Influence of workload, mental health and professional quality of life on healthcare workers' hand hygiene behavior in medical aid during COVID-19 pandemic

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Research

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Abstract

Background

Appropriate hand hygiene behavior is much crucial during COVID-19 pandemic, which is influenced by workload, mental health and professional quality of life. The increasing workload, worse mental health and negative professional quality of life are severe challenges for healthcare workers, whereas the evidence of mechanism between them and hand hygiene behavior are limited. This study aimed to understand and model how HCWs' hand hygiene behaviors were influenced by workload, mental health and professional quality of life.

Methods

A total of 1,734 healthcare workers were investigated, covering self-reported hand hygiene behavior, mental health, workload, professional quality of life and socio-demographic characteristics. Structural equation modelling was conducted to confirm interrelationships and parameters among the variables.

Findings

The final model had a good fit (CFI=0.980; TLI=0.941; RMSEA=0.055). Higher workload was linked to worse mental health ($\beta = 0.165$, $p < 0.001$) and higher burnout ($\beta = 0.183$, $p < 0.001$). Worse mental health was linked to higher burnout ($\beta = 0.339$, $p < 0.001$). The higher burnout was associated with worse self-reported hand hygiene behavior ($\beta = -0.302$, $p < 0.001$).

Conclusion

Workload is positively associated with mental health and burnout; mental health is positively related to burnout; burnout is negatively associated with hand hygiene behavior. Thus, hand hygiene behavior can be promoted by the strategy to decrease the workload, burnout and enhance mental health.

Introduction

COVID–19, as an emerging infectious disease, is caused by SARS-CoV–2. With the virus spread globally, WHO declared the outbreak a Public Health Emergency of International Concern on 30 January, and a pandemic on 11th March. Up to 8th May 2020, more than 3.8 million cases have been identified across 187 countries and territories, bringing about nearly 269,000 deaths. Healthcare workers (HCWs) are at the front line in the battle against COVID–19, placing them in more hazards. HCWs in medical aid team are particularly exposed to numerous bio-psycho-socio-behavioral risk factors[1]. These hazards, including pathogen exposure, higher workload, psychological distress and occupational burnout, lead to poor adherence to infection control, healthcare-associated infections, other adverse events, etc.[2–4].

The poor adherence of hand hygiene may induce terrible healthcare-associated infection between HCWs and patients, resulting in a considerable burden of morbidity, mortality and healthcare cost, especially in

the period of COVID–19 pandemic[5]. Previous studies have explored the influence and mechanism of knowledge, attitude, awareness and socio-demographic characteristic on hand hygiene comprehensively[6, 7]. However, the evidence concerning the workload and psychological status on hand hygiene was limited.

The contributors of workload in HCWs consist of the number of patients assigned to a nurse, severity of patients, skill set of nurses, etc.[8]. It has been shown that the increase of workload in nurse by one patient would increase the likelihood of inpatient hospital mortality by 7%[9]. The workload of HCWs increases with the growing number of confirmed and suspected cases of COVID–19, which may worsen their mental burden[3]. Pérez-Francisco found that increasing workload leads to burnout and affects related phenomena including health status of HCWs and the quality of care[10]. Detailly, Aiken indicated that effect of increased workload was manifested through burnout[11]. However, the evidence of relationship between workload, mental health and burnout in HCWs is limited.

HCWs suffered mental burden in emerging infectious diseases[12]. For example, Lai found 50.4% HCWs reported depression, 44.6% reported anxiety, 34% reported insomnia and 71.5% reported distress in early COVID–19outbreak in China[3]. Meanwhile, Tan found HCWs returning to work during COVID–19 epidemic reported the prevalence of anxiety, depression, stress and insomnia[13]. Gershon and Lu also found that HCWs were exposed to significant mental symptoms including fear, emotionally and physically exhausted and frustrated during the deployment to the Ebola and SARS epidemic[12, 14]. The severe mental health can influence the behaviors, which demands higher requirement for HCWs in pandemic period, especially for the infection control and prevention behaviors, like hand hygiene behavior. More precisely, Lawson found that the higher wellness (covering mental health) scores engaged in more career-sustaining behaviors and better reported ProQOL[15]. Liu found that mental health have negatively moderated effect on co-creation behaviors[16]. As for hand hygiene behavior, Ranasinghe found that reduced mental health status may lead to worse hygiene behaviors in adolescents[17]. Nevertheless, current evidence of how mental health influence burnout and hand hygiene behavior simultaneously is scarce.

Professional quality of life (ProQOL) is defined as “the quality one feels in relation to their work as a helper”, which is appropriate for individuals exposed to potentially traumatizing events, as a result of paid or volunteer work, like medical aid team[18]. ProQOL incorporated both negative and positive aspects, including burnout, secondary traumatic stress and compassion satisfaction. Compassion satisfaction refers to positive feelings or sense of self-efficacy derived from helping others. Burnout is a syndrome which occurs when individuals are exposed to stress that exceeds their ability to deal with or control in their work environment[19]. As compassion fatigue, burnout is related to frustration with work situation and colleague, whereas secondary traumatic stress is unique to the health care profession and patient care. Zhang found that the distance between working adults with the epicenter of Wuhan has an inverted U-shaped relationship with their negative aspect of ProQOL, suggesting the high risk of negative aspect of ProQOL for HCWs working in Wuhan[20]. It also has been shown that nurses who cared for MERS-infected or suspected patients have higher level of negative aspect of ProQOL in outbreak of MERS-

CoV[21]. Furthermore, with the higher risk of negative aspect of ProQOL, HCWs were more likely to behave with poor quality of care, including poor quality and safety measures, unprofessional behavior and suboptimal patient care practice[4, 22].Colindres and Manomenidis found that negative aspect of ProQOL was a negative predictor of adherence with infection control measures including hand hygiene[23, 24].

In summary, current evidence about how workload, mental health and ProQOL on hand hygiene behavior is limited. The aim of this study was to understand how HCWs' hand hygiene behaviors were influenced by workload, mental health and ProQOL to improve psychological status and promote hand hygiene behavior of HCWs in medical aid.

Based on the above literature analysis, we developed the following hypotheses: (Figure 1)

H1: Workload of HCWs affects their mental health

H2: Mental health of HCWs affects ProQOL

H3: Workload of HCWs affects ProQOL

H4: Mental health of HCWs affects their self-reported hand hygiene behavior

H5: ProQOL of HCWs affects their self-reported hand hygiene behavior

H6: Workload of HCWs affects their self-reported hand hygiene behavior

Methods

Settings

This study was conducted at the Optics Valley Branch of Tongji Hospital in Huazhong University of Science and Technology, Wuhan, China, where 828 beds were accessible to treat COVID-19 patients, and 1,462 patients were admitted, among whom 1,341 were cured, between 2ed February and 30th March 2020. A total of 17 medical aid teams from other hospitals across the China participated the treatment and care work in this hospital. Up to now, no HCWs from medical aid team was infected with COVID-19.

Participants and data collection

A structured online questionnaire survey was conducted from 5th to 7th March 2020. HCWs in medical aid team who were willing to take part in the study submitted the finished online questionnaires, which included the self-reported hand hygiene behavior, mental health, workload, ProQOL and socio-demographic characteristics. A total of 1,734 HCWs were surveyed.

Instrument

Hand hygiene behavior

Hand hygiene was measured by the average frequency of hand hygiene adherence to 18 moments based on the infection control guideline issued by National Health Commission of China, along a five-point Likert scale that ranges from 1 (never) to 5 score (very often), reflecting the frequency of hand hygiene. The 18 moments are before touching a patient, before aseptic procedure, after body fluid exposure risk, after touching a patient, after touching patient surroundings, during work on a soiled body site to a clean body site on the same patient, before putting on PPE, before after and during removing PPE, before wearing glove, after removing glove, arriving and leaving work place, before drinking, before and after toilet, before returning to the place of residence.

Chinese health questionnaires (CHQ)

CHQ is a self-administered instrument to measure the psychiatric morbidity in Chinese context, which was adapted from the General Health Questionnaires, with the addition of culturally-relevant items[25]. CHQ is composed by 12 items, measured by “not at all”, “about as usual”, “more than usual” and “strong feeling”, scoring 0, 0, 1, 1 respectively. The internal consistency of CHQ is indicated by an alpha coefficient of 0.79, which is generally used in Chinese context[14, 26]. The higher the score was, the poorer the health status was.

Workload

Workload was a toughly quantifiable variable, which was measured by qualitative interview, number of patients, specific questionnaires of each study and no tool[9, 10]. We used a self-reported item to measure workload by five-point Likert scale.

ProQOL

The ProQOL Scale of Chinese version was adopted to assess burnout, secondary traumatic stress and compassion satisfaction using a five-point Likert scale that ranges from 1 (never) to 5 (very often)[27]. In this study, internal consistency ranged from acceptable to strong: burnout (α = 0.869), secondary traumatic Stress (α = 0.756) and compassion satisfaction (α = 0.936). The 30-item ProQOL scale consists of three subscales: compassion satisfaction (10 items), burnout (10 items) and secondary traumatic stress (10 items). The items 1, 4, 15, 17 and 29 are reverse scored.

Statistical analysis

Descriptive analysis was performed to display the characteristics of HCWs. The score of mental health, workload, ProQOL and self-reported hand hygiene was described by mean, standard deviation (SD) and

range. Pearson's correlation analysis was conducted to evaluate the relationship between them. Structural equation modelling (SEM) was conducted via full maximum likelihood to confirm interrelationships and parameters among the variables. Goodness-of-fit indices were used to evaluate the fitness of the model. The following goodness-of-fit indices were used to establish the validity of the model: Chi-squared statistic, Tucker–Lewis index (TLI > 0.90 acceptable, > 0.95 excellent), comparative fit index (CFI > 0.90 acceptable, > 0.95 excellent), root mean square error of approximation (RMSEA < 0.08acceptable, < 0.05 excellent)[28, 29].

Results

Most participants were nurses (79.76%) and female (75.26%) among 1734 HCWs. The mean and SD of age and work year were 33.33±6.39 and 10.90±6.48, respectively. Those HCWs came from six provinces/ municipalities. (Table 1)

Table 1
HCWs' sociodemographic characteristics（N=1734）

Variable name	Median ± SD/frequency (percent)
Gender	
Male	429(24.74%)
Female	1305(75.26%)
Profession	
Doctor	351(18.17%)
Nurse	1383(79.76%)
Age	33.33±6.39
Work year	10.90±6.48
Province/municipality coming from	
Jiangsu	539(31.08%)
Zhejiang	468(26.99%)
Shandong	327(18.86%)
Fujian	217(12.51%)
Shanghai	117(6.75%)
Guangdong	66(3.81%)

The low level of mental health, slightly higher workload and high frequency hand hygiene was shown.in HCWs. As for ProQOL, burnout, secondary traumatic stress and compassion satisfaction were fell into

low level, medium level and medium level, respectively. (Table 2)

Table 2
Score of workload, mental health, ProQOL and hand hygiene

		Mean	SD	Range
Mental health		1.125	1.438	0-10.00
Workload		3.407	0.662	1.00-5.00
ProQOL	Burnout	19.420	5.735	10.00-40.00
	Secondary traumatic stress	24.764	5.095	10.00-49.00
	Compassion satisfaction	41.432	6.493	10.00-50.00
Hand hygiene		4.815	0.306	1.00-5.00

According to Pearson's correlation analysis, workload was positively associated with mental health, burnout, secondary traumatic stress and negatively associated with compassion satisfaction ($p<0.01$). Mental health was positively associated with burnout, secondary traumatic stress and negatively associated compassion satisfaction ($p<0.01$). Hand hygiene was negatively associated burnout, secondary traumatic stress and positively associated with compassion satisfaction ($p<0.01$). Burnout was positively associated with secondary traumatic stress and negatively related to compassion satisfaction, while secondary traumatic stress was negatively associated with compassion satisfaction ($p<0.01$). (Table 3)

Table 3
Correlations among workload, mental health, ProQOL and hand hygiene

	Workload	Mental health	Burnout	Secondary traumatic stress	Compassion satisfaction	Hand hygiene
Workload	1					
Mental health	0.165**	1				
Burnout	0.239**	0.369**	1			
Secondary traumatic stress	0.226**	0.386**	0.578**	1		
Compassion satisfaction	-0.105**	-0.207**	-0.797**	-0.192**	1	
Hand hygiene	-0.041	-0.40	-0.302**	-0.091**	0.366**	1
**: p<0.01; *: p<0.05						

A good fitness of data into the final model was found: ^{2} = 12.624, P = 0.002; CFI = 0.980(>0.95); TLI = 0.941(>0.90); RMSEA = 0.055(<0.08).The final pathway showed that higher workload was linked to worse mental health(β = 0.165, p < 0.001) and higher burnout (β = 0.183, p < 0.001). Worse mental health was linked to higher burnout (β = 0.339, p < 0.001). The higher burnout was associated with worse self-reported hand hygiene behavior (β = −0.302, p < 0.001). Only significant pathways (p < 0.05) were reported with standardized path coefficients. (Figure 2)

Discussion

This study found the relatively low level of symptoms of mental indisposition in HCWs and determined the mediated effect of mental health in the relationship between workload and burnout, which contributed to lower hand hygiene behavior. However, only the effect of burnout was found in ProQOL, with the relation regarding to secondary traumatic stress and compassion satisfaction insignificant.

Contributors of hand hygiene behavior

Burnout is found to be associated with hand hygiene, while the effect of workload and mental health is indirect in our study, which has been explored by previous findings. Just as burnout is frequently associated with poor practice, communication, quality and safety in health care[4], the effect works in hand hygiene behavior similarly. And researchers indicated that burnout was an incremental predictor of nurses' self-reported adherence with infection control measures (covering hand hygiene)[23, 24]. The indirect effect of workload on hand hygiene was also found to be significant in our study, which provides more explanation on how workload influence hand hygiene compared to previous studies. For example, Ataiyero and Smith found that workload is one of the main barriers to hand hygiene, especially in developing countries based on narrative review and Theoretical Domains Framework [30, 31], while Zhang found that high nursing workload is confirmed to be a main associated factor of poor hand hygiene in China[32]. Furthermore, the indirect effect of mental health on hand hygiene was also found to be significant in our study, while the direct effect was insignificant, which was different from previous studies. For example, Tan found that the less severe mental health syndrome were directly associated with more personal psychoneuroimmunity prevention measures including hand hygiene in HCWs[13]. Similarly, mental health is found the ability to directly enhance the behavior apart from hand hygiene, including career-sustaining behavior and co-creation behavior[15, 16].

Relationship of Mental health, workload and ProQOL

The relationship between workload and mental health with ProQOL (burnout) were, as hypothesized, consistent with previous studies in different context. Xiao also indicated workload is a contributor to mental health among Chinese petroleum industry workers, which should take effective preventive measures[33]. Aiken found that the nurse burnout increases when the workload augments with less patient-to-nurse ratios in America[11]. Meanwhile, Győrffy also found that increased workload has a clear

impact on mental health (sleep disorders) and burnout based on two nationally representative surveys of female doctors in Hungary[34]. In addition, Neville suggested the promotion of health is effective to counteract compassion fatigue and burnout and enhancing compassion satisfaction[35]. Meanwhile, Lawson found that counselors with better health reported higher positive ProQOL factors (compassion satisfaction)[15].

Relationship of burnout, secondary traumatic stress and compassion satisfaction

We found that higher burnout is associated with higher secondary traumatic stress and less compassion satisfaction, which is in line with previous studies[36]. Previous studies found that the overload work, inappropriate working processes and organizational structure are the drivers of more burnout and less compassion satisfaction[18, 37]. The relative intervention is the approach to reduce burnout, secondary traumatic stress and increase compassion satisfaction, including mindfulness-based technique, emotions empowerment, improving the work environment, etc.[38].

Implication and limitation

The significant relationship between mental health, workload, ProQOL and hand hygiene behavior can provide an approach to promote the adherence of hand hygiene through decrease the workload, burnout and enhance mental health, by means of increasing human resources and relevant interventions for HCWs who are working in COVID-19 period and under intensive pressure. Stress from work itself (i.e. patient care) reflecting on secondary traumatic stress is also crucial, for the close connection with burnout which focusing on working environment (i.e. work situation and colleague relationship) [18]. The study has limitation. As our SEM was constructed using cross-sectional data, those relationships should be tested by further longitudinal data to generalize the relationships between those factors.

Conclusions

This study gets a good-fit model that determines the relationships: workload is positively associated with mental health and burnout; mental health is positively related to burnout; burnout is negatively associated with hand hygiene behavior. The mediated effect of mental health is also found in the relationship between workload and burnout. It is suggested that hand hygiene behavior can be promoted by decreasing the workload, burnout and enhancing mental health, by means of increasing human resources and relevant interventions for HCWs.

Abbreviations

HCWs: Healthcare workers; ProQOL: Professional quality of life;CHQ: Chinese health questionnaires; SD: standard deviation; SEM: Structural equation modelling; TLI: Tucker–Lewis index; CFI: comparative fit

index; RMSEA: root mean square error of approximation

Declarations

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Consent for publications

Not applicable.

Authors' contributions

Qian Zhou and Xinping Zhang are responsible for conceptualization and manuscript drafting. Qian Zhou collected the data and performed the statistical analysis.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

The study was approved by Ethics Committee of Tongji Medical College, Huazhong University of Science and Technology. All participants were enrolled in the investigation using the principles of informed consent and confidentiality.

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Figures

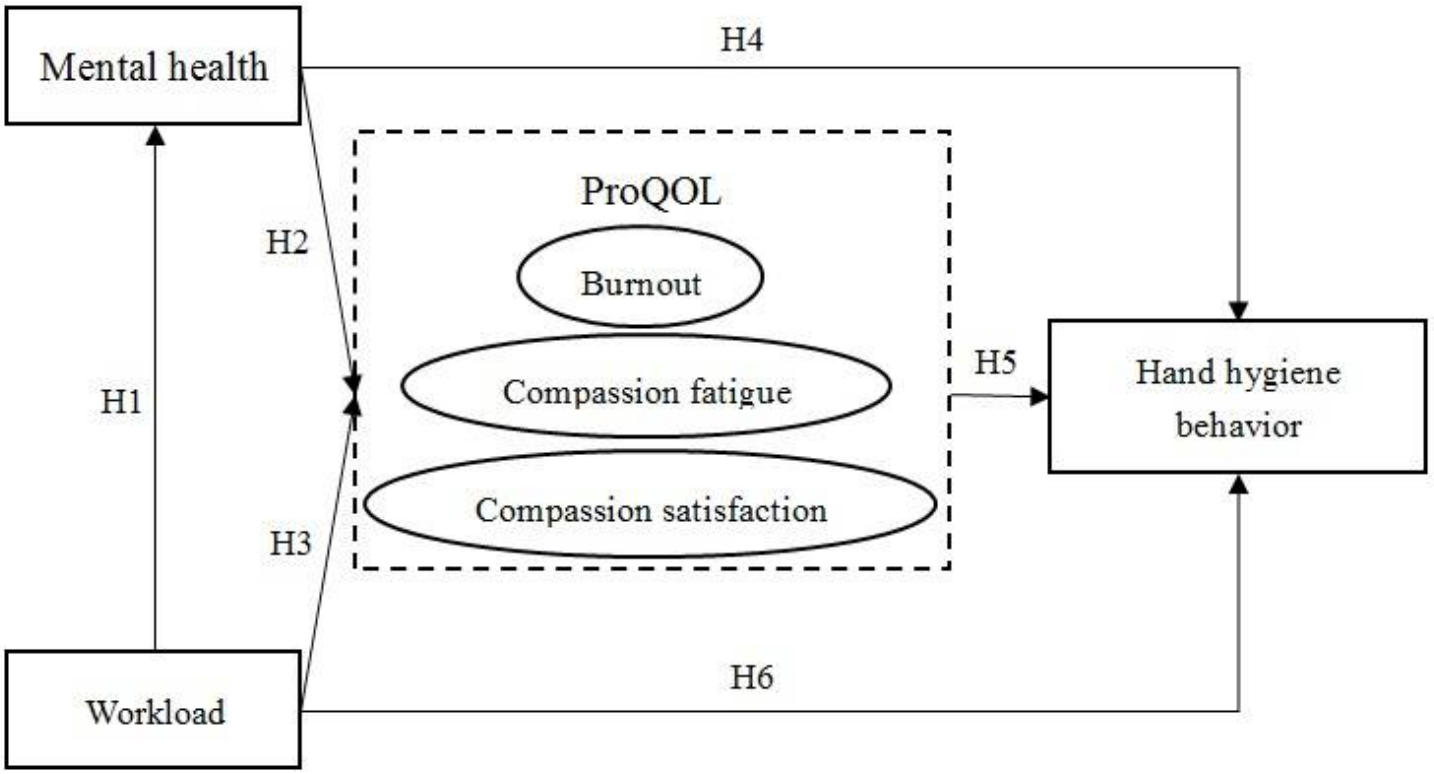

Figure 1

Hypotheses of the mental health, workload, ProQOL and hand hygiene behavior among HCWs

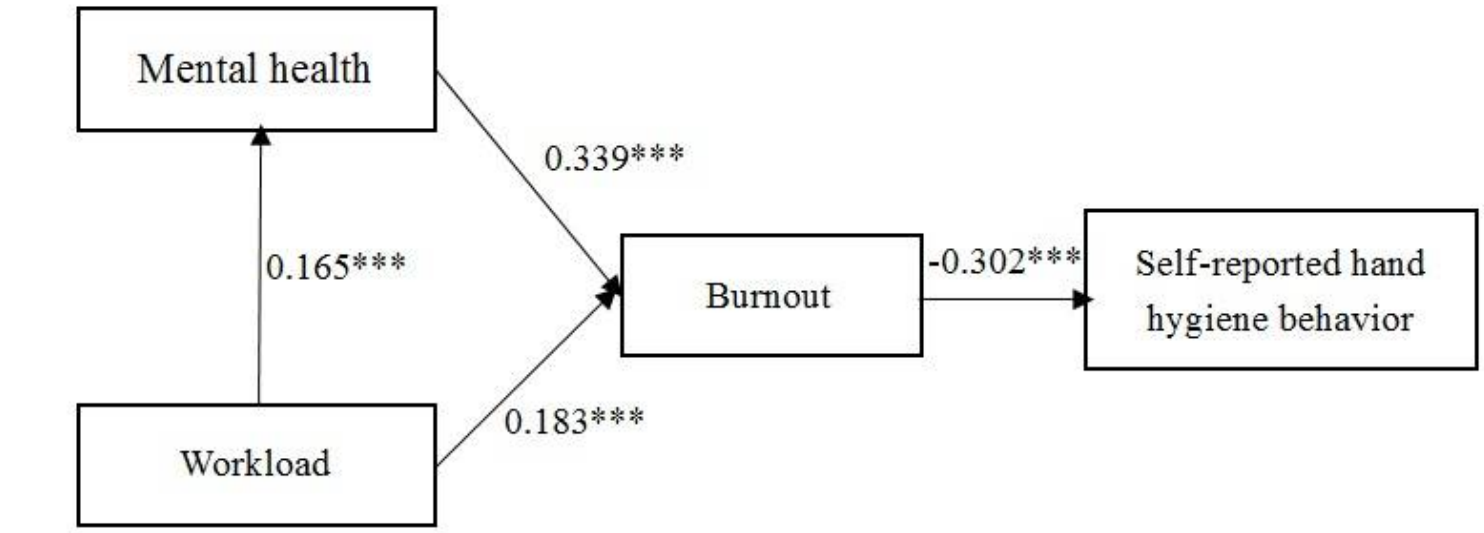

Figure 2

Structure equation model on mental health, workload, burnout and hand hygiene in HCWs. ***: p<0.001; **: p<0.01; *: p<0.05