

INVESTIGATION AND ANALYSIS OF OCCUPATIONAL PHYSICAL INJURIES AMONG HEALTHCARE STAFFS DURING ALLOPATRIC MEDICAL AID FOR THE FIGHT AGAINST COVID-19

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ABSTRACT

Background: Occupational health impairment of medical personnel manifested as a prominent problem in COVID-19. The aim of this study is to investigate the occupational physical injuries of front-line medical staffs in Hubei province during the fight against COVID-19. **Material and Methods:** A questionnaire survey was conducted among 476 medical staffs from 3 regions of Hubei Province, including general characteristics and the physical discomfort/damage suffered in the isolation wards during working hours. **Results:** A total of 457 valid questionnaires were collected. The common physical discomfort/damage included skin injuries (22.76%), conjunctivitis (15.10%), falls (9.19%), intolerant unwell symptoms (8.53%) and sharp injuries (6.13%). Logistic regression analysis showed that: lack of protective work experience (OR = 2.049, 95% CI: 1.071–3.921), continuous working for 4 h (OR = 3.771, 95% CI: 1.858–7.654), and working >4 h (OR = 7.076, 95% CI: 3.197–15.663) were high-risk factors for skin injuries. Working continuously for 4 h (OR = 3.248, 95% CI: 1.484–7.110) and working >4 h (OR = 3.096, 95% CI: 1.232–7.772) were high-risk factors for conjunctivitis. Lack of protective work experience was a high risk factor for falls (OR = 5.508, 95% CI: 1.299–23.354). The high risk factors for intolerant unwell symptoms were continuous working for 4 h (OR = 5.372, 95% CI: 1.239–23.301) and working >4 h (OR = 8.608, 95% CI: 1.843–40.217). Working in a COVID-19 critical care unit (OR = 3.249, 95% CI: 1.344–7.854) and implementation of nursing (OR = 9.766, 95% CI: 1.307–72.984) were high risk factors for sharp injuries. **Conclusions:** Occupational physical injuries are universal in the COVID-19 ward. Those who take up nursing, work in a critical care ward, with no experience in an isolation ward for infectious diseases, and work continuously for ≥4 h on the same day should get more attention. Med Pr. 2022;73(3):209–18

Key words: risk factors, personal protective equipment, emergencies, surveys and questionnaires, SARS-CoV-2, occupational injuries

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Received: October 13, 2021, accepted: April 3, 2022

INTRODUCTION

The current global epidemic of novel coronavirus disease (COVID-19) was first discovered in Hubei province, China, in January 2020 [1]. As an emerging infectious disease, COVID-19 is more contagious and pathogenic than previous infectious diseases, such as SARS, EBOV and Influenza. According to the World Health Organization (WHO), >59 000 000 people have been infected and >1 000 000 people have died of this disease so far [2]. Since the initial outbreak of COVID-19, >42 000 healthcare staffs from 346 medical teams across the country have been dispatched to aid Wuhan and other regions of Hubei to curb the spread of the epidemic, contributing to the largest medical assistance event in the human history [3]. After months of hard work, Wuhan, the hardest hit by the novel coronavirus in Hubei, was cleared of confirmed COVID-19 cases on April 27 [4].

China's mobile medical aids have played a key role in the success in controlling nascent pandemic. However, in different climates and living and working environments, medical personnel who migrated to a stranger field in emergency faced both physical and psychological pressure. Occupational health impairment of medical personnel manifested as a prominent problem. This study aimed to investigate work-related physical injuries of healthcare staffs migrated to Hubei province (Central China) from Shanxi province (North China), China, and it was expected to provide some useful information for their physical safety in responding to widespread outbreak of respiratory infectious diseases.

MATERIAL AND METHODS

A retrospective questionnaire survey was used to investigate the status of occupational physical injury among all the doctors and nurses working in COVID-19 wards during the period of allopatric medical assistance. The investigation was conducted within the 2 weeks of medical isolation after finishing the medical assistance.

Subjects

A total of 462 doctors or nurses of 6 medical teams dispatched from Shanxi Province to Hubei Province were investigated. They had provided medical aid at 7 hospitals in 3 secondary cities of Hubei from Jan 27 to Mar 23, 2020. Before taking the job, all medical staffs got the same training on protection knowledge.

Inclusion criteria:

- oral informed consent,
- working in a ward of confirmed or suspected COVID-19 cases for >1 week.

Exclusion criteria:

- there were obvious contradictions in the same questionnaire,
- it took <120 s for filling in the questionnaire.

Survey administration

First, the leader of every unit explained this survey to their staffs and mobilized them for participation through the WeChat group. After obtaining the consent of the parties, electronic questionnaires were distributed to the doctors and nurses through Sojump software and online survey platform. The questionnaire included:

- general information;
- acute physical discomfort/injury between wearing protective equipment and leaving the ward;
- the manifestation, reason and outcome of the physical discomfort/injury.

Intolerant unwell symptoms refer to uncomfortable symptoms, such as dizziness, headache, nausea, vomiting, fatigue, low back pain, palpitation, and dyspnea, etc., and most of the symptoms appear in groups, which are also called unbearable discomfort symptom group. The questionnaires were filled anonymously and each questionnaire was assigned a unique number.

Data collection

After the Sojump questionnaires were recovered, 2 researchers with unified training screened the questionnaire results one by one and selected the questionnaires that met the inclusion criteria. The respondents who raised questions about the questionnaire, or who suffered from obvious physical damage were interviewed by telephone for more details.

Data analysis

In this study, IBM SPSS 21 was used for statistical analysis. Categorical variables were represented by cases (percentages), and mean (M) \pm standard deviation (SD) was used to describe the continuous variables of participants' characteristics. Pearson's χ^2 test or Fisher's exact test was used to compare the rates between groups. Multiple logistic regression was used to analyze the risk factors of various injuries, and odds ratio (OR) and its 95% confidence interval (CI) were used to evaluate the influence of each factor on the rate of injury. Significant variables with $p < 0.1$ from univariate analysis or variables clinically

believed to have a causal relationship with the injuries were further analyzed using multivariate logistic analysis. And $p < 0.05$ was considered statistically significant.

RESULTS

A total of 476 medical staffs participated in the medical assistance, 462 of whom were surveyed and 457 valid questionnaires were recovered, with a recovery rate of 98.92%. None of these staffs were infected. Table 1 showed the general characteristics of the respondents. The respondents included 125 doctors (27.35%) and 332 nurses (72.65%), with an age of $M \pm SD = 37.59 \pm 6.67$ years old, of which females accounted for 77.46%, and 216 (47.26%) worked in wards for critical COVID-19 patients. Only 19.91% of them had experience in the isolation ward for infectious disease. The actual working days in the COVID-19 ward were $M \pm SD = 24.99 \pm 4.46$ days.

During the working hours, the common physical discomfort/damage included skin injury of head and face (22.76%), conjunctivitis (15.10%), falls (9.19%), unbearable discomfort symptom group (8.53%), and sharp injuries (6.13%). There were also some sporadic injuries including hand skin allergy (2 cases), finger extrusion injury (2 cases) and broken foot (1 case). The univariate analysis and multivariate logistic regression analysis of factors related to common physical discomfort/damage are shown in Tables 2 and 3. Through the questionnaire survey and telephone interview, the physical injuries of medical staffs presented different clinical manifestations, as shown in Table 4. Table 5 lists the reasons for these physical injuries as considered by the interviewed doctors and nurses.

Skin injuries

One hundred and four patients suffered from head or facial skin injuries (123 positions), which were manifested as erythra, blisters, ulceration or redspots that could not be resolved on the bridge of the nose, root of the ears, and cheeks. Among those, the incidence in females was significantly higher than that in males ($p = 0.024$), and nurses were more vulnerable than doctors ($p = 0.018$). People without experience in protective gears were more likely to get injured than those with experience in protective gears ($p = 0.031$). The incidence increased significantly with the extension of continuous working hours ($p < 0.001$). Multiple logistic regression analysis indicated that no experience in protective work (OR = 2.049, 95% CI: 1.071–3.921) and working continuously for 4 h (OR = 3.771, 95% CI: 1.858–7.654) or

Table 1. The general characteristics of the subjects, January–March 2020, Hubei, China

Variable	Participants (N = 457)
Age [years] (M±SD)	37.59±6.67
Working time [days] (M±SD)	24.99±4.46
Gender [n (%)]	
male	103 (22.54)
female	354 (77.46)
Job category [n (%)]	
doctor	125 (27.35)
nurse	332 (72.65)
Professional title [n (%)]	
senior	116 (25.38)
intermediate	221 (48.36)
junior	120 (26.26)
Working department [n (%)]	
mild cases ward	241 (52.74)
critical cases ward	216 (47.26)
Working experience with personal protective equipment [n (%)]	
yes	91 (19.91)
no	366 (80.09)
Continuous working time [n (%)]	
<4 h	123 (26.91)
4 h	255 (55.80)
>4 h	79 (17.29)

>4 h (OR = 7.076, 95% CI: 3.197–15.663) were the main risk factors for skin injuries. Through the investigation of the parties, the main causes of skin damage were oppression (38.89%), allergy (12.71%) and dampness (27.97%) caused by wearing personnel protective equipment (PPE). Besides, excessive and improper use of PPE exposed the skin to additional humidity and pressure.

Conjunctivitis

Sixty-nine medical personnel experienced 74 cases of photophobia, tearing, conjunctiva congestion, eye pain and other manifestations of conjunctivitis. Univariate analysis showed that women were more likely to develop conjunctivitis than men ($p = 0.041$), and the incidence in nurses was higher than that in doctors ($p = 0.044$). Conjunctivitis was more common in people who worked longer hours all at once ($p = 0.032$). Multiple logistic regression analysis showed that continuous

Table 2. Incidence of physical injuries and univariate analysis of exposure factors among doctors and nurses, January–March 2020, Hubei, China

Variable	Injuries incidence														
	skin injuries (N = 104, 22.76%)			conjunctivitis (N = 69, 15.10%)			falls (N = 42, 9.19%)			intolerant unwell symptoms (N = 39, 8.53%)			sharp injuries (N = 28, 6.13%)		
	n (%)	χ ²	P	n (%)	χ ²	P	n (%)	χ ²	P	n (%)	χ ²	P	n (%)	χ ²	P
Gender															
female	89 (85.58)	5.079	0.024	60 (86.96)	4.179	0.041	36 (85.71)	1.804	0.179	37 (94.87)	7.403	0.007	23 (82.14)	0.374	0.541
male	15 (14.42)			9 (13.04)			6 (14.29)			2 (5.13)			5 (17.86)		
Job category															
doctor	19 (18.27)	5.590	0.018	12 (17.39)	4.058	0.044	9 (21.43)	0.817	0.366	3 (7.69)	8.294	0.004	1 (3.57)	8.489	0.004
nurse	85 (81.73)			57 (82.61)			33 (78.51)			36 (92.31)			27 (96.43)		
Professional title															
senior	29 (27.88)	1.857	0.395	17 (24.64)	0.554	0.758	8 (19.05)	6.462	0.040	10 (25.64)	4.465	0.107	10 (35.71)	2.079	0.354
intermediate	53 (50.96)			36 (52.17)			28 (66.67)			24 (61.54)			13 (46.43)		
junior	22 (21.15)			16 (23.19)			6 (14.29)			5 (12.82)			5 (17.86)		
Working experience with personal protective equipment															
yes	13 (12.50)	4.639	0.031	13 (18.84)	0.059	0.809	2 (4.76)	6.657	0.010	3 (7.69)	3.993	0.046	4 (14.29)	0.592	0.442
no	91 (87.50)			56 (81.16)			40 (95.24)			36 (92.31)			24 (85.71)		
Working department															
critical cases ward	55 (52.88)	0.001	0.972	37 (53.62)	1.318	0.251	26 (61.90)	3.977	0.046	21 (53.85)	0.741	0.389	21 (75.00)	5.932	0.015
mild cases ward	49 (47.12)			32 (46.38)			16 (38.10)			18 (46.15)			7 (25.00)		
Continuous working time															
<4 h	10 (9.61)	26.173	<0.001	10 (14.49)	6.870	0.032	11 (26.19)	0.034	0.983	2 (5.13)	12.530	0.002	2 (7.14)	8.670	0.013
4 h	64 (61.54)			47 (68.12)			24 (57.14)			25 (64.10)			22 (78.57)		
>4 h	30 (28.85)			12 (19.39)			7 (16.67)			12 (30.77)			4 (14.29)		

Table 3. Multivariate logistic regression analysis of exposure factors related to physical injuries of healthcare staffs, January–March 2020, Hubei, China

Variable	B	SE	OR (95% CI)	p
Skin injuries				
working experience with personal protective equipment				
yes (ref.)				
no	0.718	0.331	2.049 (1.071–3.921)	0.030
continuous working time				
<4 h (ref.)				
4 h	1.327	0.361	3.771 (1.858–7.654)	<0.001
>4 h	1.957	0.405	7.076 (3.197–15.663)	<0.001
Conjunctivitis				
continuous working time				
<4 h (ref.)				
4 h	1.178	0.400	3.248 (1.484–7.110)	0.003
>4 h	1.130	0.470	3.096 (1.232–7.772)	0.016
Falls				
working department				
mild cases ward (ref.)				
critical cases ward	0.612	0.338	1.843 (0.950–3.576)	0.070
professional title				
senior (ref.)				
intermediate	0.664	0.424	1.943 (0.847–4.455)	0.117
junior	−0.359	0.561	0.699 (0.233–2.097)	0.522
working experience with personal protective equipment				
yes (ref.)				
no	1.706	0.737	5.508 (1.299–23.354)	0.021
Intolerant unwell symptoms				
gender				
female (ref.)				
male	1.392	0.744	4.021 (0.936–17.282)	0.061
working experience with personal protective equipment				
yes (ref.)				
no	1.135	0.619	3.110 (0.924–10.468)	0.067
continuous working time (M)				
<4 h (ref.)				
4 h	1.681	0.749	5.372 (1.239–23.301)	0.025
>4 h	2.153	0.787	8.608 (1.843–40.217)	0.006
Sharp injuries				
working department				
mild cases ward (ref.)				
critical cases ward	1.178	0.450	3.249 (1.344–7.854)	0.009
job category				
doctor (ref.)				
nurse	2.279	1.026	9.766 (1.307–72.984)	0.026

Table 4. Manifestation of physical injuries among doctors and nurses, January–March 2020, Hubei, China

Variable	Injuries (N = 312) [n (%)]
Skin injuries	123 (100)
location	
nose bridge	61 (49.59)
root of the ears	34 (27.64)
cheek	19 (15.45)
lower jaw	6 (4.88)
occiput	3 (2.44)
degree of injury	
un-erasable red spot	60 (50.42)
erythra	32 (26.89)
ulceration	21 (17.65)
intact blister	6 (5.04)
Conjunctivitis	74 (100)
self-alleviating and reversible in 12 h	48 (64.86)
requiring medical intervention	26 (35.14)
Falls	44 (100)
no obvious injury	21 (47.73)
closed soft tissue injury	17 (38.64)
occipital hematoma	3 (6.82)
coccygeal fracture	2 (4.55)
open soft tissue injury	1 (2.27)
Intolerant unwell symptoms	42 (100)
syndrome of nausea, vomiting, headache, dizziness	18 (42.86)
chest tightness, difficulty breathing, palpitations, thoracalgia	12 (28.57)
syndrome of neck-shoulder, lumbar-back and lower-limb pain	7 (16.67)
urination problem	3 (7.14)
tiredness, fatigue	2 (4.76)
Sharp injuries	29 (100)
reinstalling jacket needle cap	7 (24.14)
injecting medication	6 (20.69)
sampling of arterial/venous blood	4 (13.79)
injecting insulin with a special pen	4 (13.79)
indwelling needle venipuncture	3 (10.34)
dealing with medical wastes	3 (10.34)
dispensing medicine	2 (6.90)

Table 5. Causality of injuries among doctors and nurses, January–March 2020, Hubei, China

Variable	Causality of injuries (N = 282) [n (%)]
Skin injuries	
the oppression of protective equipment	92 (38.89)
moist, sweat impregnated	66 (27.97)
improper use of protective equipment	33 (13.98)
allergy to protective products	30 (12.71)
excessive wear of protective gear	15 (6.36)
Conjunctivitis	
no clear incentive	24 (34.78)
sweat goes into eyes	26 (21.84)
flushing conjunctiva with normal saline	18 (15.13)
disinfectant splashed into eyes	6 (5.04)
Falls	
slippery floor	26 (32.91)
blurred eyes	17 (21.52)
dizziness, black out and physical discomfort	12 (15.19)
walk too fast	13 (16.46)
trip over boot cover	6 (7.59)
the inside of the boot slip	5 (6.33)
Intolerant unwell symptoms	
activity restricted, tiredness	36 (19.78)
headband too tight	35 (19.23)
eyes blurred	30 (16.48)
lack of protection experience	29 (15.93)
having trouble in urination	16 (8.79)
improper use of protective devices	14 (7.69)
talk loudly, move vigorously	14 (7.69)
pre-existing conditions	8 (4.40)
Sharp injuries	
eyes blurred	18 (22.50)
finger insensitivity	16 (20.00)
inappropriate glove size	14 (17.50)
absence of secure equipment	12 (16.25)
irregular operation	9 (11.25)
emotional tension during operation	5 (6.25)
patients' dysphoria, urge, and lack of coordination	6 (7.50)

working for 4 h (OR = 3.248, 95% CI: 1.484–7.110) and >4 h (OR = 3.096, 95% CI: 1.232–7.772) were high-risk factors for conjunctivitis, 64.86% of the conjunctivitis cases resolved gradually, and the rest required medication. Among the reasons concluded from subjective inference, irritation from sweat, normal saline and disinfectant accounted for 65.22% of the cases.

Falls

A fall is when someone hits the ground accidentally anywhere on his body except the feet. Forty-two people experienced such accidents, and 2 of them fell twice. The incidence was higher in those who worked in a critical patient ward ($p = 0.046$) and had no working experience in PPE ($p = 0.010$), and those with intermediate titles ($p = 0.040$). Multiple logistic regression analysis showed that inexperience with PPE (OR = 5.508, 95% CI: 1.299–23.354) was a high-risk factor for falls. The most serious consequence of a fall was coccygeal fracture, followed by occipital hematoma and open soft tissue injuries.

Intolerant unwell symptoms

During working hours, 426 (93.22%) respondents experienced uncomfortable symptoms, such as dizziness, headache, nausea, vomiting, fatigue, low back pain, palpitation, and dyspnea, etc., and most of the symptoms appeared in groups, while some of them could not even be accurately described. Among them, 39 (8.53%) respondents had to terminate their jobs ahead of time or did not leave the ward according to standard procedures due to intolerant physical discomfort. The incidence was significantly higher in females than in males ($p = 0.007$), and nurses were more susceptible than doctors ($p = 0.004$). People with no PPE experience ($p = 0.046$) and those who worked for ≥ 4 h at a time ($p = 0.002$) were more vulnerable than others. According to multiple logistic regression analysis, continuous working for 4 h (OR = 5.372, 95% CI: 1.239–23.301) and >4 h (OR = 8.608, 95% CI: 1.843–40.217) were the high-risk factors for intolerant unwell symptoms. Physical discomforts were related to fatigue, protective load, and pre-existing diseases.

Sharp injuries

Twenty-eight respondents (6.13%) suffered 29 cases of sharp injuries, which were mainly involved in the following processes: reinstalling needle guard caps, injecting drugs, and collecting arterial or venous blood samples. The incidence in nurses was higher than that in

doctors ($p = 0.004$), and staffs in critical patient ward had a higher incidence than those in general patient ward ($p = 0.015$), while the incidence in people working continuously for 4 h and more was higher than that in others ($p = 0.013$). Working in a ward for critical cases (OR = 3.249, 95% CI: 1.344–7.854) and working as a nurse (OR = 9.766, 95% CI: 1.307–72.984) were high risk factors for sharp injuries. Blurred eyes, insensitive fingers, and inappropriate gloves may be the most probable causes for sharp injuries.

DISCUSSION

The main occupational injuries most commonly reported in previous literatures were sharp injuries, infectious diseases and chronic physical and mental disorders. At the beginning of the outbreak of COVID-19, some medical workers were infected due to inadequate experience in protection and materials in Wuhan [5]. Healthcare worker infection is often attributed to close contact with patients in lax protection [6], so medical personals were required to wear strict PPE to block droplet, aerosols and viral particles in the environment. However, working with PPE changes the human's physiological state, which may give rise to damage to the body. This study investigated occupational injuries among specialized medical assistance workers in emergency situation, and it was found that occupational physical impairments of medical personnel during the fight against COVID-19 were of concern, especially skin injuries, conjunctivitis, falls, discomfort symptoms and sharp injuries.

In this study, the working hours of doctors and nurses in the isolation ward were divided into groups of 4 h, 6 h or flexibly adjusted hours according to the situation. The PPE used included N95 masks (or hooded respirators), hats, goggles, face-screen rubber gloves, protective suits, and boot covers [7]. The N95 face masks are recommended as standard respirators for areas with suspected and confirmed COVID-19 patients, and block droplets and virus particles while increasing respiratory resistance [8]. Wearing PPE forces caregivers to consume more physical energy and causes more sweat and discomfort. Adverse effects of PPE have been widely reported [9–12]. Studies have shown that wearing N95 masks for 1 h can increase heart rate by 5.7–10.6 times/min, increase respiratory rate by 1.4–2.4 times/min, and increase percutaneous arterial PCO₂ by 1.7–3 mm Hg [12]. The protective clothing is made of water- and air-resistant material, which also affects sound transmission [13]. Wearing PPE forces

healthcare staffs to work through more resistance during moving, speaking and breathing activities, which make their bodies more prone to sweating, fatigue and physical pain [14].

Changes in climate and working conditions increase the risk of occupational injuries. A recent study showed that 81% of COVID-19 health care workers who used N95 masks and goggles suffered from protective-gear associated-headache [15]. However, besides N95 masks and goggles, there were also surface screens and other articles. Multiple items and elastic band compress the soft tissue and nerve formation in the head, leading to headache [16]. At the same time, when the compressed skin is subjected to moisture from sweat, it will cause pain, erythema, ulcers, blisters and other signs of pressure-induced injuries [17]. In this study, the incidence of skin injuries was 22.76%, slightly lower than the rate of 28.44–42.8% reported by Jiang et al. [18], and 8 of those had 2 repeated skin injuries and 10 had lesions in more than 1 body part. The differences were attributed to different working hours in protective equipments. The 15.10% of staffs suffered from conjunctivitis, with conjunctiva congestion, tears, tingling and other unwell symptoms during working period. Chemical lesion (sweat, disinfectant) and physical irritation (cold saline, compression from goggles) may account for as much as 65.22% of the cases. For those whose symptoms did not alleviate spontaneously, infectious etiology and chemical injuries were often considered for further drug treatment.

All the uncomfortable symptoms above interacted with each other. Over time, when the mask is wet with sweat, nasal and mouth secretions, its permeability decreases, making the discomfort more severe. In a study on SARS prevention, hemodialysis patients with end-stage renal disease and no lung disease experienced an average of 9 mm Hg decrease in oxygen partial pressure after wearing a N95 mask for 4 h, and some of them suffered from different degrees of hypoxia, chest discomfort and dyspnea [19], suggesting that physical discomforts caused by protective products are universal. In addition, uncomfortable temperature and pre-existing chronic disease factors can exacerbate the symptoms.

Falls are common in young children and the elderly [20]. Few studies have reported falls among medical personnel. The incidence of falls among medical staffs in this study was as high as 9.19%. The slippery ground caused by sanitizer and hand washing was a major cause for falls. In addition, the double boot-cover internal

slippage and accidentally stepping on the shoe cover also led to falls.

Being stabbed by a sharp instrument often led to the exposure to body fluids and consequent occupational nosocomial infection, with nursing staffs being the main high-risk group in China [21]. In this study, the incidence of sharp injuries was 6.13%, and 96.43% of the victims were nurses. In a literature, the monthly incidence of sharp injuries among medical staffs was 7.8% [22], which was basically consistent with the results of this study. It should be noted, however, that the incidence of sharp injuries in intensive care unit was significantly higher (10.19%). Wearing glasses blurs the vision, and wearing gloves dulls the fingers, while the working environment and practical medical supplies had changed. All of these factors put the medical staffs in danger of needle injuries. Notably, more than 10% of sharp injuries occurred during insulin injection with a dedicated pen. The tip of an insulin pen (30–32 G, 4–8 mm) is thinner and shorter than a conventional syringe, so special attention should be paid when using an insulin pen. Invasive procedures are significantly more frequent in the critical care unit than in the general ward. As a result, medical staffs in the critical care unit had to face a higher risk of needle injuries. In addition, physical discomforts also increase the risk of falls and sharp injuries. More devices with safety features should be used to prevent percutaneous exposure injuries in healthcare staffs [23].

It is noteworthy that only 19.91% of the employees had previous working experience in an isolation ward. Except for conjunctivitis, experienced workers had a lower incidence of fall and skin injuries than inexperienced workers. Multivariate logistic regression analysis showed that the lack of experience with protective gears was a risk factor for falls and skin injuries, possibly due to physical adaptation. In consequence, the risk of occupational injuries may be effectively reduced by daily and practical training of protective equipment. A number of medical personnel should be routinely allocated to the infectious wards and receive formal training to respond to unforeseen pandemic. This study reveals that continuous working for 4 h and >4 h were risk factors for skin injuries, conjunctivitis, and intolerant discomfort. Other studies also support to take “4 hours” as a cut-off point of duration in using PPE [15,18].

There are some limitations in this study that should be noted. First, this is a retrospective survey, and some researchers may have inaccurate memories. Second, this study investigated the situation in some areas of

Hubei Province and cannot reflect the general situation. Third, the reason for physical injuries was the subjective feeling of the respondent, but not necessarily reflect the fact.

CONCLUSIONS

Common occupational health impairments of COVID-19 health workers traveling to other places include skin lesions, conjunctivitis, falls, clusters of uncomfortable symptoms, and sharp injuries, etc. These injuries are mainly caused by occupational use of PPE. Working in the critical care unit, job position of a nurse, lack of experience in protective gear, and continuous working for ≥ 4 h were risk factors for physical discomfort/damage. During epidemics of infectious diseases, it is necessary to enhance training on protective gear and avoid continuous working for ≥ 4 h to protect the health of front-line medical personnel.

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