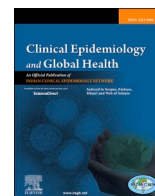




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Clinicoepidemiological and laboratory findings of COVID positive patients presenting to a tertiary care centre in South India: A retrospective analysis

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ABSTRACT

Background: SARS CoV2 continues to pose a threat to human race even after one year of its outset in China. Observational studies from across the world have shown huge disparity in the clinicoepidemiological and laboratory features of this disease. In this study we attempt to assess the clinical, epidemiological and laboratory parameters of COVID 19 positive patients in this geographic location.

Methods: This is a descriptive retrospective study of patients who were tested positive for SARS-CoV-2 at a tertiary care centre in central Kerala, India between July 16, 2020 and November 30, 2020. The clinicoepidemiological and laboratory parameters of the confirmed patients were collected from the laboratory and hospital records and analysed.

Results: A total of 1051 patients were tested positive during the study period. The mean age of the patients was 45.7 years \pm Standard Deviation (SD): 8.68; 51.76% were male. Among them 658 (62.61%) were symptomatic and 393(37.39%) were asymptomatic; males (54.7%) were more symptomatic than females (45.3%). The common presenting symptoms were fever (43.58%), cough (21.50%), myalgia or fatigue (10.28%). Lymphocytopenia was more in males than females. Laboratory parameters such as Serum Ferritin, Alanine Transferase, Aspartate Transferase, Sodium level were elevated in males compared to female.

Conclusion: The common symptoms in our study could emphasize on identifying potential patients in this geographic area. Asymptomatic patients should be monitored and investigated for effective control of the disease. A knowledge about the disease presentation in each geographic area is important in planning the effective management strategies since the features are varied from place to place.

1. Introduction

On March 11, 2020, World Health Organization (WHO) has declared the Coronavirus Disease 2019 (COVID-19) outbreak as a global pandemic.¹ The disease brought life to an unexpected standstill and continues to wreak havoc around the world. As of now there are over 91 million confirmed cases of COVID-19 including nearly 2 million deaths globally²

The first case in India was reported on Jan 30, 2020, in Thrissur, Kerala from a student who returned from Wuhan, China.³ In February 2020, there was no significant rise in case. By the month of March there was a substantial increase in the number of positive cases due to increased travel from affected countries,⁴ gradually the disease spread across the whole country. India became the second most affected

country in the world contributing to over 10 million confirmed cases and over 1 lakh deaths²

Understanding the clinical and epidemiological characteristics of the disease became an important step for effective detection and management of COVID-19. The clinical and epidemiological characteristics of COVID-19 were reported across the world.^{5–9} However most of these reports have variable characteristics suggesting the diversity and novelty of the disease across the world. Therefore, it is important to analyse the clinical and epidemiological characteristics in a local population for better management of the disease.

In this study we retrospectively analysed the clinical and epidemiological characteristics of patients diagnosed as COVID 19 positive by laboratory investigations in a tertiary care centre in South India. We also attempted to compare the disease characteristics in symptomatic and

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asymptomatic patients.

2. Methods

2.1. Data collection

This is a descriptive retrospective study conducted in the department of Microbiology, Jubilee Mission Medical College, Thrissur, Kerala between July 16, 2020 and November 30, 2020. The centre is a 1700 bedded tertiary care centre which caters patients from three districts. All patients who were tested positive for SARS CoV2 during the study period were included in our study. Those who had indeterminate or inconclusive results were excluded from the study. The clinical, epidemiological and laboratory findings of these patients at the time of testing were collected from the laboratory and hospital registers as per the proforma available as supplementary data and analysed statistically.

The testing for COVID 19 was done in the molecular diagnostic laboratory of the Microbiology Department which is an ICMR approved and National Accreditation Board of Testing and Calibration Laboratories (NABL) accredited centre for COVID 19 testing. During the study period 17057 RTPCR and 12973 antigen test was done. All patients admitted in the hospital along with their bystander had to undergo Covid test irrespective of their signs and symptoms. The following categories of people had undergone testing in our centre during study period.

- Patients with signs and symptoms suggestive of COVID 19: 6453
- All patients admitted to the hospital:10575
- Patients posted for surgeries:450
- Bystanders of the patient:10952
- Contacts of the laboratory confirmed cases: 1250
- Travellers:350

Nasopharyngeal/oropharyngeal swabs were collected from the above groups as per the national and state guidelines for testing. The diagnosis was made by either COVID 19 Real Time-Polymerase Chain Reaction (RT-PCR) or Antigen tests abiding by these guidelines.

2.2. Statistical analysis

The categorical variables were expressed in frequency and percentage. The continuous variables were expressed in mean, Standard Deviation (SD) and median. The difference between categorical variables were analysed with Chi-square Test or Fisher exact Test. All statistical analysis was performed using Statistical Package for the Social Science (SPSS) software version 26.0.

3. Results

During the study period from July 16th to November 30th 2020 a total of 1051 cases were tested positive for COVID 19 at our centre. Out of 1051 cases, 799 cases were confirmed by RT-PCR and 252 cases by Antigen test. We retrospectively analysed these 1051 confirmed cases of COVID-19. Out of 1051 cases, 800 cases were admitted in the hospital. Among 800 cases, 336 cases were category A, 356 cases were category B and 108 cases were category C.¹⁰ A total of 858 patients (81.6%) were recovered, 91 cases were transferred, 63 were opted for home treatment and 39 patients (3.71%) died in which 29(74.3%) were males. The clinical and demographic characteristics are shown in Table 1. Mean age of the patients were 45.7 years (Standard Deviation SD = 18.68). Majority of the patients belonged to the age group 15–47 years (48.91%). Out of 1051 patients, 658 (62.61%) were symptomatic and 393(37.39%) were asymptomatic. Males 544 (51.76%) were more than the females.

The common presenting symptoms were fever (43.58%), cough (21.50%), myalgia or fatigue (10.28%), sore throat (9.99%), dyspnoea (8.37%), headache (6.18%). The less common symptoms include

Table 1

Clinical and epidemiological characteristics of COVID-19 patients.

Parameters	n = 1051	%
AGE(YEAR)		
Mean \pm SD ^a	45.7 \pm 18.68	–
Range	0–93	–
0–14 (paediatric group)	37	3.52
15–47 (young group)	514	48.91
48–63 (middle age group)	295	28.07
\geq 64 (elderly group)	205	19.50
GENDER		
Male	544	51.76
Female	507	48.24
PRESENCE OF SYMPTOMS		
Symptomatic	658	62.61
Asymptomatic	393	37.39
SIGNS AND SYMPTOMS		
Fever	458	43.58
Cough	226	21.50
Others	167	15.89
Myalgia/Fatigue	108	10.28
Sore throat	105	9.99
Dyspnoea	88	8.37
Headache	65	6.18
Rhinitis	35	3.33
Anosmia	31	2.95
Loose stools	28	2.66
Vomiting	19	1.81
Abdominal pain	15	1.43

^a Standard Deviation.

rhinitis, anosmia, loose stools, vomiting, dysphagia, altered mental state, haemoptysis, dysuria, sinusitis, syncope, giddiness, appetite loss etc (Table 1).

The laboratory blood investigations were done for 490(46.62%) patients (Table 2). The blood test results showed that 12.22% of patients had increased leukocyte count and 8.49% of patients had decreased leukocyte count. Neutrophilia was seen in 28.9% of patients and lymphopenia in 34.45% of patients. Varying degree of liver dysfunction with an increase in aspartate aminotransferase (52.52%), alanine aminotransferase (28.73%) and alkaline phosphatase (10.83%) were seen. The sodium and potassium levels were decreased in 47.78% and 35.31% of patients respectively. Inflammatory markers like C-reactive protein is increased in 52.19% of patients while 41.73% had Serum ferritin above normal range. D-dimer, troponin and Lactate dehydrogenase were increased in majority of tested patients.

3.1. Comparison of clinical laboratory parameters of symptomatic and asymptomatic patients (Table 3)

There was significant difference in age and sex between symptomatic and asymptomatic patients. Males (54.7%) were more symptomatic than females (45.3%) (P = 0.013). Compared to asymptomatic patients, symptomatic patients were significantly older (P < 0.01). The occurrence of leukocytosis and lymphopenia were found similar in both symptomatic and asymptomatic patients. Asymptomatic patients have more liver dysfunction with significant difference in Alkaline Phosphatase levels (P = 0.001). Asymptomatic patients have 16.9% of increased ALP while symptomatic patients have 8.1% increase. Reduced levels of sodium and potassium were found in symptomatic patients. CRP level were found to be significantly elevated in symptomatic patients than in asymptomatic patients with a P value of 0.001.

3.2. Comparison of clinical and laboratory parameters of male and female patients (Table 4)

The Mean age \pm SD of male is 47.7 \pm 18.3 while that of female is 43.7 \pm 18.7 years. Infected males are significantly older than females(P < 0.001). Among all signs and symptoms only cough shows significant

Table 2
Laboratory findings of tested COVID-19 patients.

Parameters	Total test done	n	%
Leukocyte count (x10 ⁹ /L)			
Normal	483	383	79.3
Decreased		41	8.49
Increased		59	12.22
Neutrophil count (%)			
Normal	481	327	67.98
Decreased		15	3.12
Increased		139	28.9
Lymphocyte count (%)			
Normal	479	259	54.07
Decreased		165	34.45
Increased		55	11.48
Eosinophil count (%)			
Normal	479	311	64.93
Decreased		158	32.99
AST (U/L) ^a			
Normal	436	203	46.56
Increased		229	52.52
ALT (U/L) ^b			
Normal	449	319	71.05
Increased		129	28.73
ALP (U/L) ^c			
Normal	396	350	88.38
Increased		43	10.86
Serum protein (g/dl)			
Normal	374	280	74.87
Increased		84	22.46
Potassium (meq/l)			
Normal	405	254	62.72
Decreased		143	35.31
Sodium (meq/l)			
Normal	406	209	51.48
Decreased		194	47.78
CRP (mg/dl) ^d			
Normal	297	141	47.47
Increased		155	52.19
D-dimer (ng/ml)			
Normal	249	59	23.69
Decreased		48	19.28
Increased		142	57.03
Ferritin (ng/ml)			
Normal	139	78	56.12
Increased		58	41.73
Troponin (ng/ml)			
Normal	42	19	45.24
Increased		23	54.76
LDH (U/L) ^e			
Normal	31	10	32.26
Increased		21	67.74

^a Aspartate Aminotransferase.

^b Alanine Aminotransferase.

^c Alkaline Phosphatase.

^d C Reactive Protein.

^e Lactate Dehydrogenase.

difference between male and female ($P = 0.01$). There is a high significant difference in lymphocyte count in males and females ($P = 0.007$). Lymphopenia is seen mainly in males than females. Laboratory parameters such as Serum Ferritin, Alanine Transferase, Aspartate Transferase, Sodium level shows significant difference in males and females. All of them were increased in males ($p < 0.05$).

4. Discussion

Kerala was known for effective control and management of COVID-19 ¹¹ hence the clinical and epidemiological characteristics of COVID-19 in Kerala are worth reporting.

The mean age of our patients is similar to the previously published reports in North India ^{7,8} and lower compared to other countries reports, ^{5,12,17} this may be due to the higher proportion of young population in India. The disease was more in males than females and was

Table 3
Comparison of symptomatic and asymptomatic COVID-19 patients.

Variables	Total Case	Symptomatic n (%)	Asymptomatic n (%)	P
Sex				.013
Male	544	360(66.2)	184(33.8)	
Female	507	298(58.8)	209(41.2)	
Age(year)				.008
Mean \pm SD	45.7 \pm 18.6	47.2 \pm 18.3	43.3 \pm 19.01	
Age \geq 64 year	204	139(68.13)	65(31.87)	
Laboratory parameter ^a				
Increased D-dimer	14	104(57.1)	38(56.7)	0.42
Increased Ferritin	58	45(43.7)	13(36.1)	0.27
Increased Troponin	23	18(51.4)	5(71.4)	0.32
Increased LDH ^d	21	14(63.3)	7(77.8)	0.43
Increased CRP ^b	155	122(58.7)	33(37.1)	0.001
Leukocytopenia	59	29(11.9)	12(13)	0.88
Neutrophilia	139	101(30.8)	38(24.8)	0.40
Lymphocytopenia	165	114(34.9)	51(33.6)	0.93
Increased AST ^c	229	159(53.4)	70(50.7)	0.82
Increased ALT ^d	129	92(30.2)	37(25.7)	0.41
Increased ALP ^e	43	22(8.1)	21(16.9)	0.001
Decreased Potassium	143	106(38.4)	37(28.7)	0.053
Decreased Sodium	143	137(49.6)	57(43.8)	0.15

^a Lactate Dehydrogenase.

^b C Reactive Protein.

^c Aspartate Aminotransferase.

^d Alanine Aminotransferase.

^e Alkaline Phosphatase.

Table 4
Comparison of male and female COVID-19 patients.

Variables	Male n(%)	Female n(%)	P
Mean age \pm SD	47.7 \pm 18.3	43.7 \pm 18.7	.001
Symptoms ^a			
Fever	251(46.1)	207(40.8)	.09
Cough	134(24.6)	92(18.1)	.01
Myalgia/Fatigue	52(9.5)	56(11.04)	.74
Sore throat	45(11.8)	60(8.3)	.06
Dyspnoea	52(9.6)	36(7.1)	.18
Headache	28(5.1)	37(7.3)	.14
Laboratory parameters ^a			
Leukocytosis	35(13.7)	24(10.6)	.52
Lymphocytopenia	103(40.6)	64(27.6)	.007
Neutrophilia	85(33.3)	54(23.9)	.71
Eosinopenia	90(35.6)	68(30.1)	.20
Increased CRP ^b	94(57.3)	61(45.9)	.07
Increased D-dimer	78(60.5)	64(53.3)	.52
Increased Ferritin	47(54)	11(21.2)	.001
Increased AST ^b	150(63.3)	79(39.7)	.001
Increased ALT ^c	92(37.6)	37(18.1)	.001
Decreased potassium	66(30.7)	77(40.5)	.11
Decreased sodium	123(56.4)	71(37.8)	.001

^a C Reactive Protein.

^b Aspartate Aminotransferase.

^c Alanine Aminotransferase.

consistent with previous studies from India and around the world. ^{5,7,12,16,19} The most common symptom was fever which is similar to the reports from North India, ⁸ Saudi Arabia, ¹⁶ China ^{5,9,14} but different from other studies around the world ^{7,17,18} where cough is the most common symptom ¹³

Higher levels of C Reactive Protein, D-Dimer, Troponin, Lactate dehydrogenase are seen in 52.19%, 57.03%, 54.73%, 67.74% of patients. According to the meta-analysis of 16 studies by Zeng et al. ¹⁵ higher levels of inflammatory markers indicate severity of the disease. A positive correlation was observed between inflammatory markers and liver enzymes which is consistent with the previous report ¹⁹ It is worth to note higher level of alkaline phosphatase are seen in 16.9% of

asymptomatic patients compared to symptomatic patients (8.1%). According to the study in Ranchi, Jharkhand liver injury is common in COVID-19 patients and alkaline phosphatase is one of the best indicator for Covid-19 induced liver injury.²⁰ Our study shows that symptomatic patients belongs to older age group (Mean age \pm SD:47.2 \pm 18.1) compared to asymptomatic patients (Mean age \pm SD 43.3 \pm 19.1) which is statistically significant(P:0.08). Laboratory findings such as D-Dimer, Ferritin, Troponin, Lactate Dehydrogenase is increased in 53.87% of symptomatic and 60.5% of asymptomatic patients.

Our study shows that males (66.2%) are significantly more symptomatic compared to females (58.8%) (P:0.01). According to a study by Scully et al.²¹ the difference in clinical parameters may be due to difference in sex chromosomes, epigenetic modification, transcriptional factors and sex steroid concentration that leads to varying degree of immune response in males and females. Increased levels of ALT were seen in 37.6% of males and 18.1% females ($P < 0.0001$) and increased level of AST were seen in 63.3% of males and 39.7% of females ($P < 0.000$). Increase liver dysfunction enzymes may be due to higher expression of ACE2 receptors in males.^{22,23}

The major limitation of our study was the retrospective study design and the insufficient data on clinical and laboratory profile of the patient. Severity and course of the disease could not be analysed as the data was taken laboratory registers which mainly came from test requisition accompanying samples. Initially all COVID 19 positive patients were admitted in the hospital as per the state guidelines regardless of severity of the disease. With the change in government protocol, only symptomatic patients were admitted and asymptomatic patients were given home treatment thus laboratory investigations done for asymptomatic patients became limited.

However, the data in this study permit to assess the early clinical and epidemiological characteristics of Covid-19 in South India.

The clinicoepidemiological characteristics of Covid-19 patients behaved differently in different geographical location. The common symptoms in our study could emphasize on identifying potential patients in this geographic area. Asymptomatic patients should be monitored and investigated for effective control of the disease. A knowledge about the disease presentation in each geographic area is important in planning the effective management strategies since the features are varied from place to place.

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Ethical approval

The study was conducted after getting the Institutional ethics committee approval Jubilee Centre for Medical Research (JCMR), Jubilee Mission Medical College & Research Institute Institutional Ethical Committee Number: 42/21/IEC/JMMC&RI.

Declaration of competing interest

The authors declare that they have no competing interests.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.cegh.2021.100931>.

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