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ORIGINAL RESEARCH

Sleep Habits and Disturbances in Healthcare Workers: A Cross-Sectional Survey in French Public Hospitals

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Purpose: To describe the sleep habits (bedtime hours, waking hours, sleep duration) and to assess the prevalence of sleep disturbances (acute and chronic insomnia, insufficient sleep, perceived sleep debt) among French healthcare workers.

Participants and Methods: Nurses and assistant nurses working in public hospitals from the Loire department at different work schedules (2x12h, 2x8h, fixed daytime, fixed nighttime) were asked about their socioprofessional and demographic information, their sleep habits and disturbances during night shifts, and the acceptability of a 20-min nap opportunity.

Results: A total of 297 healthcare workers completed the survey with 76% reporting a sleep debt with a lower prevalence for fixed nighttime workers (62%) and a higher prevalence for 2x12 h (84%) workers. The prevalence of acute insomnia was 76% with a significant difference between fixed nighttime (60%) and 2x12 h (82%); whereas the prevalence of chronic insomnia was 35% without any significant difference between working schedules. Moreover, 18% of healthcare workers reported excessive daytime sleepiness, while 13% admitted to using sleep medication at least once a week.

Conclusion: French healthcare workers reported poor sleep quality with a high prevalence of sleep debt, acute and chronic insomnia symptoms without an obvious impact of working schedules.

Keywords: Sleep habits, healthcare workers, shift work, epidemiology, nurses

Introduction

About 15–20% of the adult population in Europe works atypical hours, outside the 6 a.m. to 8 p.m. range.[1] In some countries like France, night shift work has increased in popularity over the past 20 years with 2 times more night shift workers.[2] Little is known about the sleep habits and disorders of French healthcare workers, and the acceptability of potential countermeasures such as napping also remains in question.

Previous studies have shown that shift work and night shift work are associated with deleterious outcomes, such as cancers, cardiovascular events or diabetes.[3–5] One common point to most of these outcomes is probably sleep debt.[6,7] Indeed, it has been shown that most of the time, night shift workers have less than 6 h of sleep per 24 hours.[8,9] Insomnia prevalence was also shown to be 5 times higher in a sample of clinical workers with atypical work schedules.[10] Shift work is also known to disrupt circadian rhythms, with previous findings on nurses showing that melatonin secretion is reduced by exposure to light during night work.[11] Despite these short- and long-term outcomes, shift work remains essential to ensure continuity in many emergency sectors such as healthcare.

In this article, we describe the sleep habits and sleep-related disorders of French healthcare workers. In France, there are four primary working schedules in healthcare settings: 1) Fixed daytime schedule, in which caregivers work consistently for 7 hours and 40 minutes per day, starting usually between 8:00 and 11:00 a.m. and ending between

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4:10 and 7:00 p.m.; 2) Fixed nighttime schedule, in which caregivers work a 10-hour night shift from 8:30 p.m. to 6:30 a.m.; 3) 8-hour alternating schedule, in which caregivers alternate between a morning shift from 6:30 a.m. to 1:30 p.m. and an afternoon shift from 1:30 p.m. to 8:30 p.m.; and 4) 12-hour alternating schedule, in which caregivers alternate between a 12-hour day shift from 7:30 a.m. to 7:30 p.m. and a 12-hour night shift from 7:30 p.m. to 7:30 a.m..

In the last 4 years, the needs in term of workforce in the healthcare sector has drastically increased with the COVID-19 pandemic[11] and to cope with the lack of healthcare workers in France, many Hospital departments have favored the 2x12 h work schedule instead of the 2x8 h one. Still, the impact of these different work schedules on sleep remains largely unknown. In a cohort of Chinese health workers, rotating shift workers showed higher risks of sleep disturbance than the fixed day shift workers.[12] In the same time, several studies reported an increase in sleep disturbances prevalence among nurses. For example, a meta-analysis reported a 57% prevalence in sleep disturbances between March and May 2020 versus 22.8% between January and February 2020.[13] An umbrella review showed that frontline Hospital staff have a higher prevalence of insomnia or sleep disturbances than second-line hospital staff.[14] It is important to emphasize that the two studies previously mentioned were carried out within the context of the COVID-19 pandemic. This explains the shift towards 12-hour working days and a rise in absenteeism among the nursing staff. Therefore, it is important to have a better view of sleep habits, especially among healthcare workers for prevention of deleterious outcomes. A recent narrative review including 13 studies showed that 57–83.2% of nurses in shift work reported sleep disturbances, sleep deprivation or poor sleep quality.[15] These data are associated with an increased prevalence of physical, emotional and social stress.[16] More incident medical errors and driving accidents were also reported among nurses with sleep loss.[17,18]

In France, a study from Ohayon & Colleagues[8] reported 20 min less sleep duration among daytime rotating nurses for a morning shift compared to fixed daytime schedule. Moreover, nurses working on night shift or fixed nighttime schedule slept 1 h less than rotating daytime or fixed daytime nurses. To our knowledge, no other survey has investigated sleep habits in French healthcare workers since this study performed 20 years ago. Still, both societal habits and the organization of care have changed since early 2000 and updated data on sleep in healthcare workers are needed.

The primary objective of this study was to describe the sleep habits (bedtime hours, waking hours, sleep duration) of French healthcare workers according to their work schedule (fixed daytime, fixed nighttime, 2x8 h or 2x12 h). The secondary objectives were to assess the prevalence of sleep disturbances (acute and chronic insomnia, insufficient sleep, perceived sleep debt and excessive daytime sleepiness (EDS) in this population of healthcare workers according to their work schedules and to assess the feasibility of an on-duty nap during night-shift work.

Methods

Research Design

A multicentric, open, cross-sectional, observational survey was conducted in 4 out of 20 hospitals from the Loire territory Hospital group (THG) electronically using a secure web application (LimeSurvey GmbH, Hamburg, Germany). The study was approved by the local ethics committee (Commission recherche de Terre d'Éthique Centre Hospitalier Universitaire de Saint-Etienne, IRBN352022/CHUSTE, France) and complies with the principles outlined in the Declaration of Helsinki. All participants gave their written informed consent electronically using a secure web application (LimeSurvey GmbH, Hamburg, Germany). We adhered to relevant EQUATOR guidelines using the STROBE cross-sectional checklist.

Data Collection and Participants

The THG Loire gathers more than 15300 healthcare professionals and 7700 hospital beds. All these hospitals work together to ensure coordination, consultation and care offering. Thus, THG Loire appeared as a representative population to investigate sleep habits and sleep disturbances in France. This study was restricted to nurses and care assistants. Physicians and technicians were not included. No other eligibility criteria were defined. This study was coordinated by the Occupational Health Service from the University Hospital of Saint-Etienne. The principal investigator (CP) contacted occupational health physicians from four peripheral hospitals randomly selected to participate in this survey. Then each occupational health physician randomly selected departments from their Hospital to participate in this study. Data were

collected from May 2022 to September 2022. A total of 13 departments were selected from the University Hospital of Saint-Etienne, 11 services from this center and 18 from three peripheral hospitals (Roanne, Montbrison/Feurs, Annonay) accepted to participate in this study. An Email was sent to the head physician and healthcare manager of each department selected to present the study objectives. If a positive answer was provided, then an appointment was organized with the healthcare workers (nurses and care assistants) to present the purpose and procedures of this study. Flyers and posters presenting the study were left in the selected departments with a QR code allowing participation in the survey using LimeSurvey.

Working Schedule

Four different working schedules were investigated: 1) fixed daytime schedule for those always working 7 h 40/d (between 8:00 to 11:00 a.m. to 4:10–7:00 p.m); 2) fixed nighttime schedule for those always working 10 h during night shift (from 8:30 p.m. to 6:30 a.m); 3) 2x8 h for those working alternating morning shift (6:30 a.m. to 1:30 p.m) and afternoon shift (1:30 p.m. to 8:30 p.m); 4) 2x12 h for those working alternating day shift (from 7:30 a.m. to 7:30 p.m) and night shift (from 7:30 p.m. to 7:30 a.m).

Measurements

The survey was electronically and anonymously completed by volunteer nurses and nursing care assistants in LimeSurvey .This survey included 4 parts.

1) A socioprofessional and demographic section to collect age, sex, seniority, occupational status, work schedule, function, Hospital center.

2) A section about sleep habits and sleep disturbances. Self-reported sleep habits were assessed by asking about bedtime hours, waking hours, sleep duration on rest day, and nap habits on work days (depending of the working schedule) and during rest days. 24 h sleep opportunity was estimated by adding time in bed and nap time for each work schedule on work day and on rest day. Perceived sleep debt was subjectively assessed by asking participants if they felt sleep deprived. Severe sleep debt was defined as a difference greater than 90 min between self-reported sleep time and ideal sleep time.[19] Chronotype was assessed by one question asking whether participants felt alert in the morning and sleepy in the evening (morning type), not alert/sleepy in the morning or in the evening (intermediate type), or sleepy in the morning and alert in the evening (vesperal type).

Insomnia was assessed according to the third International Classification of Sleep Disturbances (ICSD-3) based on insomnia symptoms (difficulties with sleep initiation, sleep maintenance, or early awakening) for at least 3 times per week and the duration of exposure >3 months (chronic) or <3 months (acute). The Epworth Sleepiness Scale (ESS) was used to assess subjective EDS.[20] The ESS score ranged from 0–24 and a score ≥11 indicated EDS.

3) A section investigated lifestyle habits by asking about physical activity at different levels (sedentary, moderate, vigorous), alcohol consumption (number of alcohol drinks per week), coffee consumption (number of cups per day) and smoking status (nonsmoker, previous or current smoker).

4) The last section concerned the identification of barriers and levers inherent to the implementation of a 20-min nap on the night shift. The first question was designed to determine whether healthcare workers working night shifts (2x12h and fixed night shifts) would support the introduction of a 20-min nap at their workstation. In order to identify the barriers and levers inherent to napping, a multiple-choice question was asked to the study participants, with the following response choices: a) continuity of care provided by a colleague; b) a quiet room with room to lie down; c) a dedicated nap room inside the department; d) a dedicated room for napping outside the department.

Statistical Analyses

Data are presented as mean and standard deviation (SD) for continuous variables or as number of subjects and percentages for categorical variables. Normality was assessed with the Shapiro Wilks test. A one-way ANOVA was used to compare continuous parametric variables according to work schedule, following by a Bonferroni post hoc in case of significance. Otherwise, the Kruskal–Wallis test was used as a nonparametric equivalent. For categorical variables, chi-square test or Fischer exact test was used, as appropriate. All statistical analyses were performed using IBM SPPS

Statistics version 26.0 for Macintosh (IMB Corp, Armonk, N.Y. USA). Significant results were considered for a two-sided test with $p < 0.05$.

Results

Participants Characteristics

Among 740 eligible participants, 297 (40%) healthcare workers completed this survey, including 210 nurses (70.7%) and 87 (29.3%) care assistants. Among them, 49.6% (n=147) worked in a 2×12 h shift schedule, 18% (n=53) worked in a fixed nighttime schedule,15.5% (n=46) worked in a 2x8h schedule, and 13.8% (n=41) worked in a fixed daytime schedule. Table 1 shows their demographic characteristics. Most participants of the sample were female (87.2%), middle aged (mean age: 38.2 ± 10.7 years old) with a mean seniority of 13.2 ± 9.8 y, and a mean seniority inside their department of 8.0 ± 7.4 y.

Sleep Habits Characteristics

Sleep habits characteristics according to working schedule are shown in Table 2. Bedtime varies according to the working schedule (fixed day/night schedule, 2x8 h, 2x12 h) and the work or rest period. On average, during working days, fixed day workers reported spending 7.5 h in bed, while fixed night worker spent 6 h in bed. For rotating workers (2x8 h and 2 x12 h), the time spent in bed is less during work days before the morning/night shift schedule for 2x12 h. However, it differs following the afternoon/day shift in favor of afternoon shift with 9.5 h bedtime for 2x8h and only 7.5 h bedtime for 2x 12 h (Table 2).

Off-duty naps during rest days were mainly taken by fixed night shift workers, who are 3–4 times more likely to take a nap on days off compared to other shift schedules (Table 2). Off-duty naps were mainly reported by 2x12 h workers (19%) during night shift and more scarcely reported by fixed nighttime workers (4%).

Violin plots showing 24-h sleep opportunity distribution according to shift work are shown in Figure 1.

Table 1 Sociodemographic Characteristics

		Overall (n=297)	Fixed Daytime (n=41)	Fixed Nighttime (n=53)	8 h Shift Work (n=56)	12-h Shift Work (n=147)	p-value
Age (y)		38.2 ± 10.7	41.1 ± 10.9	39.2 ± 11.4	37.6 ± 11.5	37.3 ± 9.9	0.192
Gender	Female (%) Man (%)	259 (87.2%) 38 (12.8%)	38 (92.7%) 3 (7.8%)	48 (90.6%) 5 (9.4%)	53 (94.6%) 3 (5.4%)	120 (81.6%) 27 (18.4%)	**0.037**
Job	Nurses (%) Assistants Nurses (%)	210 (70.7%) 87 (29.3%)	23 (56.1%) 18 (43.9%)	33 (62.3%) 20 (37.7%)	34 (60.7%) 22 (39.3%)	120 (81.6%) 27 (18.4%)	**0.001**
Current smoker (%)		59 (22.8%)	8 (21.6%)	10 (22.2%)	11 (23.4%)	30 (23.1%)	0.997
Coffee consumption	0 1–3 cups 4 cups	86 (33.0%) 110 (42.1%) 65 (24.9%)	7 (19.4%) 21 (58.3%) 8 (22.2%)	22 (47.8%) 15 (32.6%) 9 (19.6%)	15 (31.9%) 21 (44.7%) 11 (23.4%)	42 (31.8%) 53 (40.2%) 37 (28.0%)	0.135
Chronotype	Morning type (%) Intermediate type (%) Vesperal type (%)	131 (50.2%) 62 (23.7%) 61 (23.3%)	27 (20.6%)* 4 (6.4%) 3 (4.9%)	14 (10.6%) 15 (24.2%) 17 (27.8%)*	25 (19%) 14 (22.5%) 8 (13.1%)	65 (49.6%) 29 (46.7%) 33 (55.1%)	**0.007**
Number of children (n)		1.1 ± 1.1	1.1 ± 1.0	1.2 ± 1.1	1.0 ± 1.1	1.2 ± 1.1	0.782
Distribution of working time in full-time equivalent (%)		96.1 ± 9.3	95.4 ± 8.7	93.7 ± 11.5	96.3 ± 9.4	97.0 ± 8.5	0.149
Seniority in the job (y)		13.2 ± 9.8	16.9 ± 10.4	15.1 ± 11.4	11.0 ± 9.5	12.4 ± 8.8	**0.010**
Seniority in the service (y)		8.0 ± 7.4	5.9 ± 4.8	9.1 ± 8.9	8.5 ± 8.3	8.1± 7	0.208

Notes: Data are presented as mean ± SD or n (%); significant p-values are in bold; * indicate adjusted residuals > |2|.

Table 2 Sleep Habits of Healthcare Workers by Work Schedule

	Work Schedule	Fixed Daytime (n=41)	Fixed Nighttime (n=53)	8-h Shift Work (n=46)	12-h Shift Work (n=147)	P-value
Bedtime (hh:mm)	Day/morning	10:30 (10:00–11:00) p.m.	-	10:30 (9:10–11:00) p.m.	10:30 (10:00–11:00) p.m.	0.076
	Night/afternoon	-	8:30 (8:00–9:00) a.m.	11:00 (10:30–11:30) p.m. ###	9:00 (8:30–9:00) a.m.	**<0.001**
	Free day	11:00 (10:30–11:30) p.m.	11:00 (10:30–0:00) p.m.	11:00 (10:30–11:30) p.m.	11:00 (20:30–11:30) p.m.	0.300
Wake up time (hh:mm)	Day/morning	6:00 (5:40–6:30) a.m.	-	5:25 (5:00–5:34) a.m. ###	6:00 (5:45–6:20) a.m.	**<0.001**
	Night/afternoon	-	2:30 (1:30–3:00) p.m.	8:20 (7:00–9:30) a.m. ###	2:00 (1:00–3:00) p.m.	**<0.001**
	Free day	8:00 (7:20–9:00) a.m.	7:30 (7:00–9:45) a.m.	8:00 (7:00–9:30) a.m.	8:00 (7:00–9:00) a.m.	0.548
Time in Bed (hh:mm)	Day/morning	7:30 (7:00–8:08) a.m.	-	7:00 (6:30–8:00) a.m.	7:30(7:00–8:00) a.m.	0.141
	Night/afternoon	-	6:00 (5:00–7:00) a.m.	9:30 (8:00–10:30) a.m. ###	5:00 (4:00–6:00) a.m.†	**<0.001**
	Free day	9:00 (8:00–10:00) a.m.	8:00 (7:00–9:00) a.m.	9:30 (8:00–10:30) a.m.	9:00 (8:00–10:00) a.m.	0.986
Estimated sleep duration (hh:mm)	Free day	8:00 (7:00–9:00) a.m.	8:00 (7:00–9:00) a.m.	8:00 (7:00–9:20) a.m.	8:00 (8:00–9:00) a.m.	0.293
Off duty nap (%)	Day/morning	1 (2%)	-	18 (37%)*	6 (4%)	**<0.001**
	Night/afternoon	-	22 (42%)	18 (37%)	62 (47%)	0.428
	Free day	8 (19%)	47 (89%)	13 (28%)	39 (27%)	0.585
Duration of off duty nap (min)	Day/morning	30	60 (45–120)	60 (45–120)	75(30–140)	0.592
	Night/afternoon	-	60 (52–90)	60 (45–120)	60 (45–120)	0.202
	Free day	60 (30–60)	45 (20–80)	60 (37–120)	60 (30–60)	0.120
24-h sleep opportunity (h)	Day/morning	7:30 (7:00–8:10)	–	7:30 (6:30–8:30)	7:30 (7:00–8:00)	**0**.714
	Night/afternoon	–	6:30 (5:15–7:00)	10:00 (8:30–10:30)###	5:30 (4:30–6:30)†	**<0.001**
	Free day	9:00 (8:30–10:10)	9:00 (8:15–10:40)	9:30 (8:15–10:30)	9:25 (8:30–10:30)	0.315
Severe sleep debt (%)	All	5 (14.7%)	13 (27.7%)	3 (6.7%)	21 (16.2%)	0.057
Diagnosed obstructive sleep apnea (%)	All	0 (0%)	1 (1.9%)	1 (2.2%)	2 (1.4%)	0.854

Notes: Data are presented as median (interquartile range), mean ± SD or n (%). Significant p-values are in bold. ###: p<0.001 vs fixed nighttime and 12-h shift work; †: p<0.05 vs fixed nighttime; * indicate adjusted residuals > |2|.

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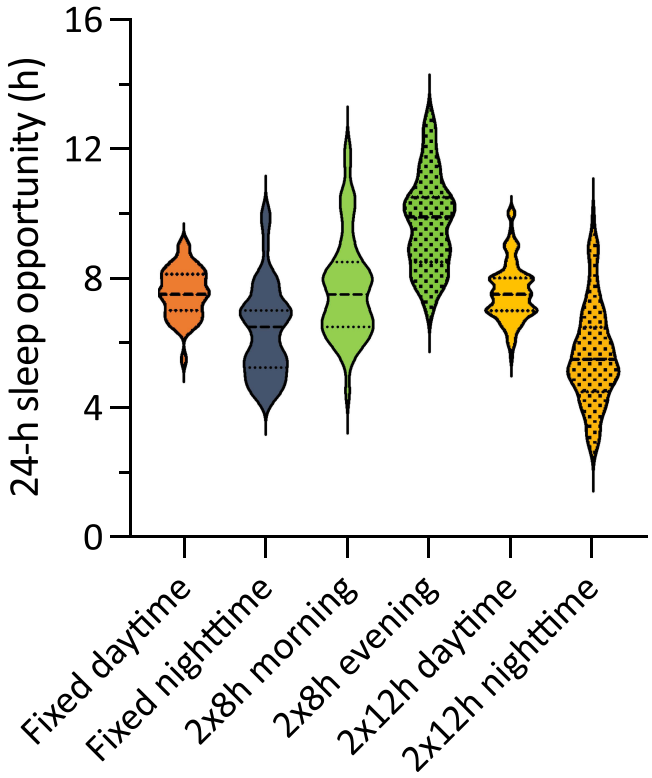

Figure 1 Violin plots showing 24-h sleep opportunity distribution according to shift work schedule.

Sleep Disturbances

Acute insomnia was highly prevalent in our healthcare workers population with 76% of the sample reporting at least one symptom of insomnia defined as difficulty falling asleep at night, waking up during the night, waking up too early more than 3 times per week. When comparing shift schedules, we found that healthcare workers working on the 2x12 h shift schedule were more likely to report acute insomnia (82%) compared to other groups; while those working on a fixed night schedule were less likely to report acute insomnia symptoms (60%, p=0.020) (Figure 1). Chronic insomnia was two times lower in the overall sample compared to acute insomnia (35% vs 76%, respectively) and no significant differences were found according to work schedules (Figure 2).

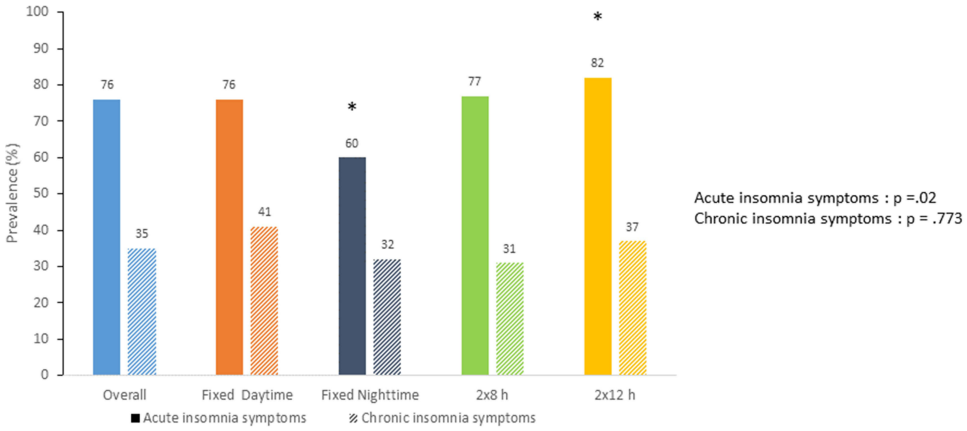

Figure 2 Acute and chronic insomnia symptoms among healthcare workers (%).
Notes: * indicate adjusted residuals > |2|.

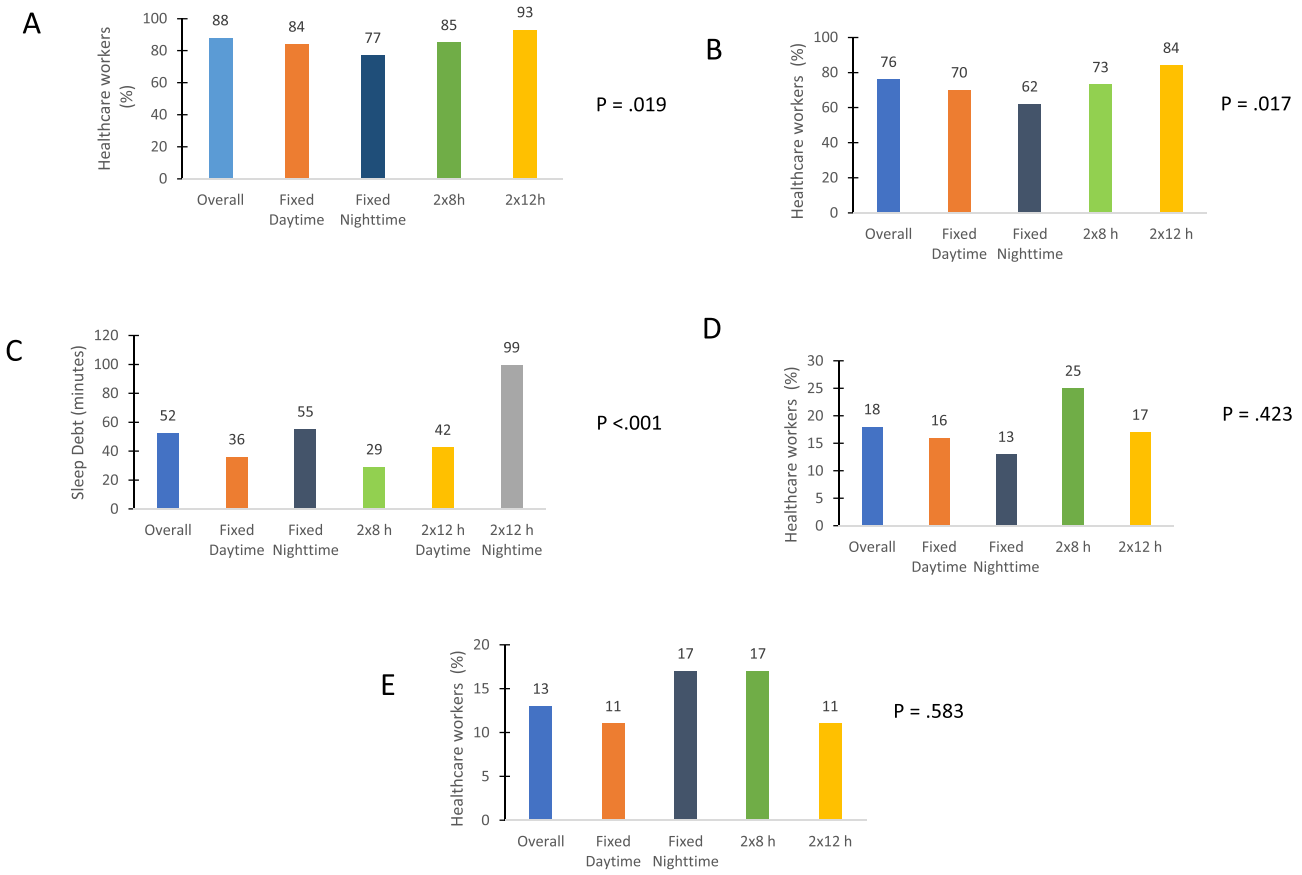

Figure 3 (**A**) Prevalence of sleep disturbances; (**B**) Prevalence of sleep debt; (**C**) Sleep debt duration (min); (**D**) Prevalence of excessive daytime sleepiness; (**E**) Use of medication at least once a week.

In our sample, 88% reported sleep disturbances. Healthcare workers in the fixed nighttime schedule reported lower sleep disturbances (77%), while those in the 2x12 h shift schedule reported more sleep disturbances (93%) (p=0.019; Figure 3A).

More than 76% of healthcare workers felt sleep deprived with a significant difference between working schedules (p=0.017; Figure 3B). Moreover, healthcare workers working on 2x12 h exhibited sleep debt almost twice higher than fixed nighttime with 99.6 min vs 55.2 min, respectively and three time higher than fixed daytime and 2x8h workers (p<0.01; Figure 3C). Overall, 18% of the healthcare workers reported EDS and no significant difference was found between work schedules (p = 0.423) (Figure 3D). Finally, 13% of healthcare workers reported using medication at least once a week to sleep. Again, no significant difference was found between workers with different sleep schedules (p = 0.583) (Figure 3E).

Nap

Concerning the identification of barriers and levers inherent to the implementation of a 20-min nap during night shifts, 197 healthcare workers (160 women, 81%) working either in fixed night shifts (27%) or in 2x12 h shifts (73%) responded. The vast majority of healthcare workers working at night (90%) were in favor of the implementation of a nap within their post. Regarding the barriers and levers, two main levers emerge from the survey: the need to ensure the continuity of care and the provision of a quiet room to lie down.

Discussion

This study aimed to explore the sleep habits of French healthcare workers working different work schedules (fixed day, fixed night, 2x8 h, 2x12 h). The results revealed that 18% of the healthcare workers were excessively sleepy and 13%

used sleeping pills more than once a week. Regarding insomnia, three quarters of the healthcare workers reported symptoms of acute insomnia, while one third reported chronic insomnia. Finally, three quarters reported sleep debt and only 12% reported no sleep disturbance.

Sleep Habits and Sleep Debt Among Healthcare Workers

Our data are similar to those of Ohayon & colleagues who found a median sleep duration of 6 h for those working night shifts and fixed night schedules. In our study, we only reported time in bed, so total sleep duration is likely even shorter. Other studies have reported similar short sleep duration associated with night shift work and are consistent with ours.[6,21,22] Reasons for such a short sleep may be explained by daytime light environment that prevents melatonin secretion from inducing sleep since melatonin secretion is a major factor in the development of sleep.[23,24]

Surprisingly, when considering perceived sleep deprivation, it is interesting to note that fixed night shift workers exhibited less sleep deprivation than 2x8 h workers (62 vs 73%) and significantly less than 2x12h workers (62 vs 84%). One might have expected a lower prevalence of perceived sleep deprivation among 2x8h workers since they get more sleep than workers on fixed night schedules. Despite a similar 24-h sleep opportunity between fixed nighttime and 2x12 h shift schedules, fixed nighttime workers reported less perceived sleep debt. Reasons for such discrepancies may be explained by the specific profile of night shift workers who may have a shorter sleep profile. Indeed, a fixed atypical work rhythm such as fixed night work allows the biological clock to adapt, whereas a work rhythm with rotations forces a continuous adaptation of the circadian rhythm of the workers, especially if these are fast as happens for healthcare workers.[25] The 2x8h workers in our sample woke up at a median time of 5:25 a.m., a time of day that corresponds to the circadian nadir of body temperature.[26] Ohayon & colleagues reported that rotating day workers suffer from more fragmented sleep than fixed scheduled or night shift workers. Although sleep fragmentation was not investigated in the present study, our results on insomnia symptoms suggest that this population not concerned by night shift work is still at high risk of sleep disturbance.

Healthcare workers working a 2x12 h schedule reported a greater perceived sleep debt than all other work schedules in our study. A previous study performed in employees of a power plant in Australia showed no difference in sleep debt between 2x12 h and 2x8 h shift work, but employees on 12-h shifts are at greater risk of occupational injury.[27] Another study showed that 2x12 h nurses were described as having a greater need for recovery,[28] which could be associated with a greater need for sleep among 2x12 h healthcare workers. One reason for such a sleep debt in our 2x12 h healthcare workers is the time spent in bed which is at least 1 h lower than all other shift schedules with a median time in bed of 5 h. These findings are consistent with a previous study showing that among 80 US nurses working 2x12 h for three consecutive days, their time in bed is only 5.4 h after the night shift,[29] which is very similar to our population sample.

This study found greater sleepiness during night work, which may subsequently increase the risk of injury or accident. In our study, we found an 18% prevalence of EDS with no significant difference according to shift schedules. These results are consistent with previous finding[8] that showed a 29% EDS prevalence in rotating daytime workers compared to 25% in our study, although questionnaires to assess EDS differed.

Sleep Disturbances

Only 4 participants (1.3%) reported being treated for obstructive sleep apnea, without significant difference between work schedules. However, in our sample, about three quarters of healthcare workers had symptoms of acute insomnia. Among them, healthcare workers in fixed night shift work we likely to report acute insomnia while those in 2x12 h shift were more likely to report these symptoms. For acute insomnia, healthcare workers working on a 2x12 h shift schedule were more likely to report sleep debt (84%) compared to other groups; while those working on a fixed night schedule were less likely to report sleep debt (62%). These findings suggest that a similar pattern seems to emerge regarding the prevalence of chronic insomnia and reported sleep debt among our participants. Of note, chronic insomnia was twice lower than acute insomnia with about one third of our sample reporting symptoms of insomnia for more than 3 months without significant difference between work schedules. However, the prevalence of healthcare workers reporting chronic insomnia in our sample remains twice higher compared to results of[8] (31–41% vs 12–18%, respectively). Reasons for such discrepancies may be explained by changes in sleep habits over time.[30] Moreover, one significant difference lies in

use of new technologies such as smartphones that may explain shortening sleep probably due to the overuse of screens at bedtime.[31]

A survey using a sample of 1586 Norwegian nurses assessed chronic insomnia with the Bergen Shift Work Sleep Questionnaire[32] working either in three-shift rotation, two-shift rotation and permanent night. The results found that insomnia was more prevalent in the two-shift rotation schedule than the three-shift rotation schedule (29.8% and 19.8%, respectively). Insomnia during the night shift showed higher frequencies among three-shift rotation workers compared with permanent night workers (67.7% and 41.7%, respectively).[33] In our study, we did not have a three-shift rotation sample, but on the evening shift the prevalence is comparable to ours; whereas for fixed nighttime the Norwegian survey showed a higher prevalence compare to our fixed nighttime sample. A Canadian survey had indicated that insomnia was more common among night and shift workers than among day workers.[34] In that study, it appeared that being a shift worker or working at night was associated with insomnia, but the association was stronger between total sleep time and insomnia than with shift work.[34] Interestingly, subjective sleep debt followed the same pattern as the findings for acute insomnia in our study. Therefore, our results for acute insomnia may be related to shorter sleep time associated with severe sleep debt rather than to the work schedule itself.

No significant differences were found concerning the use of sleeping pills in our study, with overall 13% of the healthcare workers taking sleeping pills. To our knowledge, no other study on a French population of healthcare workers reported such information. By comparison, a Norwegian study[35] found that 7.5% of nurses used prescribed sleeping pills, while 4.7% and 2.0% reported using over-the-counter sleeping pills and melatonin, respectively. Results regarding the use of sleeping pills are, however, heterogeneous. Indeed, a Japanese study[36] found that 10% of shift workers used hypnotics, whereas 56% of Canadian emergency physicians used them regularly.[37] In our sample, most healthcare workers (17%) who use sleeping pills worked at night or in daytime rotating shift (2x8 h), but no significant difference was found with other work schedules.

Countermeasure

One countermeasure adopted by healthcare workers to counter the effects of workplace sleepiness and fatigue has been identified: napping. Regarding napping, Ohayon et al reported a similar proportion (approximately 35%) of healthcare workers working night shifts, fixed night shifts, and rotating day shifts who napped 3 times per week[8].

Our results do not follow this pattern, with fixed night workers napping less off duty compared to 2x12h night workers and morning workers. The proportion of napping in the morning shift could be explained by short sleep duration and early awakening, due to the forbidden zone,[38] a phenomenon that prevents sleep induction before 9 p.m., so afternoon naps provide recovery to compensate. Most night workers in our study took a nap on their day off (89%). This strategic placement of napping is consistent with prophylactic napping defined as a nap to reduce sleep pressure and alleviate alertness.[39] With respect to the duration of naps, the aforementioned authors did not report this, but a Japanese observational study found that on a 16-h shift, 30.1% of 196 night workers slept for >90 min and 69.9% for <90 min, whereas none of our subjects napped for >75 min on average.[40] Napping at work seems to be more popular in some countries, such as Japan and less so in France or South Korea, where at best 43% of healthcare workers working a 2x12 h shift take a nap on the shift in our study and nearly 80% of the 2165 night workers did not have the opportunity to nap.[41] This can be explained by cultural and representational differences between countries, as well as the healthcare system, which must allow for continuity of care.[42] On the other hand, napping at work has been shown to decrease sleepiness and improve performance[43,44] and may be an excellent strategy to implement to improve health and healthcare performance for those working nights. Results concerning the identification of specific levers for the implementation of an "official" nap within the service highlighted some interesting elements for its practical implementation. The first being the need to ensure the continuity of care, while the second point that stands out is the setting up of a room with the possibility of lying down. These findings highlighted the need to modify working/rest schedule and workplace to facilitate these implementations; but further qualitative studies are needed to better identify the organizational, structural and societal barriers and levers to an "official" nap implementation during night work.

Study Strengths and Limitations

This survey has allowed to update our knowledge on sleep habits and sleep disturbances prevalence in French healthcare workers since workstation and workload have consistently evolved in the last two decades. The main strength of this study relies on the investigation of four different shift schedules, while previous studies usually grouped different rotating shifts without distinction.

Some limitations should, however, be mentioned. Although services participating in this study were randomized, this remains a convenience sample since only voluntary and interested healthcare workers completed the survey, which may have induced a selection bias limiting the generalizability of the results. Sleep data were self-reported and may have been underestimated or overestimated.[45] Further studies with objective measurements are needed to confirm these self-reported findings.[46] Regarding sleep habits, we only collected time in bed on workdays, but subjective sleep quality was not reported and information regarding sleep onset latency or wake after sleep onset is lacking. We have chosen not to include this questionnaire so as not to make the survey too time-consuming to complete and to encourage adhesion.

Lastly, some clinical diagnosis such as chronic insomnia must be confirmed by clinical interview with a physician.

Conclusion

Our results highlighted a high variability in sleep habits in healthcare workers depending of their work schedule. This high variability in sleep habits from one day to the other, together with sleep debt, may explain the high prevalence of acute and chronic insomnia symptoms reported in our French healthcare workers population. Knowing the impact of sleep disturbances and sleep deprivation on health outcomes, it is urgently needed to set up prevention actions on sleep in healthcare workers. Future studies should focus on the development of effective countermeasures such as physical activity, diet or naps to combat the negative effects of shift work on sleep among healthcare workers.

Abbreviations

EDS, excessive daytime sleepiness; THG, territory Hospital group; ICSD-3, third International Classification of Sleep Disturbances; ESS, Epworth Sleepiness Scale.

Data Sharing Statement

Data supporting the results reported in this manuscript will be made available by the authors upon reasonable request.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that there are no conflicts of interest in this work.

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