

Knowledge and Confidence Level among Emergency Healthcare Workers in Airway Management and Resuscitation of Suspected Covid-19 Patients: A Cross-Sectional Study in Penang and Kelantan

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ABSTRACT

INTRODUCTION: COVID-19 cases in Malaysia have followed a never-ending course of spike and fall since it was first detected. Though the prominent role of infection control standard precautions were strictly applied, cases among emergency healthcare workers (EHCW) contracting the disease continue to rise. Our study aims to evaluate the knowledge and confidence level and the factors that may influence the knowledge and confidence level among EHCW in airway management and resuscitation of suspected COVID-19 patients. **MATERIALS AND METHODS:** This was a cross-sectional study conducted in tertiary hospitals in Penang and Kelantan using a validated questionnaire. The territories evaluated include the possible method of transmission, proper steps during resuscitation, airway management and intubation, intensive care management, and etiquette of personal protective equipment. **RESULTS:** Out of 543 EHCW eligible for the study, only 300 participants responded to the questionnaire. Our study showed only 15.3% of respondents had good knowledge and 62.3% had high confidence in airway management and resuscitation of suspected COVID-19 patients. Significant associations were seen in knowledge and confidence level among respondents with previous experience attending continuing medical education ($F=7.041$, $P=0.008$ and $F=19.398$, $P<0.001$ respectively). Significant associations were also demonstrated in confidence level among respondents with previous simulation training experience ($F=13.905$, $P<0.001$). **CONCLUSION:** Our study revealed that most EHCW had poor knowledge and moderately adequate confidence in the airway management and resuscitation of suspected COVID-19 patients. A more comprehensive and strategized training program needs to be conducted to help in improvement of the knowledge and confidence level among EHCW.

Keywords

Knowledge, Resuscitation, Airway Management, COVID-19, Emergency Department

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INTRODUCTION

Emergency healthcare worker (EHCW) are at risk of contracting the disease whenever they treat a suspected COVID-19 patient in the emergency department (ED). The risk increases without proper personal protective equipment (PPE) especially when dealing with any aerosol-generating procedure, such as airway management and chest compression during resuscitation.¹ Various task forces and guidelines before the pandemic did not hold forth the challenges of providing resuscitation in the milieu of the COVID-19 era.¹ Healthcare workers must manage and treat these patients while being vigilant about

their safety.¹ To bridge this gap, task forces such as the American Heart Association, Difficult Airway Society, and European Resuscitation Council have recently issued airway management and resuscitation guidelines during the COVID-19 pandemic.¹⁻³ Updated knowledge with the latest guideline among healthcare workers attending COVID-19 cases will ensure confidence in managing such cases. It will also ensure that a proper protective strategy is instituted to prevent the disease from spreading to healthcare workers.¹

Zhang et al., in their survey among healthcare workers during the early and mid-period of the COVID-19 outbreak in Henan province, China, has demonstrated that knowledge plays a vital role in healthcare worker's attitude and confidence towards defeating this virus.⁴ In his survey, 89% of healthcare workers have sufficient knowledge of COVID-19, and 87% followed correct preventive practice.⁴ However 85% of the responders feared contracting the disease, indicating a high prevalence of low confidence among the healthcare workers.⁴ A survey conducted by Ronald Olum et al. also demonstrated adequate knowledge (overall 69%) led to good practice (overall 74%) toward COVID-19 among healthcare workers.⁵ However, these studies did not focus on healthcare workers in the emergency department. As front liners, emergency healthcare workers are frequently at risk of contracting this disease.⁶ The knowledge aspect assessed in these studies is about the origin, route of transmission, clinical symptoms, preventive strategies, and vaccine availability in the market to cure COVID-19. Knowledge and confidence in airway management and resuscitation among emergency healthcare workers were not explored.

Yoshito Kadoya et al., in their survey among cardiovascular medicine healthcare workers, concluded that more attention should be paid to the preparedness of healthcare workers towards COVID-19 care.⁷ He expresses that most healthcare workers showed low confidence (83.3%) in handling COVID-19 cases, especially among non-physician healthcare workers.⁷ He also concluded that such low confidence in handling these cases is due to a lack of knowledge on optimal infection-prevention measures.⁷

A study in a tertiary teaching hospital in Kuala Lumpur demonstrates that EHCW in Malaysia possessed good knowledge (68.9%) in airway management and resuscitation of suspected COVID-19 patients but differed between designations and length of services.⁸ In their study, most EHCW are confident (53.3%) in performing high-quality chest compression and handling PPE.⁸ The higher confidence level were demonstrated among senior EHCW especially those with more than 10 years of working experience due to previous involvement

in outbreaks such as SARS, H1N1, MERS-CoV and exposure to various level of difficulties of airway management.⁸ This study was a single-centre study with a relatively small sample size, limiting its generalization among EHCW in the country.⁸ There is also a limitation in generalizations among the EHCW, as most of the respondents were doctors.⁸ Moreover, the study was conducted during the early phase of the COVID-19 pandemic, thus limiting the value of the information obtained.

Therefore, we conducted a multicentre study to obtain more information regarding knowledge and confidence among EHCW. Our study was conducted during the surge of the COVID-19 pandemic and provided more information on how much the EHCW have prepared to deal with this pandemic.

It is crucial as only with adequate preparedness and sufficient knowledge will the EHCW face this situation confidently, and with a high degree of safety.⁶ Penang and Kelantan state were chosen for this study, as since January 2021, COVID-19 cases in both states have continued to rise.⁷ During the first wave of the COVID-19 pandemic in our nation, the lesser number of cases in these two states may contribute to a lower level of knowledge and confidence among our EHCW due to a lesser exposure in handling COVID-19 cases as compared to other states with a greater number of COVID-19 cases. Therefore, with an increasing number of cases in Penang and Kelantan, there is a need for a multicentre output study to represent EHCW on the east coast and west coast of Malaysia peninsular. By understanding and evaluating the level of knowledge and confidence among our EHCW, a platform for the future development of a training module can be strategized and implemented.

MATERIALS AND METHODS

This was a cross-sectional study conducted in the emergency department of tertiary hospitals in Penang and Kelantan during the period of June 2021 to January 2022. EHCW included in this study consisted of medical officers, assistant medical officers, and staff nurses working in the studied emergency department whereas house officers and healthcare assistants were excluded

from this study.

The sample size calculated was based on the prevalence of knowledge and confidence levels in a renowned study by Abd Samat *et al.* in 2020.⁸ The power sample was significantly calculated with the value of 296 samples for this study.

This study's questionnaire was based on a study done by Abd Samat *et al.*⁸ This questionnaire was designed by the author based on the guidelines, reports, and course material on resuscitation, and respiratory disease, including COVID-19.⁸ Three local emergency physicians validated the questionnaire, and the author conducted a pilot study to obtain the reliability of this questionnaire.⁸ Cronbach's alpha (α) score for the questionnaire was 0.748.⁸ The author was contacted to seek permission to utilize the study survey instrument.

The questionnaire form consisted of 3 sections. Section A included the population's demographic data, i.e., designation, hospital, gender, age, length of service, and any underlying comorbid. Section B consisted of 40 knowledge items that evaluate the understanding of airway management and resuscitation for suspected COVID-19 patients. Among the knowledge-related questions, 23 were about airway management, and the other 17 were about resuscitation measures. The territories evaluated in the knowledge arm include the possible method of transmission, proper steps during resuscitation, airway management and intubation, intensive care management, and etiquette of PPE for the management of a suspected COVID-19 patient. The knowledge questions were assessed using a dichotomous scale with either a true or false answer.

Section C consisted of 10 questions that explore the EHCW confidence in airway management and resuscitation of suspected COVID-19 patients. The ten questions related to confidence level consisted of 4 questions on airway-related confidence (ARC) (Q2, Q3, Q7, Q9), four questions on resuscitation-related confidence (RRC) (Q1, Q4, Q5, Q10), and the remaining two questions on personal protective equipment (PPE) (Q6, Q8). A five-point Likert scale with one being

strongly disagreed, two as disagreed, three as indeterminate, four as agreed, and five as strongly agreed is used to assess EHCW confidence level. The cut-off score of ≥ 32 indicates a good knowledge level, and a score of ≥ 3.55 indicates a high confidence level. The cut-score of ≤ 31 indicates a poor knowledge level, and a score of < 3.55 indicates a low confidence level.

The study data was collected via an online self-administered questionnaire using the WhatsApp application. The questionnaire for the study was designed on Google Forms. The online self-administered questionnaire was used to minimize the risk of transmission through contaminated contact surfaces during the conduct of this study. The questionnaires were distributed equally to each hospital and EHCW to ensure the study's generalization. To ensure equal distribution, 25% of the questionnaire set was distributed to each hospital studied, resulting in each hospital receiving 75 sets of questionnaires. The 75 questionnaires were distributed equally among doctors, staff nurses, and assistant medical officers. Upon selection, a participant code were being provided to the participants. Permission to share the online self-administered questionnaire via a WhatsApp group among the selected participants was sought during the meet-up. The participants were required to complete the questionnaire upon providing its link and were given a 30-minute time frame to complete it during the meet up. Participants were timed during answering the questionnaires to ensure a standardized and fair method of obtaining results while maintaining test integrity by preventing cheating in an online environment.

The collected data and variables from the sample were categorized accordingly by statistical analyses using the SPSS™ 26. Pearson chi-square was used to compare the difference in knowledge and confidence level of EHCW by demographic characteristic. Multivariate analysis was performed based on logistic regression to analyse the significance of the predictive value from the univariate analysis. The mean knowledge score and confidence level for the different designation, length of services, previous experience attending CME, and previous experience attending simulation training were analysed using one-way ANOVA. Further analysis was conducted on the

two arms of knowledge, which include the airway and resuscitation-related knowledge, whereas, for the confidence arm, further analysis was conducted on the airway, resuscitation, and PPE-related confidence.

Ethical approval was obtained from the Medical Research Ethics Committee (MREC), Kementerian Kesihatan Malaysia (Reference NMRR-21-354-58377 IIR), and the Ethical Board of the Hospital Ethics Committee (Reference USM/JEPeM/21040311). Permission to conduct the research in each hospital study was obtained following the ethics committee's approval. The confidentiality of all the respondents was guaranteed, and the respondents' participation was voluntary.

RESULTS

Out of 543 EHCW eligible for the study, 300 responded to the questionnaire and were included in the final analysis. Overall, the results show that only 15.3% of respondents (n=46) had good knowledge. Even though the proportion of respondents with medical officer designation was the highest in those with good knowledge (n=34, 73.9%), most medical officers fall in the poor knowledge

group (n=67, 66.3%). Only 7.8% (n=8) assistant medical officers and 4.1% (n=4) staff nurses have good knowledge of managing the airway and resuscitating suspected COVID-19 patients. Pearson chi-square showed a significant association between the knowledge and different designation with P-value <0.001. Calculated Pearson chi-square also showed a significant association between knowledge and previous experience attending Continuing Medical Education (CME) with P-value=0.001. However, there was no significant association between knowledge and centre studied, gender, age, comorbidities, length of services, or previous experiences attending simulation training.

The results also showed that 62.3% of the respondents (n=187) had a high confidence. The calculated Pearson chi-square showed an association between confidence and the hospital studied, previous experience attending CME, and previous experience attending simulation training with P-values of 0.035, 0.005, and 0.013, respectively (P<0.05). However, no associations were found between confidence and neither designation, gender, age, comorbid, or the length of services. Table I shows details of the demography.

Table I: Descriptive statistics of overall frequency and percentage for knowledge and confidence items in the questionnaire among emergency healthcare workers in airway management and resuscitation of suspected COVID-19 patient in Penang and Kelantan (n=300)

Variable	Good Knowledge	Poor Knowledge	P-value ^a for	High Confidence	Low confidence	P-value ^a for confidence	Total n (%)
Designation							
Assistant medical officer	8 (17.4)	94 (37.0)	<0.001	65 (34.8)	37 (32.7)	0.069	102 (34.0)
Medical officer	34 (73.9)	67 (26.4)		70 (37.4)	31 (27.4)		101 (33.7)
Staff nurse	4 (8.7)	93 (36.6)		52 (27.8)	45 (39.8)		97 (32.30)
Hospital							
Hospital Pulau Pinang			0.143			0.035	
Hospital Raja Perempuan Zainab	16 (34.8)	59 (23.2)		46 (24.6)	29 (25.7)		75 (25.0)
Hospital Seberang Jaya	8 (17.4)	67 (26.4)		37 (19.8)	38 (33.6)		75 (25.0)
Hospital Universiti Sains Malaysia	8 (17.4)	68 (26.8)		53 (28.3)	23 (20.4)		76 (25.3)
	14 (30.4)	60 (23.6)		51 (27.3)	23 (20.4)		74 (24.7)
Gender							
Male	25 (54.3)	114 (44.9)	0.236	95 (50.8)	44 (38.9)	0.056	139 (46.3)
Female	21 (45.7)	140 (55.1)		92 (49.2)	69 (61.1)		161 (53.7)
Age							
20 – 30 years old	17 (37.0)	120 (47.2)	0.432 ^b	84 (44.9)	53 (46.9)	0.773 ^b	137 (45.7)
31 – 40 years old	28 (60.9)	121 (47.6)		95 (50.8)	54 (47.8)		149 (49.7)
41 – 50 years old	1 (2.2)	9 (3.5)		5 (2.7)	5 (4.4)		10 (3.3)
51 – 60 years old	0 (0.0)	4 (1.6)		3 (1.6)	1 (0.9)		4 (1.3)
Length of service							
1 – 3 years	9 (19.6)	57 (22.4)	0.323	38 (20.3)	28 (24.8)	0.159	66 (22.0)
4 – 6 years	15 (32.6)	79 (31.1)		61 (32.6)	33 (29.2)		94 (31.3)
7 – 10 years	16 (34.8)	67 (26.4)		57 (30.5)	26 (23.0)		83 (27.7)
Less than a year	1 (2.2)	1 (0.4)		0 (0.0)	2 (1.8)		2 (0.7)
More than 10 years	5 (10.9)	50 (19.7)		31 (16.6)	24 (21.2)		55 (18.3)
Comorbid							
Yes	4 (8.7)	18 (7.1)	0.757 ^b	13 (7.0)	9 (8.0)	0.820	22 (7.3)
No	42 (91.3)	236 (92.9)		174 (93.0)	104 (92.0)		278 (92.7)
Previous experience attending CME related to airway management or resuscitation for suspected COVID-19 cases							
Yes	41 (89.1)	164 (64.6)	0.001	139 (74.3)	66 (58.4)	0.005	205 (68.3)
No	5 (10.9)	90 (35.4)		48 (25.7)	47 (41.6)		95 (31.7)
Previous experience attending simulation training related to airway management and resuscitation for suspected COVID-19 cases							
Yes	25 (54.3)	133 (52.4)	0.804	109 (58.3)	49 (43.4)	0.013	158 (52.7)
No	21 (45.7)	121 (47.6)		78 (41.7)	64 (56.6)		142 (47.3)

^aPearson chi-square applied; less than 20% of expected count < 5

^bFisher exact-test applied; more than 20% of expected count < 5

Knowledge and confidence in airway management and resuscitation on suspected COVID-19 based on subgroup. In the knowledge arm, out of the total score of 40, the mean score for the overall knowledge was 27.78 (SD=3.36). There was a statistically significant mean difference in overall knowledge score between the designation (F=41.33, P<0.001) and previous experience attending CME training (F=7.04, P=0.008). Both the mean score for airway-related knowledge (ARK) (F=38.11, P<0.001) and resuscitation-related knowledge (RRK) (F=13.25, P<0.001) showed a significant difference between the different designations. MO scored the highest overall mean score for ARK and RRK compared to AMO and SN. Statistically significant differences were also noted in the variable for previous experience attending CME for ARK (F=7.777, P=0.006)

In the confidence arm, the overall mean score for confidence was 3.76 (SD=0.64). There was a statistically significant mean difference in mean overall confidence level between all the subgroups (P<0.05) except for the mean score for PPE for the designation, length of services,

and previous experience attending CME. Table II shows details of the analysis.

Associated Factors for Poor Knowledge in Airway Management and Resuscitation of Suspected COVID-19 Patients

The results in multiple logistic regression indicated that designation and no experience attending CME statistically showed a significant association with poor knowledge in airway management and resuscitation of suspected COVID-19 patients. EHCW with no experience attending CME increased the risk of having poor knowledge by 3.869 compared to EHCW with experience attending CME (Adjusted OR=3.869; 95% CI: 1.426, 10.499; P=0.008). Table III shows the detail of the analysis.

Associated Factors for Low Confidence in Airway Management and Resuscitation of Suspected COVID-19 Patients

The results in multiple logistic regression indicated that no experience attending CME statistically showed a significant association with the low confidence in airway management and resuscitation of suspected COVID-19

Table II: Knowledge and confidence in airway and resuscitation on COVID-19 Patients based on subgroups among emergency healthcare workers in Penang and Kelantan (n=300)

Variable	Knowledge			Confidence			Overall Mean (SD)
	Airway Related Knowledge (ARK)	Resuscitation Related Knowledge (RRK) Mean (SD)	Overall Mean (SD)	Airway Related Confidence (ARC) Mean (SD)	Resuscitation Related Confidence (RRC) Mean (SD)	Personal Protective Equipment (PPE) Related Confidence Mean (SD)	
Designation							
Assistant medical officer	15.76 (1.98)	11.25 (1.88)	27.02 (2.99)	3.87 (0.71)	3.64 (0.73)	4.20(0.70)	3.77 (0.67)
Medical officer	17.91 (2.18)	12.03 (1.76)	29.94 (3.01)	3.90 (0.89)	3.82 (0.70)	4.18(0.64)	3.92 (0.61)
Staff nurse	15.64 (2.05)	10.69 (1.88)	26.33 (2.94)	3.66 (0.65)	3.51 (0.89)	4.05(0.73)	3.59 (0.60)
Total	16.45 (2.32)	11.33 (1.91)	27.78 (3.36)	3.81 (0.69)	3.66 (0.71)	4.14(0.69)	3.76 (0.64)
	P<0.001	P<0.001	P<0.001	P-value=0.033	P-value=0.009	P-value=0.238	P-value=0.001
	F=38.114	F=13.248	F=41.327	F=3.439	F=4.815		F=6.792
Length of service							
1 – 3 years	16.15 (2.32)	11.35 (1.94)	27.50 (3.47)	3.71 (0.65)	3.62 (0.66)	4.15(0.69)	3.71 (0.59)
4 – 6 years	16.57 (2.29)	11.27 (1.90)	27.84 (3.26)	3.79 (0.65)	3.66 (0.72)	4.12(0.66)	3.75 (0.62)
7 – 10 years	16.84 (2.27)	11.58 (1.89)	28.42 (3.27)	3.99 (0.69)	3.84 (0.71)	4.28(0.64)	3.94 (0.65)
Less than 1 year	17.00 (2.83)	11.50 (3.54)	28.50 (6.36)	3.13 (0.18)	2.50 (0.71)	3.25(0.35)	2.90 (0.14)
More than 10 years	15.96 (2.35)	11.05 (1.92)	27.02 (3.36)	3.72 (0.74)	3.49 (0.70)	3.99(0.79)	3.63 (0.67)
Total	16.45 (2.32)	11.33 (1.91)	27.78 (3.36)	3.81 (0.69)	3.66 (0.71)	4.14(0.69)	3.76 (0.64)
	P=0.177	P=0.618	P=0.168	P-value=0.034	P-value=0.006	P-value=0.058	P-value=0.012
				F=2.643	F=3.698		F=3.280
Previous experience attending CME related to airway management or resuscitation for suspected COVID-19 cases							
Yes	16.70 (2.41)	11.43 (1.97)	28.13 (3.51)	3.94 (0.63)	3.77 (0.69)	4.19(0.70)	3.87 (0.61)
No	15.91 (2.00)	11.13 (1.78)	27.03 (2.89)	3.55 (0.73)	3.43 (0.72)	4.09(0.68)	3.53 (0.65)
Total	16.45 (2.32)	11.33 (1.91)	27.78 (3.36)	3.81 (0.69)	3.66 (0.71)	4.14(0.69)	3.76 (0.64)
	P=0.006	P=0.203	P=0.008	P-value<0.001	P-value<0.001	P-value=0.219	P-value<0.001
	F=7.777		F=7.041	F=22.232	F=15.779		F=19.398
Previous experience attending simulation training related to airway management and resuscitation for suspected COVID-19 cases							
Yes	16.37 (2.30)	11.38 (2.08)	27.75 (3.50)	3.95 (0.67)	3.81 (0.70)	4.20(0.67)	3.89 (0.63)
No	16.54 (2.34)	11.28 (1.71)	27.82 (3.21)	3.66 (0.67)	3.50 (0.70)	4.02(0.73)	3.62 (0.62)
Total	16.45 (2.32)	11.33 (1.91)	27.78 (3.36)	3.81 (0.69)	3.66 (0.71)	4.14(0.69)	3.76 (0.64)
	P=0.531	P=0.658	P=0.857	P-value<0.001	P-value<0.001	P-value=0.037	P-value<0.001
				F=14.533	F=13.677		F=13.905

One-way ANOVA applied; normality and equal variances assumptions were met

Table III: Associated factors of poor knowledge in airway management and resuscitation of suspected COVID-19 patients among emergency healthcare workers in Penang and Kelantan using simple and multiple logistic regression (n=300)

Variables	Simple logistic regression		Multiple logistic	
	Crude OR (95% CI)	P-value ^a	Adjusted OR (95% CI)	P-value ^b
Designation				
Assistant medical officer	0.168 (0.073, 0.385)	<0.001	0.189 (0.081,0.439)	<0.001
Medical officer	1.979 (0.576, 6.797)	0.278	2.134 (0.616, 7.394)	0.232
Gender				
Male	0			
Female	1.462 (0.778, 2.747)	0.238		
Age				
51 – 60 years old	0			
20 – 30 years old	0.000 (0.000, 0.000)			
31 – 40 years old	0.000 (0.000, 0.000)	>0.95		
41 – 50 years old	0.000 (0.000, 0.000)	>0.95		
Length of service				
More than 10 years	0			
1 – 3 years	0.633 (0.199, 2.015)	0.439		
4 – 6 years	0.527 (0.180, 1.539)	0.241		
7 – 10 years	0.419 (0.144, 1.219)	0.110		
Less than a year	0.100 (0.005, 1.855)	0.122		
Comorbid				
No	0			
Yes	0.801 (0.258, 2.484)	0.701		
Previous experience attending CME related to airway management or resuscitation for suspected COVID-19 cases				
Yes	0		0	
No	4.500 (1.717, 11.792)	0.002	3.869 (1.426,10.499)	0.008
Previous experience attending simulation training related to airway management and resuscitation for suspected COVID-19 cases				
Yes	0			
No	1.083 (0.577, 2.034)	0.804		

^aSimple logistic regression applied

^bBackward stepwise multiple logistic regression model applied

The model's overall fit was checked and reported to be Hosmer-Lemeshow test (P=0.940), overall, correctly classified percentage=84.7%, and area under the curve (79.3%) were applied to check the model fitness.

patients. EHCW with no experience attending CME increased the risk of having low confidence by 2.062 compared to EHCW with experience attending CME (Adjusted OR=2.062; 95% CI: 1.254, 3.392; P=0.004). Table IV shows the detail of the analysis.

Association Between Knowledge and Confidence Level

There was no significant association between the knowledge and confidence level among EHCW in airway management and resuscitation of suspected COVID-19 patients in Penang and Kelantan (P=0.042).

DISCUSSION AND CONCLUSION

This study revealed that most of our EHCW had poor knowledge but adequately moderate confidence in managing the airway and handling resuscitation of suspected COVID-19 patients. It is also in line with the study conducted by Abd Samat et al. during the initial period of COVID-19 in our nation. In their study, 68.9% of participants had a high knowledge score.⁸ Contrary to our study, only 15.3% of the respondents had a good

knowledge. The study's method may be the reason for a significant discrepancy in the overall knowledge level between studies. The study by Abd Samat et al. was conducted using a single-centre with relatively smaller sample size.⁸ Most respondents were doctors, limiting the generalization of the emergency workforce in the emergency department.⁸ Our study had a similar finding in the overall knowledge level to those of AO Durodola et al.¹⁴ Their study reported a poor knowledge level as only 25.7% of the respondents had adequate knowledge about PPE to prevent COVID-19 spread.¹⁴ Even though the knowledge assessed differed from our study, PPE application still plays an essential aspect in airway management and resuscitation, creating a valuable clinical context for the current situation. A study conducted by Zoe Roupa et al. concluded that a strategic educational intervention should be implemented in order to ensure that all demographic working strata of health professionals are well-educated and informed regarding the current global public health crisis.¹⁸ A cross-sectional survey of COVID-19 among Syrian residents found only modest knowledge (60%) of COVID-19 at the time of its

Table IV: Associated factors of low confidence in airway management and resuscitation of suspected COVID-19 patients among emergency healthcare workers in Penang and Kelantan using simple and multiple logistic regression (n=300)

Variables	Simple logistic regression		Multiple logistic regression	
	Crude OR (95% CI)	P-value ^a	Adjusted OR (95% CI)	P-value ^b
Designation				
Assistant medical office	0			
Medical officer	0.778 (0.434, 1.396)	0.400		
Staff nurse	1.520 (0.862, 2.682)	0.148		
Gender				
Male	0			
Female	1.619 (1.008, 2.603)	0.046		
Age				
51 – 60 years old	0			
20 – 30 years old	1.893 (0.192, 18.676)	0.585		
31 – 40 years old	1.705 (0.173, 16.800)	0.647		
41 – 50 years old	3.000 (0.227, 39.608)	0.404		
Length of service				
More than 10 years	0			
1 – 3 years	0.952 (0.462, 1.961)	0.893		
4 – 6 years	0.699 (0.354, 1.380)	0.302		
7 – 10 years	0.589 (0.291, 1.194)	0.142		
Less than a year	0.000 (0.000, 0.000)	>0.95		
Comorbid				
No	0			
Yes	1.158 (0.479, 2804)	0.745		
Previous experience attending CME related to airway management or resuscitation for suspected COVID-19 cases				
Yes	0		0	
No	2.062 (1.254, 3.392)	0.004	2.062 (1.254, 3.392)	0.004
Previous experience attending simulation training related to airway management and resuscitation for suspected COVID-19 cases				
Yes	0			
No	1.825 (1.138, 2.927)	0.012		

^aSimple logistic regression applied

^bBackward stepwise multiple logistic regression model applied

The model's overall fit was checked and reported to be the overall correctly classified percentage=62.3%, and area the curve

global outbreak, whereby the author concluded that efforts should be directed towards raising awareness of the disease to improve their practices in the current COVID-19 pandemic, as well as for future epidemics.¹⁹

Our study found a significant association between knowledge and different designation (P<0.001), whereby medical officers (73.9%) are among those that score the highest proportion with good knowledge levels compared to staff nurses (8.7%) and assistant medical officers (17.4%). A study by Zhang et al. observed a similar result.⁴ A more comprehensive knowledge exposure during training and the opportunity to take the team leader role during resuscitation and conducting airway procedures might be the reason why medical officers constitute a

more significant proportion with a good knowledge level. In our study, we have also found that medical officers reduced the risk of having poor knowledge by 81.1% compared to assistant medical officers (Adjusted OR=0.189; 95% CI: 0.081, 0.439; P<0.001)

Our study shown that only 62.3% of the respondents had a high confidence. A similar study by Abd Samat *et al.* conducted much earlier during the initial phase of COVID-19 in our country resulted in an overall 53.3% high confidence level among the respondents.⁸ Our study was conducted a year following the completion of the previous mention study, we could deduce that the improvement in confidence may be related to more exposure to the COVID-19 case our EHCW had experienced before the start of our study. A study conducted in a hybrid hospital following the first wave of COVID-19 in Malaysia found that EHCW were willing and confident to resuscitate COVID-19 patients, despite fears of nosocomial infection and expectation of poor patients' prognosis.²⁰ They, however, observed a need for

Table V: Association between knowledge and confidence level among emergency healthcare workers in airway management and resuscitation of suspected COVID-19 patients in Penang and Kelantan (n=300)

Variable	Confidence level			P-value ^a
	High n(%)	Low n(%)	Total	
Knowledge				
Good	31(16.6)	15(13.3)	46(15.3)	0.442
Poor	156(83.4)	98(86.7)	254(84.7)	

more practice in intubation, ventilation technique, use of the supraglottic device, and intubation barriers. Nevertheless, an excellent, confident level demonstrated by healthcare workers needs to be in parallel with proper practice as a measure to prevent the chain of transmission of infection among EHCW.²⁰

Our study fails to demonstrate any significant association between confidence levels with the different designations of the emergency workforce. We also fail to demonstrate any significant association among the different lengths of services, age, gender, and the presence of underlying comorbidities on neither the knowledge nor confidence level. The fear of transmitting the newly emerging disease may affect every emergency healthcare system provider and construe the knowledge and confidence level among the EHCW.¹⁵ A study by Syed Fareed Mohsin et al. demonstrated that two-thirds of the healthcare workers who participated had a moderate risk of fear and anxiety during the COVID-19 pandemic.¹⁶

We found a significant association between candidates with previous experience attending CME and knowledge level ($P=0.001$). EHCW with no experience attending CME increased the risk of having poor knowledge by 3.869 compared to those with experience attending CME (Adjusted OR=3.869; 95% CI: 1.426, 10.499; $P=0.008$). The confidence level was also significantly associated with candidates with previous experience attending CME ($P=0.005$) and simulation training ($P=0.013$). We notice that EHCW with no experience attending CME increased the risk of having low confidence by 2.062 compared to healthcare workers with experience attending training (Adjusted OR=2.062; 95% CI: 1.254, 3.392; $P=0.004$). Providing education through CME and training may help improve knowledge and confidence levels among our EHCW. A study by Muna Aljahany et al., following 20 mock codes conducted in the emergency department, revealed that approximately 57.4% of healthcare personnel felt comfortable dealing with unstable suspected or confirmed COVID-19 compared to only 33% beforehand.¹⁷ They also reported that 44.4% of participants felt more comfortable performing airway procedures for COVID-19 cases than 29.6% beforehand.¹⁷ The mean score for resuscitation-related knowledge (RRK)

was below airway-related knowledge (ARK). Most of the responders could score a correct answer for the knowledge regarding the possible method of transmission. The rest of the knowledge territories, such as the proper steps during resuscitation and high-quality CPR, airway management and intubation, intensive care management, and etiquette of PPE, were identified as areas for improvement. Meanwhile, the three main domains of confidence evaluated in our study were airway-related confidence (ARC), resuscitation-related confidence (RRC), and personal protective equipment (PPE). The highest overall mean confidence score identified was on PPE, while the lowest was on RRC.

Since emergency care extends beyond the wall of the emergency department with the involvement of various healthcare workforces working collaboratively, a more eminent encouragement in providing training to all categories of EHCW is required to address this gap. We advocate an urgent effort with a systematic framework of training and regular evaluation to be conducted for our EHCW.

The limitation in our study was on the study location whereby only four tertiary hospitals in the two states of peninsular Malaysia were included, limiting its generalization and representation of the true nature of knowledge and confidence level among our national emergency healthcare workforces. Moreover, we fail to evaluate other significant healthcare centres dealing with the COVID-19 pandemic, such as district and private hospitals. To address this limitation, future larger multicentre studies that represent more states with different levels of healthcare centres are recommended.

Our study revealed that most of our EHCW had poor knowledge and moderately adequate confidence in managing the airway and handling resuscitation of suspected COVID-19 patients. Therefore, a more comprehensive and strategies training program needs to be conducted and regularly evaluated to help improve the knowledge and confidence level in airway management and resuscitation among our EHCW, ultimately improving our healthcare services.

CONFLICT OF INTEREST

The authors declare there is no conflict of interest during the conduct of this study.

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