

A descriptive analysis of clinical characteristics of COVID-19 among healthcare workers in a district specialist hospital

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ABSTRACT

Introduction: COVID-19 is a highly transmissible respiratory virus that has affected millions of people worldwide in the span of months. The burden of disease among healthcare workers (HCW) has not been well studied despite reports of infectivity and transmission around the world. Two HCW in Hospital Teluk Intan (HTI) contracted COVID-19 while attending a social event. They were in close proximity with colleagues upon returning to work, resulting in the spread of infection among other HCW in HTI.

Objective: The objectives of this paper are to gain a better understanding of the key presenting symptoms of COVID-19 in HCWs in a district specialist hospital, to establish the proportion of symptomatic COVID-19 cases among HCWs and its severity and to determine the time taken from onset of symptoms or perceived exposure to diagnostic testing.

Methodology: This is a retrospective descriptive analysis of clinical characteristics of subjects infected with COVID-19 among HCW in HTI. Their demography and clinical characteristics were recorded.

Results: There were 47 HCW in HTI who tested positive for COVID-19. The mean age of the patients was 37.5 years old. 7 patients (15.2%) had at least more than one comorbidity. Average duration of time from perceived close contact to onset of symptom was 4.5 days, while the mean duration of time from symptoms to first positive RT-PCR result was 3.4 days. Six patients (13.0%) were asymptomatic throughout, whereas 40 (87.0%) had at least one symptom prior to hospitalization. The most commonly reported symptoms were fever (65.2%), sore throat (39.1%) and cough (37.0%). In terms of severity of symptoms, the majority of patients experienced mild symptoms (Group 2, 52.2%). Two patients (4.3%) with multiple comorbidities had severe disease requiring ICU admission and mechanical ventilation. There were no mortalities, and the longest staying patient was hospitalized for 18 days. The high rates of infectivity among HCW in HTI can be attributed to working in close proximity while in the asymptomatic incubation phase, while no HCW directly involved in the care of COVID-19 positive patients were tested positive.

Conclusion: We report that HCW share similar clinical characteristics of COVID-19 infection as those of non HCW patients in earlier studies. The infection can spread rapidly within healthcare settings via close contacts among infected

HCWs. As such, we advocate distancing when working and usage of personal protective equipment when treating patients with respiratory illness to reduce transmission of COVID-19.

KEYWORDS:

COVID-19, Healthcare workers, Personal Protective Equipment

INTRODUCTION

In December 2019, healthcare professionals in Wuhan, China identified a severe manifestation of pneumonia appearing in clusters of patients who frequented a wet market in the region which sold exotic animals.^{1,2} Local health authorities were alerted, and in subsequent days the number of patients presenting with viral pneumonia increased exponentially. By January 2020, the World Health Organization (WHO) issued a statement warning of a highly infectious novel coronavirus.^{3,5} The pathogen was identified as a beta-coronavirus with phylogenetic similarity to the severe acute respiratory syndrome coronavirus (SARS-CoV), and eventually came to be known as the SARS-CoV2, and the disease caused as COVID-19.⁶⁻⁹ Globally as of late March 2020, more than 750,000 people have contracted the disease with deaths over 36,000 consequent to the infection.¹⁰

COVID-19 is a highly transmissible viral illness with clinical manifestations primarily involving the respiratory system. Early epidemiological and descriptive studies by Chen et al., and Huang et al., described fever, cough and shortness of breath as the clinical manifestations most commonly presented in patients who tested positive for COVID-19.^{3,5} Guan et al., reported human-to-human transmission among family members as the main source of transmission, attributing almost 73% of total human-to-human transmission in China.¹¹ Wu et al., reported that COVID-19 conferred an overall case-fatality rate (CFR) of 2.3%, with higher rates seen in patients above 70, with multiple underlying comorbidities and in the critically ill.¹²

The role of healthcare workers (HCW) in the COVID-19 pandemic has been paramount. Due to the rising number of COVID-19 cases and increased burden of care and screening, more cases of HCW infected with COVID-19 have been reported. In the United States of America, 9242 cases of COVID-19 infection were reported among HCW as of 9th April 2020.¹³ In a summary report of 72,000 cases from the Chinese Center for Disease Control and Prevention, Wu et al.,

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reported a HCW infection rate of 3.8%, of which a large proportion were HCWs working in Wuhan.¹² There is also the increased risk of HCW infection and transmission among HCW in the non-clinical setting within the workplace. Despite this increased awareness, HCW remains to be a population that is understudied in relation to disease transmission.

On 25th January 2020, Malaysia reported the first case of COVID-19 from a traveler who returned from Wuhan.¹⁴⁻¹⁶ Early efforts to contain and quarantine people with a travel history from China proved successful. The situation changed in early March 2020, when a large international religious gathering of more than 10,000 people took place in Selangor.^{16,17} In the coming weeks, there was a sharp rise in the number of positive cases which were eventually traced to this event.¹⁸ Several attendees of this gathering have already returned to other neighboring Southeast Asian countries including Brunei, Thailand and Indonesia. Globally as of late March, WHO reported more than 370,000 confirmed cases globally affecting 196 countries, with more than 16,000 deaths attributed to COVID-19.¹⁹ As of 30th April 2020, Malaysia recorded 6002 cases who tested positive for COVID-19 with 102 deaths consequent to the infection.²⁰

On 8 March 2020, 2 HCW in Hospital Teluk Intan (HTI) were diagnosed to be positive for COVID-19. Following this information, immediate action of assessment and investigation was done to verify and confirm the event. The primary objectives of this paper is to gain a better understanding of the key presenting symptoms of COVID-19 in HCWs in a district specialist hospital, to establish the proportion of symptomatic COVID-19 cases among HCW and its severity and to determine the time taken from the onset of symptoms or perceived exposure to diagnostic testing.

MATERIALS AND METHODS

Methods

This is a retrospective, single-centered study. We recruited HCW from HTI who tested positive for the COVID-19 genome via oropharyngeal or nasopharyngeal sampling and who came from the same epidemiological cluster between 15 March 2020 and 30 April 2020. The diagnosis of COVID-19 was confirmed by real-time polymerase chain reaction (RT-PCR) for SARS-CoV2 done on nasopharyngeal swab specimens. Specimens were obtained by a dedicated team of doctors trained in performing nasopharyngeal sampling and proper packing of laboratory specimens. Diagnostic testing was carried out in a designated laboratory in Ipoh. Only healthcare workers from HTI were included while those who did not consent to being interviewed were excluded from the study. Subjects were recruited from information made available by the COVID operation centre in HTI.

Procedures

This study was conducted via phone interview as all of the subjects were either quarantined or admitted in isolation wards during the study period. Subjects were read a scripted patient information sheet over the phone by the investigator, and verbal consent was recorded by the investigator. They were then asked a series of questions prepared by the

investigators about their age, comorbidities, date of contact with confirmed case, date of onset of symptoms, symptoms manifested, dates when nasopharyngeal samples were taken and the results, and the management. Information was also cross-referenced with medical records of patients in the event that they were unable to recall any details.

Statistical analysis

Descriptive analysis was used to characterise the study population by IBM SPSS (IBM Corp. Released 2016. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp). Data were compiled and reported in frequency (percentages) and standard deviation.

Ethical Consideration

The study was approved by the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia. All subjects were read a scripted informed consent prior to interview and verbal consent was documented by the investigators. This is a retrospective study without any intervention on the part of the investigators and all efforts were taken to ensure confidentiality of those who agreed to participate.

RESULTS

A total number of 1480 nasopharyngeal samples were taken. 54 samples (3.6%) were reported to have RT-PCR SARS-CoV2 genome detected, and diagnosed as COVID-19. Forty-seven (3.2%) were HCW from HTI. A total of 47 cases met the case definition, and 46 consented to be included in our study. They comprised of 24 doctors (52.2%), 14 nurses (30.4%), 5 medical assistants (10.9%) and 3 allied healthcare workers (6.5%) which included a counselor, a medical laboratory technician and a hospital safety officer.

The mean age of the patients was 37.5 years old (SD 8.9). There were 17 males (36.9%) and 29 females (63.1%). In all 27 patients were treated in Ipoh (58.7%) while the remaining 19 (41.3%) were treated in HTI. Of those who were treated in HTI, one patient had to be transferred to the state referral COVID-19 hospital in Ipoh due to clinical deterioration.

There were 7 patients (15.2%) with at least one comorbidity. The most common comorbidity among our cohort was hypertension (13.0%), followed by diabetes mellitus (6.5%), dyslipidemia (4.3%) and bronchial asthma (4.3%). Other comorbidities among our cohort were ischemic heart disease (2.2%), chronic kidney disease (2.2%), sleep apnoea (2.2%) and malignancy (2.2%). Three (6.5%) of them had multiple comorbidities. The majority of our patients were non-smokers, with only one smoker (2.2%) and three ex-smokers (6.5%). The mean BMI of the cohort was 26.4kg/m² (SD4.96). Thirteen (28.2%) of our patients were underweight with BMI of less than 23kg/m², while 20 (43.6%) were considered obese with BMI of above 27kg/m² (according to the WHO Modified BMI categorisation for Asia Pacific population).

Six patients (13.0%) in our cohort were asymptomatic in the duration of time before and after hospitalization, whereas the remaining 40 patients (87.0%) experienced at least one symptom before or during the time of admission. Symptoms most commonly reported included fever (65.2%), sore throat (39.1%) and cough (37.0%). This was followed by myalgia

Table I: Demographic of Healthcare Workers in Hospital Teluk Intan with COVID-19

	Patients (n= 46)
Age	37.5 (8.9)*
Gender	
Male	17 (36.9%)
Female	29 (63.1%)
Occupation	
Doctor	24 (52.2%)
Nurse	14 (30.4%)
Medical Assistant	5 (10.9%)
Other allied healthcare professionals	3 (6.5%)
BMI	26.4 (5.0)
<23	13 (28.2%)
23-27	13 (28.2%)
>27	20 (43.6%)
Comorbidities	
Hypertension	6 (13.0%)
Diabetes mellitus	3 (6.5%)
Dyslipidemia	2 (4.3%)
Bronchial asthma	2 (4.3%)
Ischemic heart disease	1 (2.2%)
Chronic kidney disease	1 (2.2%)
Sleep apnoea	1 (2.2%)
Malignancy	1 (2.2%)
Number of comorbidities	
0	39 (84.8%)
1	4 (8.7%)
2 or more	3 (6.5%)
Smoking status	
Active	1 (2.2%)
Ex-smoker	3 (6.5%)
Non-smoker	42 (91.3%)

*mean (SD)

n = frequency; % = percentage; BMI = body mass index.

BMI was based on WHO modified BMI for Asia Pacific region

Table II: Presenting symptoms among Healthcare Workers in Hospital Teluk Intan with COVID-19

	Patients (n= 46)
Symptomatic	40 (87.0%)
First presenting symptoms	
Fever	30 (65.2%)
Sore Throat	18 (39.1%)
Cough	17 (37.0%)
Myalgia	9 (19.6%)
Rhinorrhoea	6 (13.0%)
Lethargy	5 (10.9%)
Dyspnoea	4 (8.7%)
Diarrhea	3 (6.5%)
Nausea/ Vomiting	1 (2.2%)
Other symptoms	
Anosmia	4 (8.7%)
Headache	2 (4.3%)
Itch	1 (2.1%)
Number of patients with more than 1 symptom on presentation	27 (58.7%)
Severity of Illness (Group)	
1	12 (26.1%)
2	24 (52.2%)
3	7 (15.2%)
4	1 (2.2%)
5	2 (4.3%)
Asymptomatic	6 (13.0%)
Number of days from close contact to symptoms (N=40)	4.5 (3.8)*
Number of days from close contact to first positive swab (N=46)	8.0 (4.5)*
Number of days from symptoms to first positive swab (N=39)	3.4 (2.8)*
Number of days from close contact to first sampling	8.0 (4.2)*
Number of HCWs with COVID-19 Genome detected on first swab	35 (76.1%)
Number of HCWs with COVID-19 Genome detected on second swab	11 (23.9%)
Duration of Hospitalisation	12.0 (3.1)*

*mean (SD)

n = frequency; % = percentage; HCW: healthcare workers

(19.6%), rhinorrhoea (13.0%), lethargy (10.9%), dyspnoea (8.7%), anosmia (8.7%), diarrhoea (6.5%) and nausea/vomiting (2.2%). 27 of them (58.7%) experienced two or more symptoms upon disease onset.

We further classified our HCW based on disease severity at the time of admission. These groupings were based on the national guidelines: Group 1: for asymptomatic patients, Group 2 are patients with non-pneumonia upper respiratory symptoms, Group 3 for patients with pneumonia not requiring oxygen, Group 4 refers to patients with pneumonia requiring oxygen supplementation, and Group 5 being patients with severe manifestation of COVID-19 requiring ventilator support or ICU admission.²⁸ During their entire duration of hospitalisation, their groupings of classification of symptoms changed in the event of new symptoms that development or any deterioration. In total, 12 (26.1%) patients were classified as Group 1, 24 (52.2%) as Group 2, 7 (15.2%) as Group 3, 1 (2.2%) as Group 4 and 2 (4.3%) patients as Group 5.

The two patients with Group 5 disease required admission to the intensive care unit (ICU). They had multiple comorbidities and were also obese. Both patients required

mechanical ventilation while one had to undergo haemodialysis as well. The patient who required haemodialysis had underlying chronic kidney disease secondary to diabetic nephropathy with a baseline creatinine of 159µmol/l. Both patients improved clinically and were discharged after 17 and 18 days of admission respectively. One patient had a healing pressure sore on discharge, whereas the creatinine of the other patient who required haemodialysis returned to baseline level during subsequent outpatient follow-up. There were no mortalities among our cohort of patients. No members of the public who were admitted during this period were tested positive for COVID-19.

The mean number of days from perceived close contact with a positive case to having the first diagnostic swab was 8.0 days (SD4.2). The mean number of days from perceived close contact to the onset of symptoms was 4.5 days (SD3.8). The time from perceived close contact to the first positive RT-PCR swab was 8 days (SD4.5). Among those who were symptomatic, the mean number of days from symptom onset to a first positive RT-PCR result was 3.4 days (SD 2.8). The mean duration of hospital stay was 12 days (SD 3.1), with the longest hospital stay being 18 days.

DISCUSSION

On 8 March 2020, two HCW from HTI attended a wedding in Bandar Baru Bangi, Selangor. In this event, approximately 300 attendees were in contact with a person who were later confirmed to have COVID-19. Following this event, both HCW went back to work and continued their daily routine as they were asymptomatic. By mid-March 2020, these HCW developed symptoms of fever and cough. They underwent diagnostic RT-PCR nasopharyngeal swabs and were found to be positive for COVID-19.^{4-7,21} Swift measures of containment, contact tracing and screening were performed among the HTI staff that had the closest contact to those HCW. These two patients were then transferred to the state's designated COVID-19 hospital for further management and care. Due to the repeated exposure between the two index cases with colleagues in their respective departments, COVID-19 continued to spread within the HTI. A total of 54 COVID-19 cases were identified from this cluster, of which 48 were HCW, whereas six others were family members of these HCW. All these patients were admitted and managed in HTI and the designated hospital.

Common presenting symptoms among our cohort namely fever and cough were consistent with global trends.^{3-5,22} However, we also found that sore throat was reported more frequently compared to cough, and at a higher frequency when compared with other studies done in other centres.^{3-5, 22-26} Our cohort also had substantially lower rates of deterioration reflected by ICU admissions, and reported no mortalities as compared with studies from Zhou et al., and Yang et al.^{22,23} This was because our cohort consisted of a relatively younger population (65.2% were aged 40 years and below) and had no co-morbidities.^{22-24,27}

Our patients were admitted in accordance with local COVID-19 guidelines, whereby positive cases were admitted into designated hospitals regardless of symptoms or severity.^{28,29} Patients were only discharged when their nasopharyngeal swab 14 days from date of either symptom manifestation or first positive swab in those who were asymptomatic came back negative, and with no other clinical concerns. Due to this, the duration of hospitalisation may not be a true reflector of severity of disease. Prolonged hospitalisation adds to the burden of healthcare costs and resources of the public healthcare system, yet this measure to admit and actively isolate all positive cases regardless of severity may perhaps have played a pivotal role in reducing disease spread within the hospital community.

As of April 2020, HTI had the second highest number of COVID-19 infection among HCW in Malaysia. A number of key events led to this rapid spread. First was the increased number of meetings held in preparation for the management of COVID-19 patients. These included inter-department meetings between department heads and hospital management team. Secondly, regular teaching and training activities also contributed to the dissemination of the disease.

We observed a trend of infectivity relating to the number of occupants in a particular work area. Work areas that were enclosed and crowded were affected more: the busy and crowded Emergency and Trauma Department which had 20

healthcare staff per shift had the most number of cases at 22 (46.8%), followed by the Infection Control Unit (5 cases, 10.6%) which shared a small office, the Pathology Department (4 cases, 8.5%) and Radiology Department (2 cases, 4.3%). During this period of time, wearing of surgical 3-ply masks and social distancing were not strictly enforced as yet.

Another contributing factor was that 78.3% of affected staff had either no symptoms or mild symptoms and continued to work. Many staff tend to 'work-through' these mild symptoms as they perceive them to be the 'normal' flu or common cold. There is now an increasing awareness of the knowledge that COVID-19 is infective even in the asymptomatic incubation period.^{23,24,26} A position statement from the National Centre for Infectious Diseases and the Chapter of Infectious Disease Physicians, Academy of Medicine, Singapore, state that the infectious period begins at around two days before symptom onset, while the mean incubation period of disease is around five days.³⁰

Interestingly we noted that during this same period, apart from the six immediate family members of affected HCWs, only one other patient who spent the previous six months working aboard a cruise ship tested positive for COVID-19. No other patient from the community who was admitted for 'Severe Acute Respiratory Illness' (SARI) tested positive for COVID-19. Also of note is that there were no HCW who were directly caring for COVID-19 patients who tested positive for COVID-19 during this entire duration.

During the period between March and April 2020, a total number of 967 HCW were quarantined while awaiting for results from their confirmatory COVID-19 tests. At least five working days per HCW were lost from the quarantine time. Radiology, pathology and emergency medicine departments were reduced to 'skeleton services'. Elective procedures were postponed not only from the reduced workforce, but also in order to reduce COVID-19 contact risks by reducing patient flow in HTI. Also, added manpower was recruited from nearby hospitals during this period to provide adequate coverage of service during this period.

Following this outbreak, HTI enforced a strict 'health declaration' among HCW on a daily basis upon reporting to work. This involved HCW answering a questionnaire on their health condition (presence of fever, myalgia, cough or sore throat), recent travel out of the state, and close contact with COVID-19 positive patients. HCW who answered as yes to any of the above questions were subsequently assessed for risk of COVID-19 transmission. High risk HCW would then be quarantined and undergo a RT-PCR sampling. Strict hand hygiene, surgical 3-ply mask wearing, and social distancing rules was enforced and continuously reminded. Multiple training sessions involving prerecorded videos and online training of donning personal protective equipment (PPE) were conducted in all departments. Clinic and examination rooms which were previously shared were reduced to one-doctor, one-patient per room. Patients who presented to emergency department or as walk-in to the various clinics were screened with a similar health declaration questionnaire, and triaged to a special, isolated examination

area if deemed at risk of having SARI, influenza-like illness (ILI) or COVID-19.

To reduce risk of transmission among both patients and HCW in HTI, patients who were admitted for SARI or ILI awaiting RT-PCR results for COVID-19 were kept in isolation bays. Use of aerosol based nebulisers were significantly reduced. The pharmacy department innovated methods of delivering metered-dose inhalers via modified aerochambers with disposable plastic cups and disposable supplementary oxygen face masks. These innovations were required due to the costs and acute shortage of regular aerochambers during this period of time.

There were several limitations in this study. Due to travel restrictions during the study period, the investigators relied on phone interviews to obtain information pertaining to our patients. There were a few instances where our subjects could not recall certain information and we had to call them back later to clarify. There was also some delay in receiving test results during the early phase of the pandemic due to the sudden surge in sampling and testing. This improved as the testing capacity in Malaysia increased.

CONCLUSION

The authors observed from this study that HCW share similar clinical characteristics of COVID-19 infection as those of non HCW patients in earlier studies. The infection can spread rapidly within healthcare settings via close contacts among infected HCW. As such, we recommend instilling the practice of masks wearing, distancing during clinical activities and hand hygiene in the daily work practice to reduce risks of disease transmission.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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