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# Association between high burnout and workplace violence among healthcare workers in China: a cross-sectional study

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2	in China: a cross-sectional study
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68	ABSTRCT
69	<b>Objectives:</b> This study is conducted to examine whether overall workplace violence (WPV)
70	and its five types are associated with high burnout among healthcare workers in China.
71	Design: cross-sectional staff survey.
72	Participants: Front-line healthcare workers (N=3,706) from 149 cities across 23 provinces in
73	China responded to the survey, and 22 questionnaires were excluded because of incomplete
74	data.
75	Primary and secondary outcome measures: (1) The Chinese Maslach Burnout Inventory
76	General Survey was used to measure high burnout. (2) WPV was assessed using the Chinese
77	version of Workplace Violence Scale. (3) An anonymous self-designed web-based
78	questionnaire consisting of demographic, behavioral and occupational information was used
79	to identified covariates.
80	<b>Results:</b> A total of 3,684 front-line healthcare workers (934 physicians and 2,750 nurses)
81	were included. Of all participants, 13.3% (491/3,193) experienced high burnout. Adjusted
82	logistic regression revealed that experience of WPV in the past year associated a high
83	likelihood of high burnout (OR, $95\%$ CI = 2.10, 1.69-2.62). Healthcare workers who had
84	suffered emotional abuse, threat or verbal sexual harassment were more vulnerable to high
85	burnout.
86	Conclusion: This study finds that healthcare workers with WPV, especially emotional abuse,
87	threat, and verbal sexual harassment, are more likely to experience burnout. These types of
88	WPV should be considered in interventions to reduce and prevent burnout for healthcare

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7	90	Ke	ywords: Burnout, Workplace violence, Healthcare workers, China					
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15	93	Str	engths and limitations of this study					
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17	94	0	A wide range of healthcare workers in China responded to our survey.					
18 19								
20	95	0	To the best of our knowledge, this study is the first to examine the association between					
21								
22 22	96		five specific types of WPV and burnout after adjusting for demographic, behavioral and					
23 24								
25	97		occupational factors.					
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27 28	98	0	In this study, emotional abuse, threat, and verbal sexual harassment have been identified					
29								
30	99		as high risks of high burnout, these may be a specific target of intervention to prevent					
31 22								
33	100		and reduce burnout among healthcare workers.					
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35	101	0	This study did not adjust for psychological factors to further explore the relationship					
30 37								
38	102		between high burnout and WPV.					
39								
40 41	103	0	Data was collected using a retrospective approach, which might have led to recall and					
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43	104		report bias.					
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# 

111 INTRODUCTION
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112	Burnout is defined as a psychological syndrome caused by chronic workplace stress that
113	is not effectively controlled, including emotional exhaustion (feelings of energy depletion or
114	exhaustion), depersonalization (increased mental distance from your job, or feelings of
115	negativism or cynicism related to your job), and reduced personal accomplishment (reduced
116	professional efficacy).[1] Healthcare workers, especially physicians and nurses in clinical
117	practice, are more likely to experience high level of burnout than other working adults.[2–4]
118	According to a recent systematic review, the prevalence of burnout among physicians in
119	China ranged from 66.5% to 87.8%.[5] Numerous factors lead to burnout among healthcare
120	workers, including excessive workloads, work in shifts, a high pace, negative workplace
121	experiences, moral conflicts, sleep disorder, and perceived job security.[3,6,7] Furthermore,
122	some uniquely Chinese notions of work such as comprising collectivism, endurance and hard
123	work may lead to burnout.[8,9] Several studies have shown that burnout affects the physical
124	and psychological health, resulting in musculoskeletal pain, insomnia, alcohol abuse,
125	depression, and even suicidal ideation.[10-13] In addition, burnout can also cause negative
126	professional consequences including medical errors and low quality of care,[12,14] which
127	ultimately leads to adverse impacts on patients' health. Thus, it is crucial to identify risk
128	factors and develop effective strategies to reduce the level of burnout among healthcare
129	workers.
130	As defined by the National Institute for Occupational Safety and Health (NIOSH),
131	workplace violence (WPV) is any violent act directed towards persons at work or on

132 duty.[15] Previous studies have shown the established association between burnout and

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133	overall WPV.[16-18] Multiple systematic reviews concluded that exposure to violence was
134	an independent risk factor for burnout among healthcare workers.[19-21] There are five
135	types of WPV, including physical assault (physical contact, such as pushing, biting, beating,
136	spitting), emotional abuse (mistreatment through words, such as swearing, disrespect and
137	disparagement), threats (use of verbal, written or physical force that results in fear of negative
138	consequences), verbal sexual harassment (unwanted sexual remarks or comments), and
139	sexual abuse (unwelcome touching or other sexual acts). In a number of studies, various
140	types of violence have been reported to associate with burnout among healthcare workers.
141	However, these reports have been focused on a single type of WPV such as verbal
142	violence,[22] physical violence,[18] harassment.[23] Additionally, most of these studies may
143	be less robust because they did not adjust for some significant covariates, such as behavioral
144	factors or occupational factors. To our best knowledge, no studies have examined the
145	association between five specific types of WPV and burnout after adjusting for significant
146	factors in the same healthcare sample. More evidence is needed to deepen our comprehension
147	of the relationship between WPV and burnout.
148	To address this gap, our study adjusts for demographic, behavioral and occupational
149	covariates in logistic regression. The purpose of this research was to examine the association
150	of overall WPV and its five types (physical assault, emotional abuse, threat, verbal sexual
151	harassment, and sexual abuse) with high burnout among the healthcare workers in China.
152	METHODS

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153 Study sample

154 Data were collected from January 10<sup>th</sup> to February 5<sup>th</sup>, 2019. The study was conducted

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using an anonymous web-based questionnaire (www.wjx.cn). Forty nurses and physicians in our university hospital were the initial fillers and deliverers of the questionnaire, and their colleagues or classmates were then invited to participate in the online survey and the link to the questionnaire was spread among the respondents' WeChat (a Chinese social media APP) groups. A detailed description of the data collection procedure has previously been published.[24] Ultimately, 3,706 front-line healthcare workers from 149 cities across 23 provinces in China recruited for the study, and 3,684 participants completed the questionnaire as required through a quality check. This study was reviewed and approved by the participating institution. Patient and public involvement In this study, patients were not involved, but healthcare workers were interviewed. The results of the survey will be delivered to respondents through the WeChat group. Measurements Burnout Burnout was assessed using the 15-item Chinese Maslach Burnout Inventory-General Survey (CMBI-GS), developed by Liu et al<sup>[25]</sup> and shown good reliability and validity in the previous study.[26] CMBI-GS consists of three dimensions of job burnout: emotional exhaustion (5 items), depersonalization (4 items), and reduced personal accomplishment (6 items). Each item consists of a 7-point Likert scale ranging from 0 ("never") to 6 ("daily") based on the frequency of occurrence of the specific job-related feelings of the respondent. The scores of the three dimensions are equal to the average items score for each dimension (total dimension score divided by the number of items). The total score is the sum of the three 

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177	dimensions scores and ranges from 0 to 18, with higher scores indicating more severe			
178	burnout. According to the sum score of burnout, the participant can be classified into three			
179	levels, including low level (0-8.5), serious level (8.5-14.2) and extremely serious level (14.2-			
180	18). In this study, participants with extremely serious level burnout were defined as a "high			
181	burnout" case. The result of reliability analysis showed the CMBI-GS was in a high level of			
182	internal consistency in the current sample (Cronbach's $\alpha = 0.864$ ).			
183	WPV			
184	The Chinese version of the Workplace Violence Scale (WVS) was used to measure the			
185	frequency of WPV among healthcare workers experienced in the past year. The scale is			
186	composed of 5 dimensions, including physical assault, emotional abuse, threats, verbal sexual			
187	harassment, and sexual assault. Each item has 4 grades according to the times of violence has			
188	happened in the past year. The total score is the sum of each item, ranging from 0-15. The			
189	higher the sum score is, the more frequently he or she suffered from WPV. The WVS has			
190	shown good reliability and validity (the Cronbach's coefficient was 0.92) in healthcare			
191	workers in China.[27] In this study, respondents whether suffering five types of WPV were			
192	coded as a binary response ( $0 = no; 1 = yes$ ).			
193	Covariates			
194	Demographic characteristics included age (coded 1 to 3 for "less than 30 years, 30 to 39			
195	years, equal or more than 40 years"); gender ( $0 =$ female; $1 =$ male), education (code 1 to 3			

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197 marital status (coded 0 for unmarried and coded 1 for married).

Behavioral variables included exercise (0 = no; 1 = yes), smoking (0 = no; 1 = yes),

for "associated degree or below, baccalaureate degree, master's degree or above"), and

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> drinking (0 = no; 1 = yes), and daily sleeping time (coded 1 to 3 for "equal or less than 5 hours, 5 to 7 hours, equal or more than 7 hours").

Occupational variables included following: (1) profession (coded 0 for nurse and coded 1 for physician); (2) shift work was measured by the question "Do you need to work in shifts now?" (0 = no; 1 = yes); (3) level of hospital (coded 1 for primary hospital or community hospital, coded 2 for secondary hospital and coded 3 for tertiary hospital); (4) professional title (coded 1 for primary professional title, coded 2 for intermediate professional title and coded 3 for senior professional title), (5) weekly working time was measured with the question "In the past 12 months, how many hours per week did you work on average" (coded 1 to 3 for "less than 40 hours, 40 to 50 hours and more than 50 hours"). 

# 209 Statistical analyses

Descriptive statistics were presented as number and percentage for demographic, behavioral and occupational variables, and the rates of overall WPV and its specific types. Chi-square tests were used to compare the characteristics of the sample according to burnout categories (non-high burnout and high burnout). Binary logistic regression analysis was used to examining the association between high burnout and WPV. We presented the crude effects with only associated factors of interest included in Model 1. Then we adjusted for demographics (age, gender, education, marital status) (Model 2), and further adjusted for behavioral variables (exercise, smoking, drinking, daily sleeping time) (Model 3). Model 4 finally further adjusted for occupational variables (profession, shift work, level of hospital, professional title, weekly working time). The association between five types of WPV and high burnout was evaluated using the adjusted logistic regression. We used SPSS version 24 

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to perform all statistical analyses (IBM SPSS Statistics for MacOS, Armonk, NY, USA).

222	RESULTS
223	After excluding 22 incomplete data, a total of 3,684 front-line healthcare workers (25.4%
224	physicians and 74.6% nurses) from all provinces in mainland China were included. 84.9%
225	were female and 65.8% were married. Nearly 50% of participants were younger than 30
226	years old, with a mean age of $31.6 \pm 7.7$ years (not shown in tables). Of the respondents, a
227	majority (78.7%) had attained a bachelor's degree or above, 69.1% would not do exercise and
228	73.3% needed to work in shifts. The demographic, behavioral and occupational

characteristics of participants are shown in Table 1.

Characteristics, n (%)	Total	Non-high	High burnout	P values
	(N=3,684)	burnout	(n=491)	
		(n=3,193)		
Age				.037
< 30 years	1,780 (48.3)	1,525 (85.7)	255 (14.3)	
30-39 years	1,306 (35.5)	1,131 (86.6)	175 (13.4)	
$\geq$ 40 years	598 (16.2)	537 (89.8)	61 (10.2)	
Gender				.578
Female	3,128 (84.9)	2,707 (86.5)	421 (13.5)	
Male	556 (15.1)	486 (87.4)	70 (12.6)	
Education				.017
Associate degree or below	786 (21.3)	667 (84.9)	119 (15.1)	
Bachelor's degree	2,461 (66.8)	2,130 (86.6)	331 (13.4)	
Master's degree or above	437 (11.9)	396 (90.6)	41 (9.4)	
Marital status				.678
Unmarried	1,261 (34.2)	1,097 (87.0)	164 (13.0)	
Married	2,424 (65.8)	2,096 (86.5)	327 (13.5)	
Exercise				<.001
No	2,546 (69.1)	2,148 (84.4)	398 (15.6)	
Yes	1,138 (30.9)	1,045 (91.8)	93 (8.2)	
Smoking				.945
No	3,327 (90.3)	2,884 (86.7)	443 (13.3)	
Yes	357 (9.7)	309 (86.6)	48 (13.4)	
Drinking				.188

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No	2,272 (61.7)	1,956 (86.1)	316 (13.9)	
Yes	1,412 (38.3)	1,237 (87.6)	175 (12.4)	
Sleeping time				<.001
$\leq$ 5 hours / day	712 (19.3)	576 (80.9)	136 (19.1)	
5-7 hours / day	1,478 (40.1)	1,265 (85.6)	213 (14.4)	
$\geq$ 7 hours / day	1,494 (40.6)	1,352 (90.5)	142 (9.5)	
Profession				.201
Physician	934 (25.4)	821 (87.9)	113 (12.1)	
Nurse	2,750 (74.6)	2,372 (86.3)	378 (13.7)	
Shift work				<.00
No	984 (26.7)	916 (93.1)	68 (6.9)	
Yes	2,700 (73.3)	2,277 (84.3)	423 (15.7)	
Level of hospital				.002
Primary/Community hospital	156 (4.2)	145 (92.9)	11 (7.1)	
Secondary hospital	987 (26.8)	829 (84.0)	158 (16.0)	
Tertiary hospital	2,541 (69.0)	2,219 (87.3)	322 (12.7)	
Professional title				.028
Primary	2,269 (61.6)	1,940 (85.5)	329 (14.5)	
Intermediate	1,021 (27.7)	906 (88.7)	115 (11.3)	
Senior	394 (10.7)	347 (88.1)	47 (11.9)	
Working time				<.00
< 40 hours / week	1,012 (27.5)	919 (90.8)	93 (9.2)	
40-50 hours / week	2,140 (58.1)	1,844 (86.2)	296 (13.8)	
> 50 hours / week	532 (14.4)	430 (80.8)	102 (19.2)	
WPV				<.00
No	1,605 (43.6)	1,478 (92.1)	127 (7.9)	
Yes	2,079 (56.4)	1,715 (82.5)	364 (17.5)	
Physical Assault				.087
No	3,098 (84.1)	2,698 (87.1)	400 (12.9)	
Yes	586 (15.9)	495 (84.5)	91 (15.5)	
Emotional Abuse				<.00
No	1,895 (51.4)	1,738 (91.7)	157 (8.3)	
Yes	1,789 (48.6)	1,455 (81.3)	334 (18.7)	
Threat				<.00
No	2,689 (73.0)	2,371 (88.2)	318 (11.8)	
Yes	995 (27.0)	822 (82.6)	173 (17.4)	
Verbal Sexual Harassment	· · ·	. /	· · /	<.00
No	3,087 (83.8)	2,706 (87.7)	381 (12.3)	
Yes	597 (16.2)	487 (81.6)	110 (18.4)	
Sexual Assault		~ /	× /	.064
No	3,387 (91.9)	2,946 (87.0)	441 (13.0)	
Ves	297 (8 1)	247 (83 2)	50 (16 8)	

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233	The prevalence and characteristic of high burnout
234	The rate of high burnout among healthcare workers was 13.3% (491/3,684). There were
235	significant differences in the prevalence of high burnout by demographic, behavioral and
236	occupational characteristics (Table 1). Among three levels of education, healthcare workers
237	with master's degree or above were least vulnerable to high burnout (9.4%, $p = 0.17$ ).
238	Medical staffs who did not exercise had a higher prevalence of high burnout (15.6% vs.
239	8.2%, p < $0.001$ ) than medical staffs who did exercise. Healthcare workers sleeping less than
240	5 hours per day were more vulnerable to high burnout (19.1%, $p < 0.001$ ). shift workers
241	appeared to be more vulnerable to high burnout (15.7% vs. 6.9%, $p < 0.001$ ) than non-shift
242	workers. Healthcare workers working in secondary hospital were the most likely to
243	experience high burnout (16.0%, $p = 0.002$ ), followed by healthcare workers in tertiary
244	hospital (12.7%) and in primary or community hospital (7.1%). Healthcare workers working
245	more than 50 hours per week had the highest prevalence of high burnout (19.2%, $p < 0.001$ )
246	compared to the other groups classified by the weekly working time.
247	WPV and high burnout
248	Healthcare workers who had experienced WPV in the past year were more vulnerable to
249	high burnout (17.5% vs. 7.9%, p < 0.001) than those who had not experienced (Table 1).
250	Table 2 shows the result of association between WPV and high burnout by logistic
251	regression. The association WPV and high burnout was significant in the unadjusted model
252	(OR, $95\%$ CI = 2.47, 2.00-3.06). In the fully adjusted model (Model 4), adjustment for
253	demographic, behavioral and occupational covariates reduced the strength of these
254	associations but did not fully attenuate them (OR, $95\%$ CI = 2.10, 1.69-2.62).

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		Model 1,	Model 2,	Model 3,	Model 4,
		OR [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
WPV		2.47 [2.00-3.06] ***	2.49 [2.01-3.09] ***	2.29 [1.84-2.84] ***	2.10 [1.69-2.62] ***
Age					
< 30	years		1	1	1
30-39	years		0.84 [0.65-1.07]	0.83 [0.65-1.07]	0.96 [0.71-1.30]
$\geq$ 40 y	years		0.60 [0.43-0.84] **	0.68 [0.48-0.97] *	0.86 [0.52-1.44]
Gender	(male)		0.96 [0.73-1.27]	1.07 [0.76-1.49]	0.98 [0.67-1.41]
Educatio	on				
Assoc	ciate degree or below		1	1	1
Bacca	alaureate degree		0.83 [0.66-1.05]	0.83 [0.65-1.05]	0.84 [0.65-1.08]
Maste	er's degree or above		0.61 [0.41-0.89] *	0.63 [0.43-0.93] *	0.63 [0.40-0.98] *
Married			1.32 [1.03-1.69] *	1.33 [1.03-1.71] *	1.35 [1.05-1.74] *
Exercise	9		-	0.57 [0.44-0.73] ***	0.61 [0.47-0.78] ***
Smoking	g			0.96 [0.66-1.45]	0.95 [0.64-1.41]
Drinkin	g			0.85 [0.68-1.06]	0.85 [0.68-1.06]
Sleeping	g time				
$\leq 5 hc$	ours / day			1	1
5-7 h	ours / day			0.72 [0.57-0.92] **	0.74 [0.58-0.94] *
$1 \ge 7 \text{ hours / day}$ 0.49 [0.38-0.64]					0.53 [0.40-0.69] ***
Professi	on (nurse)				1.11 [0.82-1.50]
Shift wo	ork				2.12 [1.57-2.87] ***
Level of	fhospital				
Prima	ry/Community hospital				1
Secor	ndary hospital				1.43 [0.73-2.78]
Tertia	iry hospital				1.24 [0.64-2.42]
Professi	onal title				
Prima	ıry				1
Intern	nediate				0.90 [0.65-1.23]
Senio	r				1.34 [0.79-2.25]
Working	g time				
< 40 l	nours / week				1
40-50 hours / week					1.50 [1.16-1.93] **
> 50 1	nours / week				1.92 [1.38-2.67] ***
257	Abbreviations: WPV	workplace violence	: OR. odds ratio: CI	confidence interval	· ·· J
258	Model 1: Independer	nt variable of interest	, , ,,,, ,,		
259	Model 2: Model 1 +	demographic covariat	tes (age, gender edu	cation. marital status	)
260	Model 3: Model 2 +	behavioral covariates	(exercise smoking	drinking daily sleep	, ing time)
261	Model 4 <sup>·</sup> Model 3 +	occupational covariat	es (profession shift	work level of hospit	<i>8</i> , al
267	professional title we	ekly working time)	grouossion, sinit		····,
262	* <i>P</i> < .05, ** <i>P</i> < .00	5, *** P < 0.001.			

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265	Five types of WPV and high burnout	
266	Table 3 presents the association between five ty	pes of WPV and high burnout. After
267	adjusting for demographic, behavioral and occupation	onal factors, both emotional abuse (OR,
268	95%CI = 2.14, 1.74-2.64), threat (OR, 95%CI = 1.4	6, 1.18-1.80) and verbal sexual
269	harassment (OR, 95%CI = 1.47, 1.16-1.88) were sta	atistically significantly associated with
270	high burnout when they were both included as indep	pendent variables in the same model.
271 272	<b>Table 3.</b> Adjusted logistic regression examining the and high burnout ( $N=3$ 684)	e associations between five types of WPV
_,_	Five types of WPV	OR [95% CI]
	Physical Assault	1.10 [0.85-1.42]
	Emotional Abuse	2.14 [1.74-2.64] ***
	Threat	1.46 [1.18-1.80] ***
	Verbal Sexual Harassment	1.47 [1.16-1.88] **
	Sexual Assault	1.19 [0.86-1.66]
273	Abbreviations: WPV, workplace violence; OR, odd	s ratio; CI, confidence interval.
274	All associations adjusted for demographic (age, gen	der, education, marital status), behavioral
275	(exercise, smoking, drinking, daily sleeping time) a	nd occupational characteristics (profession,
276	shift work, level of hospital, professional title, week	kly working time)
277	* <i>P</i> < .05, ** <i>P</i> < .005, *** <i>P</i> < 0.001.	
278		
279	DISCUSSION	
200		
280	Using a national sample of Uninese nealthcare	workers, we found that wPV
281	independently associated with high burnout, even as	fter accounting for demographic,
282	behavioral and occupational factors. Healthcare wor	rkers who suffered from emotional abuse,
283	threat or verbal sexual harassment were more likely	to experience high burnout. Our finding
284	enriched our understanding of the relationship betw	een WPV and burnout.
285		
203	The results of this study confirmed that healthc	are workers were at high risk of job

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287	Previous Chinese studies have shown that 38.8% of intensivists[28] and 38.4% of
288	psychiatrists,[29] as well as half of nurses,[3] reported experiencing severe burnout.
289	Furthermore, a recent systematic review and meta-analysis, involving 45,538 nurses in 49
290	countries, has shown the overall pooled-prevalence of burnout was 11.2%.[30] Our findings
291	showed similar trends as previous studies. The incidence of WPV among healthcare workers
292	in China was higher than that in other countries. Worldwide, the incidence of WPV among
293	healthcare professionals ranges from 4% to 37%.[31] In this study, more than half of
294	respondents reported suffering WPV at least once in the past year. There are a number of
295	reasons why WPV may be higher in China. A study of serious WPV events over a 14-year
296	period suggests that emotional disorders, non-satisfactory treatment outcomes, and
297	unreasonable medical demands may be three causes of WPV against healthcare providers in
298	China.[32] In addition, according to existing studies of the current healthcare work
299	environment in China, factors such as insufficient financial support for healthcare, lack of
300	legal tools, mismatches between medical resources and patients' needs, lack of supportive
301	organizational interventions, workforce and income mismatch, poor physician-patient
302	communication, and underdeveloped mental healthcare practices may all contribute to the
303	high incidence of WPV in China.[32–34]
304	Our findings suggested that healthcare workers who experienced WPV at least once in

the last year was higher risks of high burnout, which is consistent with previous studies. Our study differs from previous studies given that prior studies did not adjust for behavioral and occupational characteristics. Therefore, this study provided more robust evidence that WPV were associated with high burnout. One possible explanation for association between WPV

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309	and burnout is that WPV is associated with some adverse health outcomes, including work
310	related stress, sleep disorder, and other psychological distress, all contributing to the risks of
311	high burnout.[7,35,36]
312	Furthermore, we found that verbal violence including emotional abuse, threat and
313	verbal sexual harassment were statistically significant associated with higher risks of high
314	burnout after adjusting for all covariates. But high burnout was not associated with physical
315	violence, such as physical assault and sexual assault. Contrary to our study, Hacer and
316	Ali[16] found significant association between physical violence and burnout. These
317	inconsistent findings may be explained by the different measures of physical violence
318	(overall physical violence vs. physical assault and sexual assault), data analyzed (Shapiro-
319	Wilks test vs. adjusted logistic regression), and sample sizes ( $N = 310$ vs. 3,684). However,
320	their study also found that verbal violence has a significant negative effect on burnout,
321	partially supporting our result. Our findings shed light on verbal violence may be a target of
322	intervention to prevent and reduce burnout among healthcare workers.
323	Today, China is facing a serious healthcare shortage. A lack of financial, human, and
324	policy support has led to an increase in workload and work hours among Chinese healthcare
325	workers. This has also led to disputes and verbal violence among some patients who are
326	dissatisfied with healthcare services.[33,34,37,38] However, healthcare workers often do not
327	have timely and effective interventions to protect themselves and punish perpetrators after
328	experiencing verbal violence. With the increase in workplace violence in the medical field
329	during the Covid-19 pandemic, the protection of healthcare workers has gained widespread
330	attention among lawmakers around the world.[35,39] India and the United States have both

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introduced entirely new laws and regulations to address the problem.[40] Although China has approved a law to protect health care workers from verbal violence, it has had little impact. In these situations, governments can enact more draconian laws and statutory measures. In addition, hospitals can develop strategies for prevention and intervention reform, including health worker training and safer work environments. By doing so, health workers will be protected from workplace violence and burnout will be reduced. Limitations There are several limitations in this study. This study used the retrospective approach to collect data, which might have led to recall and report bias. In addition, this study was an

online cross-sectional survey, which does not provide a better understanding of causality 

among the study variables. Previous studies have shown that there are interactions among 

WPV, burnout, and other negative psychological outcomes.[41,42] In this study,

psychological factors were not adjusted to further explore the association between WPV and 

high burnout among healthcare workers. Further research is needed to determine whether 

psychological factors influence the relationship between WPV and burnout.

**CONCLUSION** 

Based on a nationally representative sample of healthcare workers in China, we found that WPV were associated with high burnout, and emotional abuse, threat, and verbal sexual harassment, which were included in verbal violence, were associated with high burnout. Therefore, for future public health policy on reducing and preventing burnout in healthcare 

workers, WPV, especially verbal violence, should be taken into account.

2		
3 4 5	353	Author contribution
6 7 8	354	Zengyu Chen: Concept and design, analysis, drafting of the initial manuscript and revision.
9 10	355	Kexin Peng: Concept and design, analysis, drafting of the initial manuscript and revision.
11 12 13	356	Xiaopei Liu: Revision of the manuscript.
14 15 16	357	Jiaxin Yang: Revision of the manuscript.
17 18	358	Liuxin Long: Critical feedback and revision of the manuscript.
19 20 21	359	Yiting Liu: Critical feedback and revision of the manuscript.
22 23 24	360	<i>Yamin Li:</i> Supervision, validation, interpretation of data and critical revision of the
25 26	361	manuscript.
27 28 29	362	Yusheng Tian: Supervision, validation, interpretation of data and critical revision of the
30 31 32	363	manuscript.
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14 15 16	379	Patient and public involvement
17 18	380	Patients and the public were not involved in the design, conduct, reporting, or dissemination
19 20 21	381	plans of this research.
22 23 24	382	Competing interests
25 26 27 28 29 30 31 32 33	383	The authors declare that they have no known competing financial interests or personal
	384	relationships that could have appeared to influence the work reported in this paper.
	385	Patient consent for publication
34 35 36	386	Not required.
37 38	387	Ethics approval
39 40 41	388	This study was reviewed and approved by the ethics committee of national clinical research
42 43 44	389	center in the second Xiangya Hospital, China (2018S007).
45 46 47	390	Data availability statement
48 49	391	The datasets used and analyzed during the current study are not publicly available, but are
50 51 52	392	available from the corresponding author on reasonable request.
53 54 55	393	
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# Reporting checklist for cross sectional study.

# **Instructions to authors**

Based on the ST	ROBE cro	oss sectional guidelines.	
Instructions	s to aut	hors	
Complete this ch items listed below	ecklist by w.	entering the page numbers from your manuscript where readers will find ea	ch of the
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Upload your con	npleted ch	ecklist as an extra file when you submit to a journal.	
In your methods	section, s	ay that you used the STROBE cross sectionalreporting guidelines, and cite the	nem as:
observational stu	idies.	Reporting Item	Page
Title and abstract		<sup>1</sup> Z	
<b>Title and</b> <b>abstract</b> Title	<u>#1a</u>	Indicate the study's design with a commonly used term in the title or the abstract	1
<b>Title and</b> <b>abstract</b> Title Abstract	<u>#1a</u> <u>#1b</u>	Indicate the study's design with a commonly used term in the title or the abstract Provide in the abstract an informative and balanced summary of what was done and what was found	1 3
Title and abstract Title Abstract Introduction	<u>#1a</u> <u>#1b</u>	Indicate the study's design with a commonly used term in the title or the abstract Provide in the abstract an informative and balanced summary of what was done and what was found	1
Title and abstract Title Abstract Introduction Background / rationale	<u>#1a</u> <u>#1b</u> <u>#2</u>	Indicate the study's design with a commonly used term in the title or the abstract Provide in the abstract an informative and balanced summary of what was done and what was found Explain the scientific background and rationale for the investigation being reported	1 3 5
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Title and abstract Title Abstract Introduction Background / rationale Objectives Methods	#1a #1b #2 #3	Indicate the study's design with a commonly used term in the title or the abstract Provide in the abstract an informative and balanced summary of what was done and what was found Explain the scientific background and rationale for the investigation being reported State specific objectives, including any prespecified hypotheses	1 3 5 6
Title and abstractTitleAbstractIntroductionBackground / rationaleObjectivesMethodsStudy design	#1a #1b #2 #3 #4	Indicate the study's design with a commonly used term in the title or the abstract Provide in the abstract an informative and balanced summary of what was done and what was found Explain the scientific background and rationale for the investigation being reported State specific objectives, including any prespecified hypotheses Present key elements of study design early in the paper	1 3 5 6 7

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1			recruitment, exposure, follow-up, and data collection
2 3 4 5	Eligibility criteria	<u>#6a</u>	Give the eligibility criteria, and the sources and methods of selection of participants.
5 7 3		<u>#7</u>	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
) 10 11 12 13 14 15	Data sources / measurement	<u>#8</u>	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. Give information separately for for exposed and unexposed groups if applicable.
0  7  8	Bias	<u>#9</u>	Describe any efforts to address potential sources of bias
9 20	Study size	<u>#10</u>	Explain how the study size was arrived at
21 22 23 24	Quantitative variables	<u>#11</u>	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why
25 26 27	Statistical methods	<u>#12a</u>	Describe all statistical methods, including those used to control for confounding
29 30 31	Statistical methods	<u>#12b</u>	Describe any methods used to examine subgroups and interactions
32 33 34 35	Statistical methods	<u>#12c</u>	Explain how missing data were addressed
36 37 38 39	Statistical methods	<u>#12d</u>	If applicable, describe analytical methods taking account of sampling strategy
40 41 42 43	Statistical methods	<u>#12e</u>	Describe any sensitivity analyses
14 15	Results		
46 47 48 49 50 51 52 53 54	Participants	<u>#13a</u>	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. Give information separately for for exposed and unexposed groups if applicable.
55 56	Participants	<u>#13b</u>	Give reasons for non-participation at each stage
57 58	Participants	<u>#13c</u>	Consider use of a flow diagram
59 50		For	peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

1 2 3 4 5	Descriptive data	<u>#14a</u>	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders. Give information separately for exposed and unexposed groups if applicable.	10	0 0
6 7 8 9	Descriptive data	<u>#14b</u>	Indicate number of participants with missing data for each variable of interest	n/s	a a
10 11 12 12	Outcome data	<u>#15</u>	Report numbers of outcome events or summary measures. Give information separately for exposed and unexposed groups if applicable.	10	Protecte
13 14 15 16 17 18	Main results	<u>#16a</u>	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	1	njopen-2022-06 d by copyright,
19 20	Main results	<u>#16b</u>	Report category boundaries when continuous variables were categorized	1	4729 o 8 includ
21 22 23 24	Main results	<u>#16c</u>	If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	n/s	n 15 Nover En afor use
25 26 27 28	Other analyses	<u>#17</u>	Report other analyses done—e.g., analyses of subgroups and interactions, and sensitivity analyses	n/s	nber 2022. seignemer s related to
29 30	Discussion				Down nt Supe o text a
31 32	Key results	<u>#18</u>	Summarise key results with reference to study objectives	1	Prieur ( 1 nd dat
33 34 35 36 37 38	Limitations	<u>#19</u>	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias.	14	ABES) . ABES) . a mining, Al tra
39 40 41 42 43	Interpretation	<u>#20</u>	Give a cautious overall interpretation considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	12,13	ining, and sim
44 45 46	Generalisability	<u>#21</u>	Discuss the generalisability (external validity) of the study results	n/	ilar tech
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50 51 52 53 54	Funding	<u>#22</u>	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	10	at Agence Bib
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# Association between high burnout and workplace violence among healthcare workers in China: a WeChat-based survey

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1	Title: Association between high burnout and workplace violence among healthcare workers
2	in China: a WeChat-based survey
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ABSTRACT

**Objectives:** This study is conducted to examine whether overall workplace violence (WPV) and its five types are associated with high burnout among healthcare workers in China. **Design:** A WeChat-based cross-sectional survey. Snowball sampling was used in this study. **Participants:** Front-line healthcare workers (N = 3,706) from 149 cities across 23 provinces in China responded to the survey, and 22 questionnaires were excluded because of incomplete data. Primary and secondary outcome measures: (1) The Chinese Maslach Burnout Inventory General Survey was used to measure high burnout. (2) WPV was assessed using the Chinese version of the Workplace Violence Scale. (3) An anonymous self-designed web-based questionnaire consisting of demographic, behavioral and occupational information was used to identify covariates. **Results:** A total of 3,684 front-line healthcare workers (934 physicians and 2,750 nurses) were included. Of all participants, 13.3% (491/3,193) experienced high burnout. Adjusted logistic regression revealed that experience of WPV in the past year was associated with high burnout (OR, 95% CI = 2.10, 1.69-2.62). Healthcare workers who had suffered emotional abuse, threat or verbal sexual harassment were more vulnerable to high burnout. **Conclusion:** This study finds that healthcare workers with WPV, especially emotional abuse, threat, and verbal sexual harassment, are more likely to experience burnout. These types of WPV should be considered in interventions to reduce and prevent burnout for healthcare workers.

22 Keywords: Burnout, China, Healthcare workers, Workplace violence

2			
5 4 5	1	Str	rengths and limitations of this study
6 7	2	0	The strengths of this study include exploration of the association between five specific
8 9 10	3		types of WPV and high burnout, and adjustment for potential confounders including
11 12 13	4		demographic, behavioral and occupational factors.
13 14 15	5	0	This study did not adjust for psychological factors to further explore the relationship
16 17 18	6		between high burnout and WPV.
19 20	7	0	Snowball sampling was used in this study, which would cause the study sample to be not
21 22 23	8		representative.
24 25 26	9	0	All indicators were self-reported retrospectively which may cause recall bias and report
26 27 28	10		errors.
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**INTRODUCTION** 

2	Burnout is defined as a psychological syndrome caused by chronic workplace stress that
3	is not effectively controlled, including emotional exhaustion (feelings of energy depletion or
4	exhaustion), depersonalization (increased mental distance from your job, or feelings of
5	negativism or cynicism related to your job), and reduced personal accomplishment (reduced
6	professional efficacy). <sup>1</sup> Healthcare workers, especially physicians and nurses in clinical
7	practice, are more likely to experience high level of burnout than other working adults. <sup>2–4</sup>
8	According to a recent systematic review, the prevalence of burnout among physicians in
9	China ranged from 66.5% to 87.8%. <sup>5</sup> Numerous factors lead to burnout among healthcare
10	workers, including excessive workloads, work in shifts, a high working pace, negative
11	workplace experiences, moral conflicts, sleep disorders and perceived job insecurities. <sup>3,6,7</sup>
12	Furthermore, some uniquely Chinese notions of work such as comprising collectivism,
13	endurance and hard work may lead to burnout. <sup>8,9</sup> Several studies have shown that burnout
14	affects physical and psychological health, resulting in musculoskeletal pain, insomnia,
15	alcohol abuse, depression, and even suicidal ideation. <sup>10–13</sup> In addition, burnout can also cause
16	negative professional consequences including medical errors and low quality of care, <sup>12,14</sup>
17	which ultimately leads to adverse impacts on patients' health. Thus, it is crucial to identify
18	risk factors and develop effective strategies to reduce the level of burnout among healthcare
19	workers.
20	As defined by the National Institute for Occupational Safety and Health (NIOSH),
21	workplace violence (WPV) is any violent act directed towards persons at work or on duty. <sup>15</sup>

Worldwide, WPV remains one of the most significant occupational hazards in the healthcare

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1	sector. A systematic review has shown that physicians are at higher risk of WPV due to
2	understaffing, insufficient security, the mental stress of patients, and lacking preventative
3	measures. <sup>16</sup> A bidirectional relationship has been found between WPV and work-related
4	distress in a previous longitudinal study. <sup>17</sup> WPV was predicted by work-related distress.
5	Meanwhile, because of their experience with WPV, healthcare workers reported high levels
6	of stress at work in the following years. Burnout, as a result of work-related distress, also has
7	an association with WPV. Previous studies have shown the established association between
8	burnout and overall WPV. <sup>18–20</sup> Multiple systematic reviews concluded that exposure to
9	violence was an independent risk factor for burnout among healthcare workers. <sup>21–23</sup> There are
10	five types of WPV, including physical assault (physical contact, such as pushing, biting,
11	beating, spitting), emotional abuse (mistreatment through words, such as swearing, disrespect
12	and disparagement), threats (use of verbal, written or physical force that results in fear of
13	negative consequences), verbal sexual harassment (unwanted sexual remarks or comments),
14	and sexual abuse (unwelcome touching or other sexual acts). In a number of studies, various
15	types of violence have been reported to associate with burnout among healthcare workers.
16	However, these reports have been focused on a single type of WPV such as verbal violence, <sup>24</sup>
17	physical violence, <sup>20</sup> or harassment. <sup>25</sup> Additionally, most of these studies may be less robust
18	because they did not adjust for some significant covariates, such as behavioral factors or
19	occupational factors. To our best knowledge, no studies have examined the association
20	between five specific types of WPV and burnout after adjusting for significant factors in the
21	same healthcare sample. More evidence is needed to deepen our comprehension of the
22	relationship between WPV and burnout.

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To address this gap, our study adjusts for demographic, behavioral and occupational covariates in logistic regression. The purpose of this research was to examine the association of overall WPV and its five types (physical assault, emotional abuse, threat, verbal sexual harassment, and sexual abuse) with high burnout among healthcare workers in China. We hypothesized that healthcare workers who had suffered physical violence and verbal violence were both more vulnerable to high burnout than those who had not suffered. **METHODS** This was a web-based cross-sectional study. This study was conducted in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement. **Participants and procedure** This study was conducted using an anonymous web-based questionnaire (www.wjx.cn). We used snowball sampling to collect data between January 10<sup>th</sup> and February 5<sup>th</sup>, 2019. Forty nurses and physicians in our university hospital were the initial fillers and deliverers of the questionnaire, and their colleagues or classmates were then invited to participate in the online survey, and the link to the questionnaire was spread among the respondents' WeChat (a Chinese social media APP) groups. Medical staff who had worked in comprehensive hospitals for at least six months were included in the study. Participants who met the following criteria were excluded: (1) had been on consecutive vacations for more than three months in the past year, (2) were not currently working in the front-line departments. Furthermore, we excluded the same IP address which was used more than once to complete the questionnaire. Inclusion and exclusion criteria and a brief introduction to the study were 

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shown on the first page of the questionnaire so that participants could check them and decide whether to continue or quit the survey. Completing the questionnaire implied consent to participate in the study. Ultimately, 3,706 front-line healthcare workers from 149 cities across 23 provinces in China participated in the study, and 3.684 participants (mean age:  $31.6 \pm 7.7$ years; 3,128 [84.9%] were female) completed the questionnaire as required through a quality check. The current study was reviewed and approved by the ethics committee of the national clinical research center in the second Xiangya Hospital, China (2018S007). Only with the respondents' informed consent did the questionnaire begin, and the survey was conducted anonymously to protect the respondents' privacy. **Measurements** 

# 11 Burnout

Burnout was assessed using the 15-item Chinese Maslach Burnout Inventory-General Survey (CMBI-GS), developed by Liu et al<sup>26</sup> and shown good reliability and validity in the previous study.<sup>27</sup> CMBI-GS consists of three dimensions of job burnout: emotional exhaustion (5 items), depersonalization (4 items), and reduced personal accomplishment (6 items). Each item (e.g., It is pressure for me to work all day) consists of a 7-point Likert scale ranging from 0 ("never") to 6 ("daily") based on the frequency of occurrence of the specific job-related feelings of the respondent. The scores of the three dimensions are equal to the average item's score for each dimension (total dimension score divided by the number of items). The total score is the sum of the three dimensions scores and ranges from 0 to 18, with higher scores indicating more severe burnout. According to the sum score of burnout, the participant can be classified into three levels, including low level (0-8.5), serious level 

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(8.5-14.2) and extremely serious level (14.2-18). In this study, participants with extremely 1 serious level burnout were defined as a "high burnout" case. The result of reliability analysis 2 3 showed the CMBI-GS was in a high level of internal consistency in the current sample (Cronbach's  $\alpha = 0.864$ ). 4 5 WPV 6 WPV was assessed using the Chinese version of the Workplace Violence Scale (WVS), 7 which measured how often the healthcare worker had encountered WPV in the past year. The 8 scale is composed of 5 dimensions, including physical assault, emotional abuse, threats, 9 verbal sexual harassment, and sexual assault. Responses were on a four-point Likert scale, from "none" (0), "1 time" (1), "2-3 times" (2), and " $\geq$  4 times" (3). The total score is the sum 10 of each dimension, ranging from 0-15. The higher the sum score is, the more frequently he or 11 12 she suffered from WPV. The WVS has shown good reliability and validity (the Cronbach's coefficient was 0.92) in healthcare workers in China.<sup>28</sup> In this study, respondents whether 13 suffered five types of WPV were coded as a binary response (0 = no; 1 = yes). 14 *Covariates* 15 Demographic characteristics included age (coded 1 to 3 for "less than 30 years, 30 to 39 16 years, equal or more than 40 years"); gender (0 = female; 1 = male), education (code 1 to 3) 17 for "associated degree or below, baccalaureate degree, master's degree or above"), and 18 marital status (coded 0 for unmarried and coded 1 for married). 19 20 Behavioral variables included exercise (0 = no; 1 = yes), smoking (0 = no; 1 = yes), 21 drinking (0 = no; 1 = yes), and daily sleeping time (coded 1 to 3 for "equal or less than 5 hours, 5 to 7 hours, equal or more than 7 hours"). 22

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1	Occupational variables included the following: (1) profession (coded 0 for nurse and
2	coded 1 for physician); (2) shift work was measured by the question "Do you need to work in
3	shifts now?" $(0 = no; 1 = yes); (3)$ level of hospital (coded 1 for primary hospital or
4	community hospital, coded 2 for secondary hospital and coded 3 for tertiary hospital). In
5	China, a hospital's level indicates its scale. For example, the number of beds in a primary or
6	community hospital varies from 20 to 99, those in a secondary hospital range from 100 to
7	499, and a tertiary hospital has more than 500 beds; (4) work department ( $1 = mental health$ ;
8	2 = intensive care unit; $3 =$ emergency and outpatient; $4 =$ pediatric; $5 =$ gynecology and
9	obstetrics; 6 = internal medicine; 7 = surgical department; 8 = operating room; 9 = general);
10	(5) professional title (coded 1 for primary professional title, coded 2 for intermediate
11	professional title and coded 3 for senior professional title); (6) years of work experience was
12	measured with the question "How many years have you worked in the hospital?" (coded 1 to
13	4 for "less than 5 years, 5 to 10 years, 11 to 20 years and more than 20 years"); (7) weekly
14	working time was measured with the question "In the past 12 months, how many hours per
15	week did you work on average" (coded 1 to 3 for "less than 40 hours, 40 to 50 hours and
16	more than 50 hours").

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17 Statistical analyses

18 Descriptive statistics were presented as numbers and percentages for demographic, 19 behavioral and occupational variables, and the rates of overall WPV and its specific types. 20 Chi-square tests were used to compare the characteristics of the sample according to burnout 21 categories (non-high burnout and high burnout). Binary logistic regression analysis was used 22 to examine the association between high burnout and WPV. We presented the crude effects

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> with only associated factors of interest included in Model 1. Then we adjusted for demographics (age, gender, education and marital status) (Model 2), and further adjusted for behavioral variables (exercise, smoking, drinking and daily sleeping time) (Model 3). Model 4 finally further adjusted for occupational variables (profession, shift work, level of hospital, work department, professional title, years of work experience and weekly working time). The association between five types of WPV and high burnout was evaluated using the adjusted logistic regression. We used SPSS version 24 to perform all statistical analyses (IBM SPSS Statistics for MacOS, Armonk, NY, USA). Patient and public involvement None. **RESULTS** After excluding 22 incomplete data, a total of 3,684 front-line healthcare workers (25.4% physicians and 74.6% nurses) from all provinces in mainland China were included. 84.9% were female and 65.8% were married. Nearly 50% of participants were younger than 30 years old, with a mean age of  $31.6 \pm 7.7$  years (not shown in tables). Of the respondents, a majority (78.7%) had attained a bachelor's degree or above, 69.1% would not do exercise and 73.3% needed to work in shifts. The demographic, behavioral and occupational characteristics of participants are shown in Table 1. **Table 1**. Characteristics of healthcare workers, stratified by high burnout status (N = 3,684) Characteristics, n (%) Total Non-high High burnout p values burnout (n=491) (N=3,684)(n=3,193).037 Age

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Gender				.578
Female	3,128 (84.9)	2,707 (86.5)	421 (13.5)	
Male	556 (15.1)	486 (87.4)	70 (12.6)	
Education				.017
Associate degree or below	786 (21.3)	667 (84.9)	119 (15.1)	
Bachelor's degree	2,461 (66.8)	2,130 (86.6)	331 (13.4)	
Master's degree or above	437 (11.9)	396 (90.6)	41 (9.4)	
Marital status				.678
Unmarried	1,261 (34.2)	1,097 (87.0)	164 (13.0)	
Married	2,424 (65.8)	2,096 (86.5)	327 (13.5)	
Exercise				<.00
No	2,546 (69.1)	2,148 (84.4)	398 (15.6)	
Yes	1,138 (30.9)	1,045 (91.8)	93 (8.2)	
Smoking				.945
No	3,327 (90.3)	2,884 (86.7)	443 (13.3)	
Yes	357 (9.7)	309 (86.6)	48 (13.4)	
Drinking			~ /	.188
No	2,272 (61.7)	1,956 (86.1)	316 (13.9)	
Yes	1.412 (38.3)	1,237 (87.6)	175 (12.4)	
Sleeping time		, , , ,	( )	<.00
$\leq$ 5 hours / day	712 (19.3)	576 (80.9)	136 (19.1)	
5-7 hours / day	1,478 (40.1)	1,265 (85.6)	213 (14.4)	
> 7 hours / day	1.494 (40.6)	1.352 (90.5)	142 (9.5)	
Profession			()	.201
Nurse	2,750 (74.6)	2.372 (86.3)	378 (13.7)	
Physician	934 (25.4)	821 (87.9)	113 (12.1)	
Shift work			- ( - )	<.00
No	984 (26.7)	916 (93.1)	68 (6.9)	
Yes	2.700 (73.3)	2.277 (84.3)	423 (15.7)	
Level of hospital	,)	,	( - • • )	.002
Primary/Community hospital	156 (4 2)	145 (92.9)	11 (7.1)	
Secondary hospital	987 (26.8)	829 (84.0)	158 (16.0)	
Tertiary hospital	2.541 (69.0)	2.219 (87 3)	322 (12 7)	
Work department	-, (0).0)	_,;(0,.0)	()	<.00
Mental Health	444 (12 1)	414 (93 2)	30 (6 8)	
Intensive Care Unit	236 (6 4)	197 (83 5)	39 (16 5)	
Emergency and Outpatient	308 (8.4)	256 (83.1)	52 (16.9)	
Pediatric	165 (4 5)	126 (76 4)	39 (23.6)	
Gynecology and Obstetries	217 (5.9)	189 (87 1)	28 (12 9)	
Internal Medicine	969 (26 3)	794 (81 9)	175(12.7)	
Surgical Department	743(20.3)	652 (87.8)	91 (12 2)	
Operating Room	134 (3.6)	123 (91.8)	11 (8 2)	
Diagnosis and Subsidiary	376 (8 8)	308 (94 5)	18 (5 5)	
	520 (0.0)	JUU (JT.J)	10 (3.3)	

Page	14	of	29
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Professional title				.028
Primary	2,269 (61.6)	1,940 (85.5)	329 (14.5)	
Intermediate	1,021 (27.7)	906 (88.7)	115 (11.3)	
Senior	394 (10.7)	347 (88.1)	47 (11.9)	
Work experience				<.001
< 5 years	1,382 (37.5)	1,213 (87.8)	169 (12.2)	
5-10 years	1,054 (28.6)	872 (82.7)	182 (17.3)	
11-20 years	766 (20.8)	669 (87.3)	97 (12.7)	
> 20 years	482 (13.1)	439 (91.1)	43 (8.9)	
Working time				<.001
< 40 hours / week	1,012 (27.5)	919 (90.8)	93 (9.2)	
40-50 hours / week	2,140 (58.1)	1,844 (86.2)	296 (13.8)	
> 50 hours / week	532 (14.4)	430 (80.8)	102 (19.2)	
WPV O				<.001
No	1,605 (43.6)	1,478 (92.1)	127 (7.9)	
Yes	2,079 (56.4)	1,715 (82.5)	364 (17.5)	
Physical Assault				.087
No	3,098 (84.1)	2,698 (87.1)	400 (12.9)	
Yes	586 (15.9)	495 (84.5)	91 (15.5)	
Emotional Abuse				<.001
No	1,895 (51.4)	1,738 (91.7)	157 (8.3)	
Yes	1,789 (48.6)	1,455 (81.3)	334 (18.7)	
Threat				<.001
No	2,689 (73.0)	2,371 (88.2)	318 (11.8)	
Yes	995 (27.0)	822 (82.6)	173 (17.4)	
Verbal Sexual Harassment				<.001
No	3,087 (83.8)	2,706 (87.7)	381 (12.3)	
Yes	597 (16.2)	487 (81.6)	110 (18.4)	
Sexual Assault				.064
No	3,387 (91.9)	2,946 (87.0)	441 (13.0)	
Yes	297 (8.1)	247 (83.2)	50 (16.8)	

# 2 The prevalence and characteristic of high burnout

The rate of high burnout among healthcare workers was 13.3% (491/3,684). There were significant differences in the prevalence of high burnout by demographic, behavioral and occupational characteristics (Table 1). Among three levels of education, healthcare workers with master's degree or above were least vulnerable to high burnout (9.4%, *p* = 0.17). Medical staffs who did not exercise had a higher prevalence of high burnout (15.6% vs.

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1	8.2%, $p < 0.001$ ) than	n medical staff who d	id exercise. Healthca	re workers sleeping	less than 5	
2	hours per day were more vulnerable to high burnout (19.1%, $p < 0.001$ ), shift workers					
_			,, r			
3	appeared to be more	vulnerable to high bu	rnout (15.7% vs. 6.9	%, $p < 0.001$ ) than negative the second se	on-shift	
4	workers. Healthcare v	workers working in s	econdary hospitals w	vere the most likely to	)	
5	experience high burne	out (16.0%, $p = 0.002$	2), followed by healt	hcare workers in tert	iary	
6	hospitals (12.7%) and	l in primary or comm	nunity hospitals (7.1%	6). Physicians and nu	irses	
7	working in pediatrics	were more vulnerab	le to high burnout (2.	3.6%, <i>p</i> < 0.001). He	althcare	
8	workers working mor	re than 50 hours per v	week had the highest	prevalence of high b	urnout	
9	(19.2%, p < 0.001) cc	ompared to the other	groups classified by	the weekly working	time.	
10	WPV and high burn	iout				
11	Healthcare worke	ers who had experien	ced WPV in the past	year were more vult	nerable to	
12	high burnout (17.5% vs. 7.9%, $p < 0.001$ ) than those who had not experienced it (Table 1).					
13	Table 2 shows the result of the association between WPV and high burnout by logistic					
14	regression. The association between WPV and high burnout was significant in the unadjusted					
15	model (OR, $95\%$ CI = 2.47, 2.00-3.06). In the fully adjusted model (Model 4), adjustment for					
16	demographic, behavioral, and occupational covariates reduced the strength of these					
17	associations but did not fully attenuate them (OR, $95\%$ CI = 2.03, 1.62-2.55).					
18	Table 2. Results of lo	gistic regression ana	lysis of associations b	between WPV and hi	gh burnout	
19	(N = 3,684)	0 0	5			
	x · ·	Model 1,	Model 2,	Model 3,	Model 4,	
		OR [95% <i>CI</i> ]	OR [95% <i>CI</i> ]	OR [95% <i>CI</i> ]	OR [95% <i>CI</i> ]	
WPV		2.47 [2.00-3.06] ***	2.49 [2.01-3.09] ***	2.29 [1.84-2.84] ***	2.03 [1.62-2.55] ***	
Age						
< 30 ye	ears		1	1	1	
30-39	years		0.84 [0.65-1.07]	0.83 [0.65-1.07]	0.86 [0.61-1.22]	
$\geq$ 40 years		0.60 [0.43-0.84] **	0.68 [0.48-0.97] *	0.96 [0.48-1.92]		
Gender (male)			0.96 [0.73-1.27]	1.07 [0.76-1.49]	1.04 [0.71-1.52]	

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2					
3	Education				-
4 5	Associate degree or below	1	1	1	
6	Baccalaureate degree	0.83 [0.66-1.05]	0.83 [0.65-1.05]	0.84 [0.65-1.08]	
7	Master's degree or above	0.61 [0.41-0.89] *	0.63 [0.43-0.93] *	0.63 [0.40-1.00] *	
8	Married	1.32 [1.03-1.69] *	1.33 [1.03-1.71] *	1.15 [0.88-1.52]	
9 10	Exercise		0.57 [0.44-0.73] ***	0.64 [0.50-0.83] **	
11	Smoking		0.96 [0.66-1.45]	0.96 [0.64-1.44]	
12	Drinking		0.85 [0.68-1.06]	0.91 [0.73-1.14]	
13 14	Sleeping time				
15	< 5  hours / day		1	1	Prot
16	5-7 hours / day		0.72 [0.57-0.92] **	0.76 [0.59-0.98] *	lect
17	> 7  hours / day		0.49 [0.38-0.64] ***	0.54 [0.42-0.71] ***	ed k
10	Profession (physician)			1 08 [0 78-1 49]	y c
20	Shift work			2.10 [1.54-2.86] ***	ору
21	Level of hospital				righ
22	Primary/Community hospital			1	ļt, in
24	Secondary hospital			1 16 [0 56-2 42]	clu
25	Tertiary hospital			1 01 [0 49-2 08]	ding
26 27	Work department			1.01 [0.13 2.00]	g fo
28	Mental Health			1	ы. Го Го Го
29	Intensive Care Unit			2.82 [1.65-4.82] ***	nsei es r
30	Emergency and Outpatient			3.02 [1.83-4.99] ***	igne elat
31	Pediatric			4 14 [2 41-7 12] ***	ed t
33	Gynecology and Obstetrics			2.06 [1.17-3.64] *	o te
34	Internal Medicine			3.03 [1.97-4.65] ***	xt a
35 36	Surgical Department			1.98 [1.26-3.12] **	nd o
37	Operating Room			1.52 [0.72-3.22]	data
38	Diagnosis and Subsidiary			1.18 [0.63-2.19]	mi
39 40	General			1 18 [0 49-2 88]	S) . יוחני
40	Professional title			1.10 [0.19 2.00]	ļ, Al
42	Primary			1	trai
43	Intermediate			0 87 [0 61-1 22]	inin
44 45	Senior			1 25 [0 72-2 17]	g, a
46	Work experience			1.25 [0.72-2.17]	nd s
47	< 5 years			1	simi
48 ⊿0	5-10 years			1 1 53 [1 11_2 09] *	lar t
50	$11_{20}$ years			1.35 [1.11-2.07]	ech
51	$\sim 20$ years			1.41 [0.55-2.20]	nol
52	Vorking time			1.17 [0.33-2.37]	ogie
сс 54	< 40 hours / week			1	ŝ
55	$\sim$ to hours / week			· 1	
56	> 50 hours / week			1 72 [1 72.2 41] **	
57 58	1 Abbreviations: W/DV workplace violence	· OR odds ratio CI	confidence interval	1.74 [1.42-4.41]	-
50		, $OIX$ , $Ouus ratio, CI,$	confidence interval.		

<sup>59</sup> 2 Model 1: Independent variable of interest

3 4	1	Model 2: Model 1 + demographic covariates (age, gend	ler, education, marital status)
5	2	Model 3: Model 2 + behavioral covariates (exercise, sm	noking, drinking, daily sleeping time)
6	3	Model 4: Model 3 + occupational covariates (profession	n, shift work, level of hospital, work
7	4	department, professional title, years of work experience	e, weekly working time)
8	5	* $p < .05$ , ** $p < .005$ , *** $p < 0.001$ .	
9 10			
10	6	Five types of WPV and high hurnout	
12	0	Five types of wir v and lingh burnout	
13			
14	7	Table 3 presents the association between five types	of WPV and high burnout. After
15			
16 17	8	adjusting for demographic, behavioral and occupational	l factors, both emotional abuse (OR,
17 19			
10	9	95% $CI = 2.08 + 1.67 - 2.58$ ) threat (OR $95%$ $CI = 1.41 + 1.1$	14-1 76) and verbal sexual
20	,	<i>2.00, 1.07 2.00, 110 at (010, 957001 1.11, 1</i>	.1 1 1.70) and verbal sexual
21	10		· 11 · · · · · · · · · · · · · · · · ·
22	10	harassment (OR, $95\%CI = 1.55$ , $1.20-1.99$ ) were statistic	ically significantly associated with
23			
24	11	high burnout when they were both included as independent	dent variables in the same model.
25			
20	12	Table 3. Adjusted logistic regression examining the ass	ociations between five types of WPV
28	13	and high burnout $(N = 3.684)$	51
29	10	Five types of WPV	OR [95%C7]
30		Physical Accoult	
31			
32 33		Emotional Abuse	2.08 [1.07-2.58]
34		Threat	1.41 [1.14-1.76] **
35		Verbal Sexual Harassment	1.55 [1.20-1.99] **
36		Sexual Assault	1.29 [0.92-1.82]
37	14	Abbreviations: WPV, workplace violence; OR, odds rat	tio; CI, confidence interval.
38	15	All associations adjusted for demographic (age, gender,	education, marital status), behavioral
40	16	(exercise smoking drinking daily sleeping time) and c	occupational characteristics (profession
41	17	shift work level of hospital work department profession	onal title years of work experience
42	10	working time)	onar title, years of work experience,
43	10		
44	19	p < .05, p < .005, p < .005, p < 0.001.	
45 46			
47	20	DISCUSSION	
48			
49	21	Using a sample of Chinese healthcare workers, we	found that WPV was independently
50			1 2
51	22	associated with high burnout after adjusted for demogra	aphic behavioral and occupational
52	22	ussociated with high sufficient and adjusted for demogre	ipine, benuviorar and becapational
53 54	<u></u>		
55	23	factors. Healthcare workers who suffered from emotion	al abuse, threat or verbal sexual
56			
57	24	harassment were more likely to experience high burnou	it.
58			
59 60	25	Our results found that healthcare workers were at h	igh risk of job burnout and WPV. In
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1	this study, 13.3% of participants experienced high burnout. Previous Chinese studies have
2	shown that 38.8% of intensivists <sup>29</sup> and 38.4% of psychiatrists, <sup>30</sup> as well as half of nurses, <sup>3</sup>
3	reported experiencing severe burnout. Furthermore, a recent systematic review and meta-
4	analysis, involving 45,538 nurses in 49 countries, has shown the overall pooled prevalence of
5	burnout was 11.2%. <sup>31</sup> Our findings showed similar trends as previous studies. The incidence
6	of WPV among healthcare workers in China was higher than that in other countries.
7	Worldwide, the incidence of WPV among healthcare professionals ranges from 4% to 37%. <sup>32</sup>
8	Lu et al <sup>33</sup> have found that the overall prevalence of WPV is 62.4% among 81,771 Chinese
9	healthcare professionals in a recent meta-analysis involving 44 studies. Similar to this study,
10	our results found that more than half of the respondents have suffered WPV at least once in
11	the past year. There are a number of reasons why WPV may be higher in China. A study of
12	serious WPV events over a 14-year period suggests that emotional disorders, non-satisfactory
13	treatment outcomes, and unreasonable medical demands may be three causes of WPV against
14	healthcare providers in China. <sup>34</sup> In addition, according to existing studies regarding the
15	healthcare work environment in China, factors such as insufficient financial support for
16	healthcare, lack of legal tools, mismatches between medical resources and patients' needs,
17	lack of supportive organizational interventions, poor physician-patient communication, and
18	underdeveloped mental healthcare practices may all contribute to the high incidence of WPV
19	in China. <sup>34–36</sup>
20	Our findings suggested that healthcare workers who experienced WPV at least once in

Our findings suggested that healthcare workers who experienced WPV at least once in
the last year were at higher risk of burnout, which is consistent with previous studies.<sup>24,37</sup>
Specifically, Erdur et al<sup>24</sup> used the Maslach Burnout Inventory to assess the burnout

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1	symptoms among 174 physicians working in the emergency department in Turkey, and they
2	found that overall WPV was significantly associated with emotional exhaustion and
3	depersonalization after adjusting for four covariates (age, gender, work place and hobbies).
4	The main difference between our study and the previous study is that the prior one had a
5	small sample size and only included physicians in emergency departments, which means our
6	results have better generalizability. Duan et al <sup>37</sup> utilized MBI-GS and a Chinese WPV
7	questionnaire and they found that WPV was positively correlated with job burnout among
8	1,257 Chinese physicians, which is similar to our results. However, this study did not adjust
9	for any covariates. Our study considered more risk factors of burnout which were proven by
10	evidence as covariates, therefore, our study provided more robust evidence that WPV was
11	associated with high burnout. One possible explanation for the association between WPV and
12	burnout is that WPV is associated with some adverse health outcomes, including work-
13	related distress, sleep disorder, and other psychological distress, all contributing to the risks
14	of high burnout. <sup>7, 38-40</sup>
15	Furthermore, consistent with our study hypothesis, we found that verbal violence
16	including emotional abuse, threat, and verbal sexual harassment were statistically
17	significantly associated with higher risks of high burnout after adjusting for all covariates.
18	However, contrary to our hypothesis, high burnout was not associated with physical violence,
19	such as physical assault and sexual assault. As opposed to our study, Hacer and Ali <sup>18</sup> found a

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20 significant association between physical violence and burnout. These inconsistent findings

21 may be explained by the different measures of physical violence (overall physical violence

vs. physical assault and sexual assault), data analyzed (Shapiro-Wilks test vs. adjusted

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logistic regression), and sample sizes (N = 310 vs. 3,684). However, their study also found 1 that verbal violence has a significant negative effect on burnout, partially supporting our 2 3 result. Our findings shed light on that verbal violence may be a target of intervention to prevent and reduce burnout among healthcare workers. 4 5 Today, China is facing a serious shortage of healthcare workers. A lack of financial, human, and policy support has led to an increase in workload and work hours among Chinese 6 7 healthcare workers. This has also led to disputes and verbal violence among some patients who are dissatisfied with healthcare services.<sup>35,36,41,42</sup> However, healthcare workers often do 8 9 not have timely and effective interventions to protect themselves and punish perpetrators after experiencing verbal violence. With the increase in workplace violence in the medical 10 field during the Covid-19 pandemic, the protection of healthcare workers has gained 11 widespread attention around the world.<sup>39,43</sup> India and the United States have both introduced 12 entirely new laws and regulations to address the problem.<sup>44</sup> Although China has approved a 13 law to protect health care workers from verbal violence, it has had little impact. In these 14 15 situations, governments can enact more draconian laws and statutory measures. In addition, hospitals can develop strategies for prevention and intervention reform to protect their staff. 16 17 From a public health and healthcare policy standpoint, our study has important implications for the prevention of burnout in front-line healthcare workers. Our findings point 18 to WPV, especially verbal violence, leading to a high level of burnout. Thus, it is imperative 19 for policymakers to focus on verbal violence which is more difficult to notice than physical 20 21 violence. From a practical perspective, mental health support should increase the attention of healthcare workers who have suffered verbal violence from patients, their family, and co-22

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workers. In addition, future research could develop a simple group intervention for massive 1 front-line healthcare workers to reduce their work-related distress resulting from verbal 2 3 violence to prevent burnout.

Limitations 4

5 There are several limitations to this study. This study used the retrospective approach to collect data, which might have led to recall and report bias. The current study sample consists 6 7 of 3,684 doctors and nurses from 23 provinces in China, however, it is small compared with 8 the number of Chinese healthcare workers. In addition, this study used snowball sampling. 9 Both sample size and sampling methods would cause the study sample to be not representative. Previous studies have shown that there are interactions between WPV, 10 burnout, and other negative psychological outcomes.<sup>45,46</sup> In this study, psychological factors 11 12 were not adjusted to further explore the association between WPV and high burnout among healthcare workers. Further research is needed to determine whether psychological factors 13 influence the relationship between WPV and burnout. 14

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**CONCLUSION** 15

For the Chinese healthcare system, burnout remains a special concern. Based on a 16 sample of healthcare workers in China, we found that emotional abuse, threat, and verbal 17 sexual harassment were associated with high burnout. Therefore, for future public health 18 policy and intervention studies on preventing and reducing burnout in healthcare workers, 19 WPV, especially verbal violence, should be taken into account. 20

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# Author contribution

- 2 Zengyu Chen: Concept and design, analysis, drafting of the initial manuscript and revision.
- *Kexin Peng:* Concept and design, analysis, drafting of the initial manuscript and revision.
- *Xiaopei Liu:* Revision of the manuscript.
- 5 Jiaxin Yang: Revision of the manuscript.
- *Liuxin Long:* Critical feedback and revision of the manuscript.
- *Yiting Liu:* Critical feedback and revision of the manuscript.
- 8 Yamin Li: Supervision, validation, interpretation of data and critical revision of the
- 9 manuscript.
- 10 Yusheng Tian: Supervision, validation, interpretation of data and critical revision of the
- 11 manuscript.

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12	Ethics approval
13	This study was reviewed and approved by the ethics committee of the national clinical
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15	Data availability statement
16	The datasets used and analyzed during the current study are not publicly available but are
17	available from the corresponding author upon reasonable request.
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	Item No	Recommendation	Pag No
Title and abstract	1	( <i>a</i> ) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what	3
		was done and what was found	
Introduction		was done and what was found	
Background/rationale	2	Explain the scientific background and rationale for the investigation being	5, 0
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods	-		
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting locations and relevant dates including periods of	n/s
Setting	5	recruitment, exposure, follow-up, and data collection	11/ 0
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection	7
	-	of participants	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders,	8
		and effect modifiers. Give diagnostic criteria, if applicable	
Data sources/	8*	For each variable of interest, give sources of data and details of methods	8,
measurement		of assessment (measurement). Describe comparability of assessment	
		methods if there is more than one group	
Bias	9	Describe any efforts to address potential sources of bias	20
Study size	10	Explain how the study size was arrived at	n/a
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If	9, 1
Statistical methods	12	(a) Describe all statistical methods including those used to control for	10
		confounding	11
		(b) Describe any methods used to examine subgroups and interactions	n/a
		(c) Explain how missing data were addressed	n/a
		( <i>d</i> ) If applicable, describe analytical methods taking account of sampling	n/a
		(e) Describe any sensitivity analyses	n/a
Rosults		(c) Describe any sensitivity analyses	11/ 0
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers	11
- uniterpunto	10	potentially eligible, examined for eligibility, confirmed eligible, included	
		in the study, completing follow-up, and analysed	
		(b) Give reasons for non-participation at each stage	n/a
		(c) Consider use of a flow diagram	n/a
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical,	13
		social) and information on exposures and potential confounders	14
		(b) Indicate number of participants with missing data for each variable of interest	n/a
Outcome data	15*	Report numbers of outcome events or summary measures	13
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted	14
	-	estimates and their precision (eg, 95% confidence interval). Make clear	

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		(b) Report category boundaries when continuous variables were	8-10
		categorized	
		(c) If relevant, consider translating estimates of relative risk into absolute	n/a
		risk for a meaningful time period	
Other analyses	17	Report other analyses done-eg analyses of subgroups and interactions,	n/a
		and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential	20
		bias or imprecision. Discuss both direction and magnitude of any potential	
		bias	
Interpretation	20	Give a cautious overall interpretation of results considering objectives,	17-
		limitations, multiplicity of analyses, results from similar studies, and other	19
		relevant evidence	
Generalisability	21	Discuss the generalisability (external validity) of the study results	n/a
Other information			
Funding	22	Give the source of funding and the role of the funders for the present	22
		study and, if applicable, for the original study on which the present article	
		is based	

\*Give information separately for exposed and unexposed groups.

**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.