OUTCOME OF CHEST TRAUMA AMONG COVID-19 POSITIVE CASES COMPARED TO NON-COVID PATIENTS IN SOHAG GOVERNORATE

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ABSTRACT

Background: COVID-19 is a potentially fatal and highly contagious disease, both factors making it a significant public health problem. trauma is a leading cause of utilization of healthcare, disability, and mortality. The presence of COVID-19 infection may worsen the outcome of chest trauma **Objective**: This study aimed to describe the complications and outcome of chest trauma in patients with confirmed COVID-19 pneumonia and compare these findings with that of chest trauma in negative COVID-19 controls in Sohag. **Patients and methods:** This prospective observational study was conducted in the Department of Thoracic Surgery, Sohag university hospital. The study included 60 patients of middle age, of both genders, admitted with chest trauma. They were divided into 2 groups: Group I: 30 patients infected with COVID-19 had chest trauma and Group II: 30   patients with negative COVID-19 had chest trauma. Management of cases and data collection were done. **Results:** COVID-19 infection increase complications and mortality in chest trauma. Pneumonia and ARDS were common complications associated with higher mortality. **Conclusion;** COVID-19 infection increase complications and mortality in chest trauma.

 Keywords: COVID-19, chest trauma, mortality, pneumonia**,** acute respiratory distress syndrome**.**

INTRODUCTION

Even forensic pathology appeared to be less important on the front lines of public health, it plays an important role in public health by investigating and identifying unusual and rare infectious disease deaths such as those also caused by COVID-19. Forensic pathology is also responsible for investigating deaths that are sudden or unexplained, also helps in mortality and disease surveillance contributes data useful to physicians and epidemiologists. Also provides demographic data details, the extent of disease, and causes of death. Utilizing forensic pathology data provides good information helping in understanding the Covid-19 disease and informing public health policy (**Luchenga and Cordilia, 2020**).

Chest trauma is considered to be a major cause of acute respiratory distress. It is the main source of morbidity and mortality in healthy younger cases. Airway protection, oxygenation, management of pneumothorax, and fluid management are the main cornerstones of therapy. With these basic lines of management, most chest trauma cases can be treated successfully (**Marvin and Rosann, 1989).**

Associated COVID infection in trauma cases with respiratory failure after pulmonary trauma can obscure the cause of the respiratory failure. even treatment of both cases is similar, COVID-specific therapy is being investigated, and steroids have the best evidence. Also, superimposed bacterial infections should be treated (**Rembrandt and J.kayle, 2021).**

China first sent to the WHO about the presence of respiratory disease in Wuhan city

on December 31, 2019, which was then confirmed by the WHO as a novel coronavirus illness. On the other side here in Egypt, the first patient was discovered on February 12, 2020, and the second patient was discovered on 1 March 2020. Then in December 3,117,158 patients were confirmed diagnosed with coronavirus with a 5.7% mortality rate all over Egypt **(Hefeda et al., 2022).**

Reverse-transcriptase polymerase chain reaction test (RT-PCR) is considered the best test for the detection of COVID-19 disease. The degree and severity of mortality in COVID-19 chest infection has depend on many demographic and clinical factors such as age and related co-morbidities. presence of some signs on CT scan chest radiological investigation can help to diagnose and detect the prognosis and mortality in even younger and healthy patients **(Zhao et al., 2020; Zhou et al.,2020).**

The presence of COVID-19 infection with chest trauma may lead to a higher rate of extended, prolonged, and more severe complicated clinical course**(Li et al., 2020).** Chest trauma may be complicated by pneumonia, pneumothorax, and acute respiratory distress syndrome**(Sikander et al., 2020)**. The presence of COVID pneumonia at the same time in chest trauma cases with respiratory failure after chest trauma makes misleading for the actual cause of the respiratory failure **(VanDruff & Lee, 2021).**

AIM OF THE WORK

The present work aims to assess and compare prognosis of cases of chest trauma among COVID positive patient and Non-COVID in a Sohag governorate population.

PATIENTS AND METHODS

A prospective observational study was done in Sohag university hospital at thoracic surgery department. The study was done on 60 patients who were admitted to the thoracic surgery department with chest trauma and cases were middle age, including male and female sex.

Ethical consideration:
- Before the start of the study. This study protocol was approved by the Local Ethics Committee of our faculty of medicine at Sohag university, Sohag.
- Copy of permission to review anonymous data from patients' records obtained and included with files also submitted to the ethics committee of our faculty of medicine at Sohag university, Sohag.

Inclusion Criteria:
1- Subjects who had chest trauma were admitted to the hospital within less than 24 hours.
2- 30 cases which sure diagnosed as CORONA virus disease with polymerase chain reaction test (PCR) and the other 30 controls were negative for CORONA virus disease
3- Age 16-55 years (to minimize the effect of aging on the outcome of trauma).

Exclusion Criteria:
1. Age more than 55 years.
2. Patients with organ dysfunction or malignancies
3. Subjects with a history or clinical manifestation of other respiratory diseases (such as interstitial pulmonary fibrosis, bronchiectasis, etc.)
4. Prior history of lobectomy or pneumonectomy.

Methods:

Table (1): Groups.

	Group	**Intervention**
Group I	30 patients infected with COVID-19 had chest trauma	polymerase chain reactions (PCR) are considered for the detection of COVID-19 disease
Group II	30 patients not infected with COVID-19 had chest trauma	

For all cases, records will be reported including history and clinical examination data plus routine investigation was done. As well as Laboratory and imaging which was done, as 1-

Complete blood count 2-chest CT 3- Arterial blood gas analysis (ABG): PH, PCO_2 PaO_2, $HCO_3.O_2$sat. The outcome will be evaluated according to the presence of acute respiratory distress syndrome, and pneumonia if there is a need for assisted ventilation in ICU and up to death.

Statistical analysis procedures were computed using a statistical package for SPSS Version 23.0 (IBM Corp., Armonk, NY, USA). Continuous variables data were represented by Mean and standard deviation. on the other hand assessment of categorical variables, percentages and frequency were also done. Association between multiple study parameters was evaluated by using the chi-square test. P-value is less than0.05 which means the difference was highly significant.

RESULTS

60 cases were evaluated in our study, firstly about gender 76.7% and 73.3% in negative and positive COVID groups respectively were males, and (23.3%) and 26.7% in negative and positive Covid groups respectively were females. The mean age was 32.57±14.70 and 30.68 ±15.52 in the negative COVID and COVID groups respectively. (tables2,3)

The type of trauma and incidence of complications are shown in table 2. The mortality rate was 33% in the COVID group and 13% in the negative COVID group (table 2).

The hospital stays in ICU, ventilation, and lag before admission are represented in table 3.

The Association of mortality with different factors in COVID-19 infected and negative groups is represented in Table 4,5 respectively.

Table (2): History and complications in the studied group.

		Control cases negative for COVID-19		COVID-19 infected cases		Chi square test	
		No	%	No	%	X^2	P value
Sex	Female	7	23.3%	8	26.7%	0.089	0.766
	Male	23	76.7%	22	73.3%		
Type of trauma	Blunt	14	46.7%	18	60.0%	1.071	0.301
	Penetrating	16	53.3%	12	40.0%		
Cause	Assault	7	23.3%	6	20.0%	0.457	0.978
	Fall	4	13.3%	3	10.0%		
	Other	2	6.7%	3	10.0%		
	Road traffic accident	13	43.3%	14	46.7%		
	Sport injury	4	13.3%	4	13.3%		
complications	Wound infection	13	43.3%	17	56.7%	1.067	0.302
	Fractures	9	30.0%	8	26.7%	0.082	0.774
	Pneumonia	9	30.0%	26	86.7%	19.817	0.001
	Empyema thoracis	3	10.0%	10	33.3%	2.783	0.042
	Pneumothorax	6	20.0%	13	43.3%	3.774	0.052
	Hemothorax	8	26.7%	4	13.3%	1.667	0.197
	Acure respiratory distrsess syndrome	5	16.7%	13	43.3%	5.079	0.024
Survival	Died	4	13.3%	10	33.3%	10.145	0.032
	Survived	26	86.7%	20	66.7%		

Table (3): The hospital stay in ICU, ventilation and lag before admission

	Control cases negative for COVID-19		COVID-19 infected cases		t test	
	Mean	**SD**	**Mean**	**SD**	**t**	**P value**
Age	32.57	14.70	30.68	15.52	0.483	0.631
Time lag between trauma and admission in hours	7.47	4.88	10.50	7.34	-1.885	0.064
Hospital stay in days	25.60	12.37	31.77	12.26	-1.939	0.057
Hospital stay in ICU in days	10.17	10.42	17.00	9.62	-2.64	0.011
Duration of ventilation in days	4.50	7.63	10.83	8.83	-2.972	0.004

Table (4): association of mortality with different factors in COVID 19 infected group

		Mortality in COVID-19 infected cases				Chi square test	
		Died		**Survived**			
		No	**%**	**No**	**%**	**X^2**	**P value**
Type of trauma	Blunt	8	80.0%	10	50.0%	4.038	0.044
	Penetrating	2	20.0%	10	50.0%		
Cause	Assault	1	10.0%	5	25.0%	2.411	0.661
	Fall	1	10.0%	2	10.0%		
	Other	2	20.0%	1	5.0%		
	Road traffic accident	5	50.0%	9	45.0%		
	Sport injury	1	10.0%	3	15.0%		
complications	Wound infection	4	40.0%	13	65.0%	1.697	0.193
	Fractures	4	40.0%	4	20.0%	1.364	0.243
	Pneumonia	9	90.0%	17	85.0%	0.144	0.704
	Empyema thoracis	2	20.0%	6	30.0%	0.341	0.559
	Pneumothorax	6	60.0%	7	35.0%	1.697	0.193
	Hemothorax	4	40.0%	0	0.0%	9.231	0.002
	Acure respiratory distrsess syndrome	1	10.0%	12	60.0%	6.787	0.009

Table (5): association of mortality with different factors in COVID 19 negative group

| | | Mortality in Control cases negative for COVID-19 | | | | Chi square test | |
| | | **Died** | | **Survived** | | | |
		No	%	No	%	X²	P value
Type of trauma	Blunt	0	0.0%	14	53.8%	2.500	0.114
	Penetrating	4	100.0%	12	46.2%		
Cause	Assault	3	75.0%	4	15.4%	8.674	0.070
	Fall	1	25.0%	3	11.5%		
	Other	0	0.0%	2	7.7%		
	Road traffic accident	0	0.0%	13	50.0%		
	Sport injury	0	0.0%	4	15.4%		
complications	Wound infection	2	50.0%	11	42.3%	0.084	0.773
	Fractures	1	25.0%	8	30.8%	0.055	0.815
	Pneumonia	2	50.0%	7	26.9%	0.879	0.348
	Empyema thoracis	0	0.0%	3	11.5%	0.513	0.474
	Pneumothorax	1	25.0%	5	19.2%	0.072	0.788
	Hemothorax	3	75.0%	5	19.2%	5.514	0.019
	Acure respiratory distrsess syndrome	0	0.0%	5	19.2%	0.923	0.337

DISCUSSION

Thoracic injury is considered dangerous as it is life-threatening with high mortality due to the initial relation to respiratory failure, then by the effect of hypoxia and inflammation on other system functions **(Bouzat et al., 2017).** Our study was done to evaluate the features and characteristics of COVID-19-infected cases with thoracic injuries who came to the thoracic surgery department, and the relationship of these characteristics with the development of complications and mortality.

In this study, the mean age was 32.57 ±14.70 and 30.68 ±15.52 in COVID and negative COVID groups respectively with a higher male ratio in both groups. Similarly, in a previous study as male to female ratio was 4.1 to 1, and about age mean was 37.42 years. This observation can be explained as males and younger being more included in high-risk jobs and activities than females and older. Increased mortality in case of elderly cases with thoracic injuries may be due to the presence of more pre-morbid conditions at the same time **(Ekpe & Eyo, 2014).**

As for the type of trauma 60% of COVID patients had blunt trauma, while 46% of non-COVID had blunt trauma in our study. We discovered that motor car accidents and road accidents, in general, were the main cause of chest trauma in both groups. This study represents similar results in COVID cases with other previous studies regarding the percentage of the two types of thoracic injury where the blunt injury occurs more commonly than

penetrating injury. The ratio between penetrating trauma to blunt trauma was about 35% to 65%(**Ekpe & Eyo, 2014; Lema et al., 2011**).

In the present work, in CORONA virus cases more risky complications were presented with a statistically significant probability. The second most common complication after wound infection and the fracture was pneumonia with a higher significant risk in COVID patients. It was previously proved that Pneumonia represents the most dangerous clinical finding of CORONA virus disease, 20% of cases need hospital inpatient admission, and about 5% need intensive care unit admission for COVID-19 cases(**Özger et al., 2020**). And the presence of chest injury in this study increases the probability of chest infection with a higher risk of morbidity and mortality. The presence of chest infections in severely injured cases ranged from 8% to more than 50% (**Wutzler et al., 2017**).

In this study, the mortality was significantly higher after chest trauma in COVID patients compared to that in negative COVID. Also, acute respiratory distress syndrome and empyema thoracic were of significantly higher risk after chest trauma in COVID patients compared to that with negative COVID. Previous authors reported that COVID pneumonia exacerbated persistent respiratory failure (**VanDruff & Lee, 2021**).

In the current study, the most common complication associated with mortality in both groups was pneumonia. With mortality percentages: of 90% and 50% in COVID-19 and negative COVID 90% respectively. However, the association of mortality between Hemothorax and ARDS was significantly higher than survival in COVID than in COVID with no survival in COVID cases with haemothorax. No deaths were detected after ARDS in negative COVID.

Similarly, **Fahr et al. (2017)** in there study demonstrated that in healthy non-infected cases the occurrence of pneumonia was related to that mortality (**Fahr et al., 2017**). On the other side, however, observed that the occurrence of pneumonia did not affect the incidence of post-traumatic mortality(**Arumugam et al., 2018**). The discrepancy in our results is more obvious in the COVID group, this might be explained by

the impact of COVID on the deterioration of pneumonia and increased probability of respiratory distress.

In this study, The stay in ICU and ventilation duration significantly longer after chest trauma in COVID patients than in negative COVID. Supporting these results a previous study reported that mortality rates exceeded 50% among critically ill adults with COVID-19, particularly among those requiring mechanical ventilation (**Auld et al., 2020**).

The mortality in COVID patients was associated with significantly more lag time before hospital admission compared to survival, while this difference was insignificant in negative COVID cases in our study. That might be due to the fear of the spread of COVID-19 infection. It is of particular importance to avoid the spread of CORONA virus in intensive care units. Disinfection for example concomitant and terminal disinfection. Concomitant disinfection must be present as soon as possible for all materials contaminated by the body's excretion of cases that sure diagnosed CORONA virus or even just suspected of virus infection (**Shang et al., 2020**).

CONCLUSION

the factors indicated above increase mortality in thoracic injuries cases and must be considered in the diagnosis, treatment, and even follow-up later of cases with these types of injuries.

RECOMMENDATIONS

● This study was of a small sample size. A larger sample should be taken in further studies for confirmation of the association of mortality in chest trauma of COVID-19 patients with different factors and complications.

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الملخص العربي

نتيجة الإصابة الصدرية بين الحالات الإيجابية لـ Covid-19 مقارنة بالمرضى غير المصابين بـ COVID في محافظة سوهاج

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أبلغت الصين منظمة الصحة العالمية لأول مرة عن ظهور مرض تنفسي في مدينة ووهان في ٣١ ديسمبر ٢٠١٩ ، والذي أكدته منظمة الصحة العالمية بعد ذلك على أنه مرض جديد لفيروس كورونا. في مصر ، تم الإبلاغ عن الحالة الأولى في ١٢ فبراير ٢٠٢٠ والحالة الثانية في ١ مارس. اعتبارًا من ٣ ديسمبر ، تم تأكيد ١١٧١٥٨ حالة إصابة بنسبة ٥,٧٪ في جميع المدن المصرية.

يعتبر تفاعل البوليميراز المتسلسل للنسخ العكسي (RT-PCR) هو الاختبار القياسي الذهبي لتشخيص عدوى COVID-19. اعتمد التنبؤ بالوفيات في الالتهاب الرئوي COVID-19 على العوامل الديموغرافية والسريرية مثل عمر المريض والأمراض المصاحبة به. قد يساعد تحديد علامات معينة في الفحص الأولي للصدر بالتصوير المقطعي المحوسب على التنبؤ بالتشخيص والوفيات.

قد يؤدي وجود الالتهاب الرئوي COVID-19 فى وجود الإصابة الصدرية إلى دورة سريرية مطولة ومعقدة. قد تكون صدمة الصدر معقدة بسبب الالتهاب الرئوي واسترواح الصدر ومتلازمة الضائقة التنفسية الحادة. يمكن لعدوى COVID المتزامنة في مرضى الصدمات الذين يعانون من فشل في الجهاز التنفسي بعد الصدمة الرئوية أن تحجب سبب فشل الجهاز التنفسي .

وتهدف هذه الدراسة الى وصف مضاعفات ونتائج إصابات الصدر لدى المرضى المصابين بالالتهاب الرئوي المؤكد COVID-19 وتقارن هذه النتائج مع تلك الموجودة في صدمات الصدر في المجموعة الضابطة السلبية لـ COVID-19 في سوهاج.

أجريت هذه الدراسة دراسة مرجعية قائمة على الملاحظة في قسم جراحة الصدر في مستشفى جامعة سوهاج . اشتملت الدراسة على ٦٠ مريضاً في منتصف العمر ، من كلا الجنسين ، تم قبولهم بإصابات في الصدر . تم تقسيمهم إلى مجموعتين: المجموعة الأولى: ٣٠ مريضًا مصابًا بـ COVID-19 أصيبوا بصدمة في الصدر والمجموعة الثانية: ٣٠ مريضًا سلبيًا من COVID-19 أصيبوا بصدمة في الصدر تم تقييم النتيجة من حيث الالتهاب الرئوي ومتلازمة الضائقة التنفسية الحادة والحاجة إلى التهوية الغازية والوفاة.. وجمع البيانات.ثم التحليل الاحصائى

النتائج: في هذه الدراسة ، كان متوسط العمر ٣٢,٥٧ ± ١٤,٧٠ و ٣٠,٦٨ ± ١٥,٥٢ في مجموعتي COVID و COVID السلبي على التوالي مع نسبة ذكور أعلى في كلا المجموعتين . أما بالنسبة لنوع الصدمة ، فإن ٦٠٪ من مرضى كوفيد يعانون من إصابات حادة ، بينما ٤٦٪ من غير المصابين بفيروس كوفيد. وقد زادت عدوى COVID-19 من المضاعفات والوفيات في إصابات الصدر. كان الالتهاب الرئوي ومتلازمة الضائقة التنفسية الحادة من المضاعفات الشائعة المرتبطة بارتفاع معدل الوفيات حيث كانت نسبة الةفيات حوالى ٨٦٪ و ٦٦٪ في مجموعتي COVID و COVID السلبي على التوالي

الاستنتاج: تزيد عدوى COVID-19 من المضاعفات والوفيات في إصابات الصدر