BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-019373
Article Type:	Research
Date Submitted by the Author:	30-Aug-2017
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Primary Subject Heading:	Health policy
Secondary Subject Heading:	Mental health, Nursing
Keywords:	Workplace violence, Chinese Nurses, Compassion, Sleeping Quality, Subjective Health Status

Impact of Workplace Violence and Compassion in Hospital on Stress, Sleeping Quality and Subjective Health Status among Chinese nurses：A Cross-sectional Survey

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Keywords: Workplace violence; Chinese Nurses; Compassion; Sleeping Quality; Subjective Health Status

Abstract

Objectives: The aims of this study are to describe the current state of workplace violence (WPV) against nurses, and to survey the state of compassion care in hospital, and to explain how they affects nurses' stress, sleep quality and subjective health status.

Design: A cross-sectional online survey study.

Setting: The survey was conducted across 30 provinces of China.

Participants: A total of 1024 nurses were recruited to complete an online questionnaire survey during May 2016 in China.

Results: Of the participants, approximately 75.4% participates had suffered some forms of violence. Most

of the participants experienced workplace violence followed by verbal violence (65.2%), made difficulties (53.9%), smear reputation (38.1%), mobbing behavior (34.5%), menace behavior (18.6%), physical violence (14.4%) and sexual harassment (5.8%). In this study, 92.2% of the participants experienced the compassion from their co-workers (14.6%), their supervisors (30.3%) and on the job (47.4%). The results revealed that the exposure to WPV and experienced compassion significantly affected psychological stress, sleep quality and subjective health of nurses. Moreover, the psychological stress played a partly mediating role in relationship between work-related violence and health outcome, and played a partly mediating role in relationship between work-related compassion and health outcome.

Conclusion: In China, most nurses have suffered different forms of WPV from patients or their relatives, while they experienced various compassion from their co-workers or supervisors or patients. The prevalence of different new types of WPV and compassion has been investigated in our study. The several harms on nurses from exposure to violence is confirmed. We found that WPV could damage the nurses' health outcomes, while the compassion were beneficial to the nurses' health outcomes. A harmonious nursing environment should be provided to minimize the nurse health threats.

Strengths and limitations of this study

The prevalence of different types of workplace violence and compassion is conducted among nurses in China.

This is the first study investigating the relationship between workplace violence, compassion and psychological stress, sleep quality, and self-reported health of nurses in China.

The approach to self-reports of nurses by an online survey may resulted in response bias

Causation is unable to be established due to cross-sectional study design.

Introduction

Nursing environment directly affects the quality of care and enhances the threat of patient safety owing to nursing errors[1]. Currently, workplace violence (WPV) has rapidly increased in the health institutions[2], the patients and their relatives violence is the highest nurse risk, because of contacting with patients frequently and facing medical disputes directly. WPV characteristics include all the threatening act, verbal threat, physical assault, or sexual assault which is launched by any patients and their relatives, or any other individual against medical employees that poses a risk to them[3]. Either of violence has the negative implications to nurses' health and safety [4 5] and threatens the quality of patient care[6]. Thus, WPV exacerbates the high-pressure work environment, resulting in very serious health problems among nurses. Likewise, WPV intensifies with the nurses work stress that influence their health.

Due to their work environment character, nursing is a more psychological stress and suffering professional.[7 8].While, compassion at work is associated with more frequent positive emotion and heightened affect commitment[9]. Peter J. Frost identified compassion as comprised of three interrelated elements: noticing another suffering, feeling empathy for the other's pain[10], and responding to the suffering in some way, and compassion came from their client, supervisors and co-workers[11]. Previous studies found that nurses frequently felt that theirs supervisors and co-workers were willing to listen to them and empathize with their negative emotions and their distress. Nurses beget the positive moods that arises from this compassion could effectively increase job performance and OCB. The effects of compassion contribute to an organization's capability for cooperation. As suggested in the medical and nursing literatures, the compassion as a moral appears[12]. Compassion is seen as an essential component of patient care, while we often ignored the nurse as a special group, who is directly related to the recognition and treatment of patient suffering, which is supposed to be concerned. The compassion delivered by their

patients, supervisors and co-workers may have effect on the health outcomes of hospital nurses.

The work environment influence the nurses' stress that affects the practice worldwide and nurse-patient relationship[13]. The frequency and form of the nurse facing patients might lead to experience different forms of violence, while accepting different forms of compassion at work. Nurses suffer more risk of work stress that come from the work experience, who often undergo the gastrointestinal discomfort and sleep disorders[1]. A Swedish research reported that 80% of nurses had high or very high levels of stress[13]. The effect of stress has been considered, it is an important cause of decreasing health outcome of nurses and nursing quality[14]. Bang, Young Eun, Park, Bohyun found that nursing work environment was slightly negative, and showed that the nursing work environment and nurses' stress were factors affecting their health problems[15]. Nurses may neglect their job requirements and inadvertent medical errors can be caused when psychological stress is accumulated for long periods[1]. Psychological stress of nurses not only damaged their own health but also lead to a negative impact on patients heal in some way[16].

Sleep quality is a person's assessment of his/her sleep related characteristics and whether these qualities are satisfactory[13]. Besides, self-perceived physical health served as the predictors for psychological health[13]. Subjective sleep quality and subjective heath status were a person's overall health evaluation. Both of them have effects on the nurse-patient relationship, organization development, patient satisfaction and so on[17]. Nurses influenced by WPV with high status of stress work, tend to report poorer self-perceived health[18], which was 20% more likely to suffer from poor sleep quality than those with low stress[1]. Some nurses who experiencing workplace violence, might tend to react with fewer negative emotions, such as worry anxiety fear, and then caused the low level status of subjective health. While others may experience emotional imbalance, more anxiety, irritability, insomnia and depression, and then influenced their sleep quality, and simultaneously destroyed their health. However, compassion is

associated with a variety of positive emotions which relieve nurses' work pressure[9], and then maintain a pleasant working state. Work environment has a far-reaching influence on the nurses[19], which affects the nurses' health[16], WPV and compassion work environment could arouse different emotion experiences among nurses, further to cause their different subjective health estimated results.

In this study we try to investigate the current status of WPV and compassion in hospital, and we conducted a cross-sectional study to investigate the frequency of workplace violence and to probe into the relationship of these variables, attempt to analyze the mechanism of how WPV and compassion effects on the health outcomes towards hospital nurses of China, whether the stress mediate the positive relationship between experiencing WPV or compassion at work and healthy outcome.

Methods

Subjects and procedures

This is a cross-sectional descriptive study, which was conducted during March 2016 across 30 provinces of China.

An anonymous online questionnaire was completed by nurses throughout the country during February 2016 in China. This cross-sectional study was conducted across 30 provinces of China. First, approximately 30 nurses from the authors' unit were selected as the original deliverers of the survey. Subsequently, the colleagues or classmates of "the original deliverers" were invited to participate in our online survey. A web page linked to our questionnaire-survey (https://www.wenjuan.com/) was sent by mobile phone to subjects during nurses' rest breaks. Moreover, the questionnaires were self-administered. A total of 1362 nurses were invited in this survey. Ultimately, 1034 valid questionnaires were used in the final data analysis. The effective response rate was 75.9%.

Ethics

The research described in present article meets the ethical guidelines of the ethics committee of the College of Public Health, Harbin Medical University, and the project has been approved by the Ethics Committee of the Harbin Medical University (ECHMU). The written informed consent can't be received because of anonymous survey approach, hence, oral informed consent for survey was approved by the ECHMU and obtained from each doctor, once a questionnaire was completed we can think that the doctor has orally agreed to participate in our survey by reference to the Wen's criteria[20].

Measures

Demographic variables: gender, age, work experience, marital status, professional position, education level and so on.

Measurement of the WPV (α=0.85)

To assess exposure to WPV, 7-items measure was used [21]. Nurses were provided with the following instructions, "During the past years, have you been put in a situation where a COWORKER or SUPERVISOR?" Responses were scored on a 5-point scale from 0 (never) to 6 (every day). Scale items included the Verbal Violence, Made Difficulties, Smear Reputation, Mobbing Behavior, Intimidation Behavior, Physical Violence and Sexual Harassment. According to the coding questionnaire, "never" and "rarely" were coded as the non-experienced WPV from patients or relatives, so, those were assigned a score of "0". Other situations were assigned as "1", representing the current state that nurses have experienced the violence.

Measurement of the compassion (α=0.69)

We measured experienced compassion at work using three items developed by Lilius J M Respondents[11] indicated on a 5-point Likert-type (1=never, 5=super frequently) scale how frequently they had experienced compassion: (a) on the job, (b) from their supervisor, and (c) from their co-workers. High

scores indicate high levels of compassion.

Measurement of the psychological stress, sleep quality and subjective live health

Single-item was adopted to measure psychological stress of nurses[22]. Namely, "current work ability compared with the lifetime best, with a possible score of 0=not at all, 5= very much". High scores reflect the high levels of psychological stress. The past literature had confirmed that an item questionnaire had a high validity and sensitivity, also can measure the level of occupational expectation of new nurses[23]. Two single-items were addressed together to measure doctors self-reported health outcomes. Subjective sleep quality [24] was measured to use "How would you evaluate recent night's sleep?", the response format ranged from very bad (1) to very good (4) This study consulted a research of Fein and Skinne[25], the overall subjective health was estimated by a widely used single-item measure (In general would you say your health is 4=excellent, 3=very good, 2=good, 1=fair, poor). High scores reflect high levels of health state.

Statistical analysis

All analyses were addressed by using SPSS statistical software for Windows version 17.0 (SPSS, Inc., Chicago, IL). Demographic characteristics of the nurses were collected to report sample information. Pearson's correlation coefficients were calculated to estimate correlations between the exposure to WPV and compassion, psychological stress, sleep quality, and self-subjective health. A series of hierarchical linear regression analyses were performed to examine our hypotheses according to a procedure that was suggested by Baron & Kenny .We provided data including F, R^2 and R^2-changes, and the fit of the model was assessed with R^2. Standardization regression coefficients (β) and P values were calculated for each step in the regression model.Statistical significance was defined as $P<0.05$(two-tailed).

Results

Demographic information for samples

A summary of demographic variables can be seen in Table 1.

Table 1 Characteristics of the Respondents (n = 1034)

Characteristic	N	%
Age		
20-30	709	68.6
31-40	253	24.5
41-50	49	4.7
51+	4	0.4
Missing value	19	1.8
Gender		
Male	87	8.4
Female	936	90.5
Missing value	11	1.1
Education		
Technical secondary school or below	38	3.7
College degree	226	21.9
Bachelor's degree or above	757	73.2
Missing value	13	1.3
Marital status		
Unmarried	496	48.0
Married	507	49.0
Divorced or loss of spouse	13	1.3
Missing value	18	1.7
Professional categories		
Nurse	355	34.3
Nurse practitioner	473	45.7
Nurse supervisor	166	16.1
Vice director/director of junior	29	2.8
Missing value	11	1.1
Type of work		
work during the day	296	28.6
Day and night conversion	726	70.2
Missing value	12	1.2

As revealed in the Table 2, about 65.2% of participates reported that they had encountered the verbal violence within last 12 months, which is the most incidence rate among all kinds of WPV in hospital. Other incidence rates of WPV from highest to lowest are: made difficulties (53.9%), smear reputation

(38.1%), mobbing behavior (34.5%), intimidation behavior (18.6%), physical violence (14.4%) and sexual harassment (5.8%).

Table 2. The incidence rate and rank ordering of WPV against nurses within last 12 months (n = 1034)

Violence Styles	N	%	Total	Rank
Verbal Violence	667	65.2	1023	1
Made Difficulties	557	53.9	1022	2
Smear Reputation	38.4	38.1	1023	3
Mobbing Behavior	357	34.5	1022	4
Intimidation Behavior	192	18.6	1022	5
Physical Violence	149	14.4	1023	6
Sexual Harassment	60	5.8	1023	7

As shown in Table 3, 75.4% of participates reported that they had experienced one or more types of WPV during the previous 12 months, which indicated that prevalence of WPV against nurses is 75.4% in China. Further, 17.1% of participates reported that they had suffered one type of violence, 15.3% of participates reported they had encountered two types of violence, 13.8% of participates reported that they had experienced three types of violence, 13% of participates reported that they had suffered one four types of violence, 8.7% of participates reported that they had suffered five types of violence, 5.1% of participates reported that they had suffered six types of violence and2.5% of participates reported that they had suffered seven types of violence.

Table 3. Incidence rate of accumulated types of WPV against nurses within last 12 months (n = 1034)

Accumulated Violence	N	%	Valid Percent	Cumulative Percentages
0	250	24.2	24.6	24.6
1 type	174	16.8	17.1	41.7
2 types	156	15.1	15.3	57.0
3 types	140	13.5	13.8	70.7
4 types	132	12.8	13	83.7
5 types	89	8.6	8.7	92.4
6 types	52	5	5.1	97.5
7 types	25	2.4	2.5	100

As revealed in the Table 4, about 83.9% of participates reported that they had encountered the compassion from their co-workers within last 12 months, which is the most incidence rate among three kinds of compassion in hospital. Other incidence rates of compassion from highest to lowest are: from their co-workers (83.9%), from their supervisor (66.4%), on the job (64.4%).

Table 4. The incidence rate and rank ordering of compassion experience nurses within last 12 months (n = 1034)

Compassion Styles	N	%	Total	Rank
from their co-workers	868	83.9	1022	1
from their supervisor	687	66.4	1021	2
on the job	666	64.4	1020	3

As revealed in Table 5, 92.4% of participates reported that they had experienced one or more types of compassion during the previous 12 months, which indicated that prevalence of compassion toward nurses is 75.4% in China. Further 14.6% of participates reported that they had suffered one type of compassion, 30.3% of participates reported they had encountered two types of compassion, 47.4% of participates reported that they had experienced three types of compassion.

Table 5. Incidence rate of accumulated types of compassion experience nurses within last 12 months (n = 1034)

Accumulated Compassion	N	%	Valid Percent	Cumulative Percentages
0	79	7.6	7.8	7.8
1 types	148	14.3	14.6	22.3
2 types	308	29.8	30.3	52.6
3 types	482	46.6	47.4	100

Correlations between study variables

The means, standard deviations, and Pearson's correlation coefficients of continuous variables were described in Table 6. As results revealed, all variables were significantly correlated with each other, WPV was negatively correlated with compassion*(r=-0.224, P<0.01)* sleeping quality(*r=-0.194, P<0.01*) and subjective health status(*r=-0.254, P<0.01*) and was positively correlated with stress *(r=0.302, P<0.01)*. Compassion was positively related to sleeping quality(r=0.334, $P < 0.01$) and subjective health

status*(r=0.346, P<0.01)*, and was negatively related to stress*(r=-0.234, P<0.01)*.Stress was negatively correlated with sleeping quality*(r=-0.463, P<0.01)* and subjective health status *(r=-0.463, P<0.01)*.There was a positive correlation between the sleeping quality and subjective health status*(r=0.597, P<0.01)*.

Table 6.Means (M), standard deviations (SD) and correlations of variables (n = 1034)

Variables	M	SD	N	WPV	Compassion	Stress	Sleeping Quality	Subjective Health Status
WPV	1.1	0.77	1018	1				
Compassion	3.06	0.767	1017	-0.224**	1			
Stress	13.74	4.84	1008	0.302**	-0.234**	1		
Sleeping Quality	2.38	0.793	1022	-0.194**	0.334**	-0.463**	1	
Subjective Health Status	2.58	0.708	1022	-0.254**	0.346**	-0.463**	0.597**	1

Multiple linear Hierarchical regression models

Multiple hierarchical linear regression analysis was used to evaluate the association between the WPV, compassion, psychological stress, sleep quality, and health status of nurses. Analyzing mediation involves three steps[26]. The first step is to establish that the independent variable influences the mediator (*M2, M12*). The second step is to demonstrate the independent variable influences the dependent variable (*M4, M8, M14, M18)*. The third and last step is to demonstrate the mediator influences the dependent variable (*M5, M9, M15, M19)*, with the independent variable being controlled for (*M6, M10, M16, M20)*. In this final step, the effect of the independent variable on the dependent variable is significant reduction when the mediator is in the model partly mediation is indicated[27]. Results of mediation analysis showed that psychological stress is a partial mediator in the relationship between violence and sleep quality, between violence and subjective health. As showed in Table 7. Moreover, psychological stress also partially mediated the relationship between compassion and sleep quality, and between compassion and subjective health. As showed in Table 8.

Table 7.Multiple hierarchical linear regression models of variables (WPV Psychological stress Sleep quality Subjective health). (n = 1034).

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*1	*M*2	*M*3	*M*4	*M*5	*M*6	*M*7	*M*8	*M*9	*M*10
Control Variables										
Age	0.013	-0.022	-0.028	-0.005	-0.021	-0.015	-0.067	-0.037	-0.058	-0.046
Gender	0.055	0.043	-0.005	0.004	0.022	0.023	-0.013	-0.002	0.12	0.016
Service Years	0.034	0.009	-0.063	-0.046	-0.044	-0.041	-0.103	-0.081	-0.087	-0.078
Education	-0.003	0.003	-0.024	-0.027	-0.024	-0.025	-0.02	-0.025	-0.025	-0.024
Marital status	0.079	0.04	0.037	0.063	0.073	0.082	-0.01	0.023	0.024	0.04
Professional categories	0.069	0.58	-0.062	-0.055	-0.032	-0.028	-0.026	-0.016	0.002	0.008
Mediating variable										
Psychological stress					-0.474**	-0.458**			-0.463**	-0.425**
Independent variable										
WPV		0.295**		-0.198**		-0.063**		-0.252**		-0.127**
F	2.493*	15.578**	1.441	6.92**	42.645**	38.193**	1.922	11.142**	40.953**	38.19**
R^2	0.015*	0.099**	0.009	0.047**	0.23**	0.229**	0.011	0.073**	0.223**	0.236**
ΔR^2	0.015*	0.084**	0.009	0.038**	0.221**	0.003**	0.011	0.061**	0.211**	0.014**

*$p<0.05$** $p<0.01$,

Table 8.Multiple hierarchical linear regression models of variables (Compassion Psychological stress Sleep quality Subjective health). (n = 1034)

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*11	*M*12	*M*13	*M*14	*M*15	*M*16	*M*17	*M*18	*M*19	*M*20
Control Variables										
Age	0.009	-0.007	-0.025	-0.002	-0.021	-0.021	-0.061	-0.037	-0.058	-0.04
Gender	0.05	0.061	0.002	-0.013	0.022	0.026	-0.008	-0.024	0.012	0.001
Service Years	0.037	0.017	-0.61	-0.033	-0.044	-0.043	-0.102	-0.073	-0.087	-0.066
Education	0.002	0.018	-0.023	-0.047	-0.024	-0.022	-0.025	-0.5	-0.025	-0.043
Marital status	0.081	0.083	0.036	0.033	0.073	0.074	-0.013	-0.016	0.024	0.018
Professional categories	0.071	0.049	-0.064	-0.033	-0.032	-0.03	-0.03	-0.003	0.002	0.023
Mediating variable										
Psychological stress					-0.474**	-0.473**			-0.315**	-0.405**
Independent variable										
Compassion		-0.229**		0.326**		0.229**		-0.342**		0.249**
F	2.515	10.097**	1.441	17.944**	42.645**	47.592**	1.936	20.433**	40.953**	48.008**
R^2	0.015	0.066**	0.009	0.112**	0.23**	0.278**	0.012	0.126**	0.223**	0.279**
ΔR^2	0.015	0.051**	0.009	0.104**	0.221**	0.049**	0.012	0.114**	0.211**	0.058**

* $p<0.05$ ** $p<0.01$,

Discussions

In this survey, comprising approximately 78.2% participants reported they had experienced some forms of WPV. As well, nearly 70% of the reporters suffered not only one forms of violence types. Compared with the United States, WPV is more serious in Chinese nursing workplace[11]. Compared with other professions, nurses have high rates of non-fatal workplace assault injuries[8]. Result suggested that 92.2% of the participants received compassion from their co-worker, supervisors or work itself. Approximately 50% of the participants acquired three forms of compassion. It is showed that compassion care in medical organization was pretty common. In nursing workplace, both WPV and compassion care are in a high rate.

The influence of WPV on health outcomes

This study is consistent with prior research conclusion. The exposure to WPV has a significant influence on work stress and health outcomes among nurses[28]. This study also presents a new theoretical contribution, that is, the exposure to WPV had direct and indirect effect on the health outcomes of nurses. Moreover, work stress had a partly mediator effect on their relationship. WPV caused high job stress may result in poor sleep quality and negatively affect physical and psychological health. Namely, WPV reduced subjective sleep quality and subjective heath status by weakening work stress of nurses. Previous studies shows that 82.33% of nurses doing shift work had poor sleep quality[13]. Nurses who experienced WPV have emotional fluctuations, increase their job worries, and even appeared intermittently wake up at night, so as to increase the sleep disorders[1]. Violent incidents might result in some serious adverse effects on emotion, cognitive processing, increasing nurses' workload on taking care of hospitalized patients, further causing the stress of nurse. Thus, nurses are uneasy to sleep at night, and feel fatigue, weakness in

daily life, which should not keep positive state to face their work and life. Sleep deprivation not only results in nursing errors and accidents, but can also affect nurses' personal health[29]. The WPV and their influence under a long circle lead to negative effect on both physical and mental health.

The influence of compassion on health outcomes

This study found that high level of work compassion was significantly associated with nurses' health outcomes in nursing workplace. As a report indicated in previous studies[30], compassion at work was beneficial to improve subjective sleep quality and subjective heath status. It was shown that nurses who experienced compassion at work reported a higher score on the subjective sleep quality and subjective heath status than those who did not. Result suggested that the compassion dedicated to promotion of health outcomes. Once the nurse experience the compassion at work such as daily care, open listening and holding space from the others[31], it can prompt positive feelings[32], conscious emotional experiences operate to stimulate cognitive processing after some outcomes or behaviors[32]. Jane E. Dutton founds that acts of compassion express could create renewable resources of trust, quality connections, and positive emotions, and reaffirm shared values of dignity, mutual respect confirm that small interpersonal actions could have big system-wide effects[11]. In fact, nurses are tired caused by the nursing features and satisfies with the expression of love and care from the others, the compassion at work might help nurses balance inter-role and emotion conflict. Thus, they are more willing to devote to nursing career, to keep a positive to face the work challenges, to solve nursing problem. Compassion as a form of care in the workplace, is simple but works well to release pressure and relax of nurses. It is contribute to nurses' sleep and healthy life, that is to say getting different forms of compassion could help to achieve a healthy outcomes thought the mediating role of psychology stress. In relation to these

last ones, it help nurses remain empathetic and compassionate professionals and improve the development of nursing, face work pressure, overloads and those are full of challenge for their daily nursing.

Limitation

Although some significant discoveries were displayed by the present study, it still has several limitations needed to be mentioned. First, a convenience sample was used in this study, which risked a potential problem of sampling bias. Second, a cross-sectional nature was not helpful to establish a causal relationship between the WPV, compassion, stress, sleeping quality and subjective health status. Thus, one important future direction is that longitudinal studies should be conducted. Third, data were obtained by the self-report of nurses, to some extent, resulted in response bias from social desirability or negative affect. Nurses might have overestimated or underestimated the association between study variables. Using the foreign design scales that ignored a cross-cultural adaptability in this study, it is worth attracting academic attention in the future.

Conclusion

In this survey, a total of 78.2% participants reported they had experienced some forms of exposure to WPV. 92.2% experienced the compassion from their co-worker or their supervisor or on the job. The exposure to WPV has a significantly negative influence on the work stress and health outcomes of nurses. This study also has a new theoretical contribution, that is, the exposure to WPV had not only direct but indirect effect on health outcomes of nurses. Work stress had a partly mediator effect on their relationship. Experienced high level of work compassion were significantly associated with the health outcomes among nursing workplace, as reported in

previous studies, compassion care was beneficial to improve the subjective sleep quality and subjective heath status. There is room for improvement to relieve exposure to WPV by weakening work stress of nurses. A harmonious work environment for nurses need to be provided, it is urgent to watch the damage to the health outcomes from WPV among nurses.

Acknowledgments: The authors thanks the participants at Harbin Medical University for their support, and give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

Funding: This study was funded by the Innovation Science Research Foundation of Harbin Medical University (2016RWZX09) to Tao Sun and also was funded by the Natural Science Foundation of China (71473063) to Fan Lihua. The authors give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

Author Contribution: Conceived and designed the experiments: LF TS WL SZ. Performed the experiments: SZ WL JW YS FX. Analyzed the data: TS WL SZ. Contributed reagents/materials/analysis tools: WL SZ SC. Wroten the paper: SZ WL TS.

Competing Interests

Competing Interests: The authors have declared that no competing interests exist.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page 1, line 24-30;
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P.1; line 31; p.2, line 1-14
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	p.3, line 2-22; p.5, line 1-4
Objectives	3	State specific objectives, including any prespecified hypotheses	P.5, line 5-9;
Methods			
Study design	4	Present key elements of study design early in the paper	P.5, line 8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	p.5, line 10-17
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	P.7, line 10-17
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	no
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	p.6, line 7-22; p.7, line 1-11
Bias	9	Describe any efforts to address potential sources of bias	no
Study size	10	Explain how the study size was arrived at	no
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P.7, line 12-20

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P.7, line 12-20
		(*b*) Describe any methods used to examine subgroups and interactions	no
		(*c*) Explain how missing data were addressed	no
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	P.7, line 12-20
		(*e*) Describe any sensitivity analyses	no
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P.7, line 1-33
		(b) Give reasons for non-participation at each stage	no
		(c) Consider use of a flow diagram	No
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P.8; p.9;p.10line 1-20
		(b) Indicate number of participants with missing data for each variable of interest	P.8; p.9
Outcome data	15*	Report numbers of outcome events or summary measures	P.8; p.9; p.10; p.11,
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	p.13; p.14
		(*b*) Report category boundaries when continuous variables were categorized	no
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	no
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	no
Discussion			
Key results	18	Summarise key results with reference to study objectives	p.17;15-22 p.15;p.16;p.17line

			1-3
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P.17, Line 4-14;
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	p.15; p.16;p.17line 1-3
Generalisability	21	Discuss the generalisability (external validity) of the study results	no
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P.18, line 8-11

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Impact of workplace violence and compassionate behavior in hospitals on stress, sleep quality, and subjective health status among Chinese nurses : A cross-sectional survey

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-019373.R1
Article Type:	Research
Date Submitted by the Author:	19-Jan-2018
Complete List of Authors:	Liu, Wenhui; Harbin Medical University School of Public Health Zhang, Shue; The Third Affiliated Hospital of Harbin Medical University Wang, Jinghui; Harbin Medical University School of Public Health Shi, Yu; Harbin Medical University School of Public Health Xie, Fengzhe; Harbin Medical University School of Public Health Cang, Shuang; Medical Examination Center of the 2nd affiliated hospital of Harbin Medical University Sun, Tao; Harbin Medical University School of Public Health, Fan, Lihua; Harbin Medical University, Department of Health Management , School of Public Health
Primary Subject Heading:	Health policy
Secondary Subject Heading:	Mental health, Nursing
Keywords:	Workplace violence, Chinese Nurses, Sleeping Quality, Subjective Health Status, Compassion

Impact of workplace violence and compassionate behavior in hospitals on stress, sleep quality, and subjective health status among Chinese nurses: A cross-sectional survey

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KEYWORDS: Workplace violence; Chinese Nurses; Compassion; Sleeping Quality; Subjective Health Status

word count: 3878

ABSTRACT

Objectives: The aim of this study is to describe the current state of workplace violence (WPV) and compassionate behavior towards nurses, and to explain how they affect nurses' stress, sleep quality, and subjective health status.

Design: A cross-sectional online survey study.

Setting: The survey was conducted across 8 provinces in China.

Participants: A total of 1,024 nurses were recruited to complete an online questionnaire survey from February to May 2016 in China.

Results: Approximately 75.4% participants had experienced some form of violence. Most of the participants experienced WPV such as verbal violence (65.2%), made difficulties (54.5%), tarnished reputation (37.5%), mob behavior (34.9%), intimidation behavior (18.8%), physical violence (14.6%), and sexual harassment (5.9%). In this study, 92.4% participants experienced compassionate behavior from their co-workers (84.9%), supervisors (67.3%), and from their patients (65.3%). The results show that the exposure to WPV and compassionate behavior significantly affected the psychological stress, sleep quality, and subjective health status of nurses. Moreover, psychological stress played a partially mediating role in the relationship between work-related violence and health outcomes, and in the relationship between work-related compassion and health outcomes.

Conclusion: In China, most nurses have experienced different forms of WPV from patients and/or their relatives, as well as experiencing various forms of compassionate behavior from their co-workers, supervisors, and/or patients. This study investigates

the prevalence of the different types of WPV and compassionate behavior. Several aspects of harm to nurses from exposure to violence is confirmed. We found that WPV can damage nurses' health outcomes, while compassionate behaviors were beneficial to their health outcomes. A harmonious nursing environment should be provided to minimize threats to nurses' health status.

Strengths and limitations of this study

The prevalence of compassionate behavior towards nurses from three sources is investigated.

This is the first study that investigates the relationship between WPV and compassionate behavior and psychological stress, sleep quality, and self-reported health status among nurses in China.

This study highlights the mediation effect of psychological stress in nursing practice, and we demonstrate the interaction mechanisms between these variables.

The approach of self-reporting by nurses through an online survey may have resulted in some bias in the responses, and a convenience sample was used in this study, which risks the potential problem of a sampling bias.

Moreover, causation was not established because of the cross-sectional study design.

INTRODUCTION

The environment surrounding nurses directly affects the quality of care that patients receive as well as the threat to patient safety owing to nursing errors.[1] Workplace violence (WPV) has

rapidly increased in health institutions,[2] with violence from patients and/or their relatives being the highest risk to nurses given the frequent level of contact with patients and the possibility of facing direct medical disputes. WPV includes the threatening acts of verbal threats, physical assaults, and sexual assaults by patients and/or their relatives, or any other individual that poses a risk towards medical personnel.[3] Any of these acts of violence could have a negative implication on the health and safety of nurses,[4 5] and may threaten the quality of patient care.[6] WPV exacerbates the high-pressure work environment, which may result in very serious health problems among nurses. Likewise, WPV intensifies nurses' work stress that influence their health status.

Owing to the characteristics of their work environment, nursing is associated with high levels of psychological stress and professional hardship[7 8], whereas compassionate behavior at work is associated with frequent positive emotions and heightened levels of affective commitment.[9] Peter J. Frost identified compassionate behavior as comprising three interrelated elements: noticing other's suffering, feeling empathy for other's pain,[10] and responding to the suffering in some way. Compassionate behavior can be presented by patients, supervisors, and/or co-workers.[11] Previous studies have found that nurses frequently felt that theirs supervisors and co-workers were willing to listen to them and empathize with their negative emotions and their distress. Nurses obtain the positive mood that arises from the compassionate behavior, which could effectively increase their job performance and organizational citizenship behavior (OCB). The effects of compassionate behaviors contribute to an organization's capacity for cooperation. Medical and nursing literature suggest that compassionate behavior is a moral.[12] While compassionate behavior is seen as an essential component of patient

care, we often ignore nurses who are directly related to and concerned with the recognition and treatment of patient suffering. Compassionate behavior by patients, supervisors, and/or co-workers may influence the health outcomes of nurses.

The work environment influences nurses' stress levels that affect the practice worldwide and nurse-patient relationship in general.[13] The frequency and form of interaction between nurses and patients may lead nurses to experience different forms of violence as well as different forms of compassionate behavior at work. Nurses are at increased risk of work stress and often experience gastrointestinal discomfort[14] and sleep disorders.[1] A Swedish study reported that 80% of nurses had high or very high levels of stress.[13] The effect of stress was considered since it is an important cause of deteriorating health outcomes for nurses and of nursing quality.[15] Bang, Young Eun, Park, and Bohyun found that the nursing work environment was slightly negative, and showed that the nursing work environment and nurses' stress levels were factors affecting their health status.[16] Nurses may neglect their job requirements and make inadvertent medical errors when psychological stress is accumulated for long periods.[1] Psychological stress of nurses not only damages their health, but also lead to a negative impact on patients' recovery in certain ways.[17]

Sleep quality is a person's assessment of his/her sleep related characteristics and whether these qualities are satisfactory or not.[13] In addition, self-perceived physical health status serves as a predictor for a person's psychological health.[13] Subjective sleep quality and subjective heath status constitute a person's overall health evaluation. Both of these elements affect the nurse-patient relationship, organization development,

patient satisfaction, and so on.[18] Nurses affected by WPV with high levels of work stress tend to report poorer self-perceived health,[19] and are 20% more likely to experience poor sleep quality than those with low levels of stress.[1] Some nurses who have experienced WPV may react with fewer negative emotions, such as worry, anxiety, and/or fear, which may lead to a low level of subjective health status. Others may experience emotional imbalance, higher levels of anxiety, irritability, insomnia, and depression, which may influence their sleep quality, and simultaneously deteriorate their health status. On the other hand, compassionate behavior is associated with a variety of positive emotions which relieve nurses' work pressure,[9] and helps in maintaining a pleasant working environment, which has a far-reaching influence on nurses[20] by affecting their health status.[17] WPV and a compassionate work environment incite different emotional experiences among nurses, which cause different subjective health assessments.

In this study, we attempt to investigate the status of WPV and compassionate behaviors in hospitals. We conducted a cross-sectional study to investigate the frequency of WPV to probe into the relationship of these variables, analyze the mechanism of how WPV and compassionate behaviors affect health outcomes of hospital nurses in China, as well as whether stress mediates the relationship between WPV and compassionate behavior at work and their health outcomes. We propose the following hypotheses: WPV will be negatively correlated to sleep quality and subjective health status. Psychological stress will mediate the relationship between WPV and sleep quality and subjective health status. On the contrary, compassionate behavior will be positively

correlated to sleep quality and subjective health status. Psychological stress will mediate the relationship between compassionate behavior and sleep quality and subjective health status.

METHODS

Subjects and procedures

This study is based on a cross-sectional descriptive study, which was conducted from February to May 2016 across eight provinces in China. An anonymous online questionnaire was completed by nurses in eight provinces. Snowball sampling was used to collect data. First, we randomly selected 60 nurses who were fully informed of the content of this survey from four affiliated hospitals of Harbin Medical University. These 60 nurses were called the "original deliverers." We sent a web page link to our questionnaire survey (https://www.wenjuan.com/) to their mobile phones. The social media app WeChat developed by Tencent was used as a tool for the transmission and reading. Second, colleagues or nursing classmates of the "original deliverers" were invited to participate in our online survey after they themselves completed the questionnaire. We encouraged the transfer of questionnaires among nurses. Subsequently, the number of samples increased with the expansion of the network relationship of nurses. The questionnaires were self-administered. When a potential participant received an invitation, they were able to choose to participate or to reject. Once a nurse chose to participate, the website for the online survey recorded their information. Hence, we were able to keep track of how many people were invited to participate. A total of 1,362 nurses were invited to participate in the survey, and

ultimately 1,024 valid questionnaires were used in the final data analysis. The effective response rate was 75.18%.

Ethics

The research described in the present article meets the ethical guidelines of the ethics committee of the College of Public Health, Harbin Medical University, and the project has been approved by the Ethics Committee of the Harbin Medical University (ECHMU). A written informed consent could not be received because of the anonymous survey approach. Hence, oral informed consent for the survey was approved by the ECHMU and obtained from each nurse. Once a questionnaire was completed, we assume that the nurses has orally agreed to participate in our survey with reference to Wen's criteria.[21]

Measures

Demographic variables: gender, age, work experience, marital status, professional position, education level, and work shift.

Measurement of the WPV ($\alpha = 0.85$)

To assess exposure to WPV caused by patients and/or their relatives, a seven-items measure was used.[22] Nurses were asked the following question, "During the past year, have you found yourself in any of the following situations by a patient and/or their relatives?" Responses were scored on a six-point scale from 0 (never) to 6 (everyday). Response items included verbal violence (abuse language, sarcasm, indignity, effrontery, shouting, etc.), difficult situations (nitpicky demands, unreasonable requests, non-compliance, heckling, etc.), tarnished reputation (baseless charges or

complaints, slander, accusations that damaged reputation, etc.), mob behavior (destruction of public facilities, booing, gathering together to stir up trouble, public disorder, malicious photo taking, etc.), intimidation behavior (oral or written threats, glower, waving clenched fists, threats with weapons, stalking, etc.), physical violence (biting, pushing, fighting, cutting, throwing things towards body, etc.), and sexual harassment (including rape or attempted rape). According to the coding criteria, "never" and "rarely" were coded as not having experienced WPV from patients and/or their relatives, thus, these responses were assigned a score of "0." Other situations were assigned a "1," to indicate that the nurses have experienced that sort of violence.

Measurement of compassionate behavior ($\alpha = 0.69$)

Three items developed by J. M. Lilius Respondents[11] were asked to measure compassionate behavior that they experienced at work using a five-point Likert scale (1 (never) to 5 (very frequently)) from their (a) patients, (b) supervisor, and/or (c) co-workers. High scores indicate high levels of compassionate behavior. Considering the suggestion of the original author and because we aim to understand the behaviors that respondents experienced as compassionate, and because we do not want to restrict the respondents' thinking to only certain kinds of behavior, we chose not to define compassionate behavior for nurses in our survey. Composite index variables were calculated for all scales by averaging across items.

Measurement of psychological stress, sleep quality, and subjective health

A single item was adopted to measure the psychological stress of nurses,[23] which was "current work ability compared to your lifetime best" (a possible score of 0 (not at all)

to 5 (very much)). High scores reflect high levels of psychological stress. Past literature has confirmed that an item questionnaire has high validity and sensitivity, and that it can also measure the level of occupational expectations of new nurses.[24] Two single items were addressed together to measure nurses self-reported health outcomes. Subjective sleep quality[25] was measured by the question "How would you evaluate your most recent night's sleep?" The response ranged from very bad (1) to very good (4). We consulted the study by Fein and Skinne[26] where the overall subjective health was estimated by a widely used single-item measure ("In general, how would you rate your health?" 4 = excellent, 3 = very good, 2 = good, 1 = fair or poor). High scores reflect high levels of health status.

Statistical analysis

We used the SPSS statistical software for Windows version 17.0 (SPSS, Inc., Chicago, IL) for our analysis. Demographic characteristics of the nurses were collected to report sample information. Pearson's correlation coefficients were calculated to estimate the correlation between the exposure to WPV and compassionate behavior, psychological stress, sleep quality, and self-subjective health status. A series of hierarchical linear regression analyses were performed to examine our hypotheses according to a procedure that was suggested by Baron and Kenny. Analyzing mediation involved three steps.[27] The first step is to establish that the independent variable influences the mediator (*M2* and *M12*). The second step is to demonstrate that the independent variable influences the dependent variables (*M4, M8, M14,* and *M18)*. The third and last step is to demonstrate that the mediator influences the dependent variables (*M5, M9,*

M15, and *M19)* when the independent variable is controlled (*M6, M10, M16,* and *M20)*. In this final step, the effect of the independent variable on the dependent variables is significantly reduced when the mediator is in the model partially mediation is indicated[28].

We provide values including F, R^2 and R^2-changes, and the fit of the model was assessed with R^2. Standardized regression coefficients (β) and P values were calculated for each step in the regression model. Statistical significance was defined as $P<0.05$ (two-tailed).

RESULTS

Demographic information of the sample

A summary of demographic variables can be seen in Table 1.

Table 1 Characteristics of the Respondents (n = 1024)

Characteristic	N	%
Age		
20-30	709	69.2
31-40	253	24.7
41-50	49	4.8
51+	4	0.4
Missing value	9	0.9
Gender		
Male	87	8.5
Female	936	91.4
Missing value	1	0.1
Education		
Technical secondary school or below	38	3.7
College degree	226	22.1
Bachelor's degree or above	757	73.9
Missing value	3	0.3
Marital status		
Unmarried	496	48.4
Married	507	49.5
Divorced or loss of spouse	13	1.3
Missing value	8	0.8

Professional categories		
Nurse	355	34.7
Nurse practitioner	473	46.2
Nurse supervisor	166	16.2
Vice director/director of junior	29	2.8
Missing value	1	0.1
Type of work		
work during the day	296	28.9
night shifts	726	71.0
Missing value	1	0.1

A summary of demographic variables can be seen in Table 1. As shown in Table 2, about 65.2% of participants reported that they had encountered verbal violence within the last 12 months, which is the most common type of WPV in hospitals. Other incidence rates of WPV from highest to lowest are: difficult situations (54.5%), tarnished reputation (37.5%), mob behavior (34.9%), intimidation behavior (18.8%), physical violence (14.6%), and sexual harassment (5.9%).

Table 2. The incidence rate and rank ordering of WPV against nurses within last 12 months (n = 1024)

Violence Styles	N	%	Total	Rank
Verbal Violence	667	65.2	1023	1
Made Difficulties	557	54.5	1022	2
Smear Reputation	384	37.5	1023	3
Mobbing Behavior	357	34.9	1022	4
Intimidation Behavior	192	18.8	1022	5
Physical Violence	149	14.6	1023	6
Sexual Harassment	60	5.9	1023	7

We aggregated the experience of the various types of WPV to ascertain the total number of incidents that occurred within the previous 12 months. As shown in Table 3, 75.4% of participants reported that they had experienced one or more types of WPV during the previous 12 months. Furthermore, 17.1%, 15.3%, 13.8%, 13%, 8.7%, 5.1%, 2.5% of participants reported that they had suffered one to seven types of violence, respectively.

Table 3. Incidence rate of accumulated types of WPV against nurses within last 12 months (n = 1024)

Accumulated Violence	N	%	Valid Percent	Cumulative Percentages
0	250	24.4	24.6	24.6
1 type	174	16.8	17.1	41.7
2 types	156	15.1	15.3	57.0
3 types	140	13.5	13.8	70.7
4 types	132	12.8	13	83.7
5 types	89	8.6	8.7	92.4
6 types	52	5	5.1	97.5
7 types	25	2.4	2.5	100

According to the coding criteria, the response "never" was coded as not having experienced compassionate behavior from their co-workers, supervisor and/or patients, thus, these responses were assigned a score of "0." Other situations were assigned a "1" indicating that nurses had received compassionate behavior. As shown in Table 4, about 84.9% of participants reported that they had encountered compassionate behavior from their co-workers within the last 12 months, which was the highest incidence rate by source of compassionate behavior. The other incidence rates of compassionate behavior from highest to lowest are: from their co-workers (84.9%), from their supervisor (67.3%) and from their patients (65.3%).

Table 4. The incidence rate and rank ordering of compassion experience nurses within last 12 months (n = 1024)

Compassion Styles	**N**	**%**	**Total**	**Rank**
from their co-workers	868	84.9	1022	1
from their supervisor	687	67.3	1021	2
from their customer	666	65.3	1020	3

As shown in Table 5, 92.4% of participants reported that they had experienced one or more types of compassionate behavior during the previous 12 months, which indicated that the prevalence of compassion toward nurses is 92.4%. Furthermore, 14.6% of

participants reported that they had experienced compassionate behavior from one source, 30.3% from two sources, and 47.4% from all three sources.

Table 5. Incidence rate of accumulated types of compassion experience nurses within last 12 months (n = 1024)

Accumulated Compassion	N	%	Valid Percent	Cumulative Percentages
0	79	7.6	7.8	7.8
1 types	148	14.3	14.6	22.3
2 types	308	29.8	30.3	52.6
3 types	482	46.6	47.4	100

Correlation between the variables

The mean, standard deviation, and Pearson's correlation coefficients of the continuous variables are presented in Table 6. All variables are significantly correlated to each other, WPV is negatively correlated to compassionate behavior *($r = -0.224$, $P < 0.01$)*, sleep quality ($r = -0.194$, $P < 0.01$), and subjective health status ($r = -0.254$, $P < 0.01$), and was positively correlated with stress *($r = 0.302$, $P < 0.01$)*. Compassionate behavior was positively correlated to sleep quality ($r = 0.334$, $P < 0.01$) and subjective health status *($r = 0.346$, $P < 0.01$)*, and was negatively correlated to stress *($r = -0.234$, $P < 0.01$)*. Stress was negatively correlated with sleep quality *($r = -0.463$, $P < 0.01$)* and subjective health status *($r = -0.463$, $P < 0.01$)*. There was a positive correlation between sleep quality and subjective health status *($r = 0.597$, $P < 0.01$)*.

Table 6.Means (M), standard deviations (SD) and correlations of variables (n = 1024)

Variables	M	SD	N	Night Shift	WPV	Compassion	Stress	Sleeping Quality	Subjective Health Status
Night Shift	1.71	0.45	1023	1					
WPV	1.1	0.77	1018	-0.025	1				
Compassion	3.06	0.767	1017	-0.021	-0.224**	1			
Stress	13.74	4.84	1008	-0.009	0.302**	-0.234**	1		
Sleeping	2.38	0.793	1022	0.053	-0.194**	0.334**	-0.463**	1	

Quality Subjective Health Status	2.58	0.708	1022	0.032	-0.254**	0.346**	-0.463**	0.597**	1

Multiple linear hierarchical regression models

The results of the mediation analysis showed that psychological stress is a partial mediator in the relationship between violence and sleep quality, and between violence and subjective health as shown in Table 7. Moreover, psychological stress also partially mediated the relationship between compassionate behavior and sleep quality, and between compassionate behavior and subjective health as shown in Table 8.

Table 7. Multiple hierarchical linear regression models of variables (WPV, Psychological stress, Sleep quality, Subjective health). (n = 1024).

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*1	*M*2	*M*3	*M*4	*M*5	*M*6	*M*7	*M*8	*M*9	*M*10
Control Variables										
Age	0.013	-0.022	-0.028	-0.005	-0.021	-0.015	-0.067	-0.037	-0.058	-0.046
Gender	0.055	0.043	-0.005	0.004	0.022	0.023	-0.013	-0.002	0.12	0.016
Service Years	0.034	0.009	-0.063	-0.046	-0.044	-0.041	-0.103	-0.081	-0.087	-0.078
Education	-0.003	0.003	-0.024	-0.027	-0.024	-0.025	-0.02	-0.025	-0.025	-0.024
Marital status	0.079	0.04	0.037	0.063	0.073	0.082	-0.01	0.023	0.024	0.04
Professional categories	0.069	0.58	-0.062	-0.055	-0.032	-0.028	-0.026	-0.016	0.002	0.008
Mediating variable										
Psychological stress					-0.474**	-0.458**			-0.463**	-0.425**
Independent variable										
WPV		0.295**		-0.198**		-0.063**		-0.252**		-0.127**
F	2.493*	15.578**	1.441	6.92**	42.645**	38.193**	1.922	11.142**	40.953**	38.19**
R^2	0.015*	0.099**	0.009	0.047**	0.23**	0.229**	0.011	0.073**	0.223**	0.236**
ΔR^2	0.015*	0.084**	0.009	0.038**	0.221**	0.003**	0.011	0.061**	0.211**	0.014**

* $p<0.05$** $p<0.01$,

Table 8. Multiple hierarchical linear regression models of variables (Compassion, Psychological stress, Sleep quality, Subjective health). (n = 1024)

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*11	*M*12	*M*13	*M*14	*M*15	*M*16	*M*17	*M*18	*M*19	*M*20
Control Variables										
Age	0.009	-0.007	-0.025	-0.002	-0.021	-0.021	-0.061	-0.037	-0.058	-0.04
Gender	0.05	0.061	0.002	-0.013	0.022	0.026	-0.008	-0.024	0.012	0.001
Service Years	0.037	0.017	-0.61	-0.033	-0.044	-0.043	-0.102	-0.073	-0.087	-0.066
Education	0.002	0.018	-0.023	-0.047	-0.024	-0.022	-0.025	-0.5	-0.025	-0.043
Marital status	0.081	0.083	0.036	0.033	0.073	0.074	-0.013	-0.016	0.024	0.018
Professional categories	0.071	0.049	-0.064	-0.033	-0.032	-0.03	-0.03	-0.003	0.002	0.023
Mediating variable										
Psychological stress					-0.474**	-0.473**			-0.315**	-0.405**
Independent variable										
Compassion		-0.229**		0.326**		0.229**		-0.342**		0.249**
F	2.515	10.097**	1.441	17.944**	42.645**	47.592**	1.936	20.433**	40.953**	48.008**
R^2	0.015	0.066**	0.009	0.112**	0.23**	0.278**	0.012	0.126**	0.223**	0.279**
ΔR^2	0.015	0.051**	0.009	0.104**	0.221**	0.049**	0.012	0.114**	0.211**	0.058**

$^{*}p<0.05$ $^{**}p<0.01$,

DISCUSSION

Approximately 75.4% of survey participants reported they had experienced some form of WPV, and nearly 70% experienced multiple forms of violence types. Compared with the United States, WPV is more serious in Chinese nursing workplaces.[11] Compared with other professions, nurses have higher rates of non-fatal workplace assault injuries.[8] Our results show that 92.4% of participants received compassionate behavior from their co-workers, supervisors and/or work itself. Approximately 50% of the participants received compassionate behavior from all three sources. It is shown that compassionate behavior in medical organizations is common.In the nursing workplace, the incidents of both WPV and compassionate behavior are high.

The influence of WPV on health outcomes

This study is consistent with findings from prior research. The exposure to WPV has a significant influence on work stress and health outcomes among nurses.[29] This study also presents a new theoretical contribution, which shows that the exposure to WPV has a direct and indirect effect on the health outcomes of nurses. Moreover, work stress has a partially mediating effect on their relationship. High job stress caused by WPV may result in poor sleep quality and negatively affect physical and psychological health. Namely, WPV reduced subjective sleep quality and subjective heath status by elevating the work stress of nurses. Previous studies showed that 82.33% of nurses performing shift work experienced poor sleep quality.[13] Nurses who experienced WPV have emotional fluctuations, increased anxiety about their jobs, and even reported waking up

intermittently at night, which decreased their sleep quality.[1] Violent incidents might result in some serious adverse effects on emotions, cognitive processing, increasing nurses' workload on taking care of hospitalized patients, which further elevates stress among nurses, reducing sleep quality, increasing fatigue and weakness in their daily lives, thereby reducing the overall quality of their work and life. Sleep deprivation not only results in nursing errors and accidents, but can also affect nurses' personal health.[30] WPV and their influence lead to negative effect on both physical and mental health for nurses under a long circle.

The influence of compassionate behavior on health outcomes

This study found that high levels of compassionate behavior at work was significantly associated with nurses' health outcomes. As indicated in previous studies,[31] compassionate behavior at work was beneficial in improving subjective sleep quality and subjective heath status. It was shown that nurses who experienced compassionate behavior at work reported a higher score on their subjective sleep quality and subjective heath status than those who did not. Result suggested that the compassionate behaviors contributed to the promotion of positive health outcomes. Compassionate behavior at work such as daily interactions, careful listening, and respecting privacy[32] prompted nurses to hold positive feelings[33] and conscious emotional experiences that stimulate cognitive processing after certain outcomes or behaviors.[33] Jane E. Dutton found that acts of compassion created renewable resources of trust, quality connections, positive emotions, reaffirm shared values of dignity, and mutual respect. She confirmed that small interpersonal actions could have large system-wide effects.[11] In fact, nurses,

tiring from their work , can be satisfied with expressions of love and care from others, and thus, compassionate behavior at work may help nurses balance their emotion conflicts. Thus, they are more willing to devote themselves to their career, maintain a positive attitude in facing work challenges, and actively solve work problems. Compassion as a form of care in the workplace is simple but works well to release pressure and anxiety among nurses. It contributes to nurses' sleep quality and health status (i.e., receiving different forms of compassionate behavior can help to achieve healthy outcomes through the mediating role of psychological stress). Compassionate behavior helps nurses remain empathetic and compassionate professionals and improve the development of nursing, face work pressure, work overloads and challenges in their daily nursing tasks.

Limitations

Although some significant discoveries were presented in this study, there are several limitations that must be mentioned. First, a convenience sample was used in this study, which risks a potential problem of a sampling bias. Moreover, a total of 1,024 nurses is a small sample when compared to the entire Chinese nurse population. Thus, the findings cannot be generalized to Chinese nurses in general. Second, a cross-sectional nature was not helpful in establishing a causal relationship between WPV, compassionate behavior, stress, sleep quality, and subjective health status. Thus, an important direction for future research is longitudinal studies. Third, the data was self-reported by the nurses, and to some extent, may have resulted in a response bias from social desirability or negative affect. Nurses may have overestimated or

underestimated the association between study variables. We used foreign design scales that ignored cross-cultural adaptability in this study, thus, this area is worth attracting academic attention in the future. Fourth, the method of measurement of sleep quality is very poor, which we admit is a limitation of the study.

CONCLUSION

In this survey, a total of 75.4% participants reported they had experienced some form of exposure to WPV. About 92.4% experienced compassionate behavior from their co-workers, supervisor, or patients. Exposure to WPV has a significantly negative influence on the work stress and health outcomes of nurses. This study also makes a new theoretical contribution by showing that the exposure to WPV not only has a direct effect, but also an indirect effect on the health outcomes of nurses. Work stress had a partially mediating effect on their relationship. High levels of compassionate behavior at work was significantly associated with health outcomes among nurses, as reported in previous studies. Compassionate behavior was beneficial in improving subjective sleep quality and subjective heath status. There is room for improvement to relieve exposure to WPV by lowering the work stress of nurses. A harmonious work environment for nurses should be provided as the damage to health outcomes due to WPV is clear.

ACHNOWLEDGMENTS: The authors thanks the participants at Harbin Medical University for their support, and give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

FUNGINGS: This study was funded by the Innovation Science Research Foundation of Harbin Medical University (2016RWZX09) to Tao Sun and also was funded by the Natural Science Foundation of China (71473063) to Fan Lihua. The authors give their

sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

FUNDINGS

This study was funded by the Innovation Science Research Foundation of Harbin Medical University (2016RWZX09) to Tao Sun and also was funded by the Natural Science Foundation of China (71473063) to Fan Lihua. The authors give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

AUTHOR CONTRIBUTION: Conceived and designed the experiments: LF TS WL SZ. Performed the experiments: SZ WL JW YS FX. Analyzed the data: TS WL SZ. Contributed reagents/materials/analysis tools: WL SZ SC. Wroten the paper: SZ WL TS.

COMPETING INTERESTS: The authors have declared that no competing interests exist.

DATA SHARING STATEMENT: No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page 1, line 24-30;
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P.1; line 31; p.2, line 1-14
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	p.3, line 2-22; p.5, line 1-4
Objectives	3	State specific objectives, including any prespecified hypotheses	P.5, line 5-9;
Methods			
Study design	4	Present key elements of study design early in the paper	P.5, line 8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	p.5, line 10-17
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	P.7, line 10-17
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	no
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	p.6, line 7-22; p.7, line 1-11
Bias	9	Describe any efforts to address potential sources of bias	no
Study size	10	Explain how the study size was arrived at	no
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P.7, line 12-20

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P.7, line 12-20
		(*b*) Describe any methods used to examine subgroups and interactions	no
		(*c*) Explain how missing data were addressed	no
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	P.7, line 12-20
		(*e*) Describe any sensitivity analyses	no
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P.7, line 1-33
		(b) Give reasons for non-participation at each stage	no
		(c) Consider use of a flow diagram	No
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P.8; p.9;p.10line 1-20
		(b) Indicate number of participants with missing data for each variable of interest	P.8; p.9
Outcome data	15*	Report numbers of outcome events or summary measures	P.8; p.9; p.10; p.11,
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	p.13; p.14
		(*b*) Report category boundaries when continuous variables were categorized	no
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	no
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	no
Discussion			
Key results	18	Summarise key results with reference to study objectives	p.17;15-22 p.15;p.16;p.17line

			1-3
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P.17, Line 4-14;
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	p.15; p.16;p.17line 1-3
Generalisability	21	Discuss the generalisability (external validity) of the study results	no
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P.18, line 8-11

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Impact of workplace violence and compassionate behavior in hospitals on stress, sleep quality, and subjective health status among Chinese nurses : A cross-sectional survey

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2017-019373.R2
Article Type:	Research
Date Submitted by the Author:	17-Mar-2018
Complete List of Authors:	Zhang, Shue; The Third Affiliated Hospital of Harbin Medical University Liu, Wenhui; Harbin Medical University School of Public Health Wang, Jinghui; Harbin Medical University School of Public Health Shi, Yu; Harbin Medical University School of Public Health Xie, Fengzhe; Harbin Medical University School of Public Health Cang, Shuang; Medical Examination Center of the 2nd affiliated hospital of Harbin Medical University Sun, Tao; Harbin Medical University School of Public Health, Fan, Lihua; Harbin Medical University, Department of Health Management , School of Public Health
Primary Subject Heading:	Health policy
Secondary Subject Heading:	Mental health, Nursing
Keywords:	Workplace violence, Chinese Nurses, Sleeping Quality, Subjective Health Status, Compassion

Impact of workplace violence and compassionate behavior in hospitals on stress, sleep quality, and subjective health status among Chinese nurses: A cross-sectional survey

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KEYWORDS: Workplace violence; Chinese Nurses; Compassion; Sleeping Quality; Subjective Health Status

word count: 3878

ABSTRACT

Objectives: The aim of this study is to describe the current state of workplace violence (WPV) and compassionate behavior towards nurses, and to explain how they affect nurses' stress, sleep quality, and subjective health status.

Design: A cross-sectional online survey study.

Setting: The survey was conducted across 8 provinces in China.

Participants: A total of 1,024 nurses were recruited to complete an online questionnaire survey from February to May 2016 in China.

Results: Approximately 75.4% participants had experienced some form of violence. Most of the participants experienced WPV such as verbal violence (65.2%), made difficulties (54.5%), tarnished reputation (37.5%), mob behavior (34.9%), intimidation behavior (18.8%), physical violence (14.6%), and sexual harassment (5.9%). In this study, 92.4% participants experienced compassionate behavior from their co-workers (84.9%), supervisors (67.3%), and from their patients (65.3%). The results show that the exposure to WPV behavior significantly affected the psychological stress ($\beta = 0.295, P < 0.01$), sleep quality ($\beta = -0.198, P < 0.01$), and subjective health status ($\beta = -0.252, P < 0.01$) of nurses. The exposure to compassionate behavior significantly affected the psychological stress ($\beta = -0.229, P < 0.01$), sleep quality ($\beta = 0.326, P < 0.01$), and subjective health status ($\beta = 0.342, P < 0.01$) of nurses. The results of the mediation analysis showed that psychological stress is a partial mediator in the relationship between violence and sleep quality ($\beta = -0.458, P < 0.01$) and between violence and subjective health ($\beta = -0.425, P < 0.01$). Moreover, psychological stress

also partially mediated the relationship between compassionate behavior and sleep quality ($\beta = -0.473$, $P < 0.01$), and between compassionate behavior and subjective health ($\beta = -0.405$, $P < 0.01$).

Conclusion: In China, most nurses have experienced different forms of WPV from patients and/or their relatives, as well as experiencing various forms of compassionate behavior from their co-workers, supervisors, and/or patients. This study investigates the prevalence of the different types of WPV and compassionate behavior. Several aspects of harm to nurses from exposure to violence is confirmed. We found that WPV can damage nurses' health outcomes, while compassionate behaviors were beneficial to their health outcomes. A harmonious nursing environment should be provided to minimize threats to nurses' health status.

Strengths and limitations of this study

The prevalence of compassionate behavior towards nurses from three sources is investigated.

This is the first study that investigates the relationship between WPV and compassionate behavior and psychological stress, sleep quality, and self-reported health status among nurses in China.

This study highlights the mediation effect of psychological stress in nursing practice, and we demonstrate the interaction mechanisms between these variables.

The approach of self-reporting by nurses through an online survey may have resulted in some bias in the responses, and a convenience sample was used in this study, which risks the potential problem of a sampling bias.

Moreover, causation was not established because of the cross-sectional study design.

INTRODUCTION

The environment surrounding nurses directly affects the quality of care that patients receive as well as the threat to patient safety owing to nursing errors.[1] Workplace violence (WPV) is an important occupational hazard for nurses.[2] Workplace violence has rapidly increased in health institutions,[3] with violence from patients and/or their relatives being the highest risk to nurses given the frequent level of contact with patients and the possibility of facing direct medical disputes. WPV includes the threatening acts of verbal threats, physical assaults, and sexual assaults by patients and/or their relatives, or any other individual that poses a risk towards medical personnel.[4] Any of these acts of violence could have a negative implication on the health and safety of nurses, [2 5 6] and may threaten the quality of patient care.[7] Zampieron found that nurses were at the highest risk of aggression when they were overtired, stressed, and dissatisfied with their work.[8] Magnavita's studies have shown that the relationship between violence and stress is mutual: violence causes stress, and the stressed nurses is prone to violence observed , confirmed the relationship between work-related distress and WPV is bidirectional.[9] WPV exacerbates the high-pressure

work environment, which may result in very serious health problems among nurses. Likewise, WPV intensifies nurses' work stress that influence their health status.[2] Owing to the characteristics of their work environment, nursing is associated with high levels of psychological stress and professional hardship,[10 11] whereas compassionate behavior at work is associated with frequent positive emotions and heightened levels of affective commitment.[12] Peter J. Frost identified compassionate behavior as comprising three interrelated elements: noticing other's suffering, feeling empathy for other's pain,[13] and responding to the suffering in some way. Compassionate behavior can be presented by patients, supervisors, and/or co-workers.[14] Previous studies have found that nurses frequently felt that theirs supervisors and co-workers were willing to listen to them and empathize with their negative emotions and their distress. Nurses obtain the positive mood that arises from the compassionate behavior, which could effectively increase their job performance and organizational citizenship behavior (OCB). The effects of compassionate behaviors contribute to an organization's capacity for cooperation. Medical and nursing literature suggest that compassionate behavior is a moral.[15] While compassionate behavior is seen as an essential component of patient care, we often ignore nurses who are directly related to and concerned with the recognition and treatment of patient suffering. Compassionate behavior by patients, supervisors, and/or co-workers may influence the health outcomes of nurses.

The work environment influences nurses' stress levels that affect the practice worldwide and nurse-patient relationship in general.[16] The frequency and form of interaction between nurses and patients may lead nurses to experience different forms

of violence as well as different forms of compassionate behavior at work. Nurses are at increased risk of work stress and often experience gastrointestinal discomfort[17] and sleep disorders.[16] The relationship between violence and stress has been studied by many studies[18], some of which analyze the individual consequences of violence on the behavior of nurses to patients.[19] The effect of stress was considered since it is an important cause of deteriorating health outcomes for nurses and of nursing quality.[20] Bang, Young Eun, Park, and Bohyun found that the nursing work environment was slightly negative, and showed that the nursing work environment and nurses' stress levels were factors affecting their health status.[21] Nurses may neglect their job requirements and make inadvertent medical errors when psychological stress is accumulated for long periods.[16] Psychological stress of nurses not only damages their health, but also lead to a negative impact on patients' recovery in certain ways.[22] Sleep quality is a person's assessment of his/her sleep related characteristics and whether these qualities are satisfactory or not. Nursing environment may interfere with sleep, in turn, sleep disturbances can endanger the health and safety of nurses.[23] In addition, self-perceived physical health status serves as a predictor for a person's psychological health.[16] Subjective sleep quality and subjective heath status constitute a person's overall health evaluation. Both of these elements affect the nurse-patient relationship, organization development, patient satisfaction, and so on.[24] Nurses affected by WPV with high levels of work stress tend to report poorer self-perceived health,[25] and are 20% more likely to experience poor sleep quality than those with low levels of stress.[16] Some nurses who have experienced WPV may react with fewer

negative emotions, such as worry, anxiety, and/or fear, which may lead to a low level of subjective health status. Others may experience emotional imbalance, higher levels of anxiety, irritability, insomnia, and depression, which may influence their sleep quality, and simultaneously deteriorate their health status. In recent years, the relationships between violence, sleep and stress it is good to mention pre-existing studies, which have recently been revised. [23 26] On the other hand, compassionate behavior is associated with a variety of positive emotions which relieve nurses' work pressure,[12] and helps in maintaining a pleasant working environment, which has a far-reaching influence on nurses[27] by affecting their health status.[22] WPV and a compassionate work environment incite different emotional experiences among nurses, which cause different subjective health assessments.

In this study, we attempt to investigate the status of WPV and compassionate behaviors in hospitals. We conducted a cross-sectional study to investigate the frequency of WPV to probe into the relationship of these variables, analyze the mechanism of how WPV and compassionate behaviors affect health outcomes of hospital nurses in China, as well as whether stress mediates the relationship between WPV and compassionate behavior at work and their health outcomes. We propose the following hypotheses: WPV will be negatively correlated to sleep quality and subjective health status. Psychological stress will mediate the relationship between WPV and sleep quality and subjective health status. On the contrary, compassionate behavior will be positively correlated to sleep quality and subjective health status. Psychological stress will

mediate the relationship between compassionate behavior and sleep quality and subjective health status.

METHODS

Subjects and procedures

This study is based on a cross-sectional descriptive study, which was conducted from February to May 2016 across eight provinces in China. An anonymous online questionnaire was completed by nurses in eight provinces. Snowball sampling was used to collect data. First, we randomly selected 60 nurses who were fully informed of the content of this survey from four affiliated hospitals of Harbin Medical University. These 60 nurses were called the "original deliverers." We sent a web page link to our questionnaire survey (https://www.wenjuan.com/) to their mobile phones. The social media app WeChat developed by Tencent was used as a tool for the transmission and reading. Second, colleagues or nursing classmates of the "original deliverers" were invited to participate in our online survey after they themselves completed the questionnaire. We encouraged the transfer of questionnaires among nurses. Subsequently, the number of samples increased with the expansion of the network relationship of nurses. The questionnaires were self-administered. When a potential participant received an invitation, they were able to choose to participate or to reject. Once a nurse chose to participate, the website for the online survey recorded their information. Hence, we were able to keep track of how many people were invited to participate. A total of 1,362 nurses were invited to participate in the survey, and

ultimately 1,024 valid questionnaires were used in the final data analysis. The effective response rate was 75.18%.

Patient and public involvement

Patient and public were not involved.

Ethics

The research described in the present article meets the ethical guidelines of the ethics committee of the College of Public Health, Harbin Medical University, and the project has been approved by the Ethics Committee of the Harbin Medical University (ECHMU). A written informed consent could not be received because of the anonymous survey approach. Hence, oral informed consent for the survey was approved by the ECHMU and obtained from each nurse. Once a questionnaire was completed, we assume that the nurses has orally agreed to participate in our survey with reference to Wen's criteria.[28]

Measures

Demographic variables: gender, age, work experience, marital status, professional position, education level, and work shift.

Measurement of the WPV ($\alpha = 0.85$)

To assess exposure to WPV caused by patients and/or their relatives, a seven-items measure was used.[29] Nurses were asked the following question, "During the past year, have you found yourself in any of the following situations by a patient and/or their relatives?" Responses were scored on a six-point scale from 0 (never) to 6 (everyday). Response items included verbal violence (abuse language, sarcasm, indignity,

effrontery, shouting, etc.), difficult situations (nitpicky demands, unreasonable requests, non-compliance, heckling, etc.), tarnished reputation (baseless charges or complaints, slander, accusations that damaged reputation, etc.), mob behavior (destruction of public facilities, booing, gathering together to stir up trouble, public disorder, malicious photo taking, etc.), intimidation behavior (oral or written threats, glower, waving clenched fists, threats with weapons, stalking, etc.), physical violence (biting, pushing, fighting, cutting, throwing things towards body, etc.), and sexual harassment (including rape or attempted rape). According to the coding criteria, "never" and "rarely" were coded as not having experienced WPV from patients and/or their relatives, thus, these responses were assigned a score of "0" .Other situations were assigned a "1" to indicate that the nurses have experienced that sort of violence.

Measurement of compassionate behavior ($\alpha = 0.69$)

Three items developed by J. M. Lilius Respondents[14] were asked to measure compassionate behavior that they experienced at work using a five-point Likert scale 1 (never) to 5 (very frequently) from their (a) patients, (b) supervisor, and/or (c) co-workers. High scores indicate high levels of compassionate behavior. Considering the suggestion of the original author and because we aim to understand the behaviors that respondents experienced as compassionate, and because we do not want to restrict the respondents' thinking to only certain kinds of behavior, we chose not to define compassionate behavior for nurses in our survey. Composite index variables were calculated for all scales by averaging across items.

Measurement of psychological stress, sleep quality, and subjective health

A single item was adopted to measure the psychological stress of nurses,[30] which was "current work ability compared to your lifetime best" (a possible score of 0 (not at all) to 5 (very much). High scores reflect high levels of psychological stress. Past literature has confirmed that an item questionnaire has high validity and sensitivity, and that it can also measure the level of occupational expectations of new nurses.[31] Two single items were addressed together to measure nurses self-reported health outcomes. Subjective sleep quality[32] was measured by the question "How would you evaluate your most recent night's sleep?" The response ranged from very bad (1) to very good (4). We consulted the study by Fein and Skinne[33] where the overall subjective health was estimated by a widely used single-item measure ("In general, how would you rate your health?" 4 = excellent, 3 = very good, 2 = good, 1 = fair or poor). High scores reflect high levels of health status.

Statistical analysis

We used the SPSS statistical software for Windows version 17.0 (SPSS, Inc., Chicago, IL) for our analysis. Demographic characteristics of the nurses were collected to report sample information. Pearson's correlation coefficients were calculated to estimate the correlation between the exposure to WPV and compassionate behavior, psychological stress, sleep quality, and self-subjective health status. A series of hierarchical linear regression analyses were performed to examine our hypotheses according to a procedure that was suggested by Baron and Kenny[34]. Analyzing mediation involved three steps.[35] The first step is to establish that the independent variable influences the mediator (*M2* and *M12*). The second step is to demonstrate that the independent

variable influences the dependent variables (*M4, M8, M14,* and *M18)*. The third and last step is to demonstrate that the mediator influences the dependent variables (*M5, M9, M15,* and *M19)* when the independent variable is controlled (*M6, M10, M16,* and *M20)*. In this final step, the effect of the independent variable on the dependent variables is significantly reduced when the mediator is in the model partially mediation is indicated[36].

We provide values including F, R^2 and R^2-changes, and the fit of the model was assessed with R^2. Standardized regression coefficients (β) and P values were calculated for each step in the regression model. Statistical significance was defined as $P<0.05$ (two-tailed).

RESULTS

Demographic information of the sample

A summary of demographic variables can be seen in Table 1.

Table 1 Characteristics of the Respondents (n = 1024)

Characteristic	N	%
Age		
20-30	709	69.2
31-40	253	24.7
41-50	49	4.8
51+	4	0.4
Missing value	9	0.9
Gender		
Male	87	8.5
Female	936	91.4
Missing value	1	0.1
Education		
Technical secondary school or below	38	3.7
College degree	226	22.1
Bachelor's degree or above	757	73.9
Missing value	3	0.3
Marital status		

Unmarried	496	48.4
Married	507	49.5
Divorced or loss of spouse	13	1.3
Missing value	8	0.8
Professional categories		
Nurse	355	34.7
Nurse practitioner	473	46.2
Nurse supervisor	166	16.2
Vice director/director of junior	29	2.8
Missing value	1	0.1
Type of work		
work during the day	296	28.9
night shifts	726	71.0
Missing value	1	0.1

A summary of demographic variables can be seen in Table 1. As shown in Table 2, about 65.2% of participants reported that they had encountered verbal violence within the last 12 months, which is the most common type of WPV in hospitals. Other incidence rates of 16 WPV from highest to lowest are: difficult situations (54.5%), tarnished reputation (37.5%), mob behavior (34.9%), intimidation behavior (18.8%), physical violence (14.6%), and sexual harassment (5.9%).

Table 2. The incidence rate and rank ordering of WPV against nurses within last 12 months (n = 1024)

Violence Styles	N	%	Total	Rank
Verbal Violence	667	65.2	1023	1
Made Difficulties	557	54.5	1022	2
Smear Reputation	384	37.5	1023	3
Mobbing Behavior	357	34.9	1022	4
Intimidation Behavior	192	18.8	1022	5
Physical Violence	149	14.6	1023	6
Sexual Harassment	60	5.9	1023	7

We aggregated the experience of the various types of WPV to ascertain the total number of incidents that occurred within the previous 12 months. As shown in Table 3, 75.4% of participants reported that they had experienced one or more types of WPV during the previous 12 months. Furthermore, 17.1%, 15.3%, 13.8%, 13%, 8.7%, 5.1%,

2.5% of participants reported that they had suffered one to seven types of violence, respectively.

Table 3. Incidence rate of accumulated types of WPV against nurses within last 12 months (n = 1024)

Accumulated Violence	N	%	Valid Percent	Cumulative Percentages
0	250	24.4	24.6	24.6
1 type	174	16.8	17.1	41.7
2 types	156	15.1	15.3	57.0
3 types	140	13.5	13.8	70.7
4 types	132	12.8	13	83.7
5 types	89	8.6	8.7	92.4
6 types	52	5	5.1	97.5
7 types	25	2.4	2.5	100

According to the coding criteria, the response "never" was coded as not having experienced compassionate behavior from their co-workers, supervisor and/or patients, thus, these responses were assigned a score of "0." Other situations were assigned a "1" indicating that nurses had received compassionate behavior. As shown in Table 4, about 84.9% of participants reported that they had encountered compassionate behavior from their co-workers within the last 12 months, which was the highest incidence rate by source of compassionate behavior. The other incidence rates of compassionate behavior from highest to lowest are: from their co-workers (84.9%), from their supervisor (67.3%) and from their patients (65.3%).

Table 4. The incidence rate and rank ordering of compassion experience nurses within last 12 months (n = 1024)

Compassion Styles	**N**	**%**	**Total**	**Rank**
from their co-workers	868	84.9	1022	1
from their supervisor	687	67.3	1021	2
from their customer	666	65.3	1020	3

As shown in Table 5, 92.4% of participants reported that they had experienced one or more types of compassionate behavior during the previous 12 months, which indicated

that the prevalence of compassion toward nurses is 92.4%. Furthermore, 14.6% of participants reported that they had experienced compassionate behavior from one source, 30.3% from two sources, and 47.4% from all three sources.

Table 5. Incidence rate of accumulated types of compassion experience nurses within last 12 months (n = 1024)

Accumulated Compassion	N	%	Valid Percent	Cumulative Percentages
0	79	7.6	7.8	7.8
1 types	148	14.3	14.6	22.3
2 types	308	29.8	30.3	52.6
3 types	482	46.6	47.4	100

Correlation between the variables

The mean, standard deviation, and Pearson's correlation coefficients of the continuous variables are presented in Table 6. All variables are significantly correlated to each other, WPV is negatively correlated to compassionate behavior *($r = -0.224$, $P < 0.01$)*, sleep quality ($r = -0.194$, $P < 0.01$), and subjective health status ($r = -0.254$, $P < 0.01$), and was positively correlated with stress *($r = 0.302$, $P < 0.01$)*. Compassionate behavior was positively correlated to sleep quality ($r = 0.334$, $P < 0.01$) and subjective health status *($r = 0.346$, $P < 0.01$)*, and was negatively correlated to stress *($r = -0.234$, $P < 0.01$)*. Stress was negatively correlated with sleep quality *($r = -0.463$, $P < 0.01$)* and subjective health status *($r = -0.463$, $P < 0.01$)*. There was a positive correlation between sleep quality and subjective health status *($r = 0.597$, $P < 0.01$)*.

Table 6.Means (M), standard deviations (SD) and correlations of variables (n = 1024)

Variables	M	SD	N	WPV	Compassion	Stress	Sleeping Quality	Subjective Health Status
WPV	1.1	0.77	1018	1				
Compassion	3.06	0.767	1017	-0.224**	1			
Stress	13.74	4.84	1008	0.302**	-0.234**	1		

Sleeping Quality	2.38	0.793	1022	-0.194**	0.334**	-0.463**	1	
Subjective Health Status	2.58	0.708	1022	-0.254**	0.346**	-0.463**	0.597**	1

Multiple linear hierarchical regression models

The results show that the exposure to WPV behavior significantly affected the psychological stress ($\beta = 0.295$, $P < 0.01$), sleep quality ($\beta = -0.198$, $P < 0.01$), and subjective health status ($\beta = -0.252$, $P < 0.01$) of nurses. The exposure to compassionate behavior significantly affected the psychological stress ($\beta = -0.229$, $P < 0.01$), sleep quality ($\beta = 0.326$, $P < 0.01$), and subjective health status ($\beta = 0.342$, $P < 0.01$) of nurses. The results of the mediation analysis showed that psychological stress is a partial mediator in the relationship between violence and sleep quality ($\beta = -0.458$, $P < 0.01$) and between violence and subjective health ($\beta = -0.425$, $P < 0.01$) as shown in Table 7. Moreover, psychological stress also partially mediated the relationship between compassionate behavior and sleep quality ($\beta = -0.473$, $P < 0.01$), and between compassionate behavior and subjective health ($\beta = -0.405$, $P < 0.01$) as shown in Table 8.

Table 7. Multiple hierarchical linear regression models of variables (WPV, Psychological stress, Sleep quality, Subjective health). (n = 1024).

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*1	*M*2	*M*3	*M*4	*M*5	*M*6	*M*7	*M*8	*M*9	*M*10
Control Variables										
Age	0.013	-0.022	-0.028	-0.005	-0.021	-0.015	-0.067	-0.037	-0.058	-0.046
Gender	0.055	0.043	-0.005	0.004	0.022	0.023	-0.013	-0.002	0.12	0.016
Service Years	0.034	0.009	-0.063	-0.046	-0.044	-0.041	-0.103	-0.081	-0.087	-0.078
Education	-0.003	0.003	-0.024	-0.027	-0.024	-0.025	-0.02	-0.025	-0.025	-0.024
Marital status	0.079	0.04	0.037	0.063	0.073	0.082	-0.01	0.023	0.024	0.04
Professional categories	0.069	0.58	-0.062	-0.055	-0.032	-0.028	-0.026	-0.016	0.002	0.008
Mediating variable										
Psychological stress					-0.474**	-0.458**			-0.463**	-0.425**
Independent variable										
WPV		0.295**		-0.198**		-0.063**		-0.252**		-0.127**
F	2.493*	15.578**	1.441	6.92**	42.645**	38.193**	1.922	11.142**	40.953**	38.19**
R^2	0.015*	0.099**	0.009	0.047**	0.23**	0.229**	0.011	0.073**	0.223**	0.236**
ΔR^2	0.015*	0.084**	0.009	0.038**	0.221**	0.003**	0.011	0.061**	0.211**	0.014**

* $p<0.05$** $p<0.01$,

Table 8. Multiple hierarchical linear regression models of variables (Compassion, Psychological stress, Sleep quality, Subjective health). (n = 1024)

Variables	Psychological stress		Sleep quality				Subjective health			
	*M*11	*M*12	*M*13	*M*14	*M*15	*M*16	*M*17	*M*18	*M*19	*M*20
Control Variables										
Age	0.009	-0.007	-0.025	-0.002	-0.021	-0.021	-0.061	-0.037	-0.058	-0.04
Gender	0.05	0.061	0.002	-0.013	0.022	0.026	-0.008	-0.024	0.012	0.001
Service Years	0.037	0.017	-0.61	-0.033	-0.044	-0.043	-0.102	-0.073	-0.087	-0.066
Education	0.002	0.018	-0.023	-0.047	-0.024	-0.022	-0.025	-0.5	-0.025	-0.043
Marital status	0.081	0.083	0.036	0.033	0.073	0.074	-0.013	-0.016	0.024	0.018
Professional categories	0.071	0.049	-0.064	-0.033	-0.032	-0.03	-0.03	-0.003	0.002	0.023
Mediating variable										
Psychological stress					-0.474**	-0.473**			-0.315**	-0.405**
Independent variable										
Compassion		-0.229**		0.326**		0.229**		0.342**		0.249**
F	2.515	10.097**	1.441	17.944**	42.645**	47.592**	1.936	20.433**	40.953**	48.008**
R^2	0.015	0.066**	0.009	0.112**	0.23**	0.278**	0.012	0.126**	0.223**	0.279**
ΔR^2	0.015	0.051**	0.009	0.104**	0.221**	0.049**	0.012	0.114**	0.211**	0.058**

$^{*}p<0.05$ $^{**}p<0.01$,

DISCUSSION

Approximately 75.4% of survey participants reported they had experienced some form of WPV, and nearly 70% experienced multiple forms of violence types. Compared with the United States, WPV is more serious in Chinese nursing workplaces.[14] Compared with other professions, nurses have higher rates of non-fatal workplace assault injuries.[11] Our results show that 92.4% of participants received compassionate behavior from their co-workers, supervisors and/or work itself. Approximately 50% of the participants received compassionate behavior from all three sources. It is shown that compassionate behavior in medical organizations is common. In the nursing workplace, the incidents of both WPV and compassionate behavior are high.

The influence of WPV on health outcomes

This study is consistent with findings from prior research. The exposure to WPV has a significant influence on work stress and health outcomes among nurses.[37] This study also presents a new theoretical contribution, which shows that the exposure to WPV has a direct and indirect effect on the health outcomes of nurses. Moreover, work stress has a partially mediating effect on their relationship. High job stress caused by WPV may result in poor sleep quality and negatively affect physical and psychological health. Namely, WPV reduced subjective sleep quality and subjective heath status by elevating the work stress of nurses. Previous studies showed that 82.33% of nurses performing shift work experienced poor sleep quality.[16] Nurses who experienced WPV have emotional fluctuations, increased anxiety about their jobs, and even reported waking up intermittently at night, which decreased their sleep quality.[16] Violent incidents might

result in some serious adverse effects on emotions, cognitive processing, increasing nurses' workload on taking care of hospitalized patients, which further elevates stress among nurses, reducing sleep quality, increasing fatigue and weakness in their daily lives, thereby reducing the overall quality of their work and life. Sleep deprivation not only results in nursing errors and accidents, but can also affect nurses' personal health.[38] WPV and their influence lead to negative effect on both physical and mental health for nurses under a long circle.

The influence of compassionate behavior on health outcomes

This study found that high levels of compassionate behavior at work was significantly associated with nurses' health outcomes. As indicated in previous studies,[39] compassionate behavior at work was beneficial in improving subjective sleep quality and subjective heath status. It was shown that nurses who experienced compassionate behavior at work reported a higher score on their subjective sleep quality and subjective heath status than those who did not. Result suggested that the compassionate behaviors contributed to the promotion of positive health outcomes. Compassionate behavior at work such as daily interactions, careful listening, and respecting privacy prompted nurses to hold positive feelings[40] and conscious emotional experiences that stimulate cognitive processing after certain outcomes or behaviors.[40] Jane E. Dutton found that acts of compassion created renewable resources of trust, quality connections, positive emotions, reaffirm shared values of dignity, and mutual respect. She confirmed that small interpersonal actions could have large system-wide effects.[29] In fact, nurses, tiring from their work, can be satisfied with expressions of love and care from others,

and thus, compassionate behavior at work may help nurses balance their emotion conflicts. Thus, they are more willing to devote themselves to their career, maintain a positive attitude in facing work challenges, and actively solve work problems. Compassion as a form of care in the workplace is simple but works well to release pressure and anxiety among nurses. It contributes to nurses' sleep quality and health status (i.e., receiving different forms of compassionate behavior can help to achieve healthy outcomes through the mediating role of psychological stress). Compassionate behavior helps nurses remain empathetic and compassionate professionals and improve the development of nursing, face work pressure, work overloads and challenges in their daily nursing tasks.

Limitations

Although some significant discoveries were presented in this study, there are several limitations that must be mentioned. First, a convenience sample was used in this study, which risks a potential problem of a sampling bias. Moreover, a total of 1,024 nurses is a small sample when compared to the entire Chinese nurse population. Thus, the findings cannot be generalized to Chinese nurses in general. Second, a cross-sectional nature was not helpful in establishing a causal relationship between WPV, compassionate behavior, stress, sleep quality, and subjective health status. Thus, an important direction for future research is longitudinal studies. Third, the data was self-reported by the nurses, and to some extent, may have resulted in a response bias from social desirability or negative affect. Nurses may have overestimated or underestimated the association between study variables. We used foreign design

scales that ignored cross-cultural adaptability in this study, thus, this area is worth attracting academic attention in the future. Fourth, the method of measurement of sleep quality is very poor, which we admit is a limitation of the study.

CONCLUSION

In this survey, a total of 75.4% participants reported they had experienced some form of exposure to WPV. About 92.4% experienced compassionate behavior from their co-workers, supervisor, or patients. Exposure to WPV has a significantly negative influence on the work stress and health outcomes of nurses. This study also makes a new theoretical contribution by showing that the exposure to WPV not only has a direct effect, but also an indirect effect on the health outcomes of nurses. Work stress had a partially mediating effect on their relationship. High levels of compassionate behavior at work was significantly associated with health outcomes among nurses, as reported in previous studies. Compassionate behavior was beneficial in improving subjective sleep quality and subjective heath status. There is room for improvement to relieve exposure to WPV by lowering the work stress of nurses. A harmonious work environment for nurses should be provided as the damage to health outcomes due to WPV is clear.

ACHNOWLEDGMENTS: The authors thanks the participants at Harbin Medical University for their support, and give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

FUNGINGS: This study was funded by the Innovation Science Research Foundation of Harbin Medical University (2016RWZX09) to Tao Sun and also was funded by the Natural Science Foundation of China (71473063) to Fan Lihua. The authors give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

FUNDINGS

This study was funded by the Innovation Science Research Foundation of Harbin Medical University (2016RWZX09) to Tao Sun and also was funded by the Natural Science Foundation of China (71473063) to Fan Lihua. The authors give their sincere thanks to all participants who had helped collect data and distribute questionnaires to other subjects.

AUTHOR CONTRIBUTION: Conceived and designed the experiments: LF TS WL SZ. Performed the experiments: SZ WL JW YS FX. Analyzed the data: TS WL SZ. Contributed reagents/materials/analysis tools: WL SZ SC. Wroten the paper: SZ WL TS.

COMPETING INTERESTS: The authors have declared that no competing interests exist.

DATA SHARING STATEMENT: No additional data are available.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Page 1, line 24-30;
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	P.1; line 31; p.2, line 1-14
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	p.3, line 2-22; p.5, line 1-4
Objectives	3	State specific objectives, including any prespecified hypotheses	P.5, line 5-9;
Methods			
Study design	4	Present key elements of study design early in the paper	P.5, line 8-9
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	p.5, line 10-17
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	P.7, line 10-17
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	no
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	p.6, line 7-22; p.7, line 1-11
Bias	9	Describe any efforts to address potential sources of bias	no
Study size	10	Explain how the study size was arrived at	no
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P.7, line 12-20

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	P.7, line 12-20
		(*b*) Describe any methods used to examine subgroups and interactions	no
		(*c*) Explain how missing data were addressed	no
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	P.7, line 12-20
		(*e*) Describe any sensitivity analyses	no
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P.7, line 1-33
		(b) Give reasons for non-participation at each stage	no
		(c) Consider use of a flow diagram	No
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P.8; p.9;p.10line 1-20
		(b) Indicate number of participants with missing data for each variable of interest	P.8; p.9
Outcome data	15*	Report numbers of outcome events or summary measures	P.8; p.9; p.10; p.11,
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	p.13; p.14
		(*b*) Report category boundaries when continuous variables were categorized	no
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	no
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	no
Discussion			
Key results	18	Summarise key results with reference to study objectives	p.17;15-22 p.15;p.16;p.17line

			1-3
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P.17, Line 4-14;
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	p.15; p.16;p.17line 1-3
Generalisability	21	Discuss the generalisability (external validity) of the study results	no
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P.18, line 8-11

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.