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Community Screening of High-Risk Individuals for SARS-COV-2 Infection: An Observational Study from Dubai, United Arab Emirates

Dr. Fatima Ali Mazahir [1*], Dr. Ethar Mustafa Malik [1], Dr. Fatma Mohd AlJassim [1], Mr. Sultan Arif Belshalat [2], Dr. Amal Mahmoud Abdalqader [1], Ms. Maryam Omar Ali [3], Mr. Ali Mazahir Al Qamari [4], Dr. Maysa Saleh [1].

1. Pediatric Department, Latifa Women and Children Hospital, Dubai Health Authority, Dubai, United Arab Emirates

2. Pathology and Genetics Department, Head Quarters, Dubai Health Authority, Dubai, United Arab Emirates

3. Dubai Thalassemia Center, Head Quarters, Dubai Health Authority, Dubai, United Arab Emirates

4. Information Technology Services, Brain Debuggers, Dubai, United Arab Emirates.

Corresponding Author: Dr. Fatima Ali Mazahir, Pediatric Department, Latifa Women and Children Hospital, Dubai Health Authority, Oud Metha Street, Dubai, United Arab Emirates.

ORCID-ID: 0000-0001-5686-8624

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Abstract

Objectives: *The United Arab Emirates launched a mass public screening program to facilitate the testing of asymptomatic individuals with SARS-COV-2 infection, offering free-of-cost testing to individuals with a high risk of getting the complicated disease. The aim of this study was to detect the rate of infection of SARS-COV-2 in the high-risk population and to study their outcome including the need for hospitalization, length of hospital stay, and days taken to be recovered. To the best of our knowledge, this will be the first study on the cohort of asymptomatic high-risk populations being screened for SARS-COV-2 infection in the United Arab Emirates and the Middle Eastern Region.*

Study Design: *Retrospective, cross-sectional study.*

Methods: *This study was conducted in two specialized Dubai Health Authority's COVID-19 Screening Centers, from 06th April 2020 till 25th June 2020. A total of 2918 patients belonging to either one or more of the high-risk categories (age > 50 years, underlying chronic illness, immune-suppression, pregnancy, and people-of-determination) were screened through qualitative detection of SARS-COV-2 RNA via polymerase chain reaction (PCR). Out of the total screened patients, 260 tested positive for COVID-19 infection. Infants under the age of 6 weeks and patients with a previously confirmed diagnosis of COVID-19 infection were excluded from the study.*

Results: *188 (72.3%) COVID-19 positive patients were asymptomatic, out of whom 94% were managed with supportive measures. Males and individuals with multiple risk factors were twice as likely to have prolonged recovery (OR for gender = 2.06, CI= 1.05-4.02, OR for risk factor= 2.28, CI= 1.28-4.06). Among individuals with non-favorable outcomes, those with symptoms (OR= 6.60, CI= 2.22-19.64, p-value= 0.00) and multiple risk factors (OR= 4.88, CI= 1.36-17.46, p-value= 0.01) had greater odds of being hospitalized. Conversely, the odds of persistent viral shedding were higher in asymptomatic patients than symptomatic (OR= 1.82, CI= 0.93-3.59, p-value= 0.08).*

Conclusion: *Detection of a higher proportion of asymptomatic cases with favorable outcomes and prolonged viral shedding among the cohort of high-risk individuals emphasizes the importance of screening programs for active detection and surveillance of COVID- 19 infections in controlling the disease spread among these groups as well as reducing the burden on the healthcare systems by the timely provision of care resulting in better health outcomes.*

Key-words: *Coronavirus Disease 2019, epidemiology, pandemic, public health, Dubai, United Arab Emirates.*

Introduction

The infectious outbreak caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has led to the global pandemic of COVID-19, with 147,539,302 confirmed cases including 3,116,444 deaths globally as of 28 April 2021 **[**1**]**. The United Arab Emirates (UAE) reported its first confirmed cases of COVID-19 in a four-member Chinese family on 29th January 2020, being the first country in the Middle East to report the case **[**2**]**. Until 28 April 2021, there have been 512,497 confirmed cases of COVID-19 with 1,573 deaths in the UAE **[**1**]**.

This novel coronavirus is associated with the respiratory syndrome with a variable degree of severity ranging from a paucisymptomatic respiratory illness that ascends into severe pneumonia and acute respiratory distress syndrome (ARDS) with a conceivable relationship of multi-organ failure (MOF) and even death **[**3**]**. The morbidity and mortality of SARS-CoV-2 are more prevalent in older subjects who present different comorbidities **[**4**]**. Identifying at-risk populations is important not only for curbing the infection's spread and protecting the more vulnerable groups but also for making projections of the probable health burden in countries **[**5**]**. Meanwhile, asymptomatic carriers are a major infectious source due to the paucity of their symptoms.

The diagnosis of COVID-19 is conducted initially by history and clinical characteristics of the presenting patient; using chest imaging (generally chest tomography) to rule out viral pneumonia and secondary bacterial complication, analyzing the specimens from the respiratory tract with cell culture, sequencing analysis, and serological tests (anti-SARS-CoV IgG and IgM ELISA kits) **[**6-8**]**. Asymptomatic infections are detected through viral nucleic acid identified by reverse transcriptase-polymerase chain reaction (RT-PCR) in patients not displaying typical manifestations. RT-PCR is currently employed as the gold standard tool for detecting SARS-COV-2 infection, however, it may still develop a false negative initial RT-PCR, which increases the risk of community transmission and delay in treatment. Due to this fact, the results should be interpreted carefully in conjunction with the clinical picture. Viral shedding is one of the most important indicators of cure. A previous study suggested that viral shedding of confirmed COVID-19 cases peaked on or before symptom onset **[**9**]**. While another confirmed its extent beyond the resolution of symptoms **[**10**]**. However, data on the initiation and progression of viral shedding in relation to symptom onset and infectiousness are limited.

Keeping in line with The World Health Authority's (WHO) mandate of escalating the testing, contact tracing, and isolating the positive patients declared on 11th March 2020; the United Arab Emirates launched a mass public screening program across different emirates within the country by setting up the designated drive-through testing sites and walk-in screening centers that use the RT-PCR (real-time-polymerase chain reaction) testing methods for detection of the SARS-COV-2 strain [11,12]. By April 28th, 2021, a total of 43,461,963 total tests and 4,351,307 tests per million population conducted, UAE ranks the 1st among the Gulf countries, and 4th highest in the world per million population tested for SARS-COV-2 [13].

To the best of our knowledge, this will be the first study on the cohort of asymptomatic high-risk populations being screened for SARS-COV-2 infection in the United Arab Emirates and the Middle Eastern Region.

Materials and Methods

Study Design and Participants:

This retrospective, cross-sectional study was conducted in two specialized Dubai Health Authority's COVID-19 Screening Centers in Dubai, UAE: Shabab Al Ahli Football Club and Al Nasr Sports Club, from 06th April 2020 till the study's cutoff date of 25th June 2020. These centers are strategically located within the Emirate and accessible by public transport (metro, bus, and taxi) and private transport (drive-thru) to cater to all the socio-economic strata of the community. All individuals attending these screening centers during the study period with a minimum of one risk factor were included in the study. Infants under the age of 6 months and individuals with a previous positive SARS-COV-2 RT-PCR conducted from a non-DHA facility and attending the center only for re-testing purposes were excluded from the final sample size.

Ethical considerations:

The study was approved by the Ethical Review Board of Dubai Scientific Research Ethics Committee with reference number DSREC-07/2020_14. Due to the retrospective nature of the study, informed consent from the participating individuals was not required by the ethical review board. This research received no specific grant from any funding agency in the public, commercial, or nonprofit sectors.

Data Collection:

A total of 2918 individuals were included in the study after fulfilling the inclusion and exclusion criteria. The data were extracted from the Dubai Health Authority's electronic medical records system, Salama. Information related to age, sex, and ethnic origin was grouped into socio-demographic variables. Information related to the underlying risk factors was collected from the physician's notes recorded during the assessment prior to screening and, where needed, completed with the help of the lab investigations and medications charted into the electronic system.

Variables:

- Risk Factors: Based on the literature and the national COVID guidelines, the following risk factors were identified for contracting SARS-COV-2 infection or developing severe COVID-19 disease.
    - Age: individuals above the age of 50 years were classified into two age groups, between 50-60 years and above 60 years to give a better understanding of the age as a determinant of increased infection susceptibility.
    - Pregnancy: pregnant women were also divided into two categories based on gestation as late preterm (> 36 weeks) and preterm (<36 weeks).
    - People of determination with a valid card stating the category of their physical limitation.
    - Underlying co-morbid conditions: A wide range of co-morbidities were included as follows:

      - Diabetes Mellitus: It was classified into two groups as controlled and uncontrolled based upon the severity of the disease with participants placed in the uncontrolled group if they had an HbA1C result of >7% within the last 3 months, or in the absence of the HbA1C results, if they are on combined therapy with either 2 or more oral drugs or a single oral drug combined with SC Insulin.

      - Cardio-vascular conditions: This group included Hypertension (with patients on current anti-hypertensive treatment), Hyperlipidemia (with ongoing drug treatment), Ischemic Heart Disease (with a history of Acute Coronary Syndrome and Primary Coronary Intervention and is currently on blood thinners), Structural Heart Disease and Arrhythmia.

      - Pre-existing Pulmonary Conditions: This category included individuals with moderate-severe asthma (on regular combined controller therapy), Chronic Obstructive Pulmonary Disease (COPD) and Bronchiectasis.

      - Chronic Neurological Diseases: Individuals with Epilepsy under current treatment with anti-epileptics, survivors of cerebrovascular accidents, and other chronic neurological disorders.

      - Immune-suppression: This group included patients with underlying malignancy on treatment; drug-induced immune suppression, autoimmune conditions, and recipients of organ transplant on immune suppression.

      - Other Chronic Systemic Diseases: This group included individuals with chronic kidney disease with or without dialysis, chronic liver disease, inflammatory bowel disease, disorders involving the endocrine glands, hematological disorders such as beta-thalassemia major on regular blood transfusions.

- SARS-COV-2 PCR results: Individuals with the first positive result of the SARS-COV-2 PCR test were grouped into the “positive” category. Furthermore, individuals with an initial negative PCR test result who subsequently tested positive were also included in the “positive” group but sub-stratified as ‘subsequent positive <14d” and “subsequent positive >14d” based on the number of days taken to test positive after the initial negative swab. Development of any new symptoms during this period was also recorded.

Outcomes

The outcomes of the positive patients were assessed in terms of their disposition after being tested positive; self-quarantine either at home or designated public isolation facility, short (<1 week) or prolonged (>1 week) duration of hospitalization (if required), abnormal laboratory investigations and chest radiology findings for patients assessed in the clinic or requiring hospitalization, and treatment taken (supportive only or specific anti-COVID treatment).

Recovery for positive patients was stratified into time-based and test-based strategies as per the National Guidelines. Individuals who did not undergo any follow-up PCR testing after being tested positive were considered recovered if they remained asymptomatic for 3 consecutive days after completion of a 14-days isolation period and were placed in a time-based category. Individuals with follow-up PCR tests during and after the 14-days isolation period were considered recovered after getting 2 negative swabs a minimum of 48 hours apart and were placed into the test-based category.

Individuals recovered via test-based strategy were also assessed for viral shedding, categorized as intermittent and persistent. Intermittent shedding was defined as a positive follow-up RT-PCR result after a previous negative result, whereas persistent shedding was defined as persistent positive RT-PCR results without an intermittent negative result.

Statistical Analysis

Reports were collected, then coded and revised, and analyzed using Microsoft Excel 2017. Ours was a descriptive study and data obtained was mainly categorical. All statistical analyses were done using two-tailed tests with an alpha error of 0.05. A P-value less than 0.05 was considered to be statistically significant. Frequencies and percentages were used to describe the categorical variables. Differences in categorical variables were analyzed with the Pearson chi-square test, or with Fisher’s exact test when conditions were not fulfilled.

Results

A total of 2917 individuals with a minimum of one risk factor with complete information available about the risk factors and outcomes of interest were included in the study. The majority were male (N=1961, 67.2%) and belonged to the Asian continent (N=1503, 51.5%). Most of the cohort were above 50 years of age (N= 2104, 72.1%). There was an almost near equal distribution of individuals with single and multiple risk factors. (N= 1555, 53.3% vs N=1362, 43.7%). For the distribution of the risk factors among the study population, Diabetes and Hypertension were the leading co-morbidities, followed by cardiovascular diseases. Respiratory symptoms (N=137, 50.1%) were the most common presenting complaints among the symptomatic individuals, followed by Fever (either alone or combined with other symptoms) (N=115, 42.1%) and other atypical symptoms (N=21, 7.8%) (Table 1). Fever was more observed in patients with positive test results (63% vs 35%) (shown in Fig. 1).

Table 1. Participants' general characteristics and risk factors

	N	%
Gender		
Female	956	32.8%
Male	1961	67.2%
Age Classification		
Age >60	759	26.0%
Age 50-60y	1345	46.1%
Age <50y	813	27.9%
Ethnicity		
Arab	976	33.5%
Asian	1503	51.5%
Caucasian	337	11.6%
African	101	3.5%
Risk Factors		
POD (People of Determination)	38	1.3%
Pregnancy	138	14.4%
Chronic Disease		
DM	846	30.4%
HTN	861	30.9%
CVS	484	17.4%
Others	592	21.3%
Single VS Multiple		
Single Risk Factor Only	1555	53.3%
Multiple Risk Factors	1362	46.7%
History of Contact	301	10.3%
Asymptomatic	2644	90.6%
Symptomatic	273	9.4%
Fever	115	42.1%
Respiratory symptoms	137	50.1%
Others	21	7.8%

Others: Preexisting Lung conditions, Endocrine, Renal, Chronic GIT, Immune suppression, Oncology, Thalassemia, CNS

Fig. 1. Presence of fever according to test results

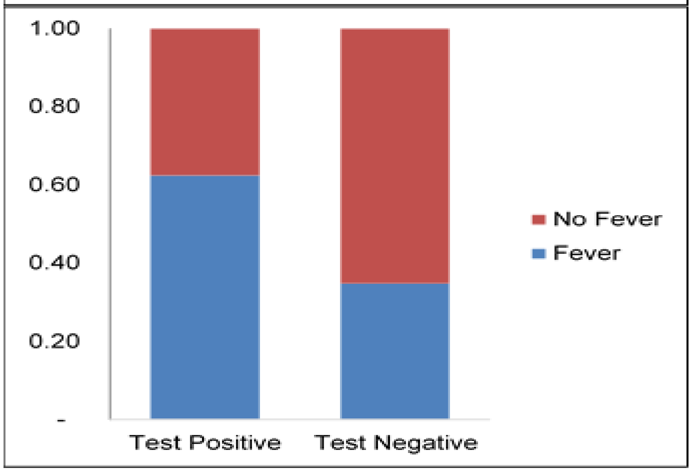


Table 2. The comparison of recovery time of SARS-COV-2 tested positive patients and their demographic variables, risk factors, and co-morbidities.

	Total Positive Patients (N)	%	Expected Recovery+ Time Based Recovery (N)	%	Prolonged Recovery+ Persistent Viral shedding (N)	%	*P value**	Odds Ratio
Total Positives	260	8.9%	193	74.2%	67	25.8%		
Gender								
Male	183	70.4%	129	70.5%	54	29.5%	0.033	2.06 (1.05-
Female	77	29.6%	64	83.1%	13	16.9%		4.04)
Age Classification								
>60y	55	21.2%	41	74.5%	14	25.5%	0.258	0.65 (0.34-
50-60y	105	40.4%	83	79.0%	22	21.0%		1.13)
<50y	100	38.5%	69	69.0%	31	31.0%		
Pregnancy	12	15.6%						
<36w	11	91.7%	9	81.8%	2	18.2%	0.64	
>36w	1	8.3%	1	100.0%	0	0.0%		
POD	6	2.3%	5	83.3%	0	0.0%		
Diabetes Mellitus	98	37.7%						
Uncontrolled Diabetes	31	31.6%	19	61.3%	12	38.7%	0.305	
Controlled Diabetes	67	68.4%	48	71.6%	19	28.4%		
Single Risk Factor	128	49.2%	105	82.0%	23	18.0%	0.005	2.28 (1.28-4.06)
Multiple Risk Factors	132	50.8%	88	66.7%	44	33.3%		
Clinical Features								
Asymptomatic	188	72.3%	134	71.3%	54	28.7%	0.078	1.823(0.93-
Symptomatic	72	27.7%	59	81.9%	13	18.1%		3.59)

Pearson chi-square test was used

Table 3. The comparison of hospitalizations of SARS-COV-2 tested positive patients and their demographic variables, risk factors, and co-morbidities.

	Isolation+ supportive Rx (N)	%	Hospitalization + specific anti-CVID Rx (N)	%	*P value**	Odds Ratio
Total Positives	244	93.8%	16	6.2%		
Gender						
Male	171	70.1%	12	75.0%	0.676	0.781 (0.245-2.487)
Female	73	29.9%	4	25.0%		
Age Classification						
>60y	44	18.0%	11	68.8%	<0.001	10.00 (3.326-30.064)
50-60y	102	41.8%	3	18.8%		
<50y	98	40.2%	2	12.5%		
Pregnancy						
<36w	10	90.9%	1	9.1%	0.753	
>36w	1	100.0%	0	0.0%		
POD	5	2.0%	1	6.3%		
Diabetes Mellitus						
Uncontrolled Diabetes	27	87.1%	4	12.9%	0.057	
Controlled Diabetes	65	97.0%	2	3.0%		
Single Risk Factor	125	51.2%	3	18.8%	0.008	4.880 (1.364-17.457)
Multiple Risk Factors	111	45.5%	13	81.3%		
Clinical Features						
Asymptomatic	183	75.0%	5	31.3%	<0.0001	6.600 (2.218-19.641)
Symptomatic	61	25.0%	11	68.8%		

*Pearson chi-square test was used

Tables 2 and 3 summarize the comparison of the outcomes of SARS-COV-2 tested positive patients and their demographic variables, risk factors, and co-morbidities. A total of 260 screened high-risk individuals (M= 183, 70.4%, F= 77, 29.6%) tested positive for SARS-COV-2 infection during the study period, whom 188 (72.3%) of them were asymptomatic up to 3 days before the screening and had an almost equal distribution of single (N=128, 49.2%) and multiple (N=132, 50.8%) risk factors. A total of 193 (74.2%) recovered within 14-21 days, 16 (6.2%) required hospitalization for specific COVID-19 treatment, including a single deceased case. Males and individuals with multiple risk factors were twice as likely to have prolonged recovery and persistent viral shedding (OR for gender= 2.061, CI= 1.052-4.026, OR for risk factor= 2.283, CI= 1.284-4.058). This difference was more significant in risk-factor comparison than gender (p-value for gender=0.03, p-value for risk-factors= 0.005). The odds of asymptomatic individuals for prolonged recovery were slightly higher than the symptomatic individuals (OR= 1.829, CI=0.931-3.592). Individuals above the age of 60 had significantly greater odds of being hospitalized (OR= 10, CI= 3.32-30.06, p-value= 0.000) as were symptomatic (OR= 6.60, CI= 2.218-

19.641, p-value= 0.000) and those with multiple risk factors (OR= 4.880, CI= 1.364-17.457, p-value= 0.008). There were no significant differences noted between different ethnicities, co-morbidities, pregnancy, and people of determination. As for risk factors, Figures 2 and 3 showed that a single risk factor was more associated with favorable outcomes whereas multiple risk factors were associated with non-favorable outcomes. In addition, asymptomatic patients had more prolonged recovery than expected (29% vs 18%), as compared to symptomatic patients however this difference was not statistically significant (p-value = 0.078) (Fig. 4, 5).

Fig. 2. Single risk factor with favorable outcome

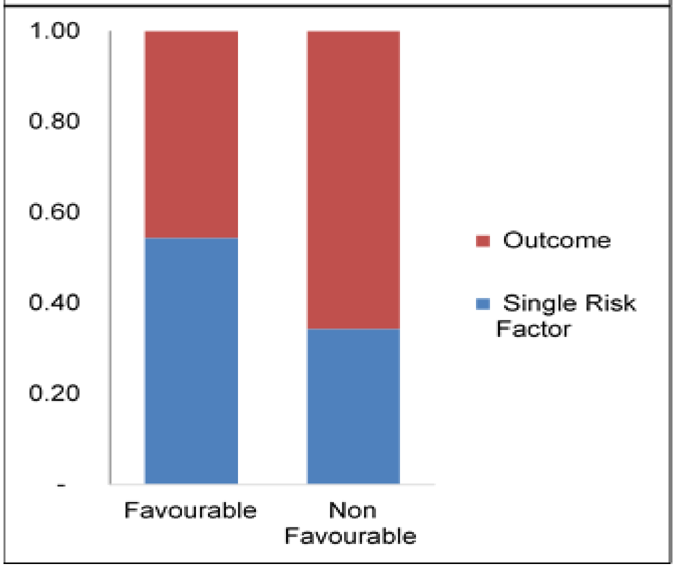


Fig. 3. Multiple risk factor with favorable outcome

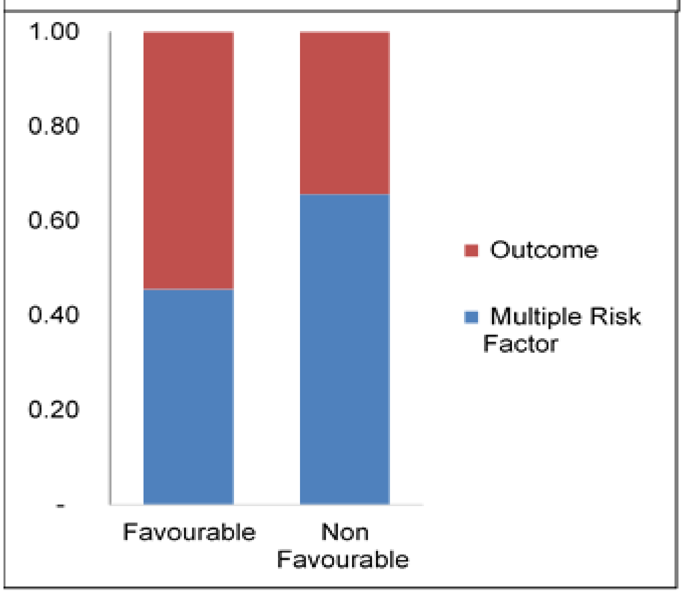


Fig. 4. Asymptomatic with Prolonged Recovery

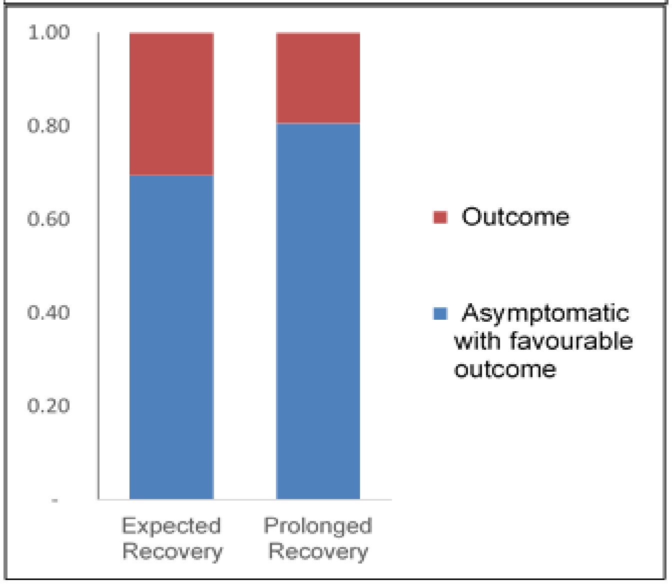
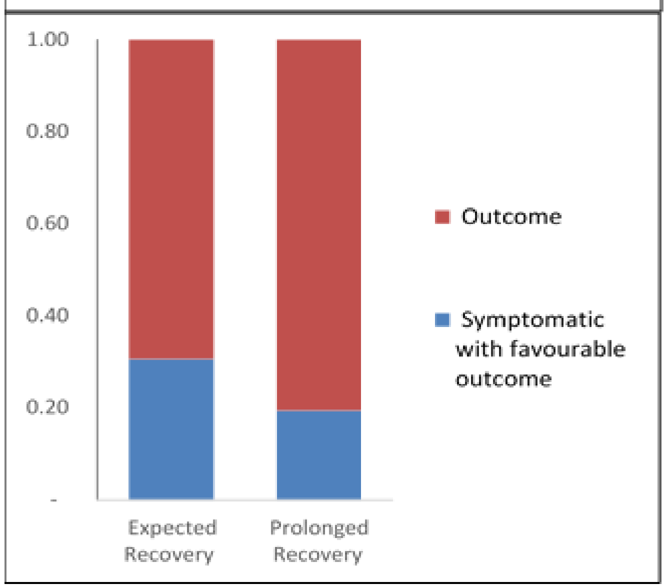


Fig. 5. Symptomatic with Expected Recovery



Discussion

The presented findings evaluated screened COVID-19 suspected cases according to their symptomatic state and assessed the association between clinical outcome and demographic variables, risk factors, and co-morbidities of RT-PCR-confirmed COVID-19 cases.

The crude finding of this study is that 72.3% were tested positive for SARS-CoV-2 in the absence of symptoms. This finding clearly suggests that focusing solely on the testing of only cases fitting a strict clinical case definition for COVID-19 will inevitably miss the asymptomatic and paucisymptomatic disease. This is of particular importance in the presence of falling numbers of community COVID-19 cases, as these individuals will become potential infection resources. The rate of asymptomatic COVID-19 patients was much higher than previous findings reporting asymptomatic proportion in UAE (43.5%) [12], and in other countries such as United Kingdom (60%) [14], Republic of Korea (29.4%) [15], and Japan (18.0%) [16]. This elevated percentage in our study may be due to the expanded active tracing and screening protocols and policies imposed by health authorities. Relative to the total population, UAE is ranked as the 4th highest in the world per million population performing COVID-19 screening tests [13].

In addition, our results showed a positive association between being asymptomatic and prolonged recovery and persistent viral shedding when compared to symptomatic patients (28.7% versus 18.1%) although this difference was not statistically significant. However, our findings contrast with a recent study where symptomatic patients had a prolonged duration of viral shedding compared to asymptomatic ones. (p-value=0.0026) [12]. This difference could possibly be attributed to the high number of asymptomatic individuals in our study, as the screening programs were rolled out aiming to detect silent infections. Therefore, early identification and isolation of infectious patients will prevent community transmission, and control measures may reduce the risk of hospitalization and avoid the progression of the disease.

There was a strong significant association between older age and requiring hospitalization (OR=10.00, 95% CI=3.326-30.064) and these findings are consistent with a previous study with a possible explanation that younger individuals are more likely to be healthier [17]. All ages are susceptible; however, presenting multiple risk factors such as elderly with underlying medical conditions place these cases as the high risk associated with worst outcomes which are also depicted in our study. Individuals with underlying respiratory illness are also at great risk and were identified as the predominant risk factors for the contraction of progressive disease [18]. Clinical severity of COVID-19 is the highest among elderly (adults aged ≥65 years) and adults with comorbidities in comparison with younger age cases, and require oxygen therapy and mechanical ventilator [19,20].

DM and hypertension were the two most frequent chronic comorbidities in our study. This finding is in line with previous investigations reporting DM and hypertension as the most distinctive comorbidities in COVID-19 cases [21-24]. Individuals suffering from chronic comorbidities are most probably older and suffer from immune system impairments which in turn increases the virulence of infectious diseases.

As a result, it is suggested that it is important to establish a reactive asymptomatic screening program that responds in real-time to the incidence of positive tests by area. Early recognition of infected patients and cutting off the route of transmission are the main factors to control COVID-19. For example, a previous study demonstrated the utility of a comprehensive staff screening program with minimal or no symptoms at a large UK teaching hospital where 31(3%) of health care workers tested positive for SARS-CoV-2 in the absence of symptoms [25].

To our knowledge, this is the first study evaluating asymptomatic high-risk populations being screened for SARS-COV-2 infection in the United Arab Emirates and the Middle Eastern Region and performed at two of the major screening centers under the Dubai Health Authority assuring the heterogeneity of the participants. However, the study also presents some limitations. First, the retrospective design limits the temporality of the associations proved in the results. Second, the data was self-reported causing information bias and recall bias. Finally, all the confirmed COVID-19 cases relied on only PCR testing without taking into consideration false negative or false positive testing to COVID-19 that may have under or overestimated the cases.

Conclusion

A substantial proportion of suspected and confirmed COVID-19 cases in the UAE identified between 06th April 2020 and 25th June 2020 were asymptomatic. Having more than a single risk factor such as older age and suffering from chronic comorbidity is positively associated with non-favorable outcomes. The estimated proportion of asymptomatic cases is a vital parameter for future studies. This study suggests that the roll-out of screening programs to include both asymptomatic and symptomatic cases should be on a priority basis for active surveillance and detection of a larger number of asymptomatic yet potentially infective individuals for ensuring control of the disease spread especially in times where mass COVID-19 vaccination programs are underway. Further follow-up cohort studies are necessary to provide more insight into viral clearance and clinical outcomes in COVID-19 symptomatic and asymptomatic cases.

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Disclosures:

• Funding: The authors did not receive support from any organization for the submitted work.

• Conflicts of Interest: The authors have no conflicts of interest to declare that are relevant to the content of this article.

• Ethics Approval: This study was reviewed and approved by the Dubai Scientific Research Ethics Committee; reference number DSREC-07/2020_14. Due to the retrospective nature of the study, informed consent was not mandated by the approving ethical committee.

• Availability of data and material: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request subjective to approval by the Dubai Scientific Research Ethics Committee.

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