

## REVIEW

From prof. Gospodinka Radeva Prakova-Vasileva, MD, PhD-Head of “First Department of Internal Diseases and General Medicine”- Faculty of Medicine at Trakia University-Stara Zagora

Of the dissertation for the award of an educational and scientific degree “**Doctor**”, in the field of higher education 7. Healthcare and sport,

Professional direction 7.1 Medicine, Doctoral Program “**Occupational diseases**”

In accordance to Order № P-109-301/ 07.06.23, issued by the Rector of Medical University “Prof. dr. Paraskev Stoyanov”- Varna.

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**Dissertation topic:** “**Sleep disorders in shift work**”

### 1. General presentation of the procedure and doctoral student

The presented on an electronic carrier set of materials is in accordance to the Law for development of the academic staff of Republic Bulgaria and the Regulation for its’ practice from Medical University Varna for the award of educational and scientific degree “Doctor”, and it includes all the necessary documents.

Dr. Aleksandra Krasimirova Yankova-Aleksieva receives her master’s degree in Medicine in 2016 from Medical University Varna. In October the same year she begins working as a resident doctor at Second Neurological Clinic at St. Marina Hospital-Varna. In 2018 she begins her specialization in Neurological diseases and also becomes an assistant in “Occupational diseases” at Medical University Varna. In 2023 she receives her specialist certificate in Neurological diseases from Medical University-Varna.

In 2019 Dr. A. Yankova becomes a doctoral student in “Occupational diseases”. During the time of her doctorate she has been a part of several thematic courses in her specialty, as well as courses required for her doctorate: scientific research methods, ethics of scientific studies, statistical methods of data analysis, communicative techniques, presentation skills and other. Her scientific interests include sleep disorders, cerebrovascular diseases, electromyography and neurological complications of occupational diseases.

Dr. A. Yankova is fluent in English and Russian. She is a member of the Bulgarian Medical Association, Bulgarian Society of Neurology and European Stroke Organisation.

## **2. Structure of the dissertation**

The dissertation is presented on 114 pages, it contains all the fundamental sections and the structure is in accordance to the requirements, listed in the Book of regulations for the development of the academic staff of Medical University-Varna. The scientific work contains 46 figures, 13 tables and 4 applications.

The presented bibliography contains 198 literary sources, of which 4 are in Cyrillic and 194 in English. Around 25% of the cited sources are from the last five years.

The dissertation has been approved and directed towards defense at a council by the Department of "Optometry and Occupational diseases", Medical University "Prof. dr Paraskev Stoyanov"- Varna.

## **3. Actuality of the dissertation**

In today's industrialized world 24 hour work day duration has become an indispensable part of certain services like healthcare, public safety, public transportation and others. One of every five workers works in shifts, which can lead to the development of Shift Work Disorder (SWD), presented with a dysregulation of the circadian rhythm, insomnia and/or excessive sleepiness. According to the International Classification of Sleep Disorders 2-5% of shift workers develop different sleep disorders, which can lead to health issues, a decline in quality of life and can increase the risk of work errors.

According to several studies, conducted in the last 10 years, between 15 to 30% of European workers have a shifting schedule. The British Trades Union Congress (2018) has presented data, revealing that in five years time shift workers have increased with 5%, from which 2/3 are women. Shift work is related to certain chronic diseases- it can increase the risk of oncological diseases (prostate cancer in men, breast cancer in women), cardio-vascular and gastrointestinal diseases, metabolic disorders and obesity. Shift workers suffer more frequently from depression (42%) or have problems in their social life due to the atypical work hours. Most workers have decreased workability and attention, as well as slower reactions during night shifts, all of which increase the risk of work related accidents, which is the reason for medical and social-economic importance of the studied problem.

### **➤ *Literature review***

The literary review is presented on 35 pages, on which dr. Aleksandra Yankova has systemized the history and physiology of sleep, the functional changes and stages of sleep, contemporary data for sleep neurotransmitters, as well as the classification of the different sleep disorders, which include insomnia, sleep apnea, hypersomnolence, parasomnia, movement and circadian disorders. The diagnosis and follow up methods of sleep disorders such as grading scales and

polysomnography have been presented in detail. Several scientific sources were cited, which concerned the connection between sleep disorders and comorbidity of cardio-vascular, endocrinal, neurological, psychiatric and oncological diseases, as well as their connection to shift work and the social-economic consequences for the individual and society. The data is presented in a logical sequence and details different aspects of the problem, which proves the ability of the doctoral student to assess and analyze scientific articles. In this section we see the significant number of consulted literary sources, from which only 4 are in Cyrillic and over a quarter are from the last 5 years. The formulated conclusions from the literary review define the main goal of the scientific study, which is to study the sleep quality and disorders, as well as their influence on the health status in shift workers, and confirm the topicality of the dissertation.

#### ➤ *Research methods*

The selected research methods allow achieving the set goal and receiving an adequate answer to the set tasks. The subject of the study are 100 individuals of working age, divided into two groups- first (50) made of shift workers (43,10±10,41 years of age) and a control group (50) with an 8 hour work day (45,38±10,39 years of age). The studies were done on the territory of Saint Marina hospital-Varna, First Neurological clinic, during the period of 10.2020 to 09.2022. Pittsburg Sleep Quality Index, Insomnia Severity Index and Epworth Sleepiness Scale were used to scale sleep quality, the presence and severity of insomnia and excessive sleepiness.

A polysomnographic study was conducted in order to objectively assess the different sleep indicators- sleep duration, latency, efficiency, arousal count, Apnea-Hypopnea Index and count of periodic limb movements.

The used assessment methods are aimed towards sleep disorders, related to Shift Work Sleep Disorder.

The statistical processing of the results was conducted with the help of a contemporary software, which has been presented in the form of tables and figures.

#### ➤ *Results and discussion*

The results from the study are presented and discussed in 50 pages, containing 13 tables and 46 figures. The analysis of the demographic data does not establish a statistically significant difference between both groups in regard to mean age, age groups, gender and education. In both groups there is a relatively higher count of workers with mainly mental labor and forced posture. A significant difference about the presence of workplace stress was found- 90% in the first group confirmed its' presence, against 62% from the control group. Shift workers describe their health as "worse" (64%) in comparison to the control group (36%), which can lead to more frequent absence from work. The number of workers with an 8 hour work day without any chronic diseases (62%) is significantly higher

than the shift workers (36%), ( $p=0,03$ ). The data, proving the appearance of chronic diseases in a younger age in the group of shift workers,  $33,55\pm 5,83$  years of age, in comparison to the control group- $41,09\pm 8,69$  years of age ( $p=0,0002$ ), presents an interest. The most common of the accompanying diseases in both groups are hypertensive disease, dislipidemia, degenerative diseases of the lumbosacral region of the spine, ischemic heart disease and anxiety, which are more common in shift workers. A significant difference is found only about dislipidemia, most likely attributed to the less healthy food habits, as well as the more common use of alcohol in shift workers.

There is a significantly higher number of shift workers who describe their sleep with a "poor quality"-64%, compared to 24% of those with normal work hours ( $p=0,011$ ). A "poor" sleep quality at a much earlier age ( $45,12\pm 10,16$  years of age) is found in shift workers in comparison to the ones with regular work hours ( $53\pm 9,39$  years of age), ( $p=0,01$ ), while in both groups with the increase of age an increase of "poor" sleep quality is seen. A statistically significant difference in the hours of falling asleep and waking up in non-work days is proven between both the studied groups. The mean count of hours of sleep in non-work days in shift workers is significantly lesser- $6,96\pm 1,53$ , in comparison to controls- $8,22\pm 0,84$ ,  $p<0,0001$ .

The used assessment scales for the quality of sleep (PSQI), the presence of insomnia (ISI) and sleepiness during different every day activities (ESS), reveal a significantly higher point count in shift workers than in the control group. A positive correlation was found between the years of experience in shift work and a worse quality of sleep, severity of insomnia and excessive sleepiness.

All of the participants underwent a nine hour polysomnography, which presented with significantly shorter sleep duration and decreased sleep efficiency, as well as an increased number of arousals in the first group (with 2 hours), in comparison to the second group. This data confirms the presence of insomnia in the shift workers and is in accordance to the Insomnia Severity Index results.

The analyzed occupational factors reveal that shift work influences significantly several sleep indicators. Workplace stress influences the number of arousals during sleep, the presence of a forced work posture and mental labor increase the Apnea-Hypopnea Index, while mental labor increases the number of periodic limb movements during sleep. Some of the results could be combined in one figure (for example fig 30 and 31; 37 and 38; 39 and 40), in order to give a better visual idea for the discovered differences.

The dissertation ends with five clearly formulated conclusions, which are in accordance to the given tasks.

Three of dr. A. Yankova's contributions are original in character due to the complex study for the first time in the country of the sleep quality and disorders, health status and accompanying

diseases, as well as the influence of the different occupational factors on the sleep quality in shift workers.

The rest of the contributions confirm the worse quality of sleep in shift workers, the positive correlation between age and worse health status in shift workers.

The bibliography is composed of 198 literary sources (4 in Cyrillic and 194 in English), 50% from which are from the last 10 years.

#### **4. Assessment of the publications and personal contributions of the doctoral student**

Dr A. Yankova has presented 3 scientific publications in full text, to all of which she is the first author and 4 scientific presentations at conferences in the country with international participation.

#### **5. Abstract**

The abstract is presented in 127 pages and contains 12 tables, 46 figures and 4 applications. In this part we see the large volume of the abstract, which repeats the structure and the contents of the dissertation, with included applications and some inconsistencies between the tables and their citation in the text. It would be best if this part was shorter and focused mainly on the results, which confirm the conclusions.

### **CONCLUSION**

The presented for opinion materials give me reason to think that dr. A. Yankova has major contribution in the development of the presented dissertation, possesses theoretical knowledge and professional capabilities in the scientific specialty "Occupational diseases". Despite the commentary and recommendations, the scientific work is in accordance to the requirements of the law for the development of academic staff in Republic Bulgaria and the regulations for its' practice by Medical University Varna. This gives me reason to give a **positive assessment for the award of educational and scientific degree "Doctor" to dr Aleksandra Krasimirova Yankova-Aleksieva in the scientific specialty "Occupational diseases"**, professional direction 7.1 Medicine, in the field of higher education 7. Healthcare and sport.

05.07.2023

Stara Zagora

Review by:



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