

Clinical, Radiological and Laboratory Profile of Covid-19 Patients Admitted to a Dedicated Covid-19 Hospital in Odisha

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ABSTRACT

BACKGROUND

The Covid-19 pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a public health challenge being faced by the world currently. International and national responses to combat the Covid-19 pandemic have been very prompt with the setting up of dedicated Covid-19 hospitals. In the state of Odisha, situated in the eastern part of India, Kalinga Institute of Medical Sciences (KIMS), set up the first dedicated Covid hospital of the state. This study intends to chronicle the clinical profile, radiological presentations, laboratory findings, and clinical outcome of patients admitted to the KIMS Covid hospital.

METHODS

A retrospective analysis of the clinical and laboratory data of patients admitted with Covid-19 diagnosis at the dedicated Covid-19 hospital from 5th April 2020 to 4th June 2020 was done.

RESULTS

A total number of 272 Covid-19 cases were included in this study. Majority of the patients were males (83.57 %) and most of the patients (79.04 %) were asymptomatic. The mortality rate was 1.9 %. Fever (18.38 %), cough (17.27 %), dyspnoea (16.91 %) and myalgia (14.7 %) were the major symptoms observed. Severity was mild in 78.94 % cases. Delayed viral clearance was seen in 13 % cases. The typical features of novel SARS-CoV-2 infection was seen in 12 - 13 % cases in computed tomography (CT) images of thorax. c-reactive protein (CRP) was raised as a biomarker of inflammation. Of the 5 deaths encountered, 2 had diabetes mellitus, 2 were hypertensive and 1 had chronic obstructive pulmonary disease (COPD).

CONCLUSIONS

Covid-19 may have a delayed viral clearance beyond two weeks. A discordance between CT images and the clinical condition may also be observed. Diabetes, hypertension, and high blood CRP levels were significantly associated with mortality.

KEYWORDS

Covid-19, SARS-CoV-2, Clinical Profile, Radiological Findings, Comorbidities, Fatality

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BACKGROUND

Kalinga Institute of Medical Sciences is the first tertiary care teaching medical institution in Odisha to have a dedicated Covid hospital. It became operational on 2nd April and admitted the first Covid-19 patient on 5th April. It has a dedicated 500 bedded indoor facility including 50 bedded critical care unit (CCU).

Covid-19 is caused by SARS-CoV-2, belonging to genus beta coronavirus and one of the 7 coronaviruses known to cause disease in human. Covid-19 was declared a pandemic on 11th March 2020 by WHO. Although the first positive case of Covid-19 from India was reported on 30th January 2020, the surge of cases came much later. Thousands of cases were reported from all the states since then with Maharashtra being the most affected state in the country.¹ As on August 9, 2020, a total of 2,212,429 cases of Covid-19 have been reported,² with India having reported the 3rd highest number of Covid-19 positives.

The first case from Odisha was recorded on 16th March 2020 following which there has been a surge in cases in the state. As of 1st August 2020 the state had recorded nearly 33,480 cases with nearly 187 deaths.³ The virus is spread through respiratory secretions of an infected person. The incubation period is 2 - 14 days (mean duration of 5.1 days) with peak viremia occurring before the onset of symptoms.⁴ The period of infectivity may start 1 - 3 days prior to the onset of symptoms.⁵ The epidemiological risk factors include older age, male sex, diabetes, hypertension, chronic pulmonary, cardiovascular and chronic kidney diseases.^{6,7,8} Respiratory tract infection has been observed to be the most common clinical manifestation of Covid.

Cases have been defined as suspect, probable or confirmed on the basis of clinical features, radiology and laboratory confirmation through RT-PCR.⁹ The spectrum of illness consists of asymptomatic, mild, moderate, severe and critical cases.¹⁰

This study intends to determine the clinical, laboratory and radiological profile of Covid-19 positive patients admitted to the hospital from 05 / 04 / 2020 to 04 / 06 / 2020 and also to assess the clinical course of the confirmed cases including virological clearance.

METHODS

It was a retrospective observational study on the data collected from electronic medical records of patients admitted to the Odisha Covid Hospital, KIMS.

Study Population

All patients admitted as confirmed Covid-19 cases from 5 / 4 / 2020 to 4 / 6 / 2020 were included in the study. The confirmed cases were based on real time reverse transcriptase polymerase chain reaction (RT-PCR) results for SARS CoV2 performed at the Regional Medical Research Centre (RMRC) under the Indian Council of Medical Research, Bhubaneswar.

RT-PCR is a qualitative detection of nucleic acid from SARS-CoV-2 from upper and lower respiratory specimen such as nasopharyngeal / oropharyngeal swabs. This test is a fluorescence probe based real-time PCR technology to qualitatively detect SARS-CoV-2. It is a selective amplification of target nucleic acid from the sample by use of target-specific forward and reverse primers for ORF1 / a non-structural region that is unique to SARS-CoV-2 virus.¹¹

RNA extracted from upper and lower respiratory specimens is reverse transcribed to cDNA and subsequently amplified and detected using SARS CoV2 specific primers and TaqMan based fluorescent probes. Biosystems QuantStudio7 Flex (QS7) instrument with software version 1.3 was used. The kit used for detection of SARS-CoV-2 was the TaqPath RT-PCR Covid-19 kit.¹² The kit is based on multiplex assays containing three primer / probe sets specific to different SARS-CoV2 genomic regions (ORF1ab, *N gene* and *S gene*) and also primers and probes for bacteriophage MS2 (which is an internal process control for nucleic acid extraction).

The annealing of the probe to a specific target sequence located between the forward and reverse primers occurs during the amplification process. The 5' nuclease activity of the Taq polymerase degrades the bound probe during the extension phase of the PCR cycle. This results in the separation of the reporter dye from the quencher dye which leads to generation of the fluorescent signal. The intensity of fluorescence is monitored at each PCR cycle by QS7.

Procedure

All patients underwent detailed history, clinical evaluation including vitals like SPO2 monitoring, routine laboratory and radiological investigations including high resolution computed tomography (HRCT) thorax. They were medically managed with antipyretics, zinc and vitamin C supplementation. Antibiotics were given empirically if there was any clinical and / or haematological evidence of secondary bacterial infection.

Various samples (nasopharyngeal and oropharyngeal swab, bronchoalveolar lavage, tracheal aspirate) as deemed appropriate, were collected from patients. Specimen referral form (SRF) ID information for Covid-19 (SARS-CoV-2) was generated in RT-PCR app in KIMS hospital. After proper labelling and triple layer packaging samples were transported, maintaining cold chain to the referral centre for diagnosis of SARS-CoV-2, RMRC, Bhubaneswar.¹² The diagnosis of SARS-CoV-2 in the said centre was done as per their protocol and the results were communicated to KIMS by appropriate government agencies.

Patients with two consecutive RT-PCR negative reports at least 24 hours interval with clinical improvement were declared cured. In our institute, samples were collected on day 9 and 10 of admission. This protocol was followed till dt.08 / 05 / 2020 as per Indian Council of Medical Research Guidelines.¹³ After dt. 8 / 5 / 20 the repeat testing protocol was discarded as per Ministry of Health and Family Welfare, Govt. of India guidelines and the discharge protocol was decided on the basis of the following criteria:

- Afebrile for 3 consecutive days.

- Normal oxygen saturation and
- 10 days of stay in the COVID hospital.¹⁴

The study was approved by the Institutional Ethics Committee.

Statistical Analysis

All the data collected was recorded in a single excel chart. Data was represented as percentage and mean. Comparison of means was done using student t-test. P-value < 0.5 was considered significant. All the calculations were done using Stata 15.1 software.

RESULTS

Majority (86.76 %) of the patients were less than or equal to 65yrs of age. A total of 272 consecutive cases were included in the study that included 233 (85.7 %) males and 39 (14.3 %) females; M:F ratio was 5.97:1 (Table 1A). Out of the 272 patients, 79 % were asymptomatic. Of the 57 symptomatic patients, 45 (78.94 %) showed mild symptoms and 12 (21.06 %) showed severe symptoms. Among symptomatic patients, fever (87.72 %), cough (82.46 %), dyspnea (80.7 %) and myalgia (70.18 %) were most commonly observed (Table 1B).

High resolution CT scan (HRCT) of thorax was done in all the 272 cases. HRCT was normal in majority (84.56 %) of patients. Bilateral consolidation, ground glass opacities suggestive of typical SARS-CoV-2 was seen in 33 out of the 57 symptomatic patients (78.57 %) and segmental shadows, discrete centrilobular nodules, unilateral fibrosis with consolidation (atypical presentation) was seen in 9 patients (21.43 %).

The mean value of routine investigations performed for all the patients were within the laboratory normal ranges except for a raised mean CRP levels in 41.7 % cases (Table 2A). The mean CRP levels were significantly raised when compared between symptomatic (27.29 ± 11.197 mg / L) and asymptomatic patients (70.96 ± 25.88 mg / L) ($P < 0.0001$). However, the comparison between mild (70.55 ± 20.45 mg / L) and severely symptomatic patients (70.9 ± 10.49 mg / L) was not significant ($P = 0.7$).

Diabetes mellitus and hypertension were the most common co-morbidities observed in 95 % and 3.7 % respectively. All patients were given zinc and vitamin C supplementation. Anti-pyretics were used when needed. Antibiotics were given empirically if there was any clinical and / or haematological evidence of infection.

The initial period between dt. 5 / 4 / 20 to dt. 8 / 5 / 20 included 60 positive cases with 36 (60 %) males and 24 (40 %) females. HRCT performed in these cases showed normal findings in 40 cases (66.7 %) while the remaining 20 cases showed typical ground glass opacities (33.3 %). The latter were followed up. Ground-glass opacities were persistent in all these cases which cleared for 8 patients (13.3 %) by 3 weeks and persisted beyond for the remaining cases (Figure 1).

	Number of Cases	% of Total Cases
Age distribution (N = 272)	0 - 20 years	29
	21 - 40 years	147
	41 - 60 years	79
	> 60 years	17
Sex distribution	Male	233
	Female	39

Table 1A. Age and Sex Distribution

	Number of Cases	% of Total Cases
Fever	50	87.7
Cough	47	82.45
Breathlessness	46	80.70
Myalgia	40	70.17
Diarrhoea	7	12.2
Anosmia	2	3.5
Abdominal pain	1	1.7

Table 1B. Presenting Complaints (N = 57)

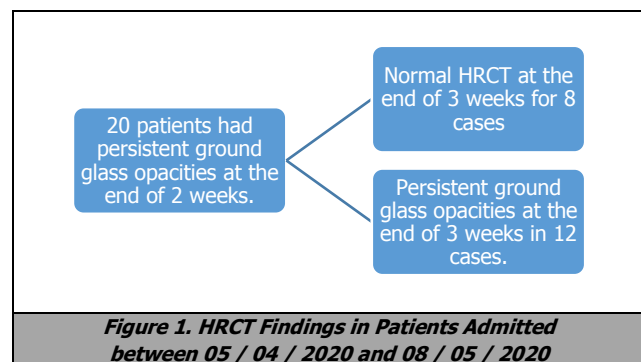


Figure 1. HRCT Findings in Patients Admitted between 05 / 04 / 2020 and 08 / 05 / 2020

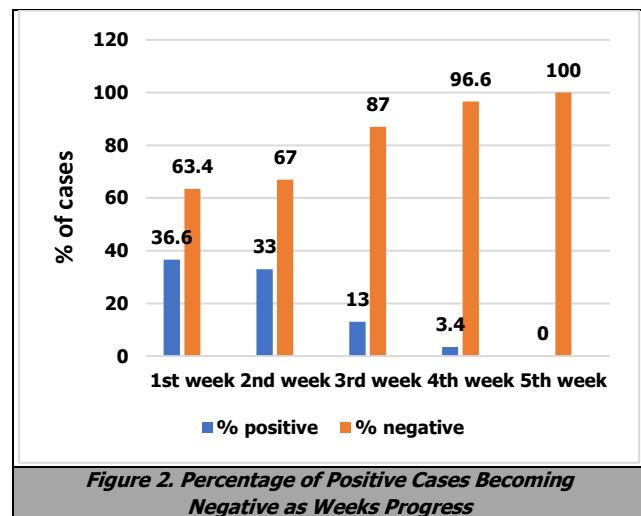


Figure 2. Percentage of Positive Cases Becoming Negative as Weeks Progress

Parameter	Mean \pm SD	Normal Range
TLC ($10^3 / \mu\text{L}$)	8.40 ± 3.42	4 - 10
N (%)	58.09 ± 11.63	40 - 80
L (%)	29.62 ± 9.34	20 - 40
Bilirubin (mg / dl)	0.453 ± 0.99	0.20 - 1.2
SGOT (U / L)	43.61 ± 35.24	0 - 40
SGPT (U / L)	41.54 ± 37.58	5 - 40
Urea (mg / dl)	21.95 ± 7.8	12 - 42
Creatinine (mg / dl)	0.72 ± 0.34	0.6 - 1.3

Table 2. Mean Laboratory Parameters

Mean Age (Years)		56.18 \pm 14.58	
Mean CRP level (mg / L)		72.45 \pm 20.9	
Sex distribution		No. of Cases	%
	Male	4	80
Co-morbidities	Female	1	20
	Initial presentation with severe ARDS	4	80
	Diabetes mellitus	2	40
	Hypertension	2	40
Co-morbidities	COPD	1	20

Table 3. Mortality Data

The delay in radiological clearance also correlated with the clearance of the virus as 33.3 % patients continued to

remain positive at the end of 2 weeks. Complete viral clearance took 5 weeks (Figure 2). At the initial period of pandemic in Odisha there was 70 % cure rate that was more than national cure rate of 30 % that was dynamically changing.

Following a change in the discharge protocol of patients on 08.05.2020, a total of 212 cases were admitted between 09 / 05 / 2020 and 04 / 06 / 2020, indicating a surge in admission due to rapid spread of Covid-19 infections. Majority of the patients were males (186; 87.3 %) and belonged to the age group of 21 - 40 years (54.24 %). The patients were mostly asymptomatic (77.83 %). HRCT thorax was performed for all patients which was mostly normal (89.62 %). Findings typical of Covid-19 were observed in 6.13 % cases while atypical features like segmental shadows, nodules etc. were seen in 4.25 % cases.

A total of 272 patients were admitted out of whom 267 (98.16 %) were cured. The mortality was 1.83 % of whom 4 were males and 1 was female. The mean age of the non-survivor was 56.18 ± 14.58 years. 4 patients (80 %) had severe acute respiratory distress syndrome (ARDS) at presentation. Diabetes mellitus and hypertension were the commonest co-morbidities associated (Table 3).

DISCUSSION

Majority of the patients were asymptomatic or had mild respiratory illness. In all these cases there was eventual clinical recovery in spite of prolonged viral shedding.¹⁵

Our cure rate of 50 % in the initial period of pandemic went up to 98.17 % in spite of surge in admission and is far more than national cure rate of around 60 %. Radiological abnormalities persisted in 20 % cases among delayed viral clearance groups beyond 3 weeks which were not translated into clinical deterioration.

As the pandemic started unfolding, the Indian regulatory agencies went on dynamically changing the criteria for testing and quarantine. The initial clinical presentations included fever, dry cough and shortness of breath; the Centres for Disease Control and Prevention (CDC) added chills, muscle pain, headache, sore throat and new loss of taste or smell as six more symptoms indicative of possible SARS-Cov-2 infection.¹⁶

In our study presence of diabetes and hypertension was seen in around 9.5 % and 3.7 % cases respectively. Diabetics suffering from Covid-19 are at risk of adverse outcomes and even mortality due to impaired immune response especially T-cell response, heightened inflammatory response, hypercoagulable state and associated comorbidities like obesity, heart and kidney disease. Emerging data suggests that Covid-19 is common in patients with diabetes, hypertension and cardiovascular disease (CVD). Epidemiology Working Group of Chinese Centre for Disease Control and Prevention that investigated 20,982 patients of Covid-19 have shown that hypertension, diabetes mellitus and CVD were associated in 13 %, 5 % and 4 % of patients respectively.¹⁷ Similarly, in a meta-analysis of 8 trials that included 46,248 Covid-19 patients,

Yang et al.¹⁸ reported a prevalence of 17 %, 8 % and 5 % for hypertension, diabetes, and CVD respectively. The impact of hypertension and CVD is still uncertain, however in our series small numbers encountered may be insufficient to draw any conclusion.

Computed tomography imaging has been routinely used in our institute to correlate the extent of parenchymal involvement in all confirmed cases. It can alert the clinician to look for any characteristic signs of Covid or any other comorbidity. The hall mark of typical Covid-19 pattern on CT images are bilateral and peripheral ground glass opacities, consolidation according to different studies^{19,20,21} which is consistent with our observations of 6.1 % cases. 4.24 % cases showed atypical pattern showing fibrosis, isolated subsegmental shadow, centrilobular nodules etc. that raised a suspicion of co-morbid illnesses like pulmonary tuberculosis. However, possibility of role of innate or acquired immunity due to impact of latent tuberculosis (TB) infection in atypical radiological presentation cases needs further study. Universal BCG vaccination may also play a role in inducing T cell induced immunity that may have some protective role in asymptomatic having high cure rate which needs further study.

Raised CRP was witnessed as biomarker of viral inflammation. All cases were followed up to one month and did not reveal any relapse. The mortality rate was 1.83 % which is comparatively lower than 2.9 % in India as per studies made by Samander Kaushik et al.²²

CONCLUSIONS

Our study reports the largest experience of clinical, virological, biochemical and pulmonary imaging patterns of Covid-19 confirmed cases. In the initial phase of pandemic the post treatment follow-up revealed a delayed viral clearance beyond two weeks. There was discordance between CT images and the clinical condition. Presence of co-morbidities and high CRP was associated with mortality in our study.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

Financial or other competing interests: None.

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