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ORIGINAL ARTICLE

Acute Respiratory Distress Syndrome in Confirmed and Suspected Cases of Covid-19: A Cross Sectional Study

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ABSTRACT

Aim: To observe the frequency, severity and susceptibility to develop the severe symptoms of acute respiratory distress syndrome in confirmed and suspected cases of COVID-19.
Study design: Cross sectional observational study.
Place and duration of study: Lahore General Hospital, Lahore.
Methodology: After Ethical Committee approval in 164 patients of confirmed or suspected COVID-19 who underwent the complication of ARDS were enrolled, admitted in department of Medicine and Intensive Care Unit at Lahore General Hospital, Lahore. After taking consent we studied different features in these patients like age, gender, comorbidities, symptoms, their radiological findings, SATS, PO2/FIO2 ratio, serum ferritin, CRP, LDH and d-dimer levels, and results were analyzed.
Result: Out of 164 patients, 103 were COVID-19 positive. Mostly middle aged to old males developed the complications of ARDS. The most common symptoms observed were fever, cough and shortness of breath. Most common comorbidities present in the patients were diabetes and hypertension. HRCT was done in severe cases and 25 out of 35 patients had either unilateral or bilateral lung opacities. On chest X-ray 76% patients had bilateral lung infiltrates and 12% patients were having unilateral infiltrates. Inflammatory markers such as CRP, serum LDH, serum Ferritin, D-dimers were raised in most of the patients who developed moderate to severe ARDS.
Conclusion: We concluded that the middle aged to old males with comorbidities like diabetes and hypertension are more likely to undergo ARDS. They can present with shortness of breath alone or in combination with fever and cough. Their X-ray usually showed bilateral patchy infiltrates and their ferritin, CRP, LDH and d- dimer levels are usually high.
Keywords: ARDS, COVID-19, Inflammatory Markers

INTRODUCTION

Novel COVID-19 virus has affected 3 million people worldwide with 75000 deaths only in USA[1]. Affected individuals range from asymptomatic, mild symptomatic cases to the worst clinical scenario of ARDS or multi-organ failure including CVS[2]. The survival rate of patients of ARDS with COVID-19 is 25%[3]. Factors which add to poor prognosis include, age>65, presence of cardiovascular or cerebrovascular disease, lymphopenia, and raised cardiac troponin levels[4].

ARDS is defined by onset of respiratory symptoms within a week of any clinical insult; radiographic changes (bilateral opacities not fully explained by effusion, consolidation or atelectasis), origin of edema not fully explained by cardiac failure or fluid over load, and severity based on PaO2/FIO2 ratio on 5cm of CPAP(continuous positive airway pressure). The 3 categories are mild, ratio 200-300, moderate is between 100-200 and severe is less than or equal to 100mmhg[5].

Since March 2020, it has been observed that frequency of unexplained ARDS cases in Pakistan were on rise. This was the same time when COVID-19 pandemic started here. There might be a strong co- relation between the two, even when our PCR for COVID-19 came negative, because PCR for COVID-19 sensitivity is only 70% with 95% specificity[6]. So, we decided to conduct an observational study in Lahore General Hospital to know the frequency of ARDS in confirmed and suspected cases of COVID-19. Which would help us to better understand this presentation, timely diagnosis; hence management of disease locally.

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METHODOLOGY

The study was approved by Ethical Review Committee of Lahore general Hospital, Lahore. It was a cross sectional observational study starting from March 2020 till the 30th June 2020. 164 suspected and confirmed cases of COVID-19 admitted in department of Medicine and Intensive Care Unit at Lahore General Hospital, Lahore, Pakistan from 14 years age onward were included in the initial study whereas the patients who develop ARDS in the background of some injury, sepsis, pancreatitis and burns or fluid over load due to cardiac or renal failure and not having suggestive features of COVID-19 on history were excluded from the study. This exclusion was done on the basis of history, clinical judgment and PCR for COVID-19 collectively.

Data including age, sex, clinical presentation, co-morbidities, PCR for COVID-19, serum LDH, CRP, serum ferritin, d dimers, lymphopenia, oxygen SATS, X ray and HRCT findings and clinical outcome was inserted in SPSS V 20.

RESULTS

We enrolled 164 patients of ARDS in confirmed and suspected cases of COVID-19. Out of these, 103 patients were COVID-19 PCR positive, and 13 were PCR negative

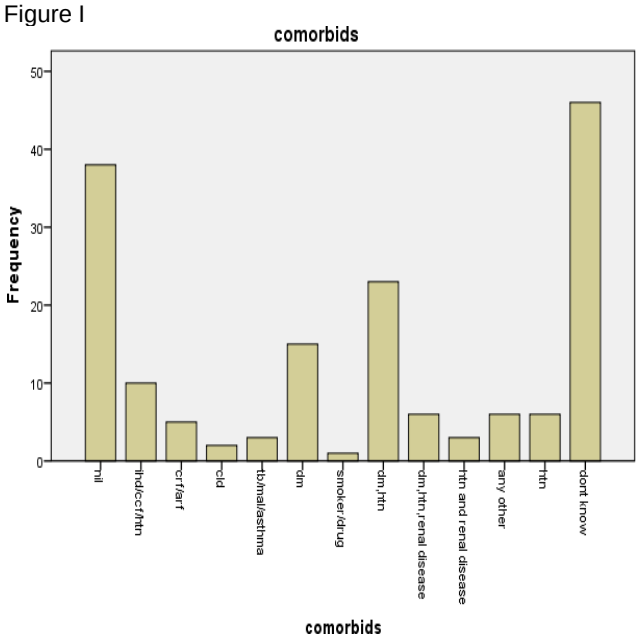
(p-value: 0.00) and in 48 patients PCR was awaited at the time of enrollment.

We found out that mostly middle aged (30 to 50y) and old age (>50y) were having the complication of ARDS as compare to youngsters (<30Y). Only 29 patients were <30 year of age, whereas 61(37.2%) patients were of middle age and 74(45%) were of older age group. We also observed that males were more to suffer from this dreadful complication than the females. 110(67%) males were involved in comparison to just 54(32.9%) females, almost half to males.

When we took the history of these patients, we observed that most of them, almost 88(53.7%) were having combination of fever, cough and shortness of breath. Second common symptom was shortness of breath in 33(20.1%) patients. Whereas fever and cough both were there in 17(10.4%) patients. Fever alone was in 13(8%) patients, cough alone was just in 4(2.4%) patients, abdominal symptoms were in just in 1 patient.

When we checked co-morbidities in these patients we found that 38 people were (23%) were having no co-morbidities. Most of the patients, however were found to have both hypertension in diabetes mellitus (23 patients, 14%). Second common comorbidity was diabetes, observed in 15(9%). Heart disease was observed in 10(6%) patients. Then was hypertension alone in 6 people. Combination of hypertension, diabetes and renal failure was also in 6 people. Renal disease was in 5(3%). Renal disease and hypertension was in just 3 people. Least common comorbidity was chronic liver disease, observed just in 2 people.

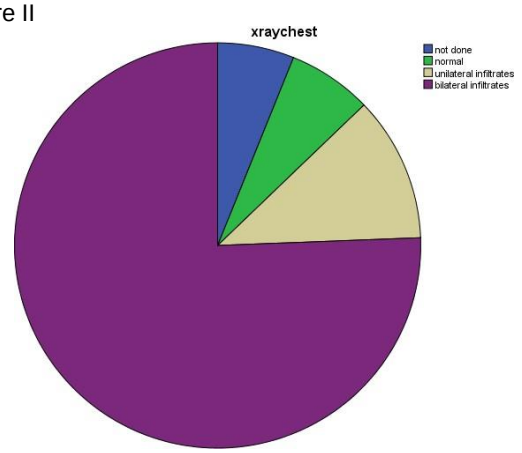
Figure I



PO2/FIO2 ratio which tells about severity of ARDS was also calculated in 107 participants with a p-value of 0.00. It was observed that the ratio of <100 indicating severe ARDS was in 69 patients (49%). Whereas mild ARDS (>300) was in just 1 patient. Rest were (23%) having >200-<300 and 14(13%) were having >100. Similarly, oxygen saturation of <70% were in 29(18%) patients (p-value: 0.00). But most of patients were maintaining oxygen saturation in between <89%-70%. These patients were 89(54.3%), and 24(15%) patients were having SATS between 93% to89%.

Radiologically, HRCT could only be possible in 35 patients and 25 patients showed either single or bilateral ground glass opacities, which is the hall mark of severe COVID-19 lung injury (p-value: 0.00). Chest X- rays were done in 154 patients. We saw that 124(76%) showed bilateral infiltrates, 19(12%) showed unilateral lung infiltrates, and 11 patients also showed up normal X-ray (p-value: 0.00), yet they were not maintaining their SATS.

Figure II



D dimers and serum ferritin were observed although were possible only in minority of patients because of lack of resources. But all the patients in whom these tests were carried out, it was clearly evident all these markers were raised. CRP could be done only in 54 patients, and it was normal in just 8 patients but raised in 46 patients (p-value: 0.00). D dimers were done in 52 patients, and in 28 patients it was raised (p-value: 0.001). Serum ferritin was done in 49 patients and it was raised in 40 patients while it was normal in just 9 patients (p-value: 0.00) and serum LDH was done in 64 patients and it was high in 56 patients whereas it was normal in only 4 patients (p-value: 0.00). All these patients were very critical and sooner or later in HDU settings. 19 patients expired at the time of enrollment. 20(12%), left against medical advice, and 1 patient was referred because of non- availability of bed in HDU to some other hospital. Out of rest 5 were on simple oxygen mask, 97(59%) were on non-re- breathable mask, and 3 patients were on ventilator.

DISCUSSION

We observed in our research that how ARDS in COVID 19 confirmed or suspected cases behaved .We observed its age, gender distribution, it's frequent symptomatology, associated co- morbidities. Then we also looked for its X-ray and HRCT findings. We further saw that how severe was that ARDS by looking SATS and PO2/fio2 ratio. We also checked for the levels of certain markers like CRP, LDH, D dimers, ferritin in these patients. By our final analysis, we came to know that mostly middle aged to old age males with most frequent symptoms of fever, cough

and shortness of breath in combination or shortness of breath alone go in ARDS. They have mostly co- morbidities which predispose them to develop this condition more quickly like hypertension and diabetes, or it can be any other comorbidity like renal failure, liver disease etc. But co-morbidities predispose to ARDS. Four international studies reported also that older age was associated with an increased risk of ARDS. In a retrospective cohort study of 201 hospitalized patients with confirmed COVID-19 pneumonia[7], 84(41.8%) developed ARDS. Wu[7] noted that the median age of ARDS patients was 58.5 years.

Lian et al also found older age to be a risk factor for ARDS in COVID-19[7]. They reported 5.37% (35/652) of those aged under 60 developed ARDS, compared to 16.91% (23/136) of 60 and over (p<0.001). Wu et al and Zhang et al also found that hypertension has a strong relationship with developing ARDS[8]. They calculated that diabetes carried a 2.34 increased risk of ARDS (95% CI, 1.35-4.05, p=0.002). Liu supported this, with 1.8% (1/56) of non-ARDS having diabetes verses 20.8% (11/53) of ARDS cases (p=0.002)[9]. However, contrasting with this was the result of Dreher et al[10], who reported a non-significant finding of diabetes in 54% of non-ARDS cases (14/26) verses 63% of ARDS cases (15/24). This is a very high rate of diabetes, both compared to Wu and to the over 60s population of Germany at large[11]. Inciardie et al found that there is no significant relationship between cardiac disease and ARDS[12], which is in contrast to our study in which 3rd major co-morbidity was cardiac disease. But overall the people having co-morbidities have more chances to undergo this fatal complication in our and international studies. The real challenge for the clinicians is to quickly identify COVID-19 patients at high risk for ARDS. Old age, comorbidities (hypertension, diabetes), lymphocytopenia, elevated inflammatory indices (C-reactive protein, serum ferritin, erythrocyte sedimentation), and organ dysfunction (aspartate aminotransferase, creatinine, lactate dehydrogenase) are risk factors for ARDS in COVID-19 patients[12,13]. In a meta-analysis by Henry et al[14], biomarkers of inflammation, cardiac and muscle injury, liver and kidney function and coagulation measures were significantly elevated in patients with both severe and fatal COVID-19, in particular Interleukin (IL) -6, IL-10 and serum ferritin were strong discriminators for severe disease[15]. We also found similar results in our study.

As far as radiological findings of COVID-19 are concerned; although chest X-rays are less sensitive than CT scans, the former may be used as a first-line approach because of their availability and ease of decontamination. Chest X-ray findings may approach because of their availability and ease of decontamination. Chest X-ray findings may be normal earlier in the clinical course and tend to peak 10-12 days after the onset of clinical symptoms[16]. X rays usually show pictures of atypical organizing pneumonias. Usual radiologic findings of OP consist of ground-glass opacification and/or consolidations distributed along the Broncho vascular bundles with peripherally or sub pleural predominant on a chest X-ray (CXR)[17,18]. Chest CT has greater sensitivity as compared to RT-PCR in diagnosing COVID-19[19]. There has been a lot of debate on using a CT scan as the front-line screening tool for diagnosing COVID-19[20].

CONCLUSION

ARDS is a dreadful complication of COVID-19. Which if develops has higher mortality .But there are certain features which can predict its development and help us to either prevent it or timely manage it. These parameters include old age, male sex ,symptoms of fever with cough and shortness of breath or shortness of breath alone, bilateral infiltrates or reticulo-nodular shadowing on x ray or ground glass opacities on HRCT, co- morbidities like diabetes mellitus, high CRP,LDH,D dimers, and serum ferritin levels and low oxygen saturation and low PO2/FIO2 ratio.

Ethical approval: The study “Acute respiratory distress syndrome in confirmed and suspected cases of COVID-19: A cross sectional study” was presented to hospital’s Ethical Committee for review. The committee gave written approval of the study.

Conflict of interest: The authors declared no conflict of interest.

Author Contribution: FS: Conception and design of work, drafting of article, **KA:** Data collection, critical revision and final approval of version to be published, **FR:** Data entry and analysis, critical revision and final approval of version to be published, **SR:** Data Collection, **AF:** Data Collection, **MK:** Data Collection.

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