Development and Validation of a Malay Questionnaire for Airborne Disease Preparedness

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Abstract

Despite ongoing workplace interventions, industries must be prepared for future infectious disease outbreaks. The COVID-19 pandemic highlighted the need for comprehensive guidelines. This study aimed to develop and validate a bilingual (Malay-English) questionnaire to assess industrial preparedness for infectious disease management. A 128-item tool was created based on literature reviews and expert input. Face and content validity were assessed by ten experts using the Face Validity Index and Content Validity Index. Results showed high validity and reliability, with Cronbach's alpha values ranging from 0.79 to 0.97, supporting the tool's effectiveness in diverse Malaysian settings.

Keywords: COVID-19; Occupation; Safety; Questionnaire Validation

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1.0 Introduction

Studies had shown that relatively few infectious individuals (10%) are the cause of COVID-19 transmission in the workplace. (Bi et al., 2020). The main methods of spread include crowded indoor settings, poor ventilation, frequent interactions with the general public, and long contact exposures. Comprehensive occupational COVID-19 infection prevention and control measures can prevent this event, via an organized prevention activity.

Following this, many countries have been creating COVID-19 or airborne infectious disease occupational safety and health (OSH) policies and guidance involving these measures following the COVID-19 pandemic. (Godderis et .al, 2023). Similarly, in Malaysia, a standardized guideline for the industries to manage the transmission of COVID-19 was developed (National Institute of Occupational Safety and Health Malaysia, 2021). In additional, the Department of Occupational Safety and Health (DOSH), a regulatory body responsible for the regulations of safety and health at the workplace, is in the process of developing a guideline for industry preparedness on combating any future infectious disease events at the workplace.

Given the importance of accurate assessment, using a validated and reliable instrument is crucial for evaluating workplace preparedness and compliance with health guidelines. In Malaysia, the use of bilingual questionnaires is particularly important to accommodate respondents from diverse linguistic and cultural backgrounds (Chee et al., 2024). Nonetheless, due to the limited availability of validated tools that caters the need of workplace infectious diseases readiness, this puts the country at risk (Kunyahamu et al., 2023). Therefore, there is an urgent need to validate such tool which may effectively capture the intended constructs, and hence strengthen the overall reliability of the tool.

The evaluation of the questionnaire involved two commonly used tests, which are the Content Validity Index (CVI) and Face Validity Index (FVI) (Dalawi et al., 2023). These steps are crucial in cross-cultural research, where language and cultural differences play an important role in influencing the respondents' comprehension (Romli et al., 2022). There were previous studies that have validated various occupational health questionnaires, but there is limited literature on instruments to measure the industrial preparedness for COVID-19 in the local context.

2.0 Literature Review

The validation of this tool is required to accurately measure the context it is meant to measure and removes any language barriers that may influence the participant's understanding on the context based on cross cultural measures. Thus, any such tool must be tailored to specific population based on their local language and culture. (Tsang et al., 2017).

The Content Validity Index (CVI) and Face Validity Index (FVI) are commonly used approaches to validate questionnaires (Yusoff, 2019). CVI determines the clarity of the items to ensure the content would represent the outcome of the questionnaire (Polit & Beck, 2006). The Face Validity Index (FVI) assesses the understandability of the questionnaire

from the respondents' perspective (Dalawi et al., 2023). Previous studies have also validated questionnaires to assess occupational health and safety in different cultural contexts. For example, Bujang and colleagues (2017) validated a Malay version of a Diabetes Quality of Life (DQOL) questionnaire for the Malaysian adult population with type 2 diabetes mellitus (DM). In addition, Ching and colleagues (2015) demonstrated the effectiveness of bilingual questionnaires in psychometric properties of the Smart Phone Addiction Scale (SAS). These research focuses the need of validating instruments to maintain the integrity of the data.

Although previous research has validated some questionnaires, nonetheless, most were concentrating on current management and not for the purpose of preparedness. Moreover, there are only a few research that had used the CVI and FVI method to validate bilingual processes. Hence, this study aims to validate the Malay version of a questionnaire designed to measure the industrial preparedness for infectious disease preparedness. The objective of this study is to determine the CVI and FVI values, contributing to improved workplace safety management and preparedness in Malaysia.

3.0 Methodology

3.1 Study Design and Sampling Method

This study is a validation study and aims to assess the validity of the Malay version of the instrument of Industrial Preparedness for Infectious Diseases in the Malaysian Workplace. The sampling method used is non-probability sampling, which is convenience sampling.

3.2 Participants

Seventeen experts were selected for content validity and face validity from Klang Valley, Malaysia. Content validity refers to the extent to which the questionnaire items represent the entire domain in the tests that need to be measured. The method seeks to assess the quality of the items on a test. Face validity refers to the degree to which test respondents view the content of a test and its items as relevant to the context in which the test is being administered (Yusoff, 2019). Then, the pilot study was conducted before the actual research.

Content Validity Index (CVI) were assessed by 7 experts from Universiti Teknologi MARA (UiTM) and the Department of Occupational Health and Safety (DOSH) from various expertise which are Environmental Health Lecturers (Expert 1 and Expert 3), Epidemiology and Biostatistics Lecturer (Expert 2), Occupational Health Lecturers (Expert 4 and Expert 6), Occupational Health Director (Expert 5) and Occupational Health Vice Director (Expert 7).

Face Validity Index (FVI) involved 10 experts who participated in this study. The experts came from various expertise in Universiti Teknologi MARA (UiTM), which are Sports Science and Recreation Officer (Expert 1), Librarian (Expert 2), Senior Dormitory Manager (Expert 3), Engineer (Expert 10), Engineer Assistants (Expert 4 and Expert 5). Architect

(Expert 6), Senior Security Officer (Expert 7), Science Officer (Expert 8) and Nurse (Expert 9).

The pilot study was conducted among a group of Universiti Teknologi MARA (UiTM) staff from the Safety and Occupational Health Committee (OSHCo) 2021 – 2023 based on the inclusion and exclusion criteria. The researchers shortlisted a few potential participants from various areas of faculty and positions. Thirty participants, including the secretary for OSHCo, were randomly chosen based on the line listing of committee members. The selected participants must complete and distribute the forms to any three people within the same faculty.

3.3 Ethical Approval

This study obtained ethical approval from the Universiti Teknologi MARA (UiTM) Committee. For participants of this validation study, the experts were contacted, and consent forms were e-mailed to them before they assessed the instrument.

3.4 Instruments

Questions were designed for active working employees, managers, and occupational health and safety managers for any country, especially Southeast countries, with similar cultural background. The survey was drafted based on reviewed publications for effective COVID-19 measures, review findings on infectious disease preparedness, consultation with various medical and health-related experts.

A preliminary questionnaire in English was designed on requestions pertaining to Industrial Preparedness for Infectious Diseases in the Workplace in Malaysia; which includes sections on organizational support, management support, indoor air quality, policy on infectious diseases, Expertise related to Human Resources and Occupational Safety and Health (OSH), post-recovery programme, creating awareness, risk communications, cleaning and disinfection, hand hygiene, business communication, knowledge, practice and culture of occupational safety and health (OSH), risk behaviour compliance, workplace readiness and disease profile factors.

The preliminary survey was independently reviewed by local experts in Public Health and Occupational Health and Safety to ensure face validity and content validity. This initial English version questionnaire underwent forward and backward translation to a Malay version by four qualified language experts.

This final instrument comprised of sociodemographic sections and Industrial Preparedness for Infectious Diseases in the Workplace in Malaysia. The form, objectives, theoretical framework, and definition of variables in the domain were distributed to the experts via e-mail and WhatsApp.

The instructions were also included in a Google Form for every domain of the questionnaires to give to the experts. The researchers added a double password to the form to ensure the confidentiality of the domains. Experts were required to fill in their official e-mails to access the questionnaire.

3.5 Validity

The expert panels were asked to comment on each domain in the questionnaires using the Content Validity Index (CVI) (Zamanzadeh et al., 2015). The experts gave the score on each item in terms of its relevance with a 4-Likert scale: 1 = the item is not relevant to the measured domain; 2 = the item is somewhat relevant to the measured domain; 3 = the item is quite relevant to the measured domain, and 4 = the item is highly relevant to the measured domain.

In addition, written comments and suggestions were also given by the experts to improve the relevance of the items. Any additional items that the panels feel need to be included were further discussed with the researcher. Scores of 3 or 4 for the relevance of the items were used to calculate the item-level content validity index (I-CVI).

The CVI for each item (I-CVI) was obtained based on the number of experts who gave scores of 3 and 4 divided by the number of the whole content expert panels. Then, the scale-level CVI (S-CVI) was calculated by averaging the I-CVI of all the items. S-CVI of 0.8 or higher is acceptable (Polit & Beck, 2006). After fine-tuning by the research team and expert panels, both questionnaires are ready for face validity.

For the face validity index, the experts were asked to review the domain and provide a score on each item in terms of its clarity and comprehension. A 4-Likert scale was used to assess the domains: 1 = the item is not clear and understandable; 2 = the item is somewhat straightforward and understandable; 3 = the item is clear and understandable, and 4 = the item is apparent and understandable.

Experts were also invited to provide written feedback or suggestions to enhance the clarity of the items, where applicable. All input was reviewed and considered for refinement of the domain and questionnaire content. To assess face validity, the item-level face validity index (I-FVI) was calculated based on the proportion of experts who rated each item as either 3 or 4 on the clarity scale. Additionally, qualitative comments regarding improvements to the instrument were collected. The research team reviewed these comments collectively and used them to further revise and improve each item.

4.0 Results

4.1 Sociodemographics of Participants

Table 1 displays the sociodemographic characteristics of participants for the Content Validity Index (CVI). In total, there were seven experts: 5 experts were from Universiti Teknologi MARA (UiTM), and the remaining two from the Department of Occupational Safety and Health (DOSH) who participated in this study. The majority of experts have at

least a Master's degree (85.0 %) and are comprised of lecturers (71%). The background of the experts was diverse within the field of occupational health and public health.

Table 1: Sociodemographic of Participants for Content Validity Index (CVI)

Participants Characteristics	N (%)
Gender	
Female	3 (42.9)
Male	4 (57.1)
Education Level	
Degree	1 (14.3)
Master	3 (42.9)
PhD	3 (42.9)
Occupation	
Lecturer	5 (71.4)
Director	1 (14.3)
Vice-Director	1 (14.3)
Expertise	
Environmental Health	2 (28.6)
Epidemiology and Biostatistics	1 (14.3)
Occupational Safety and Health	4 (57.1)

Table 2: Sociodemographic of Pilot Study

Participants Characteristics	N (%)
Gender	
Female	9 (30)
Male	21 (70)
Education Level	
Certificate	10 (33.3)
Diploma	9 (30)
Degree	10 (33.3)
Master	1 (3.3)
Occupation	
Lecturer	4 (13.3)
Officer	8 (26.7)
Assistant	9 (30)
Technologist	5 (16.7)
Clerk	4(13.3)

A total of 10 experts participated in the Face Validity Index (FVI) from Universiti Teknologi MARA (UiTM). There were 3 (30%) female experts and 7 (70%) male experts. One (10%) of the experts possess a diploma, while 6 (60%) hold a degree, and 3 (30%) have a Master's degree. Most of the experts were officers. The background of the experts

includes sports science and Recreation, Library management, administration, building construction, civil engineering, architecture, safety and health, science, nursing, and mechanical engineering.

Table 2 shows the sociodemographic characteristics of a pilot study. A total of 30 respondents have taken part in this study. The majority of respondents were male, held at least a diploma, and worked as white-collar workers. Most of the participants also work as assistants in their departments.

4.2 Content Validity Index

A total of seven experts provides an assessment for CVI. Most of the items have an I-CVI of 1. The lowest I-CVI was 0.71 (Item A3.3, 8.12, and 8.13).

Table 3 summarizes the proportion of relevance for each expert. The lowest proportion of relevance was expert 6 and 7, with 0.95. The scale-level content validity index based on the average method (S-CVI/Ave) was 0.98 and the scale-level content validity based on the universal agreement method (S-CVI/UA) was 0.87.

Table 3: I-CVI Value for All Questions by Experts

Experts	Proportion relevance
Expert 1	0.98
Expert 2	0.97
Expert 3	1.00
Expert 4	1.00
Expert 5	1.00
Expert 6	0.95
Expert 7	0.95
Scale S-CVI/Ave	0.98
Scale S-CVI/UA	0.87

Table 4 demonstrates the overall I-CVI, S-CVI/Ave and S-CVI/UA for each domain. For all items, the I-CVI was 0.978, S-CVI/Ave was 0.98 and the S-CVI/UA was 0.87. The domain Indoor Air Quality was found to be the lowest I-CVI (0.89), A-CVI/Ave (0.89) and S-CVI/UA (0.50).

Table 4. Summary of Content Validity

No.	Domain	No. of Items	I-CVI (>= 0.83)	S-CVI/Ave (>=0.90)	S-CVI/UA
1	Management Support	6	1.00	1.00	1.00
2	Organisational Measures	13	0.98	0.98	0.85
3	Indoor Air Quality	4	0.89	0.89	0.50
4	Policy on Infectious Diseases	15	1.00	1.00	1.00
5	Expertise related to Human Resources and Occupational Safety and Health (OSH)	7	1.00	1.00	1.00
6	Post-Recovery Programme	5	1.00	1.00	1.00
7	Creating Awareness	8	0.98	0.98	0.88
8	Risk Communications (Engineering Control)	16	0.95	0.95	0.75
9	Risk Communications (Administrative Control)	10	0.97	0.97	0.80
10	Cleaning and Disinfection	8	0.98	0.98	0.88
11	Hand Hygiene	6	0.98	0.98	0.83
12	Business Communication	4	1.00	1.00	1.00
13	Knowledge, Practice and Culture of Occupational Safety and Health (OSH)	12	0.99	0.99	0.92
14	Risk Behaviour (Personal Protective Equipment or PPE) Compliance	14	0.97	0.97	0.77
15	**Workplace Readiness**	**102**	**0.98**	**0.98**	**0.87**
16	**Disease Profile, Individual Control Factors**	**26**	**0.98**	**0.98**	**0.85**
17	**ALL ITEMS**	**128**	**0.98**	**0.98**	**0.87**

4.3 Face Validity Index

A total of 10 respondents were involved in this study. The distribution of I-CVI in each item is displayed Appendix. Most of the items have I-CVI of 1. The lowest I-CVI was 0.20 (Item A3.3).

The proportion of clarity and comprehension for each respondent. The lowest proportion clarity and comprehension was for respondent 5 with 0.56. The scale-level content validity index based on the average method (S-CVI/Ave) was 0.85 and the scale level content validity based on the universal agreement method (S-CVI/UA) was 0.328. (Table 5).

Table 5. I-FVI value for all questions by respondents

Expert	Proportion clarity and comprehension
Expert 1	0.83
Expert 2	0.82
Expert 3	0.94
Expert 4	1.00
Expert 5	0.56
Expert 6	0.67
Expert 7	0.78
Expert 8	0.90
Expert 9	1.00
Expert 10	0.97
Scale S-FVI/Ave	0.85
Scale S-FVI/UA	0.33

The overall I-CVI, S-CVI/Ave and S-CVI/UA for each domain. For all items, the I-CVI was 0.85, the S-CVI/Ave was 0.85 and the S-CVI/UA was 0.33, as displayed in table 6. The domain Indoor Air Quality exhibited to be the lowest in I-CVI (0.38) and A-CVI/Ave (0.38). For S-CVI/UA, there were two domains with a score 0 (indoor air quality and business communication).

Table 6. Summary of Face Validity Index

No.	Domain	No. of Items	I-FVI (>= 0.83)	S-FVI/Ave (>=0.90)	S-FVI/UA
1	Management Support	6	0.92	0.92	0.33
2	Organisational Measures	13	0.84	0.84	0.15
3	Indoor Air Quality	4	0.38	0.38	0.00
4	Policy on Infectious Diseases	15	0.90	0.90	0.33
5	Expertise related to Human Resources and Occupational Safety and Health (OSH)	7	0.86	0.86	0.29
6	Post-Recovery Programme	5	0.92	0.92	0.60
7	Creating Awareness	8	0.91	0.91	0.63
8	Risk Communications (Engineering Control)	16	0.85	0.85	0.31
9	Risk Communications (Administrative Control)	8	0.95	0.95	0.63
10	Cleaning and Disinfection	8	0.96	0.96	0.71
11	Hand Hygiene	6	0.90	0.90	0.50
12	Business Communication	4	0.85	0.85	0.00
13	Knowledge, Practice and Culture of Occupational Safety and Health (OSH)	12	0.88	0.88	0.25
14	Risk Behaviour (Personal Protective Equipment (PPE) Compliance	14	0.70	0.70	0.07
15	Workplace Readiness	99	0.87	0.87	0.37
16	Disease Profile, Individual Control Factors	26	0.78	0.78	0.15
17	ALL ITEMS	128	0.85	0.85	0.35

4.4 Pilot Study

Before moving on to the full-scale data collection, the researcher used data from an initial group of 30 participants to assess the practicality of conducting the study. This small-scale phase served several purposes: to refine and evaluate the suitability of the research instrument, to gauge whether the larger study would be feasible, to gather early data, and to anticipate any resource needs or logistical challenges that might arise.

Cronbach's alpha value was produced to analyse whether the questionnaire was valid. The tools were reliable, with an overall alpha value of 0.98. Each domain also had alpha values that ranged from 0.79 to 0.97. Table 7 shows the summary of the Cronbach's alpha values.

Table 7: Summary of the Cronbach's Alpha Values

No.	Domain	Cronbach's alpha values	Number of domains	Result
1	Management Support	0.81	6	Acceptable
2	Organisational Measures	0.88	13	Acceptable
3	Indoor Air Quality	0.95	4	Acceptable
4	Policy on Infectious Diseases	0.93	15	Acceptable
5	Expertise related to Human Resources and Occupational Safety and Health (OSH)	0.92	7	Acceptable
6	Post-Recovery Programme	0.96	5	Acceptable
7	Creating Awareness	0.95	8	Acceptable
8	Risk Communications (Engineering Control)	0.91	16	Acceptable
9	Risk Communications (Administrative Control)	0.93	8	Acceptable
10	Cleaning and Disinfection	0.93	7	Acceptable
11	Hand Hygiene	0.91	6	Acceptable
12	Business Communication	0.79	4	Acceptable
13	Knowledge, Practice and Culture of Occupational Safety and Health (OSH)	0.92	12	Acceptable
14	Risk Behaviour (Personal Protective Equipment (PPE) Compliance	0.97	14	Acceptable
15	Workplace Readiness	0.97	99	Acceptable
16	Disease Profile, Individual Control Factors	0.96	26	Acceptable
17	ALL ITEMS	0.98	125	Acceptable

5.0 Discussion

The study developed and demonstrated the validation of the Malay version questionnaire on industrial preparedness for infectious disease. The assessment provides reliable evidence in evaluating industrial preparedness. Our results showed valid items with acceptable and reliable content. Results also showed that items from domain risk communications (administrative control), number 9.8 and 9.9 were not relevant and discarded from the study.

The questionnaire consists of 16 domains, which contain management support, organisational measures, indoor air quality, policy on infectious disease, expertise related

to Human Resources and Occupational Safety and Health (OSH), post-recovery programme, creating awareness, risk communications, cleaning and disinfection, hand hygiene, business communication, knowledge, practice and culture of occupational safety and health (OSH), risk behaviour compliance, workplace readiness and disease profile factors. Items with low universal agreement and S--CVI/UA agreement remained, as they were relevant based on literature reviews and expert recommendations.

Several items used in this study were aligned with those reported in prior related research (Ingram et al., 2022). Overlapping domains included environmental factors, basic preventive actions, surveillance, and disinfection practices. However, elements addressing business communication and risk-related behaviours were notably specific to our study context and participant group. One notable omission from our survey was a section on vaccination. At the time of data collection, uncertainties surrounding the risks and benefits of vaccination led to its exclusion from the instrument.

6.0 Conclusion

Questionnaires to respondents about the industrial preparedness of infectious diseases have gone through a rigorous process to ensure that all the collected data are valid. The earlier version of the tool was prepared in English and later translated to Malay via a structured backward and forward translation. Thus, respondents could choose their preferred language, either the Malay or English version, when filling up the online Google platform.

This study demonstrated that the bilingual approach of the questionnaire was suitable and enhanced understanding. It could be understood in terms of readability and comprehension by reviewing the results of the pilot study, 125 domains of Cronbach's alpha with values of 0.98 were rated as Acceptable.

While the questionnaire showed strong readability and comprehension, the study had several limitations, including a limited sample size and a lack of industry diversity, which restrict the generalizability of the findings. Despite rigorous translation efforts, subtle differences in interpretation between the English and Malay versions may have influenced response consistency, and the reliance on self-reported data introduces potential bias.

Future research should involve a larger and more diverse sample across various industries to improve the generalizability of the findings. Additional studies are also needed to assess other psychometric properties of the questionnaire, such as construct validity, criterion validity, and test-retest reliability. Exploring cultural and linguistic nuances, as well as incorporating longitudinal and qualitative approaches, could further enhance the tool's accuracy and relevance in assessing industrial preparedness for infectious diseases.

Article Contribution to Related Field of Study

This study contributes to the field of occupational health and safety in managing infectious diseases in the industry. It highlights a crucial need in developing and validating a bilingual

(English and Malay) questionnaire, ensuring better understanding and more accurate responses from multilingual Malaysian workers. This questionnaire improves the workplace safety frameworks in assessing their preparedness and implementation of effective interventions. Moreover, this study supports the Department of Occupational Safety and Health (DOSH) Malaysia's efforts in developing a guideline to evaluate the current policies and to identify the gaps for improvement. Academically, this study contributes to the expansion of academic literature with the Content Validity Index (CVI) and Face Validity Index (FVI) index, achieving Cronbach's alpha values between 0.79 and 0.97. Overall, this study provides valuable input for researchers and policymakers in Malaysia with multilingual and multicultural settings.

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