



How Clinical and Computed Tomography Presentation of COVID-19 Patients Can be Affected by Gender: an Observational Study

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THE SEVERITY of Covid-19 disease and higher mortality rates seen in male patients reported in some literatures, increases the concern to study the effect of gender on the course of the disease. The aim of the present study is to compare between males and females at the first presentation of COVID-19 disease regarding the range of presenting symptoms, laboratory findings and risk factors with special emphasis on grade and pattern of CT and its crucial role as ionizing radiation tool at first presentation. This retrospective study includes two groups (male and female). Their chest CT scans were reviewed to evaluate the radiological characteristics and severity difference between them. The clinical presentation and the laboratory findings of all patients were also evaluated and compared in both groups trying to find possible explanations for such difference. Result showed presenting symptoms as follows, fever in 22 males (100%), 18 females (64.2%), and cough in 16 (72.6% males, 17 (60.7%) females and myalgia in 14 (63.6%) males 19 (67.9%) females. At least one comorbid condition (DM, Hypertension, Chemotherapy, Smoking, Pregnancy) was found in 32 (64 %), there was not any significant difference regarding the laboratory findings, however there was a significant difference between the two groups as regards smoking. About 32% of male patients have (moderate + severe) CT lung involvement compared to about 10% in females. Conclusion: Covid-19 CT-scan shows non-significant milder form of the female patients at the first presentation, this may be either due to early presentation finding that have multiple social aspects or due to milder form of disease due to genetic factor. Further studies, on a larger number of patients, are needed.

Keywords: Computed tomography of the chest, Covid-19, Gender, Pandemic, Presentation of the disease, Severity.

Introduction

Coronavirus is a fast-spreading virus, causing diseases involving the respiratory, gastrointestinal (GI), and neurological systems. In December 2019 a novel coronavirus, which was later named severe acute respiratory syndrome coronavirus caused a large pandemic specified as Covid-19 (Fung & Liu, 2019).

Since 31 December 2019 and up till now

(end of 2021), COVID-19 attacked more than 275,466,533 people in the world and was the cause of more than 5,361,332 deaths. In Egypt cases up till now reached 378,000 and about 21,500 deaths (WHO Coronavirus (COVID-19) Dashboard, 2021). Among patients with Covid, fever has been the most common symptom, followed by dry cough, dyspnea, myalgia, headache, and diarrhea (Chan et al., 2020; Chen et al., 2020; Huang et al., 2020). Covid-19 spreads among population mainly through respiratory droplets and direct contact

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(Song et al., 2020). In severe Covid-19 cases, symptoms can progress to acute respiratory distress syndrome, septic shock, and metabolic acidosis (Lai et al., 2020). The clinical presentation of Covid-19 ranges from asymptomatic to severe respiratory illness (Shi et al., 2020) and the multi-organ damage is characteristic of SARS (severe acute respiratory syndrome), nevertheless the major affected organs include the lungs, heart, and kidneys. The severity of disease progression and death predictor factors include old age, thrombocytopenia, severe hypoxia, and hyperglycemia (Yang et al., 2010).

Real-time reverse transcription polymerase chain reaction (RT-PCR) testing for Covid infection is the standard for diagnostic confirmation. It shows that RT-PCR and chest CT with sensitivity reaching 98% had comparable diagnostic performance in identification of suspected COVID-19 patients. An early and rapid detection method is crucial for breaking trains of community transmission, to initiate timely treatment (He et al., 2020). As the CT is characterized by convenience and accuracy as it plays a key role in the diagnoses of respiratory diseases, hence it provides a simple and noninvasive diagnostic method for the patients with respiratory complains when RT-PCR test is delayed or unavailable. CT imaging (as ionizing radiation tool) could contribute to clinical diagnosis and illness assessment by flagging suspected cases and noninvasively evaluating disease progression (Tang et al., 2020). Looking at data for 18 different countries, the Global Health 50/50 project found similar numbers of COVID-19 cases in men and women, except in Pakistan where 72% of cases were male (Global Health, 2020). However, there are very few studies which focus on gender variation in the lung CT features and clinical presentation differences between male and female Covid-19 patients at time of presentation.

Aim of work

This study aims at examining the differences between males and females at time of first presentation including range of presenting symptoms, laboratory findings and risk factors with special emphasis on presenting CT-scan, (as ionizing radiation tool) and its crucial role in diagnosing and detecting severity and possible factors contributing to this change.

Materials and Methods

- This retrospective study was conducted to focus

on the difference between male and female covid-19 patients at time of presentation with special concentration on the presenting CT of chest as guide for severity.

- Medical records of 150 patients visited our hospital from May 15, 2021, till May 30, 2021, with suspected pneumonia symptoms were viewed and data were analyzed as regards presenting symptoms, laboratory findings, and chest CT scan distribution pattern and severity in confirmed Covid-19 patients by RT-PCR.
- Inclusion criteria; all patients who underwent clinical, laboratory and chest CT scan at the same day of presentation and turned to be positive for Covid-19 via quantitative real-time reverse transcription-polymerase chain reaction testing of respiratory secretions obtained by nasopharyngeal swab.
- Exclusion criteria, patients who are under 18 years were excluded, their CT scan has known chest disease (Emphysema, Bronchiectasis etc.), and if CT or laboratory findings were delayed for more than 12 hours for any reason or patients testing negative for coronavirus via (RT-PCR).
- Each patient was subjected to full medical history for relevant diseases and presenting symptoms. Laboratory test including, CBC, CRP, Ferritin, D-dimer and ESR using blood sample, CT was then ordered. In the case of patients with CT findings suggestive of viral pneumonia, the radiologists informed the clinician immediately. The clinician would then order immediate isolation of the patient for clinical monitoring and treatment, without waiting for PCR test result.

RT-PCR is done using throat swab samples collected by experienced nurse, and total RNA extraction was conducted using TRIzol reagent (Thermo scientific, CA, USA), according to previous study (Shi et al., 2020) related primers

- After exclusion criteria, the remaining sample was 50 patients, who were divided into two groups, males (n= 22) and females (n= 28). The procedures performed involving human participants were according to Helsinki declaration.
- Criteria for hospital isolation were set as

follows: severe symptoms, age above 60 years, uncontrolled comorbidities, moderate and severe CT findings or with impossible home isolation. Home isolation was recommended in mild symptoms, patients below 60 years, controlled risk factors and with minimal CT severity.

Computerized tomography

Patients underwent non contrast CT chest using an Aquilion ONE CT scanner (Toshiba Medical Systems), no specific preparation was needed, patient set in the supine position and image acquired during full inspiration. The CT parameters were as follows: 120 kVp, current intelligent control (auto mA) of 30–300 mA, and slice thickness reconstructions of 0.6–1.5 mm.

CT image review

Every chest CT examination was read by two radiologists having more than 10 years' experience in interpreting chest CT, difference between readers is subjected to discussion till the result was reached. Chest CT scan of each one of the 50 patients were evaluated for the distribution of involvement unilateral/bilateral, basal/apical, central/peripheral. Pattern of involvement is also analyzed; ground-glass opacities, (faint opacity that did not obscure vascular markings), consolidation (dense opacity that obscured vascular markings), linear opacities (dense lines related to the interstitial tissue), pleural effusion, lymph nodes and any other symptoms which are characteristics that have been associated with Covid-19 in adult patients (Chung et al., 2020; Bernheim et al., 2020; Zhao et al., 2020). The degree of involvement was classified according to the grading system introduced by scientists (Chung et al., 2020; Bernheim et al., 2020; Zhao et al., 2020), lung was assessed for degree of area involvement, which was classified as none (0%), minimal (up to 25%) of total lung area affected, mild (25–50%), moderate (50–75%), or severe (75–100%).

Statistical analysis

Data were analyzed using Statistical Package for Social Science (SPSS) version 21.0. Chicago, Illinois, USA. Quantitative data were expressed as mean \pm standard deviation. Qualitative data were expressed as count and proportion. The independent-samples t-test was used to compare between means. Chi square test was used to compare proportions between two qualitative

parameters. $P < 0.05$ was considered significant and $P < 0.01$ was considered highly significant.

Results

Table 1 shows the overall demographic data of Covid-19 patients and the difference between males and females as regards age, working status, symptoms at presentation, laboratory findings, medical risk factors (Diabetes mellitus, hypertension, ischemic heart diseases (IHD), smoking, chemotherapy, lactation), place of isolation (Home, Hospital).

Age and gender distribution

Total number of 50 patients (mean age, 45.10 ± 17.32 years) with COVID-19 pneumonia were included in the study. The patients were classified into two groups according to their gender, group 1 consists of 22 males and comprises 44% of the cohort with a mean age of 44.77 ± 18.91 years, and group 2 consists of 28 females and comprises 56% of the cohort with a mean age of 45.36 ± 16.32 years.

Symptoms

All patients had symptoms at onset of the disease, with the fever was the most common symptom in 40 patients (80%) and significantly seen in males, myalgia in 33 patients (66%), cough in 33 (66%) patients, shortness of breath in 17 patients (34%) and significantly seen in males, no other significant difference between males and females.

Total Leucocytes (TLC) range from 2 to $9 \times 1000/\text{ml}$ with a mean of $4.52 \pm 1.74 \times 1000/\text{ml}$. The high-sensitivity C-reactive protein (CRP) was high in 42 (84%) patients, the erythrocyte sedimentation rate (ESR) was high in 37 (74%) patients, serum ferritin was high in 30 (60%) patients, and D-dimer was high in 27 (54%) patients without any significant difference between males and females.

Risk factors

Twenty-three patients had a history of hypertension (HYT), 20 patients had diabetes (DM), 12 patients had ischemic heart diseases (IHD), 4 were cancer patients (Chemotherapy) and one patient was lactating. Smoking is significantly seen in males (8 smokers with a percentage of 36.3% of the males)

TABLE 1. Characteristics of Covid-19 patients, males and females as regards age, place of working, symptoms, laboratory findings, medical risk factors and place of isolation

Characteristics		Covid-19 patients n= 50	Male n= 22 (44%)	Female n= 28 (56%)	P-value	Sig.
Age		45.1 ±17.32 (19-79)	44.77±18.91 (19-79)	45.36±16.32 (19-72)	0.907	NS
Working outside	Yes	24(48%)	16(72.7%)	8 (28.6%)	0.019	S
	No	26(52%)	6 (27.3%)	20 (71.4%)		
<u>Symptoms at presentation</u>						
Fever		40(80%)	22 (100%)	18 (64.2%)	0.032	S
Myalgia		33(66%)	14 (63.6%)	19 (67.9%)	0.754	NS
Cough		33(66%)	16 (72.6%)	17 (60.7%)	0.373	NS
Headache		30(60%)	12 (54.5%)	18 (64.3%)	0.485	NS
Dyspnea		17(34%)	11 (50.0%)	6 (21.4%)	0.034	S
Loss of smell		13(26%)	6 (27.3%)	7 (25.0%)	0.856	NS
Loss of taste		10(20%)	4 (18.2%)	6 (21.4%)	0.776	NS
Nausea		7(14%)	3 (13.6%)	4 (14.3%)	0.948	NS
Diarrhea		6(12%)	1 (4.5%)	5 (17.9%)	0.150	NS
Palpitation		4(8%)	1 (4.5%)	3 (10.7%)	0.425	NS
<u>Laboratory findings</u>						
CRP		42(84%)	20 (90.9%)	22 (78.6%)	0.238	NS
ESR		37(74%)	18 (81.8%)	19 (67.9%)	0.264	NS
Serum Ferritin		30(60%)	14 (63.6%)	16 (57.1%)	0.642	NS
D-dimer		27(54%)	11 (50.0%)	16 (57.1%)	0.615	NS
Total leucocytes (TLC)		4.52 ± 1.74	4.61 ± 1.81	4.45 ± 1.71	0.751	NS
<u>Medical risk factors</u>						
DM		20(40%)	8 (36.6%)	12 (42.9%)	0.642	NS
HYT		23(46%)	9 (40.9%)	14 (50%)	0.522	NS
IHD		12(24%)	6 (27.3%)	6 (21.4%)	0.631	NS
Smoking		8(16%)	8 (36.3%)	0 (0.0%)	0.001	HS
Chemotherapy		4(8%)	1 (4.5%)	3 (10.7%)	0.425	NS
Lactation		1(2%)	0 (0.0%)	1 (3.6%)	0.371	NS
Home Isolation		23 (46%)	6(27.3%)	17(60.7%)	0.019	HS
Hospital Isolation		27(54%)	16(72.7%)	11(39.3%)		

Data are presented as Mean ±SD, (range) or count (%)

Isolation

Twenty- three (46%) of patients were home isolated and 27 (54%) were hospitalized. Hospital isolation was significantly higher in males (72.7%) than in females (39.3%).

Work status

Active workers comprise 24 patients (48% of the total patients) and comprises (72.7%) of the male group and (28.6%) of the female group, the rest of the population are either not working or working from home since the pandemic started.

Table 2 shows the CT scan score, pattern, and distribution. There was 12 normal CT, most of affected CT (n= 38) shows the typical distribution of Covid-19 pneumonia being bilateral (100%), basal (100%) and peripheral (97.4%). Regarding

the pattern of involvement from the patients with positive CT findings, 17 (34.0%) had ground glass opacity (**GGO**) (Fig. 1), 15 (30%) had both GGO and consolidation (Fig. 2), one female shows consolidation only and comprises 2% of the cohort (Fig. 3). The combination of GGO, consolidation and linear thickening in 4 (8.0%) patients (Fig. 4). GGO and linear thickening (crazy paving) as shown in Fig. 5 was present in only one case and pleural effusion in four cases. Lymphadenopathy was absent in all cases. Exact difference between males and females is seen in Table 2.

Table 3 shows the relation between the number of risk factors (DM, HYT, IHD, smoking, lactation and chemotherapy) and CT severity score was not significant in the overall study.

TABLE 2. Characteristics of Covid-19 patients, male and female patients as regards CT scan score, CT findings and distribution of abnormal findings

Characteristics of CT scan	Total patients n=50	Male n=22 (44%)	Female n=28 (56%)	P-value	Sig.
<u>CT Scan Score</u>	12 (24.0%)	4 (18.2%)	8 (28.6%)	0.315	NS
Normal (0)	22 (44.0%)	9 (40.9%)	13 (46.4%)		
Minimal (1)	6 (12.0%)	2 (9.1%)	4 (14.3%)		
Mild (2)	6 (12.0%)	5 (22.7%)	1 (3.6%)		
Moderate (3)	4 (8.0%)	2 (9.1%)	2 (7.1%)		
Severe (4)					
<u>CT pattern</u>	12 (24.0%)	4 (18.2%)	8 (28.6%)	0.716	NS
1-Normal	17 (34.0%)	7 (31.8%)	10 (35.7%)		
2- GGO	1 (2.0%)	0 (0.0%)	1 (3.6%)		
3- Consolidation	15 (30.0%)	9 (40.9%)	6 (21.4%)		
4-GGO+ Consolidation	4 (8.0%)	2 (9.1%)	2 (7.1%)		
5- GGO + Consolidation, linear thickening	1 (2.0%)	0 (0.0%)	1 (3.6%)		
6- GGO & linear thickening					
<u>CT scans Distribution</u>	(n=38)	(n=18)	(n=20)	0.899	NS
Bilaterality	38 (100%)	18(100%)	20(100%)		
Basal	38(100%)	18(100%)	20(100%)		
Peripheral	37(97.4%)1 (2.6%)	18 (100%)	19(95%)		
Central	37(97.4%)1(2.6%)	1(5.5%)	0(0%)		
&peripheral Patchy Nodules	4 (10.5%)	18(100%)	19(95%)		
Pleural effusion		0(0%)	1(5%)		
		2(11%)	2(10%)		

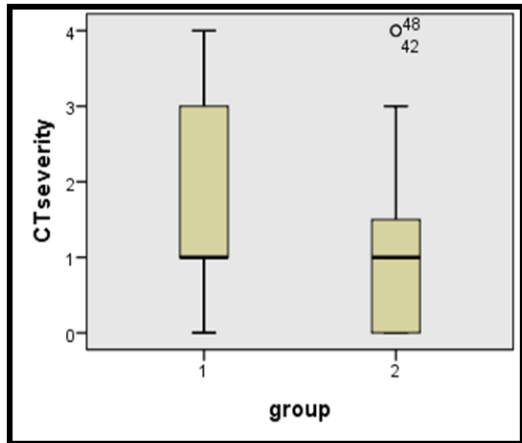


Fig. 1. The CT severity score in males is more than that in the females [Despite the nonsignificant difference between males and females in CT severity score as the P= 0.315, the Box plot figure shows a difference between the two groups, as a higher level of severity is shown in male group (group1= males, group 2= females). There were two outliers in the female group, patient number 42 and 48]

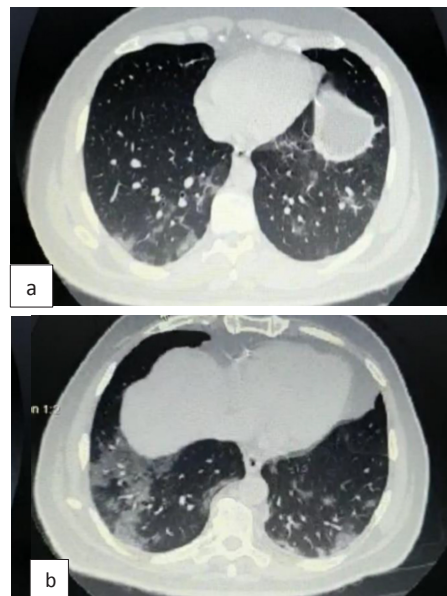


Fig. 2. Two examples of CT scan of bilateral peripheral patches of ground glass involvement (lung opacity that does not obscure vascular marking) either indicating 0-4 days/ alveoli not full of inflammatory exudate, in our study GGO comprises 34% (17/50 patients) of the whole study, 35.7% of the females and 31.8% of the males [a- minimal, b- mild]

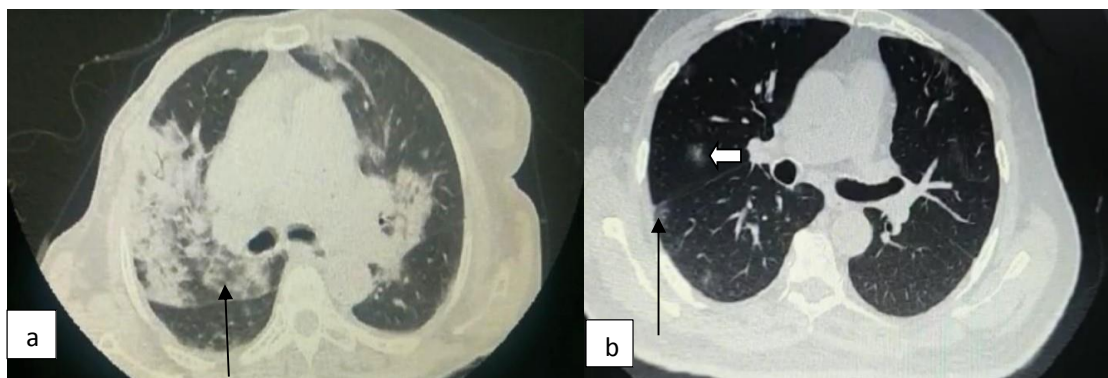


Fig. 3. Two examples of patients show bilateral patchy of mixed ground glass opacity (long black arrows in a and b) and consolidation patches (lung opacities that does not obscure lung markings in areas of GGO or obscuring lung markings in areas of consolidation, it either indicate that alveoli is not full of inflammatory exudate in areas of GGO, or full of inflammatory exudate in areas of consolidation/ this usually seen after 4 days of infection, it comprises 30% of all patients, 40.9 % of the males and 21.4% of them are females [a- Moderate with consolidation predominance, b- Minimal with GGO predominance as consolidation only seen at the center of the small nodule (short white arrow in b)]

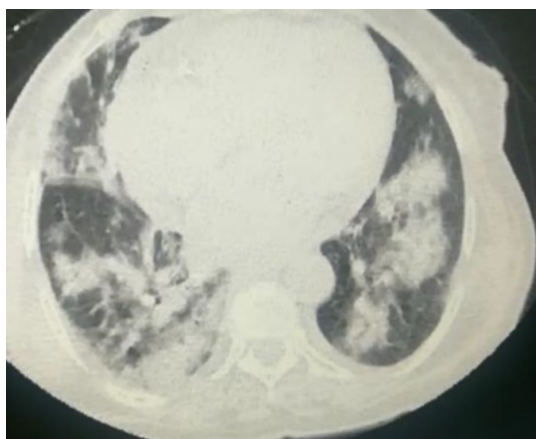


Fig. 4. Bilateral patchy areas of consolidation with basal predominance this finding comprises 2% of the abnormal CT seen in one male [It represents patient after 5 days of symptoms/ increase severity of infection as all alveoli are loaded with inflammatory exudate, pleural effusion is present bilaterally]

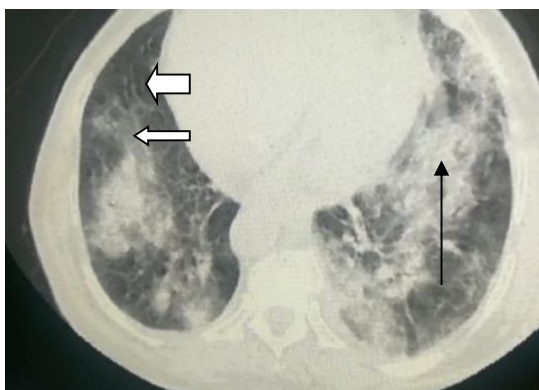


Fig. 5. Combination of GGO area (thin white arrow), consolidation (black arrow) and linear opacities (short white arrow) with bilateral basal predominance, this finding comprises 8% of the specimen, of which 9.1% of the males and 7.1% of the females [It represents patient after 5 days of symptoms/ increase severity of infection in which alveoli and interstitium are loaded with inflammatory exudate]

TABLE 3. Association between number of risk factors and CT severity

CT severity	Combination of risk factors					Total	P value
	0	1	2	3	4		
Normal	5(27.7%)	3 (30%)	2 (18.1%)	2 (28.5%)	0 (0%)	12 (24%)	0.673
Minimal involvement of <1/4 lung tissue	9(50%)	5 (50%)	6 (54.5%)	1 (14.2%)	1 (25%)	22 (44%)	
Mild involvement of 1/4-1/2 both lungs	1(5.55%)	1 (10%)	1 (9.1%)	2 (28.5%)	1 (25%)	6 (12%)	
Moderate involvement of 1/2 - 3/4 of both lungs	2(11.1%)	1 (10%)	1 (9.1%)	1 (14.2%)	1 (25%)	6 (12%)	
Severe involvement of > 3/4 of both lungs	1(5.55%)	0 (0%)	1 (9.1%)	1 (14.2%)	1 (25%)	4 (8%)	
Total	18	10	11	7	4	50	

Discussion

Covid-19 is an emerging infection with many unknowns. While many studies focused on difference between males and females regarding fatality, this study highlighted the difference between males and females at presentation regarding the presenting clinical symptoms, laboratory data with special emphasis on presenting CT-scan, (as ionizing radiation tool) and its crucial role in diagnosing and detecting severity. All patients were compared trying to find the discrepancy between men and women at time of presentation. Our 50 patients were divided into two groups, female group containing 28 patients and male group containing 22 patients, the slight predilection of females (56%) is against other studies that show equal gender predilection or higher male predilection, this discrepancy might be due to the differences in demographic features and small cohort in the present study. Mean age is 45.10 ± 17.32 without any significant difference found regarding average age between the two groups.

This study showed that 16 (72.7%) of Covid-19 male patients were active workers, on the contrary only eight female patients (28.6%) were active workers. Working outside home with less ability for proper sanitizing environment,

increase manipulation and without any guarantee of proper physical distancing increases the liability of contacting infection even more than once, factor that may contribute to the severity of disease with subsequent hospitalization.

The major clinical symptoms observed included fever (80%), cough (66%), Myalgia (66%) with no significant differences between male and female groups in most symptoms except for fever (> 38.5), as the male patients presented with fever significantly more than in females. Additionally, the shortness of breath is significantly common in male patients more than in the female patients and this is consistent with a previous report (Shi et al., 2020).

The laboratory data showed higher levels of the CRP detected in 84%, ESR in 74%, Ferritin in 60% and d-dimer in 54% of all patients, and this is consistent with a report by Chen et al. (2020), without significant difference observed in between the two genders. The WBC and the lymphocytes levels were normal in most cases or decreased, lymphocytes count was decreased in 23 patients (46%) and is observed to decrease immunity to disease, and this is consistent with Guan et al. (2020) who reported that lymphocytes count correlate with the clinical course of Covid-19. In their study, the cumulative incidence of recovery

and hospital discharge in patients with normal or elevated lymphocyte count was 87.4% within four weeks, which was significantly higher than that in patients with decreased lymphocyte count (16.3%). These results were consistent with previous reports that lymphopenia is an essential characteristic of impaired immunity (Xu et al., 2020; Zhang et al., 2020).

Smoking, (more than 15 years or > 20 cigarettes/ day) the only risk factor that was significantly higher in the male group, was observed in 8 men (36.3%), and this may explain the significant increase in shortness of breath among males. It is also of note that 50% of smokers shows moderate and severe CT scan with a higher need for hospitalization.

Previous data suggest that smoking is associated with adverse outcomes of Covid-19. A systematic review showed that smokers were 1.4 times more likely than non-smokers to have severe symptoms of Covid-19 that could be explained by the underlying inflammatory affection of the bronchioles and endothelium of alveoli that deprive the tissues from antioxidants leaving them more liable to damage and raising the severity of signs and symptoms at presentation and hence raising hospitalization rate, ICU admission (2.4 times to non-smokers) and even mortality rate (Vardavas & Nikitara, 2020).

When comparing the cumulative effect of risk factors (hypertension, diabetes, IHD, smoking and chemotherapy) with CT severity (Table 3) there were no significant differences between patients having 1, 2, 3 or 4 risk factors in the affection of their lungs in relation to CT severity. This may be explained by the importance of time of presentation. Patients regularly visiting doctors for proper medical condition is more liable to present early, a factor that may affect the course of the disease.

The pattern of CT involvement in the present study showed the classical distribution of Covid-19 infection of being bilateral, basal, and peripheral. Most Covid-19 patients presented with bilateral lungs lesions with scattered distribution, lower lobes mostly involved, and nearly 97.4% was peripheral affection of the lungs, 2.6% shows central and peripheral distribution, being patchy in 97.4% and nodular in 2.6%. These lesions were not confined to

certain segments of lung lobes, possibly due to the small size of the virions that tend to deposit at the periphery of the lung (Ketani et al., 2006). The right and left lower lobes were most involved, which is consistent with basal predominance in a previous study (Shi et al., 2020). These findings according to Zhao et al. (2020) are the classic pattern of involvement and can even be used as a primary screening method being fast and effective with high sensitivity. The results showed that the overall difference between male and female in CT severity was non-significant as demonstrated in Fig. 1, precise description seen in Table 2. However, careful inspection shows that from the normal 12 scans there were 8 females and 4 males, and from the 17 GGO cases there were 10 females and 7 males. Finding that can be explained by earlier female presentation in the disease as some studies related these morphological findings to temporal changes of the disease as follows; early stage from 0-4 days that shows patchy GGO, Progressive stage from 5-8 days including progressive GGO, patchy consolidation or interstitial thickening, peak stage from 9-13 days that shows more progression of the findings, and resolution change that starts after 14 days (Pan et al., 2020). Other study by Bernheim et al. (2020) related the severity of the disease to its morphological features as follows, the ground glass density patches seen early in the disease caused by the presence of exudate not filling the alveoli, progressive filling will result in more dense form which is consolidation, with further progression and coalescence. The thickening of interlobular septum indicates that the pulmonary interstitium has been involved (Bernheim et al., 2020). When considering severity of CT affection 31.8% of male patients have moderate and severe CT lung involvement (50-75% and over 75% respectively of total lung area) compared to about 10.7% in females, a finding which can be explained by earlier presentation/ milder form of disease in females. Figures 2-6 show different CT findings and its relation to severity and time of presentation.

These differences between males and females at presenting symptoms and CT severity and morphology significantly affect hospitalization rates being 73% in males versus 39% in female group.

Jin et al. (2020) investigated the role of gender in morbidity and mortality in patients with

Covid-19 and reported that men with Covid-19 are more at risk for worse outcomes and death, independent of age, although reported that men and women were equally likely to contract the novel coronavirus in the same circumstances.

It is of possibility that difference between males and females in the course could be explained at time of presentation. The difference in symptoms and CT severity at presentation could be explained in different ways. On a social level, male patients are more active workers during this pandemic that subject them to infection possibly more than once, a factor that may increase the load of virus that in turn increases the severity of infection. The Lancet reported that people who developed more severe pneumonia tend to have, on average, higher viral loads when they are first admitted to the hospital (To et al., 2020).

Smoking as a more prevalent habit in males has a profound effect on the respiratory system that is directly related to the severity of signs and CT findings at presentation via inflammatory mediators and unhealthy lung tissue.

Female being obsessed by the health of her family are more stuck to health habits for examples washing hands, physical distancing. Taking symptoms seriously making them more likely to seek doctor's advice earlier in the disease leading to milder signs and symptoms at presentation.

On the biological level, many studies explained the importance of X chromosome which is known to contain the largest number of immune-related genes in the whole genome (Bianchi et al., 2012). Females with their XX chromosome, have a double copy of key immune genes compared to the single copy in XY of men. Thus, women's immune systems are generally more responsive to infections (Klein et al., 2016). Even if both groups had risk factors in the same manner however, males were more affected due to higher levels of circulating Angiotensin Converting Enzyme 2 (ACE2) levels (Patel et al., 2013). It shows that Covid-19 attack cells via the same receptor (ACE2) (Devaux et al., 2020) leaving hypertensive and diabetic males more susceptible for infection and increase severity than matched groups of females.

To summarize, this retrospective study highlighted the difference between male and

female at their early presentation of COVID-19 disease regarding the symptoms, laboratory data and severity of CT- chest findings. The authors also tried to find a reason for such difference - if present- and it could be concluded that females presented with milder symptoms either due to earlier stage of the disease or lower viral load due to the fact that most of them are house hold during this pandemic. Females show less respiratory symptoms likely due to less prevalence of smoking among them. The most interesting feature is that the CT- chest at presentation shows earlies signs of the disease suggesting early presentation of females during the disease. All the former explanation has nothing to do with the course of the disease that may be affected by several other factors such as age, health status of the individual, genetic and other risk factors.

Conclusion

While typical radiology features of Covid-19 pneumonia; non-respiratory clinical symptoms and laboratory data suggested no significant difference, it shows that males are susceptible to more severe form of illness regarding respiratory symptoms and CT severity findings at time of presentation. The difference that can be explained in multifactorial way includes biological and social impact on the disease process.

CT scan is a powerful tool for diagnosis of Covid-19 during this pandemic playing an important role in diagnosis, detecting severity due its characteristic pattern of involvement and classification of severity that can help in management.

Limitation of the study: As retrospective study, small number of patients met our criterion which resulted in small sample size. The authors recommend other larger prospective studies that address this issue.

Conflict of interest: No conflict of interest.

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