

Pre-triage screening and isolation of patients suspected of COVID-19 in the Emergency Department of St. Paul's Hospital Millennium Medical College

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Abstract

Background: Early identification and isolation of suspected Coronavirus Disease 2019 (COVID-19) patients decrease disease transmission in the emergency department. Using clinical pre-triage criteria, suspected patients were kept in the isolation ward and treated for the identified illness until the confirmatory test for Severe Acute Respiratory Syndrome- Corona Virus 2 (SARS-COV2) arrived. However, the effectiveness of the pre-triage screening was not known.

Objectives: The main goal of this study was to describe the clinical characteristics of isolated COVID-19-suspected patients at the emergency department of St. Paul's Hospital Millennium Medical College.

Methods: A hospital-based cross-sectional study was conducted involving patients who were suspected to have COVID-19 but waiting for the confirmatory result and those who tested positive for COVID-19 after emergency department presentation. Trained general practitioners collected data using a structured questionnaire, and entered it into SPSS version 25 for cleaning and analysis. Descriptive statistics were used to analyze the data. The findings are presented using tables and text descriptions.

Results: A total of 4,350 patients were screened and 202 patients fulfilled COVID-19 suspect criteria and triaged to the isolation ward; among which 130 (64.3%) tested positive for COVID-19. In addition, 40 patients who were not suspected at triage, tested positive for COVID-19 after they were kept in the emergency department. Cough 54 (26.7%) and shortness of breath 31 (15.4%) were the most common presenting symptoms and the number of lymphocytes decreased in 161 cases (79.7%).

Conclusion: One fifth of COVID-19 patients were missed to be isolated during triaging and mixed with other patients. Emergency rooms should be well designed to prevent cross-transmission of disease.

Keywords: Isolation, Suspected, Pre-triage Screening, Effectiveness, COVID-19

Background

The first Coronavirus Disease 2019 (COVID-19) case was discovered in China in December 2019 and expanded to nearly every nation, resulting in extensive travel restrictions and nationwide lockdowns (1). Healthcare workers used COVID-19 case definitions and triage tools to identify and prioritize potentially problematic patients (2).

Ethiopia's Ministry of Health has released guidelines for pre-triaging, diagnosis, treatment, prevention, and management of COVID-19 cases. To locate and isolate any suspected cases, it also advises the creation of isolation wards in medical facilities. Every patient who presents to an emergency unit undergoes pre-triaging before being admitted or sent to an isolation ward following appropriate clinical triage (3).

In a study conducted in emergency departments of Australian hospitals, around 2% of patients who were triaged became positive for COVID-19 after admission to the emergency units (3). Concerning clinical characteristics of COVID-19-suspected patients visiting emergency departments in the USA, 30.7% of cases were febrile and 17.3% had respiratory distress during triage (4). According to a study conducted in Egypt, about 50% of the cases presented with cough and dyspnea (5). In the initial 33 COVID-19 cases in Addis Ababa, Ethiopia, fever, headache, and cough were the most prevalent symptoms. Among the uncommon symptoms were diarrhea, sore throats, and loss of taste or smell sensation. Many of the COVID-19 patients in Ethiopia were adults, the elderly, and people with comorbid conditions such as hypertension and diabetes (6).

Based on the COVID-19 triage guideline of the Ministry of Health, patients who met the triage criteria for suspected cases based on the triage score were first placed in an isolation ward before undergoing a microbial or serological test at St. Paul's Hospital Millennium Medical College. This was done to minimize cross-transmission in the hospital. However, the effectiveness of the triage approach to detect COVID-19 patients and the clinical characteristics of COVID-19 suspected or confirmed patients were not well established. The objective of this study was to describe the clinical characteristics and hospitalization of suspected patients who visited St. Paul's Hospital Millennium Medical College.

Methods and materials

Study Design

A hospital-based cross-sectional study was conducted from April 1 to September 30, 2020, in the emergency department of SPHMMC.

Study setting

This study was carried out in the adult emergency department and isolation ward of St. Paul's Hospital Millennium Medical College (SPHMMC), the 2nd largest Hospital in Ethiopia. The college has 750 beds and an average of 30,000 patients visit the emergency annually. The college had more than 4000 permanent academic and clinical staff. During the COVID-19 pandemic, the hospital was providing healthcare to both COVID-19-confirmed patients with 256 beds, and the other beds were dedicated to non-COVID-19 essential healthcare services. The hospital also had an isolation ward for COVID-19 suspected until a confirmatory test arrived. This ward had 20 beds, and patients were managed by general practitioners, specialist emergency and critical care medicine physicians, anesthesiologists, resident physicians, and emergency and critical care nurses.

Data collection and analysis

A retrospective chart review was done to collect the data. All adult patients who visited the SPHMMC Emergency Department (ED) during the study period were included in the study. Patients met the eligibility requirements if they had visited a high-risk location, had close contact with a confirmed or suspected case, or displayed symptoms suggestive of COVID-19 were suspected to have COVID-19 but waiting for the confirmatory results and those patients who turned out to be positive after emergency room admission excluding patients with other confirmed infectious diseases, previous COVID-19 diagnosis, and inability to provide consent, or death upon arrival. A structured questionnaire was developed based on the Ethiopian national patient safety guideline (3). General practitioners who had experience in COVID-19 care collected the data after one-day orientation training and the principal investigator, Dr. GZ supervised the data collection process.

The collected data was entered into SPSS version 25 for cleaning and analysis. Descriptive and summary statistics (i.e. mean, frequency, percentage, standard deviation) were used to analyze the data.

Operational definitions and measurements

Pre-triage: This is the initial assessment and screening of patients in the emergency department of SPHMMC to identify those who are suspected of having COVID-19 and who should be isolated from others to prevent further transmission within the hospital (3).

Isolation ward: This is a dedicated place within the emergency department of SPHMMC, which was designed to separate and manage patients suspected of Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2), the cause of COVID-19.

Suspected case: Is a patient with any acute respiratory illness (runny nose, sore throat) & at least one of the pre-triage parameters (fever, cough, SOB) (3).

Confirmed case: A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms (3).

Quality Control

A pretest was conducted involving 10 isolated patient charts and the questionnaire was modified accordingly based on the feedback from the trained data collectors and experts in the area. Data was kept locked and backup memory was used to avoid data loss.

Results

During the six-month study period, a total of 4,350 patients were screened and 202(4.64%) patients fulfilled the suspect criteria and isolated at the emergency department and transferred to the isolation ward of the hospital and remaining 40 (19.8%) patients were missed during triaging and were tested positive for COVID-19 after they were kept in the emergency unit. Of all isolated patients in this study tested for RT-PCR, 130 (64.3%) of them were found to be positive. There were 170 males (70.3%), and the male-to-female ratio was 2.4:1.

Clinical characteristics of patients (Table 1)

Among a total of 202 triaged at the emergency unit and admitted to the isolation ward, the major presenting complaints were only cough in 54 (26.7%), and shortness of breath in 31 (15.3%). About 21.8% of the isolated cases had combined complaints of myalgia, arthralgia, vomiting, diarrhea, and back pain. Regarding the exposure status, there were 12 patients with definite exposure history (6%). Of them, 6 (3%) patients had contact with the suspected COVID-19 patient at home and 190 patients (94%) of them claimed not to have any contact with the suspect

or confirmed cases. More than one-fifth (40) of patients were confirmed to have COVID-19 after admission to the emergency department presented with main complaints of cough and shortness of breath in 4 (7.5%), and 2 (5%) with only cough. Whereas 33 (82.5%) of patients were found to have complaints not related to COVID-19.

Moreover, patients stayed in an isolation ward with a median hospitalization days of 3 in about 82 (40.6%) of patients. With 2 and 3 days being the 25th and 75th percentile, about 51 (25.2%) of patients stayed 2 days, and 29 (14.4%) of patients stayed only one day. 82 (40.6%) of patients stayed 3 days. About 29 (14.4%) and 11 (5.4%) patients were stayed for 4 and 5 days, respectively.

Table 1: Clinical characteristics of patients suspected of having COVID-19 in the ED of

Category	Variable	Isolated patients		Non-isolated patients	
		Frequency	Percent	Frequency	Percent
Clinical future	Shortness of breath	43	21.4	1	2.5
	Cough and shortness of breath	30	14.8	4	7.5
	Fever and Cough	54	26.7	-	-
	Cough	44	21.8	2	5
	Atypical presentation	44	21.8	33	82.5

SPHMMC, April 1 to September 30, 2020, Addis Ababa, Ethiopia.

Vital signs during the presentation

Table 2 presents the vital signs from the patient's record. The body temperature (T^o) was normal in 142 cases (70.3%) whereas 35 (17.3%) of the patients had a fever record of greater than 37.5 C^o. The number of random blood sugar levels (RBS) was normal glycemetic in 101 (50.0%) and hyperglycemic in 59 (29.2%). According to the analysis of the electrocardiogram (ECG) of the suspected and isolated patients, normal sinus rhythm was present in 111 cases (55%) and sinus tachycardia was present in 90 cases (44.6%). The respiratory rates of the suspected and isolated patients showed that 139 cases had tachypnea (68.8%).

The triage vital sign recorded showed systolic blood pressure of 90-120 mmHg in 92 (45.5%) patients, less than 90mmHg in 5 (2.5%) patients whereas diastolic pressure was 60-90mmHg in 163(80.7%) and less than 60mmHg in 11(5.4%) of patients. The pulse oximetry saturation record of the participants showed that 143 (70.8%) of the patients had severe hypoxemia which is less than 85% (Table 2).

Eight seven (43.1%) of patients from participants didn't have any preexisting comorbidities. The major comorbid illness among the isolated patients was hypertension 35 (17.3%), diabetes 26 (12.9%), Cardiac illness 12(5.9%), Asthma and COPD 12 (5.9%) and other illnesses only

accounted for 20 (9.9%) patients and these consisted of cancer, chronic kidney disease, chronic liver disease, RVI, TB, stroke, and psychiatric illnesses.

Table 2: Vital sign during presentation of patients suspected of having COVID-19 in the ED of SPHMMC, April 1 to September 30, 2020, in Addis Ababa, Ethiopia.

Variable		Isolated patients	
		Frequency	Percent
Temperature	Hypothermia	25	12.4
	Normothermia	142	70.3
	Fever	35	17.3
Random glucose level	Hypoglycemia	2	1.0
	Normoglycemia	101	50.0
	Prediabetes	40	19.8
	Hyperglycemia	59	29.2
Pulse rate	Bradycardia	1	.5
	Sinus rhythm	111	55.0
	Sinus Tachycardia	90	44.6
Respiratory rate	Bradypnea	1	.5
	Normal rate	4	2.0
	Tachypnea	139	68.8
	Impending Respiratory failure	58	28.7

Laboratory results of the patients

From the total laboratory test, we found that the white blood cell level was normal in 107 (53%). The number of lymphocytes (LYM) were decreased in 161 (79.7%). The number of neutrophils (NTF) was increased in 138 (68.3%) (Table 3).

The liver function test of suspected and isolated patients was determined and alanine aminotransferase and aspartate aminotransferase were normal in the majority 144 (71.3%) and 162 (80.2%) respectively. Creatinine was also determined to be normal in 93 (46.0%) of participants (Table 3).

Table 3: Laboratory results of patients suspected of having COVID-19 in the ED of SPHMMC, April 1 to September 30, 2020, in Addis Ababa, Ethiopia.

Variable		Isolated patients	
		Frequency	Percent
WBC count	Normal	107	53
	Increased	89	44.1
	Decreased	6	3
Lymphocyte count	Increase	3	1.5
	Less than 1.5	161	79.7
	Normal 1.5-5	38	18.8
Neutrophil count	less than 56	20	9.9
	Normal 56-70	43	21.3
	>70	138	68.3
SGPT	Low	2	1.0
	Normal range	162	80.2
	Higher	35	17.3
SGOT	Normal level	144	71.3
	Elevated	58	28.7

Creatinine	lower than 0.7	66	32.7
	0.8-1.2 Normal	93	46.0
	higher than 1.3	35	17.3

SGOT: Serum Glutamic-Oxaloacetic Transaminase

SGPT: Serum Glutamic-Pyruvic Transaminase

WBC: White Blood Cell

Discussion

The main aim of this study was to describe the clinical characteristics of pre-triaged, isolated patients suspected of having COVID-19 from the emergency department of SPHMMC. Among the suspected and isolated patients, 40 patients (19.8%) were found to be positive for COVID-19 with a reverse-transcriptase polymerase chain reaction (RT-PCR) test.

A total of 4,350 patients were screened during pre-triage and admitted to the emergency department during the study period and only 40 (1%), which were about 19.8% of suspected patients, were confirmed COVID-19 patients were missed to be isolated. Those results were consistent with Australian studies revealing, 2% of the patients tested positive for COVID-19 (4).

It was understandable that missed triage is a possibility as COVID-19 was ever-changing in symptoms but considering non-ventilated and crowded emergency departments this finding is alarming. In contrast to this study, however, a study conducted in New York reported that 1641 (81.8%) of the 2004 patients referred to the biological ED were tested for SARS-CoV-2 PCR, and 143 (8.7%) of these samples were positive. Only two unintentionally carrying COVID-19-positive individuals reached the main, clean hospital, showing that the triage tool was effective (5).

To date, validated research on triage performance is limited, complicating the incorporation of these strategies by the EDs. Most previous studies focused on positive versus negative results of patients with suspected COVID-19 infection (5-10). Different organizational methods for changing emergency departments (EDs) during the COVID-19 pandemic have been proposed in recent studies. However, real data on the practical application of these strategies is not yet available. Triage screening by experienced professionals and surveillance protocols may be effective in the early isolation of COVID-19 patients. But general precaution of infection prevention is more important (11-13).

In this study, the male-to-female ratio in the isolation ward was 2.4:1

which is consistent with the findings of studies conducted in New York and China which revealed male predominance. This might be related to higher smoking behavior among men but the exact association with COVID-19 is yet unknown (14)

According to the summary of clinical features in this study, cough (53%) and shortness of breath (31%) were the most common presenting symptoms of patients admitted to the isolation ward in contrast to an epidemiological review published from China, which suggested fever (98.6%) as one of the most common symptoms during the early phase of COVID outbreak (14).

In this study, the number of lymphocytes (LYM) decreased in 44.1% of the patients in the isolation ward. This is similar to the study done at the Indonesian National Referral Hospital and explained as this may be related to the fact that the virus depletes T- lymphocytes mainly T- helper and T- suppressor cells and it also suggests significant inflammation and tissue damage (15).

Limitations

This study has certain limitations that might not adequately reflect the disease's actual status because it was conducted at a single center.

Conclusion

This study found that clinical triage identified roughly 66% of COVID-19 patients, but a significant number were missed, risking exposure for others in the emergency department (ED). The most common symptoms were cough and shortness of breath. Lymphopenia and hyperglycemia were frequently observed in lab tests. We suggest using a high index of suspicion after initial triage, along with frequent evaluation, imaging, and testing to improve detection and prevent the mixing of contagious diseases like COVID-19 and other patients.

Abbreviations

COPD: Chronic obstructive pulmonary disease

COVID-19: coronavirus disease 2019

IRB: Institutional Review Board

RT-PCR: Reverse transcriptase polymerase chain reaction

RVI: Retrovirus infection

TB: Tuberculosis

SARS COV-2: Severe acute respiratory syndrome coronavirus 2

SPHMMC: St. Paul's Hospital Millennium Medical College

Declarations

Ethical Considerations

Before the start of the study, the proposal was reviewed and approval was obtained from the Institutional Review Board (IRB) of SPHMMC. Permission to access patient data was obtained from the Medical Service vice provost of SPHMMC. Since we were collecting data from the chart, there were no interventions in the triaging and treatment of the patients. In addition, we did not collect patient identification to prevent a breach of confidentiality and autonomy.

Conflict of interest

The authors declare no conflict of interest.

Funding

None

Competing interest

The authors declare that they have no competing interests.

Availability of data and materials

The datasets used in the current study or data collection tool are available upon request of the corresponding author.

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Authors contributions

All authors contributed to the study equally from its conception to data collection, analysis, and manuscript writing. All authors agreed on the final version and publication.

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