

ORIGINAL ARTICLE

The use of chest X-rays in patients with COVID-19 pandemic and its relevance in early diagnosis and assessment of the severity of disease

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ABSTRACT

BACKGROUND: In time of pandemic there is a lot of adjuncts use to help of victims in respect of diagnosis, treatments and preventions. Chest X-rays one of the tests which use in rapid assessment of cases of SARS- COVID 19.

METHODS: Early in crisis of COVID-19, 95 patients with symptoms and sign of covid19 viral infection, who meet the criteria of infection, were included in the study. fifty six (61.9%) were female and thirty six (38.1%) were male, during the period from august to October 2020, their age range from 18 to 79 years, their mean ages 46.81 ± 16.07 years. all sent for chest X-rays examination in addition to the highly refined physical examination.

RESULTS: Only seven chest X-rays reading (7.4%) patients were negative and 85 (92.6%) patients were positive for evidence of infection with COVID-19 suspecting pneumonia, the respiratory symptoms significantly correlate more with radiological changes than the presence of only general symptoms accompanied COVID-19 suspected Infected patients, especially bilateral radiological lesions is predominant type and the right-side involvement is the predominant side of the unilateral lesions.

CONCLUSIONS: Plain simple chest X-rays is a valuable test in the diagnosis of COVID-19 during early stage of pandemic pending the PCR results.

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KEY WORDS: COVID-19; Mass chest X-ray; Diagnosis.

Owing to the pandemic spread capacity, severity, outcome and the large numbers of cases are markers of outbreak, added to the paucity of clear-cut diagnostic tests for diagnosis in this highly infectious viral disease in the early days of crisis. As the infection mostly and ominously goal the respiratory system in spite of other symptoms point to other systems involvements, which are not specific and as far as the fatality cases are related to ARDS and its sequel, the initial medical staff who first facing this crisis and its victims. through situation of crisis mandated them to use rapid tool for diagnosis, to initiate

immediate treatments, care, isolation to the save life of victims and to reduce the transmission of cases, as labelling the diagnosis is the initial phase in every care and management's.¹ Coronavirus disease (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus. With incubation period of around 5 days (ranging from 2 to 14 days), and people who develop symptoms do so within initial ten days of infection.² A substantial percentage of viral transmission may occur in the asymptomatic phase of infection.² COVID-19 diagnostic tests can be clustered as nucleic acid, serological, antigen, and

adjuvant tests, completely show distinctive roles in the care of population analysis for evidence of infections during this horrifying health crisis. The FDA, food and drugs administration and CDC, the centers for disease control and prevention have endorsed SARS-CoV-2 a specific RNA regions for testing virus nucleo capsids primers, and reagents.³ The standard test adapted for COVID-19 diagnosis is the real-time reverse transcription-polymerase chain reaction (RT-PCR) which detect viral nucleic acids; though, with some low sensitivity. If RT-PCR is not available or if the results are negative in symptomatic COVID-19 patients, chest imaging is considered as a part of the ancillary screening diagnostic test for doubted COVID-19 infected person. Though the findings on Chest X-rays are non-specific, and in the initial phases of the infection the readings could be normal. The most common features is lung infiltrate, which might involve lobar, multi-lobar, mainly bilateral or some time is unilateral lung parenchymal consolidation.^{4,5} Plain chest X-ray image indeed may complements clinical evaluation and laboratory parameters for diagnosing and early managements of COVID-19 patients. Of course, inadequate studies in early period of crises have compared the sensitivity of CXR and RT-PCR for detecting COVID-19 infection, which actually it's not acceptable means of comparison between both approaches. however, the association between CXR findings and clinical and laboratory findings has not been assessed adequately. Some health care center during this pandemic and for reaching early suggestive diagnosis, perhaps before the availability of RT-CRP because of shortage of last one, recommend using simple, plain chest X-rays as a tool for subjective diagnosis. Studies have shown that the typical CXR findings of COVID-19 include bilateral peripheral, basal multifocal airspace opacities "ground-glass opacity" and variable consolidation.⁵⁻⁷ Though no studies consider the chest X-rays in at least the evaluation of patients in early wave of crisis to yet in May 2020 but an acceptable option to be adapted in such critical situation.⁸⁻¹⁰ Due to the absence of diagnostic tests which in the beginning of COVID-19 crises, which yet not available at national levels and even at international level and the rapid onset of disease, similarity of

symptoms to other disease, like upper respiratory tract infections as well complexity of presented symptoms which include respiratory and extra respiratory, the use other available diagnostic test at least even if it suggestive for the diagnosis, on the top of this is radiological image tests, missing an suspecting case in a giving community, means an source for spread and if serological or viral reagent are negative, radiological test is known may limit this.¹⁰ Which means a won in this war against highly infectious diseases, this indeed form the main aim of this study?

Materials and methods

Descriptive cross-section study conducted during the period of pandemic of COVID-19 crises during the period of 2020 to 2021, were the numbers of people attacked by the virus were increasing aggressively. Ninety-two patients complain from unusual features of upper air way infections, in that they complain from extra respiratory symptoms as severe headache, loss of appetite, nausea, vague abdominal pain, diarrhea and generalized ache in body in addition to features of respiratory tract infections as cough, shortness of breath, chest pain, sore throat, fever. Prior to writing a request to send patients for chest X-rays, an strict rules of antiseptic as isolation resources is essential at crisis of COVID-19 like wearing a face mask, gloves and Gawain and rapid perfect assessments clinical examination including the vital sign (pulse rate, respiratory rate, temperature, pulse oximeter and blood pressure) in additions to evaluations and essential history including history of contacts with febrile patients a requests for chest X-rays, were sent for a nearby radiological departments in a hospital or private clinics. The inclusions criteria including any patients apart from children, pregnancy and those severe disease, were directly send to emergency unit in hospital after the agreement of patients or their relative for the test. After the test was done and the patient return with chest X-rays, with reports of radiologist, the participants subdivided in this study according to types of lesion, site of lesion and weather finding, bilateral or unilateral lesion, the result are interrelated with patients symptoms Data were computed

correlated with clinical symptoms and with other demographic data, then all feed to program, statistical package for social sciences SPSS v. 20, percentage, means, standard deviation measured, comparisons made between variable, and P value of 0.05 considered significant.

Results

Results are provided in Table I, II, III, and IV.

TABLE I.—*General demographic and characteristics features of sample, shows, age ranges, sex variations, symptoms, chest X-rays variations in the study sample.*

Variable	Value
Age	46.81±16.07 (18-79)
Sex, female	56 (60.9%)
Resp. symptoms	57 (62.0%)
General symptoms	79 (85.9%)
Chest X-rays	85 (92.4%)
Unilateral lesion	33 (35.9%)
Bilateral lesion	52 (56.5%)

TABLE II.—*The occurrence of non-specific and respiratory symptoms in regards to chest X-rays finding. Shows of occurrences of the frequency respiratory versus the general symptoms in relation to positive chest X-rays.*

Symptoms	Occurrence	X-ray negative	X-ray positive	Total	P value
General	Present	4 (4.3%)	75 (81.5%)	79 (85.9%)	0.051
	Absent	3 (3.3%)	10 (10.9%)	13 (14.1%)	
	Total	7 (7.6%)	85 (92.4%)	92 (100%)	
Respiratory	Present	7 (7.6%)	50 (54.3%)	57 (62.0%)	0.008
	Absent	35 (38.0%)	0 (0.00%)	35 (38.0%)	
	Total	42 (45.7%)	50 (54.3%)	92 (100%)	

TABLE III.—*The occurrence of non-specific and respiratory symptoms in regards to chest X-rays finding whether the involved side, bilateral, unilateral.*

Symptoms	Subcategory	Unilateral	Bilateral	Normal	Total	P value
General	Absent	6 (6.5%)	4 (4.3%)	3 (3.3%)	13 (14.1%)	0.053
	Present	27 (29.3%)	48 (52.2%)	4 (4.3%)	79 (85.9%)	
	Total	33 (35.9%)	52 (56.5%)	7 (7.6%)	92 (100.0%)	
Respiratory	Absent	16 (17.4%)	19 (20.7%)	0 (0.0%)	35 (38.0%)	0.016
	Present	17 (18.5%)	33 (35.9%)	7 (7.6%)	57 (62.0%)	
	Total	33 (35.9%)	52 (56.5%)	7 (7.6%)	92 (100.0%)	

TABLE IV.—*General symptoms versus respiratory symptoms with the site of radiological lesion, which demonstrate bilateral, right side, left side respectively.*

Symptoms	CXR	Bilateral	Left	Right	Normal	Total	P value
General	Absent	4 (4.3%)	1 (1.1%)	5 (5.4%)	3 (3.3%)	13 (14.1%)	0.116
	Present	48 (52.2%)	5 (5.4%)	22 (23.9%)	4 (4.3%)	79 (85.9%)	
	Total	52 (56.5%)	6 (6.5%)	27 (29.3%)	7 (7.6%)	92 (100%)	
Respiratory	Absent	19 (20.7%)	2 (2.2%)	14 (15.2%)	0 (0.0%)	35 (38.0%)	0.030
	Present	33 (35.9%)	4 (4.3%)	13 (14.1%)	7 (7.6%)	57 (62.0%)	
	Total	52 (56.5%)	6 (6.5%)	27 (29.3%)	7 (7.6%)	92 (100.0%)	

Discussion

In this study, although the emergency situation at time of the crisis of corona pandemic, radiological examination, in particular the plain chest X-rays, showed significantly correlations with symptomatology of patients suffering from the possibility of corona virus infection, the results demonstrate that, most patients with corona show abnormal radiological sign of infection, which ranges from discrete consolidation to classical type of feathery parenchymal infiltrations in early stage of inflammatory response to infections strongly suggestive to COVID-19 infections, to the classical picture of ground glass appearance of the involved segments or lobe. the presence of predominant respiratory symptoms, correlate with the positive finding in CXR in comparisons with their near absence appearances in the predominant general symptoms, particularly in bilateral finding in CXR, though the presence of predominant general symptoms against respiratory symptoms, which are com-

mon in respect to radiological response, to disease and its occurrences is high in in this way, might reflect the early occurrence of general symptoms as complain to respiratory one. Still the respiratory component of the symptomatology more than the general symptoms significantly correlated with radiological test, this might indicate that the virus is solely pulmonary than other system. The study shows that the presence of predominant side of abnormality detected by chest X-rays, is not vary from the usual, were bilateral lesions overcome unilateral one as its shown a significantly associations in comparisons to other studies, were it too shows the bilateral occurrences is the common. Variation of virus and the viral load of infection could be of a role in this respects, the predominance of the presence of extra respiratory symptoms, which shown to be in a high percent in this study, perhaps change the predominance of radiological site to be right side rather than left in unilateral groups, that indeed is reflected in the results of the study might explained by the anatomical variation of bronchial tree and the dependency of right side trachea and its direct continuation with the main bronchus. Another explanation for study outcome could be explained by that, the early exposure of patients, from their awareness or doctor awareness to the importance of radiological test as some of respiratory symptoms occurs early after contact and the awareness of patients of their condition as part of obsession of infection as result of the crisis and lack availability of other tests. The high sensitivity of this chest plain image, consider it as valuable investigation in comparisons to other complicated diagnostic tests, though it's not commonly considered seriously as ancillary add to the diagnostic tools at time of critical situations of crises.^{8,9}

Conclusions

In conclusions chest X-rays is simple, cheap, less radiation exposure than chest computed to-

mography scan, and almost available, is valuable in diagnosis and managements during viral respiratory pandemic, its noninvasive, cheap tool for diagnosis, early suggestive aid for diagnosis, though regarded assistant for diagnosis, still of value. Automated chest X-rays, its penetrations, density focusing and interpretations may further revolutionize diagnostic aid in emergency medicine in future.

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Conflicts of interest

The author certifies that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions

The author read and approved the final version of the manuscript.

History

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