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Workers' perceptions on the tolerability of their respirators in Malaysia

Muhammad Z. Yusof
Department of Community Medicine, Kulliyyah of Medicine, International Islamic University Malaysia

Nor I. Mukhtar
Department of Community Medicine, Kulliyyah of Medicine, International Islamic University Malaysia

Workers' Perceptions on the Tolerability of Their Respirators in Malaysia

Muhammad Z. Yusof [a,b,*], Nor I. Mukhtar [a]

[a] Department of Community Medicine, Kulliyyah of Medicine, International Islamic University Malaysia, Malaysia
[b] IIUM Health, Safety and Environment (IHSEN), Kulliyyah of Medicine, International Islamic University Malaysia, Malaysia

Abstract

Background: **Little is known about Malaysian workers' tolerance for respirators in the workplace. This study aimed to assess Malaysian workers' perceptions of respirator tolerability and its relationship to socio-demographics and compliance.**

Method: **This cross-sectional study was conducted between October and December 2021 among respirator users in the agricultural, industrial, and service sectors. Background information and respirator compliance were collected using a structured online questionnaire. A R-COMFI questionnaire was used to measure respirator tolerability.**

Results: **This study recruited 340 participants, but only 278 of them met the inclusion criteria. More than half reported that wearing respirators was uncomfortable, impacted focus, and hindered communication. Few had health concerns from respirators. Malay ethnicity ($\beta = -2.604$, 95% CI $= -4.983, -0.225$) and respirator training ($\beta = -2.213$, 95% CI $= -4.339, -0.088$) were found to be associated with better respirator tolerability.**

Conclusion: **This study showed that Malay ethnicity and respirator training predicted better respirator tolerance. Policy aimed at emphasizing the need of respirator training programs, particularly for non-Malay workers, should be thoroughly considered in order to improve worker tolerance of respirator wear and prevent hazardous health effects by inhalation.**

Keywords: Respirator, Tolerability, Worker, R-COMFI, Malaysia

1. Introduction

Respiratory protection is an essential element of personal protective equipment (PPE) in the workplace, as it protects against the inhalation of dangerous substances [1]. It can be accomplished through an effective respiratory protection programme. Such a programme requires the employer to develop and implement a written respiratory protection programme containing the necessary worksite-specific procedures and elements [1]. These elements include the selection of the respirators, medical evaluation, training and fit testing.

Respirators' filtration efficiency and breathing resistance are the most important aspects of their design [2]. Filtration specifications are built into the respirators to prevent the inhalation of hazardous small airborne particles. The N95 respirator, for example, can filter out 95% of airborne particles as small as 0.3 m. However, it does not entirely eliminate the risk of disease transmission [3].

To be functional, the respirator must also comfortably fit the wearer's face and have minimal seal leakage [4]. The fitting of a respirator is performed by using a fit test procedure to assess whether the selection of the type, model, and size of the respirator can fit an individual's face properly. This is to ensure an effective seal between the respirator's facepiece and the user's face [1,5]. Employers in Malaysia are required to provide adequate respirators to employees as needed. A fit test of the respirators should be undertaken to ensure the effectiveness of the respirators provided by the employers. The proper use of respirators could be evaluated through training and supervision by professional trainers.

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* Corresponding author.
E-mail address: zubiryusof@iium.edu.my (M.Z. Yusof).

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There is a high rate of non-compliance, despite the claim that these respirators protect against harmful substances [6]. Respirator tolerability might be the reason for this non-compliance. The key factors influencing non-compliance were most likely the tolerability of the respirator in terms of discomfort; issues with functionality such as job hindrance from respirator use; a lack of awareness and training; and the health effects of wearing the respirator [6–10].

Although wearing a respirator can potentially prevent a worker from inhaling hazardous substances, it may cause also discomfort, leading to poor tolerability. Exploring the needs of these workers and their attitudes towards wearing a tight-fitting respirator can help us better understand when we should encourage or require them to wear a respirator. Even though Malaysia has respiratory protection guidelines [11], the practice does not always adhere to legislative requirements. This issue is common throughout all Malaysian industries [12]. It is also challenging to observe the Malaysian workers' understanding of how to put on the respirator correctly. Since currently available respirators are primarily based on Western facial dimensions, they may not be suitable for Malaysian facial dimensions. For this reason, Malaysian workers may tend to remove their respirators because they feel it is ineffective or uncomfortable to wear, especially in the hot and humid conditions. To the best of the authors' knowledge, evidence related to Malaysian workers' perceptions of proper respirator use is scarce. It is also crucial to understand their perspectives on respirator compliance and how respiratory protection programmes are implemented in Malaysia. Thus, we aimed to determine Malaysian workers' perceptions of respirator tolerability, as well as the relationship these perceptions had with respirator compliance.

2. Methods

2.1. Study design and recruitment

We conducted a cross-sectional survey of Malaysian workers from three key sectors: agriculture, industrial, and service. An online survey was created using Google Forms, a web-based survey platform. The online questionnaire was constructed in such a way that all survey items were required to be completed. As a result, without a valid response, the respondents were unable to move on to the next question. Thus, there was no issue with missing data. Links to the survey were distributed purposely to the relevant industries via social media platforms such as Facebook, WhatsApp, Twitter, LinkedIn, and email between October and December 2021. We also asked the respondents to share the study link with others to increase the number of participants who would receive the invitation. This strategy allowed more respondents to be recruited, especially during the rapidly changing pandemic situation, which might have limited the authors' movements. A single mean calculation was used to determine the sample size. Using an estimated mean score of 5.79 (standard deviation = 0.55) for respirator comfort and tolerability [13], a 0.05% margin of error, a 95% confidence level, and a 50% dropout rate, the estimated sample size was 300 workers.

Workers aged 18 and older who were currently wearing or had previously worn a respirator at work, such as filtering facepiece (i.e., N95, R95, P95), half-face and full-face respirators; who had consented to participate in the study; and who could understand either Malay or English were eligible to participate. Participants were given a brief description of the study and its objectives, as well as a declaration of anonymity and confidentiality, before completing the questionnaire. The participants were not required to give their names or contact information. They also had the option to leave the survey at any time. There were no incentives for completing the survey.

2.2. Study instrument

The first two sections of the questionnaire collected background information about aspects of the respondents' socio-demographic status and employment such as age, gender, race, level of education, marital status, household income, smoking status, existing chronic diseases, type of job sector, and working duration. The questionnaire then asked about respirator compliance, including the size and type of respirator they had used, medical fitness, training, and fit testing. The Respirator Comfort, Wearing Experience and Function Instrument (R-COMFI) questionnaire was then used to assess the workers' tolerability while wearing respirators [14]. This questionnaire has been validated for evaluating the comfort and tolerability of the respirator, and the questions are applicable to a wide range of populations [14].

The R-COMFI questionnaire consists of three subscales: discomfort, general wearing experience, and function. The Discomfort Subscale comprises of ten items, with scores ranging from 0 (None of the time) to 2 (All of the time), and a total score of 20. In general, it assesses the discomfort of wearing a

respirator that causes facial irritation, nasal pinching, facial sweat, and heat. The Wearing Experience Subscale measures the physiological conditions associated with respirator use, such as dizziness, fatigue, claustrophobia, difficulty breathing, and eye dryness. It comprises six items that can be scored from 0 (None of the time) to 2 (All of the time); it has a score range of 0–12. The Function Subscale consists of five items scored from 0 (Strongly disagree) to 3 (Strongly agree), with a score range of 0–15. It evaluates the respirator's functionality in terms of communication, work interference, hearing and visual ability. There were no reverse-scored items. The maximum R-COMFI score was 47, with lower scores indicating greater tolerability.

The Malay version of the R-COMFI questionnaire was translated using forward and reverse translation by a certified, independent translator who was blind to the purpose of the study. The face validity of the translated questionnaire was established by conducting a pre-test with ten volunteer respirator users (8 health care workers and 2 industrial workers) to determine if they could comprehend the questions. The participants were instructed to highlight and clarify any ambiguous words, either by writing them down on a copy of the pretested questionnaire or by notifying one of the researchers. The internal consistency of the questionnaire was also evaluated using test-retest reliability.

2.3. Data analysis

All the collected data were analysed using the IBM Statistical Package for the Social Sciences version 24.0 (SPSS Statistics 2.0) [15]. Face validity was determined through a respondent review. Cronbach's alpha statistics were calculated to evaluate the internal consistency of all the measured outcome items within each domain. Descriptive statistics were used to analyse background characteristics and respirator compliance. The independent variables that linked significantly ($p < 0.05$) with the outcome variables using simple linear regression were considered possible contributory factors and included in the multiple regression models (Enter method). A linear relationship between the contributory factors and the R-COMFI scores was assumed after there was no evidence of multicollinearity. We checked for this problem by obtaining the tolerance for each independent variable to assume a linear relationship. A tolerance value of more than 0.4 is considered acceptable. Linearity was also checked by examining the assumption of equal variance using a scatter plot between residual (x) and predicted values (y). A p-value less than 0.05 was considered statistically significant.

2.4. Ethical consideration

This study was approved by the International Islamic University Malaysia Research Ethics Committee (IREC) (IREC 2021-250).

3. Results

3.1. Background characteristics and respirator compliance

A total of 340 respondents participated in the survey; however, only 278 met the inclusion criteria. The respondents' background characteristics and respirator compliance are described in Table 1. The majority of them were male (86.7%) and Malay (85.6%), with a mean age of 36 years old (standard deviation (SD) = 8). More than half of the respondents had tertiary education (62.9%), were married (76.6%), and did not smoke (54.7%). Almost all of the respondents (91.4%) did not suffer from chronic diseases such as hypertension, respiratory problems, or heart disease. A high proportion of respondents (60.8%) reported having a low income (B40, or bottom 40% of Malaysian household income). Most were employed in service sectors, such as healthcare and public services (68%), and had less than 10 years of employment (58.6%).

About 40% of the respondents reported wearing two different types of respirators, followed by those who had only worn one type (37.8%). A minority of respondents (21.9%) had worn all types of respirators such as filtering facepieces (i.e., N95, R95, P95), half-face respirators, and full-face respirators. Only one-third of the respondents claimed they were unsure about the size of the respirator that they had donned. More than half of the respondents had not undergone medical fitness for respirator usage (56.8%). In addition, the majority of respondents claimed that respirator training had been provided in the workplace (76.6%), with most of it provided as needed. However, more than half of them (55.8%) had not undergone fit testing before wearing the respirator in the workplace. Among the respondents who reported having undergone fit testing, approximately 43% of them reported that the fit test had been performed annually (Table 1).

3.2. Respirator tolerability

Overall, the Malay version of the questionnaire was deemed clear, straightforward, and simple to

Table 1. Background characteristics and respirator compliance of the respondents (N = 278).

Characteristics	n	%
Age (years)	36 (8)[a]	
Gender		
Male	241	86.7
Female	37	13.3
Race		
Non-Malay	40	14.4
Malay	238	85.6
Level of education		
Primary	6	2.2
Secondary	97	34.9
Tertiary	175	62.9
Marital status		
Single	57	20.5
Married/ever married	221	79.5
Smoking status		
No	152	54.7
Yes	126	45.3
Chronic disease		
No	254	91.4
Yes	24	8.6
Household income		
B40 (< RM4850)	169	60.8
M40 (RM4850- RM10959)	77	27.7
T20 (> RM10959)	32	11.5
Type of job sector		
Agriculture	4	1.4
Industry	85	30.6
Service	189	68
Working duration (years)		
Less than 10 years	163	58.6
10 years and more	115	41.4
Type of respirator use (Filtering face piece (i.e., N95, R95, P95, half-face & full-face)		
One type only	105	37.8
Two types only	112	40.3
All types	61	21.9
Respirator size		
S	11	4
M	123	44.2
L	58	20.9
Not sure	86	30.9
Have you undergone medical fitness for respirator use by medical personnel?		
No	158	56.8
Yes	120	43.2
Is there any respirator training provided in your workplace?		
No	54	23.4
Yes	213	76.6
If yes, when is respirator training offered? (N = 213)		
Upon employment/initial use	61	28.6
As needed	79	37.1
Annually	73	34.3
Is fit testing provided for you?		
No	155	55.8
Yes	123	44.2
How often is fit testing conducted? (N = 123)		
Upon employment/initial use	23	18.7
As needed	47	38.2
Annually	53	43.1

[a] Mean (Standard deviation (SD)).

understand by the participants. The Cronbach's alpha coefficients were good for discomfort (0.84), general wearing experience (0.82), and function (0.79). The Malay version of the R-COMFI questionnaire demonstrated high internal consistency, with a total Cronbach's alpha coefficient of 0.89 [16].

Table 2 shows the responses to the respirator tolerability. More than half of the respondents complained about the discomfort of wearing respirators. The most common reasons for their discomfort were sweat or moisture accumulation around the mouthpiece, followed by strap tightness, facial irritation, facial heat, facial itching, nose pinching, and facial pinching. However, a majority of respondents did not experience nausea (71.9%) or headaches (63.3%) due to the discomfort of wearing a respirator.

Based on their general wearing experience, most of the time, only a small percentage of the respondents experienced dizziness (1.4%), loss of energy (1.4%), claustrophobia (1.8%), shortness of breath (2.5%), breathing difficulties (3.6%), or dry and itchy eyes (2.2%). Regarding the functionality of the respirator, the majority of the respondents agreed that wearing the respirator had affected their attention while working. Respondents also reported having trouble communicating verbally with others and difficulty hearing others. On the other hand, most of them did not agree that wearing a respirator might obstruct their vision and/or interfere with their duties (Table 2). The detailed descriptive statistics of respirator tolerability scores are shown in Table 3. The overall mean total R-COMFI score was 17.5 (SD = 7.2).

3.3. Factors associated with respirator tolerability

Several factors linked with respirator tolerability were investigated (Table 4). As the table shows, those respondents with a secondary level of education had higher tolerability (β = −2.498, 95% CI = −4.266, −0.729), whereas those with a tertiary level of education had lower tolerability (β = 2.268, 95% CI = 0.519, 4.017). In addition, respondents who

Table 2. Respirator tolerability responses.

Domain/Question	n (%)		
	None of the time	Some of the time	Most of the time
Discomfort			
How often did wearing the respirator cause discomfort to you?			
Tightness of straps	39 (14)	164 (59)	75 (27)
Facial irritation (leaves marks/indents)	56 (20.1)	149 (53.6)	73 (26.3)
Facial itching	123 (44.2)	136 (48.9)	19 (6.8)
Facial pinching	166 (59.7)	93 (33.5)	19 (6.8)
Nose, nose - bridge (pinching, redness from metal band)	133 (47.8)	119 (42.8)	26 (9.4)
Facial heat/warmth	68 (24.5)	150 (54)	60 (21.6)
Sweat/moisture build-up	23 (8.3)	147 (52.9)	108 (38.8)
Lack of fresh air	60 (21.6)	164 (59)	54 (19.4)
Nausea	200 (71.9)	73 (26.3)	5 (1.8)
Headache	176 (63.3)	96 (34.5)	6 (2.2)
General wearing experience			
Due to wearing the respirator, I experienced the following:			
Dizziness	187 (67.3)	87 (31.3)	4 (1.4)
Loss of energy, tiredness, fatigue	153 (55)	121 (43.5)	4 (1.4)
Claustrophobia	204 (73.4)	69 (24.8)	5 (1.8)
Shortness of breath	186 (66.9)	85 (30.6)	7 (2.5)
Breathing difficulty	151 (54.3)	117 (42.1)	10 (3.6)
Dry and itchy eyes	192 (69.1)	80 (28.8)	6 (2.2)
	Strongly disagree	Disagree	Agree	Strongly agree
Function				
Think about your experience with wearing the respirator mask and indicate your level of agreement with each statement.				
The respirator affected my concentration while working (always adjusting the mask).	21 (7.6)	90 (32.4)	150 (54)	17 (6.1)
I had difficulty verbally communicating to others (unintelligible, muffled speech)	11 (4)	42 (15.1)	186 (66.9)	39 (14)
Had difficulty hearing others.	19 (6.8)	120 (43.2)	117 (42.1)	22 (7.9)
The respirator obstructed my vision.	26 (9.4)	166 (59.7)	80 (28.8)	6 (2.2)
The respirator interfered with my duties (quick to leave room, less interaction).	33 (11.9)	160 (57.6)	82 (29.5)	3 (1.1)

Table 3. Descriptive statistics of respirator tolerability.

Domain	Maximum score	Mean	SD
Discomfort	20	7.8	3.9
General wearing experience	11	2.2	2.2
Function	15	7.4	2.5
Total R-COMFI score	40	17.5	7.2

underwent fit testing reported improved respirator tolerability at work (β = −1.956, 95% CI = −3.661, −0.251). However, only ethnicity and respirator training were significantly associated with respirator tolerability after adjusting for multiple linear regression. Malay respondents had better tolerability (β = −2.604, 95% CI = −4.983, −0.225) compared to non-Malay respondents. Respondents who had received respirator training showed greater tolerability (β = −2.213, 95% CI = −4.339, −0.088) of wearing the respirator compared to those without training.

4. Discussion

This study aimed to measure workers' perceptions of the tolerability of wearing respirators in the workplace, and to identify the demographics and respirator compliance factors linked to respirator tolerability. Tolerability was measured using a validated R-COMFI tool and measured based on discomfort, the general wearing experience, and the respirator's functionality. We found that the workers generally experienced discomfort when wearing the respirator, and had issues with the functionality of the respirator itself. However, more than half of the workers experienced no general health symptoms while wearing the respirator. The average R-COMFI tolerability score among our respondents was higher (mean = 17.5 (SD = 7.2)) than that of Lebanese workers from another study (mean = 13.63 (SD = 3.28) [17]. These results suggest that our respondents had poorer tolerability of wearing respirators compared to Lebanese workers.

Table 4. Factors associated with respirator tolerability.

Variables	Total R-COMFI score							
	Simple Linear Regression				Multiple Linear Regression			
	β	SE	95% CI		β	SE	95% CI	
Age (years)	0.040	0.053	−0.064	0.144	–	–	–	–
Gender (ref: Male)	−0.296	1.278	−2.812	2.220	–	–	–	–
Ethnicity (ref: non-Malay)	−2.536*	1.227	−4.952	−0.120	−2.604*	1.209	−4.983	−0.225
Level of education								
Primary	1.819	2.985	−4.058	7.695	–	–	–	–
Secondary	−2.498*	0.898	−4.266	−0.729	−3.264	2.955	−9.081	2.553
Tertiary	2.268*	0.888	0.519	4.017	−0.692	2.920	−6.440	5.056
Marital status (ref: Single)	0.079	1.075	−2.038	2.196	–	–	–	–
Smoking status (ref: No)	0.438	0.872	−1.277	2.154	–	–	–	–
Chronic disease (ref: No)	1.583	1.543	−1.454	4.620	–	–	–	–
Household income								
B40	−1.458	0.885	−3.200	0.284	–	–	–	–
M40	1.317	0.967	−0.586	3.221	–	–	–	–
T20	0.822	1.359	−1.854	3.498	–	–	–	–
Type of job sector								
Agriculture	−6.142	3.626	−13.281	0.997	–	–	–	–
Industry	0.304	0.942	−1.551	2.158	–	–	–	–
Service	0.104	0.930	−1.728	1.936	–	–	–	–
Working duration (years)	0.138	0.881	−1.597	1.873	–	–	–	–
Type of respirator use								
One type	−0.553	0.895	−2.315	1.208	–	–	–	–
Two types	0.463	0.885	−1.279	2.204	–	–	–	–
All types	0.109	1.049	−1.955	2.174	–	–	–	–
Respirator size					–	–	–	–
S	0.559	2.227	−3.824	4.942	–	–	–	–
M	−0.177	0.874	−1.897	1.543	–	–	–	–
L	0.847	1.067	−1.254	2.948	–	–	–	–
Not sure	−0.550	0.939	−2.397	1.298	–	–	–	–
Medical fitness assessment for respirator user	−0.725	0.875	−2.449	0.998	–	–	–	–
Respirator training	−2.209*	1.017	−4.211	−0.207	−2.213*	1.080	−4.339	−0.088
Respirator training frequency (N = 213)								
Upon employment/initial use	0.256	1.049	−1.808	2.321	–	–	–	–
As needed	−1.145	0.960	−3.035	0.745	–	–	–	–
Annually	−1.067	0.984	−3.005	0.871	–	–	–	–
Undergo fit testing	−1.956*	0.866	−3.661	−0.251	−1.298	0.909	−3.087	0.491
Fit testing frequency (N = 123)								
Upon employment/initial use	0.676	1.575	−2.425	3.777	–	–	–	–
As needed	−1.563	1.154	−3.835	0.710	–	–	–	–
Annually	−2.037	1.098	−4.199	0.126	–	–	–	–

Note: Unstandardized coefficient (β), Standard error (SE), Confidence interval (CI); reference group (ref); *significant at p value < 0.05.

These poor tolerability findings were related to discomfort and concerns about respirator functionality. Our respondents complained that wearing respirators was uncomfortable, particularly due to sweat or moisture buildup on their faces, which may be exacerbated in Malaysia's hot and humid weather. Previous research has shown that wearing a respirator can cause excessive sweating on the facial skin, which became the primary cause of intolerance towards wearing respirators [6,18,19]. It has been explained that wearing an N95 respirator, regardless of workload, may increase the facial skin temperature by 1.9 ± 3.5 °C, as measured by infrared thermography [20]. Consistent with the previous studies, discomfort may also result from other facial symptoms, such as facial itching and nasal pinching [18,21].

The functionality of the respirator was also a major feature of lower tolerability in our study. Similar to previous research, our respondents believed that a respirator could hinder their concentration while working and impede their ability to communicate with their co-workers [22,23]. In addition, prolonged respirator use may cause undesirable health effects, such as headaches and breathing difficulties [24–26]. However, the majority of our participants indicated that wearing the respirator did not hinder their ability to perform their duties. Even though they claimed the respirator affected with their concentration, they did not

believe that wearing the respirator compromised with their responsibilities to complete their duty. Workers may have felt obliged to wear the respiratory, despite its intolerability, in order to fulfill their duties [27]. Our findings suggest that respirators are poorly tolerated due to the discomfort, ineffective functionality, and unfavourable health effects with which they are associated.

Through regression analysis, it appeared that ethnicity and respirator training were contributing factors to the perceived tolerability of respirators among our respondents. Malay respondents reported greater tolerability than other ethnicities. The differences in tolerability of the respirator by ethnicity might be influenced by different facial dimensions, which indirectly affect the fit of the respirator [5]. African Americans and Hispanics, for example, have more face lengths that are 2.7 and 2.8 mm longer, respectively, than Caucasians. Meanwhile, Chinese and Koreans tend to have shorter and wider facial features, as well as wider lips, than Caucasians [28,29].

In Malaysia, there are differences in the facial dimensions among the country's three major ethnic groups, Malay, Chinese, and Indian. For Malay, Indian, and Chinese people, the mean for nose protrusion headboard (nose height) is 54.13, 51.9, and 25.62 mm, respectively [30−32]. As a result, this finding implies that diverse ethnic backgrounds among workers may influence their varied experiences with comfort and functionality of wearing respirators.

Training was significantly associated with better respirator tolerance and adherence, which was consistent with previous research [33−35]. This can be explained by the fact that respirator training may enhance the likelihood of personal comfort, which in turn influences respirator compliance. For example, training on how to perform a fit check not only reduces the respirator's leakage but also improve the wearer's comfort [36]. The use of respirators in the workplace is crucial, as this can protect workers from the inhalation of hazardous substances. If a respirator does not comfortably fit over a worker's face, they tend to remove the device and not comply with the safety and health regulations.

Though our study did not find a significant association between undergoing a respirator fit test was and tolerability of using a respirator, previous research has found that respiratory fit testing may affect the comfort of wearing a respirator. In other studies, a higher respiratory fit factor was associated with a higher comfort score [37,38]. The observed heterogeneity of our study's findings, in contrast to the findings of previous research, may be attributable to the different assessment tools used to measure comfort or the differences between the study populations.

Previous studies revealed that the different types of respirators could be related to the wearer's tolerability [13], [27], [39]. However, our study showed no link between respirator type and respirator tolerability. It is possible that a majority of our respondents were wearing more than one type of respirator, making it difficult to determine which type of respirator was correlated with tolerability. Employment in a specific job sectors was not significantly associated with the outcome. This is most likely because a majority of workers across industries experienced similar issues with respirator tolerability [40−43].

Respirators are widely used in practically all industries in Malaysia to control harmful inhalation exposures. For example, it is estimated that approximately 10,000 workers in Malaysia alone use respirators for upstream and gas companies [12]. However, not all workers have received the necessary training to correctly wear respirators. This study also suggests that workers of different ethnicities may experience different levels of comfort and functionality while using respirators. Thus, it is the employer's responsibility to provide a suitable respirator, and that employees may be allowed to select the respirator model, size, and type that work best for their comfort. It is hoped that our findings will contribute to the improvement of the existing guidelines for the use of respirators in the workplace in Malaysia [11].

Several limitations should be noted. As we conducted an online survey, we may not have obtained responses from areas with limited access to social media and Internet infrastructure. Given the cross-sectional nature of the data, it was impossible to determine the causal relationship of the findings. The generalizability of our results might be limited as the recruitment and sampling process only took place via purposive sampling of the selected industries. However, respirators are commonly used by workers in these industries. Despite these limitations, the findings obtained through the online survey were useful for remotely assessing workers' perceptions in the midst of the COVID-19 pandemic. The high reliability of the Malay version of the R-COMFI questionnaire was also another strength of this study.

5. Conclusion

We conclude that our respondents generally experienced discomfort from wearing respirators

and were concerned about the functionality of respirators. Malay ethnicity, compared to non-Malays, and respirator training, compared to no training, were also identified as factors influencing respirator tolerance. Emphasis should be placed on educating and training employees and employers about the necessity of respiratory protection in the workplace. To achieve this objective, both stakeholders will need continuous education and a greater commitment to sustain respiratory protection programmes in their workplaces.

Conflict of interest

The authors declare that they have no conflict of interest.

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