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Workplace violence against healthcare professionals in multi-ethnicity area: a cross-sectional study in southwest China

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Abstract

Objective: The purpose of this study is to examine WPV towards healthcare professionals in multi-ethnicity area of China, including prevalence, influencing factors, healthcare professionals' response to WPV, expected anti-violence training measures and content, and evaluation of WPV interventions.

Methods: We conducted a cross-sectional study in a Grade III Class A hospital in the capital of Yunnan province, which is the province with most kinds of ethnic minorities groups in China. Data were collected from July to October 2017 using questionnaires designed jointly by International Labour Office (ILO), International Council of Nurses (ICN), World Health Organization (WHO), and Public Services International (PSI). Descriptive statistics, Chi-square test, Fisher's exact test, propensity score matching (PSM) and logistic regression were used to analyze. A total of 2,036 valid questionnaires were collected. The prevalence of physical and psychological violence was 5.4% and 43.7%, respectively.

Results: Healthcare professionals who were ethnic minorities were more likely to experience psychological violence. After stratified by gender, males who are ethnic

minorities suffered more physical violence, while females psychological violence . We also found a unique work situation in China—overtime duty call work (6pm-7am) was a risk factor of psychological violence (OR=1.403, $p<0.05$). Ethnic minority healthcare professionals less likely to order perpetrators to stop or to report to superiors when facing psychological violence ($p<0.05$). Ethnic minority healthcare professionals are more interested in receiving training of force skills and self-defense. Both Han and ethnic minority participant considered security measures as the most useful intervention, while changing the time of shift as the most useless one.

Conclusion: Our study comprehensively described WPV towards healthcare professionals in multi-ethnicity minority area. More WPV research conducted in multi-ethnicity area are needed.

Keyword: Workplace violence; healthcare professionals; multi-ethnicity area

Strengths and limitations

- ✧ Although lots of study investigate WPV in hospital, few of them conducted in multi-ethnicity minority area.
- ✧ Different with previous studies that pay attention to single part of WPV, our study describe WPV comprehensively including prevalence, influencing factor, response to WPV.etc.
- ✧ Due to the recall bias or reporting bias resulting from shame and stigma, the number of violence events in past 12 months may be underestimated.
- ✧ Our study didn't explain WPV using cultural factors, which needs further study

to fulfill.

1. Introduction

In December 2019, a doctor was killed brutally by a patient's family member in Beijing. Less than a month later, another doctor in Beijing hospital was stabbed and severe injured. These 2 cases once again drew great attention to the safety of healthcare professionals in Chinese society.

Workplace violence (WPV)towards healthcare professionals is an extremely serious problem in China lasted for a long time. From 2000 to 2015, there were less than 290 severe WPV towards healthcare workers reported by media[1]. The seriousness of WPV towards healthcare professionals in China leads to great attention from researchers. Most of researches that studied WPV prevalence of China were conducted in the area that Han people (the main ethnic group in China) mainly lives in ,and the reported rates of physical and psychological violence are 6.4%–35.4% and 54.4%–79.8%, respectively[2-7]. However, few WPV studies conducted in multi-ethnicity area of China. According to the latest national census in 2010, ethnic minorities account for 8.49% of the total population in China. In multi-ethnicity area, the proportion and ethnic diversity of both ethnic minority patients and healthcare professionals is higher. In addition, research has revealed that due to the relatively lower level of education in general, ethnic minorities may suffered work discrimination to some extent[8]. However, since healthcare profession requires high level of skill and education, it's still unknow whether this discrimination exists in healthcare workplace or not. It's essential to provide more

information of WPV in multi-ethnicity area thus conduct specific interventions. Also, limited studies from other counties and regions focus on WPV towards healthcare professionals in multi-ethnicity areas.

Although many studies have investigated the influence factor of WPV towards healthcare professionals, an essential factor has been neglected. In China, the medical system requires healthcare workers to be on 24 hours standby and to be able to connect with for on-call work beyond the general worktime. Due to the work regulation, healthcare professionals in charge are responsible for their patients at any time, even when they have already got off work or have a rest. In addition, healthcare workers who are on duty would ask their superior or healthcare professionals in charge of patients for help when meet severe situations. These make it common that physicians who are at rest must go back work if needed, which often happens in late night. However, limited study has taken this factor into consideration.

Due to the research purpose and background, most previous WPV studies were conducted in several hospitals, which has several advantages. Firstly, more samples could be collected to make a more reliable conclusion. In addition, the results could reflect common problems in a certain context. However, at the same time, it would neglect some specific factors or characteristics. The investigation conducted in a typical and representative hospital is conducive to examine the relation between specific factors or information and WPV, which could also be an effective reference of practical work for hospitals with similar features. As for

multi-ethnicity area, the study conducted in several hospitals may cover up the features of ethnic minorities due to the difference proportion of ethnic groups in each hospital. Therefore, it's necessary to choose a hospital that is both representative for the region and with the proper proportion of ethnic groups.

Most previous WPV studies have only investigate a part of WPV, such as prevalence, influencing factors, or interventions. In this study, we aim to investigate the WPV in a general hospital of multi-ethnicity area, including the prevalence, influencing factors, response to WPV and evaluation of WPV intervention, which could not only interpret WPV from a broader perspective, but also provide more reference for practice.

2.Methods

2.1 Study population

Yunnan, located in southwestern border of China, has the greatest diversity of ethnic minorities in southwestern China, containing 52 of 56 ethnic groups (51 ethnic minority groups and Han). In 2017, 33.6% residents in Yunnan were ethnic minority groups.

We conducted a retrospective survey in a Grade III Class A hospital in Kunming, the capital of Yunnan Province. The hospital was founded in 1939 and is the first Grade III Class A hospital in Yunnan Province. It is one of the most capable general hospitals in Yunnan, containing 2,400 open beds and over 2 million annual total visits. Around 18.6% the hospital employees were ethnic minorities at the time of the study. As a medical center in the province, it has wide radiation range, and

patients from all over the province come to the hospital ask for medical treatment.

2.2 Questionnaire

A questionnaire developed jointly by the International Labour Office (ILO), International Council of Nurses (ICN), World Health Organization (WHO), and Public Services International (PSI) in 2003 was used to measure hospital WPV[9]. First, we asked for permission to use the questionnaire from the ILO and WHO. Then, we translated it into Mandarin Chinese and back translated it into English to verify the accuracy of the Mandarin version. After this translation processed, 17 experts in the field of healthcare were invited to assess the effectiveness of the measurement tools, including the applicability of culture and the appropriateness of language. We selected 79 medical staff to form a group and conducted a two-week test-retest reliability test (0.83).

The questionnaire included the following sections: (1) demographics (e.g., gender, age, education, ethnicity, occupation) and work status (e.g., shift work, overtime duty call work, participation in anti-violence training, anxiety regarding WPV); (2) experience of physical violence in the past 12 months (i.e., intentional behavior that harms healthcare workers physically); (3) experience of psychological violence in the past 12 months (i.e., verbal abuse, threatening events, and sexual harassment); (4) healthcare professionals' response to physical violence and psychological violence; (5) the expected measures (e.g. leaflets, video, lecture) and content of anti-violence training (e.g. WPV cognition, self-defense; (6) the evaluation of usefulness of WPV interventions.

2.3 Sample and data collection

First, we obtained permission from the hospital management office and human resources department to collect employee's information in the whole hospital. Then, the person who is in charge of each unit issued a questionnaire to the staff and informed them of the instructions and precautions. The study subjects included doctors, nurses, medical technicians, etc. and was conducted on the basis of voluntary and anonymous.

Because the respondents were asked to provide their experience of WPV in the previous 12 months, we excluded employees who met any of the following criteria: (1) less than 1 year of work experience in this hospital; (2) short-term secondment or training (less than 12 months); (3) personnel who did not come to work during the study period due to traveling, training, vacation, etc.

The questionnaire had to be completed by employees themselves and could not be answered by any other person. The time of data collection ranged from July to October 2017. A total of 2,036 valid questionnaires were collected, and the effective response rate was 83.79%.

2.4 Data analysis

Descriptive statistics were used to summarize the demographic characteristics, prevalence of physical and psychological violence and the response to WPV between Han and ethnic minority participants. Chi-square test and Fisher's exact was to compare the difference of response to WPV between Han and ethnic minority healthcare workers.

Since the bias in the number between Han and ethnic minority participants, propensity score matching (PSM) was used to match the group of ethnic minority healthcare professionals (treatment group) to the group of Han healthcare professionals (control group) in a 1:2 manner to create two groups with similar demographic characteristics. The propensity score model used the ethnicity as a dependent variable, age, gender, marriage status, educational background and years of work experience as explanatory variables. After matching, a set of 960 cases was created, with 325 ethnic minority and 635 Han healthcare professionals. The matched set was used to identify the factors associated with WPV in hospitals using logistics regression. Since the fact that the proportion of male and female was almost 1:3, we have also conducted logistics regression stratified by gender.

The data were entered using Epidata 3.1 and analyzed using IBM SPSS Statistics 22.0. The significance level was set at 0.05.

2.5 Ethic approval

This study was reviewed and approved by the Research Ethics Committee of Harbin Medical University and the investigation hospital (Project Identification Code: HMUIRB20160014). All the respondents were provided with informed consent, which described the purpose and method of data collection and kept the data confidential.

2.6 Patient and public involvement

No patient involved.

3. Results

3.1 Demographic characteristics

Table 1 shows the demographic details of the 509 men and 1,527 women who participated in the study. Around 84% of respondents were of "Han ethnicity", while 16% were ethnic minorities. A majority of respondents were nurses (42.7%) and physicians (31.5%), 12.5% were medical technology workers, the rest (11.6%) held other positions. Most of the respondents (70.2%) worked in rotational shifts, and 74.2% engaged in overtime work (from 6 pm to 7 am the next day), such as overtime or emergency consultation. Over half reported high or extremely high levels of anxiety regarding WPV (58.9%) and participated in anti-violence training (67.5%). As for the prevalence of WPV, 43.7% of the respondents reported that they have experienced psychological violence, while 5.4% reported physical violence.

Table1. Demographic information and the prevalence of workplace violence

	N	%
Gender		
Male	509	25.0%
Female	1527	75.0%
Age		
≤30	940	46.2%
31–45	789	38.8%
≥46	207	15.1%
Marital status		

Single	603	29.6%
Married	1389	68.2%
Divorced/widowed	44	2.2%
Education background		
College graduates	448	22.0%
Bachelor	1207	59.3%
Master's and above	381	18.7%
Ethnicity		
Han	1711	84.0%
Minority	325	16.0%
Years of work experience		
1–5	570	28.0%
6–10	548	26.9%
11–20	413	20.3%
>20	505	24.8%
Profession		
Physician	624	31.5%
Nurse	869	42.7%
Medical technology	255	12.5%
Others	236	11.6%
Work in shift		

Yes	1429	70.2
No	607	29.8
Overtime duty call work (6 pm-7am)		
Yes	1510	74.2%
No	526	25.8%
Anxiety level		
Never	103	5.1%
Low	219	10.8%
Moderate	513	25.2%
High	360	17.7%
Extremely high	841	41.2%
Anti-violence training		
Yes	1374	67.5%
No	662	32.5%
Physical violence		
Yes	110	5.4%
No	1926	94.5%
Psychological violence		
Yes	889	43.7%
No	1147	56.3%

3.2 Influencing factors

Table 2 shows the results of the logistic regression analysis of physical and psychological violence using the matched set (unstratified and stratified by gender), including P-values, odds ratios (OR) and 95% confidence intervals (95%CI). The unstratified results showed that female respondents had lower odds of experiencing physical violence than male did (OR = 0.287; P = 0.000). Respondents with anxiety level towards WPV had higher odds of physical violence (OR = 1.875; P = 0.000). After stratified by gender, the results showed that the educational background of masters and above(OR=7.485 P = 0.026), ethnic minority(OR=3.312 P= 0.030), anxiety level towards WPV(OR=2.456 P= 0.003) were the risk factors of physical violence for males, while only anxiety level towards WPV(OR=1.838 P= 0.008) was the risk factor of physical violence for females.

As for psychological violence, minority medical workers had higher odds of experiencing it than did workers of Han ethnicity (OR = 1.542; P= 0.003). Engaging in overtime work from 6 pm to 7 am the following day was also a risk factor of psychological violence (OR = 1.403; P= 0.036). Anxiety level about WPV was also negatively associated with psychological violence (OR=1.543; P= 0.000). When stratified by gender, females who are ethnic minorities (OR=1.711; P= 0.001)were more likely to suffer psychological violence, while anti-violence training (OR=0.713; P= 0.042) was the positively associated with psychological violence; both males (OR=1.483; P= 0.003)and females (OR=1.508; P= 0.000) with higher anxiety level towards WPV suffered more

psychological violence.

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Table 2. Results of logistic regression of physical and psychological violence

Variable	Physical Violence									Psychological Violence								
	Unstratified			Stratified						Unstratified			Stratified					
				Male			Female						Male			Female		
	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*	OR	95% CI	*P*
Gender																		
Male	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Female	0.287	0.151-0.546	0.000	-	-	-	-	-	-	0.998	0.711-1.400	0.990	-	-	-	-	-	-
Age (years)																		
≤30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31–45	1.263	0.265-6.013	0.770	3.250	0.066-160.962	0.554	0.761	0.091-6.359	0.801	1.107	0.551-2.227	0.775	0.772	0.190-3.141	0.718	1.455	0.636-3.332	0.374
≥46	1.436	0.430-4.801	0.557	0.515	0.014-19.395	0.720	2.406	0.451-12.843	0.304	0.803	0.455-1.418	0.450	0.492	0.160-1.506	0.214	1.099	0.554-2.182	0.787
Marital status																		
Single	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Married	0.466	0.078-2.771	0.401	0.099	0.005-1.861	0.122	0.965	0.085-10.921	0.977	0.850	0.296-2.442	0.762	0.572	0.052-6.347	0.649	0.851	0.260-2.779	0.789
Divorced/widowed	0.463	0.089-2.408	0.360	0.320	0.021-4.836	0.411	0.573	0.061-5.416	0.627	0.949	0.344-2.618	0.920	0.776	0.075-7.991	0.831	0.883	0.284-2.749	0.883
Educational background																		
College graduates	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bachelors	0.981	0.349-2.751	0.970	0.921	0.098-8.696	0.943	0.690	0.208-2.281	0.542	0.923	0.580-1.469	0.735	1.184	0.496-2.826	0.704	0.884	0.503-1.554	0.668
Masters and above	1.358	0.546-3.378	0.510	7.485	1.272-44.041	0.026	0.451	0.147-1.381	0.163	1.202	0.792-1.825	0.387	1.156	0.5462.448	0.705	1.234	0.738-2.065	0.423
Ethnicity																		

Han	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Minority	1.574	0.863-2.869	0.139	3.312	1.121-9.788	0.030	1.182	0.531-2.632	0.683	1.542	1.161-2.048	0.003	1.069	0.563-2.033	0.838	1.711	1.240-2.362	0.001
Years of work experience																		
1–5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6–10	0.818	0.202-3.309	0.778	1.003	0.020-51.346	0.999	0.989	0.175-5.591	0.990	0.537	0.282-1.023	0.059	0.595	0.158-2.237	0.442	0.510	0.241-1.083	0.080
11–20	0.498	0.138-1.805	0.289	0.769	0.017-35.107	0.893	0.513	0.104-2.531	0.412	0.718	0.402-1.284	0.265	0.618	0.188-2.029	0.428	0.716	0.361-1.421	0.339
>20	0.799	0.271-2.361	0.685	1.368	0.035-53.891	0.867	0.846	0.252-2.840	0.786	1.336	0.800-2.231	0.268	1.438	0.460-4.496	0.533	1.236	0.689-2.219	0.477
Work in shift																		
Yes	1.162	0.575-2.350	0.676	0.869	0.257-2.944	0.822	1.506	0.589-3.853	0.393	1.171	0.851-1.610	0.333	1.283	0.653-2.520	0.469	1.124	0.777-1.625	0.535
No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Overtime duty call work (6pm-7am)																		
Yes	0.875	0.430-1.781	0.713	1.343	0.308-5.856	0.695	0.734	0.31301.724	0.478	1.403	1.022-1.925	0.036	1.263	0.573-2.782	0.562	1.412	0.997-2.000	0.052
No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anxiety level	1.875	1.339-2.624	0.000	2.456	1.348-4.475	0.003	1.838	1.172-2.884	0.008	1.500	1.326-1.697	0.000	1.483	1.144-1.921	0.003	1.508	1.307-1.739	0.000
Anti-violence training				-	-	-							-	-	-	-	-	-
Yes	1.253	0.647-2.426	0.504	3.288	0.867-12.473	0.080	0.886	0.388-2.022	0.773	0.790	0.592-1.055	0.111	1.090	0.561-2.115	0.800	0.713	0.514-0.989	0.042
No	-	-	-	-	-	-	-	-	-				-	-	-	-	-	-

237 OR: odds ratio; CI: Confidence interval.

3.3 Participants' response to WPV

Table 3 shows the different response to psychological/physical violence between Han and ethnic minority healthcare professionals. More Han healthcare professionals ordered perpetrators to stop and reported to superiors than ethnic minorities when psychological violence happened, and the difference shows statistical significance ($p<0.05$). As for the physical violence, compared to ethnic minority, more Han healthcare professionals chose to response in all ways except pretending nothing happened. However, none of the difference is statistically significant.

Table 3. Response to psychological and physical violence

	Psychological violence				Physical Violence			
	Han(N=727)		Ethnic minority(N=162)		Han(N=88)		Ethnic minority(N=22)	
	n	%	n	%	n	%	n	%
Pretend nothing happened	216	29.71	49	30.25	6	6.82	4	18.18
Order to stop*	324	44.57	55	33.95	27	30.68	3	13.64
Talk to families or friends	474	65.20	114	70.37	21	23.86	4	18.18
Psychological counseling	70	9.63	23	14.20	9	10.23	2	9.09
Talk to colleague	631	86.80	131	80.86	33	37.50	6	27.27
Change department	47	6.46	13	8.02	4	4.55	0	0.00
Report to superiors*	469	64.51	82	50.62	31	35.23	6	27.27
Charge perpetrators	28	3.85	4	2.47	5	5.68	0	0.00

*: Statistically significant in psychological violence

3.4 Anti-violence training measures and content

Table 4 has shown the anti-violence training measures and content expected by healthcare professionals. Lecture is the most expected measures of training both by Han (54.13%) and ethnic minority (52.62%). Pre-job training is expected by half of ethnic minority healthcare professionals, which is slightly higher than that proportion in Han (43.89%). Wall newspaper and poster is the least popular measure both by Hans and ethnic minorities. As for the training content, more than 70% Han and ethnic minority participants expects identification of WPV signs and escaping training. Compared to Han, ethnic minority healthcare professionals are more interested in force skills and self-defense, and these differences show statistical significance($p<0.05$).

Table 4. Expected measures and contents of anti-violence training

	Han		Ethnic minority	
	n	%	n	%
Expected training measures				
Leaflets	680	39.74%	125	38.46%
Video	759	44.36%	145	44.62%
Lectures	926	54.12%	171	52.62%
Wall newspaper, poster	435	25.42%	77	23.69%
Employee handbooks	507	29.63%	93	28.62%
Pre-job training	751	43.89%	163	50.15%

Expected training content				
WPV cognition	891	52.07%	177	54.46%
Identification of WPV signs	1242	72.59%	234	72.00%
Language skills	1162	67.91%	232	71.38%
Force skills*	815	47.63%	182	56.00%
Relevant laws and regulations	1113	65.05%	223	68.62%
Escaping training	1235	72.18%	245	75.38%
Self-defense*	1227	71.71%	257	79.08%

3.5 Evaluation of the usefulness of WPV interventions

As for the evaluation of interventions, there is no significant difference between Han and ethnic minority healthcare professionals. Participants hold that security measures are the most useful ways to prevent WPV. The following are improving the environment and anti-violence training. More than 40% consider patient examination and changing the time of shift as useless measures. There are few differences when stratified by ethnicity. More Han healthcare workers look down on the usefulness of protective equipment, while ethnic minority participants undervalue patient examination and anti-violence training. However, none of this difference between Han and ethnic minority is statistically significant. (Table 5)

272 **Table 5. Evaluation of the usefulness of WPV interventions**

	All participants		Han		Ethnic minority	
	n	%	n	%	n	%
Improve the environment（e.g. enhance lighting）						
Very useful	715	35.12	611	35.71	104	32.00
Somewhat useful	945	46.41	784	45.82	161	49.54
Useless	376	18.47	316	18.47	60	18.46
Restrict non-staff access						
Very useful	591	29.03	513	29.98	78	24.00
Somewhat useful	778	38.21	638	37.29	140	43.08
Useless	667	32.76	560	32.73	107	32.92
Patient examination (e.g. history of committing violence)						
Very useful	498	24.46	429	25.07	69	21.23
Somewhat useful	698	34.28	586	34.25	112	34.46
Useless	840	41.26	696	40.68	144	44.31
Increase manpower						
Very useful	667	32.76	571	33.37	96	29.54
Somewhat useful	796	39.10	663	38.75	133	40.92
Useless	573	28.14	477	27.88	96	29.54
Protective equipment						
Very useful	610	29.96	522	30.51	88	27.08
Somewhat useful	738	36.25	625	36.53	113	34.77

Useless	688	33.79	564	32.96	124	38.15
Change the time of shift						
Very useful	470	23.08	411	24.02	59	18.15
Somewhat useful	699	34.33	578	33.78	121	37.23
Useless	867	42.58	722	42.20	145	44.62
Avoid working alone						
Very useful	659	32.37	568	33.20	91	28.00
Somewhat useful	636	31.24	526	30.74	110	33.85
Useless	741	36.39	617	36.06	124	38.15
Anti-violence training						
Very useful	785	38.56	675	39.45	110	33.85
Somewhat useful	800	39.29	672	39.28	128	39.38
Useless	449	22.05	362	21.16	87	26.77
Security measures						
Very useful	899	44.16	762	44.54	137	42.15
Somewhat useful	932	45.78	779	45.53	153	47.08
Useless	205	10.07	170	9.94	35	10.77

4.Discussion

This study examined the prevalence, influence factors, and response of WPV in a hospital where located in multi- ethnicity area of China. The percentage of medical workers of minority ethnicity was substantially higher than what has been

reported in studies conducted in eastern and central China (2.41–7.95%)[10-12]. The result shows that the prevalence of physical and psychological violence in our study are lower than what has been found in areas Han people mainly lives in [2-7 13 14]. The results of logistics regression indicated that ethnic minority healthcare professionals maybe more likely to suffer psychological violence. After stratified by gender, males who are ethnic minorities were more likely to suffer physical violence, while females psychological violence. This discrepancy may be due to the proportion of males and females. Some studies from other countries or regions showed that ethnic minority healthcare workers were less likely to experience WPV when comparing to the majority (Whites)[15 16], while some studies held the opposite conclusion that ethnic minority healthcare professionals were more vulnerable in suffering workplace bullying, verbal abuse, physical violence, etc. [17-21] However, due to the huge difference of investigation background and participants' characteristics, these studies couldn't be compared with our study. We speculate several reasons for this result. First, study shows that there is behavioural difference between Han and ethnic minority, culture and religious beliefs may be a key factor to explaining [22]. Second, our study shows that when facing WPV, compared with Han, ethnic minority healthcare professionals may be more likely to tolerate, which may lead to more violence. Third, the language from difference linguistic culture may hamper the doctor-patient communication, thus lead to violence[23].

Respondents who engaged in overtime duty call work from 6 pm to 7 am had

greater odds of experiencing psychological violence. This is a new finding in our study, which has been ignored in most research in China. We speculate several reasons for this finding. First, our definition of overtime work might have captured individuals handling urgent issues. The staff working therein are more likely to experience higher levels of frustration, distress, cognitive impairment or arousal[24 25], which is similar with the WPV high-risk department — emergency department. Second, healthcare professionals would face more aggressive situations such as drunk patients or companions and traumatic patients caused by fighting. Third, since the on-call work is not during the general working time, there are less colleagues and guards. We suggest that more effective measures should be adopted to protect healthcare professionals who engage duty call beyond general working time. Future study should investigate this phenomenon in Han mainly living area.

The result of logistics regression shows that males have higher odds of experiencing physical violence, which is similar to the WPV studies conducted in the areas that Han mainly lives in[6 14 26]. In other countries, some studies came to the same thing[27-30], while some studies have reported that women are more vulnerable to physical violence[31]. This discrepancy can be attributed to the different study backgrounds[32]. In many countries, beliefs, ethics, or moral principles serve as guidance for public behavior. For instance, in some Arab countries, being a male is a risk factor of experiencing WPV partly because of cultural norms that reject disrespect of females[30]. Consistent with other

researches[6 14] conducted in the areas that Han mainly lives in , our study shows that higher anxiety levels regarding WPV increased the odds of experiencing WPV in multi-ethnicity area, which may because WPV can lead to adaptive behavior that might create opportunities for the violence reoccurred[33].

Compared to Han, more ethnic minority healthcare professionals pretend nothing happened after suffering physical violence. Also, they may less likely to talk with surroundings about these events, or to report to their leaders, or to use legal methods. The reason why we think there is no statistical significance in this result is the number of cases physical violence happened. Despite this, we speculate that this may due to the cultural belief of ethnic minority makes them silent. Study has proved that talking with surroundings about their WPV is helpful to release their tension or anxiety gain from WPV[34]. Since the anxiety towards WPV is a risk factor to WPV, more social support from individual level, such as friends, families, and colleagues, should be provided to help ethnic minority healthcare professionals managing violence through diverse methods instead of tolerating by themselves. Study has shown that in the environment that encourage to report WPV, more incidents of WPV were reported and healthcare workers gained better awareness of risk for violence, as well as how to avoid potential danger, and how to manage aggressive customers[35]. An adequate WPV reporting system should be established to encourage ethnic minority healthcare professionals to report their WPV experience.

It seems that both Han and ethnic minority healthcare professionals are less

interested in the textual anti-violence training measures (leaflets, poster, wall newspaper, employee handbook). Although printed materials could summarize content and be learned repeatly, the lack of practice details makes it less effective[36]. Video holds the advantages such as attractiveness, convenience, clarity of demonstration, superior cost-effectiveness and easy to apply, while lectures contain variety of lively styles such as group interaction and scenario simulation, which makes them more popular[37 38]. Future study should compare the effect of these measures. Pre-job training is more needed by ethnic minority healthcare workers, which maybe that it could help them to adapt to work environment better and faster. As for the training content, ethnic minority healthcare professionals are more interested in tough measures. Since ethnic minorities are more likely to suffer psychological violence, they may perceive more threat thus give rise to the tendency of handle violence by force[39 40].

Our finding indicated that there is no much difference in evaluation of usefulness of WPV intervention between Han and ethnic minority. Security measure is regarded as the most useful intervention of WPV. China has enacted ‘Guidance on strengthening the security and protection system construction in hospitals’ in 2013 and ‘Opinions on strictly punishing medical related crimes and maintaining the medical order’ in 2017 to strengthen security of hospital. However, since these policies served as instructions rather than mandatory regulations, insufficient resource has constrained the implementation in all hospitals. Security measures are not only an intervention that could prevent

healthcare professionals from WPV, but also may enhance the sense of safety as a kind of organizational support. Hospitals should implement specific scale of security measures according to actual situation. Most participants consider anti-violence training as useful. Although it could increase the knowledge and boost confidence, the effect could not reduce of WPV incidents for long-term[41]. We suggest that it's essential to make a complete and periodic curriculum for repetitive training. Improving environment, such as enhancing lighting and install cameras, is be considered as useful measure. Previous study has shown that working in a daring environment at night is a risk factor of WPV[42]. Camera installation is required by Occupational Safety and Health Administration (OSHA)[43], which may be a deterrence for committing violence. Using protective equipment is not a popular intervention. In the period of frequent WPV in China, there are indeed some healthcare workers wearing helmet at work[44]. However, this may lead to a more tense doctor-patient relationship. Participants don't trust patient examination and restriction non-staff access much. Due to big hospital scale and treatment number, there would be numerous patients admitted to hospital. The process of patient examination and restriction of non-staff access would not be serious enough, otherwise the crowded queue and longer waiting time may breed new contradictions. In addition, since there is no system or platform share the patient information between each hospital, it is difficult to verify WPV history strictly. Although previous studies have shown that work shift is negatively associated with WPV[14 28 30], changing the time of shift are treated as

less useful. It may be better to enhance the protection during shift rather than changing the regulation.

5. Limitations

This study has a few limitations. First, since the respondents were asked to report WPV that had taken place in the past 12 months, violence might not be adequately reported due to recall bias or reporting bias resulting from shame and stigma. Second, the study exploratively examined the WPV in multi-ethnicity area are but did not conduct in-depth research on the underlying cause by cultural factors. Future, research should investigate the perpetrators or patients, especially explore WPV by qualitative methods.

6. Conclusion

Our study investigated WPV in a hospital located in multi-ethnicity area. The WPV prevalence reported in our study is lower than that in the areas that Han mainly lives in. Ethnic minority healthcare professionals may be more likely to suffer WPV and they have differences in response to WPV compared to Han. Additionally, we broke through the single focus of existing WPV research and explored WPV from a more comprehensive perspective including prevalence, influencing factors, response to WPV, expected anti-violence training measures and contents, and evaluation of interventions, which may provide a practical reference to hospitals with similar characteristics. More WPV research should be conducted in multi-ethnicity areas from the perspective of perpetrator or patients, especially by qualitative methods.

Contributors : Mingli Jiao, Jingfu Mao and Qunhong Wu contributed to the conception and design of the study. Haonan Jia, Huiying Fang, Yameng Wang, Kexin Jiang, Yuanheng Li, Ying, Wang, Lifen Wei, and Gangyu Zhang contributed to the data collection. Omar Yacouba Ismael, Haonan Jia and Xiaowen Jia contributed to literature search and data quality control. Huiying Fang and Haonan Jia, Ruohui Chen did the statistical analysis and drafted the original manuscript. Mingli Jiao revised the manuscript for important intellectual content. Ruohui Chen, Kexin Jiang and Jingqun Li prepared the manuscript and supplementary material. All authors contributed to data interpretation and rewriting the paper.

Haonan Jia, Huiying Fang, Ruohui Chen contributed equally to this work. Mingli Jiao and Jingfu Mao are corresponding author.

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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	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
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	7-9
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
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	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	10-20
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	10-20
		(*b*) Report category boundaries when continuous variables were categorized	10-16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	21
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	26-27
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	21-26
Generalisability	21	Discuss the generalisability (external validity) of the study results	27
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	28

*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.

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Workplace violence against healthcare professionals in multi-ethnicity area: A cross-sectional study in southwest China

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Abstract

Objective: The purpose of this study is to examine workplace violence (WPV) towards healthcare professionals in multi-ethnicity area of China, including prevalence, influencing factors, healthcare professionals' response to WPV, expected anti-violence training measures and content, and evaluation of WPV interventions.

Design: A cross-sectional study.

Setting: A Grade III Class A hospital in the capital of Yunnan province, which is the province with most kinds of ethnic minorities groups in China.

Participants: In total, 2,036 healthcare professionals participated with a response rate was 83.79%.

Results: The prevalence of physical and psychological violence was 5.4% and 43.7%, respectively. Healthcare professionals who were ethnic minorities were more likely to experience psychological violence (OR=1.54, 95%CI=1.16-2.05). After stratified by gender, males who were ethnic minorities suffered more physical violence (OR=3.31, 95%CI=1.12-9.79), while females suffered

psychological violence (OR=1.71, 95%CI=1.24-2.36). We also found a unique work situation in China—overtime duty on call work (6 pm-7 am) was a risk factor of psychological violence (OR=1.403, 95%CI=1.02-.93). Ethnic minority healthcare professionals less likely ordered perpetrators to stop or reported to superiors when facing psychological violence. Ethnic minority healthcare professionals are more interested in receiving training of force skills and self-defense. Both Han and ethnic minority participants considered security measures as the most useful intervention, while changing the time of shift as the most useless one.

Conclusion: Our study comprehensively described WPV towards healthcare professionals in multi-ethnicity minority area. More WPV research conducted in multi-ethnicity area are needed.

Keyword: Workplace violence; healthcare professionals; multi-ethnicity area

Strengths and limitations

- ✧ Although lots of studies investigated WPV in hospital, few of them were conducted in multi-ethnicity minority area.
- ✧ Previous studies paid attention to a single part of WPV whereas our study describes WPV comprehensively including prevalence, influencing factor, response to WPV.
- ✧ Due to recall bias or reporting bias resulting from shame and stigma, the number of violent events in the past 12 months may be underestimated.
- ✧ Our study did not explain WPV using cultural factors, which further studies

can investigate.

1. Introduction

In December 2019, a doctor was brutally killed by a patient's family member in Beijing. Less than a month later, another doctor in Beijing hospital was stabbed and severely injured. These two cases once again drew great attention to the safety of healthcare professionals in the Chinese society.

Workplace violence (WPV) was defined as "incidents where employees are abused, threatened, assaulted or subject to other offensive acts or behaviors in circumstances related to their work", which includes two types: (1) physical violence (e.g., beating, kicking, slapping, stabbing, shooting, pushing, biting, and pinching) and (2) psychological violence (e.g., threat of physical force against another person or group that can result in harm to physical, mental, spiritual, moral, or social development)[1]. WPV towards healthcare professionals is an extremely serious problem in China, which is happening for a long time. There were less than 290 severe WPV towards healthcare workers reported by media from 2000 to 2015[2]. The seriousness of WPV towards healthcare professionals in China leads to great attention from researchers. Most of researches that studied WPV prevalence of China were conducted in the area where the Han people (the main ethnic group in China) mainly live and rates of physical and psychological violence were 6.4%–35.4% and 54.4%–79.8%, respectively [3-8]. However, there were few WPV studies conducted in multi-ethnicity area of China. According to the latest national census in 2010, ethnic minorities account for 8.49% of the total

population in China. In multi-ethnicity area, the proportion and ethnic diversity of both ethnic minority patients and healthcare professionals is higher. In addition, there is preferential treatment policy in education for Chinese ethnic minorities (lower threshold to receive high level of education), which may make ethnic minority workers' capabilities undervalued [9] [10]. However, since healthcare professionals require high level of skill and education, it is still unknown whether the ethnic minority healthcare professionals' ability and skill would be undervalued that can lead to patients' distrust with even more WPV occurrence. It is essential to provide more information of WPV in the multi-ethnicity area thus conducting specific interventions. In addition, limited studies from other counties and regions focus on WPV towards healthcare professionals in multi-ethnicity areas.

Although many studies have investigated the influence factor of WPV towards healthcare professionals, an essential factor has been neglected. In China, more than 90% healthcare professionals work more than eight hours a day, which makes overtime work a common phenomenon [11]. Since the medical system requires healthcare professionals in charge to be responsible for their patients at any time, duty on call has become a form of overtime work. Healthcare workers need to be on 24 hours standby and be able to return to hospital if patients are in an acute or severe situation, even when they have already got off work or having a rest [12]. Previous studies found that workload was associated with WPV victimization [13] [14]. However, limited WPV studies focused on relationship between

WPV experience and the exact form of overtime.

Most previous WPV studies have only investigated a part of WPV, such as prevalence, influencing factors, or interventions. In this study, we aim to investigate WPV in a general hospital of multi-ethnicity area, including the prevalence, influencing factors, response to WPV and evaluation of WPV intervention, which could not only interpret WPV from a broader perspective, but also provide more reference for practice.

2. Methods

2.1 Study population

Yunnan, located in southwestern border of China, has the greatest diversity of ethnic minorities in China, containing 52 of 56 ethnic groups (51 ethnic minority groups and Han). In 2017, 33.6% residents in Yunnan were ethnic minority groups.

We conducted a retrospective survey in a Grade III Class A hospital in Kunming, the capital of Yunnan Province. The hospital was founded in 1939 and is the first Grade III Class A hospital in Yunnan Province. It is one of the most capable general hospitals in Yunnan, containing 2,400 open beds and over 2 million annual total visits. Around 18.6% of the hospital's employees were ethnic minorities at the time of the study. As a medical center in the province, it has a wide radiation range, and patients from all over the province come to the hospital seeking medical treatment.

2.2 Questionnaire

A questionnaire developed jointly by the International Labor Office (ILO),

International Council of Nurses (ICN), World Health Organization (WHO), and Public Services International (PSI) in 2003 was used to measure WPV [1]. First, we asked for permission to use the questionnaire from the ILO and WHO. Thereafter, we translated it into Mandarin Chinese and back translated it into English to verify the accuracy of the Mandarin version. After this translation processed, 17 experts in the field of healthcare were invited to assess the effectiveness of the measurement tools, including the applicability of culture and the appropriateness of language. We selected 79 medical staff to form a group and conducted a two-week test-retest reliability test (0.83).

The questionnaire included the following sections: (1) demographics (e.g., gender, age, education, ethnicity, occupation) and work status (e.g., shift work, overtime duty on call work, participation in anti-violence training, anxiety regarding WPV); (2) experience of physical violence in the past 12 months (i.e., intentional behavior that harms healthcare workers physically); (3) experience of psychological violence in the past 12 months (i.e., verbal abuse, threatening events, and sexual harassment); (4) healthcare professionals' response to physical violence and psychological violence; (5) the expected measures (e.g., leaflets, video, lecture) and content of anti-violence training (e.g., WPV cognition, self-defense; (6) the evaluation of usefulness of WPV interventions.

2.3 Sample and data collection

First, we obtained permission from the hospital management office and human resource department to collect employee's information in the hospital. Thereafter,

the person in charge of each unit issued a questionnaire to the staff and informed them of the instructions and precautions. The study subjects included doctors, nurses, medical technicians who participated voluntarily and remained anonymous.

The respondents were asked to provide their experience of WPV in the previous 12 months, therefore, we excluded employees who met any of the following criteria: (1) less than 1 year of work experience in this hospital; (2) short-term secondment or training (less than 12 months); (3) personnel who did not come to work during the study period due to traveling, training, vacation, and so on.

The questionnaire had to be completed by employees themselves and could not be answered by any other person. The time of data collection ranged from July to October 2017. A total of 2,036 valid questionnaires were collected, and the effective response rate was 83.79%.

2.4 Data analysis

Descriptive statistics were used to summarize the demographic characteristics, prevalence of physical and psychological violence and the response to WPV between Han and ethnic minority participants. Chi-square test and Fisher's exact were used to compare the difference of response to WPV between Han and ethnic minority healthcare workers.

Since ethnic minority participants were almost 1/5 of Han participants in our data collection, the result may be biased if we used the original data to conduct logistic regression. To control confounders and to balance the number of Han and

ethnic minority samples, propensity score matching (PSM) was used. The PSM model used the ethnicity as a dependent variable, and age, gender, marriage status, educational background, and years of work experience as explanatory variables. We matched the group of ethnic minority healthcare professionals (treatment group) to the group of Han healthcare professionals (control group) in a 1:2 manner to create two groups. These two groups had similar explanatory variables (age, gender, marriage status, educational background, years of work experience) and different dependent variable – ethnicity, which could control confounders and highlighted the comparison between Han and ethnic minority healthcare professionals. After matching, a set of 960 cases were created, with 325 ethnic minority and 635 Han healthcare professionals. The matched set was used to identify the factors associated with WPV in hospitals using logistics regression. Since the proportion of male and female was almost 1:3, we also conducted logistics regression stratified by gender.

The data were entered using Epidata 3.1 and analyzed using IBM SPSS Statistics 22.0. The significance level was set at 0.05.

2.5 Ethics approval

This study was reviewed and approved by the Research Ethics Committee of Harbin Medical University and the investigation hospital (Project Identification Code: HMUIRB20160014). All the respondents were provided with informed consent, which described the purpose and method of data collection and kept the data confidential.

2.6 Patient and public involvement

No patients were involved in the whole process of the research.

3. Results

3.1 Demographic characteristics

Table 1 shows the demographic details of the 509 men and 1,527 women who participated in the study. Around 84% of respondents were of "Han ethnicity", while 16% were ethnic minorities. A majority of respondents were nurses (42.7%) and physicians (31.5%), 12.5% were medical technology workers, the rest (11.6%) held other positions. Most of the respondents (70.2%) worked in rotational shifts, and 74.2% engaged in overtime work (from 6 pm to 7 am the next day), such as overtime or emergency consultation. Over half reported high or extremely high levels of anxiety regarding WPV (58.9%) and participated in anti-violence training (67.5%). As for the prevalence of WPV, 43.7% of the respondents reported that they had experienced psychological violence, while 5.4% reported physical violence.

Table 1. Demographic information and the prevalence of workplace violence (N=2036)

	n	%
Gender		
Male	509	25.0%
Female	1527	75.0%

Age		
⩽30	940	46.2%
31–45	789	38.8%
⩾46	207	15.1%
Marital status		
Single	603	29.6%
Married	1389	68.2%
Divorced/widowed	44	2.2%
Education background		
College graduates	448	22.0%
Bachelor	1207	59.3%
Master's and above	381	18.7%
Ethnicity		
Han	1711	84.0%
Minority	325	16.0%
Years of work experience		
1–5	570	28.0%
6–10	548	26.9%
11–20	413	20.3%
>20	505	24.8%
Profession		

Physician	624	31.5%
Nurse	869	42.7%
Medical technology	255	12.5%
Others	236	11.6%
Work in shift		
Yes	1429	70.2
No	607	29.8
Overtime duty on call work (6 pm-7 am)		
Yes	1510	74.2%
No	526	25.8%
Anxiety level		
Never	103	5.1%
Low	219	10.8%
Moderate	513	25.2%
High	360	17.7%
Extremely high	841	41.2%
Anti-violence training		
Yes	1374	67.5%
No	662	32.5%
Physical violence		
Yes	110	5.4%

No	1926	94.5%
Psychological violence		
Yes	889	43.7%
No	1147	56.3%

3.2 Influencing factors

Table 2 shows the results of the logistic regression analysis of physical and psychological violence using the matched set (unstratified and stratified by gender), including P-values, odds ratios (OR) and 95% confidence intervals (95%CI). The unstratified results showed that female respondents had lower odds of experiencing physical violence than males did (OR=0.29, 95%CI=0.15-0.55). Respondents with anxiety level towards WPV had higher odds of physical violence (OR=1.88, 95%CI=1.34-2.62). After stratified by gender, the results showed that the educational background of masters and above (OR=7.49, 95%CI=1.27-44.04), ethnic minority(OR=3.31, 95%CI=1.12-9.79), anxiety level towards WPV (OR=2.46, 95%CI=1.35-4.48) were associated with physical violence occurrence for males, while only anxiety level towards WPV (OR=1.84, 95%CI=1.17-2.88) was statistically significant in physical violence experience for females.

As for psychological violence, minority medical workers had higher odds of experiencing it than workers of Han ethnicity (OR=1.54, 95%CI=1.16-2.05). Engaging in overtime work from 6 pm to 7 am the following day was also a risk factor of psychological violence (OR=1.40, 95%CI=1.02-1.93). Anxiety level about WPV was also negatively associated with psychological violence (OR=1.50,

95%CI=1.33-1.70). When stratified by gender, females who were ethnic minorities (OR=1.71, 95%CI=1.24-2.36) were more likely to suffer psychological violence, while anti-violence training (OR=0.71, 95%CI=0.51-0.99) was positively associated with psychological violence; both males (OR=1.48, 95%CI=1.14-1.92) and females (OR=1.51, 95%CI=1.31-1.74) with higher anxiety levels towards WPV were associated with WPV victimization.

241 **Table 2. Results of logistic regression of physical and psychological violence (N=960)**

	Physical violence			Psychological violence		
	Unstratified	Stratified		Unstratified	Stratified	
		Male	Female		Male	Female
Gender						
Male	Reference	-	-	Reference	-	-
Female	0.29(0.15-0.55) ***	-	-	0.99(0.71-1.40)	-	-
Ethnicity						
Han	Reference			Reference		
Minority	1.57(0.86-2.87)	3.31(1.12-9.79) *	1.18(0.53-2.63)	1.54(1.16-2.05) **	1.07(0.56-2.03)	1.71(1.24-2.36) **
Age (years)						
⩽30	Reference			Reference		
31–45	1.26(0.27-6.01)	3.25(0.07-160.96)	0.76(0.09-6.36)	1.11(0.55-2.23)	0.77(0.19-3.14)	1.46(0.64-3.33)

⩾46	1.44(0.43-4.80)	0.52 (0.01-19.40)	2.41(0.45-12.84)	0.80(0.46-1.42)	0.49(0.16-1.51)	1.10(0.55-2.18)
Marital status						
Single		Reference			Reference	
Married	0.47(0.08-2.77)	0.10(0.01-1.86)	0.97(0.09-10.92)	0.85(0.30-2.44)	0.57(0.05-6.35)	0.85(0.26-2.78)
Divorced/widowed	0.46(0.09-2.41)	0.32(0.02-4.84)	0.57(0.06-5.42)	0.95(0.34-2.62)	0.78(0.08-7.99)	0.88(0.28-2.75)
Educational background						
College graduates		Reference			Reference	
Bachelors	0.98(0.35-2.75)	0.92(0.10-8.70)	0.69(0.21-2.28)	0.92(0.58-1.47)	1.18(0.50-2.83)	0.88(0.50-1.55)
Masters and above	1.36(0.55-3.38)	7.49(1.27-44.04) *	0.45(0.15-1.38)	1.20(0.79-1.83)	1.16(0.55-2.45)	1.23(0.74-2.07)
Years of work experience						
1–5		Reference			Reference	
6–10	0.82(0.20-3.31)	1.00(0.02-51.35)	0.99(0.18-5.59)	0.54(0.28-1.02)	0.60(0.16-2.24)	0.51(0.24-1.08)
11–20	0.50(0.14-1.81)	0.77(0.02-35.11)	0.51(0.10-2.53)	0.72(0.42-1.28)	0.62(0.19-2.03)	0.72(0.36-1.42)

>20	0.80(0.27-2.36)	1.37(0.04-53.89)	0.85(0.25-2.84)	1.34(0.80-2.23)	1.44(0.46-4.50)	1.24(0.69-2.22)
Work in shift						
Yes	1.16(0.58-2.35)	0.87(0.26-2.94)	1.51(0.59-3.86)	1.17(0.85-1.61)	1.28(0.65-2.52)	1.12(0.78-1.63)
No		Reference			Reference	
Overtime duty on call work (6 pm-7 am)						
Yes	0.88(0.43-1.78)	1.34(0.31-5.86)	0.73(0.31-1.72)	1.40(1.02-1.93) *	1.26(0.57-2.78)	1.41(0.99-2.00)
No		Reference			Reference	
Anxiety level	1.88(1.34-2.62) ***	2.46(1.35-4.48) **	1.84(1.17-2.88) **	1.50(1.33-1.70) ***	1.48(1.14-1.92) ***	1.51(1.31-1.74) ***
Anti-violence training						
Yes	1.25(0.65-2.43)	3.29(0.87-12.47)	0.89(0.39-2.02)	0.80(0.59-1.06)	1.09(0.56-2.12	0.71(0.51-0.99) *
No		Reference			Reference	

Note: (*): p<0.05; (**): p<0.01; (***): p<0.001. All the variables in each logistic regression models were mutually adjusted.

3.3 Participants' response to WPV

Table 3 shows the different response to psychological/physical violence between Han and ethnic minority healthcare professionals. More Han healthcare professionals ordered perpetrators to stop (OR=0.64, 95%CI=0.45-0.91) and reported to superiors (OR=0.56, 95%CI=0.40-0.79) than ethnic minorities when psychological violence happened, and this difference was statistically significant. As for the physical violence, compared to ethnic minority, more Han healthcare professionals chose to respond in all ways except pretending nothing happened. However, none of the difference was statistically significant.

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Table 3. Response to psychological and physical violence

	Psychological violence					Physical Violence				
	Han (N=727)		Ethnic minority (N=162)		OR (95%CI)	Han (N=88)		Ethnic minority (N=22)		OR (95%CI)
	n	%	n	%		n	%	n	%	
Pretend nothing happened	216	29.71	49	30.25	1.03(0.71-1.49)	6	6.82	4	18.18	3.04(0.78-11.88)
Order to stop	324	44.57	55	33.95	0.64(0.45-0.91) ***	27	30.68	3	13.64	0.36(0.10-1.31)
Talk to families or friends	474	65.20	114	70.37	1.27(0.88-1.84)	21	23.86	4	18.18	0.71(0.22-2.33)
Psychological counseling	70	9.63	23	14.20	1.55(0.94-2.57)	9	10.23	2	9.09	0.88(0.18-4.39)
Talk to colleague	631	86.80	131	80.86	0.64(0.41-1.01)	33	37.50	6	27.27	0.63(0.22-1.76)
Change department	47	6.46	13	8.02	1.26(0.67-2.39)	4	4.55	0	0.00	-
Report to superiors	469	64.51	82	50.62	0.56(0.40-0.79) ***	31	35.23	6	27.27	0.69(0.24-1.94)
Charge perpetrators	28	3.85	4	2.47	0.63(0.22-1.83)	5	5.68	0	0.00	-

Note: (*): $p<0.05$; (**): $p<0.01$; (***): $p<0.001$. Han participants as the reference.

3.4 Anti-violence training measures and content

Table 4 has shown the anti-violence training measures and content expected by healthcare professionals. Lectures were the most expected measures of training both by Han (54.13%) and ethnic minority (52.62%). Pre-job training was expected from half of ethnic minority healthcare professionals, which was slightly higher than the proportion of Han healthcare professionals (OR=1.29, 95%CI=1.01-1.63). Wall newspaper and poster were the least popular measures both by Hans and ethnic minorities. As for the training content, more than 70% Han and ethnic minority participants expected identification of WPV signs and escaping training. Compared to Han, ethnic minority healthcare professionals were more interested in force skills (OR=1.40, 95%CI=1.10-1.78) and self-defense (OR=1.48, 95%CI=1.10-2.01).

Table 4. Expected measures and contents of anti-violence training (N=2036)

	Han		Ethnic minority		OR（95%CI）
	n	%	n	%	
Expected training measures					
Leaflets	680	39.74	125	38.46	0.95(0.74-1.21)
Video	759	44.36	145	44.62	1.01(0.80-1.28)
Lectures	926	54.12	171	52.62	0.94(0.74-1.19)
Wall newspaper, poster	435	25.42	77	23.69	0.91(0.69-1.20)
Employee handbooks	507	29.63	93	28.62	0.95(0.73-1.24)

Pre-job training	751	43.89	163	50.15	1.29(1.01-1.63) *
Expected training content					
WPV cognition	891	52.07	177	54.46	1.10(0.87-1.40)
Identification of WPV signs	1242	72.59	234	72.00	0.97(0.75-1.27)
Language skills	1162	67.91	232	71.38	1.18(0.91-1.53)
Force skills	815	47.63	182	56.00	1.40(1.10-1.78) **
Relevant laws and regulations	1113	65.05	223	68.62	1.18(0.91-1.52)
Escaping training	1235	72.18	245	75.38	1.18(0.90-1.55)
Self-defense	1227	71.71	257	79.08	1.48(1.10-2.01) *

Note: (*): $p<0.05$; (**): $p<0.01$; (***): $p<0.001$. Han participants as the reference.

3.5 Evaluation of the usefulness of WPV interventions

As for the evaluation of interventions, there were no significant differences between Han and ethnic minority healthcare professionals. Participants considered that security measures were the most useful ways to prevent WPV. The following were improving the environment and anti-violence training. More than 40% considered patient examination and changing the time of shift as useless measures. There were few differences when stratified by ethnicity. More Han healthcare workers looked down on the usefulness of protective equipment, while ethnic minority participants undervalued patient examination and anti-violence training. However, none of these differences between Han and ethnic minority were statistically significant. (Table 5)

280 **Table 5. Evaluation of the usefulness of WPV interventions (N=2036)**

	All participants		Han		Ethnic minority	
	n	%	n	%	n	%
Improve the environment（e.g., enhance lighting）						
Very useful	715	35.12	611	35.71	104	32.00
Somewhat useful	945	46.41	784	45.82	161	49.54
Useless	376	18.47	316	18.47	60	18.46
Restrict non-staff access						
Very useful	591	29.03	513	29.98	78	24.00
Somewhat useful	778	38.21	638	37.29	140	43.08
Useless	667	32.76	560	32.73	107	32.92
Patient examination (e.g., history of committing violence)						
Very useful	498	24.46	429	25.07	69	21.23
Somewhat useful	698	34.28	586	34.25	112	34.46
Useless	840	41.26	696	40.68	144	44.31
Increase manpower						
Very useful	667	32.76	571	33.37	96	29.54
Somewhat useful	796	39.10	663	38.75	133	40.92
Useless	573	28.14	477	27.88	96	29.54
Protective equipment						
Very useful	610	29.96	522	30.51	88	27.08
Somewhat useful	738	36.25	625	36.53	113	34.77

Useless	688	33.79	564	32.96	124	38.15
Change the time of shift						
Very useful	470	23.08	411	24.02	59	18.15
Somewhat useful	699	34.33	578	33.78	121	37.23
Useless	867	42.58	722	42.20	145	44.62
Avoid working alone						
Very useful	659	32.37	568	33.20	91	28.00
Somewhat useful	636	31.24	526	30.74	110	33.85
Useless	741	36.39	617	36.06	124	38.15
Anti-violence training						
Very useful	785	38.56	675	39.45	110	33.85
Somewhat useful	800	39.29	672	39.28	128	39.38
Useless	449	22.05	362	21.16	87	26.77
Security measures						
Very useful	899	44.16	762	44.54	137	42.15
Somewhat useful	932	45.78	779	45.53	153	47.08
Useless	205	10.07	170	9.94	35	10.77

4. Discussion

This study examined the prevalence, influence factors, and response of WPV in a hospital located in the multi- ethnicity area of China. The percentage of medical workers of minority ethnicity was substantially higher than previous studies

conducted in eastern and central China (2.41–7.95%)[15-17]. Due to the different investigation tools and time period, it is difficult to compare the WPV prevalence with some other researches. However, compared with our previous studies with the same questionnaire and time period, the prevalence of physical and psychological violence in our study are lower than what has been found in areas where Han people mainly lived [7 8 18 19]. The results of logistics regression indicated that ethnic minority healthcare professionals maybe more likely to suffer psychological violence. After stratified by gender, males who were ethnic minorities were more likely to suffer physical violence, while females from psychological violence. The different results in stratified and unstratified analysis may be due to the proportion of males and females. Namely, in unstratified analysis, the fact that males suffered more physical violence would be covered by the fact that females suffered more psychological violence. Some studies from other countries or regions showed that ethnic minority healthcare workers were less likely to experience WPV when comparing to the majority (Whites)[20 21], while some studies held the opposite conclusion that ethnic minority healthcare professionals were more vulnerable in suffering workplace bullying, verbal abuse, physical violence, etc. [22-26] However, due to the huge difference between the background investigation and participants' characteristics, these studies could not be compared with our study. We speculate several reasons for this result. First, our study showed that there were behavioral differences between Han and ethnic minority, culture and religious beliefs could be key factors in explaining this [27].

Second, our study showed that when facing WPV, compared with Han, ethnic minority healthcare professionals may be more likely to tolerate it, which may lead to more violence. Third, the language from difference linguistic culture may hamper the doctor-patient communication, thus lead to violence [28]. Fourth, ethnic minority healthcare professionals' ability or skill maybe undervalued by patients, thus leading to distrust or WPV, which needs further studies to investigate this phenomenon from the patients' perspective.

Respondents who engaged in overtime duty on call work from 6 pm to 7 am had greater odds of experiencing psychological violence. This is a new finding in our study, which has been ignored in most research of China. We speculate several reasons for this finding. First, our definition of overtime duty on call work might have captured individuals handling urgent issues. The staff working therein are more likely to experience higher levels of frustration, distress, cognitive impairment or arousal [29 30], which is similar with the WPV high-risk department — emergency department. Second, healthcare professionals would face more aggressive situations such as drunk patients or companions and traumatic patients caused by fighting. Third, since the on-call work is not during the general working time, there are less colleagues and guards. We suggest that more effective measures should be adopted to protect healthcare professionals who engage duty on-call beyond general working time. Future studies should investigate this phenomenon in mainly Han living area.

The result of logistics regression showed that males have higher odds of

experiencing physical violence, which is similar to the WPV studies conducted in the areas that Han mainly lived [7 19 31]. In other countries, some studies came to the same conclusion [32-35], while some studies have reported that women were more vulnerable to physical violence [36]. These different results could be attributed to the different study backgrounds [37]. In many countries, beliefs, ethics, or moral principles serve as guidance for public behavior. For instance, in some Arab countries, being a male is a risk factor of experiencing WPV partly because of cultural norms that reject disrespect of females [35]. Consistent with other researches [7 19] conducted in the areas that Han mainly lives in , our study showed that higher anxiety levels regarding WPV was associated with WPV experience. Further study should determine whether the anxiety is the predisposition of consequence of WPV occurrence.

Compared to Han, more ethnic minority healthcare professionals pretend nothing happened after suffering physical violence. In addition, they may less likely talk to others about these events, or report to their leaders, or use legal methods. The reason we think there was no statistical significance in this result was that the number of participants who experienced physical violence was small. Despite this, we speculate that this may be due to the cultural belief of ethnic minority that causes them to remain silent. Previous study has proved that talking with others in their surroundings about their WPV was helpful to release their tension or anxiety caused from WPV [38]. Since the anxiety towards WPV is associated with WPV experience, more social support for the individual, such as

friends, families, and colleagues, should be provided to help ethnic minority healthcare professionals manage violence through diverse methods instead of tolerating it by themselves. Previous study has shown that in the environment that encourages reporting WPV, more incidents of WPV were reported and healthcare workers gained better awareness of risk for violence, as well as how to avoid potential danger, and how to manage aggressive customers [39]. An adequate WPV reporting system should be established to encourage ethnic minority healthcare professionals to report their WPV experience.

It seems that both Han and ethnic minority healthcare professionals are less interested in the textual anti-violence training measures (leaflets, poster, wall newspaper, employee handbook). Although printed materials could summarize content and be learned repeatedly, the lack of practice details makes it less effective [40]. Videos hold the advantages such as attractiveness, convenience, clarity of demonstration, superior cost-effectiveness and easy to apply, while lectures contain variety of lively styles such as group interaction and scenario simulation, which makes them more popular [41 42]. Future studies should compare the effect of these measures. Pre-job training is more needed by ethnic minority healthcare workers, which could help them adapt to the work environment better and faster. As for the training content, ethnic minority healthcare professionals are more interested in tough measures. Since ethnic minorities are more likely to suffer psychological violence, they may perceive more threat thus give rise to the tendency of handling violence by force [43 44].

Our findings indicated that there was not much difference in evaluation of usefulness of WPV intervention between Han and ethnic minority. Security measure is regarded as the most useful intervention of WPV. China has enacted 'Guidance on strengthening the security and protection system construction in hospitals' in 2013, and 'Opinions on strictly punishing medical related crimes and maintaining the medical order' in 2017, to strengthen security of hospital. However, since these policies served as instructions rather than mandatory regulations, insufficient resource had constrained the implementation in all hospitals. Security measures are not only an intervention that could prevent healthcare professionals from WPV, but also may enhance the sense of safety as a kind of organizational support. Hospitals should implement specific scale of security measures according to the actual situation. Most participants consider anti-violence training useful. Although it could increase knowledge and boost confidence, the effect could not reduce of WPV incidents for long-term [45]. We suggest that it is essential to make a complete and periodic curriculum for repetitive training. Improving environment, such as enhancing lighting and installing cameras, should be considered as a useful measure. A previous study has shown that working in a daring environment at night is a risk factor of WPV [46]. Camera installation is required by Occupational Safety and Health Administration (OSHA)[47], which may be a deterrence for committing violence. Using protective equipment is not a popular intervention. In the period of frequent WPV in China, there are indeed some healthcare workers wearing a helmet at work [48]. However,

this may lead to a more tense doctor-patient relationship. Participants do not trust patient examination and restriction to non-staff access. Due to large hospital scales and treatment numbers, there would be numerous patients admitted to hospital. The process of patient examination and restriction of non-staff access would not be serious enough, otherwise the crowded queue and longer waiting time may breed new contradictions. In addition, since there is no system or platform sharing the patient's information between each hospital, it is difficult to verify WPV history strictly. Although previous studies have shown that work shift is negatively associated with WPV [19 33 35], changing the time of shift are treated as less useful. It may be better to enhance the protection during shift rather than changing the regulation.

Due to the research purpose and background, most previous WPV studies were conducted in several hospitals, which has several advantages. Firstly, more samples could be collected to make a more reliable conclusion. In addition, the results could reflect common problems in a certain context. However, at the same time, it would neglect some specific factors or characteristics. The investigation conducted in a typical and representative hospital is conducive to examine the relation between specific factors or information and WPV, which could also be an effective reference of practical work for hospitals with similar features. Our study has exploratively examined WPV in multi-ethnicity area using PSM, and which method was conducive to control confounders and minimized the bias caused by quantity gap. In addition, our study has given a complete report about WPV,

including prevalence, influencing factor, healthcare professionals' response to WPV, expected content and measure of anti-violence training, and healthcare professionals' evaluation of WPV interventions, which was helpful to interpret WPV from wider aspects.

5. Limitations

This study has a few limitations. First, since the respondents were asked to report WPV that had taken place in the past 12 months, violence might not be adequately reported due to recall bias or reporting bias resulting from shame and stigma. Second, the study exploratively examined the WPV in multi-ethnicity area but did not conduct in-depth research on the underlying cause by cultural factors. Third, our study is limited to consider the temporality between the influencing factor and WPV, which makes it difficult to conclude the causation. In addition, the clustering effect of WPV in several departments were not fully considered, which may affect the standard error of the results. Future research should investigate the perpetrators or patients, especially explore WPV by qualitative methods.

6. Conclusion

Our study investigated WPV in a hospital located in a multi-ethnicity area. Ethnic minority healthcare professionals may be more likely to suffer WPV and have different responses to WPV compared to Han. Additionally, we broke through the single focus of existing WPV research and explored WPV from a more comprehensive perspective including prevalence, influencing factors, response to WPV, expected anti-violence training measures and contents, and evaluation of

interventions, which may provide a practical reference to hospitals with similar characteristics. Moreover, WPV research should be conducted in multi-ethnicity areas from the perspective of the perpetrator or patients, especially by qualitative methods.

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Haonan Jia, Huiying Fang, Ruohui Chen contributed equally to this work. Mingli Jiao and Jingfu Mao are corresponding author.

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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	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
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	7-9
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
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	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	10-20
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	10-20
		(*b*) Report category boundaries when continuous variables were categorized	10-16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	21
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	26-27
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	21-26
Generalisability	21	Discuss the generalisability (external validity) of the study results	27
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	28

*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.

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Workplace violence against healthcare professionals in multi-ethnicity area: A cross-sectional study in southwest China

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Workplace violence against healthcare professionals in multi-ethnicity area: A cross-sectional study in southwest China

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Abstract

Objective: The purpose of this study is to examine workplace violence (WPV) towards healthcare professionals in multi-ethnicity area of China, including prevalence, influencing factors, healthcare professionals' response to WPV, expected anti-violence training measures and content, and evaluation of WPV interventions.

Design: A cross-sectional study.

Setting: A Grade III Class A hospital in the capital of Yunnan province, which is the province with most kinds of ethnic minorities groups in China.

Participants: In total, 2,036 healthcare professionals participated with a response rate was 83.79%.

Results: The prevalence of physical and psychological violence was 5.4% and 43.7%, respectively. Healthcare professionals who were ethnic minorities were more likely to experience psychological violence (OR=1.54, 95%CI=1.16-2.05). After stratified by gender, males who were ethnic minorities suffered more physical violence (OR=3.31, 95%CI=1.12-9.79), while females suffered

psychological violence (OR=1.71, 95%CI=1.24-2.36). We also found a unique work situation in China—overtime duty on call work (6 pm-7 am) was a risk factor of psychological violence (OR=1.40, 95%CI=1.02-1.93). Ethnic minority healthcare professionals less likely ordered perpetrators to stop or reported to superiors when facing psychological violence. Ethnic minority healthcare professionals are more interested in receiving training of force skills and self-defense. Both Han and ethnic minority participants considered security measures as the most useful intervention, while changing the time of shift as the most useless one.

Conclusion: Our study comprehensively described WPV towards healthcare professionals in multi-ethnicity minority area. More WPV research conducted in multi-ethnicity area are needed.

Keyword: Workplace violence; healthcare professionals; multi-ethnicity area

Strengths and limitations

- ✧ Although lots of studies investigated WPV in hospital, few of them were conducted in multi-ethnicity minority area.
- ✧ Previous studies paid attention to a single part of WPV whereas our study describes WPV comprehensively including prevalence, influencing factor, response to WPV.
- ✧ Due to recall bias or reporting bias resulting from shame and stigma, the number of violent events in the past 12 months may be underestimated.
- ✧ Our study did not explain WPV using cultural factors, which further studies

can investigate.

1. Introduction

In December 2019, a doctor was brutally killed by a patient's family member in Beijing. Less than a month later, another doctor in Beijing hospital was stabbed and severely injured. These two cases once again drew great attention to the safety of healthcare professionals in the Chinese society.

Workplace violence (WPV) was defined as "incidents where employees are abused, threatened, assaulted or subject to other offensive acts or behaviors in circumstances related to their work", which includes two types: (1) physical violence (e.g., beating, kicking, slapping, stabbing, shooting, pushing, biting, and pinching) and (2) psychological violence (e.g., threat of physical force against another person or group that can result in harm to physical, mental, spiritual, moral, or social development)[1]. WPV towards healthcare professionals is an extremely serious problem in China, which is happening for a long time. There were less than 290 severe WPV towards healthcare workers reported by media from 2000 to 2015[2]. The seriousness of WPV towards healthcare professionals in China leads to great attention from researchers. Most of researches that studied WPV prevalence of China were conducted in the area where the Han people (the main ethnic group in China) mainly live and rates of physical and psychological violence were 6.4%–35.4% and 54.4%–79.8%, respectively [3-8]. However, there were few WPV studies conducted in multi-ethnicity area of China. According to the latest national census in 2010, ethnic minorities account for 8.49% of the total

population in China. In multi-ethnicity area, the proportion and ethnic diversity of both ethnic minority patients and healthcare professionals is higher. In addition, there is preferential treatment policy in education for Chinese ethnic minorities (lower threshold to receive high level of education), which may make ethnic minority workers' capabilities undervalued [9] [10]. However, since healthcare professionals require high level of skill and education, it is still unknown whether the ethnic minority healthcare professionals' ability and skill would be undervalued that can lead to patients' distrust with even more WPV occurrence. It is essential to provide more information of WPV in the multi-ethnicity area thus conducting specific interventions. In addition, limited studies from other counties and regions focus on WPV towards healthcare professionals in multi-ethnicity areas.

Although many studies have investigated the influence factor of WPV towards healthcare professionals, an essential factor has been neglected. In China, more than 90% healthcare professionals work more than eight hours a day, which makes overtime work a common phenomenon [11]. Since the medical system requires healthcare professionals in charge to be responsible for their patients at any time, duty on call has become a form of overtime work. Healthcare workers need to be on 24 hours standby and be able to return to hospital if patients are in an acute or severe situation, even when they have already got off work or having a rest [12]. Previous studies found that workload was associated with WPV victimization [13] [14]. However, limited WPV studies focused on relationship between

WPV experience and the exact form of overtime.

Most previous WPV studies have only investigated a part of WPV, such as prevalence, influencing factors, or interventions. In this study, we aim to investigate WPV in a general hospital of multi-ethnicity area, including the prevalence, influencing factors, response to WPV and evaluation of WPV intervention, which could not only interpret WPV from a broader perspective, but also provide more reference for practice.

2. Methods

2.1 Study population

Yunnan, located in southwestern border of China, has the greatest diversity of ethnic minorities in China, containing 52 of 56 ethnic groups (51 ethnic minority groups and Han). In 2017, 33.6% residents in Yunnan were ethnic minority groups.

We conducted a retrospective survey in a Grade III Class A hospital in Kunming, the capital of Yunnan Province. The hospital was founded in 1939 and is the first Grade III Class A hospital in Yunnan Province. It is one of the most capable general hospitals in Yunnan, containing 2,400 open beds and over 2 million annual total visits. Around 18.6% of the hospital's employees were ethnic minorities at the time of the study. As a medical center in the province, it has a wide radiation range, and patients from all over the province come to the hospital seeking medical treatment.

2.2 Questionnaire

A questionnaire developed jointly by the International Labor Office (ILO),

International Council of Nurses (ICN), World Health Organization (WHO), and Public Services International (PSI) in 2003 was used to measure WPV [1]. First, we asked for permission to use the questionnaire from the ILO and WHO. Thereafter, we translated it into Mandarin Chinese and back translated it into English to verify the accuracy of the Mandarin version. After this translation processed, 17 experts in the field of healthcare were invited to assess the effectiveness of the measurement tools, including the applicability of culture and the appropriateness of language. We selected 79 medical staff to form a group and conducted a two-week test-retest reliability test (0.83).

The questionnaire included the following sections: (1) demographics (e.g., gender, age, education, ethnicity, occupation) and work status (e.g., shift work, overtime duty on call work, participation in anti-violence training, anxiety regarding WPV); (2) experience of physical violence in the past 12 months (i.e., intentional behavior that harms healthcare workers physically); (3) experience of psychological violence in the past 12 months (i.e., verbal abuse, threatening events, and sexual harassment); (4) healthcare professionals' response to physical violence and psychological violence; (5) the expected measures (e.g., leaflets, video, lecture) and content of anti-violence training (e.g., WPV cognition, self-defense; (6) the evaluation of usefulness of WPV interventions.

2.3 Sample and data collection

First, we obtained permission from the hospital management office and human resource department to collect employee's information in the hospital. Thereafter,

the person in charge of each unit issued a questionnaire to the staff and informed them of the instructions and precautions. The study subjects included doctors, nurses, medical technicians who participated voluntarily and remained anonymous.

The respondents were asked to provide their experience of WPV in the previous 12 months, therefore, we excluded employees who met any of the following criteria: (1) less than 1 year of work experience in this hospital; (2) short-term secondment or training (less than 12 months); (3) personnel who did not come to work during the study period due to traveling, training, vacation, and so on.

The questionnaire had to be completed by employees themselves and could not be answered by any other person. The time of data collection ranged from July to October 2017. A total of 2,036 valid questionnaires were collected, and the effective response rate was 83.79%.

2.4 Data analysis

Descriptive statistics were used to summarize the demographic characteristics, prevalence of physical and psychological violence and the response to WPV between Han and ethnic minority participants. Chi-square test and Fisher's exact were used to compare the difference of response to WPV between Han and ethnic minority healthcare workers.

Since ethnic minority participants were almost 1/5 of Han participants in our data collection, the result may be biased if we used the original data to conduct logistic regression. To control confounders and to balance the number of Han and

ethnic minority samples, propensity score matching (PSM) was used. The PSM model used the ethnicity as a dependent variable, and age, gender, marriage status, educational background, and years of work experience as explanatory variables. We matched the group of ethnic minority healthcare professionals (treatment group) to the group of Han healthcare professionals (control group) in a 1:2 manner to create two groups. These two groups had similar explanatory variables (age, gender, marriage status, educational background, years of work experience) and different dependent variable – ethnicity, which could control confounders and highlighted the comparison between Han and ethnic minority healthcare professionals. After matching, a set of 960 cases were created, with 325 ethnic minority and 635 Han healthcare professionals. The matched set was used to identify the factors associated with WPV in hospitals using logistic regression. Since the proportion of male and female was almost 1:3, we also conducted logistic regression stratified by gender.

The data were entered using Epidata 3.1 and analyzed using IBM SPSS Statistics 22.0. The significance level was set at 0.05.

2.5 Ethics approval

This study was reviewed and approved by the Research Ethics Committee of Harbin Medical University and the investigation hospital (Project Identification Code: HMUIRB20160014). All the respondents were provided with informed consent, which described the purpose and method of data collection and kept the data confidential.

2.6 Patient and public involvement

No patients were involved in the whole process of the research.

3. Results

3.1 Demographic characteristics

Table 1 shows the demographic details of the 509 men and 1,527 women who participated in the study. Around 84% of respondents were of "Han ethnicity", while 16% were ethnic minorities. A majority of respondents were nurses (42.7%) and physicians (31.5%), 12.5% were medical technology workers, the rest (11.6%) held other positions. Most of the respondents (70.2%) worked in rotational shifts, and 74.2% engaged in overtime work (from 6 pm to 7 am the next day), such as overtime or emergency consultation. Over half reported high or extremely high levels of anxiety regarding WPV (58.9%) and participated in anti-violence training (67.5%). As for the prevalence of WPV, 43.7% of the respondents reported that they had experienced psychological violence, while 5.4% reported physical violence.

Table 1. Demographic information and the prevalence of workplace violence (N=2036)

	n	%
Gender		
Male	509	25.0%
Female	1527	75.0%

Age		
⩽30	940	46.2%
31–45	789	38.8%
⩾46	207	15.1%
Marital status		
Single	603	29.6%
Married	1389	68.2%
Divorced/widowed	44	2.2%
Education background		
College graduates	448	22.0%
Bachelor	1207	59.3%
Master's and above	381	18.7%
Ethnicity		
Han	1711	84.0%
Minority	325	16.0%
Years of work experience		
1–5	570	28.0%
6–10	548	26.9%
11–20	413	20.3%
>20	505	24.8%
Profession		

Physician	624	30.6%
Nurse	869	42.7%
Medical technology	294	14.4%
Others	249	12.3%
Work in shift		
Yes	1429	70.2
No	607	29.8
Overtime duty on call work (6 pm-7 am)		
Yes	1510	74.2%
No	526	25.8%
Anxiety level		
Never	103	5.1%
Low	219	10.8%
Moderate	513	25.2%
High	360	17.7%
Extremely high	841	41.2%
Anti-violence training		
Yes	1374	67.5%
No	662	32.5%
Physical violence		
Yes	110	5.4%

No	1926	94.5%
Psychological violence		
Yes	889	43.7%
No	1147	56.3%

3.2 Influencing factors

Table 2 shows the results of the logistic regression analysis of physical and psychological violence using the matched set (unstratified and stratified by gender), including P-values, odds ratios (OR) and 95% confidence intervals (95%CI). The unstratified results showed that female respondents had lower odds of experiencing physical violence than males did (OR=0.29, 95%CI=0.15-0.55). Respondents with anxiety level towards WPV had higher odds of physical violence (OR=1.88, 95%CI=1.34-2.62). After stratified by gender, the results showed that the educational background of masters and above (OR=7.49, 95%CI=1.27-44.04), ethnic minority(OR=3.31, 95%CI=1.12-9.79), anxiety level towards WPV (OR=2.46, 95%CI=1.35-4.48) were associated with physical violence occurrence for males, while only anxiety level towards WPV (OR=1.84, 95%CI=1.17-2.88) was statistically significant in physical violence experience for females.

As for psychological violence, minority medical workers had higher odds of experiencing it than workers of Han ethnicity (OR=1.54, 95%CI=1.16-2.05). Engaging in overtime work from 6 pm to 7 am the following day was also a risk factor of psychological violence (OR=1.40, 95%CI=1.02-1.93). Anxiety level about WPV was also negatively associated with psychological violence (OR=1.50,

95%CI=1.33-1.70). When stratified by gender, females who were ethnic minorities (OR=1.71, 95%CI=1.24-2.36) were more likely to suffer psychological violence, while anti-violence training (OR=0.71, 95%CI=0.51-0.99) was positively associated with psychological violence; both males (OR=1.48, 95%CI=1.14-1.92) and females (OR=1.51, 95%CI=1.31-1.74) with higher anxiety levels towards WPV were associated with WPV victimization.

241 **Table 2. Results of logistic regression of physical and psychological violence (N=960)**

	Physical violence			Psychological violence		
	Unstratified	Stratified		Unstratified	Stratified	
		Male	Female		Male	Female
Gender						
Male	Reference	-	-	Reference	-	-
Female	0.29(0.15-0.55) ***	-	-	0.99(0.71-1.40)	-	-
Ethnicity						
Han	Reference			Reference		
Minority	1.57(0.86-2.87)	3.31(1.12-9.79) *	1.18(0.53-2.63)	1.54(1.16-2.05) **	1.07(0.56-2.03)	1.71(1.24-2.36) **
Age (years)						
⩽30	Reference			Reference		
31–45	1.26(0.27-6.01)	3.25(0.07-160.96)	0.76(0.09-6.36)	1.11(0.55-2.23)	0.77(0.19-3.14)	1.46(0.64-3.33)

⩾46	1.44(0.43-4.80)	0.52 (0.01-19.40)	2.41(0.45-12.84)	0.80(0.46-1.42)	0.49(0.16-1.51)	1.10(0.55-2.18)
Marital status						
Single		Reference			Reference	
Married	0.47(0.08-2.77)	0.10(0.01-1.86)	0.97(0.09-10.92)	0.85(0.30-2.44)	0.57(0.05-6.35)	0.85(0.26-2.78)
Divorced/widowed	0.46(0.09-2.41)	0.32(0.02-4.84)	0.57(0.06-5.42)	0.95(0.34-2.62)	0.78(0.08-7.99)	0.88(0.28-2.75)
Educational background						
College graduates		Reference			Reference	
Bachelors	0.98(0.35-2.75)	0.92(0.10-8.70)	0.69(0.21-2.28)	0.92(0.58-1.47)	1.18(0.50-2.83)	0.88(0.50-1.55)
Masters and above	1.36(0.55-3.38)	7.49(1.27-44.04) *	0.45(0.15-1.38)	1.20(0.79-1.83)	1.16(0.55-2.45)	1.23(0.74-2.07)
Years of work experience						
1–5		Reference			Reference	
6–10	0.82(0.20-3.31)	1.00(0.02-51.35)	0.99(0.18-5.59)	0.54(0.28-1.02)	0.60(0.16-2.24)	0.51(0.24-1.08)
11–20	0.50(0.14-1.81)	0.77(0.02-35.11)	0.51(0.10-2.53)	0.72(0.42-1.28)	0.62(0.19-2.03)	0.72(0.36-1.42)

>20	0.80(0.27-2.36)	1.37(0.04-53.89)	0.85(0.25-2.84)	1.34(0.80-2.23)	1.44(0.46-4.50)	1.24(0.69-2.22)
Work in shift						
Yes	1.16(0.58-2.35)	0.87(0.26-2.94)	1.51(0.59-3.86)	1.17(0.85-1.61)	1.28(0.65-2.52)	1.12(0.78-1.63)
No		Reference			Reference	
Overtime duty on call work (6 pm-7 am)						
Yes	0.88(0.43-1.78)	1.34(0.31-5.86)	0.73(0.31-1.72)	1.40(1.02-1.93) *	1.26(0.57-2.78)	1.41(0.99-2.00)
No		Reference			Reference	
Anxiety level	1.88(1.34-2.62) ***	2.46(1.35-4.48) **	1.84(1.17-2.88) **	1.50(1.33-1.70) ***	1.48(1.14-1.92) ***	1.51(1.31-1.74) ***
Anti-violence training						
Yes	1.25(0.65-2.43)	3.29(0.87-12.47)	0.89(0.39-2.02)	0.80(0.59-1.06)	1.09(0.56-2.12	0.71(0.51-0.99) *
No		Reference			Reference	

Note: (*): p<0.05; (**): p<0.01; (***): p<0.001. All the variables in each logistic regression models were mutually adjusted.

3.3 Participants' response to WPV

Table 3 shows the different response to psychological/physical violence between Han and ethnic minority healthcare professionals. More Han healthcare professionals ordered perpetrators to stop (OR=0.64, 95%CI=0.45-0.91) and reported to superiors (OR=0.56, 95%CI=0.40-0.79) than ethnic minorities when psychological violence happened, and this difference was statistically significant. As for the physical violence, compared to ethnic minority, more Han healthcare professionals chose to respond in all ways except pretending nothing happened. However, none of the difference was statistically significant.

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Table 3. Response to psychological and physical violence

	Psychological violence					Physical Violence				
	Han (N=727)		Ethnic minority (N=162)		OR (95%CI)	Han (N=88)		Ethnic minority (N=22)		OR (95%CI)
	n	%	n	%		n	%	n	%	
Pretend nothing happened	216	29.71	49	30.25	1.03(0.71-1.49)	6	6.82	4	18.18	3.04(0.78-11.88)
Order to stop	324	44.57	55	33.95	0.64(0.45-0.91) ***	27	30.68	3	13.64	0.36(0.10-1.31)
Talk to families or friends	474	65.20	114	70.37	1.27(0.88-1.84)	21	23.86	4	18.18	0.71(0.22-2.33)
Psychological counseling	70	9.63	23	14.20	1.55(0.94-2.57)	9	10.23	2	9.09	0.88(0.18-4.39)
Talk to colleague	631	86.80	131	80.86	0.64(0.41-1.01)	33	37.50	6	27.27	0.63(0.22-1.76)
Change department	47	6.46	13	8.02	1.26(0.67-2.39)	4	4.55	0	0.00	-
Report to superiors	469	64.51	82	50.62	0.56(0.40-0.79) ***	31	35.23	6	27.27	0.69(0.24-1.94)
Charge perpetrators	28	3.85	4	2.47	0.63(0.22-1.83)	5	5.68	0	0.00	-

Note: (*): $p<0.05$; (**): $p<0.01$; (***): $p<0.001$. Han participants as the reference.

3.4 Anti-violence training measures and content

Table 4 has shown the anti-violence training measures and content expected by healthcare professionals. Lectures were the most expected measures of training both by Han (54.13%) and ethnic minority (52.62%). Pre-job training was expected from half of ethnic minority healthcare professionals, which was slightly higher than the proportion of Han healthcare professionals (OR=1.29, 95%CI=1.01-1.63). Wall newspaper and poster were the least popular measures both by Hans and ethnic minorities. As for the training content, more than 70% Han and ethnic minority participants expected identification of WPV signs and escaping training. Compared to Han, ethnic minority healthcare professionals were more interested in force skills (OR=1.40, 95%CI=1.10-1.78) and self-defense (OR=1.48, 95%CI=1.10-2.01).

Table 4. Expected measures and contents of anti-violence training (N=2036)

	Han		Ethnic minority		OR（95%CI）
	n	%	n	%	
Expected training measures					
Leaflets	680	39.74	125	38.46	0.95(0.74-1.21)
Video	759	44.36	145	44.62	1.01(0.80-1.28)
Lectures	926	54.12	171	52.62	0.94(0.74-1.19)
Wall newspaper, poster	435	25.42	77	23.69	0.91(0.69-1.20)
Employee handbooks	507	29.63	93	28.62	0.95(0.73-1.24)

Pre-job training	751	43.89	163	50.15	1.29(1.01-1.63) *
Expected training content					
WPV cognition	891	52.07	177	54.46	1.10(0.87-1.40)
Identification of WPV signs	1242	72.59	234	72.00	0.97(0.75-1.27)
Language skills	1162	67.91	232	71.38	1.18(0.91-1.53)
Force skills	815	47.63	182	56.00	1.40(1.10-1.78) **
Relevant laws and regulations	1113	65.05	223	68.62	1.18(0.91-1.52)
Escaping training	1235	72.18	245	75.38	1.18(0.90-1.55)
Self-defense	1227	71.71	257	79.08	1.48(1.10-2.01) *

Note: (*): $p<0.05$; (**): $p<0.01$; (***): $p<0.001$. Han participants as the reference.

3.5 Evaluation of the usefulness of WPV interventions

As for the evaluation of interventions, there were no significant differences between Han and ethnic minority healthcare professionals. Participants considered that security measures were the most useful ways to prevent WPV. The following were improving the environment and anti-violence training. More than 40% considered patient examination and changing the time of shift as useless measures. There were few differences when stratified by ethnicity. More Han healthcare workers looked down on the usefulness of protective equipment, while ethnic minority participants undervalued patient examination and anti-violence training. However, none of these differences between Han and ethnic minority were statistically significant. (Table 5)

280 **Table 5. Evaluation of the usefulness of WPV interventions (N=2036)**

	All participants		Han		Ethnic minority	
	n	%	n	%	n	%
Improve the environment（e.g., enhance lighting）						
Very useful	715	35.12	611	35.71	104	32.00
Somewhat useful	945	46.41	784	45.82	161	49.54
Useless	376	18.47	316	18.47	60	18.46
Restrict non-staff access						
Very useful	591	29.03	513	29.98	78	24.00
Somewhat useful	778	38.21	638	37.29	140	43.08
Useless	667	32.76	560	32.73	107	32.92
Patient examination (e.g., history of committing violence)						
Very useful	498	24.46	429	25.07	69	21.23
Somewhat useful	698	34.28	586	34.25	112	34.46
Useless	840	41.26	696	40.68	144	44.31
Increase manpower						
Very useful	667	32.76	571	33.37	96	29.54
Somewhat useful	796	39.10	663	38.75	133	40.92
Useless	573	28.14	477	27.88	96	29.54
Protective equipment						
Very useful	610	29.96	522	30.51	88	27.08
Somewhat useful	738	36.25	625	36.53	113	34.77

Useless	688	33.79	564	32.96	124	38.15
Change the time of shift						
Very useful	470	23.08	411	24.02	59	18.15
Somewhat useful	699	34.33	578	33.78	121	37.23
Useless	867	42.58	722	42.20	145	44.62
Avoid working alone						
Very useful	659	32.37	568	33.20	91	28.00
Somewhat useful	636	31.24	526	30.74	110	33.85
Useless	741	36.39	617	36.06	124	38.15
Anti-violence training						
Very useful	785	38.56	675	39.45	110	33.85
Somewhat useful	800	39.29	672	39.28	128	39.38
Useless	449	22.05	362	21.16	87	26.77
Security measures						
Very useful	899	44.16	762	44.54	137	42.15
Somewhat useful	932	45.78	779	45.53	153	47.08
Useless	205	10.07	170	9.94	35	10.77

4. Discussion

This study examined the prevalence, influence factors, and response of WPV in a hospital located in the multi- ethnicity area of China. The percentage of medical workers of minority ethnicity was substantially higher than previous studies

conducted in eastern and central China (2.41–7.95%)[15-17]. Due to the different investigation tools and time period, it is difficult to compare the WPV prevalence with some other researches. However, compared with our previous studies with the same questionnaire and time period, the prevalence of physical and psychological violence in our study are lower than what has been found in areas where Han people mainly lived [7 8 18 19]. The results of logistic regression indicated that ethnic minority healthcare professionals maybe more likely to suffer psychological violence. After stratified by gender, males who were ethnic minorities were more likely to suffer physical violence, while females from psychological violence. The different results in stratified and unstratified analysis may be due to the proportion of males and females. Namely, in unstratified analysis, the fact that males suffered more physical violence would be covered by the fact that females suffered more psychological violence. Some studies from other countries or regions showed that ethnic minority healthcare workers were less likely to experience WPV when comparing to the majority (Whites)[20 21], while some studies held the opposite conclusion that ethnic minority healthcare professionals were more vulnerable in suffering workplace bullying, verbal abuse, physical violence, etc. [22-26] However, due to the huge difference between the background investigation and participants' characteristics, these studies could not be compared with our study. We speculate several reasons for this result. First, our study showed that there were behavioral differences between Han and ethnic minority, culture and religious beliefs could be key factors in explaining this [27].

Second, our study showed that when facing WPV, compared with Han, ethnic minority healthcare professionals may be more likely to tolerate it, which may lead to more violence. Third, the language from difference linguistic culture may hamper the doctor-patient communication, thus lead to violence [28]. Fourth, ethnic minority healthcare professionals' ability or skill maybe undervalued by patients, thus leading to distrust or WPV, which needs further studies to investigate this phenomenon from the patients' perspective.

Respondents who engaged in overtime duty on call work from 6 pm to 7 am had greater odds of experiencing psychological violence. This is a new finding in our study, which has been ignored in most research of China. We speculate several reasons for this finding. First, our definition of overtime duty on call work might have captured individuals handling urgent issues. The staff working therein are more likely to experience higher levels of frustration, distress, cognitive impairment or arousal [29 30], which is similar with the WPV high-risk department — emergency department. Second, healthcare professionals would face more aggressive situations such as drunk patients or companions and traumatic patients caused by fighting. Third, since the on-call work is not during the general working time, there are less colleagues and guards. We suggest that more effective measures should be adopted to protect healthcare professionals who engage duty on-call beyond general working time. Future studies should investigate this phenomenon in mainly Han living area.

The result of logistic regression showed that males have higher odds of

experiencing physical violence, which is similar to the WPV studies conducted in the areas that Han mainly lived [7 19 31]. In other countries, some studies came to the same conclusion [32-35], while some studies have reported that women were more vulnerable to physical violence [36]. These different results could be attributed to the different study backgrounds [37]. In many countries, beliefs, ethics, or moral principles serve as guidance for public behavior. For instance, in some Arab countries, being a male is a risk factor of experiencing WPV partly because of cultural norms that reject disrespect of females [35]. Consistent with other researches [7 19] conducted in the areas that Han mainly lives in , our study showed that higher anxiety levels regarding WPV was associated with WPV experience. Further study should determine whether the anxiety is the predisposition of consequence of WPV occurrence.

Compared to Han, more ethnic minority healthcare professionals pretend nothing happened after suffering physical violence. In addition, they may less likely talk to others about these events, or report to their leaders, or use legal methods. The reason we think there was no statistical significance in this result was that the number of participants who experienced physical violence was small. Despite this, we speculate that this may be due to the cultural belief of ethnic minority that causes them to remain silent. Previous study has proved that talking with others in their surroundings about their WPV was helpful to release their tension or anxiety caused from WPV [38]. Since the anxiety towards WPV is associated with WPV experience, more social support for the individual, such as

friends, families, and colleagues, should be provided to help ethnic minority healthcare professionals manage violence through diverse methods instead of tolerating it by themselves. Previous study has shown that in the environment that encourages reporting WPV, more incidents of WPV were reported and healthcare workers gained better awareness of risk for violence, as well as how to avoid potential danger, and how to manage aggressive customers [39]. An adequate WPV reporting system should be established to encourage ethnic minority healthcare professionals to report their WPV experience.

It seems that both Han and ethnic minority healthcare professionals are less interested in the textual anti-violence training measures (leaflets, poster, wall newspaper, employee handbook). Although printed materials could summarize content and be learned repeatedly, the lack of practice details makes it less effective [40]. Videos hold the advantages such as attractiveness, convenience, clarity of demonstration, superior cost-effectiveness and easy to apply, while lectures contain variety of lively styles such as group interaction and scenario simulation, which makes them more popular [41 42]. Future studies should compare the effect of these measures. Pre-job training is more needed by ethnic minority healthcare workers, which could help them adapt to the work environment better and faster. As for the training content, ethnic minority healthcare professionals are more interested in tough measures. Since ethnic minorities are more likely to suffer psychological violence, they may perceive more threat thus give rise to the tendency of handling violence by force [43 44].

Our findings indicated that there was not much difference in evaluation of usefulness of WPV intervention between Han and ethnic minority. Security measure is regarded as the most useful intervention of WPV. China has enacted 'Guidance on strengthening the security and protection system construction in hospitals' in 2013, and 'Opinions on strictly punishing medical related crimes and maintaining the medical order' in 2017, to strengthen security of hospital. However, since these policies served as instructions rather than mandatory regulations, insufficient resource had constrained the implementation in all hospitals. Security measures are not only an intervention that could prevent healthcare professionals from WPV, but also may enhance the sense of safety as a kind of organizational support. Hospitals should implement specific scale of security measures according to the actual situation. Most participants consider anti-violence training useful. Although it could increase knowledge and boost confidence, the effect could not reduce of WPV incidents for long-term [45]. We suggest that it is essential to make a complete and periodic curriculum for repetitive training. Improving environment, such as enhancing lighting and installing cameras, should be considered as a useful measure. A previous study has shown that working in a daring environment at night is a risk factor of WPV [46]. Camera installation is required by Occupational Safety and Health Administration (OSHA)[47], which may be a deterrence for committing violence. Using protective equipment is not a popular intervention. In the period of frequent WPV in China, there are indeed some healthcare workers wearing a helmet at work [48]. However,

this may lead to a more tense doctor-patient relationship. Participants do not trust patient examination and restriction to non-staff access. Due to large hospital scales and treatment numbers, there would be numerous patients admitted to hospital. The process of patient examination and restriction of non-staff access would not be serious enough, otherwise the crowded queue and longer waiting time may breed new contradictions. In addition, since there is no system or platform sharing the patient's information between each hospital, it is difficult to verify WPV history strictly. Although previous studies have shown that work shift is negatively associated with WPV [19 33 35], changing the time of shift are treated as less useful. It may be better to enhance the protection during shift rather than changing the regulation.

Due to the research purpose and background, most previous WPV studies were conducted in several hospitals, which has several advantages. Firstly, more samples could be collected to make a more reliable conclusion. In addition, the results could reflect common problems in a certain context. However, at the same time, it would neglect some specific factors or characteristics. The investigation conducted in a typical and representative hospital is conducive to examine the relation between specific factors or information and WPV, which could also be an effective reference of practical work for hospitals with similar features. Our study has exploratively examined WPV in multi-ethnicity area using PSM, and which method was conducive to control confounders and minimized the bias caused by quantity gap. As a cross-sectional study, the causal conclusion on ethnicity and

gender could be strengthened by this temporality. In addition, our study has given a complete report about WPV, including prevalence, influencing factor, healthcare professionals' response to WPV, expected content and measure of anti-violence training, and healthcare professionals' evaluation of WPV interventions, which was helpful to interpret WPV from wider aspects.

5. Limitations

This study has a few limitations. First, since the respondents were asked to report WPV that had taken place in the past 12 months, violence might not be adequately reported due to recall bias or reporting bias resulting from shame and stigma. Second, the study exploratively examined the WPV in multi-ethnicity area but did not conduct in-depth research on the underlying cause by cultural factors. Third, our study is limited to consider the temporality between the influencing factor and WPV, which makes it difficult to conclude the causation. In addition, the clustering effect of WPV in several departments were not fully considered, which may affect the standard error of the results. Future research should investigate the perpetrators or patients, especially explore WPV by qualitative methods.

6. Conclusion

Our study investigated WPV in a hospital located in a multi-ethnicity area. Ethnic minority healthcare professionals may be more likely to suffer WPV and have different responses to WPV compared to Han. Additionally, we broke through the single focus of existing WPV research and explored WPV from a more comprehensive perspective including prevalence, influencing factors, response to

WPV, expected anti-violence training measures and contents, and evaluation of interventions, which may provide a practical reference to hospitals with similar characteristics. Moreover, WPV research should be conducted in multi-ethnicity areas from the perspective of the perpetrator or patients, especially by qualitative methods.

Contributors： Mingli Jiao, Jingfu Mao and Qunhong Wu contributed to the conception and design of the study. Haonan Jia, Huiying Fang, Yameng Wang, Kexin Jiang, Yuanheng Li, Ying Wang, Lifeng Wei, and Gangyu Zhang contributed to the data collection. Omar Yacouba Ismael, Haonan Jia and Xiaowen Jia contributed to literature search and data quality control. Huiying Fang and Haonan Jia, Ruohui Chen did the statistical analysis and drafted the original manuscript. Mingli Jiao revised the manuscript for important intellectual content. Ruohui Chen, Kexin Jiang and Jingqun Li prepared the manuscript and supplementary material. All authors contributed to data interpretation and rewriting the paper.

Haonan Jia, Huiying Fang, Ruohui Chen contributed equally to this work. Mingli Jiao and Jingfu Mao are corresponding author.

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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	2
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6-8
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	8
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-8
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	7-9
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	8
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	8-9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	8-9
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	-
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	-
		(*e*) Describe any sensitivity analyses	-
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	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	-
Outcome data	15*	Report numbers of outcome events or summary measures	10-20
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	10-20
		(*b*) Report category boundaries when continuous variables were categorized	10-16
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-
Discussion			
Key results	18	Summarise key results with reference to study objectives	21
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	26-27
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	21-26
Generalisability	21	Discuss the generalisability (external validity) of the study results	27
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	28

*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.