

Experience from a COVID-19 screening centre of a tertiary care institution: A retrospective hospital-based study

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ABSTRACT

Background: The COVID-19 pandemic continues to be a significant public health concern across the whole world, including India. In the absence of any specific treatment or vaccine against COVID-19, the role of efficient testing and reporting has been uncontested so far as the number of cases is rising daily. In order to strengthen the screening activities and to prevent nosocomial infection, facility-based screening centres have been designed and operated at various levels of healthcare, including tertiary care institutions. **Methods:** The present study has been planned with an objective to understand the patient profile and evaluate the functioning of COVID-19 screening OPD (CS-OPD) at a tertiary care hospital. In this hospital-based retrospective study, data from individuals visiting the COVID-19 screening OPD during the period from 17th March 2020 to 31st July 2020 were collected. We documented and analysed relevant demographic, epidemiological and clinical characteristics of the patients. **Results:** A total of 10,735 patients visited the COVID-19 screening OPD during the defined study period of which 3652 individuals were tested. The majority of the patients, i.e., 65.67% (7050) were male and in the 15–59 years age group (84.68%). The most common symptoms among patients visiting CS-OPD was cough (9.86%). Of the total, 17.17% (1843) of patients reported to the CS-OPD with a contact history of COVID-19-positive patient. On the other hand, 13.49% (1448) of patients were with either domestic or international travel history. The overall testing rate and positivity rate for CS-OPD during this period were found to be 34.02% and 7.94%, respectively. **Conclusion:** The clinical, demographic and epidemiological characteristics of patients visiting CS-OPD varied across the study period depending upon the containment and testing strategy. The CS-OPD played a crucial role in preventing nosocomial infection and maintaining non-COVID care at the tertiary care hospital.

Keywords: COVID-19, screening OPD, tertiary care hospital

Introduction

The novel severe acute respiratory syndrome coronavirus- 2 (SARS-CoV-2, previously known as 2019-nCoV, also known as

COVID-19) has rapidly spread across India, with unprecedented propagation, because of its highly infectious nature. The World Health Organization declared the COVID-19 outbreak as a pandemic on 11th March 2020. On 30th January 2020, the first confirmed case of COVID-19 was detected in India.^[1] The state of Odisha identified the first case of COVID-19 on 15th March 2020.^[2] With a rising number of cases, the need to screen all patients with respiratory symptoms and travel history was recognised. One effective strategy was the establishment of

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fever clinics or COVID-19 screening centres. These screening centres were assigned to screen patients based on a standard criterion. With increasing instances of nosocomial outbreaks of COVID-19, it has become even more important to screen all patients with suspected infectious disease in the hospital setting as well as for control and prevention of infection in the community.^[3]

As a pandemic alert was sounded in India and patient screening in health facilities was strongly recommended, the Ministry of Health and Family Welfare (MOHFW), India issued guidelines for setting up COVID-19 screening centres in healthcare settings. The purposes of these screening centres were to (a) attend to patients of influenza-like illness in a separate area from the general outpatient department (OPD), (b) to facilitate implementing standard droplet precautions, (c) to triage the patients and (d) collect samples.^[4]

Based on these principles, healthcare institutions have developed and implemented a hospital-specific systematic process for screening and managing suspected COVID-19 patients.^[5,6] However, till now there is limited published literature regarding the functioning and patient profile of these COVID-19 screening facilities, especially at tertiary care institutions which are significantly involved in both COVID-19 and non-COVID-19 services simultaneously.^[7] Hence, we planned this study to understand the patient profile and evaluation of COVID-19 screening centres at a tertiary health care institution.

Materials and Methods

This study was conducted in the COVID-19 screening Outpatient department (CS-OPD) under the Department of Community & Family Medicine at All India Institute of Medical Sciences (AIIMS), Bhubaneswar. AIIMS Bhubaneswar is a 922-bedded tertiary care institution in the state of Odisha which caters for approximately 1.2 million outpatients, 30,000 inpatients and 40,000 emergencies per year.

The AIIMS, Bhubaneswar CS-OPD was made functional from 17th March 2020. The main objective of CS-OPD was to maintain the function of the tertiary care institution by segregating COVID-19 and Non-COVID-19 patients through screening before their admission or entry into the hospital.

The functioning of the CS-OPD was based on the standard operating procedures devised by the COVID-19 management committee of the institution with the help of all the guidelines and protocol notified by the Indian Council of Medical Research (ICMR) and MOHFW. A two-level screening system was made operational as the number of cases started to rise in the state. As part of the first level of screening, all the patients and their attendants were screened at the entry gate of the main OPD by paramedical staffs based on three criteria, i.e., travel history, contact history and complaint of fever (by measuring body temperature with the help of an infrared thermometer). Patients needing immediate hospitalisation were referred to the Trauma and Emergency ward for screening and treatment. Based on the first-level triage result, the patient was either referred to CS-OPD for second-level screening by medical officers (if any of the suspect criteria was present) or inside the main OPD building for further treatment (if none of the suspect criteria was present). The patient or visitor could also directly visit the CS-OPD and was also referred by clinicians from their OPD. From 15th June 2020 onwards, all the patients requiring admission, surgical interventions or day-care procedures were also referred to CS-OPD for COVID-19 testing.

The CS-OPD was situated in a standalone building in the peripheral zone of the hospital separated from other general OPDs with separate entry and exits point to prevent possible cross-infection. The CS-OPD was broadly divided into the following four zones: Registration-cum-report collection zone, OPD zone, sample collection zone and control room-cum-nursing station zone. [Figure 1] A total of 21 staffs from the existing pool of AIIMS, Bhubaneswar have been designated to work at CS-OPD and to ensure its proper functioning [Table 1]. A patient at CS-OPD was managed as per the algorithm explained in Figure-2 [Figure 2]. The CS-OPD was operational from 8.00 AM to 2.00 PM every day. Patients were categorised into “Suspect” and “Not-a-suspect” case for COVID-19 based on travel history (in the last 14 days), contact history (in the last 14 days) and relevant symptoms suggestive of COVID-19 (fever, sore throat, cough, dyspnoea and loss of taste/smell). A suspected case was categorised into ICMR-specified categories and referred to the sample collection zone [Figure 3]. The nasopharyngeal swab samples are collected in two sessions, i.e., 8.00 AM-11.00 AM and 11.00 AM-2.00 PM. All the samples are sent to the ICMR-approved

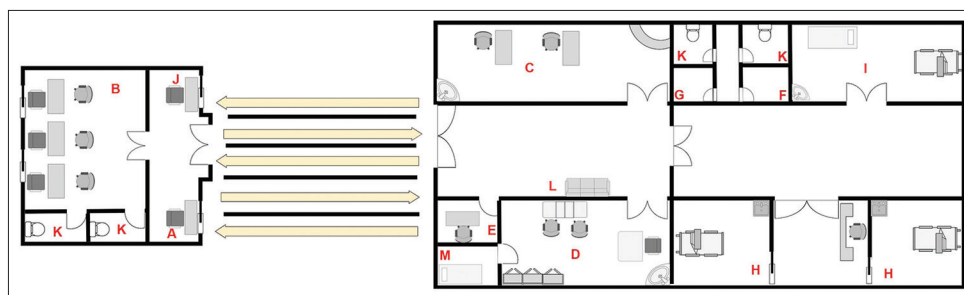


Figure 1: COVID-19 screening OPD (CS-OPD) map: A-Registration counter, B-Screening clinic OPD, C-Sample collection room, D-Control room/Nursing station E-SRF generation/VTM distribution counter, F-Donning room, G-Duffing room, H-COVID-19 emergency OT I- COVID-19 Labor room, J-Report collection counter, K-Toilet, L-Patient waiting area, M-Staff room

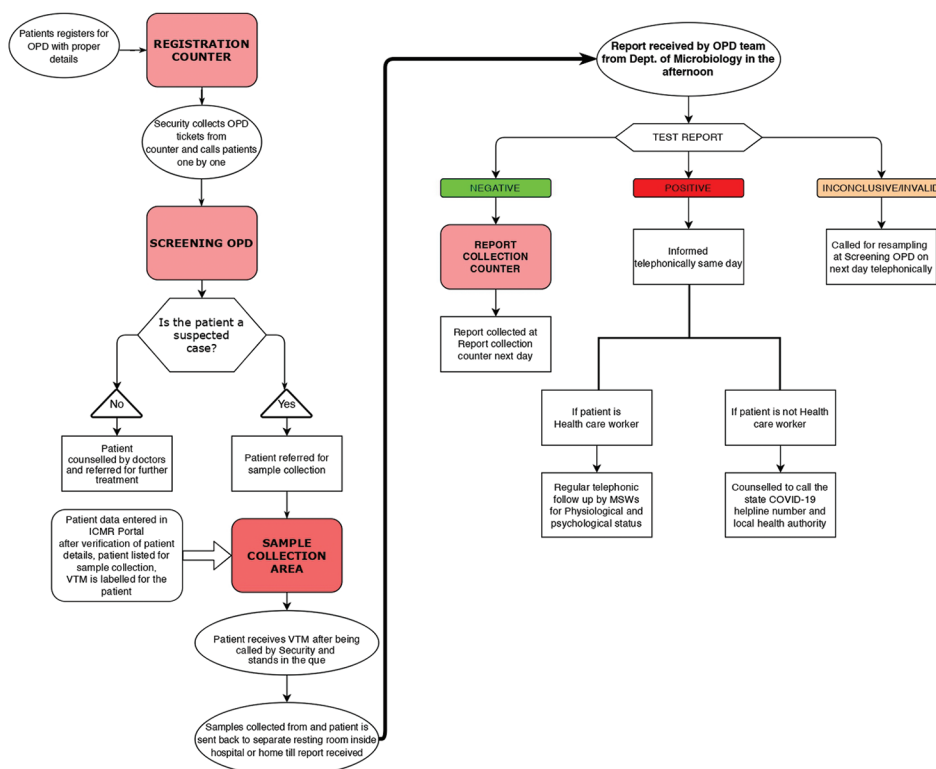


Figure 2: Algorithm for patient-flow and service delivery at CS-OPD

Table 1: Human resources for CS-OPD

Designation	Number
Faculty-in-charge	1
Senior resident (Doctor)	2
Junior resident (Doctor)	2
Intern	2
Nursing officer	6
Lab technician	1
Data entry operator (DEO)	2
Medical social worker (MSW)	2
Security staff	2
Housekeeping staff	1

Viral Research and Diagnostic Laboratory (VRDL) of the microbiology department under a proper cold-chain system. All the samples are tested by the reverse transcriptase-polymerase chain reaction (RT-PCR) method.

The present study is a hospital-based retrospective study in which all the patient-related data of subjects who attended COVID-19 screening in OPD from 17th March 2020 to 31st July 2020 were collected and analysed. Any patient with incomplete or missing data or duplicity were being excluded from the study. At the time of patient examination, the staffs input the data, such as the presence of COVID-19 symptoms, travel history, and a history of contact with COVID-19 patients, after interviewing the patient. The study used standard case definitions and categories for sample collection as advised by the MOHFW and ICMR.^[8,9] [Figure 3]

All the extracted quantitative data were administered in Microsoft Excel along with the relevant variables mentioned. Data analysis was performed by SPSS version 23. The analysis of sociodemographic variables and variables related to COVID-19 screening services was expressed using descriptive statistics like mean, median, proportion and relevant graphical presentation. Personal identifiers for the patients were removed from the dataset after data extraction to maintain privacy and confidentiality. The institutional ethical committee of AIIMS, Bhubaneswar approved this study (Reference number: T/IM-NF/CM&FM/20/72).

Results

A total of 10,735 patients were screened for COVID-19 during these 136 days (17th March 2020–31st July 2020). A median of 57 (IQR = 93.00) patients visited CS-OPD every day. Out of them, a majority, i.e., 65.67% (7050) were male and in the 15–59 years age group (84.68%). The median age among male and female patients visiting CS-OPD was 34.00 (IQR = 22.00) and 33.00 (IQR = 20.00) years, respectively. The most common symptoms among patients visiting CS-OPD was cough (9.86%) followed by fever (9.30%). However, 79.23% (8505) of the patients were without any specific symptoms relevant to COVID-19. Out of all, 17.17% (1843) patients reported to the CS-OPD with a contact history of a COVID-19 positive patient and 13.49% (1448) of patients were with either domestic or international travel history within the last 14 days [Table 2].

Table 2: Distribution of CS-OPD patients based on symptoms, travel and contact history

	Frequency	Percentage
Gender (n=10,735)		
Male	7050	65.67
Female	3685	34.33
Age group (n=10,735)		
≤14 years	544	5.06
15-59 years	9091	84.68
≥60 years	1100	10.24
Symptoms (n=10,735)		
Fever	998	9.30
Cough	1058	9.86
Sore throat	669	6.23
Shortness of breath	252	2.35
Running nose	319	2.97
No symptoms	8505	79.23
History of travel (n=10,735)		
No travel history	9287	86.51
International	18	0.17
Domestic	1430	13.32
History of contact with confirmed COVID-19 positive case (n=10,735)		
Yes	1843	17.17
No	8818	82.14
Don't know	74	0.69

The seven-day moving average for the number of patients with travel history was higher initially in March 2020 (range: 2.4–8.4) followed by a decrease in April 2020 (range: 0.7–1.7). However, it showed an increasing trend from May 2020 till the first week of July 2020 (range: 1.7–42.1). Similarly, the seven-day moving average for the number of patients with a contact history was stagnant from March 2020 to May 2020 (range: 0–4.6). But it peaked during June 2020 and the first week of July (range: 1.6–73.3). Similarly, the number of patients with the symptoms was initially higher in March 2020 (range: 12–28) followed by a decline from April 2020 to May 2020 (range: 6–14). It further increased from June 2020 to July 2020 (range: 3–37) [Figure 4].

The total daily patient visit showed a steady increase from April 2020 to 9th July 2020 (range: 7–268) followed by a steady decline till the end of July 2020 (range: 57–161). On the other hand, the weekly average daily sample testing increased significantly from June 2020 till mid of July 2020 (range: 10.71–104.43) followed by a declining trend. Similarly, the seven-day moving average for positive cases (range: 0–11.43) increased after July 2020 (range: 3.57–11.43) [Figure 5].

A total of 3652 samples were collected during the study period and a median of 10.00 (IQR = 38.00) samples were being collected from CS-OPD every day. The overall testing rate and positivity rate for CS-OPD during this period were found to be 34.02% and 7.94%, respectively. The patients from the female paediatric population had the highest testing rate (44.51%) and positivity rate (18.18%). The overall testing and positivity rates were maximum for the paediatric age group [Table 3].

S.L.NO.	CATEGORY	MARCH 2020	APRIL 2020	MAY 2020	JUNE 2020	JULY 2020
1	Symptomatic international travellers in the last 14 days	1*				
2	Symptomatic contacts of laboratory-confirmed case	1*				
3	Symptomatic healthcare workers	1*				
4	Patient with severe acute respiratory infection	20*				
5	Asymptomatic high-risk/close contacts of positive cases	20*		18*		
6	Asymptomatic direct and high-risk contacts of laboratory-confirmed case-family members			10*		
7	Asymptomatic healthcare workers in contact with confirmed case without			10*		
8	Symptomatic IJ in hospital			10*		
9	Pregnant women in labor			10*		
10	Symptomatic IJ among relatives and caregivers within 7 days of illness			10*		
11	Symptomatic IJ in hotspot/entertainment zones		9*			
12	Others			10*		

Figure 3: Timeline of revision of COVID-19 testing strategy by ICMR: *Date of the month in which the category was added. #Date of the month in which the category was removed

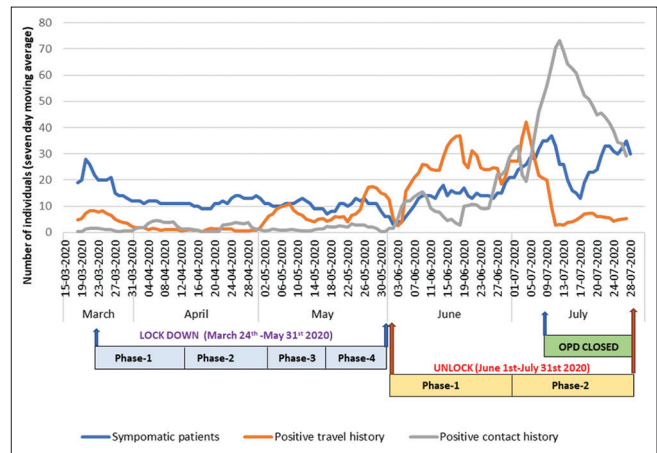


Figure 4: Time distribution of seven-day moving average of the number of individuals with a positive travel history, positive contact history and symptoms

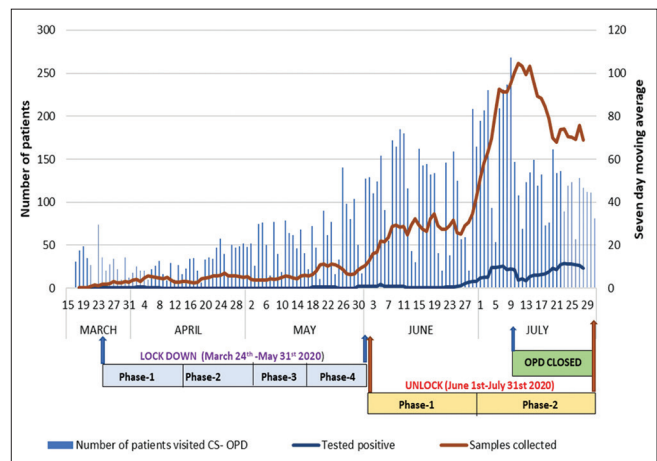


Figure 5: Variation in the seven-day moving average of the number of samples tested and those tested positive for COVID-19 as compared to daily patient visit

The maximum proportion of samples were collected from the others category (29.71%) followed by the symptomatic healthcare workers category (20.21%). However, the positivity rate was maximum in the symptomatic contacts of laboratory-confirmed cases (19.40%) followed by asymptomatic direct and

high-risk contacts of laboratory-confirmed case—family members (18.82%). [Table 4].

Discussion

The role of screening OPD for COVID -19 can be discussed from two perspectives, i.e., maintaining hospital function through preventing nosocomial infection and providing diagnostic services to suspected COVID-19 patients from the community in an accurate and timely manner. The previous experience during the H1N1 pandemic as well as the present experience with COVID-19 has reinforced the role of separate OPD under various names like “fever clinic”, “screening OPD”, “screening clinic” etc.^[10-12] In a resource-constrained setting like India, these CS-OPDs played a significant role in both screening and triage during the pandemic.^[13] Mahesh *et al.* conducted a similar study in a tertiary care hospital in western India. They concluded that early diagnosis, quick initiation of treatment, infection control measures and reasonable care at the hospital through flu OPD effectively reduced the morbidity and mortality during the H1N1 pandemic.^[14] Similarly, in a study conducted by *Kwon et al.*, they found that COVID-19 screening clinics were effective in maintaining the non-COVID-19 treatment

facilities by reducing the incidence of nosocomial infection in the hospital. The CS-OPD might have played a crucial role in the prevention of possible nosocomial infection by early diagnosis and segregation of COVID-19 positive patients as well as healthcare workers at AIIMS Bhubaneswar. Although CS-OPD was planned and designed according to the existing health facility infrastructure and local environment, some of the improvements based on evidence from other studies can be incorporated into its functioning. Modifications like a separate passage for patient–staff waste and sample collection in a negative pressure chamber can further strengthen the infection prevention and control measures.^[10,15,16]

As far as the CS-OPD patient profile is concerned, the maximum proportion of patient belongs to the male gender and are from the 15–60 years age group. This is in line with the study done by *Khan et al.*, and this may be due to the lesser tendency among the female and elderly population to seek proactive COVID-19 related care because of social and inadequate health-seeking behaviour issues.^[11,17] Fever and cough were the two most common presenting symptoms among patients visiting CS-OPD which is similar to the findings of

Table 3: Age and gender-wise distribution of sample testing indicators

Age group	Gender	OPD visited (Frequency)	Tested (Frequency)	Tested positive (Frequency)	Testing rate (%)	Positivity rate (%)
<14 years	Male	371	121	11	32.61	9.09
	Female	173	77	14	44.51	18.18
	Total	544	198	25	36.40	12.63
15-59 years	Male	5898	1860	154	31.54	8.28
	Female	3193	1303	86	40.81	6.60
	Total	9091	3163	240	34.79	7.59
>60 years	Male	781	212	15	27.14	7.08
	Female	319	79	10	24.76	12.66
	Total	1100	291	25	26.45	8.59
Total	Male	7050	2193	180	31.11	8.21
	Female	3685	1459	110	39.59	7.54
	Total	10735	3652	290	34.02	7.94

Table 4: Category-wise distribution of samples collected along with positivity rate

Category	Tested positive (% of total)	Total samples collected (% of total)	Positivity rate (%)
Symptomatic international travellers in the last 14 days	2 (0.68)	18 (0.49)	11.12
Symptomatic contacts of laboratory-confirmed case	26 (8.96)	134 (3.67)	19.40
Symptomatic healthcare workers	37 (12.75)	738 (20.21)	5.01
Patient with Severe acute respiratory infection	3 (1.03)	54 (1.48)	5.56
Asymptomatic high risk/direct contact of positive cases*	0 (0.0)	42 (1.15)	0.00
Asymptomatic direct and high-risk contacts of laboratory confirmed case - family members	64 (22.06)	340 (9.31)	18.82
Asymptomatic healthcare workers in contact with confirmed case without adequate protection	28 (9.65)	732 (20.04)	3.83
Symptomatic Illi in hospital	16 (5.51)	147 (4.03)	10.88
Pregnant women in/near labour	2 (0.68)	30 (0.82)	6.67
Symptomatic Illi among returnees and migrants within 7 days of illness	11 (3.79)	88 (2.41)	12.50
Symptomatic Illi in hotspot/containment zones	23 (7.93)	233 (6.38)	9.87
Others	78 (26.89)	1085 (29.71)	7.19
Not specified	0 (0.0)	11 (0.30)	0.00
Total	290 (100.00)	3652 (100.00)	7.94

*Asymptomatic high risk/direct contact of positive cases—This category was later divided into two as healthcare workers (Category-5A) and family members (Category-5B) by ICMR

Mohan *et al.* in a study done among COVID-19 positive patients at a tertiary care institution in North India.^[18] The maximum proportion (79.23%) of patients visiting CS-OPD were without any symptoms relevant to COVID-19. This asymptomatic population visiting CS-OPD mainly consisted of patients coming to the hospital for follow up visits, patient attendants, healthcare workers and individuals with travel history to hotspot areas at that point of time.

On further analysis of the profile of CS-OPD patients with respect to time, the number of patients visiting CS-OPD with travel history and contact history increased from June 2020. This may be due to the initiation of phased unlock after a nationwide lockdown from 25th March 2020 to 31st May 2020.^[19] However, it again showed a declining trend from mid-July 2020. This can be attributed to the closure of AIIMS Bhubaneswar main OPD from 10th July 2020 due to a staff crunch associated with increased COVID-19 infection among healthcare workers.^[20] A similar type of trend was also observed for total samples collected after the closure of OPD. The number of patients coming to AIIMS Bhubaneswar decreased suddenly leading to reduced screening and subsequent reduction in suspected cases. But the number of positive cases detected remained on the higher side despite OPD closure, mostly due to the increasing case burden in the community.

In the case of testing indicators, the overall 7.94% positivity rate indicates that we may need a more efficient implementation of relevant public health interventions to reach the WHO devised epidemiological criteria for controlling the epidemic.^[21] The higher positivity rate among the paediatric population is in contrast to findings from the ICMR COVID study group where they reported a higher positivity rate among the adult and elderly population. This may be due to the higher testing rate among them as compared to that in other age groups.^[22]

Apart from this, the ongoing evolution of the ICMR testing strategy also has an impact on testing indicators as it has varied throughout the study period [Figure 3]. In spite of this, if we look into sampling categories, maximum samples have been contributed by the “others” category (29.71%). This may be explained by the fact that AIIMS Bhubaneswar being a tertiary care referral institution, patients with immunocompromised status like cancer (on chemotherapy/radiotherapy) or chronic kidney diseases (on dialysis) or patients with pre-operative conditions have been screened and tested extensively before admitting them to non-COVID wards. We included these patients under the “others” category as they did not fit any other ICMR testing category. Similarly, the higher testing percentage among healthcare workers can be due to their increased susceptibility to infection, easy approachability to COVID-19 testing services and regular contact tracing at the institutional level.

On the other hand, maximum positivity among symptomatic contacts of laboratory-confirmed cases (19.40%) is in agreement with the ICMR COVID study group findings (10.6%). However, the second-highest positivity was detected in the “Asymptomatic

direct and high-risk contacts of laboratory-confirmed case – family members” category (18.82%) in contrast to SARI patients (6.1%) in the ICMR COVID study group findings. This may be due to the fact that most of the SARI cases coming to the hospital were being referred directly to the emergency department for immediate care and proper evaluation.^[22]

Although the current CS-OPD model is from a tertiary care institution, to a larger extent, it can be also be implemented at the primary and secondary care levels with limited resource mobilisation. Evolution in pandemic response strategies like rapid antigen test, improvement in health care infrastructure and emergency transportation services can facilitate the functioning of CS-OPDs at the primary care institutions if planned adequately.^[23,24]

Strengths and limitations

This is one of the few studies from India which was conducted to understand the patient profile and functioning of a COVID-19 screening OPD in a tertiary healthcare setting. We have collected and analysed the data from all the patients who visited the screening OPD during the study period. Our study has been able to demonstrate the variation in patient profile associated with the introduction of a containment strategy to control the COVID-19 pandemic. However, the periodic changes in testing strategy and categorisation of suspected cases for sample collection by ICMR had influenced the testing and positivity rate in our study.

Conclusion and Recommendations

Our study gives an overview of the functioning of a COVID-19 screening OPD as a part of a tertiary care institution. We have demonstrated how public health interventions like lockdown and travel restrictions impacted the patient profile and brought a change in its due course of the study period. Although the COVID-19 screening OPD has been effective in providing screening and diagnostic services to patients, various best practices, and evolving strategies based on evidence should be added to it continuously. Inclusion of point-of-care testing services and broadening the ambit of suspected criteria at screening OPDs can help us to detect more COVID-19 positive cases. Moreover, tertiary care institutions should also plan permanent and separate infectious disease clinics like CS-OPDs and keep on upgrading them to address evolving public health challenges like COVID-19.^[25] As the pandemic continues, it is evident that no single strategy is sufficiently effective. Therefore, the health system must adhere to a holistic approach in dealing with this pandemic for which COVID-19 screening OPDs remains a critical component.

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Conflicts of interest

There are no conflicts of interest.

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