

PREVALENCE AND ASSOCIATED FACTORS OF MUSCULOSKELETAL COMPLAINTS AMONG NURSES OF MANSOURA UNIVERSITY CHILDREN HOSPITAL

By

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Abstract

Introduction: Work-related musculoskeletal disorders (WMSDs) are described as discomforts experienced by the worker on the musculoskeletal and neurovascular systems. According to the Occupational Safety and Health Administration, nurses are in the 10 major occupations which have the high risk of work-related musculoskeletal disease. It is more relevant in less-developed countries because of prolonged hospital stays and increased patient loads. **Aim of work:** To estimate the prevalence of musculoskeletal complaints and its associated factors among nurses. **Materials and Methods:** A cross sectional study with comparative component was conducted among nurses working in Mansoura Children University Hospital during the period from January to May 2017. Data was collected using a questionnaire included personal, past and occupational histories. Furthermore, a Nordic Questionnaire was used to examine the prevalence of musculoskeletal complaints among the participants. Dutch Musculoskeletal Questionnaire was employed to study the possible associated ergonomic factors. **Results:** The prevalence of musculoskeletal complaints among nurses was 85.9 % .The most common sites were elbow (85.2%) followed by pelvis/thigh (74.9%) and wrist (64.6%). Surprisingly the least site for pain was low back pain (37%). This prevalence was statistically lower among age group (30- <40 years old) compared to younger age group (80.0% versus 91.2%). It increased for continuous working ≥ 6 hours and shift work with adjusted odds ratio (2.59, 2.19; respectively).

Conclusion: Nearly 86% of the pediatric nurses reported 1-year prevalence of musculoskeletal complaints affecting mostly elbow, pelvis/thigh and wrists/hands. Ergonomic assessment and preventive intervention should be conducted to decrease the prevalence through improving associated occupational factors and implementing preventing programs as manual handling techniques.

Keywords: Prevalence, Musculoskeletal complaints, Nurses, Occupational risks and Shift work.

Introduction

Work-related musculoskeletal disorders (WMSDs) are best described as disorders or discomforts experienced by the worker on the musculoskeletal, peripheral nervous, and neurovascular systems, due to prolonged workplace hazards exposure. Clinical presentation of people suffering from these types of injuries is severe muscle pain that makes simple movements difficult and painful. According to the Occupational Safety and Health Administration (OSHA) and The Bureau of Labor Statistics, nurses are in the 10 major occupations which have the high risk of work-related musculoskeletal disease (OSHA, 2013 and Bureau of Labor Statistic, 2013) and with a frequency of approximately 40 to 90% among the nursing population worldwide (Trinkoff et al., 2002; Smith et al., 2006). In addition, female staff are more susceptible to WMSDs compared to male staff (Mehrdad et al., 2010). Furthermore, studies suggest that the

most common body regions injured are the lower back area (Smith et al., 2006), followed by the neck (Trinkoff et al., 2002 and Anap et al., 2017), and shoulder (Trinkoff et al., 2003 and Smith et al., 2004).

The main cause of nurses' musculoskeletal disease is their work character requiring excessive tension with concentration such as lifting heavy objects, prolonged standing work (Sosnowitz and Hriceniak, 1998). As well as the character of their jobs requiring the postures damaging the waist and the body, as bending, twisting hands, and dealing with patients (Trinkoff et al., 2001). Nurses also do repetitive jobs mainly using their upper limbs, like writing medical records. They use frequently their lower body part in stations, which need improper and atypical postures during injection and medical care for patients (Park et al., 2003).

As nurses represent approximately one-third of the working force at any hospital, the problem of WMSDs in this population may have a substantial impact on absence from work, work restrictions, or even transfers to other jobs. These impacts might be more relevant in less-developed countries because of prolonged hospital stays and increased patient loads (Attar, 2014).

To the best of our knowledge, no studies have explored the occurrence of different musculoskeletal complaints among nurses working at Mansoura University Children Hospital (MUCH).

Aim of work

To estimate the prevalence of musculoskeletal complaints and its associated factors among nurses working in Mansoura University Children Hospital (MUCH) in Mansoura city.

Materials and Methods

- **Study design:** Descriptive cross sectional study with comparative component.
- **Place of the study:** The Mansoura University Children Hospital (MUCH) in Mansoura city, Daqahlia Governorate, Egypt. It

comprised of several departments as inpatient ward, operation room, ICU, outpatient clinic, emergency room and specialty units (such as cardiology, gastroenterology, asthma and allergy, neurology, endocrinology, neonatology, infectious disease and malnutrition, nephrology, pediatric surgery and laboratory).

- **Time and duration of the study:** The study was done during the period from January to May 2017.
- **Study sample:** The target group was all pediatric nurses working in MUCH who is on duty at the time of the study and fulfilling the eligibility criteria. They were 357 nurses. Only 311 questionnaires returned completed with response rate 87.11%.

Our study inclusion criteria were age group ranging from 19 to 60 years, work experience equal to or more than one year and agreement to participate in the study. On the other side, the study exclusion criteria were history of unhealed fractures, recent dislocations, inflammatory arthritis, tumors, recent traumatic soft tissue injuries, diagnosed

disc lesion or present history of pregnancy.

- **Study method:** a self-administered questionnaire was structured to collect data. The questionnaires were distributed to the target nurses, who were instructed how to complete them. The researchers were available to respond for any inquiries during filling the questionnaire.

Prevalence of musculoskeletal complaint is operationally defined as “the case where a symptom lasted more than one week or happened more than once every month over the last one year” (Sherehiy et al., 2004).

The questionnaire included personal history information such as sex, age, marital status, educational level, height, weight, house working hours. It also included occupational history: the working department, total work duration, position (general nurse, responsibility nurse), continuous working hours and shift work.

Regarding the prevalence of work-related musculoskeletal complaints, this study employed the original

structure (English version) of Nordic Questionnaire (Kuorinka et al., 1987). It gave information whether the study subjects experienced any pain or discomfort symptom in one of the nine body areas including neck, shoulders, upper back, elbows, wrists/hands, low back, hips/thighs, knees, and ankles/feet over the last one year.

For ergonomic factors, the Dutch Musculoskeletal Questionnaire (DMQ) was employed (Hildebrandt et al., 2001). The checklist is comprised of standing for long period, sitting for long period, squatting position, static position, arm hand exertion, repetitive work, computer using, comfortable seats using, carrying heavy load > 15 kg.

Consent

An informed written consent was obtained from all nurses before participation. They were informed that all collected data will be confidential and used for scientific purposes only.

Ethical approval

Formal approval was obtained from hospital management. The study was approved by Institutional Review

Board (IRB) of Faculty of Medicine, Mansoura University with code number (R/17.05.127).

Data management

Data were analyzed using SPSS software (version 17.0 for Windows; SPSS Inc., Chicago, IL, USA). Descriptive statistics were calculated for all variables (qualitative) that were presented as frequencies and percentages. It is a comparative study within categories of each variable with one of them being chosen as a reference. Chi-square test or Fisher's

exact test was used for categorical data to compare the variation of musculoskeletal complaints in each category to the reference category of the same variable according to different associated factors. Crude Odd's ratio and its 95% CI were calculated. Binary logistic regression was done to detect the independent predictors of musculoskeletal complaints. Adjusted Odd's ratios and their 95% CI were calculated. The statistical significance level was set at <0.05 and highly statistical level was set at <0.01 .

Results

Table (1): Prevalence of musculoskeletal complaints and its variation according to personal characteristics among pediatric nurses.

| | Total No | Musculo-skeletal complaints No (%) | Test of significance | Odds ratio (95% CI) ^{##} |
|------------------------------------|-------------|--|---------------------------|--------------------------------------|
| Overall | 311 | 267 (85.9) | ----- | (81.96 -89.75) |
| Age (years) | | | | |
| 20- (r)^a | 136 | 124(91.2) | ----- | 1 |
| 30- | 125 | 100(80.0) | $\chi^2=6.6$ (p=0.009**) | 0.39(0.19-0.81) |
| 40- | 35 | 31(88.6) | $\chi^2=0.2$ (p=0.64) | 0.75(0.23-2.5) |
| 50-60 | 15 | 12(80.0) | $\chi^2=1.9$ (p=0.16) | 0.39(0.09-1.6) |
| Sex | | | | |
| Male (r)^a | 16 | 12(75.0) | | 1 |
| Female | 295 | 255(86.4) | $\chi^2=1.6$ (p=0.20) | 2.1(0.65-6.91) |
| Marital status | | | | |
| Unmarried (r)^a | 44 | 38(86.4) | | 1 |
| Married | 267 | 229(85.8) | $\chi^2=0.01$ (p=0.92) | 0.9 (0.38-2.4) |
| Educational level | | | | |
| High school (r)^a | 218 | 190(87.2) | ---- | 1 |
| University | 87 | 73(83.9) | $\chi^2=24.8$ (p<0.001**) | 0.19(0.09-0.39) |
| Post graduate | 6 | 4(66.7) | FET [#] (p=0.18) | 0.29(0.05-1.68) |
| BMI (Kg/m²) | | | | |
| Normal (r)^a | 63 | 55(87.3) | --- | 1 |
| Overweight | 151 | 129(85.4) | $\chi^2=0.13$ (p=0.7) | 0.85(0.36-2.03) |
| Obese | 97 | 83(85.6) | $\chi^2=0.09$ (p=0.7) | 0.86(0.33-2.2) |
| House work hours/day | | | | |
| <8 (r)^a | 146 | 125(85.6) | --- | 1 |
| 8-16 | 158 | 137(86.7) | $\chi^2=0.07$ (p=0.78) | 0.91(0.48-1.75) |
| >16 | 7 | 5(71.4) | FET [#] (p=0.2) | 0.38(0.07-2.1) |

FET: Fisher Exact Test

** : Highly significant

(r)^a: Reference category

##CI : Confidence Interval

BMI : Body Mass Index

Table 1 showed that the overall prevalence of musculoskeletal complaints was 85.9 %. This prevalence was statistically lower among age group (30- <40 years old) compared to younger age group (80.0% versus 91.2%). There was no statistically significant difference in prevalence regarding sex, marital status or working hours per day.

Table (2): Prevalence of musculoskeletal complaints and its variation according to occupational factors among pediatric nurses.

| | Total No | Musculo-skeletal complaints No (%) | Test of significance | Odds ratio (95% CI) ^{##} |
|--|----------------------|---|---|--|
| Position Nurse manager (r) ^a Nurse | 89 222 | 72(80.9) 195(87.8) | $\chi^2=2.52$ $p=0.11$ | 1 1.7(0.88-3.3) |
| Continuous working hours < 6 (r) ^a ≥ 6 | 133 178 | 107(80.5) 160(89.9) | $\chi^2=5.58$ $p=0.01^*$ | 1 2.2 (1.12-4.13) |
| Work duration(years) <20 (r) ^a ≥20 | 254 57 | 216(85) 51(89.5) | $\chi^2=0.75$ $p=0.38$ | 1 0.67(0.27-1.67) |
| Departments Inpatient (r) ^a ICU Operation room Others ^b | 149 76 6 80 | 133(89.3) 62(81.6) 6(100.0) 66(82.5) | ----- $\chi^2=2.6$ (p=0.10) $\chi^2=0.7$ (p=0.39) $\chi^2=2.09$ (p=0.15) | 1 0.53(0.24-1.16) Undefined 0.56(0.26-1.23) |
| Shift works No (r) ^a Yes | 121 190 | 97(80.2) 170(89.5) | $\chi^2=5.2$ $p=0.02^*$ | 1 2.1 (1.1 - 4.0) |
| Standing for long period No (r) ^a Yes | 71 240 | 59(83.1) 208(86.7) | $\chi^2=0.5$ $p=0.45$ | 1 0.7 (0.37-1.56) |
| Sitting for long period No (r) ^a Yes | 176 135 | 153(86.9) 114(84.4) | $\chi^2=0.39$ $p=0.05$ | 1 1.23(0.65-2.32) |
| Squatting position No (r) ^a Yes | 171 140 | 141(82.5) 126(90.0) | $\chi^2=3.61$ $p=0.06$ | 1 1.9 (0.97 - 3.77) |
| Arm hand exertion No (r) ^a Yes | 82 229 | 71 (86.6) 196(85.6) | $\chi^2=0.05$ $p=0.82$ | 1 1.09 (0.52-2.27) |
| Repetitive work No (r) ^a Yes | 86 225 | 72 (83.7) 195(86.7) | $\chi^2=0.44$ $p=0.51$ | 1 0.79 (0.39-1.58) |
| Computer using No (r) ^a Yes | 177 134 | 156(88.1) 111(82.8) | $\chi^2=1.76$ $p=0.18$ | 1 1.5 (0.81-2.9) |
| Comfortable seats No (r) ^a Yes | 230 81 | 198(86.1) 69 (85.2) | $\chi^2=0.04$ $p=0.84$ | 1 1.08 (0.52-2.21) |
| Heavy load > 15 kg No (r) ^a Yes | 204 107 | 179(87.7) 88 (82.2) | $\chi^2=1.74$ $p=0.19$ | 1 0.6(0.34-1.2) |

*: Significant

(r)^a: Reference category

##CI : Confidence Interval

b: others as outpatient clinic, emergency room and specialty units.

Table (2) reveals that the prevalence of musculoskeletal complaints was statistically higher among nurses who work continuously more than 6 hours (OR and 95% CI=2.2 and 1.12-4.13; respectively) ($p=0.01$). The nurses who had shift hours were two times more likely suffering from musculoskeletal complaints comparable to those with no shift hours (CI=1.1 - 4.0).

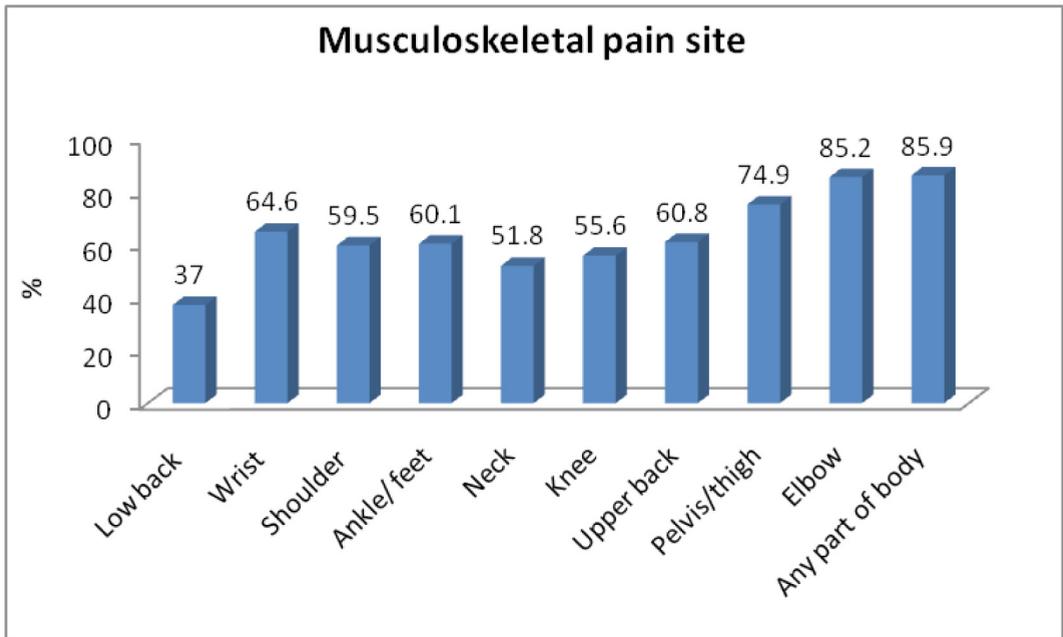


Figure (1): Distribution of musculoskeletal complaints according to the site among pediatric nurses.

Categories aren't mutually exclusive

Figure 1 demonstrates that the most common sites of musculoskeletal complaints among nurses were elbow (85.2%) followed by pelvis/thigh (74.9%) and wrist (64.6%). Surprisingly the least site for pain was low back pain (37%).

Table (3): Binary logistic regression of independent predictors of musculoskeletal complaints among pediatric nurses

| Predictors | β | p | Adjusted OR (95% CI)## |
|---------------------------------|---------|-----------|---------------------------|
| Continuous working hours | | | 1 |
| < 6 (r) ^a | | | |
| ≥ 6 | 0.95 | 0.007** | 2.59(1.31-5.17) |
| Age (years) | | | 1 |
| 20- (r) ^a | | | |
| 30- | -0.89 | 0.02* | 0.41 (0.19-0.88) |
| 40- | 0.48 | 0.48 | 1.61 (0.43-5.98) |
| 50-60 | -0.42 | 0.58 | 0.66 (0.15-2.96) |
| Shift work | | | 1 |
| No (r) ^a | | | |
| Yes | 0.78 | 0.03* | 2.19(1.06-4.52) |
| Constant= 1.38 | | | |
| Model Chi-Square test= 20.98 | | p=0.004** | |
| Percent predicted=86.2% | | | |

*: Significant

**: Highly significant

##CI: Confidence Interval

(r)^a: Reference category

Table (3) : Binary logistic regression displays that the significant independent predictors of musculoskeletal complaints among pediatric nurses are continuous working hours more than 6 hours and shift works with adjusted odds ratio (2.59, 2.19; respectively). However, the age group 30-40 are less likely to develop musculoskeletal complaints compared to younger age group .The model predict about 86% of the variability of musculoskeletal complaints.

Discussion

Musculoskeletal disorders have been listed as occupational disorders by the International Labor Organization (ILO) since 1960. They are considered a serious occupational health problem among persons included in the nursing profession who are in direct contact with patients and associated with actual tasks and duties related to work postures, work control and work organization. Therefore, the present study was conducted to estimate the prevalence of musculoskeletal complaints and its associated factors among nurses.

The results of the present study indicated a high prevalence (85.9%) of musculoskeletal complaints among the nurses working in Mansoura University Children Hospital (MUCH) (Table 1). This strongly agrees with the cross-sectional survey done in Nigeria in 2010 detecting musculoskeletal disorders among nurses with prevalence of 84.4% (Tinubu et al., 2010). Also, Smith et al. 2003a in a study from rural Japan reported a 12-months prevalence of 91.9%. Also Ribeiro et al., in 2017 detected that the prevalence of WMSDs in Portuguese among primary health

care nurses, in last 12 months was 89.0%. On the other hand, Loveness et al., 2015 in their study about WMSDs among nurses in Zambia found a prevalence of 68.9% which was lower than our results.

Concerning age, it was found that the prevalence of musculoskeletal complaints was statistically higher among nurses aging from 20 to 29 years compared to higher age group (30- <40 years old) (91.2% and 80% respectively) (Table 1) which can be referred to the heavier manual tasks of younger nurses. These results are in agreement with Attarchi et al., 2014 who found in his study that the prevalence of musculoskeletal disorders among ages less than 30 years was higher than more than 30 years. The results of this work were in contrast to that of Ribeiro et al., 2017 who detected that most respondents were in the age range between 31 and 40 years and between 41 and 50 years (35.7% and 35.9%, respectively).

The present study showed that the prevalence of musculoskeletal complaints was higher among nurses graduated from high school (87.2%)

followed by those graduated from the university (83.9%) with statistical significant difference ($P < 0.001$) (Table 1) and this can be attributed to the higher manual work load in lower educated nurses. Alexopoulos et al. 2006 agreed with this result as they found in their study of musculoskeletal disorders among the Greek and Dutch nurses that the lower educated nurses experienced a significantly higher physical load than highly educated nurses. On the opposite side, Attarchi et al. 2014 found that nurses and nurse aides with higher work experiences were more prone to be affected by low back disorders.

As regards the musculoskeletal complaints and continuous working hours, the present study revealed that the prevalence of musculoskeletal complaints was statistically higher among nurses who work continuously more than 6 hours (OR and 95% CI=2.2 and 1.12-4.13; respectively) ($P=0.01$) (Table 2). This fact can be explained that increasing working hours is associated with increased work load and this is compatible with Caruso and Waters, 2008 who reported a significant increase in one or more measures of

musculoskeletal complaints in eight studies that examined long work hours among healthcare workers. Also, Yan et al. 2017 found that daily working hours of 8.5 hours is a risk factor for musculoskeletal disorders. On the contrary, low prevalence rate (31.6%) among Pakistanian nurses was attributed to the working periods ranged from six to eight hours per day (Rathore et al., 2017).

Concerning the distribution of musculoskeletal complaints according to the working department in MUCH, the present study showed that there was no statistical significant difference on comparing the different departments (Table 2) but this result opposed to the result of Yan et al. (2017) who found that nurses working in the emergency department showed the highest prevalence of WMSDs. Also our results were against that of a Korean study which detected that the highest prevalence of WMSDs among nurses was in the intensive care unit, followed by the surgical ward, while it was the lowest in the emergency room (Kee and Seo, 2007).

The current study showed that nurses who had shift work had higher prevalence of musculoskeletal complaints than those who had not and this was statistically significant ($P=0.02$) with odds ratio (2.1) (Table 2). Attarchi et al. 2014 agreed with our result as they found that the prevalence of musculoskeletal disorders among shift workers was higher than among fixed day workers pointing to that the prevalence of low back pain and ankle symptoms among nurses was significantly higher among shift workers compared to fixed day workers.

Regarding the ergonomic risk factors for musculoskeletal complaints in the current study (standing for long period, sitting for long period, squatting position, static position, arm hand exertion, repetitive work, computer using, comfortable seats using, carrying heavy load >15 kg), there was no statistically significant difference (Table 2). By contrast, Munabi et al. 2014 detected significant work place risk factors included the pushing/pulling of heavy loads and working in awkward postures.

The present work concluded that the most common sites of musculoskeletal complaints among nurses were elbow (85.2%) (Figure 1) that can be attributed to activities performed in direct patient care that usually involve upper limb force in manual handling and positioning the patients (Smith et al., 2003 a), followed by pelvis/thigh (74.9%) and this can be explained by the prolonged standing. The main actions causing the development of musculoskeletal disorders among nurses are: pushing occupied beds, lateral patient transfers, repositioning patients in bed, assisting patients during movement, treating excessive number of patients daily, working with confused and agitated patients and performing the same task repeatedly as well as lifting and carrying heavy equipment over long distances (Waters et al., 2006; Loveness et al., 2015). However, this result opposed that of Anap et al., 2017 in their study among Indian nurses who mentioned that these regions [elbow (1.88%) and pelvis/thigh (1.6 %)] with the less prevalence.

The least site for pain in the present study (Figure 1) was low back pain (LBP)

(37%) and this result was compatible with previous studies among nurses as in France (41.1%) (Niedhammer et al., 1994), in Hong Kong (40.6%) (Yip, 2001) and in Korea 19.8% (Smith et al., 2003 b). However, this result was not consistent with literature as LBP is one of the most important WMSDs among nursing professionals that accounts for an annual prevalence of 40-50% and a lifetime prevalence of 35-80% (Hignett, 1996). As well as some researchers reported that more than half (56%) of their nurses have ongoing back troubles (Lagerström et al., 1996).

These observations regarding different body site affection may refer to the role of body weight and redistribution of fat as Majumdar et al. 2014 explained these variations in their study.

For identification of associated factors for the musculoskeletal complaints in the present study, logistic regression analysis was performed using the significant variables including age, continuous working hours, education level and shift work as independent variables and musculoskeletal complaint as dependent variable (Table 3). The

results indicated that musculoskeletal complaints were more likely to occur with a continuous working of ≥ 6 hours and shift works (odds ratio: 2.59 and 2.19; respectively). Yan et al., 2017 agreed with these findings as they detected in their study that the long working hours and shift work were identified as risk factors of WMSDs.

However, the logistic regression analysis in the present study, showed that the age group 30-40 were less likely to develop musculoskeletal complaints compared to younger age group (odds ratio 0.41) (Table 3). On the other hand, Attarchi et al., 2014 found no significant associations between age and low back symptoms ($P > 0.05$). While, Yan et al., 2017 found that the ages of the nurses were identified as risk factor of WMSDs.

Study limitation: It is difficult to assess temporal relationship between potential risk factors and outcome. Moreover, this study is conducted in a single center study so the results can't be generalized to all health care facilities or the nurses working in other specialties.

Conclusion and Recommendations

The current study showed that nearly 86% of the pediatric nurses reported 1-year prevalence of musculoskeletal complaints affecting mostly elbow, pelvis/thigh and wrists/hands. Ergonomic assessment and preventive intervention should be conducted to decrease the prevalence through improving associated occupational factors and implementing preventing programs as manual handling techniques. Moreover, further studies should be carried out on a larger scale for additional evaluation of the prevalence and risk factors of musculoskeletal complaints among nurses.

Conflict of interests

None .

Acknowledgement

The authors would like to acknowledge MUCH administration for their help and support.

Also we thank the head nurse, her assistants and nurse managers for their help in distributing the questionnaire. Lastly we acknowledge the whole nurses who agreed to participate in the current study.

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