

Compliance with COVID-19-Preventive Behaviours among Employees Returning to Work in the Post-Epidemic Period

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Abstract

Background

The emergence of the new coronavirus disease (COVID-19) as a global pandemic has had an impact on the lifestyle of people worldwide. Government measures aimed at containing the spread of the virus have been successful in many places, leading to a relaxation of these measures. To prevent the return of an outbreak in these places, people returning to the workforce are expected to follow proper health behaviours. Therefore, this study investigated COVID-19 related knowledge, attitudes, and behaviours of employees who are returning to work during the COVID-19 prevention and control period as well as their compliance with recommended COVID-19 preventive behaviours.

Methods

A cross-sectional study design was used. Data were gathered using an online questionnaire survey from March to May 2020 among 1,300 returning employees in China. Questionnaire items concerned participants' COVID-19-related knowledge, compliance with recommended preventive behaviours, and levels of depression and anxiety. Univariate and multi-factor methods were used to analyse the data and identify factors influencing behaviour compliance.

Results

Six hundred and ninety-eight (53.7%) participants showed high compliance, and 602 (46.3%) showed low compliance. High education level (odds ratio [OR] = 5.598, 95% confidence interval [CI]: 1.846–16.976), white-collar occupation (OR = 1.992, 95% CI: 1.331–2.983), high knowledge of COVID-19 (OR = 1.704, 95% CI: 1.303–2.229), no anxiety (OR = 0.646, 95% CI: 0.463–0.901), and quarantining (OR = 1.320, 95% CI: 1.039–1.676) predicted better compliance with preventive behaviours ($p < 0.05$).

Conclusion

Factors such as educational background, occupation, isolation, COVID-19 knowledge level, and psychological anxiety have an impact on the health behaviour of employees returning to work. For employees returning to work during the post-COVID-19-epidemic period, compliance with recommended health behaviours requires improvement. The provision of health education and psychological counselling and the continuance of a strict isolation policy could enhance such compliance.

1. Background

The novel coronavirus (COVID-19) pneumonia is an emerging infectious disease caused by severe acute respiratory syndrome coronavirus 2, and is characterised by high infectivity and complex transmission

routes [1, 2]. On 11 March 2020, the World Health Organization (WHO) defined COVID-19 as a 'global pandemic' [3] and, by 10 June, 7,145,539 confirmed COVID-19 cases, including 408,025 deaths, had been reported across 216 countries, territories, or regions [4]. China has reported 84,641 COVID-19 cases and 4,645 deaths [4]. *Where there is an epidemic, measures need to be made to eliminate it* [5]. The Chinese government conducted resolute and scientific prevention and control measures to address the outbreak, and implemented multi-level targeted prevention and control strategies across regions; this resulted in the epidemic being effectively brought under control [6]. Consequently, in early March, the entire country began to resume production and social life began to return to normal. However, the question of how to retain this level of progress remains. The WHO has recommended that people wear masks, maintain a minimum physical distance of at least one metre from others [7], avoid gathering in large crowds [8], and avoid eating wild animals [9]. Such behaviours can reduce the risk of infection, as the wide dissemination of COVID-19 is closely related to a lack of healthy behaviours[29]. In the post-epidemic period, behavioural factors will play a key role in ensuring that the epidemic does not return. The present study examined existing health behaviours and their influencing factors among individuals who are returning to work in the post-epidemic period.

2. Methods

2.1. Participants and procedure

From 15 March to 15 May 2020, an online questionnaire survey was administered to employees in China who were returning to work after the COVID-19 epidemic. The subjects were presented with a description of the study, and were informed that participation was voluntary and anonymous. The inclusion criteria were: Over 18 years old who returning to work between 15 March and 15 May 2020, and able to independently complete the online questionnaire. The exclusion criteria were: A minor under the age of 18,not working or not yet returned to work, having a confirmed or suspected COVID-19 infection after resuming work or during isolation, and being illiterate and unable to complete the questionnaire independently. The survey was anonymous. Online informed consent was obtained by asking participants to check the box on their device's screen with the response of their choice (i.e. 'I agree to participate in the survey' or 'I do not agree to participate in the survey'). If they checked 'I do not agree', the computer program terminated automatically. The questionnaire used in the article was developed for this study, a blank English language version was provided after the References, titled "Additional files.Overall, 1,410 questionnaires were collected, of which 1,300 were valid, giving an effective response rate of 92.2%. The respondents' characteristics are shown in Table 1 and Table 2.

The study was approved by the institutional review board of Ningxia Medical University (document number: 2020112).

2.2. Survey Instrument

2.2.1. General demographic information

Part of our online questionnaire consisted of questions concerned with general demographic information, including sex, age, marital status, education level, household registration, occupation, and years of employment.

2.2.2. COVID-19 knowledge

Based on the New Diagnosis and Treatment Scheme for Novel Coronavirus Infected Pneumonia (fifth trial edition) [26] and the Protocol on Prevention and Control of COVID-19 (sixth edition) [27] issued by the National Health Commission of China, a definitive questionnaire concerning epidemiological characteristics, clinical symptoms, and comprehensive prevention and control measures for COVID-19 was formed. The scale comprised 10 items, with one point awarded for each correct answer (total score: 0–10). Scores of ≥ 8 indicated high knowledge, while scores of < 8 indicated low knowledge.

2.2.3. Mental-health status

As a result of the high incidence of depression and anxiety symptoms reported among quarantined subjects in previous studies [10], depression and anxiety were assessed in the present study. For this, the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder (GAD-7) were used; both scales have shown good reliability and validity in both foreign and domestic studies [11, 12]. Both scales use a four-point Likert scale (range: 0–3) for each item. For the PHQ-9, which comprises nine items, scores of 0–4, 5–9, 10–14, 15–19, and 20–27 indicate no, mild, moderate, severe, and extremely severe depression, respectively. The GAD-7 comprises seven items, with scores of 0–4, 5–9, 10–14, 15–21 indicating no, mild, moderate, and severe anxiety, respectively.

2.2.4. Behavioural compliance

To evaluate the respondents' compliance with COVID-19-preventive behaviours when returning to work, items concerning 10 such behaviours were included. The 10 behaviours were 1) wearing masks; 2) covering your mouth and nose when coughing and sneezing; 3) washing your hands frequently; 4) avoiding contact with, or buying or eating, wild animals; 5) being mindful of symptoms such as fever and coughing, and performing comprehensive health monitoring; 6) avoiding close contact with people showing symptoms of respiratory disease; 7) avoiding crowded places; 8) keeping rooms clean and opening windows for ventilation; 9) reducing visits to friends and relatives and dinners; 10) maintaining a healthy diet and taking moderate exercise. For these items, a five-point Likert scale was used (1 = 'completely unnecessary', 5 = 'very necessary'). Total scores ranged from five to 50 points. Scores of ≥ 40 indicated high compliance; scores of < 40 indicated low compliance.

2.3. Quality control

As the questionnaire was electronic, responses were required for all questions before submission. A 'skip item' option was provided to increase the likelihood of obtaining complete and logical responses. To avoid repeat answers, each IP address could only access the questionnaire once. A preliminary survey showed that it would take at least 300 seconds to complete all questions; thus, responses provided in less than 300 seconds were excluded.

2.4. Data Analysis

The data were checked and categorised. SPSS version 21.0 statistical software was used for statistical calculations. Two-sided p values of 0.05 were considered to indicate statistical significance. Chi-square tests and logistic multiple stepwise regression were used to determine the factors influencing the respondents' compliance.

The dependent variable was whether the respondents had good compliance with preventive behaviours (0 = no, 1 = yes). Education level, occupation, quarantining, COVID-19 knowledge, and anxiety were set as independent variables; multiple categorical variables (occupation, education) were set as dummy variables (Table 3). The relative risk for the variables and their confidence intervals (CIs) were calculated using the forward stepwise regression method of the unconditional logistic regression model.

3. Results

3.1. Respondents' knowledge and psychological status

The respondents showed high awareness of basic COVID-19-related knowledge, and most were aware of the associated protective actions, but some areas required strengthening. The average score for the general knowledge questionnaire was eight (\pm two); 971 (74.4%) participants showed high knowledge (total score: ≥ 8) and 329 (25.3%) showed low knowledge. Spearman rank correlation analysis showed a correlation with behavioural factors, $R = 0.224$ ($P < 0.001$). The three items with the lowest rate of correct responses concerned clear sources of infection (553 correct answers; 42.5%), clear routes of transmission (963; 74.1%), and clear symptoms of infection (651; 50.1%). The average score for the PHQ-9 was zero (\pm three); 1,059 (81.5%) showed no depression symptoms and 241 (18.5%) showed depression; of the latter, 93 (14.8%), 35 (2.7%), nine (0.7%), and four (0.3%) had mild, moderate, severe, and very severe depression, respectively. The average GAD-7 score (which was not normally distributed and was represented by the median and quartile distance) was zero (\pm two), with 1,118 (86.0%) showing no anxiety and 182 (14.0%) showing anxiety; among the latter, 167 (12.8%), 13 (1%), and two (0.2%) had mild, moderate, and severe anxiety, respectively.

3.2. Compliance with preventive behaviours

The average score for compliance with preventive behaviours was 36.39 ± 6.958 ; 698 (53.7%) participants showed high compliance and 602 (46.3%) showed low compliance. The three behaviours with the worst compliance were covering your mouth and nose when coughing or sneezing (50.84%), keeping rooms clean and opening windows for ventilation (54.11%), and avoiding crowded public places (56.92%).

3.3. Behavioural compliance in terms of demographic characteristics

For behavioural compliance, there were no statistically significant differences regarding age, household registration, source of epidemic-related concerns, or presence of depression. However, statistically significant differences were found for gender, marital status, education level, occupation, years of employment, quarantining, knowledge of COVID-19, and presence of anxiety ($P < 0.05$; Table 1, Table 2).

Table 1. Comparison and analysis of compliance with preventive behaviours and basic characteristics.

Variable	Grouping	n	Behaviour	χ^2	P
Isolation	No	659	320	14.168	< 0.001
	Yes	641	378		
Source of epidemic-related concerns	Government release	726	376	2.392	0.122
	The media	574	322		
COVID-19 knowledge	Low	329	132	32.626	< 0.001
	High	971	566		
Anxiety	No	1118	615	5.568	< 0.001
	Yes	182	83		
Depression	No	1059	578	1.810	0.179
	Yes	241	120		

Table 2. Comparative analysis of compliance with preventive behaviours and other relevant factors.

Variable	Grouping	n	Behaviour	χ^2	P
Isolation	No	659	320	14.168	< 0.001
	Yes	641	378		
Source of epidemic-related concerns	Government release	726	376	2.392	0.122
	The media	574	322		
COVID-19 knowledge	Low	329	132	32.626	< 0.001
	High	971	566		
Anxiety	No	1,118	615	5.568	< 0.001
	Yes	182	83		
Depression	No	1,059	578	1.810	0.179
	Yes	241	120		

3.4. Analysis of factors influencing compliance with preventive behaviours

The results showed that education level, occupation, experience of isolation, COVID-19 knowledge, and psychological anxiety influenced the participants' compliance with preventive behaviours. Those with bachelor's degrees or above (odds ratio [OR] = 5.598, 95% CI: 1.846–16.976); office, management, and professional technical personnel (OR = 1.992, 95% CI: 1.331–2.983); people who were quarantining (OR = 1.320, 95% CI: 1.039–1.676); and those with good knowledge of COVID-19 (OR = 1.704, 95% CI: 1.303–2.229) all showed better behavioural compliance than their counterparts. Finally, people with anxiety showed lower behavioural compliance (OR = 0.646, 95% CI: 0.463–0.901). The results are shown in Table 4.

Table 3. Variable assignment

Variable	Grouping
Behaviour	Good compliance with preventive behaviours = 1, Bad compliance with preventive behaviours = 0
Education	Junior middle school or below = 1, High school or technical secondary school = 2, Junior college = 3, Bachelor's degree or above = 4
Occupation	Outdoor workers = 1, Office staff = 2, Managerial or technical personnel = 3, Other = 4
Experience of isolation	Yes = 1, No = 0
Knowledge of COVID-19	Good = 1, Bad = 0
Anxiety	Yes = 1, No = 0

Table 4. Logistic analysis of behavioural influencing factors

	Variable	β	SE	Wald c ²	P	OR (95% CI)
Education level	High school or technical secondary school	0.405	0.151	7.209	0.007	1.499 (1.115-2.014)
	Junior college	0.86	0.158	29.818	< 0.001	2.364 (1.736-3.219)
	Bachelor's degree or above	1.722	0.566	9.261	0.002	5.598 (1.846-16.976)
Occupation	Office staff	0.689	0.206	11.204	0.001	1.992 (1.331-2.983)
	Managerial or Technical personnel	0.377	0.175	4.659	0.031	1.458 (1.035-2.052)
	Other	-0.096	0.164	0.34	0.56	0.909 (0.659-1.254)
Quarantining		0.278	0.122	5.176	0.023	1.320 (1.039-1.676)
Anxiety		-0.437	0.17	6.621	0.01	0.646 (0.463-0.901)
COVID-19 knowledge		0.533	0.137	15.159	< 0.001	1.704 (1.303-2.229)
Constant		-0.938	0.159	34.989	< 0.001	0.391

4. Discussion

Since the COVID-19 outbreak, China has implemented comprehensive government and social mobilisation, and the epidemic has gradually been brought under control [13]. This study involved a comprehensive investigation of the COVID-19-related knowledge, attitudes, and behaviours of personnel returning to work in the post-epidemic period, focusing on identifying factors that influence compliance with preventive behaviours. The respondents showed a generally good level of overall compliance; however, some areas required attention (e.g., covering your mouth and nose when sneezing, avoiding close contact with people with respiratory diseases). Education, occupation, quarantining, anxiety, and knowledge factors impacted the respondents' health behaviours. This indicates that interventions such as health education, continued strict implementation of isolation policies, and psychological counselling should be administered, as this could enhance such workers' compliance with the recommended health behaviours and lifestyles.

The present findings showed that the higher the participants' academic background, the better their compliance with preventive behaviours. This may be because highly educated individuals may be more likely to learn and accept the COVID-19-related behavioural requirements. Recent studies have reported that a higher education level predicts higher knowledge of COVID-19 [14, 15], which accords with the present findings. This indicates that more comprehensive knowledge of COVID-19, especially regarding prevention and control measures and prognoses, leads to better behavioural compliance and a more active response to COVID-19 prevention and control measures. Concurrently, this study found that the respondents had a poor understanding of the sources of COVID-19 infection, the transmission routes, and the symptoms of infected people. Public information campaigns and educational interventions could improve the overall awareness of infectious-disease-prevention knowledge [16]. Thus, relevant government departments should strengthen knowledge dissemination regarding the epidemiological characteristics of COVID-19 and training regarding symptom recognition. Further, medical personnel, while conducting health-monitoring work, could contribute to this by issuing informational manuals, WeChat short videos, etc.

The respondents' occupations were related to their compliance with preventive behaviours, with office and management personnel and professional and technical personnel returning better scores than outdoor workers. This may be related to the low educational level of outdoor manual workers. Therefore, government health departments and enterprises should focus on performing temperature detection among and providing health education for outdoor workers. Businesses should conduct regular, scientific, and effective disinfection of workplaces, including the cleaning and disinfection of public areas such as offices, production workshops, vehicles, restaurants, elevators, meeting rooms, toilets, and object surfaces [17].

According to the pathology and characteristics of the COVID-19 epidemic, everyone is susceptible [18]. Our results showed that quarantined people had better compliance with preventive behaviours than did non-quarantined people. This indicates that people who have taken quarantine measures pay more attention to prevention and control behaviours, which plays a positive role in epidemic prevention and control. Research has shown that quarantining facilitates symptom surveillance, which allows early diagnosis and reduces the risk of infecting others [19] [20]. Therefore, migrant workers should be placed in isolation and observed before they return to work. During the isolation process, health education can be conducted through video courses, media, direct education, etc. Concurrently, businesses should disseminate information regarding preventive measures for COVID-19 through public announcements, bulletin boards, WeChat public accounts, and banners in workplaces. Before resuming work and production, businesses should provide all employees with information regarding COVID-19 prevention and control. Information manuals for such prevention and control measures and a practical mental health manual could be developed [21], which could help employees improve their awareness of how to protect themselves.

Studies have shown that anxiety is common during epidemics, and that psychological conditions influence behavioural compliance [22]. In this study, people with strong anxiety were found to be more

likely to have poor compliance with preventive behaviours. From this finding, it is clear that anxiety is linked to a lack of awareness and reluctance to perform recommended behaviours. The reason why anxiety would result in these attitudes is that people with anxiety may, in an attempt to avoid experiencing further distress and fear, seek to avoid reports in the news and on the Internet regarding the epidemic, which would result in these people being less informed regarding the virus and its characteristics. Businesses should be aware of the employees' mental-health status before they return to work, and should provide psychological consultation services if necessary [23]. Further, false information on the Internet regarding COVID-19 can cause panic [28]; therefore, in the short term, it is necessary to strengthen the management of online information and support scientific, in-depth, and continuous reporting by official media channels, which would serve to guide the direction of public opinion [24]; in the long term, public health literacy should be greatly improved [25].

5. Conclusions

In this study, a rapid population survey was conducted during the COVID-19 epidemic using online survey questionnaire. The knowledge, attitudes, and behaviours of people returning to work in the later period of the epidemic were determined, as were the factors influencing their behaviours. The findings can represent a reference for improving behavioural interventions, as well as a theoretical basis for epidemic prevention and control. A limitation of this study is that non-random sampling based on network invitations was employed, and the sample is not sufficiently representative of the entire population. Thus, further studies with an expanded sample size and scope are necessary.

Abbreviations

WHO
World Health Organization

Declarations

Ethics approval and consent to participate

This study was approved by the institutional review board of Ningxia Medical University (document number: 2020112). Participants provided informed consent. Online informed consent was obtained by asking participants to check the box on their device's screen with the response of their choice (i.e. 'I agree to participate in the survey' or 'I do not agree to participate in the survey'). If they checked 'I do not agree', the computer program terminated automatically. So we obtained from study participants was written.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to confidentiality.

Competing interests

The authors declare that they have no competing interest

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Authors' contributions

JL wrote the original draft, handled data curation, undertook formal analysis, and cowrote the methodology section. YT was mainly responsible for the overall data collection, investigation, and methodology of the study. SL handled data curation, was responsible for utilizing the software, and cowrote the methodology section. ZT served as the resource project administrator. LH supervised, and validated the information in our study. Lastly, JZ was mainly responsible for writing (reviewing and editing), and the study's overall conceptualisation among others. All authors have read and approved the manuscript.

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