RELIABILITY AND VALIDITY OF A QUESTIONNAIRE MEASURING CONCERNS, PERCEIVED IMPACT, ADEQUACY OF PRACTICE AND PREVENTIVE MEASURES OF COVID-19 PANDEMIC AMONG HEALTH CARE WORKERS IN MALAYSIA

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ABSTRACT

COVID-19 has posed an unprecedented burden on healthcare workers (HCWs) physically and mentally. Therefore, it is important to assess the psychological impact of the pandemic on HCWs mental well-being to be able to address the issue and plan appropriate interventions. However, validated instruments to evaluate mental health concerns suited for Malaysian HCWs are limited. This study aims to validate an adapted and translated questionnaire that measures the concerns, perceived impact, adequacy of practice and preventive measures related to COVID-19 measures (CIPP-Q). Items in the CIPP-Q were adapted from previous literature and local COVID-19 protocols. Items were developed in a dual-language, Malay-English format. Content validity was established with a panel of experts and face validity was conducted among a group of HCWs and researchers. Exploratory factor analysis and reliability analysis were performed to determine the dimensionality and internal consistency of the instrument. Final version of the CIPP-Q contained 39 items grouped into six constructs. A single component explaining 51.43 to 69.50% of the variance was extracted from each of the six constructs, demonstrating good dimensionality of the questionnaire. Whereas, Cronbach's alpha for each construct ranged from 0.738 to 0.917, indicating good internal consistency. The CIPP-Q is a reliable and valid instrument for measuring the psychological impact of COVID-19 on Malaysian HCWs.

KEYWORDS: Research Instrument, Survey, Outbreak, Mental Health, Occupational Health, Occupational Hazard

INTRODUCTION

The Coronavirus Disease 2019 (COVID-19) was first reported as an outbreak of pneumonia of unknown aetiology in the city of Wuhan, China in the end of December 2019 (1). Infected patients presented with breathing difficulties, dry cough, fever and lung infiltrations on radiographs. The virus has then crossed continents and the number of reported cases has escalated globally, prompting the World Health Organization to declare the outbreak as a Public Health Emergency of International Concern in January 2020 (2), and later on as a pandemic in March 2020 (3). As of 5th April 2021, the virus had infected 352,029 people and killed 1,295 individuals in Malaysia (4).

The ongoing COVID-19 pandemic has caused unforeseeable psychological distress for people around the globe, especially health care workers (HCWs), who are on the front lines of combating the infectious disease. With the increasing number of infected cases, HCWs are undeniably burdened with a higher workload, putting them at risk for deleterious health effects both physically mentally. A systematic review on the psychological impact of COVID-19 pandemic among HCWs showed the pooled prevalence of anxiety, depression and insomnia at 23.2%, 22.8% and 34.3%; respectively (5). Similarly, a cross-sectional survey in China reported a twofold prevalence of fear, anxiety and depression among front line HCWs who managed COVID-19 patients as compared to non-clinical staff (6).

Questionnaires are convenient and reliable measuring tools that may be used to assist in identifying mental health issues. A wide variety of questionnaires have been used to assess the psychological impact of outbreaks, such as the General Health Questionnaire (GHQ-28), Impact of Event Scale (IES) (7-9), Kessler Psychological Distress Scale (8), Emotional Exhaustion Scale of Maslach Burnout Inventory (MBI-EE) (8), Davidson Trauma Scale Chinese version (DTS-c) (10), and Chinese Health Questionnaire (CHQ-12) (10). Moreover, questionnaires could potentially detect symptoms of psychological distress that respondents may not want to disclose during face-to-face interviews. A study that investigated the comparison between questionnaire and interview results on burnout among medical residents in the Netherlands found that none of the ten respondents reported any serious burnout symptoms during an interview, but two of them had actually met the criteria for burnout through the questionnaire (11).

Understanding the perceptions of HCWs toward an outbreak is important as it provides an insight into how they recognise and approach stressful working conditions. Several studies on HCWs' perceptions of the COVID-19 pandemic (12,13) and prior outbreaks (9,14,15) have been conducted. However, to date, there has been no satisfactory measure of such mental health concerns in respect of Malaysia's healthcare settings and proprieties. This knowledge is crucial to guide policymakers and health authorities to develop proper interventions and preventive control measures appropriate for the country's HCWs. In this regard, we adapted and translated a questionnaire to assess HCWs' perceived concerns, impacts, preventive measures and practises on the COVID-19 pandemic among HCWs in Malaysia, dubbed the CIPP-Q. This study aims to validate the CIPP-Q which intends to investigate the concerns and perceptions of HCWs regarding the impact, preventive measures and practises during the pandemic while being sensitive to the local language, culture and institutional protocols.

MATERIALS AND METHODS

Questionnaire development

Items in the CIPP-Q were mainly adapted from a questionnaire developed by Koh et al. (9), which has been used to assess HCWs' psychological status during the Severe Acute Respiratory Syndrome (SARS) (9), Avian flu (14), and Middle East Respiratory Syndrome (MERS) outbreaks (12,15). Items in the questionnaire were modified to assess HCWs' sociodemographic and perceived concerns, impact, preventive measures and practises regarding COVID-19 with reference to the Ministry of Health Malaysia (MOH) guideline on the management of COVID-19 (16). There are items from Koh et al. (9) questionnaire concerning employers' responsibilities that were removed, e.g.; if employers would look after employees' needs, should they fall ill, and if employees were given a task outside their job scopes; because such issues were not pertinent to HCWs in Malaysia and do not apply to local governmental procedures and COVID-19 management in Malaysia. The "Preparedness" section of the questionnaire was further divided into two sections; "Practice" and "Preventive Measures"; to correspond to COVID-19 protocols and practises implemented within Malaysia's health care settings.

The initial CIPP-Q contained a total of 44 items to assess their concerns and perceptions towards the

pandemic, measured by a 4-point Likert scale from which respondents will choose the option that best supports their opinion; 0 for "Strongly Disagree", 1 for "Disagree", 2 for "Agree", and 3 for "Strongly Agree". Following a series of discussions, the 44 items were further grouped into four constructs that were identified as important in structuring the CIPP-Q (Table 1).

It was anticipated that the linguistic proficiency of the respondents would vary considerably in both English and Malay languages due to the diverse backgrounds of the HCWs. Therefore, to enhance comprehension, it was decided to present corresponding English and Malay language versions of all materials in the CIPP-Q. The CIPP-Q was translated into Malay by four bilingual Malays who spoke English fluently. Two translators were aware of the concepts the questionnaire intends to measure, while the other two translators were unaware of the objectives of the questionnaire. Back-translations of the initial questionnaire were then produced by another four bilingual Malays to verify the accuracy. The translated questionnaires were then reviewed, reconciled, and harmonised in a meeting attended by all of the translators and researchers.

Table 1. Constructs and number items in the initial CIPP-Q

Construct	Number items	Concept measured
Concerns	14	Concerns of work and non-work-related during COVID-19 outbreak management
Impact	7	Perceived impact on self and social life with work colleague with same working background
Practice	15	Self and work practices taken to prevent COVID-19 infection at workplace
Preventive Measures	8	Perceived adequacy on protocol and preventive measures that was taken during COVID-19 outbreak management

Content and face validity

Content validity was established with a panel of four experts within the MOH to assure that the items in the CIPP-Q were fully representative of what they aimed to measure. A discussion was held with the experts who were bilingual physicians with expertise in public health and occupational health. To be considered as an expert reviewer, the invited physicians must be native Malay language speakers and have at least five years of working experience in the field of public health or occupational health. The meeting discussed face and content validity as well as suggestions on how to improve the translated scale.

Another face validity meeting session to review whether the CIPP-Q was relevant and measurable by the items was conducted among a group of ten HCWs with similar backgrounds as the study population. In the session, reviewers were asked to express their opinions and suggestions with regard to the comprehension and length of sentences in the translated questionnaire as well as the suitability of its font size and layout. Based on all of the experts' and reviewers' opinions and suggestions, necessary modifications were then made to the questionnaire.

Study subjects

With reference to the rule of thumb established by Costello & Osborne (17), of using a minimum of five subjects for each item of the questionnaire, we decided to collect at least 220 responses for validation of the CIPP-Q. The questionnaire was made accessible to eligible participants via an open-sourced online platform from 1st March 2020 to 30th April 2020. Eligible participants were HCWs from three different health care settings; a hospital, a health clinic and a district health office; all of which were involved in the management of COVID-19 patients and screening activities in the state of Selangor, Malaysia. Over the 8-weeks period, a total of 224 HCWs responded and gave written informed consent to take part in the study.

Data analysis

Data was analysed using Statistical Packages Social Sciences (SPSS) version 26 for Windows. Descriptive statistics were utilised for selected variables. Results were presented as frequencies and percentages for categorical data, and as mean and standard deviation for numerical data. Factor analysis was performed to organise items into constructs, followed by reliability

Table 2. Socio-demographic background of the study population

Variable	Frequency (%)	Mean (SD)
Gender		
Male	94 (42.0)	
Female	130 (58.0)	
Age		33.42 (6.815)
Healthcare facility		
Hospital	54 (24.1)	
Health Clinic	135 (60.3)	
District Health Office	35 (15.6)	
Year service in the Ministry of Health		8.65 (0.406)
Profession		
Doctors	62 (27.7)	
Nurses	63 (28.1)	
Auxiliary staffs	66 (29.5)	
Administrative staffs	20 (8.9)	
Others	13 (5.8)	
Ethnicity		
Malay	185 (82.6)	
Chinese	14 (6.3)	
Indian	14 (6.3)	
Others	11 (4.9)	
Marital status		
Single	66 (29.5)	
Married	157 (70.1)	
Widowed	1 (0.4)	
Number children		2 (0.100)
Residency		
Together with family members or friends	183 (81.7)	
Alone	41 (18.3)	

Abbreviations: SD, Standard deviation

analysis to determine how well each item in the construct holds together.

Exploratory Factor Analysis (EFA) was done to determine the construct validity of the CIPP-Q. Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were applied to measure the sampling adequacy. A sample was considered adequate if the KMO value was above 0.50 and Bartlett's test was significant ($p<0.05$) (18). Principal Component Analysis (PCA) method was applied in the extraction of components, retaining components with Eigenvalues of >1.0. Varimax rotation was chosen as it has been shown to reduce factor complexity and concurrently optimise the variance of the loading factor of each item on the extracted components (19). Moreover, the PCA with varimax rotational method has previously been applied in similar psychology-related questionnaire validation studies (20,21). Items with a correlation value (r) of <0.30 were deleted (19); and after checking the factor loading (FL), items with FL<0.50 or conflicting with a sound theoretical explanation were also deleted (22). One-component constructs were desired, where each of the identified components should have at least three variables with FL⩾0.50 loading only on one component for each construct. Additionally, the acceptable total variance explained (TVE) by the retained components was set to ⩾50% (23). Different PCAs with varimax rotation runs were iteratively performed until a satisfactory and interpretable solution was achieved.

Once the constructs of CIPP-Q were finalised, reliability analyses of individual items were carried out to investigate the reliability of CIPP-Q. Internal consistency of the items was measured using Cronbach's alpha coefficient. Items with a corrected-item total correlation value (CITC) of ⩾0.30 were selected and items with CITC value of <0.30 were deleted. The items of the CIPP-Q were considered to represent a measure of high internal consistency if the total alpha value was more than 0.70 (24).

RESULTS

Sociodemographic

Table 2 shows the sociodemographic background of the participating subjects. The gender of the subjects was almost equally represented with 42.0% males and 58.0% females. More than half of the subjects were from health clinics (60.3%). The mean age and duration of service in the MOH was 33.42 years old (SD=6.82) and 8.65 years (SD=0.41), respectively. Most of the subjects were clinical staff; 27.7% doctors, 28.1% nurses and 29.5% auxiliary staff. The majority were of Malay ethnicity (82.6%). A total of 70.1% were married, with a mean of twp (SD=0.10) children, and most of them lived together with family or friends (81.7%).

Exploratory factor analysis

Using PCA with a varimax rotational method, an initial EFA was run on the 44 items, which provided the KMO and correlation statistics, retained all factors with Eigenvalues >1.0, and suppressed all factor coefficients <0.3. Tests for the goodness of fit for EFA revealed that the KMO value was 0.848 and Bartlett's Test of Sphericity value was 5,827.917 (df=946, p<0.001), indicating that the data were suitable for factor analysis (25). The items' commonalities of the initial solution observed were all larger than 0.2 (26), hence, all 44 items were retained. Table 3 shows the highest correlation value for each item of the initial 44-item CIPP-Q.

For the construct "Concern", items C8, C9 and C10, were dropped because they had r <0.30 following the initial EFA (Table 3). A second EFA was then performed on the remaining 11 items to evaluate the dimensionality of the CIPP-Q. The construct was submitted to PCA with the rotation method of varimax, and all items achieved the priori criteria for r ⩾0.30 and FL⩾0.50. However, based on the Kaiser criterion and analysis of the Eigenvalues >1.0, two components for "Concern" were suggested. Fixing the number of factors into one resulted in a low percentage of TVE (45.60%). Hence, items were further divided into two separate constructs; "Concerns related to personal life" which contained seven items, and "Concerns related to work" which contained four items. Subsequently, PCA with varimax rotation was performed again and yielded satisfactory results (Table 4).

With regards to the construct "Impact", all seven items achieved the priori criteria of *r*⩾0.30 and FL⩾0.50, but extraction suggested two components. Similarly, the percentage of TVE was unsatisfactory when the number of factors were fixed into one (45.90%). Therefore, items were further divided into two separate constructs: "Impact on personal life," which consisted of four items, and "Impact on work," which consisted of three items, and the analysis was re-run to extract one component for each separate construct with better outputs (Table 4).

Consecutively, analysis performed on 15 items in the construct "Practice" demonstrated all items achieved r⩾0.30 and FL of ⩾0.50. A total of three components were extracted, wherein, similarly, a low TVE (45.90%) was generated as a result of fitting the components into a single factor. In this regards, items Pn and Po were removed as an attempt to achieve only one component for the construct "Practice". The two items were dropped due to the fact that proper changing rooms, extra clothes and showering facilities were only provided in the hospital but not in health clinics and district health offices. Subsequently, a re-run of the analysis resulted in satisfactory outcomes (Table 4).

The analysis was then performed on eight items in the construct "Preventive Measures", whereby all items demonstrated *r*⩾0.30 and FL⩾0.50, as well as the desired one-component based on the Kaiser criterion and analysis of the Eigenvalues >1.0. Hence, all eight items were retained (Table 4).

The total number of items in the CIPP-Q was reduced from 44 to 39, and the number of constructs was increased from four to six. The KMO value for each construct ranged from 0.680 to 0.901, which is considered good (18). A single component was extracted from each construct which acceptably explained 55.11 to 65.90% of the variation in the items (23). FL and CITC values of items in the final 39-item CIPP-Q are shown in Table 4, and the summary of outputs from the analyses is shown in Table 5.

Reliability analysis

Each construct was then assessed with Cronbach's alpha to examine the internal consistency of the CIPP-Q. Cronbach's alpha values of the six constructs were very

Table 2. Socio-demographic background of the study population

Contents		*r*
Construct 1. Concern		
C1	I feel my job puts me a great risk of exposure to COVID-19 *Saya rasa perkerjaan saya mengundang risiko yang tinggi untuk dijangkiti COVID-19*	0.524
C2	I am afraid falling ill with COVID-19 *Saya rasa takut dijangkiti COVID-19*	0.524
C3	My family believes that I have a high risk of getting COVID-19 *Keluarga saya percaya bahawa saya berisiko tinggi dijangkiti COVID-19*	0.539
C4	People close to me are at high risk of getting COVID-19 because of my job *Mereka yang rapat dengan saya berisiko tinggi untuk dijangkiti COVID-19 disebabkan perkerjaan saya*	0.539
C5	I am most concerned about passing COVID-19: *Saya sangat bimbang akan menjangkitkan COVID-19:*	
C5a	To my family members *Kepada ahli keluarga*	0.903
C5b	To friends *Kepada rakan-rakan*	0.903
C6	People close to me are worried they might get infected with COVID-19 through me *Mereka yang rapat dengan saya risau mereka boleh dijangkiti COVID-19 melalui saya*	0.458
C7	At my workplace, I am most likely at risk of getting COVID-19 because of: *Ditempat kerja, saya berkemungkinan berisiko tinggi dijangkiti COVID-19 kerana:*	
C7a	Close contact with COVID-19 patients *Kontak rapat dengan pesakit COVID-19*	0.524
C7b	The air that I breathe *Daripada udara yang saya bernafas*	0.512
C7c	Close contact with colleagues handling COVID-19 patients/samples *Kontak rapat dengan rakan sekerja yang mengendalikan pesakit/sampel COVID-19*	0.512
C7d	From objects and surfaces *Daripada permukaan dan objek*	0.510
C8	I feel that I should not be looking after patients with COVID-19	0.275
C9	I accept the risk of getting COVID-19 as part of my job	0.279
C10	I find it acceptable if my colleagues resign because of their fear of COVID-19	0.169
Construct 2. Impact		
I1	I have been afraid of telling my family about the risk I am exposed to *Saya takut untuk memberitahu keluarga tentang risiko yang saya hadapi*	0.460
I2	People avoid me because of my job *Orang lain mengelakkan diri daripada saya disebabkan perkerjaan saya*	0.721
I3	People avoid my family members because of my job *Orang lain mengelakkan diri daripada ahli keluarga saya disebabkan perkerjaan saya*	0.721
I4	There is more conflict among colleagues at work *Terdapat lebih banyak konflik dalam kalangan rakan setugas*	0.485

I5	I feel more stressed at work *Saya rasa lebih stres semasa berkerja*	0.512
I6	I have an increase in workload *Beban kerja saya meningkat*	0.520
I7	I have to work overtime *Saya terpaksa berkerja lebih masa*	0.520
Construct 3. Practice		
P	I believe that the following measures are useful in protecting me from contracting COVID-19: *Saya percaya langkah-langkah pencegahan seperti berikut adalah berguna untuk melindungi saya dari dijangkiti COVID-19*:	
Pa	Screening of patients and visitors for fever *Membuat pemeriksaan suhu terhadap pesakit dan pelawat*	0.700
Pb	Limiting number of caretakers and visitors *Mengehadkan bilangan penjaga dan pelawat*	0.755
Pc	Prominent notices to warn patients, caretakers and visitors *Notis amaran yang jelas kelihatan kepada pesakit, penjaga dan pelawat*	0.755
Pd	Temperature checks for staffs *Memeriksa suhu badan anggota kesihatan*	0.700
Pe	Using 3-ply surgical mask *Menggunakan topeng muka pembedahan 3 lapis (3-ply)*	0.542
Pf	Using N95 face mask *Menggunakan topeng muka N95*	0.660
Pg	Using face shield *Menggunakan pelindung muka*	0.773
Ph	Using disposable gown *Menggunakan gaun pakai buang*	0.773
Pi	Using disposable hair cover *Menggunakan penutup rambut pakai buang*	0.772
Pj	Using disposable shoe cover *Menggunakan penutup kasut pakai buang*	0.750
Pk	Using alcohol rubs *Menggunakan disinfaktan beralkohol*	0.540
Pl	Regular hand washing *Mencuci tangan secara berkala*	0.652
Pm	Special room and area to isolate COVID-19 patients *Bilik dan kawasan khas untuk pengasingan pesakit COVID-19*	0.652
Pn	Changing out of work clothes before going home	0.833
Po	Showering before going home	0.833
Construct 4. Prevention		
P1	I feel that implementation of protective measures at work are generally effective *Saya rasa perlaksanaan langkah-langkah pelindungan di tempat kerja secara umumnya adalah berkesan*	0.585
P2	There was adequate training provided to me in the use of PPE *Saya telah diberi latihan yang mencukupi bagi penggunaan PPE*	0.596
P3	I have someone to turn to when I have a problem in using the PPE *Saya boleh mendapatkan bantuan jika terdapat masalah penggunaan PPE*	0.582
P4	I feel that the supply of PPE was sufficient *Saya merasakan bekalan PPE yang disediakan mencukupi*	0.504

P5	Emotional support is available to those who need help (eg. psychological first aid) *Sokongan emosi disediakan kepada yang memerlukan (cth bantuan asas psikologi)*	0.579
P6	Clear policies and protocols were instituted for everyone to follow *Polisi dan protokol yang jelas telah dimaklumkan kepada semua anggota kesihatan untuk dipatuhi*	0.740
P7	These policies and protocols were implemented quickly enough *Polisi dan protokol berkenaan telah dilaksanakan dengan segera*	0.710
P8	Most staff have adhered to the recommended measures consistently *Kebanyakan anggota kesihatan telah mematuhi langkah-langkah pelindungan yang disarankan secara konsisten*	0.607

Abbreviations: *r*, Correlation value; PPE, Personal Protective Equipment

good, ranging from 0.740 to 0.917 (Table 5). All items scored CITC⩾0.30 (Table 4), and therefore the total 39 items and six constructs were retained as the final CIPP-Q.

DISCUSSION

This present study was prompted by the need to adapt and validate a dual language instrument to evaluate the concerns and perceptions of HCWs in Malaysia towards the COVID-19 pandemic. This study documented the validity and reliability of the CIPP-Q, and demonstrated that the instrument is acceptable as a self-administered questionnaire through an online platform, as indicated by the engaging responses from the HCWs.

Since a brief questionnaire was considered desirable, a number of items were eliminated from the initial 44-item CIPP-Q. The final CIPP-Q contained 39 items, each with FL⩾0.5 and fitted well into six hypothetical groups as shown in Table 5, reflecting a good construct. The findings from reliability analysis suggested that all items had a CITC⩾0.3 and demonstrated a measure of high internal consistency with Cronbach's alpha value of ⩾0.7, reflecting the reliability of the CIPP-Q (27,18). Hence, the CIPP-Q can be used in research and practice to measure HCWs' concerns and perceived risks related to COVID-19.

Overall, there is some evidence of uni-dimensionality among the items in each of the six constructs. Based on FL and CITC of items in the construct "Concerns related to personal life", HCWs' concerns can be seen directed towards the fear of infecting their close ones. Correspondingly, in China, Dai et al. found that HCWs' distress was majorly attributable to the fear of their families and colleagues being infected with COVID-19 (29). Additionally, Singh and Sharma have expressed similar apprehensions following a survey they conducted to evaluate the concerns of doctors in India during COVID-19 revealed that the majority of them were residing in their homes with other family members which may increase the probability of HCWs infecting their relatives (30).

While for "Concerns related to work", based on the coefficients, HCWs' agitations were inclined towards being in proximity with colleagues handling COVID-19 patients and samples. This is in agreement with a study investigating the psychological levels of HCWs in China, which found that anxiety and depression levels among HCWs were significantly associated with the history of contact with suspected cases and contact with specimens of positive patients (31). On another note, a survey conducted in a paediatric tertiary-care hospital in Canada revealed that COVID-19 exposure or infection at work was a greater concern for HCWs as opposed to contracting it outside of work (32). Besides that, three items were removed from the initial CIPP-Q because they did not achieve the priori criteria for *r*⩾0.30. Moreover, the items could also be deemed non-critical as numerous studies have found that despite the risks faced by HCWs, the majority of them were committed and willing to work during the COVID-19 pandemic (33,34,35,36,37).

With regards to HCWs' perceived impact, items contained in the construct "Impact on personal life" indicated sentiments on potential stigmatisation and its impact on HCWs' personal lives. Considering HCWs are the frontlines in combating this crisis, they are potentially vulnerable to societal challenges such as labelling, stigma and discrimination (38). Moreover, studies have found that due to the nature of their work, HCWs and

Table 4. Factor loadings and CITC values of each item in the final CIPP-Q

Contents		FL	CITC
Construct 1. Concern			
C1	I feel my job puts me a great risk of exposure to COVID-19 *Saya rasa perkerjaan saya mengundang risiko yang tinggi untuk dijangkiti COVID-19*	0.735	0.627
C2	I am afraid falling ill with COVID-19 *Saya rasa takut dijangkiti COVID-19*	0.667	0.544
C3	My family believes that I have a high risk of getting COVID-19 *Keluarga saya percaya bahawa saya berisiko tinggi dijangkiti COVID-19*	0.699	0.591
C4	People close to me are at high risk of getting COVID-19 because of my job *Mereka yang rapat dengan saya berisiko tinggi untuk dijangkiti COVID-19 disebabkan perkerjaan saya*	0.710	0.605
C5	I am most concerned about passing COVID-19: *Saya sangat bimbang akan menjangkitkan COVID-19:*		
C5a	To my family members Kepada ahli keluarga	0.840	0.735
C5b	To friends *Kepada rakan-rakan*	0.845	0.745
C6	People close to me are worried they might get infected with COVID-19 through me *Mereka yang rapat dengan saya risau mereka boleh dijangkiti COVID-19 melalui saya*	0.679	0.564
Construct 2. Concern related to work			
C7	*At my workplace, I am most likely at risk of getting COVID-19 because of:* *Ditempat kerja, saya berkemungkinan berisiko tinggi dijangkiti COVID-19 kerana:*		
C7a	Close contact with COVID-19 patients *Kontak rapat dengan pesakit COVID-19*	0.744	0.545
C7b	The air that I breathe *Daripada udara yang saya bernafas*	0.775	0.583
C7c	Close contact with colleagues handling COVID-19 patients/samples *Kontak rapat dengan rakan sekerja yang mengendalikan pesakit/ sampel COVID-19*	0.810	0.630
C7d	From objects and surfaces *Daripada permukaan dan objek*	0.778	0.586
Construct 3. Impact on personal life			
I1	I have been afraid of telling my family about the risk I am exposed to *Saya takut untuk memberitahu keluarga tentang risiko yang saya hadapi*	0.724	0.478
I2	People avoid me because of my job *Orang lain mengelakkan diri daripada saya disebabkan perkerjaan saya*	0.877	0.664
I3	People avoid my family members because of my job *Orang lain mengelakkan diri daripada ahli keluarga saya disebabkan perkerjaan saya*	0.890	0.702

Construct 4. Impact on work			
I4	There is more conflict among colleagues at work *Terdapat lebih banyak konflik dalam kalangan rakan setugas*	0.637	0.418
I5	I feel more stressed at work *Saya rasa lebih stres semasa berkerja*	0.805	0.606
I6	I have an increase in workload *Beban kerja saya meningkat*	0.773	0.546
I7	I have to work overtime *Saya terpaksa berkerja lebih masa*	0.773	0.556
Construct 5. Practice			
P	I believe that the following measures are useful in protecting me from contracting COVID-19: *Saya percaya langkah-langkah pencegahan seperti berikut adalah berguna untuk melindungi saya dari dijangkiti COVID-19:*		
Pa	Screening of patients and visitors for fever *Membuat pemeriksaan suhu terhadap pesakit dan pelawat*	0.701	0.622
Pb	Limiting number of caretakers and visitors *Mengehadkan bilangan penjaga dan pelawat*	0.747	0.668
Pc	Prominent notices to warn patients, caretakers and visitors *Notis amaran yang jelas kelihatan kepada pesakit, penjaga dan pelawat*	0.722	0.641
Pd	Temperature checks for staffs *Memeriksa suhu badan anggota kesihatan*	0.718	0.646
Pe	Using 3-ply surgical mask *Menggunakan topeng muka pembedahan 3 lapis (3-ply)*	0.588	0.501
Pf	Using N95 face mask *Menggunakan topeng muka N95*	0.709	0.671
Pg	Using face shield *Menggunakan pelindung muka*	0.781	0.757
Ph	Using disposable gown *Menggunakan gaun pakai buang*	0.801	0.772
Pi	Using disposable hair cover *Menggunakan penutup rambut pakai buang*	0.787	0.766
Pj	Using disposable shoe cover *Menggunakan penutup kasut pakai buang*	0.764	0.740
Pk	Using alcohol rubs *Menggunakan disinfaktan beralkohol*	0.697	0.627
Pl	Regular hand washing *Mencuci tangan secara berkala*	0.651	0.564
Pm	Special room and area to isolate COVID-19 patients *Bilik dan kawasan khas untuk pengasingan pesakit COVID-19*	0.623	0.538
Construct 6. Prevention			
P1	I feel that implementation of protective measures at work are generally effective Saya rasa perlaksanaan langkah-langkah pelindungan di tempat kerja secara umumnya adalah berkesan	0.696	0.585
P2	There was adequate training provided to me in the use of PPE Saya telah diberi latihan yang mencukupi bagi penggunaan PPE	0.704	0.596

P3	I have someone to turn to when I have a problem in using the PPE Saya boleh mendapatkan bantuan jika terdapat masalah penggunaan PPE	0.687	0.582
P4	I feel that the supply of PPE was sufficient *Saya merasakan bekalan PPE yang disediakan mencukupi*	0.609	0.504
P5	Emotional support is available to those who need help (eg. psychological first aid) *Sokongan emosi disediakan kepada yang memerlukan (cth bantuan asas psikologi)*	0.685	0.579
P6	Clear policies and protocols were instituted for everyone to follow *Polisi dan protokol yang jelas telah dimaklumkan kepada semua anggota kesihatan untuk dipatuhi*	0.824	0.740
P7	These policies and protocols were implemented quickly enough *Polisi dan protokol berkenaan telah dilaksanakan dengan segera*	0.806	0.710
P8	Most staff have adhered to the recommended measures consistently *Kebanyakan anggota kesihatan telah mematuhi langkah-langkah pelindungan yang disarankan secara konsisten*	0.716	0.607

Abbreviations: FL, Factor loading; CITC, Corrected-Item Total Correlation; PPE, Personal Protective Equipment

Table 5. Summary from factor and reliability analyses of the CIPP-Q

Construct	Initial		Final		KMO	TVE (%)	Min FL	α	Min CITC
	Item	Component	Item	Component					
Concern	14	4							
Personal			7	1	0.815*	55.11	0.667	0.859	0.544
Work			4	1	0.787*	60.39	0.744	0.781	0.545
Impact	7	2							
Personal			4	1	0.643*	69.50	0.686	0.776	0.478
Work			3	1	0.702*	56.26	0.794	0.738	0.418
Practice	15	3	13	1	0.901*	51.43	0.623	0.917	0.501
Preventive Measures	8	1	8	1	0.844*	51.63	0.609	0.861	0.504

Abbreviations: KMO, Kaiser-Meyer-Olkin measure of sampling adequacy; * Bartlett's Test of Sphericity p-value <0.001; TVE, Total Variance Explained; Min FL, Minimum Factor loading; α, Cronbach's alpha; Min CITC, Minimum Corrected-Item Total Correlation

volunteers working with infectious diseases may indeed become stigmatised, resulting in higher rates of stress and burnout (39,40,41).

Whereas for "Impact on work", the item that loads and correlates the highest in the construct suggest that occupational pressures may impact HCWs' professional lives. As implied by other items in the construct, this could be due to the fact that HCWs were burdened with a higher workload and longer shifts to cope with the increasing number of infected cases. According to Xiao et al. (31), the prevalence of psychological stress perceived by HCWs at the peak of the COVID-19 crisis was increased by 140%, almost twice higher than during the SARS epidemic. Moreover, a study on the mental health conditions of HCWs in Italy demonstrated that longer working hours were a significant predictor of HCWs' perceptions on COVID-19 infection risk, which could negatively impact their mental well-being (42).

Meanwhile, high loading and correlating items in "Practice" can be seen as aimed towards HCWs'

perception of COVID-19 practises on infection control. Comparatively, Al-Dossary et al. (43) found that nurses in hospitals in Saudi Arabia had good practises and positive perceptions of COVID-19 management, where 83.2% achieved high preventive practises and 69.2% had very high perceptions towards COVID-19. Likewise, the results were also in agreement with a similar study investigating the perception and attitude of HCWs in Vietnam toward the COVID-19 pandemic (44). Furthermore, two items regarding changing clothes and showering before going home were deleted from the initial CIPP-Q because they did not apply to the health care settings involved in the study. This decision is supported by an observation by Ingason et al. (45) which revealed no transmission occurred among HCWs involved in advanced life support of a patient with COVID-19, despite a few of them not taking a shower nor changing clothes after the exposure.

Finally, items in the sixth construct, "Preventive Measures", can be observed relating to HCWs' impressions of the implemented precautionary guidelines, particularly on the supply of Personal Protective Equipment (PPE) and the MOH protocols on COVID-19 management. This matter of subject was assuredly substantial as shown in a study conducted in a paediatric hospital in Canada that captured the perspectives of HCWs on the implemented COVID-19 prevention and control measures, in which more than half of the HCWs were satisfied with the hospital's recommendations for transmission-based precautions for routine care of patients with COVID-19 (46).

It is worth noting that studies which critically examine the implications of eliminating items from multi-item scales are scarce. Wieland et al. (47) analysed the current state of the item elimination process in supply chain management (SCM) research, and found 27 articles reported to have eliminated items and justified the deletions. However, none of the articles discussed the potential implications of the decision on the studies' representativeness of the construct, or any further theoretical consequences. Hence, whether or not removing an item from this questionnaire affects the constructs that it was intended to measure remains unclear.

We have identified a few limitations in this present study. Firstly, due to the pandemic situation at the time this study was conducted, there were difficulties in obtaining cooperation from the panel of experts and reviewers to gather their responses within a specified timeline, hence, content and face validation were established in meeting sessions as opposed to the standard method in terms of Content Validity Index and Content Validity Ratio. Secondly, our study population was limited to HCWs from one region, which was the state of Selangor. Evaluation of validity and reliability of the CIPP-Q in a more diverse study population might produce different factor patterns as well as reproducibility of the CIPP-Q. Thirdly, further confirmatory factor analysis (CFA) is necessary to complement the validation analyses reported in this study as it would verify the existence of a relationship between the observed variables and their underlying latent constructs. This present study had only explored the possible constructs of the CIPP-Q. Hence, a CFA is suggested for the next research using the CIPP-Q in order to confirm that the items are measuring what they are intended to measure. The usefulness of the CIPP-Q has certainly been demonstrated, but the limitations of just one measurement tool to entirely evaluate the mental health statuses of HCWs must also be noted.

CONCLUSION

This present study showed that the CIPP-Q is a reliable and valid instrument to assess HCWs' concerns as well as perceived impact, preventive measures and practises during the COVID-19 pandemic. The usefulness of the CIPP-Q should be considered as another helpful tool, but not the only tool, to evaluate the psychological outcomes of stressful events. Although the CIPP-Q was primarily developed to be used as a measurement tool for the COVID-19 pandemic, additional uses to research the mental health statuses of HCWs during other infectious disease outbreaks are possible.

ETHICAL APPROVAL

Ethical approvals were obtained from the Medical Research and Ethics Committee Malaysia with reference number KKM/NIHSEC/P20-715(7). Written informed consent was obtained from the participants prior to data collection and confidentiality was assured for the information given by the participants.

CONFLICTS OF INTERESTS

The authors have no conflicts of interest with the materials presented in this paper.

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