ORIGINAL ARTICLE

PREVALENCE AND FACTORS ASSOCIATED WITH PROBABLE GENERALIZED ANXIETY DISORDER AMONG HEALTHCARE WORKERS WORKING IN MEDICAL LABORATORIES OF THE CENTRAL PENINSULAR MALAYSIA DURING COVID-19 PANDEMIC

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ABSTRACT

Mental health problems are major public health concerns during the COVID-19 pandemic due to uncertainties of the disease, public fears and movement control orders which interrupt economic activities. Uncertainties about the diseases could trigger anxiety, particularly among healthcare workers (HCWs) who are directly involved in handling COVID-19 patients and specimens. This study aims to determine the prevalence and factors associated with a probable generalized anxiety disorder (GAD) among public laboratory HCWs in Central Peninsular Malaysia. A cross-sectional study was conducted from October to December 2021 with a total of 406 respondents participating in this study. Anxiety symptoms were assessed using the Malay-validated 7-items GAD questionnaire. The cut-off points to define probable GAD were scores of eight and above. A descriptive analysis and multiple logistic regression were conducted to calculate the prevalence of probable GAD and its associated factors. The prevalence of probable GAD among laboratory HCWs was 20.7%. Factors associated with probable GAD among laboratory HCWs during the COVID-19 pandemic were younger age group (aOR=3.23; 95% CI:1.22, 8.57), excessive working time of more than 50 hours per week (aOR=3.09; 95% CI: 1.76, 5.42) and working with COVID-19 specimens (aOR=1.83; 95% CI:1.07, 3.14). HCWs in the national laboratory were at risk of having probable GAD during the COVID-19 pandemic, especially among the younger age group, those exposed to excessive working time and those who handled COVID-19 specimens. Thus, stakeholders should improve the existing psychological support and provide supportive working environments including a regular mental health screening and early intervention among those who were screened positive for probable GAD.

***Keywords**: probable GAD, GAD-7 questionnaire, medical laboratory, COVID-19, healthcare workers*

INTRODUCTION

The emergence of coronavirus disease 2019 (COVID-19) has triggered uncertainties among people worldwide, especially during the earlier phase of the pandemic. These uncertainties include the progression of the new disease, treatment options, prevention, and control strategy[1]. Besides that, false information and rumors worsened the situation and added more fearful feelings in the community as reported by researchers in Wuhan; the place where the outbreak began[2]. There are several theories to describe individual reactions toward a major health event such as "Crisis Theory" [3], the health belief model [4] and the theory of planned behavior[5]. The subsequent response to a pandemic is fear, challenges, coping strategies and inability to cope which may lead to psychosocial diseases[1,6].

In this situation, HCWs were found to be more psychologically affected compared to the general public who may not have direct exposure to COVID-19 patients[7]. HCWs in this context may include medical professionals working in the medical laboratory and also the auxiliary staff such as health attendants, laboratory technicians, and temporary staff. During the pandemic, they had to cater to the surge of laboratory test demands for COVID-19 and worked directly with the biohazard samples[8]. This may lead to long working hours as the work demands are not proportional to the number of staff. At a global level, various studies reported that HCWs are facing psychological problems during the pandemic such as depression, anxiety, stress, suicide or fatigue[9,10]. Furthermore, the movement restriction imposed during the COVID-19 pandemic has limited people from engaging in their regular activities, leading to a negative

impact on their general mental health, well-being, and coping mechanism[11,12].

It was reported that the prevalence of GAD in the general population of Organisation for Economic Co-operation and Development (OECD) countries doubled in 2020 compared to the pre-COVID-19 era[10]. A systematic review mentioned that the prevalence of GAD among HCWs was 32.04% (95% CI: 26.89–37.19) based on the published literature between January to June 2020, however, the majority of the findings were from China[13]. A wide gap was noticed in the prevalence of GAD among HCWs in Singapore, which was 13%[14] compared to 37.3 % in a study conducted in Nepal[15] and 63.0% in Ethiopia[16]. A study conducted in Egypt reported prevalence of overall GAD among HCWs was 90.5% with a further breakdown of 32% for moderate anxiety and 18.5% for severe anxiety[17]. All the above-mentioned studies used GAD-7 as the screening tool for anxiety disorder.

Among the identified factors associated with anxiety were perceived high-risk jobs, unclear work protocol and sociodemographic factors such as age, gender and years of working experience[14,18]. A person with probable GAD may need prompt intervention because this situation may contribute to a decline in mental health status and quality of work. HCWs with poor mental health may result in absenteeism, less productivity, poor judgment and may risk others' life[19,20]. This study was conducted because of the sudden tenfold increase in laboratory test volume per day during the COVID-19 pandemic at the national laboratories in Central Peninsular Malaysia, along with the cumulative number of cases at that time was more than one million cases[21,22]. The impact of increased work burden is correlated with an elevated prevalence of mental health problems among HCWs, a phenomenon that was not previously known specifically among laboratory HCWs. This study aims to determine the prevalence and factors associated with GAD among public laboratory HCWs during the COVID-19 pandemic in three national medical laboratories in Central Peninsular Malaysia.

METHODS

A cross-sectional study design was conducted among HCWs who were working in national laboratories located in Central Peninsular Malaysia from October to December 2021 via a hybrid method. This study was part of a burnout project among HCWs and consisted of three parts: (1) sociodemographics, (2) mental health assessment and (3) saliva sample for biomarker analysis (salivary cortisol & secretory IgA). The study obtained ethical approval from the Medical Research and Ethics Committee, Ministry of Health Malaysia. It was also registered under the National Medical Research Registration (NMRR-20-2858-55111). The respondents were selected via a computer-generated random sampling from the list of all registered HCWs, and it was proportionate according to the three laboratories. The respondents' identity was treated as private and confidential, and this was reassured to the study participants. HCWs with a known case of psychiatric illness were excluded from this study at the invitation level by stating that this study is targeting those who do not have any psychiatric illness. The questionnaire was distributed via google form and a biomarker sample was collected in a few phases.

A dichotomous two-proportion sample size was calculated based on the previous study after considering a few factors such as age, gender and years of work experience[16]. The minimum sample size of 212 is required for a two-factor comparison based on factor age, adjusted with a 20% non-response, the total minimum sample was 265 respondents. However, the main burnout study calculated a total number of 410 respondents after considering the biomarker sample. The randomly selected respondents were invited to join the survey via a specified link sent directly to their official email addresses. The online survey started with detailed information about the survey and respondents who gave consent will be directed to the actual survey questionnaire.

The anxiety symptoms were assessed using the 7-item Generalized Anxiety Disorder questionnaire. The cut-off points to define possible anxiety were 8 and above[23,24]. The GAD-7 has been reported as a reliable self-reported tool in screening for anxiety symptoms for respondents with time constraints or in a busy clinic setting[23]. Malay version GAD-7 underwent a validation process in a primary care setting with Cronbach's alpha of 0.74, a significant correlation with GHQ12, a sensitivity of 0.76, and a specificity of 0.94[24].

Statistical analysis

A descriptive analysis and multiple logistic regression were conducted in this study using IBM SPSS version 23. The chi-square test was used to compare the difference between categorical variables and the Mann-Whitney U test for the numerical variable of age. A p-value of less than 0.05 shows that the groups have a statistically significant difference. The logistic regression model was built to predict the odds of possible GAD among HCWs based on the independent variables of age groups, gender, marital status, ethnicity, total years of work duration, working with COVID-19 sample, working time per week, distance to workplace and duration of travel to work. The first step in logistic regression includes simple logistic regression to obtain crude odds ratio for each independent variable. All the independent variables were entered in the second stage or final model regardless of the p-value to control the confounding variables. The model fit was assessed using the Hosmer and Lemeshow Test for Goodness of Fit with a p-value of more than 0.05 is considered a valid model. The model

was also tested for interaction terms and multicollinearity.

Table 1a: Distribution of respondents by demographic profiles, N=406

Variable	n	%
Age (median; IQR)	32; 12	
Age group (years)		
< 35	171	42.4
35 and above	232	57.6
Gender		
Male	92	22.7
Female	314	77.3
Marital status		
Married	187	46.1
Not married	219	53.9
Ethnicity		
Malay	335	82.5
Chinese	13	3.2
India	28	6.9
Others	30	7.4
Working Place		
Facility A	90	22.2
Facility B	132	32.5
Facility C	184	45.3
Designation		
Medical Laboratory Technicians	163	40.2
Officer in research	74	18.3
Support staff in research	107	26.4
Administration staff	61	15.1
Total duration of work (years)		
≤ 10 years	261	64.4
>10 years	144	35.6
Work with COVID-19 samples		
Yes	186	45.8
No	220	54.2
Working time/per week (hours)		
60 and longer	8	2.0
50-60	104	25.9
49 and shorter	290	72.1
Distance of workplace (km)		
10 and above	213	52.6
<10	192	47.4

Table 1b: Distribution of respondents by demographic profiles, N=406

Variable	n	%
Duration of travel (minutes)		
45 and above	83	20.5
< 45	321	79.5
Transportation		
public	24	5.9
own car	295	72.8
motorcycle/bicycle	66	16.3
pedestrian	20	4.9
Overall possible GAD		
Yes	84	20.7
No	322	79.3

RESULTS

There were 410 respondents participated in this survey. A total of 406 respondents completed the survey giving a response rate of 99.0%. The sociodemographic profiles of the respondents were tabulated in Table 1. The respondents' age ranged from 20 to 58 years, of which more than half of them were above 35 years old (57.6%). The majority of respondents were females (77.3%), of Malay ethnicity (82.5%) and 53.6% were not married. Most of them had working experience of less than 10 years (64.4%). Nearly half of the respondents were medical laboratory technicians (40.2) and 45.8% were directly working with the COVID-19 samples. The median score of GAD-7 in this study was 4; interquartile range (IQR)=21 and the overall prevalence of probable GAD among laboratory HCWs was 20.7%.Figure 1 shows the pattern of respondent's scores according to each item in GAD-7. The highest prevalence of GAD symptoms that participants reported having nearly every day was "worrying too much about different things" (6.7%), followed by "feeling afraid as if something awful might happen" and "feeling nervous, anxious, or on edge".

The prevalence of anxiety was significantly higher among the younger age group (<35 years), not married respondents, respondents with working duration of 10 years and lower, respondent who worked with the COVID-19 samples and those who worked for 50 hours and more per week.

The potential predictors for anxiety in this study were tested in simple logistic regression. The crude finding showed there were five predictors significantly associated with anxiety, as shown in Table 3. Only three variables were retained in the final step of regression analysis.

The associated factors with anxiety disorder among laboratory staff during the COVID-19 pandemic were younger age group (aOR=3.23; 95% CI:1.22, 8.57), excessive working time of more than 50 hours per week (aOR=3.09; 95% CI: 1.76, 5.42) and also working with COVID-19 samples (aOR=1.83; 95% CI:1.07, 3.14).

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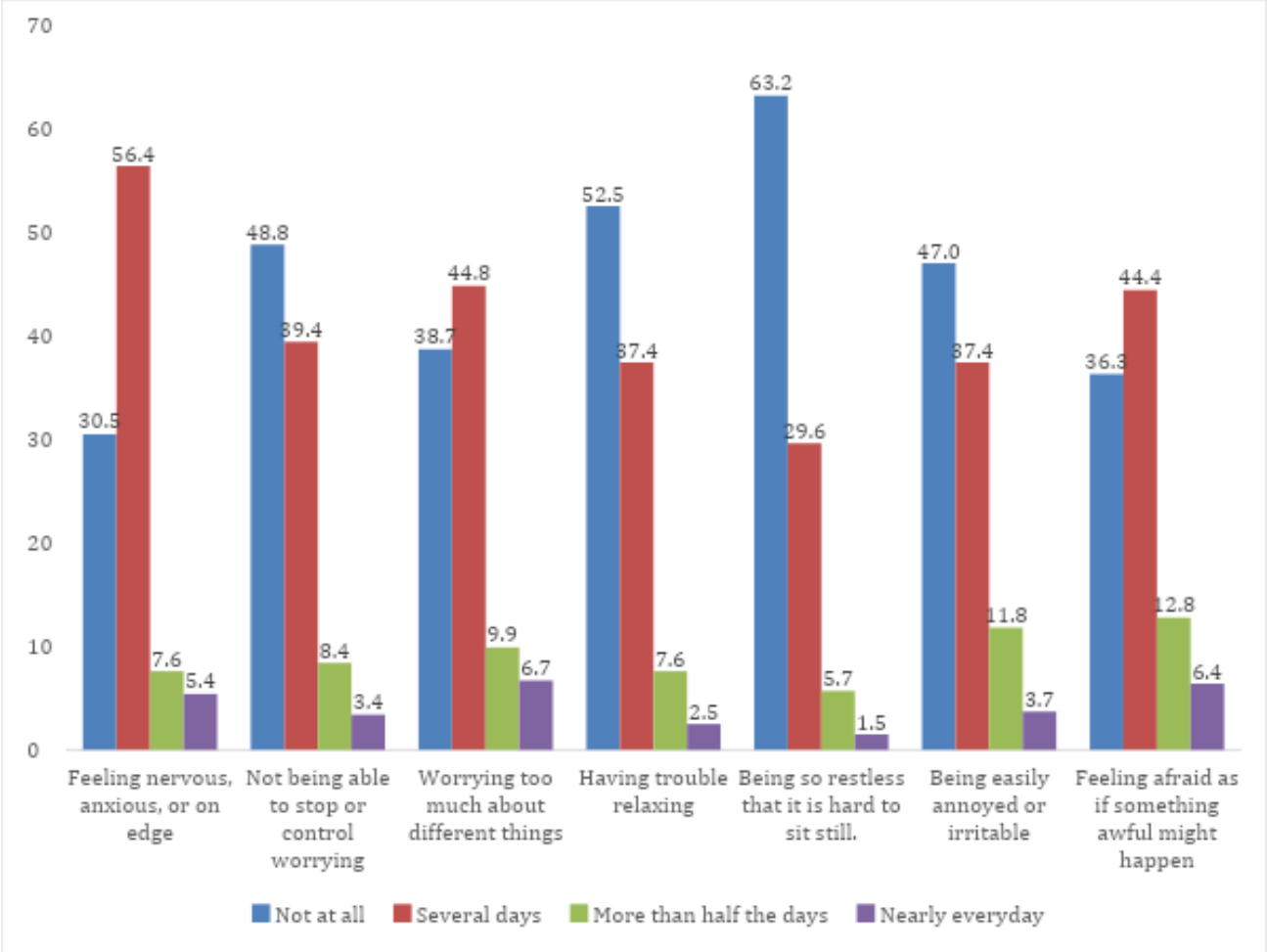

Figure 1: Percentage of each item in GAD-7

Table 2: Prevalence of possible anxiety symptoms during the pandemic COVID-19 medical laboratory workers in Central Malaysia

Variable	Yes		No		*p*-value
	n	%	n	%	
Age (median; IQR)	**28; 9**		**34; 13**		**< 0.001**
Age group (years)					
< 35	**69**	**29.7**	**156**	**91.2**	
35 and above	**15**	**8.8**	**163**	**70.3**	**< 0.001**
Gender					
Male	18	19.6	74	80.4	
Female	66	21.0	248	79.9	0.762
Marital status					
Married	**56**	**29.9**	**131**	**70.1**	
Not married	**28**	**12.8**	**191**	**87.2**	**< 0.001**
Ethnicity					
Malay	65	19.5	269	80.5	
Non-Malay	19	26.4	53	79.3	0.188
Total duration of work (years)					
≤ 10 years	**70**	**26.8**	**191**	**73.2**	
>10 years	**14**	**9.7**	**130**	**90.3**	**< 0.001**
Work with COVID-19 sample					
Yes	**50**	**26.9**	**136**	**73.1**	
No	**34**	**15.5**	**186**	**84.5**	**0.003**
Working time/per week (hours)					
50 hours and above	**38**	**33.9**	**74**	**66.1**	
< 50	**44**	**15.2**	**246**	**84.8**	**< 0.001**
Distance to workplace (km)					
10 and above	41	19.2	172	80.8	
<10	42	21.9	150	78.1	0.298
Duration of travel (minutes)					
45 and above	18	21.7	65	78.3	
< 45	65	20.2	256	79.8	0.439

Table 3: Factors associated with possible anxiety symptoms during the pandemic COVID-19 among medical laboratory workers in Central Malaysia

Variable	Crude OR	95% CI		p-value	aOR#	95% CI		p-value
		lower	upper			lower	upper	
Age group (years)								
< 35	**4.40**	**2.42**	**8.02**	**< 0.001**	**3.23**	**1.22**	**8.57**	**0.018**
35 and above								
Gender								
Male								
Female	1.09	0.61	1.96	0.762	1.16	0.61	2.21	0.660
Marital status								
Married	**2.92**	**1.76**	**4.83**	**< 0.001**	1.87	1.00	3.52	0.050
Not married								
Ethnicity								
Malay								
Non-Malay	1.48	0.82	2.68	0.190	1.33	0.68	2.59	0.406
Total duration of work (years)								
≤ 10 years	**3.40**	**1.84**	**6.30**	**< 0.001**	1.27	0.46	3.52	0.649
>10 years								
Work with COVID-19 sample								
Yes	**2.01**	**1.23**	**3.28**	**0.005**	**1.83**	**1.07**	**3.14**	**0.028**
No								
Working time/per week (hours)								
50 hours and above	**2.87**	**1.73**	**4.76**	**< 0.001**	**3.09**	**1.76**	**5.42**	**< 0.001**
< 50								
Distance to workplace (km)								
10 and above	0.85	0.53	1.38	0.513	1.10	0.59	2.05	0.773
<10								
Duration of travel (minutes)								
45 and above	1.09	0.61	1.97	0.773	1.46	0.67	3.18	0.344
< 45								

Note: Adjusted with all the selected variables as in the table; Hosmer and Lemeshow Test for Goodness of Fit p-value= 0.380; Model predictability based on classification table= 83.4%; The area under the curve =0.752 (0.692-0.812)

DISCUSSION

In Malaysia, there are a few validated questionnaires to screen for anxiety disorders including GAD-7[24,25]. The questionnaire specifically screens for anxiety problems that may fall into many diagnoses such as generalized anxiety disorder (GAD), social anxiety disorder, agoraphobia and panic disorder[25]. In the DSM 5, anxiety disorder is defined as a condition of excessive fear of perceived imminent threats and anxiety for the anticipation of a future threat and related behavioral disturbances[26]. The local prevalence of anxiety among the adult population in the pre-pandemic era is between 0.4 -5.6% but the study used other than the GAD-7 questionnaire. Another study among women showed a prevalence of 7.8%, using the GAD-7 questionnaire in their study[24]. The possible reasons for a higher prevalence of anxiety disorder during the pandemic especially among HCWs because they were in direct contact with patients and their samples, they have extreme workloads with inconsistent protocols and they also live in fear of infecting relatives, just like other members of the community[7].

A systematic review for the prevalence of generalized anxiety disorders among HCWs during the pandemic was 32.04% (95% CI: 26.89–37.19) but the studies were conducted among first-line HCWs, mostly in China. This study focused on HCWs who were working in the national medical laboratories in central peninsular Malaysia. These laboratories faced a surge of high demand in laboratory testing throughout Malaysia. There was scarce information on the mental well-being of national laboratory staff since they were classified as second-line HCWs and did not directly deal with COVID-19 patients (27,28). Nevertheless, the second-line HCWs also have the risk of laboratory contamination with COVID-19 samples which can be transmitted airborne[29].

This study found that the prevalence of anxiety among HCWs who worked with the COVID-19 samples was significantly higher than their counterpart in the national COVID-19 laboratories. Nevertheless, the prevalence was lower than HCWs who were categorized as front liners elsewhere based on similar screening tools[9,13,15].

In this study, three predictors for anxiety among HCWs were identified via a logistic regression model. The factors of age showed anxiety was associated with the younger age group, in this case referring to age less than 35 years. This finding is consistent with previous studies comparing age groups in their studies[9,16,30]. Regarding the age factor, the younger cohort undergoes a pivotal phase in their lives as they navigate the process of adapting to their work environment, colleagues, and personal challenges.

The second factor was the total working time per week which showed that HCWs working more than 50 hours per week had 3.09 times the likelihood of anxiety than those working lesser than 50 hours per week. HCWs faced extreme workloads during the pandemic with the high number of laboratory tests and longer working hours due to inadequate qualified manpower. Besides that, a sudden global shortage of personal protective equipment (PPE) may prolong the working time because of the limited number of laboratory staff who can conduct the test for COVID-19 despite the test demand[31]. HCWs who work with the COVID-19 sample were more likely to develop anxiety than those working as administrative staff. This finding was quite similar to other studies that compare the frontliner and second-line HCWs[27] or studies comparing the prevalence of anxiety among HCWs with the general population[7]. Even though anxiety is associated more with females than males[24,32], this predictor was not significant in the final model. The possible explanation depends upon the cultural and resilience factors among the population working in central peninsular Malaysia which contributed to the no significant difference in the prevalence of anxiety between males and females. Factors such as marital status, ethnicity, distance to the workplace, and duration of travel to the workplace were not significant showing that these factors do not contribute to the likelihood of anxiety among HCWs in this study.

This study provides information on the prevalence and factors associated with probable GAD among laboratory HCWs. Further research is recommended to examine the long-term effects of anxiety disorders on healthcare workers (HCWs) in national laboratories beyond the COVID-19 pandemic, focusing on understanding lasting psychological impacts and developing preventive and supportive strategies. Age-specific interventions should be explored to address anxiety disorders among different age groups of HCWs, while strategies for managing excessive working time and workload need to be investigated to mitigate the risk of anxiety disorders. The effectiveness of various psychological support mechanisms and interventions for HCWs exposed to COVID-19 specimens should be evaluated, including counseling, peer support, and other mental health services. Additionally, research should explore resilience-building interventions to enhance coping mechanisms and mental well-being among HCWs, assessing the effectiveness of such programs in reducing anxiety disorders.

Strength and limitations

This study was conducted during the pandemic phase which may picture the real situation contributing to the feeling of fear and anxiety among HCWs who work in the national COVID-19 laboratories. HCWs may have time constraints due to work demands, but they spent time participating in this survey for their mental health

assessment. There may be a possibility of recall bias due to the use of self-reported questionnaire, but this may likely have been minimized as the participants were asked to recall recent events occurring within the past two weeks. This is a cross-sectional study design that limits the causal relationship between the predictors and the outcome variables. The questionnaire used in this study was only a screening tool, thus HCWs need to be assessed by the professional team to confirm the problems.**CONCLUSION**

HCWs in national laboratories were at risk of suffering anxiety disorders during the COVID-19 pandemic, especially among the younger age group, those exposed to excessive working time and handling COVID-19 specimens. Thus, stakeholders should improve the existing health promotion, supportive environments, and psychological support including regular mental health screening and early intervention among the identified high-risk workplace and workers.

Conflict of interest
The authors declare no conflict of interest.

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