Original Article

Predictors of COVID-19 positivity among patients presenting to screening clinic in a dedicated COVID-19 hospital, in chandigarh, India - A cross-sectional study

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Abstract

Background: The aim of this study was to analyze the clinical features of patients attending the screening clinic of a dedicated COVID-19 hospital (DCH), including COVID-19 RT-PCR test positivity rate, symptom predictors for COVID-19 positivity, the proportion of recovery, and the mortality among COVID-19 positive cases. **Methods:** We conducted a cross-sectional study of the patients who reported in the screening clinic of a DCH. Data were retrieved from medical records. Step-wise binary logistic regression was applied to determine the symptom predictors for determining the likelihood of the suspects turning out to be COVID-19 positive. **Results:** A total of 573 patients reported to the screening clinic were enrolled, and their median age was 36 ± 14 years. Of the total patients, 237 (41%) were females and 112 (20%) patients were COVID-19 suspects. Fifty (45%) suspects tested COVID-19 positive. The majority of the positives had complaints of cough, fever, and sore throat. Running nose (OR = 7.951) and history of contact with a COVID-19-positive case (OR = 169.9) were found to be statistically significant symptom predictors for COVID-19 positivity. All patients recovered with nil case fatality. **Conclusion:** Running nose and history of contact with COVID-positive patients were significant predictors for COVID-19 positivity. In this pandemic state, patients who present with any of the upper respiratory infection (URI) symptoms such as cough, sore throat, running nose, headache, and loss of taste/smell should be tested for COVID-19 for early identification and isolation to break the chain of transmission. The public should be encouraged to undergo COVID-19 testing if they develop any of the URI symptoms.

Keywords: Case positivity rate, COVID-19, predictors, severe acute respiratory syndrome coronavirus 2, symptoms

Introduction

Coronavirus disease (COVID 19) is an infectious disease caused by a newly discovered severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first reported in December 2019 in Wuhan, Hubei, China. The earliest case presented as pneumonia of unknown cause and was reported to the WHO country office in China on December 31, 2019.[1] The outbreak was declared as a public health emergency of international concern on January 30, 2020.[2] COVID 19 infection was declared a pandemic on March 11, 2020.[3] In India, the first case of COVID-19 was reported on January 30, 2019 in Kerala.[4] The infection was characterized by fever, cough, sore throat, breathlessness along with chest pain, diarrhea, vomiting, body aches, etc.[5] Mild COVID-19 infection can progress to severe forms such as acute respiratory distress syndrome (ARDS) and

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Received: 01-08-2021 **Revised:** 09-12-2021
Accepted: 21-12-2021 **Published:** 31-01-2022

Access this article online

Quick Response Code:

Website: www.jfmpc.com

DOI: 10.4103/jfmpc.jfmpc_1544_21

How to cite this article: Persis J, Kiran T, Goel K, Rana K, Mohindra R, Padhi BK. Predictors of COVID- 19 positivity among patients presenting to Screening clinic in a dedicated COVID- 19 hospital, in Chandigarh, India - A cross-sectional study. J Family Med Prim Care 2022;11:305-11.

respiratory failure. Even asymptomatic people can be COVID-19 positive and that should not be ignored.[6]

As people are presenting with varied symptoms at presentation, understanding the pattern of presenting symptoms based on demographic characteristics such as age group, gender, education, and occupation becomes important for the primary care providers and family physicians in deciding the early management of the patients. It is also important to quarantine/isolate symptomatic and COVID-19-positive patients earlier to break the chain of transmission. Screening for symptoms and contact tracing are the two important strategies to interrupt the chain of transmission of COVID 19.[7] Initially, the Government of India made screening mandatory for all international travelers, which was later on extended to the travelers of high-burden states and districts. Also, contact tracing was done to find out the immediate contacts of COVID-19-positive patients.

By the end of February 2020, screening of patients was started with the history of international travel and for people suffering from flu-like symptoms in a medical teaching institute of Chandigarh, India. The medical teaching institute was declared as a dedicated COVID-19 hospital (DCH) on April 2, 2020 for the Union Territory of Chandigarh and as a referral center for patients with Severe Acute Respiratory Infections (SARI) from neighboring states of Punjab, Haryana, Himachal Pradesh, Uttarakhand, and Uttar Pradesh.[8]

The current study on predictors of COVID-19 positivity in a screening clinic of Chandigarh, India was planned with the following objectives:

1. To ascertain the demographic and clinical features of patients attending the screening clinic of a designated COVID-19 hospital
2. To determine the proportion of COVID-19 suspects among the attendees
3. To determine the COVID-19 positivity rate among the suspects identified from the screening clinic and the proportion of recovery and the mortality among COVID-19-positive cases
4. To evaluate the probability for each symptom as predictors in determining the suspects turning out to be COVID-19 positive.

Methods

A cross-sectional study was planned in the screening clinic of a dedicated COVID-19 hospital in Chandigarh from March 13, 2020 to June 30, 2020. The study was reviewed and approved by the Institutional Ethics Committee (IEC) in Chandigarh.

The institute set up two screening outpatient departments for screening suspected patients. One screening clinic was set outside the main entrance of the new outpatient department (OPD) block of the medical teaching institute. A separate pathway for entering the screening clinic was made with barricades. All patients underwent thermal monitoring by the security personnel before entering the OPD. Patients who had a temperature of more than 38°C and/or patients who had complaints of flu-like illness and/or patients with a history of international travel were directed to the screening clinic via a separate pathway. The screening clinic of the OPD block was functional during all working days from 8 AM to 2 PM. The screening clinic of the OPD block was manned by two junior residents and a consultant on call from the Department of Internal Medicine and two hospital attendants. All were given personal protective equipment (PPE), which included an N95 mask, surgical gloves, and a face shield, and maintained a distance of at least 2 **m** from the patient. The second screening clinic was set up in the emergency area of the medical institute and was functional 24 × 7. The emergency area screening clinic was also maintained by a junior resident in shifts (8-h shifts). The area was supervised by the faculty-in-charge of emergency.

We reviewed OPD medical records of the participants and information regarding date of assessment and demographic details such as age, gender, place of residence, and presenting symptoms such as fever, cough, running nose, sore throat, shortness of breath, diarrhea, vomiting, and temperature, and oxygen saturation; moreover, history of travel and history of confirmed case contact were noted. We categorized each participant as a COVID-19 suspect/not a COVID-19 suspect as per the Indian Council of Medical Research (ICMR) guidelines.[9]

All patients suspected to have COVID-19 were referred to the communicable disease (CD) ward at Nehru Block of the medical institute by dedicated ambulance for COVID-19 testing by reverse transcriptase-polymerase chain reaction (RT-PCR) method. The screened negative patients were given symptomatic treatment in the screening OPD, health education related to COVID-19 at the screening clinic, and sent back. The COVID-19 RT-PCR reports were collected from the medical records. The outcome of all patients in terms of recovery or death were collected from the hospital medical records.

Statistical analysis

Data were entered in Microsoft excel 2016, and data analysis was done using IBM SPSS software version 24. Mean and standard deviation were the descriptive statistical measures to express the continuous variables. Categorical variables were presented as frequency and percentage. Chi-square test was applied to test the statistical significance between categorical variables. The probability of each symptom as a predictor in determining the suspects turning out to be COVID-19 positive was evaluated by step-wise binary logistic regression with a P value of <0.05 considered as statistically significant. The purpose of using the backward stepwise binary logistic regression in the current study was to start with the full model that includes all the relevant symptom predictors and to gradually move toward a final reduced model after eliminating the least significant symptom variables in the model at each successive step. The Nagelkerke

pseudo R^2 value was also used to analyze the goodness of fit of the model.

Results

During the reference period, 573 patients attended the OPD screening clinic, including 336 (59%) males and 237 (41%) females. The mean age was 36 ± 14 years. The majority of the patients belonged to the 16–30-years age group (42%), followed by 31–45 years (35%). Around 92% of the patients were from urban areas. Most patients (72%) reported to the screening clinic on their own, while the remaining (28%) were either referred from various departments of the institute or from other hospitals. The reason for referral to screening clinic was flu-like symptoms (16.7%), patients from containment zones (38.5%), or preoperative reasons (44.9%). Most of the patients attending the screening clinic were general public (67.5%), followed by health care workers (32.5%).

Age, gender, reasons for referral, category of patients, contact with a COVID-19-positive case, and history of travel were found to be significantly associated with the COVID-19 suspects [Table 1]. Among the 573 patients who attended the screening clinic, 112 (20%) patients were found as COVID-19 suspects as per the ICMR guidelines [Figure 1].

Among the suspects (112), 76.8% of the patients were from the general public and the remaining 23.2% of patients were health care workers. Around 36.6% of patients had a history of contact with a positive case. Around 90.3% of patients had no history of travel. The majority of the patients presented with complaints of cough (61.6%), fever (42.9%), sore throat (24.1%), running nose (8%), headache (3.6%), breathing difficulty (3.6%), diarrhea (1.8%), and vomiting (0.9%); 12 (10.7%) patients were asymptomatic.

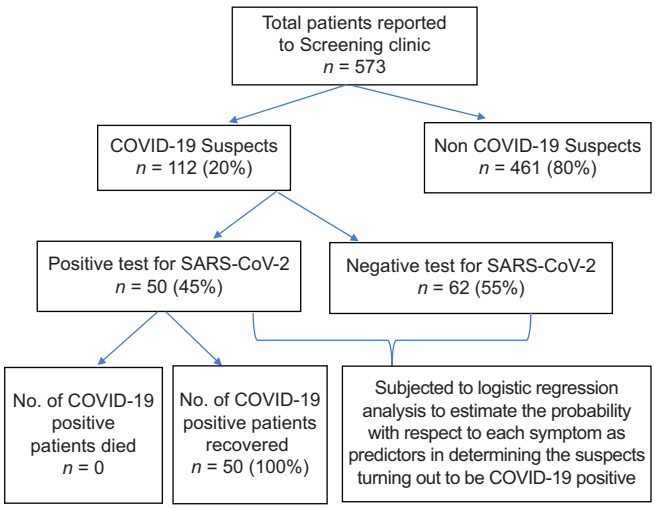

Figure 1: Flowchart demonstrating the proportion of COVID-19 suspects and COVID-19-positive cases among the patients who reported to the screening clinic in the dedicated COVID-19 hospital in Chandigarh, 2020

Among the 112 patients suspected to have COVID-19, 50 (45%) patients were found to be positive for COVID-19. Among patients who tested positive for COVID-19, the majority of the patients (72%) had exposure with a confirmed positive case.

COVID-19-positive patients presented with complaints of cough (72%), fever (30%), sore throat (14%), running nose (10%), headache (6%), and breathing difficulty with SpO_2 <95% (4%). Very few patients (8%) were asymptomatic. All the COVID-19-positive patients recovered. The case recovery rate was 100% with a nil case fatality rate.

A significant association was found with cough, history of fever, sore throat, temperature >38°C, and history of contact with a COVID-19 positive case among the two groups of COVID-19 suspects and COVID-19 positive patients [Table 2].

The results of stepwise backward binary logistic regression predicted significant odds of the suspects turning out to be COVID-19-positive among the patients who presented with complaints of running nose (OR = 7.951) and history of contact with a COVID-19-positive case (OR = 169.9) at each of the four steps of the logistic regression model results, thereby confirming that patients with running nose and COVID-19 contact history are the most significant predictors resulting in an increased probability of a patient turning out to be COVID positive. The value of Nagelkerke pseudo R^2 value ranged between 0.616 and 0.611 from step 1 to step 4, which further indicates that the logistic regression model explains approximately 60% of the results and has a reasonable predictive accuracy [Table 3].

Discussion

The current study described the demographic and clinical characteristics of patients attending the COVID-19 screening clinic, the proportion of COVID-19 suspects, rate of COVID-19 positivity, and probability of each symptom as a predictor in determining the suspect turning out to be positive. These will be pertinent to the practice of primary care physicians who deal with patients at the first point of care.

Among all, 20% of the patients attending the screening clinic were COVID-19 suspects. Cough, fever, temperature >38°C, and sore throat were the significant symptoms complained by the participants. We also found that 45% of COVID 19 suspects tested positive for COVID-19. The binary logistic regression found that patients who reported symptoms of running nose and history of contact with COVID-positive patients had a higher probability of turning to be COVID-19 Positive.

The majority of the attendees were between in the age group of 16–30 years (42%) and 31–45 years (35%). Our finding of age groups is consistent with the findings reported by Sahu *et al.*[10] in Odisha, India and Maechler *et al.*,[11] in Germany. Due to state-wise curfews and later on nation-wide lockdowns, schools, colleges and workplaces were shut down and hence the people of

Table 1: Socio-demographic characteristics of COVID-19 suspects and non-COVID-19 suspects reported to the screening clinic of the dedicated COVID-19 hospital in Chandigarh, 2020 (*n*=573)

Variables	Total (%) (*n*=573)	Suspect (%) (*n*=112)	Not a Suspect (%) (*n*=461)	*P*
Sex				
Male	336 (59)	54 (48.2)	282 (61.2)	0.013*
Female	237 (41)	58 (51.8)	179 (38.8)	
AGE				
1-15	13 (2.3)	9 (8)	4 (0.9)	<0.001*
16-30	242 (42)	47 (42)	195 (42.3)	
31-45	199 (35)	32 (28.6)	167 (36.2)	
46-60	82 (14)	15 (13.4)	67 (14.5)	
>60	37 (7)	9 (8)	28 (6.1)	
Residence				
Urban	528 (92)	108 (96.4)	420 (91.1)	0.060
Rural	45 (8)	4 (3.6)	41 (8.9)	
Referral state				
Self-reported	417 (72.8)	87 (77.7)	330 (71.6)	0.232
Referred by doctors in PGI/Pvt doctors	156 (27.2)	25 (22.3)	131 (28.4)	
Reasons for referral for Screening				
ILI symptoms	26 (16.7)	6 (16.7)	20 (16.7)	<0.001*
Containment Zone	60 (38.5)	29 (80.6)	31 (25.8)	
Before undergoing interventional procedures	70 (44.9)	1 (2.8)	69 (57.5)	
Category of patients				
Health care workers	186 (32.5)	26 (23.2)	160 (34.7)	0.020*
Others (General patients)	387 (67.5)	86 (76.8)	301 (65.3)	
Contact with COVID -19 positive case				
Yes	43 (7.5)	41 (36.6)	2 (0.4)	<0.001*
No	530 (92.5)	71 (63.4)	459 (99.6)	
Travel				
Domestic Travel	73 (12.7)	1 (0.9)	72 (15.6)	<0.001*
International Travel	37 (6.5)	6 (5.4)	31 (6.7)	
No travel	463 (80.8)	105 (93.8)	358 (77.7)	

*P<0.05 - Significant

those active age group of 16-45 years had shown more attendance in the hospital as compared to other groups. Moreover, routine OPDs were suspended during the COVID-19 pandemic due to which the elderly population, which usually suffers from chronic diseases, did not visit the hospital.

The majority of the participants (92%) belonged to urban areas. The geographic location of the dedicated COVID-19 hospital makes it more accessible to urban people. Most of the people during the initial period of the COVID-19 pandemic from rural areas were not able to reach a dedicated COVID-19 hospital due to interstate curfews/lockdowns.[12] Urban areas have a high-density population as compared to rural areas, which leads to overcrowding, making people more susceptible to contracting the COVID-19 infection.

Our study found that cough, fever, and sore throat were the significant symptoms associated with COVID-19-positive patients. The symptoms reported in our study were similar to those described by WHO for the COVID-19 infection.[5] This finding of our study is consistent with the findings of studies by Sahu *et al.*[10] and Gupta *et al.*[13] in India, Mizrahi *et al.*[14] in Israel, and Liang Li *et al.*[15] in China.

Our study found running nose as a significant predictor for COVID-19 infection, which is inconsistent with the findings of the studies conducted by La Torre *et al.*,[16] Roland *et al.*,[17] Haehner *et al.*,[18] and Trubner F *et al.*,[19] where anosmia and ageusia were the predictors of positivity. Our study results were inconsistent with the study done by Lan *et al.*,[20] where fever and myalgia were significant predictors of COVID-19 positivity. A review of the literature by El-Anwar *et al.*[21] found that running nose was reported very less among COVID-19-positive patients. The symptom *per se* is not grievous and may not urge the patient to report to a health facility; this leads to less testing and less reporting of COVID-19. This in turn can lead to the iceberg phenomenon for the disease.

Our study also found that patients reported with a history of contact with the COVID-19-positive patients had more predicted probabilities of testing positive for COVID-19, which is consistent with the study conducted by Zoabi *et al.*[22] As many asymptomatic cases were found to be COVID-19 positive and in the absence of symptoms, it cannot be determined whether their contacts were COVID-19 carriers. [6] Asymptomatic carriers are the people of great concern as they can act as super spreaders and transmit the infection to a large number of people.

Table 2: Symptom profile of COVID-19 suspects reported to the screening clinic of the dedicated COVID-19 hospital in Chandigarh, 2020 (*n*=112)

Variables	Suspects (*n*=112)	Negative (%) (*n*=62)	Positive (%) (*n*=50)	*P*
Cough				
Yes	69 (61.6)	33 (53.2)	36 (72)	0.042*
No	43 (38.4)	29 (46.8)	14 (28)	
Fever				
Yes	48 (42.9)	33 (53.2)	15 (30)	0.014*
No	64 (57.1)	29 (46.8)	35 (70)	
Sore throat				
Yes	27 (24.1)	20 (32.3)	7 (14)	0.025*
No	85 (75.9)	42 (67.7)	43 (86)	
Running Nose				
Yes	9 (8)	4 (6.5)	5 (10)	0.492
No	103 (92)	58 (93.5)	45 (90)	
Breathing Difficulty				
Yes	4 (3.6)	2 (3.2)	2 (4)	0.826
No	108 (96.4)	60 (96.8)	48 (96)	
Diarrhoea				
Yes	2 (1.8)	2 (3.2)	0 (0)	0.200
No	110 (98.2)	60 (96.8)	50 (100)	
Vomiting				
Yes	1 (0.9)	1 (1.6)	0 (0)	0.367
No	111 (99.1)	61 (98.4)	50 (100)	
Headache				
Yes	4 (3.6)	1 (1.6)	3 (6)	0.214
No	108 (96.4)	61 (98.4)	47 (94)	
SpO_2 <95%				
Yes	2 (1.8)	0 (0)	2 (4)	0.112
No	110 (98.2)	62 (100)	48 (96)	
Temperature				
>38°C	47 (42)	32 (51.6)	15 (30)	0.021*
≤38°C	65 (58)	30 (48.4)	35 (70)	
Asymptomatic				
Yes	12 (10.7)	8 (12.9)	4 (8)	0.404
No	100 (89.3)	54 (87.1)	46 (92)	
Contact with COVID-19 positive case				
Yes	41 (36.6)	5 (8.1)	36 (72)	<0.001*
No	71 (63.4)	57 (91.9)	14 (28)	

*P<0.05 - Significant

Among the patients, 72% of patients reported on their own to the screening OPD, which shows increased awareness about the symptoms of COVID-19 and increased attitude of approaching health care. In our study, 45% of patients were positive for COVID-19 among the suspects, which was found to be inconsistent (higher) with other studies.[11,23,24] The higher proportion of COVID-19 suspects who tested positive for COVID-19 provide confidence in the ICMR guidelines[9] applied for identifying the epidemiological and clinical features that distinguish COVID-19-positive from COVID-19-negative patients.

The case recovery rate was 100% with no fatality. This finding of our study is not consistent with the findings of studies done by Mohan A *et al.*[25] and De Souza *et al.*[26] Zero fatality in our study may be because we collected data from only the OPD screening center and not from the emergency screening clinic; this might have added reporting bias. Further, the deaths that happened outside the hospital were not recorded.

One of the limitations of the study is that follow-up was not done for the patients who attended the screening clinic and were labeled as non-suspects for COVID-19. Among the two screening clinics functioning in the dedicated COVID-19 hospital, only the data pertaining to the screening clinic of the OPD block were included and not from the emergency screening clinic. As it is a record-based study, only the information available on records was extracted and no further information was available.

Conclusion

Among the patients who presented to the screening clinic and tested positive, the majority of them had complaints of cough, fever with a temperature of >38°C, and sore throat. Patients

Table 3: Estimates of binary logistic regression where each screening variable serves as predictors in determining the suspects turning out to be COVID-19 positive

Step No.	Variable	Coef.	Odds ratio	*P*	Goodness of Fit (Nagelkerke R^2)
Step 1	Cough	−1.172	0.310	0.125	
	Fever with temperature >38°C	1.309	3.701	0.086	0.616
	Sore throat	−0.321	0.726	0.669	
	Running nose	2.073	7.951	0.022*	
	Diarrhoea	−19.186	0	0.999	
	Vomiting	−19.049	0	1.000	
	Headache	2.889	17.973	0.079	
	Contact with COVID-19 positive case	5.135	169.855	<0.001*	
	Constant	−2.154	0.116	0.004	
Step 2	Cough	−1.093	0.335	0.139	
	Fever with temperature>38° C	1.256	3.512	0.092	0.615
	Running nose	2.061	7.851	0.025*	
	Diarrhoea	−19.114	0	0.999	
	Vomittng	−18.951	0	1.000	
	Headache	2.770	15.959	0.079	
	Contact with COVID-19 positive case	5.157	173.642	<0.001*	
	Constant	−2.252	0.105	0.002	
Step 3	Cough	−1.079	0.340	0.144	
	Fever with temperature>38° C	1.293	3.645	0.082	0.613
	Running nose	2.092	8.097	0.023*	
	Diarrhoea	−19.118	0	0.999	
	Headache	2.783	16.172	0.079	
	Contact with COVID-19 positive case	5.190	179.442	<0.001*	
	Constant	−2.299	0.100	0.001	
Step 4a	Cough	−1.153	0.316	0.118	
	Fever with temperature>38C	1.272	3.568	0.088	0.611
	Running nose	2.105	8.204	0.022*	
	Headache	2.856	17.389	0.071	
	Contact with COVID-19 positive case	5.254	191.284	<0.001*	
	Constant	−2.291	0.101	0.001	

*P<0.05 - Significant

who reported with complaints of running nose and a history of contact with COVID-positive patients had significantly more predicted probabilities for turning out to be COVID-19 positive.

Recommendation

This study shows that for controlling the pandemic, contact tracing of confirmed cases and isolation of contacts followed by testing is crucial. Usage of protective measures and safe distancing is essential as there were a high number of asymptomatic carriers. The public should be informed and motivated to report to the health facility for COVID-19 testing irrespective of the severity of URI symptoms such as cough, fever, sore throat, running nose, headache, and loss of taste/smell. All patients with any of the complaints of URI symptoms must be tested for COVID-19 for early identification and isolation to break the chain of transmission.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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