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Demographic, Clinical, Laboratory and Radiological Spectrum of COVID-19 patients

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ABSTRACT

Aim: To find out the demographic, clinical, laboratory and radiological spectrum of COVID-19 patients.
Study design: Cross-sectional observational study.
Place and duration of study: Al-Tibri Medical College Hospital, Isra University Karachi campus Karachi from June 2021 to December 2021.
Methodology: The study enrolled adult patients of both genders with COVID-19 infection confirmed through positive qualitative RT‑PCR from nasal swab. After obtaining informed consent each confirmed patient with COVID-19 disease underwent a process of detailed medical history, clinical examination, laboratory tests, and radiological assessment. Based on presentation patients were divided into three groups; Group I, asymptomatic patients having only positive for COVID 19 were advised for self-isolation at home, Group 2 patients with mild symptoms and admitted to ward for observation and monitoring, while Group 3 were patients with moderate to severe disease and requiring intensive care.
Results: A total of 179 patients with a mean age of 49.218±13.237 years (rang 18 to 85 years) were enrolled in the study with gender based presentation 51 (28.5%) were women and 128 (71.5%) were men. Clinically; main symptoms were fever in 155 (86.6%), shortness of breath 129(72.1%), cough 126 (70.39%), and body ache in 104 (58.1%). Twenty six (14.5%) patients were asymptomatic (Group I), 107(59.8%) were symptomatic mild disease (Group II) and 37 (20.7%) patients presented with moderate to severe symptomatic illness (Group III). The majority of study participants 140 (78.21%) have various comorbidities, DM 60(33.5%), hypertension in 61(34.1%).
Conclusion: Our study has highlighted the variability of most aspects of COVID-19 and this might be the main reason why the spectrum of the disease cannot be predicted. Radiologic, pulmonary with clinical patterns are relatively specific but extra pulmonary involvement especially hepatic may misguide and worse the prognosis.
Keywords: COVID-19. Pandemic. Demographic. Clinical. Laboratory. Radiologic. Spectrum.

INTRODUCTION

The Coronavirus disease 2019 (COVID-19) was first presented in December 2019 in Wuhan, China as clusters of pneumonia cases.[1] Subsequently, due to its highly infectious and rapidly spreading characteristics, World Health Organization (WHO) declared it as a pandemic within three months of its discovery on 11th March 2020 due to its highly contagious and rapidly spreading properties[2]. Since then, almost every country has been affected by this deadly disease and emphasizing the threat it poses to global health. In Pakistan the first two cases of COVID-19 appeared on February 26, 2020. Gradually, these cases increased exponentially until May 2022 the total number of confirmed cases has passed over 1.53 million and more than 30000 deaths have been caused by COVID in Pakistan so far[3].

COVID 19 has affected all countries worldwide differently from high infection and death rates in USA (>124000 cases/million &>2000 death/million population), Brazil (>97000 cases/million &>27000 deaths/million population) to low infection and death rates in New Zealand (700 cases/million & only 05 deaths/million population) and Tajikistan (1700 ceases/million & 13 deaths/million population)[4]. Furthermore, this dissimilarity has created a big room in research to identify the possible reasons/factors of variability related to virus, host and environment. During the first few months of the COVID 19 pandemic, few assumptions were materialized like temperature/climate, geographical, racial, socioeconomic factors age and associated comorbidities of patient have role in acquiring infection and outcome of disease. But later, the behavior of COVID 19 invalidated all these beliefs as the disease was affected independently of mentioned factors. Hence, the question of the discrepancy of COVID 19 infection and associated mortality has not yet been confidently answered even after 2 years of pandemic and this demands further studies to ascertain the rationale for different attitude and symptomatology of

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COVID 19 infection [5A] and its outcome towards apparently similar characteristics.

It has been well obvious now that COVID‑19 has emerged as a multi systemic disease involving respiratory, cardiovascular, gastrointestinal, neurological, hematopoietic and immune systems[6] and this has been linked tospeculation that COVID 19 infection leads to an excessive immune response in the host causing extensive tissue damage termed as a "cytokinestorm"[7]. In addition, the multisystem nature of COVID 19 disease results in wide variable clinical, laboratory and radiological spectrum of the disease. Clinically; spectrum has been ranging from completely asymptomatic presentation to a severe condition progressing to respiratory failure and multiple organ dysfunction syndrome. Similarly, the laboratory spectrum of COVID 19 has wide array of findings from mild abnormal results on routine laboratory tests to severe hematological, serological, inflammatory markers and blood gases abnormalities. From radiological perspective, COVID 19 patients may exhibit different patterns such as bilateral lower lung peripheral air space opacities/consolidation presenting in variable patterns[8] and the ground‑glass appearance on chest radiograph refers to a diffuse hazy opacity that does not obscure the underlying bronchial structures[9].

Our aim of this study was toattemptto fill the current knowledge gap about COVID 19 patients by presenting detailed demographic, clinical, laboratory and radiological characteristics of 179 outpatients or hospitalized patients.

PATIENTS AND METHODS

This research was cross sectional prospective study conducted at Al Tibri Medical College Hospital a Tertiary care Hospital of Karachi, Pakistan. This study was carried out from June 2021 to December 2021. Sampling Technique used was non-probability convenient sampling technique was used in this study.
Sample size: The research was time based/bound prospective study rather a sample size based.

Data collection procedure: The data was collected from all patients presented to hospital services with clinical picture or incidental laboratory reports of evidence for COVID-19 infection.

Ethical approval: Ethical approval by the institutional ethical committee was obtained before initiating the study and during study and data collection, the complete confidentiality of participants was maintained.

The study enrolled adult patients of both genders who presented to the outpatient emergency department or those admitted for other services of hospital like surgical, medical and obstetrical procedures having clinical suspicion of COVID-19 infection were assessed and confirmed through positive qualitative RT‑PCR from nasal swab. After obtaining informed consent each confirmed patient with COVID-19 disease underwent a process of detailed medical history (demographics, history of contact with COVID-19 patients and comorbidities), clinical examination (vital signs, oxygen saturation, and chest examination), laboratory tests (routine tests as well as inflammatory markers such as ferritin, C reactive protein (CRP) and D dimer in selected cases) and radiological assessment (chest x-ray and chest Computed Tomography in selected cases).

All of those parameters (demographic, clinical, laboratory and radiological) were evaluated for relationship among those various factors. Based on presentation patients were divided into three groups; Group I asymptomatic patients having only positive for COVID 19 were advised for self-isolation at home, Group II patients with mild symptoms and admitted to ward for observation and monitoring, while Group III were patients with moderate to severe disease and requiring intensive care. By profession; the studied subjects were broadly divided into subjects with health related job working in/with hospital or non-health job subjects having profession other than hospital/patient care.

The monitoring and management of these three group of patients were explained and discussed with the patients and their families accordingly. All the care givers involved in suspected or confirmed cases of COVID 19 patients were fully endowed with personal protective equipments for their safety and protection.

Data analysis: Data were entered and analyzed using SPSS version 23.0 software. Categorical variables were presented as counts and percentages, while means and standard deviations (SDs) were used for continuous variables. Statistical analysis was performed by using Chi-Squire test for categorical variable and the p-value< 0.05 was considered statistically significant.

RESULTS

Demographics: A total of 179 patients with a mean age of 49.218±13.237 years (rang 18 to 85 years) were enrolled in the study. Of these, 51(28.5%) were women while men were 128(71.5%) with a mean age of 48.33±15.687 and 49.57±12.176 years respectively. The educational status of studied subjects was mainly primary to matric; 58(32.4%) middle pass, 51(28.5%) were having deeni or primary level education, 39(21.8%) have matriculation, 21(11.7%) were having graduation, 5(2.8%) subjects had master in education and 5(2.8%) had no education at all. Statistically, age, gender and educational status showed no significant association with patents disease status at presentation (p-value= 0.081, 0.516 & 0.063 respectively). From socioeconomic perspective; most of the studied subjects 130(72.6%) belonged to the low middle class, followed by upper middle class 31(17.3%), below poverty line 12(6.7%) while 06(2.8%) of subjects had high socioeconomic status class. Lower middle class was main group presented with moderate to severe disease 32(86.5%) as compare to other socioeconomic classes which was also statistically significance (p-value 0.016) as shown in Table III. By profession; subjects with health related job were 17(9.5%) or non health job 162(90.5%). Demographic details are shown in Table I.

Clinical manifestation: Clinically, 155(86.6%) patients had presented with fever, 129(72.1%) shortness of breath,126(70.39%) cough, 104(58.1%) body ache, 75(41.9%) throat pain, 72(40.2%)

anosmia, 28(15.6%) with sneezing while diarrhea was presentation of 49(27.4%) patients, details of the clinical presentation are shown in Table I.

Table I. Demographic, Clinical and Radiological spectrum of study subjects

Variable	N (%)
Age (years)	
≤ 20	02 (1.1%)
21 to 40	43 (24.0 %)
41 to 60	97 (54.2%)
≥ 61	37 (20.7%)
Gender	
Male	128 (71.5%)
Female	51 (28.5%)
Fever	
Yes	155 (86.6%)
High grade with chills	50 (27.9%)
High grade without chills	24 (13.4%)
Low grade with chills	23 (12.8%)
Low grade without chills	58 (32.4%)
No	24 (13.4%)
Cough	
Yes	126 (70.39%)
Cough only	76 (42.5%)
Cough with sputum	48 (26.8%)
Cough with sputum and blood	02 (1.1%)
No	53 (29.60%)
Sneezing	
Yes	28 (15.6%)
Sneezing with runny nose	16 (8.9%)
Sneezing without runny nose	12 (6.7%)
No	151 (84.4%)
Shortness of breath (SOB)	
Yes	129 (72.1%)
SOB on minimal exertion	58 (32.4%)
SOB on moderate exertion	49 (27.4%)
SOB at rest	22 (12.3%)
No	50 (27.9%)
Anosmia	
Yes	72 (40.2%)
No	107 (59.8%)
Diarrhea	
Yes	49 (27.4%)
No	130 (72.6%)
Throat pain	
Yes	75 (41.9%)
No	104 (58.1%)
Body ache	
Yes	104 (58.1%)
No	75 (41.9%)
Joint pain	
Yes	62 (34.6%)
No	117 (65.4%)
Restlessness	
Yes	85 (47.5%)
No	94 (52.5%)
Comorbidities	
DM	
Yes	60 (33.5%)
No	119 (66.5%)
Hypertension	
Yes	61 (34.1%)
No	118 (65.9%)
IHD	
Yes	08 (4.5%)
No	171 (95.5%)
Malignancy	
Yes	05 (2.8%)
No	174 (97.2%)
Asthma/COPD	
Yes	06 (3.5%)
No	173 (96.65%)
Mosque exposure	
Yes	57 (31.8%)
No	122 (68.2%)
Radiological findings	
Bilateral lung involvement	123 (68.7%)
Multilobe involvement	29 (16.2%)
CT Scan Chest findings	
Ground-glass appearance (GGA) only	110 (61.5%)
GGA with consolidation	18 (10.1%)
Consolidation only	16 (8.9%)
GGA with reticular &/or interlobular septal thickening	13 (7.3%)

Regarding the risk factors for COVID 19 infection, 57(31.8%) patients had a history of visiting mosques for prayers, a history of travel was present in only 19(10.6%) while 37(20.7%) subjects had history of exposure to confirmed COVID 19 cases. Based on presentation and disease severity; 35(19.6%) patient presented

mainly in OPD or incidentally found to have positive COIVD-19 RT‑PCR with no symptom at all, Group II has majority of study participants 107(59.8%) presenting mild symptoms with positive COIVD-19 RT‑PCR while 37(20.7%) patients belonged to Group III and presented to emergency department primarily with moderate to severe disease and were referred to the ICU after initial assessment and treatment at emergency department.

Table II. Laboratory spectrum of study subjects

Variable	N	Minimum	Maximum	Mean±SD
Hemoglobin	162	6.9	18.8	12.93±1.97
WBC	66	2.4	33.2	8.724±4.60
Platelet count	58	43	632	239±106
C-Reactive Protein (CRP)	129	0.5	310.9	72.44±72.79
ALT	130	13	629	63.03±66.99
ALP	129	37	518	107.6±79.019
S. Ferritin	79	10.33	2023.9	548.59±493.64
LDH	101	5.39	1195	496.4±222.124
D-Dimer	18	.20	8.95	1.776±2.435
PH	159	7.165	7.898	7.439±0.726
PO₂	159	24.60	199.7	93.26±33.797
Saturation	158	61.4	99.80	95.478±5.835

Table III. Presentation Based statistics of study population.

Variable	Group			p-value
	Group I	Group II	Group III	
Gender				
Male	26(74.3%)	81 (75.7%)	21 (56.8%)	0.081
Female	09 (25.7%)	26 (24.3%)	16 (43.2%)	(NS)
Age (years)				
≤20	01 (2.9%)	01 (0.9%)	00	
21-40	10 (28.6%)	21 (19.6%)	12 (32.4%)	0.516
41-60	17 48.6%)	60 (56.1%)	20 54.1%)	(NS)
≥61	07 (20.0%)	25 (23.4%)	05 (13.5%)	
Educational status				
No education	01 (2.9%)	04 (3.7%)	00	
Primary	09 25.7%	27 (25.2%)	15 (40.5%	
Middle	18 (51.4%	35 (32.7%)	05 (13.5%0	0.063
Matriculation	06 (17.1%)	24 (22.4%)	09 (24.3%)	(NS)
Graduate	01 (2.9%)	13 (12.1%)	07 (18.9%)	
Master	00	04 (3.7%)	01 (2.7%)	
Socioeconomic status				
Below poverty	01 (2.9%)	09 (8.4%)	02 (5.4%)	
Low Middle Class	29(82.9%)	69 (64.5%)	32 (86.5%)	0.016
High Middle class	02 (5.7%)	26 (24.3%)	03 (8.1%)	
High Class	03 (8.6%)	03 (2.8%)	00	

Comorbidities: The majority of study participants 140(78.21%) have various comorbidities, including diabetes mellitus in 60(33.5%), hypertension in 61(34.1%), ischemic heart disease in 8(4.5%) while 5(2.8%) had history of malignancy and 6(3.5%) have chronic respiratory disorders such as asthma or COPD on regular therapy.

Laboratory and radiological findings: Regarding the laboratory results of the study subjects, mean hemoglobin was 12.93±1.97, mean WBC was 8.724±4.60, mean platelets was 239±106, C reactive protein was 72.44±72.79, ALT 63.03±66.99, Serum ferritin 548.59±493.64, D-Dimer 1.776±2.435 as shown in Table II. Radiographically, the majority of patients 123(68.7%) showed bilateral lung involvement on chest x-rays, followed by multilobe involvement in 29(16.2%) patients while on CT scan chest Ground glass appearance (GGA) was seen in most of the patients 110(61.5%), Ground glass appearance with consolidation in 18(10.1%), pure consolidation in 16(8.9%) and ground glass appearance with reticular &/or interlobular septal thickening was observed in 13(7.3%) patients as shown in Table I.

DISCUSSION

The versatile behavior of the COVID 19 infection has challenged the health care systems of both developing and developed countries in all aspects of the disease such as risk factors, diagnosis, management and prognosis. The global and local health authorities together with researchers have been tried their best to authenticate various observations/results for final conclusive spectrum of the disease during the pandemic, but only viral

features have been well studied and confirmed while the clinical aspect is still not clear.

Demographic; mean age of study participants was 49.218±13.237 years (rang 18 to 85 years) which is consistent with the findings of other researchers[10-11]. Regarding gender based presentation, the majority of studies[12-13] found male dominance and our study results (men 71.5% vs females 28.5%) were supported the findings of those investigators. The reason for male dominance could be because of more outdoor activities and social gathering by males but further studies are required to confirm the reason along with mechanism.

In our study fever was the most prevalent symptom in 86.6% of patients and in accordance with Chen et al[14] who reported 92.8% in their study but the literature show wide variable results regarding the prevalence of symptoms, for example a study by Alshukry et al[15] reported fever in 34.3% of cases, while another study conducted by Wang & colleagues (8BBC) in the city of Wuhan reported a fever prevalence of 98.6%. The second and third most common symptom in our study were shortness of breath (70.39%) and cough (58.1%) respectively. Similar to fever, the variability in frequencies of findings has been reported by different investigators such as Alshukry et al[15] found shortness of breath in only 18.2% cases and dry cough was present in 32.6% subjects, on other hand, Chen et al[14] found shortness of breath in 34.5% cases and cough in 69.8% of study subjects.Although prevalences of COVID-19 symptoms vary by various investigators but most common symptomatology at presentation remained more or less the same such as fever, cough and fatigue, while other symptoms include sputum production, headache, hemoptysis, diarrhea, dyspnea, and lymphopenia[16-19]. The explanation for these wide variable findings of different investigators could be differences in demographics, inclusion and exclusion and diagnostic criteria used and the usefulness. Regarding laboratory findings; abnormal hematological finding noticed in our study are more as comparable to Nazir et al[13] findings while serological data are nearly comparable with some variations in CRP, and ferritin which has been well established as an acute phase reactant in COVID-19[20]. These differences can be explained by different sampling times onset of disease, comorbidities and race.

Computed tomography (CT), is a non-invasive imaging approach for the precise diagnosis and staging of COVID-19 disease. Hence, patients suspected of having COVID-19 undergo a chest x-ray as early as possible and depending on the severity, an urgent CT scan, also according to the routine protocol subsequently[21]. As with other COVID-19 spectra, there is variability also exists in radiological findings. In our study, bilateral lung involvement was found in 68.7% of patients supporting other studies[14,17,22,23] while multilobe involvement was observed in 29(16.2%) cases consistent with study by Chung et al[24]. Ground-glass appearance (GGA) was the most common finding on CT 110(61.5%), followed by GGA with consolidation in 18(10.1%), pure consolidation in 16(8.9%) and Ground-glass appearance with reticular &/or interlobular septal thickening 13(7.3%) which is in agreement with other studies[22, 24-26].

Limitations of study: Our study has some limitations. First, it was conducted with relatively small sample size and therefore limited solid evidence for concerned various factors and characteristics of limited population. Second, patients who were referred to ICU were not fully followed up to their recovery or death and therefore the outcome of the disease could not be assessed in each patient. Finally, our results and conclusions should be tested to the general population with caution as the study patients are from a single hospital in Karachi.

CONCLUSION

Despite the whole world is trying to understand COVID-19, several issues remain ambiguous in most aspects. Our study has highlighted the variability of most aspects of COVID-19 and this might be the main reason why the spectrum of the disease cannot

be predicted. Although the severity of the disease has been reduced and its spread controlled but literature is still fails to inform us about the factors responsible for its declaration as a pandemic and consequent universal harm. Hence the extensive research throughout pandemic period even couldn't conclude those factors.
Conflict of interest: All authors disclose no conflict of interest.

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