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COVID-19 Infection at Mabila Health Centre: Lessons Learned

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Abstract

Oman, like other countries worldwide, was hit by the COVID-19 pandemic in all its sectors, not merely the health one. There are some important indicators steering the prognosis of COVID-19 infection. This is a cross-sectional study to help understand this disease, its transmission, and course of illness, as well as highlighting the factors that may affect its prognosis. A total of 1000 participants from Mabila Health Centre who got the infection were included. Results showed that 97.3% had a mild course of the disease requiring only home quarantine. Around (45.4%) got the infection from their family, (43.4%) from the community, and only (11.2%) got it from their work. Age was a major factor in determining the course of the disease, $F(77, 922) = 11.90$, $p < 0.001$. Having a job is strongly correlated with milder course of COVID-19 infection, X^2 (12, $N = 1000$) = 70.50, $p < 0.001$. Having the annual flu vaccine is highly correlated with a more benign course of the infection, X^2 (3, $N = 128$) = 17.24, $p = 0.001$. In conclusion, COVID-19 pandemic varies in its presentation and prognosis. Age and unemployment indicate a worse prognosis, while having the seasonal flu vaccine may improve the prognosis. The study is important as it orients the primary health care providers on picking up patients with high risk so they can be followed more closely in order to reduce the disease morbidity and mortality.

Keywords: COVID-19 infection, COVID-19 pandemic, COVID-19 in Oman, COVID-19 outbreak

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Introduction

The coronaviruses have become the major pathogens of emerging respiratory disease outbreaks. They are a large family of single-stranded RNA viruses (+ssRNA) that can be isolated in different animal species [1]. For reasons yet to be explained, these viruses can cross species barriers and can cause, in humans, illnesses ranging from the common cold to more severe diseases such as MERS and SARS. Interestingly, these latter viruses have probably originated from bats and then moved into other mammalian hosts — the Himalayan palm civet for SARS-CoV, and the dromedary camel for MERS-CoV — before jumping to humans. The dynamics of SARS-CoV-2 are currently unknown, but there is speculation that it also has an animal origin [2].

COVID-19 was initially encountered in December 2019 by Chinese authorities in the setting of cases of pneumonia that seemed to be clustered around a seafood market in Wuhan, Hubei Province. Then, bronchoalveolar lavage samples collected from affected patients in late December 2019 yielded evidence of a novel beta coronavirus, genetically-distinct from previously identified SARS-CoV and MERS-CoV but genetically-similar to previously- published coronavirus strains collected from bats from southwestern China, yielding hypotheses of potential zoonotic origin. After this initial detection of the virus in China, it spread across the globe. The World Health Organization (WHO) was alerted by a number of serious pneumonia cases with an unidentified cause in Wuhan, China by the end of December 2019. A new type of coronavirus disease, presenting with acute respiratory complaints, was discovered and corona virus 2 virus (SARS- Cov-2) was identified in those cases. The disease progressed very fast to a pandemic and an international alert was then declared by the WHO on March 2020 [3,4].

The presentation of the COVID-19 infection can vary; the most common is a non- specific flu-like illness. The majority of patients present more than one sign/symptom on admission, although the combination of fever, cough and shortness

of breath may be rare [5-13]. The most common symptoms are: fever (44-94%), cough (68-83%), anosmia and/or ageusia (70%), upper respiratory symptoms (sore throat, rhinorrhea, nasal or sinus congestion) in 5-61%, shortness of breath (11-40%), fatigue (23-38%), muscle aches (11- 15%), headache (8-14%), confusion (9%) and gastrointestinal symptoms (nausea, vomiting, diarrhea) in 3-17% [5]. Children are less likely to have fever or cough and 20% of confirmed cases may be asymptomatic [14].

The duration of the above-mentioned symptoms varies from one patient to another, with a fever lasting on average about 4-12 days. Regarding the severity of the symptoms, around 81-91% have mild to moderate symptoms (mild symptoms to mild pneumonia), 9-14% have severe symptoms (defined as hypoxemia or >50% lung involvement) and around 5% have critical symptoms. The average time from a symptom onset to an Intensive Care Unit (ICU) transfer is around 12 days. Patients are usually shifted to the ICU because of either hypoxemic respiratory failure (which is the most common) or because of cardiomyopathy. The causes of death in COVID-19 infections can be due to respiratory failure alone, circulatory failure alone or both respiratory and circulatory failure. However, in some cases the cause of death is unknown. The average hospitalization period is 12 days [10-14].

There are some important indicators steering the prognosis of a COVID-19 infection. For example, increased age correlates with a more severe disease and increased mortality [6,9,15,16]. Children are less likely to have a severe disease, but pediatric deaths have been reported. Patient with other comorbidities like diabetes, hypertension or chronic kidney diseases are more likely to have a severe disease and are often associated with worse outcomes [6-7,10,11,15-20].

People with diabetes have increased risks of morbidity and mortality during acute COVID-19 infection. This phenomenon can be explained by the suppression of innate and humoral immune functions. Studies showed an increased incidence of COVID-19 among patients with diabetes, and agreed that such patients face a higher chance of serious complications from a COVID-19 infection than others [21]. Having a heart disease or other complications in addition to diabetes could worsen the chance of getting seriously ill from COVID-19, like other viral infections, because the body's ability to fight off an infection is compromised [22]. The levels of glycated hemoglobin (HbA1c) > 9% have been linked to a 60% increased risk of hospitalization and pneumonia-related severity during a bacterial infection. Glycemic control is important in patients infected with COVID-19, although there are limited data and studies to show the association of severity of COVID-19 and blood glucose level [23,24]. Data from other infections like SARS and influenza H1N1 has shown that patients with poor glycemic control have increased risk of complications and death [25]. It is of paramount clinical importance that such high risk patients are vaccinated against the flu annually.

Seasonal influenza vaccines are usually used to protect against flu illnesses along with reducing hospital admission and death. The seasonal influenza vaccine may have a partial effect on reducing the severity and the course of illness in a patient with COVID 19. However, getting the vaccine will not protect against the infection [26]. Influenza vaccination is of critical importance for high-risk groups (including the elderly, pregnant, immunocompromised and health care workers) to reduce the possibility of influenza infection and co-infection with SARS-CoV-2, diagnostic dilemmas and inappropriate management in terms of antiviral therapy and infection control [27].

Oman, like other countries worldwide, was hit by the COVID-19 pandemic. The first cases were reported on the 24th of February 2020 and were linked to travelers arriving from Iran. It progressed in the country very rapidly, and Muscat, the capital city of Oman, started taking precautions and shutting down schools, mosques, malls and businesses as a major lockdown proceeded [28]. As per Today Statistics, Oman has declared 105890 positive cases for Covid -19, 1038 deaths and 92840 cases (87%) which have recovered. There has been a sharp increase of hospitalized patients in Oman, especially in Muscat, for the first time in the history of Oman and the ICU's reached their maximum capacity [29,30]. Moreover, Oman has the second highest number of deaths among GCC countries, which has raised major concerns and led to multiple city lockdowns [30,31]. In the Mabila Health Center, we had a total of over 3000 Confirmed cases, which makes it one of the busiest health centers in Muscat, and total of 15 deaths [29,30].

Statement of the Problem/Aim

The increased burden of COVID-19 pandemic in Oman has affected all the sectors especially the healthcare system. The number of patients with the infection is still increasing, with increased morbidity and mortality from the disease. Studying Omani COVID-19 patients at the Mabila Health Center, as one of the busiest primary health care (PHC) institutions in Muscat governorate, will help in identifying risk factors and highlight preventive measures for the pandemic in the country. Additionally, studying the course of the disease helps in picking up high risk patients so frequent follow ups are arranged in order to reduce their morbidity and mortality rates.

Research Questions

Main scientific hypothesis

Knowing the course of the disease can help in finding modalities to reduce its morbidity and mortality.

Research question

1. Determine the course of the disease among infected patients (from home isolation until full recovery, required hospital admission, required ICU admission, death)
2. What are the risk factors that led to increased morbidity and mortality among affected population?
3. Does administering annual influenza vaccine improve the progression of COVID-19 infection?.

Research Design and Methods

A cross-sectional, retrospective descriptive study conducted at the primary health care setting; at the Mabila Health Center in the Muscat region over a period of six to nine months. One thousand Omani males and females, of varying ages, who were infected with COVID-19 virus and followed up at the Mabila Health Center, were included in the study.

All the COVID-19 confirmed cases that belong to Mabila HC catchment area are entered in the Tarrasud website in alphabetical order. The collected information includes their age, work status, symptoms, date of symptoms, along with their daily course throughout the quarantine period and their disposal (home quarantine or hospital admission) was recorded.

Randomization was done by taking every third registered patient if eligible. If the chosen participant is not eligible the one after him/her was taken instead.

Data Collection

Demographic variables of the participants were collected from their case summary that was already entered in Tarrasud application during the contact tracing process. Those variables include: age, gender, work status and presence of chronic illness or risk factors. Then, their influenza status was collected from their electronic medical records using their MRN at the Mabila Health Center. Their course of Covid-19 illness during the 14 days from the first day of their symptoms was collected from the Excel sheet already entered during the contact tracing process. Those who were admitted were followed up till one week after their discharge on the same Excel sheet.

Data Quality/Management

Recheck data entry for around 10% of the participants (done earlier by the principal investigator), through random selection. The collected data was entered on daily basis to avoid errors in the latest version of the SPSS program.

Data Analysis

One thousand participants were included in the study with a good variety of ages, ranging from less than one year and up to 82 years old (M = 32.69, SD = 14.04). Most of the studied populations were men (61.7%). Out of the 383 total women studied, only 13 of them were pregnant (3.4%) and only (2.9%) were lactating. The majority of the population did not have any prior chronic illness (85.6%), never smoked (96.5%), and do not consuming alcohol (99.4%). More than half of the populations (57%) were working at the time of the study, with only (7.8%) of them working in the health sector. The 430 non-working participants were either students (32.8%), housewives or unemployed (60.2%) or retired (7%). Regarding infection transmission, (45.4%) got it from family, (43.4%) from the community, and only (11.2%) got the infection from work.

From the studied population, only 64 people (6.4%) received the annual flu vaccine. Over the 14 days after showing symptoms of COVID-19 infection, the majority had a mild course and were only home quarantined (97.3%), about 2.4% were hospitalized but did not require intubation, one participant (0.1%) required intubation and two of them died (0.2%). Out of the 64 participants who got the flu vaccine only four of them (6%) were hospitalized and discharged home without the need for intubation, the rest (94%) required only home quarantine signifying a milder course of the disease. **Table 1** describes the participants'' characteristics and their course of illness at day 14 of symptoms.

Analysis of variance (ANOVA) test showed that age was highly correlated with the course of the disease, as the older the age, the worse the outcome of COVID-19 infection, $F(77, 922) = 11.90$, $p < 0.001$ as shown in **Table 2**. Interestingly, chi squared test showed that having a job is strongly correlated with milder course of COVID-19 infection, $X^2(12, N = 1000) = 70.50$, $p < 0.001$ as demonstrated in **Table 3**.

Out of the 64 patients who had the annual flu vaccine prior to COVID-19 infection, only four got hospitalized with no need for intubation. SPSS software is used to randomly select 64 participants who did not receive the flu vaccine and compared to those who received the vaccine, then chi square test was used to analyze the correlation. Having the annual flu vaccine is highly

Table 1: Shows a summary of participants' demographic characteristics.

Variable	Number (%)
Age: 0-10 11-20 21-30 31-40 41-50 51-60 61-70 >70	60 (6.0%) 107 (10.7%) 288 (28.8%) 309 (30.9%) 131 (13.1%) 66 (6.6%) 25 (2.5%) 14 (1.4%)
Gender: males females	617 (61.7%) 383 (38.3%)
Work status: Student Housewife/ unemployed Works health sector Works non-health sector Retired	141 (14.1%) 259 (25.9%) 41 (4.1%) 529 (52.9%) 30 (3.0%)
Chronic illness: Yes No	144 (14.4%) 856 (85.6%)
Smoking: Yes No	35 (3.5%) 965 (96.5%)
Alcohol: Yes No	6 (0.6%) 994 (99.4%)
Flu vaccine: Yes No	64 (6.4%) 936 (93.6%)
Course of illness: Home quarantine only Hospitalized no intubation Required intubation Died	973 (97.3%) 24 (2.4%) 1 (0.1%) 2 (0.2%)

Table 2: Shows ANOVA analysis for correlation between age and the course of disease.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	22.419	77	.291	11.900	.000
Within Groups	22.557	922	.024		
Total	44.976	999			

Table 3: Shows Chi-Square test of correlation between having a job and the course of illness.

	Value	df	Asymp. Sig. (2- sided)
Pearson Chi-Square	70.499a	12	.000
Likelihood Ratio	34.435	12	.001
Linear-by-Linear Association	6.391	1	.011

Table 4: Shows Chi-Square test of correlation between having the flu vaccine and the course of disease.

	Value	df	Asymp. Sig. (2- sided)
Pearson Chi-Square	17.241a	3	.001
Likelihood Ratio	19.399	3	.000
Linear-by-Linear Association	15.039	1	.000

correlated with a more benign course of the COVID-19 infection, X^2 (3, N = 128) = 17.24, p = 0.001 as shown in **Table 4**.

Discussion

COVID-19 infection is affecting people in different ways. Its course of the disease varies from mild, moderate or severe form. As this study showed, the most common (97.3%) is mild-moderate illness and will recover without the need for hospitalization. Yet, there are some cases who had severe illness and required to be admitted in hospital settings (2.7%).

Existing research supports the hypothesis the older people are disproportionately affected by the COVID-19 pandemic [32]. A retrospective study of middle-aged and elderly patients with COVID-19 found that the elderly population is more susceptible to this illness and is more likely to be admitted to the ICU with a higher mortality rate. Similarly, the results from this study revealed that older age group had worse outcome from inquiring COVID 19 infection with p< 0.001. This could be justified by many reasons, for example, medical comorbidities, functional status, lack of social support, mental health and late presentation for medical support and treatment. Some studies stated that the age-related changes in the geriatric population may be due to the changes in lung anatomy and muscle atrophy which results in changes in physiologic function, reduction of lung reserve, reduction of airway clearance, and reduction of the defense barrier function[33]. These factors need to be addressed further in order to prevent bad outcomes on their health.

The underlying medical condition played an important role in prognosis of COVID- 19 infection. The most common comorbidities were obesity, hypertension, asthma and diabetes mellitus. In the United States, the Centers for Disease Control and Prevention (CDC) use COVID-NET in 14 states to monitor the demographics of COVID-19 patients who are being hospitalized [33]. From March 1st through the 30th, 2020, there were a total of 180 patients on COVID-NET, of which 89.3% of the patients had an underlying comorbidity. Of the 180 patients, 94.4% aged 65 years and older had at least one comorbidity [34].

The populations of this study were different as only 14.4% of them had a coexisting chronic illness prior to infection with covid-19. This could be explained by the fact that this study was done at the primary healthcare level and not at tertiary level hospital like other studies.

The impact of unemployment on health has been analyzed by many literatures as it has negative effects on physical and mental health. Experiencing losing a job has been found to be related to higher risks of a heart attack or stroke and with the risk of mental illness [35], poorer self-rated health and ultimately with a higher mortality risk [36-38]. Interestingly, the results of this study revealed that having a job is strongly correlated with milder course of COVID-19 infection, X^2 (12, N = 1000) = 70.50, p< 0.001. This can be explained because job insecurity may cause more stress about risk of poverty, leading to lower perception of health and hence bad health outcomes.

COVID-19 outbreak continues to evolve and mutate into different strains requiring frequent evaluation and careful monitoring of signs, symptoms and related complications. It has been noted that both COVID-19 and seasonal influenza can cause respiratory illnesses. Moreover, both share the same course of illness ranging from being asymptomatic, to mild and severe. One study done in Italy aimed to analyze the association between influenza vaccination and COVID-19 in a population of healthcare workers. Flu vaccinations did not appear to be associated with SARS-CoV-2 infection [39]. On other hand, the results of our study showed that out of the 64 patients who had the annual flu vaccine prior to COVID- 19 infection, only four got hospitalized with no need for intubation with p = 0.001. This could explain the CDC statement. Because of the on-going COVID-19 pandemic, getting a flu vaccine during 2020-2021 will be more important than ever. Flu vaccines will not prevent COVID-19, but they will reduce the burden of flu illnesses, hospitalizations and deaths on the health care system and conserve scarce medical resources for the care of people with COVID-19 [6,7,10,11,15-20].

Limitations

The main limitation of this study was lack of heterogeneity of the participants as most of them were males with no pre-existing chronic illnesses. Additionally, not enough participants received flu vaccination, however, this was taken care of during analysis by randomly choosing similar number of participants who received no vaccine using the SPSS program to avoid selection bias. Further study comparing two groups of those received the annual flu vaccine and those who did not, in order to compare the course of COVID-19 illness among the two groups is needed

Conclusion

COVID-19 pandemic has hit the healthcare system worldwide. Its course of illness varied from mild requiring only home isolation to a moderate-severe one requiring hospital admission and maybe intubation. Having a preexisting chronic illness and unemployment are associated with bad prognosis. On the other hand, having the annual flu vaccine may have a protective effect and improves the disease prognosis. As the disease continues to evolve and mutate, continuous research is needed to fully understand it, and hence, plan needed health programs to tackle it at all levels of the healthcare system.

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