


RESEARCH

Open Access



Sleep disorders linked to quality of life in a sample of Egyptian policemen a comparative study between shift workers and non-shift workers

Rehab Mohamed Naguib^{1*} , Abdel Nasser Mahmoud Omar¹, Naglaa Mohamed ElKhayat², Sherien Ahmed Khalil¹, Mostafa Ahmed Mohamed Kotb³ and Lobna Azzam¹

Abstract

Background Poor sleep is associated with bad health outcomes, worse well-being and decreases in performance, productivity and safety at work. Police officers are exposed to several risk factors including extended work schedules, shift work, occupational stress, dangerous and traumatic events and can, as such, develop sleep problems.

So, this study aimed to compare quality of life, occupational stress level, between shift and non-shift workers' policemen working at EL-Agouza Police Hospital.

This was a cross-sectional comparative study conducted on 64 policemen working in 6 different Police department recruited from sleep clinic neuropsychiatry department at EL-Agouza Police Hospital serving police officers in EL-Nile Street, Giza, Egypt. The total included cases were classified to two groups: group I (shift workers) included 32 of shift workers who provide service across, all 24 h of the clock each day of the week (often abbreviated as 24/7), group II (non-shift workers): included 32 of non-shift workers.

Results Occurrence of sleep disorders was significantly higher in the shift workers compared to the non-shift worker group ($p < 0.01$).

Conclusions In the current population-based study of police officers, poor sleep quality was more prevalent among officers who were engaged in shift work. The findings are consistent with prior evidence that night shift carried the greatest risk of poor sleep quality because night-shift officers have to make some adaptations that compensate for their natural circadian patterns.

Keywords Sleep, Shift work, Occupational, Occupational stress, Police officers, Quality of life

Background

A stressful environment at work and shift work together can cause disturbed sleep [17]. Also, less psychosocially supportive and highly demanding jobs can be a causative factor of stress and sleep disturbance, compared to good psychosocial support and better work environment [19].

High levels of stress and fatigue are strictly inherent to police work. Police officers often experience extended work schedules, shift work, occupational stress, and dangerous and traumatic events [21]. Numerous studies

*Correspondence:

Rehab Mohamed Naguib

rehab_naguib@med.asu.edu.eg; Rehab.naguib@gmail.com

¹ Okasha Institute, Ain Shams University, Cairo, Egypt

² Ain Shams University, Cairo, Egypt

³ New Cairo Police Authority Hospital, Cairo, Egypt

have reported that, compared with other professions, police officers are at increased risk for stress-related physical illnesses, including heart disease and metabolic syndrome [10].

Even nightshift police officers have poorer sleep quality compared to day workers [8]. So assessment of the extent of poor sleep quality among police officers who work for long hours under high-risk and uncontrolled environments is particularly important [26]. This is because poor sleep quality and fatigue in police officers elevates the risk of fatal and non-fatal injuries to both the officers and the general public [26].

Sleep disturbance occurs in shift workers because of the disturbance of circadian rhythm [24]. Which in turn can cause disturbance of several hormones, including melatonin and cortisol, thus leading to an increased risk of metabolic syndrome, e.g., obesity and type 2 diabetes mellitus [24].

Meanwhile, the poor sleep that results from disruption of circadian rhythms can lead to cognitive impairment and work under-performance; this can be overcome by good social support and a supportive work environment [5].

Fortunately, preventive measures to reduce psychosocial stress at work places such as family support, social support and better work environment can decrease sleep problems and a worker can then be more efficient and productive during working hours [13].

Aim of the work

To assess the occurrence of sleep disorders in shift workers police officers and its impact on quality of life.

To examine association of shift work with sleep quality, quality of life between shift and non-shift workers' policemen.

Methods

Study design

This study is a cross-sectional comparative study.

Setting

This study was carried out in El-Agouza Police Hospital serving police officers and their families in 101 El Nile Street, Giza, Egypt.

Time of the study

From January 2019 till December 2020.

Target population

Sixty-four cases (32 cases of shift workers and 32 cases of non-shift workers) of at El-Agouza Police Hospital.

Inclusion criteria

Age range: 20–50 (retirement age). Gender: males. Nationality: Egyptian.

Exclusion criteria

Presence of major medical illness. Presence of other neurological or psychiatric disorders. Refusal to give consent. Those who are on medications affecting sleep cycle 1 month before polysomnography.

Sampling method

Convenient sample method.

Sample size

Sample size was calculated using SPSS program, setting the type-1 error (α) at 0.05 and the confidence interval width at 0.2 (margin of error 10%). Result from previous study [11] showed that the prevalence of sleeping disorders among policemen ranged between 3.5% for hypersomnia and 20.6% for insomnia. Calculation according to these values produced a minimal sample size of 64 policemen.

Data collection tools

A signed detailed informed consent was obtained by each patient and control before enrollment into the study.

Tools

The structured clinical interview for DSM-IV (SCID I)

It is a clinician-administered semi-structured interview for use in psychiatric patients. It provides a broad coverage of psychiatric diagnosis according to DSM-IV and consists of nine diagnostic modules (mood episode, psychotic symptoms, psychotic disorder differential, mood disorder differential, substance use, anxiety, somatoform disorder, eating disorder, and adjustment disorder). It was designed to be more efficient and simpler to use other than other existing instruments and, consequently, to require less time for training and administration, the Arabic version was used and done by the psychiatrist [7].

Arabic translation of the short version of The World Health Organization Quality of Life scale (WHOQOL-BREF)

The World Health Organization Quality of Life (WHOQOL) project was initiated in 1991. The aim was to develop an international cross-culturally comparable quality of life assessment instrument. It assesses the individual's perceptions in the context of their culture and value systems, and their personal goals, standards, and concerns. The WHOQOL instruments were developed collaboratively in a number of centers worldwide, and have been widely field-tested. The WHOQOL-BREF instrument comprises 26 items, which measure

the following broad domains: physical health, psychological health, social relationships, and environment. The WHOQOL-BREF is a shorter version of the original instrument that may be more convenient for use in large research studies or clinical trials 26 questions which evaluates 4 domains: physical health, mental health, social relationships, and environmental health. In scoring the sleep quality questionnaire, seven components were checked. The minimum and maximum scores for each component were considered from 0 (no difficulty) to 3 (very serious problem). Finally, scores of each component were summed together and resulted in a general score (from 0 to 21).

Polysomnography (sleep lab)

Polysomnography is an investigative tool used to diagnose sleep disorders. Polysomnography records the brain waves, the oxygen level in your blood, heart rate and breathing, as well as eye and leg movements during the study [15]. Polysomnography is usually done at a sleep disorders unit within a hospital or at a sleep center. The test records the nighttime sleep patterns. Polysomnography is occasionally done during the day to accommodate shift workers who habitually sleep during the day [16]

Structured sleep disorders questionnaire of Asaad and Kahla (Arabic-translated version)

Sleep history was taken from all patients through the structured sheet for sleep disorders, which consist of 72 questions regarding the following: Personal sleep rituals. Past or present history of sleep disturbance and medications used. Drug history of psychiatric or other physical disorders. Sleep disorders which are insomnia, hypersomnia, parasomnias, or dyssomnias [2].

Study procedures

The study was conducted on a segment of cases attending sleep disorders clinic at El-Agouza Police Hospital on Saturdays and Monday of each week after completion of the procedures for approval of the study. The cases were attending the clinic suffering from different types of sleep problems and cases selection was upon non medicated cases for any sleep aid treatment.

The study tools were applied to all cases, SCID I for exclusion of any psychiatric disorder that may affect the sleep pattern of the cases and then the other tools were applied to complete the research, all the tools were applied by the researcher in one setting either with the cases or controls.

The polysomnography was applied to all cases during night, in the off days away from their shifts; all cases were working "24 h" shifts with maximum 3 shifts per week on the basis of a shift day and an off day.

Before starting to collect final data, a pilot study was carried out over 10 participants to fulfill the following purposes

Determination of the organization and administrative procedures. Testing the questionnaire form and detecting any modifications needed. Estimation of the time needed to collect the data and examination. Detection of the difficulties that might arise and how to deal with them.

Administrative design

Data management

The data were coded, entered and analyzed by SPSS program version 14 (statistical package for social sciences) data were summarized as mean \pm standard deviation and percentage. *T* test was used for comparison of mean of the two groups, chi-square for comparison of qualitative data Pearson's correlation test was used to test relation between two numeric variables. Multiple regression test to find out the most important variables affecting QOL. Cut-off level: $P \leq 0.05$ = significant (*), $P \leq 0.001$ = highly significant (**).

Results

This is a cross-sectional comparative study included a total of 64 cases recruited from sleep clinic neuropsychiatry department at EL-Agouza Police Hospital serving police officers in El-Nile Street, Giza, Egypt. The total included cases were classified to two groups:

Group (I) shift workers

Included 32 of shift workers who provide service across, all 24 h of the clock each day of the week (often abbreviated as 24/7).

Group (II) non-shift workers

Included 32 of non-shift workers, who were matching the cases group.

All subjects were selected according to inclusion and exclusion criteria and they were subjected to the study tools selected for diagnosis and exclusion and were studied by the polysomnography and the results were as follows:

Table 1 revealed that there is no statistically significant difference between the two studied groups as regard age, BMI, marital status, and smoking.

Table 2 shows that The non-shift worker police officers group scored significantly higher (better) WHOQOL-BREF score compared to the shift workers as regards physical health, psychological health, social relationships, and environment ($p < 0.01$).

Table 1 Sociodemographic data

Variable	Groups		P value (Sig.)
	Group (I) Shift workers (n = 32)	Group (II) Non-shift workers (n = 32)	
Age (year)	36.1 ± 6.9 (21–50)	35.6 ± 8.0 (23–50)	0.78 ^{NS}
Body mass index (kg/m ²)	28.7 ± 4.4 (24.5–38.1)	27.3 ± 2.9 (24.1–33.6)	0.14 ^{NS}
Marital status			0.45 ^{NS}
Single	8 (25%)	7 (21.9%)	
Married	20 (62.5%)	19 (59.4%)	
Divorced	4 (12.5%)	6 (18.7%)	
Cigarette smoker	28 (87.5%)	25 (0.78%)	0.25 ^{NS}

Quantitative data were presented as mean ± SD (range). Qualitative data were presented as no. (%) T test was used. NS not significant

Table 2 Comparison of the WHOQOL-BREF between shift workers and non-shift workers

The World Health Organization Quality of Life scale (WHOQOL-BREF)	Groups		P value (Sig.)
	Group (I) Shift workers (n = 32) (M ± SD)	Group (II) Non-shift workers (n = 32) (M ± SD)	
Physical health	23.4 ± 4.5	28.6 ± 3.9	0.01**
Psychological health	21.2 ± 3.2	24.7 ± 3.1	0.01**
Social relationships	11.1 ± 2.3	13.7 ± 2.7	0.01**
Environment	23.1 ± 3.3	26.2 ± 3.1	0.01**

T test was used

** highly significant ($p < 0.01$)

Table 3 Comparison of the polysomnography between shift workers and non-shift workers

Sleep efficiency	Groups		P value (Sig.)
	Group (I) Shift workers (n = 32)	Group (II) Non-shift workers (n = 32)	
Poor (< 80%)	15 (46.9%)	5 (15.6%)	0.01**
Fair (80:90%)	13 (40.6%)	11 (34.4%)	
Good (> 90%)	4 (12.5%)	16 (50.0%)	
Sleep quality			
Very poor	19 (59.4%)	7 (21.9%)	0.01**
Poor	12 (37.5%)	13 (40.6%)	
Fair	1 (3.1%)	12 (37.5%)	
Sleep latency	22.15 ± 4.749	17.4 ± 2.8	0.007*
NI	3.195 ± 1.416	2.2 ± 0.7	0.037*
NII	52.09 ± 2.031	50.2 ± 0.8	0.01*
NIII	19.97 ± 2.458	24.2 ± 1.1	0.0001*
REM	24.43 ± 2.28	23.4 ± 1.6	0.224
REM latency	64.8 ± 7.172	70.5 ± 6.0	0.039*
REM density	18.89 ± 1.741	18.6 ± 1.0	0.629
Apnea index	2.74 ± 1.679	0.9 ± 0.3	0.002*

Chi-square test was used

*significant ($p < 0.05$)

** highly significant ($p < 0.01$)

Table 3 shows that Polysomnography parameters was significantly better in the non-shift worker group compared to the shift workers ($p < 0.01$).

Table 4 shows that occurrence of sleep disorders was significantly higher in the shift workers compared to the non-shift worker group ($p < 0.01$).

Discussion

Shift work is defined as diversity of working hour's arrangements, including night shifts, overtime work, and irregular or rotational work patterns. Also, described as 'a way of organizing daily working hours in which different persons or teams work in succession to cover more than the usual 8-h workday, up to and including the whole 24 h [3]. Sleep disturbance is one of the most common health-related effects of shift work particularly among health-care workers [6].

The association of shift work with poor sleep quality is also well documented in the literature. Working on night shifts has been associated with insomnia, shorter sleep duration, day time sleepiness, and overall poor sleep quality; however, there are limited epidemiologic studies that estimated prevalence of poor sleep quality and examined its association with shift work among law

Table 4 Comparison of the sleep disorders between shift workers and non-shift workers

Sleep disorders	Groups		P value (Sig.)
	Group (I) Shift workers (n = 32)	Group (II) Non-shift workers (n = 32)	
Sleep disorders			
Yes	31 (96.9%)	11 (34.4%)	0.01**
No	1 (3.1%)	21 (65.6%)	
Type of sleep disorders			
Hypersomnia	4 (12.5%)	1 (3.1%)	0.35 ^{NS}
Insomnia	24 (75.0%)	9 (28.1%)	0.01**
Breathing	5 (15.6%)	3 (9.4%)	0.71 ^{NS}
Limb movements	7 (21.9%)	1 (3.1%)	0.49 ^{NS}

Chi-square test was used

** highly significant ($p < 0.01$)

NS non significant

enforcement officers, especially studies where shift work was objectively assessed for longer durations [18].

Results from prior studies of shift work and sleep quality among law enforcement officers are conflicting; some reported a significant and negative impact of shift work on overall sleep quality or component(s) of sleep quality, whereas others were either inconclusive or did not find significant differences in poor sleep quality between shift working versus day time officers [12].

In this study, the results of the base line characteristics of the studied groups demonstrated that there was insignificant difference between both groups regarding age, BMI, marital status, and smoking cigarette ($p > 0.05$).

Kerkhof [14] in his study found that shift workers did not differ significantly from the sample of day workers with respect to gender, age, number of children, level of income, and participation in housekeeping. While statistically significant differences were observed with respect to partnership and education, that is, shift workers were more likely to be single. This harmony may be due to similarity in the studied age group as his study excluded the records of individuals younger than 21 years and older than 60 years, considering that the lifestyles of students and retired persons would warrant separate categories [14].

Also in agreement to the study results, Shaker and his colleagues [22] who conducted a study on 99 male employees who were divided into three groups, which are morning shift workers ($n = 36$), afternoon shift workers ($n = 19$), and night shift workers ($n = 44$); demonstrated that there was no statistically significant difference between three groups as regards age, duration of employment, and smoking habit ($P > 0.05$).

Similarly, in another study including 210 shift workers and 204 non-shift workers in textile factory conducted by Yazdi and his colleagues [26], found that all participants were male, and the mean age was 34.8 ranging from 22 to 45 in which there were no significant differences in the age, BMI, marital status, and years of employment. This similarity may be due to the nature of the two occupation that require rotation of work hours between employees and the studied groups in both studies were male.

On the other hand, the study conducted by Ahmed and his colleagues [1], found that the mean age of shift work nurses was lower than that of the morning shift work group (32.11 ± 6.14 vs 37 ± 7.84 years) with statistically significant difference ($P < 0.001$). This difference may be due to the dissimilarity of the studied group.

Moreover, the same study revealed that higher education was more prevalent among the morning shift group compared with the shift work group (66.7 vs 27.8%). Mean job duration among the morning shift group was higher compared with the shift group (15.23 ± 7.4 vs 11.62 ± 6.23 , $P < 0.001$).

Also in study to evaluate sleep disorders, health, and safety in police officers by Rajaratnam and his colleagues [20] showed resemblance with our study findings who revealed that shift workers had significantly associated with positive screening for sleep disorder. A (40.4%) screened positive for at least 1 sleep disorder. One thousand six hundred sixty-six participants (33.6%) screened positive for obstructive sleep apnea, the most common disorder, followed by 281 (6.5%) with moderate to severe insomnia.

Moreover, this agreement explained by the finding of circadian misalignment can deteriorate cognitive

performance in chronic shift workers and increase the rate of depressive symptoms in nurses working night shifts [12].

This study results demonstrated that the non-shift worker police officers group scored significantly higher (better) WHOQOL-BREF score compared to the shift workers as regards physical health, psychological health, social relationships, and environment ($p < 0.01$).

Similar findings were reported by Ferri and his colleagues [9] who found that shift nurses had greater emotional instability and worse social relationships. Furthermore, Booker and his colleagues [4] found that impaired psychological health is strongly associated with risk of shift work disorders.

In this study, the results found that Polysomnography parameters including Sleep efficiency and sleep quality was significantly better in the non-shift worker group compared to the shift workers ($p < 0.01$).

In consistence with our study results, Ahmed and his colleagues [1] found that 73% of shift group nurses suffered from poor subjective sleep quality compared with the morning shift group (20%), and the mean scores (2.26 ± 0.76 vs 1.17 ± 0.53) have differed significantly ($P < 0.001$), which is similar to the result of a study in China, which reported that the poor sleep quality rate was 72.1% among shift work nurses and in another study from Taiwan, 75.8% of shift nurses suffered from poor sleep quality.

Moreover, Shaker and his colleagues [22] results portrayed that sleep problems were higher in night workers than in morning and afternoon workers. Also, night workers had more disturbed sleep, snoring, recovery need after a work period, sleep problems on day sleep after night shifts, and sleep problems before the morning shift than morning and afternoon workers; the differences between the three groups were statistically significant.

In similar with our study results, Fekedulegn and his colleagues [8] found that there was a significant association between shift work in the past month and prevalence of poor sleep quality.

In the same direction, previous study on police officers have reported significantly poorer overall sleep quality or component of sleep quality in shift-working officers compared with those on the day shift. Wu and his colleagues [25] study of Chinese policemen found that officers involved in shift work had significantly higher sleep quality scores compared with those on day shift. In our study, we also observed significantly higher global sleep quality scores among shift workers. This harmony may be due to the similarity of the studied population and the use of the same measurement tools.

Also, in another study by Sofianopoulos and his colleagues [23], it was demonstrated that compared shift-working officers with those on the day shift indicated that symptoms of insomnia and insufficient sleep are more frequent among shift workers.

Garbarino and his colleagues [11] found that differences in the prevalence of overall poor sleep quality (day shift = 15%, non-day shift = 29%, $P = 0.137$) and mean global sleep quality score (day = 5.8 ± 3.0 , non-day = 6.1 ± 2.6 , $P = 0.629$) were not statistically significant. This is in contrast to findings from the current study in which both the prevalence of poor sleep quality and mean global sleep quality score were significantly higher in shift-working officers.

Our study illustrated that sleep disorders assessed by structured sleep disorders questionnaire of [2] was significantly higher in the shift worker group compared to the non-shift workers ($p < 0.01$). In the same direction Yazdi and his colleagues [26] study demonstrated that that the prevalence of insomnia and poor sleep quality was significantly higher in shift workers than non-shift workers. This harmony may be due to excessive daytime sleepiness is related to increased rate of stress and interpersonal tensions at work.

Limitations

This study had some limitations in which the small sample size which may affect generalization of our results so further study with larger sample size is needed to establish our results.

Another limitation of this study included the cross-sectional design and the ensuing inability to make causal inferences, the use of subjective sleep reports and the potential common method bias, and the inability to conduct clinical interviews or employ objective sleep recordings.

Conclusions

In the current population-based study of police officers, poor sleep quality was more prevalent among officers who were engaged in shift work. The findings are consistent with prior evidence that night shift carried the greatest risk of poor sleep quality because night-shift officers have to make some adaptations that compensate for their natural circadian patterns. The results of this study, as well as studies from other countries, showed that policemen are at risk of sleep disorders. Work shift was also associated with increased incidence of depression or anxiety. Work shift sleep disorders are prevalent and important health concerns among policemen. Sleep disorders can affect police's performance and quality. Therefore, planning for improving work shift schedules by the police administration can be helpful and the use of day rest after night shift work can improve the sleep quality of policemen.

Abbreviations

DSM-IV	Diagnostic and Statistical Manual of mental disorders
QoL	Quality of life
SCID I	The structured clinical interview for DSM-IV
WHOQOL-BREF	The World Health Organization Quality of Life scale

Acknowledgements

We would like to thank all the participants in this research, without their time and efforts, we could not have reached this step.

Authors' contributions

RN analyzed the data. AO reviewed the results. NE contributed to the polysomnography analysis. SK contributed to the formation of results. MK collected the data from the cases and controls. LA contributed to the writing of the manuscript. All authors read and approved the final manuscript.

Funding

None.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations**Ethics approval and consent to participate**

An informed verbal and written consent from participants was taken and confidentiality of information was assured. An official written administrative permission letter was obtained from dean of faculty of medicine, Ain Shams hospital manager, El-Agouza Police Hospital manager. The title and objectives of the study were explained to them to ensure their cooperation. Ethical Consideration: Permission from the faculty of medicine ethical committee was also obtained. And each participant has the right to withdraw anytime during the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 30 January 2023 Accepted: 22 May 2023

Published online: 04 August 2023

References

- Ahmed AS, Hamed RA (2020) Sleep disorder among shift work nurses and its impact on their quality of life at Al Ahrar Governmental Hospital, Zagazig City Egypt. *Egypt J Psychiatr* 41(2):117
- Asaad T, Kahla O (2001) Psychometric sleep assessment instrument, an Arabic version for sleep evaluation. EL Nahda library, EL Fagala, Cairo
- Bazrafshan MR, Rahimpoor R, Moravveji F, Soleymaninejad N, Kavi E, Sookhak F, Zolghadr R (2019) Prevalence and effects of sleep disorders among shift work nurses. *Jundishapur J Chronic Dis Care* 8(1):e81185
- Booker LA, Sletten TL, Alvaro PK, Barnes M, Collins A, Chai-Coetzer CL et al (2020) Exploring the associations between shift work disorder, depression, anxiety and sick leave taken amongst nurses. *Journal of sleep research* 29(3):e12872
- Cheng P, Tallent G, Bender TJ, Tran KM, Drake CL (2017) Shift work and cognitive flexibility: decomposing task performance. *J Biol Rhythms* 32(2):143–153
- Cho JW, Duffy JF (2019) Sleep, sleep disorders, and sexual dysfunction. *World J Mens Health* 37(3):261–275
- El Missiry A, Sorour A, Sadek A, Fahy T, Abdel Mawgoud M, Asaad T (2004) Homicide and psychiatric illness: an Egyptian study [MD thesis]. Faculty of Medicine, Ain Shams University, Cairo
- Fekedulegn D, Burchfiel CM, Charles LE, Hartley TA, Andrew ME, Violanti JM (2016) Shift work and sleep quality among urban police officers. *J Occup Environ Med* 58(3):e66–e71
- Ferri P, Guadi M, Marcheselli L, Balduzzi S, Magnani D, Di Lorenzo R (2016) The impact of shift work on the psychological and physical health of nurses in a general hospital: a comparison between rotating night shifts and day shifts. *Risk Manage Healthcare Policy* 9:203–211. <https://doi.org/10.2147/RMHP.15326>
- Garbarino S, Magnavita N (2015) Work stress and metabolic syndrome in police officers. A prospective study *PLoS one* 10(12):e0144318
- Garbarino S, De Carli F, Nobili L, Mascialino B, Squarcia S, Penco MA, Ferrillo F (2002) Sleepiness and sleep disorders in shift workers: a study on a group of Italian police officers. *Sleep* 25(6):642–647
- Haile KK, Asnakew S, Waja T, Kerbih HB (2019) Shift work sleep disorders and associated factors among nurses at federal government hospitals in Ethiopia: a cross-sectional study. *BMJ Open* 9(8):e029802
- Johannessen HA, Sterud T (2017) Psychosocial factors at work and sleep problems: a longitudinal study of the general working population in Norway. *Int Arch Occup Environ Health* 90(7):597–608
- Kerkhof GA (2018) Shift work and sleep disorder comorbidity tend to go hand in hand. *Chronobiol Int* 35(2):219–228
- Kramer NR (2018) Overview of polysomnography in adults. <https://www.uptodate.com/contents/search>. Accessed Oct. 22
- Mason RJ, et al. (2018) Obstructive sleep apnea. In: Murray and Nadel's textbook of respiratory medicine. 6th ed. Philadelphia, Pa: Saunders Elsevier; 2016. <https://www.clinicalkey.com>. Accessed Oct. 21
- Palmer KT, D'Angelo S, Harris EC, Linaker C, Sayer AA et al (2017) Sleep disturbance and the older worker: findings from the Health and Employment after Fifty study. *Scand J Work Environ Health* 43(2):136–145
- Pepin E, Gillet P, Sauvet F, Gomez-Merino D, Thaon I, Chennaoui M, Leger D (2018) Shift work, night work and sleep disorders among pastry cooks and shopkeepers in France: A cross-sectional survey. *BMJ Open* 8(5):e019098
- Portela LF, Kröning Luna C, Rotenberg L, Silva-Costa A, Toivanen S et al (2015) Job strain and self-reported insomnia symptoms among nurses: what about the influence of emotional demands and social support? *Biomed Res Int* 2015:820610
- Rajaratnam SM, Barger LK, Lockley SW, Shea SA, Wang W, Landrigan CP, Czeisler CA (2011) Sleep disorders, health, and safety in police officers. *JAMA* 306(23):2567–2578
- Santana AM, Gomes JK, De Marchi D, Girondoli YM, Rosado LE, Rosado GP, de Andrade IM (2012) Occupational stress, working condition and nutritional status of military police officers. *Work* 41:2908–2914
- Shaker D, Samir A, Zyada F, El-Sharkawy M, Ekladios SM (2018) Impact of shift work on sleep problems, hormonal changes, and features of metabolic syndrome in a sample of Egyptian industrial workers: a cross-sectional study. *Middle East Curr Psychiatry* 25(2):91–97
- Sofianopoulos S, Williams B, Archer F (2012) Paramedics and the effects of shift work on sleep: a literature review. *Emerg Med J* 29(2):152–155
- Wirth MD, Andrew ME, Burchfiel CM, Burch JB, Fekedulegn D et al (2017) Association of shiftwork and immune cells among police officers from the Buffalo Cardio-Metabolic Occupational Police Stress study. *Chronobiol Int* 34(6):721–731
- Wu H, Gu G, Yu S (2014) Effect of occupational stress and effort-reward imbalance on sleep quality of people's policeman. *Zhonghua yu Fang Yi Xue Za Zhi [Chinese Journal of Preventive Medicine]* 48(4):276–280
- Yazdi Z, Sadeghniaat-Haghighi K, Loukazadeh Z, Elmizadeh K, Abbasi M (2014) Prevalence of sleep disorders and their impacts on occupational performance: a comparison between shift workers and nonshift workers. *Sleep Disord* 2014:870320

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.