The Relationship Among Occupational Stress, Coping Styles, and Mental Health of Pediatric Nurses in China: A Combination Study with the Application of the Spearman Correlation and Structural Equation Modelling

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Abstract

Background

Pediatric nurses experience a wide range of stressful events at work every day, which can trigger a lot of emotional responses. The objectives of this study were mainly to assess occupational stress, coping styles and mental health among pediatric nurses, and to explore the potential interrelationships of these factors.

Methods

A total of 381 pediatric nurses from Chongqing, China were recruited in this cross-sectional study. We performed this study based on a questionnaire survey that contained the Chinese Perceived Stress Scale (CPSS), Simplified Coping Style Questionnaire and Symptom-Checklist 90 (SCL-90).

Results

The prevalence of healthy risk stress (HRS) in pediatric nurses was 54.3%, and nurses with different genders and professional titles have different occupational stress level. The result of the positive screen rates of mental healthy problems, by descending order, they were: obsessive-compulsive symptoms (52.0%), depression (33.1%), hostility (32.8%), and so on. Wilcoxon signed rank tests analysis showed pediatric nurses had both significantly higher risk mental health problems compared to general population and national nurse population. And with the application of the Spearman correlation analysis and Structural Equation Modelling were revealed a significant relationship among occupational stress, coping style and mental health. The positive coping style had a negative direct predictive effect on occupational stress ($\beta = -0.499, P < 0.01$) and mental health ($\beta = -0.115, P < 0.01$), negative coping styles had positive predictive effect on occupational stress ($\beta = 0.185, P < 0.01$) and mental health ($\beta = 0.205, P < 0.01$). Occupational stress had significant impact on mental health ($0.416, P < 0.01$), and it was played a part of mediating effect between coping style and mental health.

Conclusion

A high prevalence of occupational stress and worse mental health among pediatric nurses, and occupational stress and coping styles were important predictors for their mental health. In order to improve their mental health level, more attention should be paid and modifications should be made to the occupational stress and coping style for this population.

Background

Occupational stress, also known as stress in the workplace, is described as a pattern of physiological, emotional cognitive and behavioral responses that occur when workers are presented with work demands not matched to their knowledge, skills, or abilities and which challenge their ability to cope[1]. Occupational stress is recognized worldwide as a major problem facing healthcare workers[2]. Epidemiological studies[3–5] conducted in different countries have shown that healthcare workers were at a higher risk of suffering from occupational stress, which directly or indirectly affected the quality and safety of medical/clinical service. Therefore, the health-related issues being encountered by the healthcare workers themselves are being increasingly recognized.

Nursing has been acknowledged to be a stressful occupation with a high prevalence of distress and worked-related stress[6], notably in pediatric settings as the structure and service is very particularity and complexity. Pediatric nurses experience repetitive stress when dealing with sick children and their emotional and desperate parents, which may be extra stressful compared to other general nurses[7]. Moreover, some nurses’ job in the pediatric includes inter alia working under specific circumstances and frequent exposure to longer work shifts, human suffering, grief, death and events which are far beyond usual human experience. Various indicators such as higher incidence of work discontent, turnover rate, insomnia, musculoskeletal diseases, more frequent post-traumatic stress disorders (PTSD), and even suicide suggest[8–10] that pediatric nurses are exposed to higher risk as compared to the general working population and other healthcare workers. For those working in the business environment, burnout and poor job productivity are signs of occupational stress[11].

The topic of occupational stress has been given considerable attention as an important reference guide of psychological health. Chronic excessive continuous stress may worsen their mental health conditions, causing difficulty in the ability to function at work. A survey about the 1-year prevalence of mood disorders in Dutch showed that citizens with a high income was 3.0%, and the 1-year prevalence of anxiety disorders was 6.0% vs 29% and 24% respectively for physicians[9]. However, the prevalence of anxiety and mood disorders in Chinese adults according to the National Mental Health Survey could be as high as 7.4% and 7.6%[12], respectively. And for nurses, the prevalence of both depression and anxiety disorders were 43.4% and 61.7%[13–14]. Consequently, the increasing numbers of nurses feel frustrated and burned out in their job, and related behavioral health issues have drawn public attention. An important task for research is to determine the variables that might protect nurses’ mental health against occupational stress.

Lazarus and Folkman[15] defined coping as constantly changing cognitive and behavioral efforts to manage specific internal/external demands that are appraised as exceeding the resources of the person. Coping mechanisms are categorized as problem solving and emotionally focused coping. Lin et al.[16] found that the effective utilization of coping mechanisms interferes with the level of stress and depression experienced. Moreover, a study of
hospital nurses in Australia and New Zealand found that the avoidance type of coping strategy was significantly associated with physical and mental health[17]. This means that a stress level can be mediated if an individual administers the effective coping strategies to handle the stressors. However, there is a paucity of studies examining these variables in Middle East countries, and the majority of the previous studies were conducted with nurses as follows: emergency, ICU, psychiatric,community [16, 18–20]. Little is known about pediatric nurses in mainland China, and an association among occupational stress, coping strategy and mental health is not unclear.

Under the current opening-two child-policy in China, the working conditions of pediatric nurses have become exhausting and highly stressful in recent years due to heavy workloads and litigation, extended working hours and high rates of workplace violence, a lack of control over work, and tense nurse-patient-parent relationships[21–24]. Moreover, many graduates of Medical University were unwilling to work in children’s hospital[25]. Wenling H et al.[26] found that there were only 1.3 pediatric staffs (0.6 doctors and 0.7 nurses) in per ten thousand Chinese people. It means that critical situation need to be faced is the shortage of pediatric nurses. As our previously studies described[27] that the prevalence of health related stress(HRS) in pediatric staffs was 70%, which having higher stress risk than the general population. Thus, further understanding occupational stress and coping variables that may relate most closely to mental health among pediatric nurses is necessary. The quantitative studies already conducted in this area used classical statistical procedures assessing straightforward relationships, such as linear or logistic regression. However, the association between all of these factors is probably more complex. Structural equation modeling (SEM) is a statistical procedure that allows testing non-straightforward relationships and is therefore well suited to the management of cross-sectional data for inferential purposes. These models enable the simultaneous fit of several multiple linear regressions and the variables present in the regressions may be either observable or latent[28].

The objective of the study is firstly, to assess occupational stress, coping styles and mental health among pediatric nurses, and secondly, to explore the inter-relationships of these factors in our institute.

**Methods**

**Participants**

The cross-sectional study was conducted in Chongqing, China from December 2019 to February 2020, and a convenience method was used to recruit participants from a tertiary specialized children’s hospital. All pediatric nurses from different departments, including Internal Medicine, Surgery and Outpatients, Emergency, and Intensive Care Unit (ICU). In each department, we invited all nurses who satisfied the inclusion criteria to participate this study. The inclusion criteria were: 1) qualified nurses with registration; 2) more than 6 months of working experience in at least one pediatric department; 3) no history of mental illnesses; 4) consent to participate in the study. Nurses were excluded if they were intern nurses or receiving standardized training, or if they worked less than 6 months in pediatric department.

**Participant recruitment**

The research was conducted according to the guidelines stated in the Declaration of Helsinki, and ethical approval was obtained from an Institutional Review Board. Prior to data collection, we explained to every participant the purposes and significance of the survey before obtaining their written informed contents. And we also informed their right to withdraw from the study at any time or choose not to answer questions about their experience. Participants participated in the study voluntarily and anonymously and their information were kept strictly confidential and only used for this research.

**Measures**

**Demographic variables**

Demographic variables included age, gender, educational level, marital status, title, department, and length of employment.

**Occupational stress**

A Chinese version of Perceived Stress Scale (CPSS) was used to assess the nurses’ occupational stress. It had been reported as having good reliability and validity in Chinese populations[29]. The questionnaire contains 14 items of two scales. Responses to all the items were scored as 0 meaning never and 4 meaning always. All the scores of the responses for the scale and subscales were dichotomized as "high" or "low" from the median, the higher scores, the higher level of stress. Respondents with a total score above 25 were considered as HRS.

**Coping style**

The style of coping strategies was assess by the Simplified Coping Style Questionnaire(SCSQ). It was a validated instrument of 20 statements within positive copying (12 items) and negative copying (8 items). Responses to all the items were scored from 0 to "Never do" and 3 to "always do". The higher the scores, the more likely this copying style is to be used by the participants. The subscales alpha coefficients ranged from 0.78 to 0.89, and test-retest reliabilities was 0.89[30].

**Mental health**
A 90-item Symptom Checklist 90 (SCL-90) was applied to measure the level of mental health, including somatization disorder, obsessive compulsive symptom, sensitivity to interpersonal relationships, depression, anxiety, hostility, fear, stubbornness, and psychological symptoms. The scale contained 90 items based on a 5-point scale (1, Never; 2, mild; 3, moderate; 4, serious; 5, excessive serious.). A higher score indicated worse mental health status. Respondents with a total score of 160 points, or had more than 43 positive items, or a score of ≥2 points for any symptom was considered as having mental problem. The scales’ alpha coefficients was 0.954 for this rating scale.

Data analysis

All statistical data analyses were performed using Statistical Package for Social Sciences (SPSS) software version 22.0. Descriptive statistics were generated from the demographic data. The prevalence of occupational stress among different sociodemographic groups were compared using independent t-tests or One-way ANOVA. The differences of SCL-90 scores between pediatric nurses and general norm were compared using Wilcoxon signed rank tests. And the Spearman correlation analysis was performed to examine the linear relationships between each independent variable before they entered the model. AMOS 5.0 was used for SEM analysis, and this SEM model estimation was conducted using maximum-likelihood estimation. Model fit indices were examined to test the overall fit of the model to the collected data including the chi-square test, the goodness-of-fit index (GFI; values approximating 0.90), the comparative fit index (CFI; values approximating 0.90), and the root mean square error of approximation (RMSEA; values approximating 0.08). In all analyses, statistical significant was set as a two-tailed p-value of <0.05.

Results

Participant characteristics

Among the 399 questionnaires delivered, 381 valid questionnaires were returned (response rate 95.5%). There were 25 (6.6%) male nurses and 356 (93.4%) female nurses. The age distributions were: <30 years (n = 231, 60.6%); 31–40 years (n = 129, 33.9%); and ≥ 41 years (n = 21, 5.5%). There were 98 (25.7%) nurses from Department of Internal Medicine, 107 (28.1%) nurses from Department of Surgery, 78 (20.5%) nurses from Department of Outpatient and Emergency, and 98 (25.7%) nurses from the ICU. 44 (11.6%) nurses had a college degree, 331 (86.9%) had a bachelor’s degree, and 6 (1.6%) had a master’s degree.

Status of Occupational Stress and coping style among pediatric nurses

Sociodemographic variables and the results of independent t-tests or One-way ANOVA were shown in Table 1. For whole sample, the mean score of CPSS was 25.80 (SD = 6.85), and approximately 54.3% were reported as having HRS. There were statistical significant difference among the variables of gender and professional title. Prevalence of occupational stress in females was significant higher than males. Within professional title groups, the respondents in the senior group had the highest prevalence of occupational stress.

And descriptive statistics about coping style was showed that for whole sample, the mean score of positive coping style was 1.87 (SD = 0.51), and the negative coping style mean score was 1.18 (SD = 0.49).
Table 1
Comparison of occupation stress of baseline characteristics (N = 381)

| Variables          | Groups                   | N(%)     | CPSS scores mean(SD) | F/t | P-value |
|--------------------|--------------------------|----------|-----------------------|-----|---------|
| Department         | Internal Medicine        | 98(25.72)| 26.86(6.29)           | 1.94| 0.122   |
|                    | Surgery                  | 107(28.08)| 26.25(6.86)           |     |         |
|                    | Outpatient and Emergency | 78(20.47)| 25.13(6.48)           |     |         |
|                    | ICU                      | 98(25.72)| 24.77(7.55)           |     |         |
| Gender             | Male                     | 25(6.56) | 22.40(8.93)           | -2.58| 0.017   |
|                    | Female                   | 356(93.44)| 26.03(6.63)           |     |         |
| Age(years)         | ≤ 30                     | 231(60.63)| 26.03(7.22)           | 1.07| 0.344   |
|                    | 31–40                    | 129(33.86)| 25.71(6.17)           |     |         |
|                    | ≥ 41                     | 21(5.51) | 23.76(6.72)           |     |         |
| Education          | College degree           | 44(11.55)| 26.18(7.80)           | 0.28| 0.759   |
|                    | Bachelor's degree        | 331(86.88)| 25.78(6.73)           |     |         |
|                    | Master's degree          | 6(1.57)  | 24.00(7.27)           |     |         |
| Title              | Junior                   | 56(14.70)| 25.89(8.94)           | 3.24| 0.040   |
|                    | Senior                   | 273(71.65)| 26.20(6.54)           |     |         |
|                    | Advanced                 | 52(13.65)| 23.58(5.46)           |     |         |
| Work experience(years) | < 5                  | 132(34.65)| 25.48(7.25)           | 1.32| 0.267   |
|                    | 5–9                      | 150(39.37)| 26.49(6.61)           |     |         |
|                    | ≥ 10                     | 99(25.98)| 25.16(6.64)           |     |         |

Status Of Mental Health Among Pediatric Nurses

Table 2 showed that the positive detection rates of mental healthy problems, by descending order, they were: obsessive-compulsive symptoms (52.0%), depression (33.1%), hostility (32.8%), sensitivity to interpersonal relationships (30.7%), somatization disorder (28.6%) and so on. Table 3 displayed the average score of the SCL-90 subscales ranged from 1.14 to 2.00, and significant higher than general population[31] and national nurse population[32], respectively.

Table 2
The positive detection rates of mental healthy problems for Participants (N = 381)

| Subscales                        | Positive numbers(N) | rates(%) |
|----------------------------------|---------------------|----------|
| Obsessive-compulsive symptoms    | 198                 | 52.0%    |
| Depression                       | 126                 | 33.1%    |
| Hostility                        | 125                 | 32.8%    |
| Sensitive to interpersonal relations| 117                 | 30.7%    |
| Somatization disorder            | 109                 | 28.6%    |
| Anxiety                          | 88                  | 23.1%    |
| Stubbornness                     | 79                  | 20.7%    |
| Psychological symptoms           | 79                  | 20.7%    |
| Fear                             | 64                  | 16.8%    |
Table 3
Comparison of SCL-90 with other study participants

| Subscales                        | Current study (n = 381)   | General population (n = 1388) | National nurse population (n = 79,663) | P-values † | P-values ‡ |
|----------------------------------|--------------------------|-------------------------------|--------------------------------------|------------|------------|
|                                  | M(P25-P75) mean(SD)      | mean(SD)                      | mean(SD)                             |            |            |
| Somatization disorder            | 1.50(1.17–2.08)          | 1.37(0.48)                    | 1.64(0.68)                           | 0.000      | 0.659      |
| Obsessive-compulsive symptoms    | 2.00 (1.60–2.50)         | 1.62(0.58)                    | 1.81(0.70)                           | 0.000      | 0.000      |
| Sensitive to interpersonal       | 1.67 (1.22–2.00)         | 1.65(0.51)                    | 1.70(0.65)                           | 0.354      | 0.371      |
| relationships                    |                          |                               |                                      |            |            |
| Depression                       | 1.69 (1.23–2.15)         | 1.50(0.59)                    | 1.72(0.73)                           | 0.000      | 0.833      |
| Anxiety                          | 1.50 (1.20–1.90)         | 1.39(0.43)                    | 1.65(0.66)                           | 0.000      | 0.014      |
| Hostility                        | 1.50 (1.17–2.17)         | 1.46(0.55)                    | 1.61(0.64)                           | 0.000      | 0.161      |
| Fear                             | 1.14 (1.00–1.57)         | 1.23(0.41)                    | 1.40(0.57)                           | 0.097      | 0.000      |
| Stubbornness                     | 1.50 (1.17–1.83)         | 1.43(0.57)                    | 1.50(0.60)                           | 0.078      | 0.479      |
| Psychological symptoms           | 1.40 (1.10–1.85)         | 1.29(0.42)                    | 1.42(0.55)                           | 0.000      | 0.023      |

†: Comparison with General population; ‡: Comparison with National nurse population.

Associations Among Mental Health, Occupational Stress And Coping Style

Table 4 displayed the results of the Spearman correlation. SCL-90 and all of subscale scores had a positively significant correlation with CPSS and Negative coping style (P < 0.01), while negatively correlation with Positive coping style (P < 0.01).

| Variables                        | Somatization disorder | Obsessive-compulsive symptoms | Sensitive to interpersonal relationship | Depression | Anxiety | Hostility | Fear | Stubbornness | Psychological symptoms | Total score |
|----------------------------------|-----------------------|-------------------------------|-----------------------------------------|------------|---------|-----------|------|--------------|------------------------|-------------|
| CPSS                             | 0.40**                | 0.45**                        | 0.44**                                  | 0.51**     | 0.47**  | 0.49**    | 0.38**| 0.41**       | 0.41**                 | 0.50**      |
| Coping style                     | -0.27**               | -0.19**                       | -0.28**                                 | -0.32**    | -0.31** | -0.30**   | -0.24**| -0.28**      | -0.27**                | -0.30**     |
| Positive coping style            | 0.20**                | 0.23**                        | 0.21**                                  | 0.20**     | 0.19**  | 0.25**    | 0.25**| 0.26**       | 0.20**                 | 0.23**      |
| Negative coping style            |                       |                               |                                         |            |         |           |      |              |                        |             |

*P < 0.05, **P < 0.01.

The Structural Equation Model of occupational stress, coping style and mental health

Our model showed that the overall fit information was as follows: $\chi^2 = 3.299$; GFI = 0.925, CFI = 0.974, and RMSEA = 0.078. These indicators proved to fit the data adequately based on the standards of model testing. Moreover, we found that positive coping style had a negative direct predictive effect on occupational stress ($\beta = -0.499, P < 0.01$) and mental health ($\beta = -0.115, P < 0.01$), negative coping styles had positive predictive effect on occupational stress ($\beta = 0.185, P < 0.01$) and mental health ($\beta = 0.205, P < 0.01$), and occupational stress had significant impact on mental health ($0.416, P < 0.01$). We also found that occupational stress played a part of mediating effect between coping style and mental health, with a mediating effect of 64.33%, 27.24% for positive coping style path and negative coping style path, respectively.

Discussion

In this study, the prevalence of HRS in pediatric nurses was 54.3%, and the mean score of CPSS was 25.80 (SD = 6.85), which was much higher than that among the radiological medical personnel in Zhengzhou, China (22.11 (SD = 4.69)) [33] and among the medical personnel in Sichuan, China (25.31 (SD = 6.44)) [34]. The results of the present study regarding the CPSS test revealed that pediatric nurses working in locked units experienced relatively high levels of stress. It is may related to the working conditions of pediatric nurses have become exhausting due to service particularity, heavy workload, occupational environment and complexly interpersonal relationships, work-family conflicts, notable is the high prevalence of aggressive behavior and workplace violence towards nurses, as stated in the quotes. we also found that the occupational stress had significant difference among gender and professional title. As for gender, female nurses had a significantly higher occupational stress when compared to male. A possible reason is that 84% of
the male nurses are from intensive-care unit (ICU), where the ratio of bed were the highest than other departments in children's hospital. And ICU may can reduce the probability of workplace violence due to it's an unaccompanied ward, which a little direct contact with the children's parents. Additionally, the gender differences in occupational stress may be attributed to psychological behavior factors, Wu et al.

The risks of occupational stress in pediatric nurses may also be affected by different professional title. Our data showed that senior nurses had significantly higher occupational stress than junior and advanced nurses. The main reason may be attributed to the ranking professional title system in mainland China. In China, a nurse wants to promote the titles from junior to senior, they just need to pass the major exam when he or she has 2–4 years of clinical experience according to the education background. However, for senior nurses, if they want to be advanced one, they should conform to the more higher criterion including years of clinical nursing experience, the professional title examination, English level exam and research paper presentations[36]. Especially, for most of nurses, little or rarely experience in scientific research and paper writing means little or rarely chances to promote the title in contest of Chinese, which becomes a main work-stressor and a big barrier for them[27, 37–38].

Pediatric nurses are the major force in hospitals and are in the front line in contact with ill children and their parents, but our findings evidenced positive screens of mental healthy problems as obsessive-compulsive symptoms (52.0%), depression (33.1%), hostility (32.8%), and so on, the status of pediatric nurses’ mental health may be worse in mainland China. Moreover, among the pediatric nurses in this study, we also found that they had both significantly higher risks of developing obsessive-compulsive symptoms, anxiety and psychological symptoms compared to general population and national nurse population. Suspicion of child abuse and critically ill children are two topics that distinguish pediatric from other specialties and why this specific specialty can have high emotional burden[9]. Interestingly, the obsessive-compulsive symptoms was ranked first in the SCL-90 subscales. This result might be explained by the necessity of more unmasked attention and care from nurses due to lack of the expression ability of illness and immaturity children. Otherwise, the medications used in pediatric clinics are usually complex and varied significantly among different age group with different medicines, which need pediatric nurses to repeatedly check the name and dose of medicine over and over again, as a result of them more vulnerably to have obsessive compulsive. Additionally, previous studies of nurses that have evidence mental health problems and associated conditions(e.g., depression, stress, exposure to trauma, anxiety) as significant factors related to suicidal behaviors[10, 39–40].Therefor, these finding indicated that the prevention for pediatric nurses need to focus more on mental health should be provided.

Looking at the level of mental health among our participants, the study revealed a significant relationship among these variables. Changes on some variables will predict changes on other variables. From the SEM model in Fig. 1, it could be seen that coping styles was an important independent variable that have several paths of influence with other variables in the model. For instance, positive coping style had a negative direct predictive effect on occupational stress (-0.499) and mental health (-0.115), negative coping style had positive predictive effect on occupational stress(0.185) and mental health(0.205). Consistently, Hasan et al.

Moreover, occupational stress had significant impact on mental health(0.416), this relationship reflected that the level of work-related stress increased, the level of obsessive-compulsive symptoms, depression, hostility, anxiety, and so on also increased, consistent with previous research[5, 41]. Furthermore, we found that occupational stress played a part of mediating effect between coping style and mental health. It means that coping styles could indirectly affect the mental health of pediatric nurses through occupational stress. Thus, future intervention programs should target pediatric nurses (e.g., establish an accessible employee assistance program for then) as well as their mental health, especially to decrease the work-related stress problems and enhance coping style. Doing this can strengthen work satisfaction in clinical setting and reinforce better coping strategies.

This study also has some limitations. Firstly, the study data was obtained from a single city in southwestern China, the sample may not have been representative of China pediatric nurses. Future research could involve the nurses from different grades or regions of hospital. Second, the study is mainly used structure questionnaires. So that, qualitative study approach is recommended to explore this issue further. Thirdly, we gave little consideration on the relations between occupational stress, coping styles and mental health, which need to be further researched in the future.

**Conclusion**

Despite these limitations, this study showed a high prevalence of occupational stress and worse mental health in pediatric nurses. Additionally, exposure to suffering stress with difference of gender and professional title. Furthermore, we identified that occupational stress and coping styles were important predictors for mental health in pediatric nurses. The present study provided valuable insights into the correlation among occupational stress, coping styles and mental health, and may offer guidance for develop a better support system or implement ways to cope with this issue for pediatric nurses.

**Abbreviations**

CPSS
A Chinese version of Perceived Stress Scale; HRS: healthy risk stress.

**Declarations**
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Author’s contribution

ZYT wrote the manuscript as a first author. GXL contributed to interpretation of the analysis results and revised the manuscript as a co-first author. ZYT and GXL contributed equally to this manuscript. Professor YHY conceived and designed the study and revised the manuscript as a corresponding author. ZYT and GXL were involved in the collection of the data. All authors read and approved the final article.

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Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author (Huaying Yin) on reasonable request.

Ethics and consent to participate

This study was approved by the Ethics Committee of the children’s hospital of Chongqing Medical University, China. Written Informed consent to participate was obtained from all the study subjects before enrollment.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

Figure 1

Graphical research model for SEM (Structural Equation Modelling) analysis