Situational Analysis of COVID-19 among Healthcare Workers in Terengganu State of Malaysia

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ABSTRACT

**Background:** In Terengganu, healthcare workers (HCW) face similar risk of exposure to COVID-19 as other settings in Malaysia and globally. This study aimed to describe the current situation of COVID-19 among HCW in Terengganu state.

**Materials and Methods:** A cross-sectional descriptive study was conducted in Terengganu state of Malaysia among healthcare workers based on retrospective record review. The inclusion criteria were HCW working in Terengganu’s public healthcare facilities with laboratory reverse transcription polymerase chain reaction (RT-PCR) confirmed positive test for COVID-19 and notified to Terengganu State Health Department from 1st March 2020 until 30th September 2021. Descriptive statistics were employed for statistical analysis.

**Result:** As of 30th September 2021, there were 919 HCW infected with COVID-19. The mean (±SD) of samples’ age and RT-PCR cycle threshold (Ct) value was 36 (±7) and 24.87 (±7.86), respectively. Majority of infected HCW in Terengganu were female (74.5%), from job category of nurses (38.7%) followed by medical doctors (19.6%), not directly involved in COVID-19 cases management (72.3%), symptomatic (61.2%), diagnosed as Category 2 COVID-19 (52.4%) followed by Category 1 COVID-19 (47.2%), and had no comorbidity (91.0%).

**Conclusion:** COVID-19 commonly involved personnel related to clinical work (doctors and nurses). Screening and diagnosis of COVID-19 among HCW was early as depicted by relatively low mean RT-PCR CT value and therefore averted progression to severe COVID-19 stages (Category 4 and Category 5).

**Keywords:** COVID-19, Healthcare workers, Situational analysis, Ct-value, Malaysia

I. INTRODUCTION

COVID-19 was initially discovered in December 2019 in Wuhan province, China and the virus (SARS-CoV-2) was most likely transferred to humans from wild exotic animals at one of Wuhan’s wet markets [1]. The first cases in Malaysia were reported in the January 2020, and two years later, the total cases had exceeded three million cases, with more than 30,000 deaths due to COVID-19 [2]. Terengganu, a state in the east coast region of Peninsular Malaysia recorded 82,810 confirmed COVID-19 cases with 711 deaths as of 1st January 2022 [3].

The COVID-19 pandemic has challenged and, in many cases, exceeded the capacity of healthcare facilities worldwide. Healthcare workers have continued to provide care for patients despite exhaustion, personal risk of infection, fear of transmission to family members, illness or death of friends and colleagues, and the loss of many patients. Globally, COVID-19 infection among healthcare workers is inevitable as they work with COVID-19 patients on daily basis. As COVID-19 has some degree of similarity to the viruses that caused Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS), the pattern of infection among healthcare workers during this COVID-19 pandemic is similar with infection among healthcare workers during the SARS outbreaks in 2002 and 2003, as well as the MERS outbreaks since 2012 [4]. However, the nation-by-nation number of healthcare workers infections and deaths is unclear because some countries do not share the data to the public. In Malaysia, the number of COVID-19 cases are publicly reported but cases involving healthcare workers are not elaborated in details, unless requested by relevant agencies.

Currently, there are 9,020 Ministry of Health workers serving 335 healthcare facilities in the state of Terengganu [5]. Majority of healthcare workforce in Terengganu particularly in clinical setting faces high risk of COVID-19 infection as they are the frontliners in engaging with undiagnosed individuals who seek treatment in health clinics or hospitals. This study was conducted to describe the
current situation of COVID-19 infection among healthcare workers in Terengganu healthcare facilities to depict the magnitude of infection and to describe the socio-demographic and clinical characteristics of healthcare workers infected with COVID-19.

II. MATERIAL AND METHODS

This was a cross-sectional descriptive study conducted in the state of Terengganu, an east coast region of Peninsular Malaysia [6]-[9]. The study sample were all individuals working in Terengganu healthcare facilities (government facilities) with laboratory reverse transcription polymerase chain reaction (RT-PCR) confirmed positive test for COVID-19 and notified to Terengganu State Health Department from 1st March 2020 until 30th September 2021. The inclusion criteria were all healthcare workers working in government healthcare facilities in Terengganu. Private healthcare workers in Terengganu and samples with incomplete record of 30% variables were excluded from the study.

The sample size was calculated using single proportion formula [10], [11]. The minimal sample size required is 846 samples using the proportion of 44% [12], precision of 0.04, 5% type 1 error, 80% power and 30% dropout rate.

Data were collected from Terengganu state COVID-19 online registry and SIMKA Outbreak system (an online database for COVID-19 test results reporting) and recorded in patient’s proforma. The retrieved information for independent variables included socio-demographic and clinical characteristics such as age, gender, job category, RT-PCR cycle threshold (Ct) value, risk of exposure (occupationally-acquired), presence of symptom, COVID-19 severity and presence of comorbidity.

In this study, diagnosis of COVID-19 was made based on positive RT-PCR test result. Patients with either asthma, diabetes, hypertension, chronic kidney diseases, chronic pulmonary diseases, chronic cardiac diseases, or immunodeficiency state were classified as having comorbidity. COVID-19 cases who had household contact with confirmed COVID-19 case were not considered to be occupationally-acquired COVID-19 cases. COVID-19 cases are stratified according to clinical stage of severity which include stage I (asymptomatic); stage II (symptomatic without pneumonia); stage III (pneumonia without hypoxia); stage IV (hypoxic pneumonia which requires supplemental oxygen); and stage V (critically ill and requires mechanical ventilation) [13]. Allied health staff include laboratory technologist, dental technologist, food technologist, entomologist, environmental health officer and auxiliaries, radiographers, occupational therapist and science officer. Support staff include driver, security officer, kitchen staff, cleaner and maintenance staff. The presence of symptom was defined as having symptoms of suspected COVID-19 case as outlined in the latest Malaysian COVID-19 guideline which is either one or combination of fever, cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, anorexia-nausea/vomiting, diarrhoea, altered mental status [14].

III. STATISTICAL METHODS

Data entry and analysis was done using SPSS Statistics (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 24.0. Armonk, NY: IBM Corp). Descriptive statistics with mean and standard deviation (SD), frequency and percentages were calculated.

IV. RESULTS

From 1st March 2020 until 30th September 2021, there were 919 healthcare workers in Terengganu infected with COVID-19 and notified to Terengganu State Health Department. Majority of cases were female, nurse, not occupationally-acquired, symptomatic, had mild severity of COVID-19 and had no comorbidity. Details are shown in Table 1.

| TABLE I: CHARACTERISTICS OF HEALTHCARE WORKERS INFECTED WITH COVID-19 IN TERENGGANU (N=919) |
|---------------------------------------------------|
| Characteristics | Frequency, n(%) |
| Age* | 36 (±7) |
| RT-PCR Ct Value* | 24.87 (±7.86) |
| Gender | |
| Male | 234 (25.5) |
| Female | 685 (74.5) |
| Job category | |
| Medical doctors | 180 (19.6) |
| Nurses | 356 (38.7) |
| Assistant medical officers | 68 (7.4) |
| Pharmacy staff | 32 (3.5) |
| Dental staff | 54 (5.9) |
| Administrative staff | 35 (3.8) |
| Allied health staff | 48 (5.2) |
| Support staff | 146 (15.9) |
| Occupationally-acquired COVID-19 | |
| Yes | 255 (27.7) |
| No | 664 (72.3) |
| Symptomatic | |
| Yes | 562 (61.2) |
| No | 357 (38.8) |
| COVID-19 Severity | |
| Category 1 | 434 (47.2) |
| Category 2 | 482 (52.4) |
| Category 3 | 3 (0.4) |
| Comorbidity | |
| Yes | 83 (9.0) |
| No | 836 (91.0) |

*Mean (±SD)

V. DISCUSSION

Approximately 10.2% of healthcare workers in Terengganu (919 out of 9,020 healthcare workers) had been infected with COVID-19 as of 30th September 2021. In our study, nurses and medical doctors were the top two job categories infected with COVID-19. Our finding is congruent with studies in Wuhan, China and Fars, Iran.
which reported similar finding of job categories infected with COVID-19 [15, 16]. Nurses regardless in hospital or clinic settings comprise majority (46.9%) of the working population in Terengganu healthcare facilities with 2,846 nurses and 1,385 community nurses [5]. COVID-19 commonly involved personnel related to clinical work particularly doctors and nurses as compared to other job categories, suggesting differential effects of occupation types on infection status. It is known that nurses have more patient-contact time in healthcare facilities than other job categories [15], and hence explaining the reason why nurses are the most commonly group infected with COVID-19.

As for gender, female healthcare workers were the most commonly group infected with COVID-19 similar to previous Chinese study [15]. This finding is expected as majority of cases were nurses, of which this particular job category in Malaysian setting is highly dominated by women [17].

Almost 30% of healthcare workers in Terengganu contracted nosocomial COVID-19. In the early phase of the COVID-19 outbreak, the numbers of healthcare workers and personal protective equipment (PPE) were both inadequate, and the continuous working hours of healthcare workers particularly nurses and doctors were relatively longer [15]. Hence, it is possible for them to contract nosocomial or occupationally-acquired COVID-19. Moreover, SARS-CoV-2 has a high transmissibility rate in indoor environments and, therefore, asymptomatic patients admitted to hospitals without respiratory symptoms have probably spread the virus to unaware and unprotected healthcare workers [18]. Majority of our COVID-19 infected healthcare workers contracted the disease from their household contacts. This nature of infection is inevitable as many studies had proven that the risk of COVID-19 infection among household contacts could go beyond 10-folds as compared to other category of contacts [6, 19].

The RT-PCR cycle threshold (Ct) value provides a measure of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) viral load in the sample for RT-PCR testing for COVID-19. The Ct value is inversely related to the viral load in which lower Ct values correspond to higher viral ribonucleic acid (RNA) concentrations [8]. Screening and diagnosis of COVID-19 among healthcare workers in current study was early as depicted by relatively low mean RT-PCR Ct value (24.87) and therefore averted progression to severe COVID-19 stages (Category 4 and Category 5). Majority of infected healthcare workers in our study were diagnosed with mild-moderate COVID-19 (Category 1 and Category 2). It is known that screening and case detection in Terengganu state is early based on previous study on Ct value [8].

Majority of our infected healthcare workers were asymptomatic, similar with finding from an Iranian study [16]. Symptomatic cases are less worrying as they can be quickly screened, diagnosed, isolated and treated. As almost 40% of our infected healthcare workers were asymptomatic, they can become a significant source of infection in healthcare facilities as they may silently transmit the virus not only to their colleagues, but also to patients attending the facilities. Reference [16] also reported small proportion of infected healthcare workers had comorbidity which is in line with our finding (9.0%). A systematic review and meta-analysis showed that comorbidities had significant association with the severity and prognosis of COVID-19 [20]. As majority of infected healthcare workers in our current study had no comorbidity, their prognosis and treatment outcome are better. Therefore, no healthcare worker progressed to severe stage of COVID-19 (Category 4 and 5) in our current study.

VI. CONCLUSION

With the ongoing COVID-19 pandemic and the emergence of new variant such as Delta and Omicron variants, ensuring the safety of healthcare workers is essential to end the pandemic. Therefore, exploration of the burden of COVID-19 among healthcare workers is paramount in decreasing the spread of the virus, by increasing public awareness, and also offering useful recommendations for government agencies such as isolating infected cases in specific well-equipped hospitals. Since asymptomatic cases were of a significant proportion, expanding protective measures for healthcare workers is essential to decrease infection rates among family members and colleagues in healthcare facilities.

AUTHORS’ CONTRIBUTION

Awang H, Abd Rahman MA and Embong K conceptualized thes study; Awang H, Mahmud N, Wahab A and Abdul Rashid N conducted the data collection; Awang H analyzed the data and drafted the manuscript. All the authors read and approved the final manuscript.

ACKNOWLEDGEMENT

This study was approved by the Medical Review and Ethical Committee from National Institute of Health, Ministry of Health Malaysia (NMRR ID-22-00162-BAO). The authors would like to thank the Director General of Health Malaysia for allowing us to use the secondary data from Terengganu state COVID-19 online registry and SIMKA Outbreak system. Our gratitude also goes to all personnel at Occupational and Environmental Health Unit, Terengganu State Health Department for their assistance during data collection.

CONFLICT OF INTEREST

Authors declared that they do not have any conflict of interest.

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