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Do sleep disturbances mediate the association between work-family conflict and depressive symptoms among nurses? A cross-sectional study

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Abstract

Introduction: Depression has been identified as the leading cause of disability worldwide. Nurses report higher rates of depression than the general public. Work-family conflict is challenging for nurses and may lead to depression and poor health. However, the mechanisms for the effect of work-family conflict on depression have not been well understood.

Aim: The objective is to use a cross-sectional design to examine the role of sleep disturbances in the association between work-family conflict and depressive symptoms in nurses.

Methods: Questionnaires, measuring working conditions, work-family conflict, sleep disturbances and depressive symptoms were collected from 397 nurses at a not-for-profit community hospital in the north-eastern United States.

Results: We observed a significant association between work-family conflict and depressive symptoms ($\beta = 2.22, p < .001$) among nurses. Sleep disturbances partially mediated this association by 40.54%.

Discussion: Sleep disturbances play an important role in translating work-family conflict into depressive symptoms.

Implications: Evidence-based interventions to promote healthy sleep practices should be evaluated for their effectiveness in addressing the impact of work-family conflict on mental health. Organizations should include sleep education and training as a component of workplace health promotion and employee assistance programmes to mitigate the effect of work-family conflict and promote overall health in nurses.

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CONFLICT OF INTEREST

The authors report no conflict of interest.

Keywords

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1 | INTRODUCTION

The burden of mental disorders continues to grow, with significant impacts to society worldwide. Depression, a common mental disorder, affects over 300 million people globally (World Health Organization, 2017). The World Health Organization (2017) states that depression is the leading cause of disability worldwide and is a major contributor to the overall global burden of disease. Depression ranked as the second leading cause of disability in the U.S.A between 1990 and 2010 (US Burden of Disease Collaborators, 2013). Previous studies have shown that mental disorders, especially depression in the general population, were associated with increased prevalence of many chronic diseases, including cardiovascular disease, kidney disease, diabetes, arthritis and cancer (Chapman, Perry, & Strine, 2005; Novak et al., 2016), as well as many risk behaviours, such as smoking, alcohol use, sedentary behaviours and unhealthy sleep practices (Artaud et al., 2016; Foley, Ancoli-Israel, Britz, & Walsh, 2004; Saneei et al., 2016).

1.1 | Background

As an occupational group with shift work and high work stress (Geiger-Brown & Lipscomb, 2010), nurses experience a higher incidence of stress-related illnesses than the general public, leading to a high rate of burnout, absenteeism and turnover (Gilmartin, 2012; Khamisa, Oldenburg, Peltzer, & Ilic, 2015). Nurses also report higher rates of depressive symptoms than the U.S. adult population (Letvak, Ruhm, & McCoy, 2012). Nurses with depressive symptoms are likely to suffer poor health and wellbeing, and those illnesses in turn can affect their coworkers and patients, potentially impacting the quality of care delivered to patients.

Work-family conflict is a bidirectional role conflict including work interference with family and family interference with work. It is a significant source of stress for workers and greatly impacts work, family, behaviours and health. Nurses are at a high risk for work-family conflict and its negative consequences (Cortese, Colombo, & Ghislieri, 2010), due to demanding work schedules (e.g., shift work, long work hr and overtime) and diverse physical and psychosocial work stressors (e.g., workload and time pressure) (Simon, Kümmerling, & Hasselhorn, 2004). Grzywacz, Frone, Brewer, and Kovner (2006) reported that half of nurses experience chronic work interference with family, and 11% experience chronic family interference with work. Work-family conflict has been studied in the nursing population and is reported to be associated with physical illnesses such as musculoskeletal pain (Kim et al., 2013) and cardiometabolic risk (Berkman et al., 2015), as well as mental disorders such as emotional exhaustion (Leineweber et al., 2014) and depressive symptoms (Hao, Wu, Liu, Li, & Wu, 2015).

Although the negative effects of work-family conflict in the nursing population have received considerable research attention, the mechanisms for these effects are not well understood. There have been few studies examining the influence of health behaviours such as sleep on the association between work-family conflict and depressive symptoms. Nurses are at risk for numerous sleep problems, including insufficient sleep quantity and quality, acute and chronic sleep loss, and sleep disturbances (Geiger-Brown et al., 2012). In addition to the sleep problems that impact most shift workers, nurses often have family responsibilities such as child and/or elder care that interfere with daytime sleep. Sleep disturbances have been reported as a possible consequence of work-family conflict in patient care workers (Jacobsen et al., 2014) and other occupational groups (Aazami, Mozafari, Shamsuddin, & Akmal, 2016; Lallukka et al., 2014).

Sleep quality has been shown to play an integral part in mental wellness, with sleep disturbances contributing to mental disorders such as depression in different patient and ageing populations (Bhati & Richards, 2015; Foley et al., 2004; Le Grande, Jackson, Murphy, & Thomason, 2016). Nurses with fewer sleep problems report better mental health (Perry, Lamont, Brunero, Gallagher, & Duffield, 2015). According to Punnett and colleagues' conceptual framework (2009), health behaviours such as sleep may play an important role in the association between working conditions and selected health outcomes including mental health. Additionally, as explained above, sleep disturbances may be a consequence of work-family conflict, and a contributor to mental disorders. Therefore, it is possible that sleep disturbances may, in part, explain the mechanism for the effect of work-family conflict on depressive symptoms.

1.2 | Aim

The objective of this study was to examine the role of sleep disturbances in explaining the association between work-family conflict and depressive symptoms in nurses.

2 | METHODS

2.1 | Study design

This study used a quantitative, cross-sectional design to explore the role of sleep disturbances in the association between work-family conflict and depressive symptoms in nurses.

2.2 | Setting

This study was conducted at a 430-bed, independent, not-for-profit community hospital in the north-eastern United States. The community hospital provides critical care, emergency care, medical-surgical, maternity, paediatrics and outpatient services to the surrounding community.

2.3 | Subjects

This study collected data in March 2015 from a sample of 397 Registered Nurses (RNs) and licensed practical nurses (LPNs). LPNs provide basic medical care, work with RNs to assess patients, coordinate and implement nursing care, administer medications and report patient

status to RNs. In this community hospital, LPNs have similar responsibilities as RNs with the exceptions that they cannot assess or evaluate patients nor can they administer narcotic medications. We therefore included LPNs with RNs in our study sample. A non-probability convenience sampling method was used to recruit study participants. All RNs and LPNs over 18 years of age working in the hospital were eligible to participate.

2.4 | Measurement of variables

2.4.1 | Dependent variable

Depressive symptoms: We assessed depressive symptoms with the Center for Epidemiologic Studies Depression Scale (CES-D), 10-item version. This scale is used to identify current depression symptomatology in individuals age 18 and older during the past week (Radloff, 1977). Each item is rated on a 4-point Likert scale (0 = rarely or none of the time; 1 = some or a little of the time; 2 = occasionally or a moderate amount of the time; and 3 = most or all of the time) with a range in total score from 0 to 30. Higher scores indicate greater severity of depression symptomatology, and a total score of 10 or more is considered indicative of depression (Andresen, Malmgren, Carter, & Patrick, 1994). The scale demonstrated acceptable reliability for this study sample (Cronbach's alpha = .77).

2.4.2 | Independent variable

Work-family conflict: We assessed work-family conflict from interrole conflict, with three items from Kopelman, Greenhaus, and Connolly (1983). The three items were as follows: "After work I come home too tired to do some of the things I'd like to do;" "On the job, I have so much work to do that it takes away from my personal interests;" and "My family and/or friends dislike how often I am preoccupied with my work while I am at home." All three items were assessed using a 4-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly agree). The three items were averaged to give a mean score, with a higher score indicating more work-family conflict. The reliability (Cronbach's alpha) of this scale for the study sample is .61.

2.4.3 | Potential mediator

Sleep disturbances: We assessed sleep disturbances with the PROMIS Sleep Disturbance Short Form (SD-SF) (Yu et al., 2011), an 8-item scale to assess the severity of sleep disturbances in individuals aged 18 and older. Each item was rated on a 5-point Likert scale with a range in total raw score from 8 to 40, and a higher score indicates greater severity of sleep disturbances. We calculated a *T*-score from the total raw score, with a range from 28.9 to 76.5 based on the instrument scoring manual. A *T*-score of 55 or more indicates mild (55.0–59.9), moderate (60.0–69.9) or severe (70.0 and over) sleep disturbances (Yu et al., 2011). The scale demonstrated good reliability for this study sample (Cronbach's alpha = .90).

2.4.4 | Covariates

Socio-demographics: We collected socio-demographic information including age, gender, race, height, weight and frequency of exercise. Body mass index (BMI) was calculated from self-reported weight and height, expressed as weight/height². BMI was categorized

as underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) or obese (≥30.0 kg/m²) (Centers for Disease Control and Prevention, 2015). We measured frequency of exercise with one single item “How many times a week on average do you exercise to work up a sweat (at least 20 min per session, for example, fast walking, jogging, bicycling, swimming, rowing, etc.)?” on a 5-point Likert scale (0 = None; 1 = less than once/week; 2 = 1–2 times/week; 3 = 3 times/week; and 4 = more than 3 times/week). Regular exercise was defined as exercise three or more times per week.

Working conditions: We also collected information on participants’ physical demands, psychological demands, decision authority and social support. A 4-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly agree) was used for each item. We selected physical demands (five items), psychological demands (four items), decision authority (three items) and social support (four items) items from the subscales of the Job Content Questionnaire (JCQ) (Karasek et al., 1998). The JCQ subscales have demonstrated good validity and acceptable reliability in large study populations from six countries (Karasek et al., 1998). The reliabilities (Cronbach’s alpha) of these subscales were .85 (physical demands), .63 (psychological demands), .56 (decision authority) and .75 (social support) for this study sample, which were similar to their reliabilities reported in a previous study with nursing assistants (Zhang, Punnett, Phillips McEnany, & Gore, 2016). Participants’ usual work shift was collected, and choices were 8 hr day, 8 hr evening, 8 hr night, 12 hr day, 12 hr evening (including work schedules of 9 a.m.–9 p.m. 11 a.m.–11 p.m. and 12 p.m.–12 a.m.) and 12 hr night shifts.

2.5 | Data collection

We posted the study recruitment flyer at each hospital unit two weeks before the onsite survey collection. We then distributed and collected the survey over five days at the Annual Nurse Skill Days in March 2015, which all nurses at the hospital were required to attend. The study was reviewed and approved by the Institutional Review Boards at the hospital and at the University of Massachusetts Lowell (No. 2015–001). Because the study did not collect any personal identification information, signed informed consent was waived by the Institutional Review Boards. The informed consent form was attached on the first page of the survey. The research team explained the study purpose and procedure, and potential benefits and risks to participants in person, and confirmed their understanding and agreement of the consent form. We assured participants that their employer would not receive any identifying information from the surveys and that participating or not participating in the study would not affect their work status. Then, participants were requested to complete the survey onsite. Participants received a compensation of \$5 cash for completing the survey. All surveys collected were available only to members of the research team and were kept in locked file cabinets and password-protected computer files.

2.6 | Data analysis

We conducted all analyses using SPSS software 24.0. The associations of socio-demographics and working conditions with work-family conflict and depressive symptoms were examined using independent samples *t* test (comparing the means of two independent groups), ANOVA (comparing the means of three or more independent groups) and

Spearman's correlations (examining correlations among variables that are not continuous or not normally distributed) (Field, 2009). We treated work-family conflict, sleep disturbances and depressive symptoms as continuous variables in the bivariate and multivariate analyses. Associations among work-family conflict, sleep disturbances and depressive symptoms were examined using Spearman's correlations (Rho). Gender, race, regular exercise and shift work were treated as categorical variables, while age, BMI and other working conditions were treated as continuous variables in the bivariate and multivariate analyses.

We used Baron and Kenny (1986) to assess the potential mediating effect of sleep disturbances on the association between work-family conflict and depressive symptoms by evaluating four criteria: (1) work-family conflict association with depressive symptoms; (2) work-family conflict association with sleep disturbances; (3) sleep disturbances association with depressive symptoms; and (4) attenuation of the association between work-family conflict and depressive symptoms with inclusion of sleep disturbances. We used multivariate linear regression models to calculate coefficients and 95% confident intervals (CI). Multicollinearity assumptions were checked in the multivariate linear regression models (Field, 2009). Two-tail significance level was reported at $p < .05$.

3 | RESULTS

3.1 | Descriptive and bivariate analyses

A total of 397 of the 1,102 RNs and LPNs employed by the hospital completed the survey, which is a response rate of 36%. The participants came from many units (critical care, emergency care, medical-surgical, maternity, paediatrics and outpatient) of the hospital. Overall, the participants were primarily middle-aged women, more than half (55.60%) were overweight or obese, and 56.90% reported that they did not exercise regularly (Table 1). One-third (33.30%) of the participants reported sleep disturbances (T -score = 55), and 11.40% reported their sleep disturbances to be moderate to severe (T -score = 60). Nearly one-quarter (24.40%) of the participants reported depressive symptoms (CES-D = 10).

We observed a correlation between depressive symptoms and sleep disturbances (Rho[387] = .51, $p < .001$), work-family conflict (Rho[388] = .38, $p < .001$), physical demands (Rho[387] = .23, $p < .001$), psychological demands (Rho[384] = 0.25, $p < .001$), decision authority (Rho[382] = -.17, $p = .001$), social support (Rho[378] = -.15, $p = .004$) and age (Rho[386] = -.19, $p < .001$). Depressive symptoms were not significantly associated with gender (t [385] = 1.07, $p = .28$), race (F [2, 387] = 1.68, $p = .19$), BMI (Rho[378] = .06, $p = .06$), regular exercise (t [383] = 1.77, $p = .08$) or shift work (F [5, 381] = 2.04, $p = .07$).

We also observed a correlation between work-family conflict and sleep disturbances (Rho[393] = .31, $p < .001$), physical demands (Rho[393] = .25, $p < .001$), psychological demands (Rho[390] = .31, $p < .001$), decision authority (Rho[388] = -.15, $p = .003$) and age (Rho[392] = -.14, $p = .006$). Work-family conflict was not significantly associated with gender (t [391] = 1.26, $p = .21$), race (F [2, 393] = 1.53, $p = .22$), BMI (Rho[384] = -.06, $p = .27$), regular exercise (t [389] = .96, $p = .34$), shift work (F [5, 386] = .98, $p = 0.43$) or social support (Rho[384] = -.05, $p = .30$).

3.2 | Multivariate analyses

Multivariate linear regression model of work-family conflict and depressive symptoms was adjusted for socio-demographics and working conditions (Table 2). Tests to see whether the data met the assumption of collinearity indicated non-multicollinearity, with variance inflation factor (VIF) ranging from 1.10 to 1.69. We observed a significant association between work-family conflict and depressive symptoms. With every unit increase in the work-family conflict score, the depressive symptoms score was increased by 2.22 units (Table 2, Model 1, $R^2 = .21$, $F[11, 342] = 8.09$, $\beta = 2.22$, $p < .001$).

We then tested the potential mediating effect of sleep disturbances in the association between work-family conflict and depressive symptoms following Baron and Kenny (1986). In the multivariate linear regression models, we observed significant associations between work-family conflict and sleep disturbances (Model 2, $R^2 = .15$, $F[11, 346] = 5.71$, $\beta = 3.67$, $p < .001$), and between sleep disturbances and depressive symptoms (Model 3, $R^2 = .32$, $F[11, 341] = 14.33$, $\beta = .27$, $p < .001$), after adjustment for socio-demographics and working conditions (Table 2). When we introduced sleep disturbances into the multivariate linear regression model for work-family conflict and depressive symptoms, work-family conflict remained significantly associated with depressive symptoms (Model 4, $R^2 = .34$, $F[12, 340] = 14.57$, $\beta = 1.32$, $p = .001$). Sleep disturbances were associated with depressive symptoms (Model 4, $\beta = .24$, $p < .001$) and partially attenuated the association between work-family conflict and depressive symptoms by 40.54% (Table 2). Multicollinearity was not a concern (VIF ranges 1.09–1.70). Figure 1 explains the relationships among work-family conflict, sleep disturbances and depressive symptoms in the study sample.

4 | DISCUSSION

In this study of nearly 400 nurses, one-quarter of them reported depressive symptoms in the past week, a much higher rate than the national norm (Centers for Diseases Control and Prevention, 2013), and a higher rate than that reported from a random sample of hospital-employed nurses (Letvak et al., 2012). Nurses usually experience high work stress from multiple sources (Happell et al., 2013; Jennings, 2008), which can lead to poor physical and mental health outcomes. Nurses' mental health deserves considerable attention from administrators because it could be associated with their job satisfaction (Faragher, Cass, & Cooper, 2005), intention to turnover (Zhang et al., 2016), quality of care delivery, and patient safety and health.

In this study, we found that work-family conflict was positively associated with depressive symptoms among nurses, which is consistent with previous findings in nursing populations (Hao et al., 2015; Leineweber et al., 2014) and other occupational groups (Hämmig & Bauer, 2009; Nylén, Melin, & Laflamme, 2007). Two meta-analyses have reported a high correlation between work-family conflict and depression (Allen, Herst, Bruck, & Sutton, 2000), as well as psychological strain, stress and anxiety (Amstad, Meier, Fasel, Elfering, & Semmer, 2011). Allen et al. (2000) reported a weighted correlation coefficient of .32 between work-family conflict and depression in a meta-analysis of 11 research studies with over 5,000 subjects.

We found that sleep disturbances were associated with both work-family conflict and depressive symptoms among nurses, confirming our expectation. Work-family conflict was previously reported to be associated with sleep quantity and quality among nurses (Camerino et al., 2010; Berkman et al., 2015) and patient care workers (Jacobsen et al., 2014). Sleep, as a significant domain of self-care, is important for human health. Both sleep quantity and quality have been closely associated with self-rated physical and mental health (Chasens, Twerski, Yang, & Umlauf, 2010; Faubel et al., 2009), and sleep problems were reported to have a significant association with mental health in nurses (Perry et al., 2015).

This study adds new evidence to the international literature by reporting that sleep disturbances partially mediated the strength of the association between work-family conflict and depressive symptoms in nurses. Even though Punnett and colleagues' conceptual framework (2009) suggested a possible role of sleep in the association between working conditions and mental health, our study is innovative in examining and verifying this mechanism in a sample of nurses. As we expected, sleep disturbances play a partial mediating role in this association, considering the significant association of self-reported sleep disturbances with both work-family conflict and depressive symptoms in our study sample. This finding may explain the important role of sleep in translating work-family conflict into poor mental health. For example, when facing numerous work and family responsibilities, nurses may experience sleep disturbances, which in turn may lead to depressive symptoms.

Work-family conflict, especially the work interference with family indicated in this study, can be greatly affected by working conditions. As we expected, work-family conflict was associated with physical demands, psychological demands and decision authority. To our surprise, we did not find an association of work-family conflict with shift work or social support in the study sample. In previous studies, heavy workload and irregular work schedules were reported as important predictors of work-to-family conflict, and work-to-family conflict was associated with lower job and life satisfaction among nurses (Yildirim & Aycan, 2008).

4.1 | Strengths and limitations

The strengths of this study are the considerations of multiple confounders and mediators in the data analyses. This study has several limitations. The primary limitation was the use of a cross-sectional design with which definitive conclusions about causal relationships cannot be drawn. Future research needs to use a longitudinal design to examine the role of sleep disturbances in the association between work-family conflict and depressive symptoms among nurses in order to verify the study findings.

A second limitation was the limited generalizability of the study findings to other healthcare institutions or companies due to the inclusion of nurses from a single not-for-profit community hospital, the comparative low response rate (36%) and the lack of racial diversity in the study sample. However, inclusion of a single organization in the study avoids possible confounders at the organizational level. The sample size is reasonable, even though the response rate may lead to a selection bias of the population. According to the American Association of Colleges of Nursing (2015), the nurse population in the United States is

comprised of 83% White, 6% Black and 11% others. Therefore, a follow-up study using a more nationally representative random sample of nurses would allow generalizing our conclusions to other healthcare settings.

A final limitation was the low reliabilities of the work-family conflict, psychological demands and decision authority scales in the study sample. Even though the reliabilities of these scales reported in this study were similar to those reported in a previous study with nursing assistants (Zhang et al., 2016), further assessment and refinement of these scales are needed to improve the internal validity of the study findings.

5 | IMPLICATIONS

This cross-sectional study identified sleep disturbances as a partial mediator in the association between work-family conflict and depressive symptoms among nurses. Future interventions to promote healthy sleep practices should be evaluated for their effectiveness in addressing the impact of work-family conflict on the mental health of nurses.

Healthcare organizations can use the study findings to inform organizational initiatives to provide mental health services to nurses. For example, similar to other shift workers, employee assistance programmes should include sleep health education, evaluation, and training for employees, and sleep disorders screening and sleep wellness should be an integral part of employee health services (Barger et al., 2016; Rajaratnam et al., 2011; Richter, Acker, Scholz, & Niklewski, 2010). Nursing management should be actively involved in the process of recognizing sleep as an important factor in mental health among nurses and providing screening, education and advice. A specific focus on improving sleep should be considered to mitigate the effect of work-family conflict and promote mental health in this population of employees.

Quality sleep is essential to daily functioning. Nurses also need to receive specific training in sleep health, how to recognize sleep disorders, the health and safety consequences of sleep deficiency, and how to cope with the impact of work on sleep, even before entering the workforce (Lee et al., 2004). Cognitive behavioural therapy (Babson, Feldner, & Badour, 2010) and complementary and integrative health strategies (e.g., yoga and meditation) (Sarris & Byrne, 2011) have been reported to be effective interventions for sleep disorders. Institutions should include sleep health education in workplace health programmes, which may improve the mental health of nurses.

In addition, organizations should consider the improvement of work environment as a pathway in the prevention and intervention of work-family conflict. Previous research has demonstrated the importance of enhancing job control and social support in reducing work-family conflict (Kelly et al., 2011; Kossek et al., 2011). Therefore, actions by employers that enhance the job control and social support of nurses may also reduce work-family conflict. Possible work environmental improvements to reduce nurses' work-family conflict include involving nurses in making decisions about work schedules; reducing nurses' workload through increasing staffing; and genuinely listening to nurses' expectations and opinions when difficulties arise from their work or family life.

6 | RELEVANCE STATEMENT

This cross-sectional study contributes to international evidence through identifying sleep disturbances as a mediator in the association between work-family conflict and depressive symptoms among nurses. The study has critical implications for future mental health practice. Healthcare organizations should incorporate healthy sleep practices for nurses, including providing psychological and sleep disorders screening, counselling and follow-up. Evidence-based interventions to promote healthy sleep practices such as cognitive behavioural therapy and complementary and integrative approaches should be evaluated for their effectiveness in addressing the impact of work-family conflict on mental health of nurses. Organizations should include sleep education and training in workplace health programs.

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Accessible summary

What is known on the subject:

- Nurses are at a high risk for work-family conflict due to long and irregular work hours and multiple physical and psychosocial stressors in their work environment.
- Nurses report higher rates of depressive symptoms than the general public, leading to a high rate of burnout, absenteeism, and turnover.
- Work-family conflict is associated with negative consequences in nurses including physical illnesses and mental disorders.

What this study adds to existing knowledge:

- Past research on this topic has not examined the mechanisms for the effect of work family conflict on depression. Studies rarely examine the influence of health behaviors such as sleep in explaining this association.
- Our study identified significant association of sleep disturbances with both work-family conflict and depressive symptoms in nurses.
- Our main contribution is reporting the important role of sleep disturbances in translating the effect of work-family conflict on depressive symptoms among nurses.

What are the implications for practice:

- Nurses need to receive training in best practices for maintaining their own sleep and mental health. Organizations should include sleep health education and training in workplace health programs.
- Evidence-based interventions to promote healthy sleep practices such as cognitive behavioral therapy and complementary and integrative approaches should be evaluated for their effectiveness in addressing the impact of work-family conflict on the mental health of nurses.
- Healthcare organizations should incorporate mental health services as part of their Employee Assistance Program for nurses and include psychological and sleep disorders screening, counseling, and follow-up.

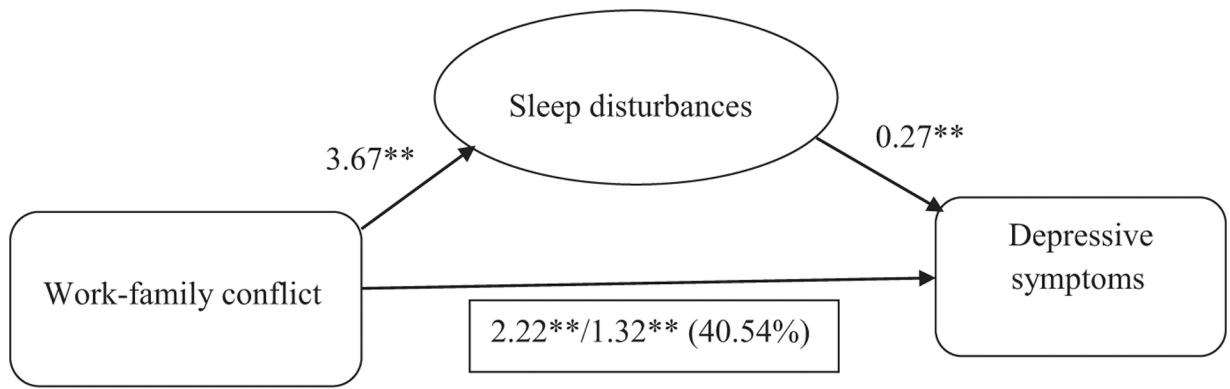


FIGURE 1.

Results of the mediator model, 2.22 = the standardized coefficient before introducing sleep disturbances into the model; 1.32 = the standardized coefficient after introducing sleep disturbances into the model; 40.54% = the mediated percentage of the associations between work-family conflict and depressive symptoms after introducing sleep disturbances into the model. * $p < .05$, ** $p < .01$

TABLE 1

Socio-demographics, working conditions, work-family conflict, sleep disturbances and depressive symptoms among nurses ($N = 397$)

Variables	Mean \pm SD or frequency (percentage)
Age	43.15 \pm 12.00
40 years	166 (42.00%)
40–60 years	191 (48.40%)
>60 years	38 (9.60%)
Gender	
Female	375 (95.20%)
Male	19 (4.80%)
Race	
White	365 (91.90%)
Black	12 (3.10%)
Others	20 (5.00%)
BMI	26.77 \pm 5.97
Underweight	8 (2.10%)
Normal	163 (42.30%)
Overweight	123 (31.90%)
Obese	91 (23.70%)
Regular exercise (yes)	169 (43.10%)
Shift work	
8 hr day	141 (35.90%)
8 hr evening	54 (13.70%)
8 hr night	27 (6.90%)
12 hr day	79 (20.10%)
12 hr evening ^a	14 (3.60%)
12 hr night	78 (19.80%)
Physical demands (range 5–20)	13.44 \pm 3.32
Psychological demands (range 4–16)	11.40 \pm 1.82
Decision authority (range 3–12)	9.10 \pm 1.42
Social support (range 4–16)	12.09 \pm 1.85
Work-family conflict (range 1–4)	2.49 \pm 0.56
Sleep disturbances (range 28.9–76.5)	51.69 \pm 7.07
Depressive symptoms (range 0–30)	6.78 \pm 4.25

BMI, Body Mass Index.

^a 12 hr evening shift includes work schedules of 9 a.m.–9 p.m. 11 a.m.–11 p.m. and 12 p.m.–12 a.m.

Multivariate linear regression models for work-family conflict, sleep disturbances and depressive symptoms among nurses

TABLE 2

Analysis and model	Independent variable	Dependent variable	β	95% Confidence intervals	<i>p</i>	<i>R</i> ²	Adjusted <i>R</i> ²	Mediating effect
Analysis I								
Model 1	Work-family conflict	Depressive symptoms	2.22**	1.44–3.00	<.001	.21	.18	
Analysis II								
Model 2	Work-family conflict	Sleep disturbances	3.67**	2.35–5.00	<.001	.15	.13	
Analysis III								
Model 3	Sleep disturbances	Depressive symptoms	0.27**	0.21–0.32	<.001	.32	.30	
Analysis IV								
Model 4	Work-family conflict Sleep disturbances	Depressive symptoms	1.32** 0.24**	0.58–2.07 0.18–0.30	.001 <.001	.34 <.001	.32	40.54%

Model 1, 2, 3 and 4 were adjusted for age, gender, race, BMI, regular exercise, shift work and physical demands, psychological demands, decision authority and social support.

* *p* < .05

** *p* < .01.