

1 **Ebola: Emergency preparedness and perceived response of Malaysian healthcare providers**

2 **Background**

3 Ebola virus disease (EVD) is a public health emergency of international concern [1] and a
4 serious global health threat because of its high fatality rate [2]. During an Ebola outbreak, along with
5 the general public, healthcare providers (HCP) involved in EVD management are also at highest risk.
6 HCPs are frequently infected during the diagnosis, isolation and care process of patients with suspected
7 EVD. Their preparedness to act and their response during an outbreak is essential to control the spread
8 of the disease. Guidance from Centers for Disease Control and Prevention (CDC) is available for HCPs
9 to prevent spreading of EVD [3]. A high quality infection control, contact tracing, and public health
10 infrastructure are the most significant mechanisms to limit any EVD epidemic [4]. The World Health
11 Organisation (WHO) advised all countries to track active screening and provided strategies to prevent
12 further spread of EVD [5]. Malaysia stepped up its efforts in preparing their HCPs to cope with possible
13 cases and to strengthen their preparedness and response by simulation-based exercises [6]. The
14 objective of this study was to analyse the differences among the Malaysian HCPs' emergency
15 preparedness and their perceived response towards EVD.

16 **Materials and Methods**

17 A 30-item self-reported survey questionnaire was prepared based on WHO checklists [7] and
18 distributed to HCPs in private health clinics. The sample size of each category was calculated using a
19 formula to estimate population proportion. 10% of the calculated sample size was added to compensate
20 for the non-response rate. Data analysis was performed through descriptive statistics, such as
21 frequencies for each variables. Significant findings were further analysed by Tukey's post hoc test to
22 determine the groups' differences. The threshold for statistical significance was $p \leq 0.05$.

23 **Results**

24 Responses were received from 645 of the 658 participants (98.02% response rate). The
25 distribution of respondent by profession, was as follows: General practitioner (29.32%) Pharmacist
26 (26.51%) Nurse (27.90%) Dentist (16.27%). A variety of age groups were represented, 20–30 years
27 (19.38%), 31–40 years (58.13%) and 41–50 years (22.49%). The female respondents were slightly

28 higher than their male counterparts (Female 53.79% Vs Male 46.21%). The total mean scores for
29 emergency preparedness and perceived response for EVD was high among all the HCPs.

30 There was no significant difference in mean scores of emergency preparedness among the
31 HCPs regarding age, gender, profession and ethnicity. However, the mean scores were different based
32 on their professional experience level. Among the experience level (> 5 to 10 years) of HCPs, the mean
33 score of general practitioners was significantly higher (15.54 ± 3.47) than the other HCPs. There was a
34 significant difference in perceived response scores among the HCPs by their age. Among the 20-30
35 years age group, the nurses scored significantly higher (14.02 ± 4.95) than the other HCPs. There was
36 also a significant difference in mean scores of the perceived response by the experience level, in which
37 nurses (1 to 5 years) scored significantly high (Table: 1).

38 Differences in emergency preparedness and perceived response among HCPs were
39 measured. For emergency preparedness, the total mean score of the nurses was approximately 15%
40 higher than other HCPs. There was a significant difference between nurses and dentists mean scores
41 towards emergency preparedness ($p=0.001$). For perceived response, the total mean score of the
42 nurses was approximately 25% higher than other HCPs. There was a significant difference between
43 nurses and dentists mean scores towards perceived response ($p=0.01$) (Table: 2).

44

45 **Table 1: Differences in emergency preparedness and perceived response among healthcare**
 46 **providers by demographic profile**

	Emergency preparedness of healthcare providers					Perceived response of healthcare providers				
	General practitioners (n=189)	Nurses (n=180)	Pharmacists (n=171)	Dentists (n=105)	P value	General practitioners (n=189)	Nurses (n=180)	Pharmacists (n=171)	Dentists (n=105)	P value
Age in Years										
• 20 - 30	13.52 ± 5.23	14.68 ± 3.98	13.53 ± 4.28	12.25 ± 5.22	0.82	12.87 ± 3.28	14.02 ± 4.95	13.81 ± 4.11	11.22 ± 4.34	0.018 ^d
• 31 - 40	14.25 ± 4.33	14.43 ± 5.32	12.67 ± 4.20	11.8 ± 2.9	0.70	14.36 ± 4.76	13.94 ± 4.22	12.45 ± 3.54	11.86 ± 0.57	0.70
• 41 - 50	15.22 ± 4.38	14.29 ± 4.83	12.25 ± 4.43	11.26 ± 4.63	0.67	14.45 ± 4.62	14.01 ± 4.47	12.79 ± 3.06	11.68 ± 4.32	0.82
Gender										
Male	14.25 ± 4.33	14.43 ± 5.32	12.67 ± 4.20	11.8 ± 5.29	0.69	13.91 ± 3.98	14.04 ± 4.02	13.34 ± 3.87	12.02 ± 4.37	0.69
Female	14.52 ± 4.23	13.72 ± 3.25	12.22 ± 5.28	11.52 ± 5.63	0.68	13.80 ± 4.28	14.05 ± 3.76	12.79 ± 4.07	11.97 ± 4.66	
Ethnicity										
Malay	14.12 ± 4.23	13.68 ± 3.92	13.76 ± 4.02	11.95 ± 4.28		14.34 ± 4.26	14.68 ± 4.06	13.87 ± 4.36	12.05 ± 4.08	
Chinese	13.78 ± 3.56	14.56 ± 5.72	13.04 ± 5.10	12.12 ± 4.98		13.87 ± 3.84	14.73 ± 4.10	13.49 ± 4.15	12.08 ± 4.11	
Indian	14.97 ± 5.04	13.78 ± 4.73	13.65 ± 4.15	12.02 ± 3.54		13.97 ± 4.07	14.78 ± 4.12	13.58 ± 4.24	12.22 ± 4.31	
Experience in years										
Up to 5 years	14.34 ± 4.88	14.45 ± 4.13	12.53 ± 5.81	11.87 ± 4.67		13.47 ± 3.81	14.53 ± 4.09	12.78 ± 4.71	11.91 ± 4.79	0.003 ^e
>5 to 10 years	15.54 ± 3.47	14.73 ± 4.29	12.34 ± 5.05	11.43 ± 4.30	<0.05 ^{a b c}	14.58 ± 3.92	13.73 ± 4.20	12.54 ± 4.90	11.69 ± 4.81	
More than 10 years	15.35 ± 5.63	14.68 ± 4.29	12.28 ± 4.07	11.93 ± 4.83		14.35 ± 4.38	13.68 ± 4.31	12.68 ± 4.75	11.33 ± 4.86	

47 Data are expressed as mean ± standard deviation (SD). One-way ANOVA was used.

48 a = p < 0.05 for the difference between general practitioners and pharmacists (one-way ANOVA with the Tukey's post hoc test).

49 b = p < 0.05 for the difference between general practitioners and nurses (one-way ANOVA with the Tukey's post hoc test).

50 c = p < 0.05 for the difference between general practitioners and dentists (one-way ANOVA with the Tukey's post hoc test).

51 d = p < 0.05 for the difference between nurses and dentists (one-way ANOVA with the Tukey's post hoc test).

52 e = p < 0.05 for the difference between nurses and dentists (one-way ANOVA with the Tukey's post hoc test).

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54 **Table 2: Difference in emergency preparedness and perceived response within healthcare**
 55 **providers**

	General practitioners (n=189)	Nurses (n=180)	Pharmacists (n=171)	Dentists (n=105)	P value
Emergency Preparedness	14.42 ± 5.12	14.86 ± 4.98	12.54 ± 4.63	11.25 ± 4.27	0.001 ^a
Perceived response	09.05 ± 0.30	09.60 ± 0.22	08.02 ± 1.20	06.81 ± 2.29	0.01 ^b

56 Data are expressed as mean ± standard deviation (SD).
 57

58 One-way ANOVA was used.

59 a = p <0.05 for the difference between nurses and dentists (one-way ANOVA with the Tukey's post hoc test).

60 b = p <0.05 for the difference between nurses and dentists (one-way ANOVA with the Tukey's post hoc test).
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62 Discussion

63 The preparedness and response programme initiated and implemented by the National
 64 Emergency Authority of the Ministry of Health (MOH) in Malaysia [8] might influence the health
 65 professionals. This is a good sign for the Malaysian healthcare system as healthcare providers are
 66 prepared for EVD and they perceive that they can respond to EVD endemic.

67 Experience played a key role in the emergency preparedness of HCPs. General Practitioners
 68 with experience level group (5 to 10 years) were more prepared than other HCPs of the same
 69 experience group level. Professionals with more years of experience might have attended more training
 70 programs in the past year and therefore feel more prepared. In addition, general practitioners'
 71 experience with the training program conducted by MOH Malaysia in various exercises including a
 72 simulation-based exercise to prevent the possibility of the spread of Ebola might have helped them to
 73 feel more prepared [8]. In future, the same type of training can be provided to all the HCPs involved in
 74 the patient care.

75 The emergency preparedness and perceived response scores of nurses were significantly
 76 higher than that of the dentists. Nurses by virtue of their close vicinity to the patient, have more
 77 challenges for a health service during an infection outbreak. Generally, new nursing graduates will
 78 undergo rigorous training and exercise on public health issues [9]. Their experience with simulated
 79 exercise to counter EVD might be fresh in their memories which made them perceive that they can
 80 respond well to EVD. On the other hand, dentists did not perceive that they can respond to the EVD,
 81 even though they were new graduates. The skill-based training during their graduate program, which

82 focus mainly on oral health during their clinical practice may be the reason. The CDC suggested that
83 the dentists also have to be prepared to handle an Ebola outbreak [10]. Therefore, to be more prepared
84 for any EVD emergency, they can attend Epidemiology Intelligence Program (EIP) Malaysia as a
85 continuing education.

86 **Limitation**

87 HCPs in public sectors were not included in this study as the approval to access the public hospitals
88 could not be established within the stipulated time during the study period.

89 **Conclusions**

90 The recent Ebola outbreak exposed deficiencies in the global health system. Malaysian healthcare
91 providers are sufficiently prepared and believe they can respond at any moment in the event of an Ebola
92 outbreak in this county. The MOH is vigilant and continually conducts preventive measures programs.
93 A mandatory participation for all HCPs may further improve their emergency preparedness and
94 response towards any emergency outbreak. With the current level of preparedness, it may be possible
95 to prevent the spread of EVD in Malaysia.

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