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Occupational Risk for Headache Disorders in Female Registered Nurses. A Retrospective Study

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Abstract

Background: *Prevention of headache disorders (HDs) among healthcare workers in hospital settings remains a challenge for organizations and employees worldwide. The goals of the present retrospective study were both to analyze the 1-year prevalence of any primary HDs among female registered nurses (RNs) employed in hospital settings and to investigate the relationship between occupational risk factors and HDs.* **Methods:** *We analyzed the occupational medicine database of RNs employed in a large hospital. The sample included 975 female RNs; the diagnostic criteria were based on the International Classification of Headache Disorders, 3rd edition (beta version).* **Results:** *One-year prevalence of any HD was 45.9%; tension-type headache (TTH) was the most commonly reported headache type (by 25.6% of participants), followed by migraine (17.5%). No association was found between the different headache types and work schedules; TTH was linked to age ≥40 years (OR=1.91; 95% CI=1.41-2.72), duration of service ≥15 years (OR=1.61; 95% CI=1.24-2.38), and number of night shifts >5 per month (OR=1.71; 95% CI=1.09-2.68). A high level of WRS was a significant predictor of TTH.* **Conclusions:** *We found a link between TTH and modifiable risk factors at both the individual and organizational levels. These findings suggest interventions in occupational settings to minimize the occurrence of TTH among RNs. Policy-makers and employers should implement preventive measures to reduce the incidence of HDs among RNs by minimizing modifiable risk factors associated with increased occupational risk.*

1. Introduction

Headache disorders (HDs) represent a public health problem worldwide as they affect up 90% of people during their lifetime. and are recognized the second cause of disability in all age groups and the first among women under 50 years of age [1, 2]. Globally, HDs affect people of all races, income levels, and geographic areas, and occur more frequently in females than in males [3]. HDs are among the top three most common neurological conditions across most age groups, from age five onward, and remain in the top three until age 80 [4-5]. According to a growing body of evidence, people who suffer from headache-related disorders face health consequences that can lead to impaired quality of life and financial cost due to lost productivity resulting from headache-related absenteeism [6,7]. Several studies revealed increased risk of cardiovascular and cerebrovascular events, myocardial infarction, and stroke in people suffering from HDs [8]; moreover, increased prevalence of anxiety and depression was

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found in people suffering from migraines compared to healthy individuals. [9]. Given the global burden of HDs, the World Health Organization (WHO) endorsed the Global Campaign to Reduce the Burden of Headache, aimed at minimizing the burden of headache worldwide [10]. In a recent study, Thomas et al. [11] found a relationship between headache-attributed disability and lost productivity in occupational settings; interestingly, the authors demonstrated that investment in structured headache services for treatment of HDs is expected as cost saving besides cost-effective, given that relief of disability through effective treatment of HDs is expected to recover > 20% pro rata of lost productivity.

Many studies performed in workplace settings showed occupational risk factors as triggers for HDs, with females at higher risk than males [1, 12-14]. Work-related stress (WRS) and psychosocial factors present in the workplace, such as low skill discretion, low decision authority, role conflicts, bullying, and effort–reward imbalance, have been found among the triggers of headache, with reciprocal relationships between these factors [15]. Nevertheless, to date, few studies have analyzed the relationship between shift work and HDs, and conclusions are not convergent and suffer from methodological limitations that limit generalizability across occupational settings. In a recent cross-sectional study among nurses, Bjovartn et al. [16] found a relationship between HDs and both shift-work disorder (SWD) and working >20 nights per year, but no relationship with work schedule. Consistent with these findings, a study by Wang et al. [17] found a relationship between HDs and >8 night shifts per month among nursing staff; moreover, seniority of >5 years was found to be a risk factor for HDs. A recent metanalysis [18] focused on seven cross-sectional studies in different occupational settings, showed that individuals working night shifts had a 44% higher risk of developing headaches (HR = 1.44, 95% CI: 1.09-1.90, P = 0.011); furthermore, shift work was found to be associated with a higher incidence of migraines (HR = 1.63, 95% CI: 1.27-2.08, P < 0.001) and night shift work was associated with a decreased incidence of migraines (HR = 0.74, 95% CI: 0.57-0.96, P = 0.024); although the cross-sectional design of such seven checked studies included in the metanalysis did not allow the authors to draw strong conclusions, the findings confirmed the need for further studies on the matter.

Given the current concern regarding the occurrence of HDs in nursing staff working in hospital settings we performed a retrospective survey aimed to analyze the 1-year prevalence of any primary HDs among female registered nurses (RNs) in a large Hospital in Salento, Italy, and to investigate the relationship between occupational risk factors and HDs. The diagnostic criteria for HDs were based on the International Classification of Headache Disorders, 3rd edition (beta version) [19].

2. Methods

We conducted a retrospective survey by analyzing the occupational medicine database of RNs employed in a large hospital (Vito Fazzi Hospital, Lecce) located in Salento (the Southern part of the Puglia region, in Italy), who underwent the routine annual mandatory occupational health surveillance from March 1st, 2024, to February 28th, 2025. The sample included female RNs employed in hospital wards. To evaluate the prevalence of HDs, all RNs were interviewed by the occupational physician during the mandatory health surveillance. The diagnostic criteria were based on the International Classification of Headache Disorders, 3rd edition (beta version) (ICHD-3-beta) [19]. The occupational physician first interviewed the RNs, and the following question was asked: 'Have you suffered from a headache during the last year?' Only RNs who answered "yes" were asked to respond to the other headache items. The screening-positive RNs were asked to report frequency, attack duration, intensity, and accompanying headache symptoms to classify migraine, chronic headache (CH), medication overuse headache (MOH), and tension-type headache (TTH).

Respondents reporting headaches lasting more than 4 h per day on 15 or more days per month were given the label of chronic headache and questioned on medication usage to identify MOH [13]. Trigeminal autonomic cephalalgia, other primary headaches, and secondary headaches were not included in this study. MOH was defined as a chronic headache disorder in which the headache occurs

on 15 or more days per month due to regular overuse of medication; these headaches must have been present for more than 3 months last year [20]. We excluded RNs who had suffered head injuries, road accidents in the past year, or who were professionally exposed to chemicals that can cause HDs. All RNs were screened for SWD using three questions from the International Classification of Sleep Disorders (ICSD) [21]. The questions were: (a) Do you experience either difficulties sleeping or excessive sleepiness? (yes/ no), (b) Is the sleep or sleepiness problem related to a work schedule that makes you work when you usually would sleep? (yes/no), (c) Have you had this sleep or sleepiness problem related to the work schedule for at least 1 month? (yes/no). Participants were identified as suffering from SWD if they answered "yes" to all three questions. The WRS was evaluated according to the INAIL methodology [22, 23], and each RN was assigned a WRS level (high, medium, or low).

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 14.0. Analysis of the frequency of individual variables was conducted using descriptive statistics. Comparisons between groups were performed using the Mann-Whitney U test for nonparametric data when the groups were independent. The statistical significance was set at $p < 0.05$ for all analyses. The statistical analysis included an adjusted (age, marital status, and children living at home as covariates) logistic regression to calculate the odds ratio (OR) with a 95% confidence interval. In this study, the independent variables were age, length of service, work schedule, number of night shifts per month, SWD, and the dependent variables were the headache types (migraine, TTH, CH, MOH).

3. Results

The study involved 975 female RNs, with a mean age of 48.7 years (SD±9.4); demographic data are shown in Table 1.

The one-year prevalence of any HD among RNs was 448 (45.9%), with TTH being the most commonly reported headache type (by 25.6% of participants), followed by migraine (17.5%). Chronic headache and MOH were reported by 1.7% and 1.1% of RNs, respectively. Most of the RNs were exposed to high WRS (62,7%), and the 1-year prevalence of SWD was 24.4 %.

We found no significant differences in the prevalence of headache, migraine, TTH, chronic headache, or MOH across different work schedules (Table 2).

Similarly, logistic regression analyses adjusted for age, marital status, and children living at home showed no association between the various headache types and work schedule (Table 3).

Table 1. Main characteristics of the study population (female registered nurses).

Variables	n. (%)
Age (years)	
<40	355 (36.4)
≥40	620 (63.6)
Lenght of service (years)	
<15	381 (39.1)
≥15	594 (60.9)
Work schedule	
Day only	76 (7.7)
Two shift rotation	308 (31.6)
Three shift rotation	591 (60.7)
Number of night shifts per month	
0	385 (39.5)
1-5	485 (49.7)
>5	105 (10.8)
Shift work disorder	
No	737 (75.6)
Yes	238 (24.4)
Prevalence of primary headache last year	
Migraine	171 (17.5)
Tension-type headache (TTH)	249 (25,6)
Chronic headache (CH)	17 (1.7)
Medication overuse headache (MOH)	11 (1.1)
Work-related stress	
Low	62 (6.3)
Medium	302 (31)
High	611 (62.7)

Table 2. Prevalence of different headache types.

Variables	Migraine n (%)	TTH n (%)	CH n (%)	MOH n (%)
Age (years)				
<40	80 (22.5)	64 (18)	6 (1.69)	4 (1.12)
≥40	91 (14.7)	185 (29.8)	11 (1.77)	7 (1.13)
Lenght of service (years)				
<15	68 (17.8)	76 (19.9)	7 (1.84)	4 (1.05)
≥15	103 (17.3)	173 (29.1)	10 (1.68)	7 (1.18)
Work schedule				
Day only	14 (18.4)	18 (23.7)	1/(1.32)	1 (1.31)
Two shift rotation	52 (16.9)	70 (22.7)	6 (1.95)	4 (1.30)
Three shift rotation	105 (17.8)	161 (27.2)	11 (1.86)	6 (1.01)
Number of night shifts per month				
0	68 (17.7)	96 (24.9)	7 (1.81)	4 (1.04)
1-5	85 (17.5)	115 (24.5)	8 (1.65)	5 (1.03)
>5	18 (17.1)	38 (32.4)	2 (1.9)	2 (1.9)
Shift-work disorder				
No	129 (17.5)	171 (23.2)	13 (1.76)	6 (0.81)
Yes	42 (17.6)	78 (32.8)	4 (1.68)	5 (2.1)
Work-related stress				
Low	10 (16.1)	8 (12.9)	1 (1.6)	1 (1.6)
Medium	53 (17.5)	70 (23.2)	5 (1.7)	3 (1)
High	108 (17.7)	171 (27.9)	11 (1.8)	7 (1.1)

In the adjusted logistic regression analysis, TTH was associated with age ≥40 years (OR=1.91; 95% CI=1.41-2.72), length of service ≥15 years (OR=1.61; 95% CI=1.24-2.38), and having more than 5-night shifts per month (OR=1.71; 95% CI=1.09-2.68) (Table 3).

The prevalence of TTH was higher among RNs with SWD compared to nurses without SWD (Table 2); adjusted logistic regression analysis showed that TTH was associated with SWD (OR=1.59; 95% CI=1.18-2.21) (Table 3). Migraine, CH, and MOH were not linked to SWD. A high level of WRS was a predictive factor for TTH in RNs (OR=2.64; 95% CI=1.31-5.65), but not for other types of HDs.

After adjusting for age, we found a higher prevalence of TTH among RNs over 40 exposed to high-level WRS than among younger RNs (OR=3.19; 95% CI=2.10-4.85) (Table 4).

Migraine was most common among RNs under 40 years old (OR=3.19; 95% CI= 0.41-0.84), but no significant link was found with length of service, work schedule, night shifts, and SWD; no connection was found between both MOH and CH and the dependent variables examined in the study (Table 3).

4. Discussion

Our study examined the one-year prevalence of any primary HDs in female RNs working in hospital settings. Consistent with other studies [17,24], we found that the most common HDs were TTH and migraine, with prevalence rates aligning with the 1-year global prevalence in

Table 3. Adjusted regression analysis with different headache types as dependent variables.

Variables	Migraine OR (95% CI)*	TTH OR (95% CI)*	CH OR (95% CI)*	MOH OR (95% CI)*
Age (years)				
<40	1	1	1	1
≥40	0.58 (0.41-0.84)	1.91 (1.41-2.72)	1.1 (0.48-2.75)	1.15 (0.31-3,49)
Lenght of service (years)				
<15	1	1	1	1
≥15	0.98 (0.71-1.42)	1.61 (1.24-2.38)	0.92 (0.31-2.48)	1.08 (0.27-3.88)
Work schedule				
Day only	1	1	1	1
Two shift rotation	0.91 (0.49-1.67)	0.94 (0.51-1.68)	1.49 (0.18-12.56)	0.99 (0.11-8.96)
Three shift rotation	0.98 (0.52-1.85)	1.28 (0.71-2.24)	1.42 (0.18-11.17)	0.77 (0.10-6.48)
Number of night shifts per month				
0	1	1	1	1
1-5	0.99 (0.68-1.38)	0.98 (0-72-1.35)	0.91 (0.32-2.52)	0.99 (0.26-3.72)
>5	0.95 (0.51-1.65)	1.71 (1.09-2.68)	1.05 (0.21-5.12)	1.85 (0.33-10.24)
Shift-work disorder				
No	1	1	1	1
Yes	1.01 (0.69-1.49)	1.59 (1.18-2.21)	0.98 (0.35-2.98)	2.61 (0.79-8.65)
Work-related stress				
Low	1	1	1	1
Medium	1.11 (0.53-2.32)	1.91 (0.91-4.46)	1.03 (0.12-8.95)	0.61 (0.06-5.98)
High	1.12 (0.57-2.61)	2.64 (1.31-5.65)	1.12 (0.14-8.91)	0.71 (0.10-5.81)

**Logistic regression analyses with independent variables adjusted for age, marital status and children at home.*

Table 4. Adjusted regression analysis with tension-type headache (TTH) as dependent variable among RNs exposed to high WRS and split for age.

Age (years)	TTH OR (95% CI)*
< 40	1
> 40	3.19 (2.10-4.85)

**Logistic regression analyses with each independent variable adjusted for age, marital status and children living at home.*

the general population reported in the review by Stovner et al. [1].

Interestingly, our research revealed that the prevalence of migraine decreased in individuals over 40 years old, while the prevalence of TTH continued to increase in the same age group; these findings contrasted with the Global Burden of Disease study [25], which found that the prevalence of TTH declines with increasing age, including beyond 65 years, after peaking between ages 35–39. However, consistent with our findings, the review by Onan et al. [26] showed a negative relationship between age and migraine. We hypothesize that occupational exposure to WRS could lead to a higher risk of TTH in older RNs, as evidence suggests that vulnerability to stress increases with age [27].

To date, psychological WRS is widely recognized as a contributing factor to TTH; indeed, while many factors have been reported as headache triggers, stress is by far the most common [28]. The pathway through which WRS leads to TTH is not clearly

understood. Several past studies have highlighted that psychosocial factors appear to play a significant role in the onset of headaches and have shown that excessive psychosocial burdens resulting from work demands, insufficient control over work, and dissatisfaction with uninteresting tasks are associated with HDs [14, 15]. Low skill discretion and low decision authority, role conflict, poor social climate, bullying/harassment, and effort-reward imbalance have consistently been linked to higher odds of headaches in multiple studies examining occupational settings [29, 30].

Regarding the relationship between TTH and SWD, our findings are consistent with the study conducted by Bjorvatn [16], which revealed SWD as a risk factor for HDs, including TTH. The cross-sectional design of our study does not allow us to draw conclusions about the causal relationship between SWD and HDs but emphasizes the need for further investigation into the biological pathway linking SWD and TTH.

To date, although HDs have been suggested as a possible predisposing and sustaining factor of SWD, the causal relationship between SWD and HDs remains unclear, given the potential for a two-way relationship [31] as suggested by some studies that examined the issue and hypothesized that the connection between SWD and HDs is bidirectional [32]. In a recent study, Petit et al. [33] argued that SWD and HDs share a common metabolic cause, as glycogen metabolism has been shown to play a crucial role in both disorders; specifically, sleep disturbances impair glycogen metabolism, leading to disruptions in synaptic function and network plasticity, as observed in HDs. Given the increasing evidence of interrelations between SWD and HDs, interventions focused on sleep hygiene could serve as a strategic approach to prevent HDs.

Interestingly, in our study, we found a connection between TTH and modifiable risk factors at both the individual level (i.e., suffering from SWD) and the organizational level (i.e., working night shifts of more than 5 per month, occupational exposure to high WRS). These findings suggest implementing interventions in occupational settings aimed at reducing the occurrence of TTH in RNs, focusing on minimizing WRS and limiting night shifts to 5 per month.

Regarding the increase in TTH occurrence among RNs suffering from SWD, the findings of our study suggest the need for interventions aimed at preventing SWD. To date, a body of evidence indicates that organizational and individual measures are effective in reducing the impact of shift work on workers' health and in preventing the misalignment between sleep-wake rhythm and shift work that leads to SWD [34-36].

This study had some limitations; firstly, the cross-sectional design does not allow for determining the causal relationship between variables; cross-sectional studies can reveal associations but cannot indicate whether the associated factor is a cause or a consequence or whether there is reciprocity between the variables. Therefore, in future studies, causal relationships among variables should be analyzed using a longitudinal study design.

Secondly, the findings relate to hospital settings and may have been affected by organizational factors specific to the Italian occupational context, and therefore, might not be generalizable to all healthcare environments.

Third, our study did not investigate the "healthy night worker effect." Since vulnerable RNs might have left early in their careers, the risk of SWD among shift work nurses could be underestimated.

Finally, we didn't assess the individual chronotype of the RNs.

5. Conclusion

The knowledge and, therefore, prevention of the professional risk factors triggering HDs can reduce the frequency of the phenomenon and prevent its chronicity, thereby promoting RNs' health and, consequently, their wellness.

Based on our study findings, policy-makers and employers should take preventive actions to lower the incidence of HDs among RNs by reducing modifiable risk factors linked to higher occupational risk.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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