating habits have not been studied.

Aim of this literature review is to search for and analyze studies on the relationship between eating disorders and work patterns in medical workers.

Search strategy

A literature search was performed in the PubMed, Cochrane, The Lancet databases. 323 published papers were found. The search strategy consisted of searching the databases using keywords: medical workers "eating disorders", "endogenous circadian system", "anxiety", "shift work disorders", "burnout", "dietary, eating habits, behavior", "Metabolic syndrome", "Sleep patterns of shiftworkers", "stress", "physicians". Duplicates and articles not related to the topic of the literature review were excluded. Of the remaining 122 articles, the following were excluded: Clinical trials, Meta-analysis, Randomized

Controlled Trial (RCT), and Systematic review. Seventy-one articles were selected for the final review

Inclusion criteria: published papers on the eating habits of shift-worker health professionals who experience physical and psycho-emotional stress were examined. Materials from an early period, more than 10 years old, were included in the review because they contain conceptually important information about the understanding and diagnosis of shift work disorders, on which this literature review is based.

Clinical studies, meta-analyses, and RCTs (Randomized Controlled Trials) were preferred. This systematic literature search was conducted according to PRISMA guidelines, as schematically shown in Figure 1.

Results of the literature review

General data. Eating Behavior.

Among many factors, eating habits depend on the profession as well. In this review, we examined the relationship between the work schedule and eating habits of health care workers.

There is a worldwide concept of "shift work" - a type of work schedule in which the hours of work during the day on different work days may vary. Shift work is an employment practice designed to provide services for 24 hours each day of the week (often abbreviated as 24/7).

In practice, the day is usually divided into shifts, establishing periods of time during which different groups of workers perform their duties.

The term "shift work" includes both long night shifts and work schedules in which employees rotate or alternate

shifts Shift work is used by health care workers for uninterrupted health care, especially in hospitals and emergency medical services. Workers who have shift work schedules and work at night may be predisposed to manifestations of Shift work disorders-SWD [59], [48].

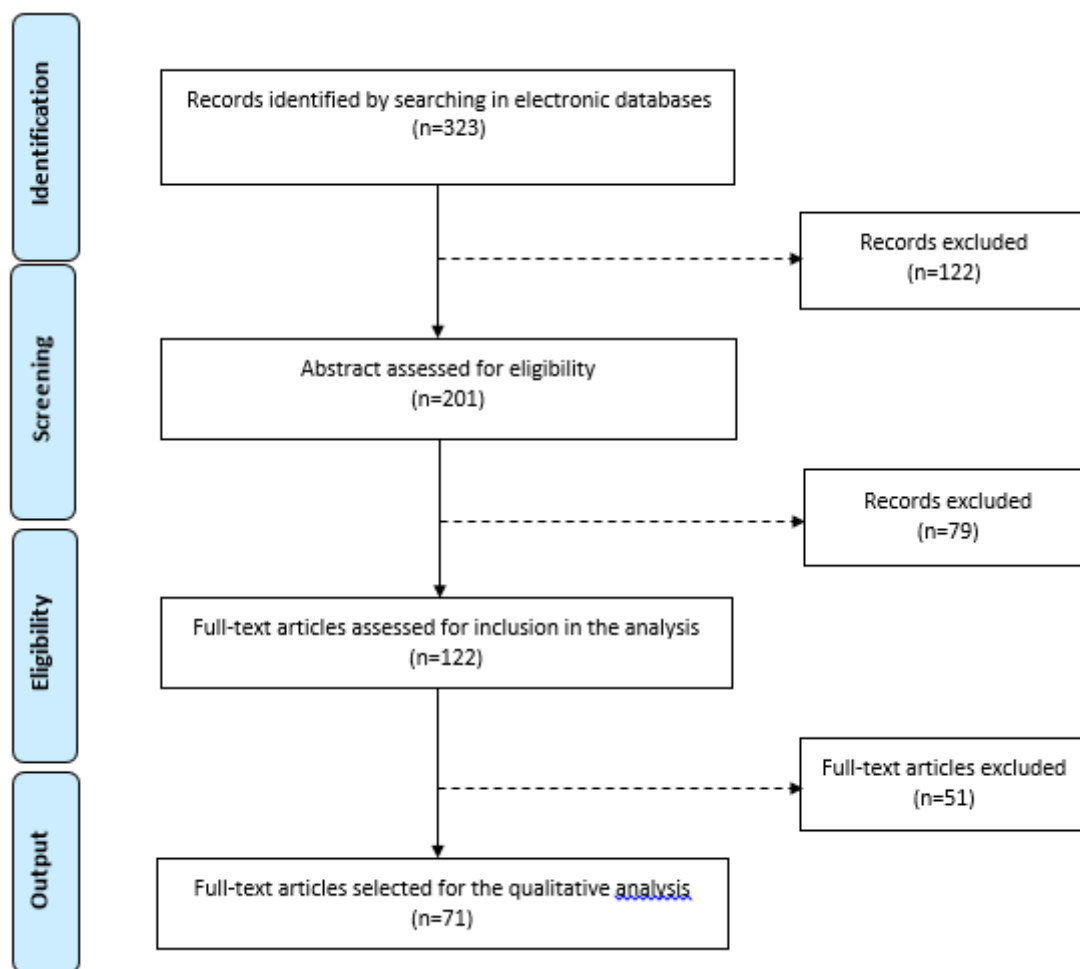


Figure 1: Literature search flow diagram (based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses))

Health status of medical students depending on nutrition

The process of learning and becoming a specialist affects eating habits, starting at medical schools. Increased loads, a long period of training, the need to obtain a large amount of information - all this is inherent in medical students. Stress in medical students has long been recognized [45]. For medical students, stress is a serious problem, especially during the first year of medical school, due to lack of study strategies, sleepless nights before exams, and unhealthy food during exams [1], [58], [16]. Medical students may be stressed due to the overload of work related to lectures, seminars, and the amount of homework. As a result, their appetite can be affected by skipping meals and eating on the run, frequent consumption of fast food [4]. The quality of students' nutrition also depends on the level of the country development: in more developed countries, students eat better than in countries with a low level of economic development. Evidence suggests that students in low-income countries prefer fast food - food that is predominantly fried, fatty, but low in

micronutrients and vitamins [40]. Students' daily consumption of fatty foods (73.4%) and fast food (13.1%) leads to overweight and obesity in medical students [24], [6], [21]. A high percentage of medical students are overweight and obese. For example, a study among Indian medical students found a significant relationship between body mass index (BMI) and fast food consumption, less physical activity: 138 students out of 147 (more than 90%) ate fast food, 47 students (34.05%) were overweight and obese [53], [41]. Lack of physical activity was found in 349 (64.3%) students [51]. Disrupted dietary habits such as skipping breakfast and eating irregularly are associated with the prevalence of fatigue in medical students [57]. A study showed that eating habits have a stronger effect on BMI than physical activity [70]. In addition, poor, monotonous eating habits may contribute to the development of anemia. Various sociodemographic characteristics such as age, gender, social class, eating habits, and infections are etiologic factors for nutritional anemia [25]. Although alimentary anemia can affect any age group, female medical students constitute a vulnerable population

because of their busy schedules, inconsistent meal times, and long working hours, when they mostly stay in the dormitory [63].

According to J. Crowley, L. Ball, G.J. Hiddink, lack of information in nutrition education affects students' knowledge, skills, and confidence to implement nutritional care in patient care. Despite the central role of nutrition in a healthy lifestyle, medical students are not supported to provide high quality and effective nutritional care [11]. Medical students, although aware of the importance of a balanced diet, generally do not follow it [3].

Thus, the above factors associated with eating disorders affect the health of future physicians.

Relation of shift work and eating habits in healthcare workers

It is known that there are differences in eating habits among employees who work only during the daytime and those who have night shifts [55]. According to published papers, there is a direct association between sleep deprivation and the functioning of the hypothalamic-pituitary-adrenal (HPA) axis, especially in the context of stress [62]. The HPA axis has been previously identified as one potential mechanism that could explain the link between sleep deprivation and negative health outcomes. There are significant group differences in cortisol reactivity to stress. Disturbed sleep homeostasis is usually accompanied by increased activity of the HPA axis, resulting in increased levels of stress hormones [42], [37], [52]. Participants with sleep deprivation had elevated baseline cortisol levels, and there was a blunted cortisol response to the Trier Social Stress Test (TSST) [62].

Physicians reported that inadequate nutrition in the workplace has a significant negative impact on their personal well-being and professional performance. Nutrition is a basic necessity for wellness, but some physicians have difficulty accessing proper nutrition during the workday.

For example, J. Winston, C. Johnson, and S. Wilson found that less than half of responding physicians reported taking regular lunch breaks and that limited dining room hours, lack of choice, and lack of breaks were the most commonly perceived barriers to healthy eating while at work [66]. Physicians stated that they were too busy even to think about food, that there was no time during the workday to stop and eat, that their workload did not allow them time to eat. Also, was mentioned, that their work schedules (e.g., business meetings or meeting with patients' family members during lunch breaks, working in the operating room) made it difficult to access food on a regular basis.

The second important point was about the limited or inconvenient access to food during the physicians' workday. They described how the physical spaces in the hospital make it difficult for them to access food, including having to travel long distances from the department where they work to the food outlets or canteens, waiting for elevators, and standing in long lines. In addition, they noted that limited access to meal shops or canteens after working hours is currently impractical, given that hospital staff work 24 hours. Participants also described insufficient storage space for the food they bring from home. Many participants cited food choice as a major barrier, describing low quality foods, limited healthy food choices, and limited variety, while very few cited the cost of healthy foods as a barrier. In addition

to these practical access issues, physicians also identified issues that reflect the culture of medicine and how physicians' professionalism keeps them from taking care of their nutritional needs in the workplace. For example, many physicians reported that work and their patients came first, that they felt obligated to "just get the job done," and that time spent eating puts off caring for sick patients. Several participants also described profession-related barriers, including low prioritization of health care meals in the workplace for physicians in general and feeling uncomfortable or unprofessional about carrying food in the workplace or eating in patient care settings [32]. Frequent tea and coffee consumption has been reported among health care workers [30]. Shift work results in altered eating patterns, with workers often eating within 24 hours [22]. Shift workers eat a variety of foods, with sandwiches, fruit, cakes, potato chips, and cookies, which are high in carbohydrates and fats, being more frequently mentioned in their diet [23]. Shift work, including night shifts, is usually associated with a chronic mismatch between the endogenous circadian rhythm system and behavioral cycles, leading to metabolic disorders, including metabolic syndrome [12]. In addition, increased consumption of caloric foods as an energy source may contribute to an increased risk of overweight and obesity among health care workers who work night shifts [13].

Stress factors in medical workers

Medical workers suffer from high levels of stress, burnout and other mental illnesses compared to other professions [54]. For example, doctors of intensive care units, experience high psychoemotional and physical loads due to the specifics of work, are under constant stress [20]. Because of stress factors, these workers have changes in eating behavior, they have higher BMI and higher leukocyte counts, and an increased risk of developing metabolic syndrome [65], [69]. As a rule, ICU workers have SWD, which is associated with decreased productivity, impaired safety and quality of life, and adverse health consequences [59], [17].

Considering the effects of shift work on body systems:

1) Cardiovascular risk: Because of the need to provide medical care to patients around the clock (24 hours). Shift work is common among health care workers, and as shift workers they are prone to developing many chronic diseases. Several risk factors for cardiovascular diseases that should be prioritized in assessing shift work risk in the healthcare system have been recognized, including the high number of night shifts worked per year, the frequent lack of opportunity for a nap, the need to respond quickly, and an unhealthy workplace [60]. The risk of any cardiovascular disease is higher among shift workers than among day workers, and the association between shift work and cardiovascular disease risk is evident only after the first five years of exposure. In addition, smoking and obesity also influence the risk of cardiovascular disease [39].

2) Studies done by M. Oishia, Y. Suwazono, K. Sakataa, Y. Okubob, H. Haradaa, E. Kobayashia, M. Uetania and K. Nogawaa, conducted from 1991 to 2001 showed that alternating shift work is a significant independent risk factor for increased blood pressure [44].

This is confirmed by the work of Yun-Sik Choa, Seungho Leeb, and Jin-Ha Yoon, which described the dependence of the risk of hypertension in shift workers in hospitals on a decrease in the interval between shifts [10]. Moreover, the effect of shift work on blood pressure was more pronounced than other known factors such as age and body mass index [56].

3) Due to frequent night shifts, medical workers may have worse eating habits and metabolic profiles compared to day workers with similar overall health status [39]. Shift work may be a risk factor for insulin resistance and metabolic syndrome [31]. Shift workers are at increased risk for both sleep disorders and metabolic syndrome [67]. Night shifts and shift work in general have been associated with an increased risk of type 2 diabetes [28].

4) Frequent shifts due to staff deficiency and turnover. The problem of turnover and deficiency of ICU staff is recognized by the global community [14]. Workers report increased workload due to the large number of patients in the ICU, increased number of night shifts, possibility of infection from patients, unfavorable work environment, increased risk of sleep deprivation, stress factors in the family, and mood changes due to night shift work [7], [35] as causes of turnover. Long shifts should be avoided in order to protect the health of physicians and the safety of patients, with shifts not exceeding 16 hours (and only in exceptional cases) [48].

5) Chronic night shift exposure, as well as recent night shift work, can affect workers' immune status [34], [51]. There is a proven association between sleep disturbances, depression, and anxiety, and adverse safety consequences [46], [18]. Cortisol and inflammatory proteins are released into the blood in response to stressors, and chronic elevation of cortisol and inflammatory proteins may contribute to ongoing disease processes and may be biomarkers of disease [64]. Shift workers with nighttime problems are more likely to have fatigue on days-off [71].

6) Disturbances in sleep and circadian rhythms alter the gut microbiota, contributing to the inflammatory state and metabolic diseases associated with shift work [49], [9].

7) The circadian system plays an important role in the decreased glucose tolerance observed in the evening compared to the morning. In addition, circadian rhythm shifts reduce glucose tolerance, providing a mechanism that helps explain the increased risk of diabetes in shift workers [19]. Circadian disturbances in shift workers are considered important factors in the biological dysfunction that these individuals often experience [67]. Shift work is associated with impaired alertness and performance due to sleep loss and circadian bias [50], [38].

8) Bad habits (smoking, alcohol, binge-eating problems). Shift workers demonstrate changes in eating patterns, skipping more meals and consuming more food at irregular times. They also show higher consumption of unhealthy foods, such as saturated fats and soft drinks [68]. Studies have shown that nonsmokers lead healthier lifestyles than those who smoke [27]. Alcohol habits of more than 7.5 thousand Japanese physicians were studied and their causal factors were elucidated [43]. Correlations of alcohol habits with age, medical department, smoking and exercise, work environment, sleep problems, and mental health were analyzed. Trends in alcohol use or abuse

decreased with age. Sleep problems have been associated with the habit of drinking a lot [61]. A study of stress and burnout examined alcohol consumption among Finnish physicians. Average weekly alcohol consumption over the past year and various aspects of alcohol behavior were assessed, and the presence or absence of symptoms and illnesses common in heavy drinkers and addicts were determined. Increased alcohol consumption was associated with older age, career disappointment, heavy smoking, benzodiazepine use, symptoms of stress and burnout, suicidal ideation, general dissatisfaction, and alcohol-related illnesses. Alcohol use habits were heavier among physicians working in community health centers, those on extended sick leave; younger physicians frustrated with their careers or the atmosphere at work, and older physicians fully immersed their work. Alcohol consumption among physicians seems to be higher than in the general Finnish population, and excessive alcohol consumption seems to be associated with stress and burnout [26]. In addition, studies have shown that night shift workers consumed more meals per day with greater meal timing mismatch than day shift workers [15].

9) Night and long shifts can negatively affect fatigue, family and social life. Drowsy driving and accidents: traffic accidents often occur because of drowsy driving [36]. Trainee physicians working traditional 24-hour shifts are at significantly increased risk for occupational sharp-edged injuries or car accidents on their way home from work and committing serious or even fatal medical errors. The weight of evidence strongly suggests that long shifts significantly increase fatigue and impair performance and safety. To reduce the unacceptably high rate of preventable medical errors and fatigue-related injuries among health care workers, the United States has recommended that safe work hour limits be established and enforced [33].

10) A burnout syndrome and a chronic fatigue syndrome, suicides occur as a result of a long-term exposure to stress [5]. Also among the causes of a burnout syndrome are those connected with the professional environment: high workload, ambiguity and conflict of roles, lack of autonomy, multiple responsibilities, overwork, long working hours, unsatisfactory relations with colleagues, events of negative influence (for example, death of a patient) and misunderstanding [8]. People suffering from a burnout syndrome can show early signs of stress agitation (irritability, forgetfulness, sleep disturbances), can try to compensate stress (social isolation, increased cynicism, persistent fatigue) and suffer from exhaustion (show symptoms of depression or anxiety, chronic symptoms). Suicide, substance abuse, and increased rates of early retirement are common among anesthesiologists [47].

11) In addition, the effect of night shifts on mental performance has been noted: cognitive abilities deteriorate after the night shift in the ICU, regardless of the amount of professional experience or the length of sleep during the shift. In this regard, the implications for patient safety and physician health should be further evaluated [2].

Conclusion

Thereby, the review of the literature data has shown that unbalanced nutrition has a negative influence on the health status, physical and nervous-psychological state of medical workers. Specialists, working at a shift schedule,

have the highest psycho-emotional load and are in the group of high risk of burnout syndrome development. The following factors lead to a burnout syndrome: constant stress, lack of sleep due to a large number of night shifts, necessity of being constantly ready for an emergency and immediate cardiopulmonary resuscitation, compassion for dying patients. Stress and night shifts can lead to adverse effects in the form of burnout, changes in eating behavior, development of metabolic syndrome, and sleep disturbances. This, in turn, can lead to decreased personal well-being, increased errors, and, ultimately, worse patient care. Health education programs on healthy eating and risk factor reduction need to be implemented. The administration should establish the provision of adequate nutrition, pay attention to the prevention of emotional burnout, rest regimen, and strictly monitor the timeliness of medical examinations. It is necessary to implement scientifically developed work schedules and infrastructural changes based on actual data of working time limitations. [29]. In addition, it is necessary to consider at the legislative level the issue of lowering the retirement age for workers of this specialty.

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Лумепамыра:

1. Abebe M., Kebede Y.G., Mengistu F. Prevalence of Stress and Associated Factors among Regular Students at Debre Birhan Governmental and Nongovernmental Health Science Colleges North Showa Zone, Amhara Region, Ethiopia 2016 // *Psychiatry J*, 2018. 2018: p. 7534937.
2. Abut Y.C., Kitapcioglu D., Erkalp K., Toprak N., Boztepe A., Sivrikaya U., Paksoy I., Gur E.K., Eren G., Bilen A. Job burnout in 159 anesthesiology trainees // *Saudi J Anaesth*, 2012. 6(1): p. 46-51.
3. Alghamdi S.A., Alqarni A.A., Alghamdi A.F., Alghamdi T.K., Hasosah N.M., Aga S.S., Khan M.A. Knowledge, attitude, and practices regarding dietary habits among medical and non-medical university students // *J Family Med Prim Care*, 2021. 10(9): p. 3436-3443.
4. AlJaber M.I., Alwehaibi A.I., Algaeed H.A., Arafah A.M., Binsebayel O.A. Effect of academic stressors on eating habits among medical students in Riyadh, Saudi Arabia // *J Family Med Prim Care*, 2019. 8(2): p. 390-400.
5. Balan S.A., Bubenek-Turconi S.I., Droc G., Marinescu E., Nita E., Popa M.C., Popescu-Spineni D., Tomescu D. Burnout syndrome in the Anaesthesia and Intensive Care Unit // *Rom J Anaesth Intensive Care*, 2019. 26(1): p. 31-36.
6. Bertsias G., Mammias I., Linardakis M., Kafatos A. Overweight and obesity in relation to cardiovascular disease risk factors among medical students in Crete, Greece // *BMC Public Health*, 2003. 3: p. 3.
7. Books C., Coody L.C., Kauffman R., Abraham S. Night Shift Work and Its Health Effects on Nurses // *Health Care Manag (Frederick)*, 2017. 36(4): p. 347-353.
8. Burisch M. A longitudinal study of burnout: The relative importance of dispositions and experiences // *Work & Stress*, 2002. 16(1): p. 1-17.
9. Chang W.P., Peng Y.X. Differences between fixed day shift workers and rotating shift workers in gastrointestinal problems: a systematic review and meta-analysis. *Ind Health*, 2021. 59(2): p. 66-77.
10. Cho Y.S., Lee S., Yoon J.H., Lee J., Park J.B., Lee K.J., Jeong I. Short rest between shifts and risk of hypertension in hospital workers // *J Hypertens*, 2020. 38(2): p. 211-217.
11. Crowley J., Ball L., Hiddink G.J. Nutrition in medical education: a systematic review // *Lancet Planet Health*, 2019. 3(9): p. e379-e389.
12. D'Ettore G., Pellicani V., Greco M., Caroli A., Mazzotta M. Metabolic syndrome in shift healthcare workers // *Med Lav*, 2019. 110(4): p. 285-292.
13. D'Ettore G., Pellicani V., Greco M., Mazzotta M., Vullo A. Assessing and managing the shift work disorder in healthcare workers // *Med Lav*, 2018. 109(2): p. 144-150.
14. Daouda O.S., Hocine M.N., Temime L. Determinants of healthcare worker turnover in intensive care units: A micro-macro multilevel analysis // *PLoS One*, 2021. 16(5): p. e0251779.
15. de Freitas Eda S., Canuto R., Henn R.L., Olinto B.A., Macagnan J.B., Pattussi M.P., Busnello F.M., Olinto M.T. Alteration in eating habits among shift workers of a poultry processing plant in southern Brazil // *Cien Saude Colet*, 2015. 20(8): p. 2401-10.
16. Erschens R., Keifenheim K.E., Herrmann-Werner A., Loda T., Schwille-Kiuntke J., Bugaj T.J., Nikendei C., Huhn D., Zipfel S., Junne F. Professional burnout among medical students: Systematic literature review and meta-analysis // *Med Teach*, 2019. 41(2): p. 172-183.
17. Figueiro M.G., White R.D. Health consequences of shift work and implications for structural design // *J Perinatol*, 2013. 33 Suppl 1: p. S17-23.
18. Ganesan S., Magee M., Stone J.E., Mulhall M.D., Collins A., Howard M.E., Lockley S.W., Rajaratnam S.M.W., Sletten T.L. The Impact of Shift Work on Sleep, Alertness and Performance in Healthcare Workers // *Sci Rep*, 2019. 9(1): p. 4635.
19. Gao Y., Gan T., Jiang L., Yu L., Tang D., Wang Y., Li X., Ding G. Association between shift work and risk of type 2 diabetes mellitus: a systematic review and dose-response meta-analysis of observational studies // *Chronobiol Int*, 2020. 37(1): p. 29-46.
20. Goldberg R., Boss R.W., Chan L., Goldberg J., Mallon W.K., Moradzadeh D., Goodman E.A., McConkie M.L. Burnout and its correlates in emergency physicians: four years' experience with a wellness booth // *Acad Emerg Med*, 1996. 3(12): p. 1156-64.
21. Gopalakrishnan S., Ganeshkumar P., Prakash M.V., Christopher Amalraj V. Prevalence of overweight/obesity among the medical students, Malaysia // *Med J Malaysia*, 2012. 67(4): p. 442-4.
22. Gupta C.C., Coates A.M., Dorrian J., Banks S. The factors influencing the eating behaviour of shiftworkers: what, when, where and why // *Ind Health*, 2019. 57(4): p. 419-453.
23. Haus E., Reinberg A., Mauvieux B., Le Floc'h N., Sackett-Lundeen L., Touitou Y. Risk of obesity in male shift

workers: A chronophysiological approach. *Chronobiol Int*, 2016. 33(8): p. 1018-36.

24. Ibrahim N.K., Mahnashi M., Al-Dhaheeri A., Al-Zahrani B. et al. Risk factors of coronary heart disease among medical students in King Abdulaziz University, Jeddah, Saudi Arabia // *BMC Public Health*, 2014. 14: p. 411.

25. Jawed S., Tariq S., Tariq S., Kamal A. Frequency of nutritional anemia among female medical students of Faisalabad // *Pak J Med Sci*, 2017. 33(2): p. 398-403.

26. Juntunen J., Asp S., Olkinuora M., Aarimaa M., Strid L., Kauttu K. Doctors' drinking habits and consumption of alcohol // *BMJ*, 1988. 297(6654): p. 951-4.

27. Kaetsu A., Fukushima T., Moriyama M., Shigematsu T. Smoking behavior and related lifestyle variables among physicians in Fukuoka, Japan: a cross sectional study // *J Epidemiol*, 2002. 12(3): p. 199-207.

28. Kulkarni K., Schow M., Shubrook J.H. Shift Workers at Risk for Metabolic Syndrome // *J Am Osteopath Assoc*, 2020. 120(2): p. 107-117.

29. Landrigan C.P., Czeisler C.A., Barger L.K., Ayas N.T., Rothschild J.M., Lockley S.W. Harvard Work Hours Health and Safety Group. Effective implementation of work-hour limits and systemic improvements // *Jt Comm J Qual Patient Saf*, 2007. 33 (11 Suppl): p. 19-29.

30. Laraqui O., Manar N., Laraqui S., Boukili M., Ghailan T., Deschamps F., El Houssine Laraqui C. Job perception and well-being among healthcare workers in Morocco // *Sante Publique*, 2017. 29(6): p. 887-895.

31. Ledda C., Cina D., Matera S., Mucci N., Bracci M., Rapisarda V. High HOMA-IR Index in Healthcare Shift Workers. *Medicina (Kaunas)*, 2019. 55(5).

32. Lemaire J.B., Wallace J.E., Dinsmore K., Roberts D. Food for thought: an exploratory study of how physicians experience poor workplace nutrition // *Nutr J*, 2011. 10(1): p. 18.

33. Lockley S.W., Barger L.K., Ayas N.T., Rothschild J.M., Czeisler C.A., Landrigan C.P., Harvard H. Effects of health care provider work hours and sleep deprivation on safety and performance // *Jt Comm J Qual Patient Saf*, 2007. 33(11 Suppl): p. 7-18.

34. Loef B., Nanlohy N.M., Jacobi R.H.J., van de Ven C., Mariman R., van der Beek A.J., Proper K.I., van Baarle D. Immunological effects of shift work in healthcare workers // *Sci Rep*, 2019. 9(1): p. 18220.

35. Mahran G., Taher A., Saleh N. Challenges and work crisis facing critical care nurses // *Egyptian Nursing Journal*, 2017. 14(3): p. 235-241.

36. McElroy S.F., Olney A., Hunt C., Glennon C. Shift work and hospital employees: A descriptive multi-site study // *Int J Nurs Stud*, 2020. 112: p. 103746.

37. Meerlo P., Koehl M., van der Borght K., Turek F.W. Sleep restriction alters the hypothalamic-pituitary-adrenal response to stress // *J Neuroendocrinol*, 2002. 14(5): p. 397-402.

38. Morris C.J., Yang J.N., Garcia J.I., Myers S., Bozzi I., Wang W., Buxton O.M., Shea S.A., Scheer F.A. Endogenous circadian system and circadian misalignment impact glucose tolerance via separate mechanisms in humans // *Proc Natl Acad Sci U S A*, 2015. 112(17): p. E2225-34.

39. Mota M.C., Waterhouse J., De-Souza D.A.,

Rossato L.T., Silva C.M., Araujo M.B., Tufik S., de Mello M.T., Crispim C.A. Association between chronotype, food intake and physical activity in medical residents // *Chronobiol Int*, 2016. 33(6): p. 730-9.

40. Musaiger A.O., Al-Khalifa F., Al-Mannai M. Obesity, unhealthy dietary habits and sedentary behaviors among university students in Sudan: growing risks for chronic diseases in a poor country. *Environ Health Prev Med* // 2016. 21(4): p. 224-30.

41. Nisar N., Qadri M.H., Fatima K., Perveen S. Dietary habits and life style among the students of a private medical university Karachi // *J Pak Med Assoc*, 2009. 59(2): p. 98-101.

42. Nollet M., Wisden W., Franks N.P. Sleep deprivation and stress: a reciprocal relationship // *Interface Focus*, 2020. 10(3): p. 20190092.

43. Ohida N., Otsuka Y., Kaneita Y., Nakagome S., Jike M., Itani O., Ohida T. Factors Related to Alcohol Consumption Among Japanese Physicians // *Asia Pac J Public Health*, 2018. 30(3): p. 296-306.

44. Oishi M., Suwazono Y., Sakata K., Okubo Y., Harada H., Kobayashi E., Uetani M., Nogawa K. A longitudinal study on the relationship between shift work and the progression of hypertension in male Japanese workers // *J Hypertens*, 2005. 23(12): p. 2173-8.

45. Oro P., Esquerda M., Mas B., Vinas J., Yuguero O., Pifarre J. Effectiveness of a Mindfulness-Based Programme on Perceived Stress, Psychopathological Symptomatology and Burnout in Medical Students // *Mindfulness (N Y)*, 2021. 12(5): p. 1138-1147.

46. Potter G.D.M., Wood T.R. The Future of Shift Work: Circadian Biology Meets Personalised Medicine and Behavioural Science // *Front Nutr*, 2020. 7: p. 116.

47. Quick J.C., Henderson D.F. Occupational Stress: Preventing Suffering, Enhancing Wellbeing // *Int J Environ Res Public Health*, 2016. 13(5).

48. Reed D.A., Fletcher K.E., Arora V.M. Systematic review: association of shift length, protected sleep time, and night float with patient care, residents' health, and education // *Ann Intern Med*, 2010. 153(12): p. 829-42.

49. Reynolds A.C., Paterson J.L., Ferguson S.A., Stanley D., Wright K.P., Dawson D. The shift work and health research agenda: Considering changes in gut microbiota as a pathway linking shift work sleep loss and circadian misalignment, and metabolic disease // *Sleep Med Rev*, 2017. 34: p. 3-9.

50. Sateia M.J. International classification of sleep disorders-third edition: highlights and modifications // *Chest*, 2014. 146(5): p. 1387-1394.

51. Savic S., Gavran L., Tesanovic G. Assessment of physical activity and body weight among medical students in Banja Luka, Bosnia and Herzegovina // *Med Glas (Zenica)*, 2020. 17(1): p. 188-193.

52. Sgoifo A., Buwalda B., Roos M., Costoli T., Merati G., Meerlo P. Effects of sleep deprivation on cardiac autonomic and pituitary-adrenocortical stress reactivity in rats // *Psychoneuroendocrinology*, 2006. 31(2): p. 197-208.

53. Shah T., Purohit G., Nair S.P., Patel B., Rawal Y., Shah R.M. Assessment of obesity, overweight and its association with the fast food consumption in medical students // *J Clin Diagn Res*, 2014. 8(5): p. CC05-7.

54. Shanafelt T.D., Boone S., Tan L., Dyrbye L.N.,

Sotile W., Satele D., West C.P., Sloan J., Oreskovich M.R. Burnout and satisfaction with work-life balance among US physicians relative to the general US population // *Arch Intern Med*, 2012. 172(18): p. 1377-85.

55. Souza R.V., Sarmiento R.A., de Almeida J.C., Canuto R. The effect of shift work on eating habits: a systematic review // *Scand J Work Environ Health*, 2019. 45(1): p. 7-21.

56. Suwazono Y., Dochi M., Sakata K., Okubo Y., Oishi M., Tanaka K., Kobayashi E., Nogawa K. Shift work is a risk factor for increased blood pressure in Japanese men: a 14-year historical cohort study // *Hypertension*, 2008. 52(3): p. 581-6.

57. Tanaka M., Mizuno K., Fukuda S., Shigihara Y., Watanabe Y. Relationships between dietary habits and the prevalence of fatigue in medical students // *Nutrition*, 2008. 24(10): p. 985-9.

58. Thomas M.R., Dyrbye L.N., Huntington J.L., Lawson K.L., Novotny P.J., Sloan J.A., Shanafelt T.D. How do distress and well-being relate to medical student empathy? A multicenter study // *J Gen Intern Med*, 2007. 22(2): p. 177-83.

59. Thorpy M. Understanding and diagnosing shift work disorder // *Postgrad Med*, 2011. 123(5): p. 96-105.

60. Torquat, L., Mielke G.I., Brown W.J., and Kolbe-Alexander T. Shift work and the risk of cardiovascular disease. A systematic review and meta-analysis including dose-response relationship // *Scand J Work Environ Health*, 2018. 44(3): p. 229-238.

61. Vanttola P., Puttonen S., Karhula K., Oksanen T., Harma M. Prevalence of shift work disorder among hospital personnel: A cross-sectional study using objective working hour data // *J Sleep Res*, 2020. 29(3): p. e12906.

62. Vargas I. and Lopez-Duran N. Investigating the effect of acute sleep deprivation on hypothalamic-pituitary-adrenal-axis response to a psychosocial stressor // *Psychoneuroendocrinology*, 2017. 79: p. 1-8.

63. Vibhute N.A., Shah U., Belgaumi U., Kadashetti V., Bommanavar S., Kamate W. Prevalence and awareness of nutritional anemia among female medical students in Karad, Maharashtra, India: A cross-sectional study // *J*

Family Med Prim Care, 2019. 8(7): p. 2369-2372.

64. Weaver M.D., Vetter C., Rajaratnam S.M.W., O'Brien C.S., Qadri S., Benca R.M., Rogers A.E., Leary E.B., Walsh J.K., Czeisler C.A., Barger L.K. Sleep disorders, depression and anxiety are associated with adverse safety outcomes in healthcare workers: A prospective cohort study // *J Sleep Res*, 2018. 27(6): p. e12722.

65. Wilf Miron R., Malatskey L., Rosen L.J. Health-related behaviours and perceptions among physicians: results from a cross-sectional study in Israel // *BMJ Open*, 2019. 9(9): p. e031353.

66. Winston J., Johnson C., Wilson S. Barriers to healthy eating by National Health Service (NHS) hospital doctors in the hospital setting: results of a cross-sectional survey // *BMC Res Notes*, 2008. 1: p. 69.

67. Wong H., Wong M.C., Wong S.Y., Lee A. The association between shift duty and abnormal eating behavior among nurses working in a major hospital: a cross-sectional study // *Int J Nurs Stud*, 2010. 47(8): p. 1021-7.

68. Wright K.P., Jr., Drake A.L., Frey D.J., Fleshner M., Desouza C.A., Gronfier C., Czeisler C.A. Influence of sleep deprivation and circadian misalignment on cortisol, inflammatory markers, and cytokine balance // *Brain Behav Immun*, 2015. 47: p. 24-34.

69. Wu Y.S., Tzeng W.C., Chu C.M., Wang W.Y. Metabolic Syndrome and Its Related Factors among Hospital Employees: A Population-Based Cohort Study // *Int J Environ Res Public Health*, 2021. 18(18).

70. Yousif M.M., Kaddam L.A., Humeda H.S. Correlation between physical activity, eating behavior and obesity among Sudanese medical students Sudan // *BMC Nutr*, 2019. 5: p. 6.

71. Zhang C., Yang L., Liu S., Ma S., Wang Y., Cai Z., Du H., Li R., Kang L., Su M., Zhang J., Liu Z., Zhang B. Survey of Insomnia and Related Social Psychological Factors Among Medical Staff Involved in the 2019 Novel Coronavirus Disease Outbreak // *Front Psychiatry*, 2020. 11: p. 306.

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