The Association between Presence of Comorbidities and Covid-19 Outcomes

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Abstract:

Background: The pandemic situation with the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has endangered human lives. . This study aimed to assess the association between comorbid diseases and covid-19 severity. **Design:** Observational retrospective study was followed in this study. Study setting: This study was conducted at Tanta main university hospital and Itay El-baroud general hospital. **Subjects:** A purposeful sample of 100 adult isolated patients from the previously mentioned settings was included in this study. **Tools of data collection:** one tool was used to collect data in this study "Covid-19 clinical characteristics assessment sheet" this tool consists of 2 parts: **Part *(1)*:** Demograhic data of the studied cases with covid-19 **Part *(2)*:** clinical characteristics of studied cases with covid-19. The results: There was highly significant relationship between hypertension and diabetes mellitus and risk of death**. Conclusion:** The presence of comorbidities is associated with severity of COVID-19 infection. The strongest association was observed for diabetes, and hypertension. **Recommendations:** pay attention to increase the awareness of the association between comorbidities and covid-19 severity.

Keywords: COVID-19, Disease severity, Comorbid conditions.

Introduction

Coronavirus disease 2019 (COVID-19) is a highly contagious infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 has had a catastrophic effect on the world, resulting in more than 6 million deaths worldwide. It has emerged as the most consequential global health crisis since the era of the influenza pandemic of 1918. As the virus mutates, treatment guidelines are altered to reflect the most efficacious therapies. This activity is a comprehensive review of the disease presentation, complications, and current guideline-recommended treatment options for managing this disease**(Cascella, Rajnik, Aleem, Dulebohn, & Di Napoli, 2020)**

Several studies reported the prevalence of comorbidities in COVID-19 patients; however, a systematic evaluation of comorbidities to compare the relation of underlying medical conditions between severe and non-severe patients is lacking. Previous systematic reviews and meta-analyses explored some but not all aspects of this association. Therefore, this meta-analysis aims to assess the association between all underlying comorbidities in COVID-19 infection severity. The results could

guide healthcare professionals to encounter properly with COVID-19. Besides, it will help policy-makers to design a prevention plan as well as respond to CO-VID-19 and its critical outcomes more preparedly **(Huang et al., 2020).**

The Aim of the study:

The aim of this study was to assess the association between presence of comorbidities and covid-19 severity.

Research Questions:

What are the association between presence of comorbidities and covid-19 severity**?**

Research Design:

Observational retrospective study was followed in this study.

Setting:

This study was conducted in Tanta main university hospital and Itay El-baroud general hospital in Egypt.

Subjects:

A purposeful sample of 100 adult isolated patients from the above mentioned settings were included in the study.

Study Duration

The data were collected throughout a period of 6 months from the beginning of November 2021 up to April 2022.

Inclusion criteria:

All confirmed cases of COVID-19 were screened and only patients with definitive outcomes were included.

Exclusion criteria:

Patients who didn't have medical folders or information.

Tools for data collection

Data that collected used the following tool: Tool of data collection that was used to achieve the purpose of the current study is one tool which is "Covid-19 clinical characteristics assessment sheet".

This tool was adapted from **(Zhao, 2020).** Modifications were added by the researcher after reviewing the relevant literatures **(Wang, 2020), (Chua et al., 2021), (Ghelichkhani, 2020)** it was used to assess the clinical characteristics of patients with covid-19; this tool consists of 2 parts:

Part 1: demographic data of studied cases with covid-19.

This part included: age, sex, time from illness onset to hospital admission and APCHII score.

Part 2: Clinical characteristics of studied cases with covid-19.

This included acute signs and symptoms of admission, Comorbidities, APACHE score (Acute Physiology And Chronic Health Evaluation), Laboratory findings, Imaging results, treatment and clinical outcomes of studied cases with covid-19.

Outcomes: this included:

- Discharge.

- Death.

- Complications and the hospital length of stay of discharged patients.

Validity:

It is the extent to which an instrument measures what it is supposed to measure and performs as it is designed to perform. External validity is the extent to which the results of a study can be generalized from a sample to a population. Content validity refers to the appropriateness of the content of an instrument .

This tool was submitted for external and content validity to a jury of 5 experts in the fields of Critical Care and Emergency Nursing department, Faculty of Nursing, Damanhour University to check its content validity, construction clarity, and completeness of items and accordingly, all necessary modifications were introduced.

Reliability:

Cronbach's Alpha was used to determine the internal reliability of the tool. Reliability of the tools was tested to determine the extent to which the tool items are related to each other and the result was (0.75) which is accepted. Cronbach's alpha reliability coefficient normally ranges between 0 and 1; higher values (more than 0.7) denote acceptable reliability.

Pilot study:

A pilot study was carried out on 10 cases (10 % from the study sample) to test the clarity and applicability of the research tool and they were excluded from the study.

Field work:

- An official letters from the faculty of nursing Helwan university were sent to the administrative authorities of Tanta main university hospital and Itay elbaroud general hospital .

- A written approval to conduct this study was obtained after providing explanation of the aim of the study.

- Selection of sample (patients' records) after inclusion and exclusion criteria.

• Each folder was coded for ethical consideration.

• Unmet criteria were extracted.

• Data were collected using the designed Tool "Covid-19 clinical characteristics assessment sheet" and started by biological factors(demographics, acute signs and symptoms, laboratory values, imaging features, comorbidities, treatment protocol and clinical outcomes), psychological factors(anxiety and depression)

• Data were collected using patients records.

The data were collected throughout a period of 4 months from the beginning of November 2021 up to February 2022.

Administrative item:

An official permission was obtained by submission of a formal letter issued from the Dean of Faculty of Nursing Helwan University to the general managers of Tanta main university hospital and Itay Elbaroad general hospital After explanation of the study aim and objectives an approval to collect data of this study was obtained.

Ethical Considerations:

The researcher approval was obtained from the ethical committee of the Faculty of Nursing Helwan University. Then went to general managers of Tanta main university hospital and Itay Elbaroad general hospital, interviewed with them, read the protocol papers and research tools, then signed with approval, Then the researcher was directed to responsible employee, who coordinated the entry into the archive unit in the hospital. The anonymity, privacy and the confidentiality of the data were assured.

Statistical Analysis:

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 23.0. Qualitative data were described using number and percent. Quantitative data were described using mean, standard deviation. Significance of the obtained results was judged at the 5% level. The used tests were

- Chi-square test

For categorical variables, to compare between different categories.

- Fisher's Exact or Monte Carlo correction

Correction for chi-square when more than 20% of the cells have expected count less than 5.

-Student t-test

For normally distributed quantitative variables, to compare between two studied categories.

Results

Table (1): Distribution of the studied cases with Covid-19 according to demographic data (n = 100)

	No.	%
Age (years)		
18 – 30	8	8.0
31 – 40	12	12.0
41 – 50	11	11.0
51 – 60	20	20.0
More than 60	49	49.0
Min. – Max.	18.0 – 90.0	
Mean ± SD.	58.26 ± 17.61	
Gender		
Male	70	70.0
Female	30	30.0
Time from illness onset to hospital admission (n = 96)[#]		
Min. – Max.	0.0 – 24.0	
Mean ± SD.	6.70 ± 4.19	
APCHII score		
Min. – Max.	2.0 – 20.0	
Mean ± SD.	8.77 ± 5.64	

SD: Standard deviation; #: 4 cases NA

Table (1) illustrates Distribution of the studied cases with Covid-19 according to demographic data, Regarding demographic data, it can be noted, about one half of confirmed cases aged more than sixty years old, the majority of them were males(70%). It was also noted that the mean and standard deviation of Time from illness onset to hospital admission and APCHII score were (6.70 ± 4.19 and 8.77 ± 5.64 respectively

Table (2): Distribution of the studied cases with Covid-19 according to comorbidities (n = 100)

	N	No		Yes	
		No.	%	No.	%
Comorbidities					
Hypertension	100	38	38.0	62	62.0
Diabetes	100	46	46.0	54	54.0
Coronary heart disease	100	68	68.0	32	32.0
Chronic obstructive lung disease	100	90	90.0	10	10.0
Carcinoma	100	90	90.0	10	10.0
Chronic kidney disease	100	86	86.0	14	14.0
Liver dysfunction	100	97	97.0	3	3.0
Smoking	67	54	80.6	13	19.4

Table (2) illustrates Distribution of the studied cases with Covid-19 according to comorbidities, according to this table it was noted that, about two third of cases suffered from hypertension (62%), and about half of cases were diabetic (54%), while only 19.4% of recorded cases were smokers.

Table (3): Association between Comorbidities and covid-19 clinical outcomes.

Variable	Death				χ^2	p
	No (N = 77)		Yes (N = 23)			
	No.	%	No.	%		
Comorbidities						
Hypertension						
No	37	48.1%	1	4.3%	14.358*	<0.001*
Yes	40	51.9%	22	95.7%		
Diabetes						
No	44	57.1%	2	8.7%	16.734*	p <0.001*
Yes	33	42.9%	21	91.3%		
Coronary heart disease						
No	56	72.7%	12	52.2%	3.438	p=0.064
Yes	21	27.3%	11	47.8%		
Chronic obstructive lung disease						
No	70	90.9%	20	87.0%	0.307	FEp=0.692
Yes	7	9.1%	3	13.0%		
Carcinoma						
No	68	88.3%	22	95.7%	1.06	FEp=0.446
Yes	9	11.7%	1	4.3%		
Chronic kidney disease						
No	68	88.3%	18	78.3%	1.486	FEp=0.302
Yes	9	11.7%	5	21.7%		
Liver dysfunction						
No	74	96.1%	23	100.0%	0.924	FEp=1.000
Yes	3	3.9%	0	0.0%		
Smoking	**N=57**		**N=10**			
No	47	82.5%	7	70.0%	0.844	0.394
Yes	10	17.5%	3	30.0%		

χ^2: **Chi square test**

FE**: Fisher Exact**

*: Statistically significant at $p \leq 0.05$

Table (3) illustrates relation between clinical outcome and Comorbidities, this table indicates that: there was highly significant relationship between hypertension, diabetes and death (p<0.001). This table also indicates that there was non-significant relationship between coronary heart disease, chronic obstructive lung disease, carcinoma, chronic kidney disease, liver dysfunction, smoking and death.

Discussion

Severe acute respiratory syndrome (SARS-CoV-2) belongs to a group of viruses that cause Coronavirus disease 2019 (COVID-19) which affects the respiratory, gastrointestinal, liver and central nervous system **(Lau, Chan, 2015).** The SARS-CoV-2 novel coronavirus was identified in Wuhan, Hubei province of China in December 2019 by the Chinese Center for Disease and Prevention from the throat swab of a patient and the virus is named severe acute respiratory distress COV-2 by WHO which causes Coronaviruses disease 2019 (COVID-19). The clinical manifestation of the current coronavirus infection is similar to the one occurred in China in 2002 by the name severe acute respiratory distress syndrome**. (Chen et al, 2020) & (WHO, 2020).**

Regarding **demographic data and clinical characteristics**, the current study concluded that the majority of affected cases were males. This may be attributed to what was reported that differences in the levels and types of male and female sex hormones influence the susceptibility to infection by COVID-19 because sex hormones modulate adaptive and innate immune responses. Thus, the reduced susceptibility of females to viral infections can be attributed to the protection from the X chromosome and sex hormones **(Jaillon et al., 2019).**

Research has identified that males were affected most in the SARS and MERS epidemics (**Badawi et al., 2016**). Thus, the results presented in this study converge with these findings. These findings are contradicted by **Tavakolifard et al (2022)** who conducted study entitled "Clinical Symptoms of COVID-19 and Their Association with Disease Outcome." and reported that the majority of cases were females.

Previously, older age has been reported as an important independent predictor of mortality in SARS and MERS (**Choi et al., 2003**) & (**Hong et al.2018**). The current study confirmed that increased age was more susceptible to infection with COVID-19. Previous studies inoculated with SARS-CoV found that olders had stronger host innate responses to virus infection than younger adults; Age-related responses with weak immune systems are probable contributing factors for adverse outcomes of the disease (**Wu et al., 2020**).

This result is in the same line with **Xiaobo et al. (2020)** who reported that, the patients were older in their study than in previous studies. These results also converge with some studies **(Oliveira et al 2020) & (Martins et al., 2021)** by showing that the most affected population by COVID-19 is between 50 and 64 years of age.

The result of the current study is contradicted by a study conducted **byZhao et al (2020)** entitled "A Retrospective analysis of the clinical and epidemiological characteristics of COVID-19 patients in Henan Provincial People's Hospital, Zhengzhou, China" who reported that the largest percentage of cases (31%) were middle aged.

Concerning the average time from illness onset to hospital admission, the result of the current study revealed that the median length between symptom onset and hospitalization ranging between 4and 6.7 days. This may be attributed to similarity of many COVID-19 symptoms to those of seasonal influenza.

The result of the current study is to some degree in line with Faes et al, (2020) who conducted a study entitled "Belgian Collaborative Group on COVID-19 Hospital Surveillance. Time between Symptom Onset, Hospitalization and Recovery or Death" and reported that the median length between symptom onset and hospitalization ranging between 3and 10.9 days.

Chronic illness such diabetes and hypertension are identifiable risk factors for morbidity and mortality , **Regarding comorbidities**, the current study revealed that hypertension and diabetes mellitus were the most reported comorbid diseases of confirmed covid-19 patients. This may be attributed to impairment of the immune response. This occurs either as a direct consequence of the disease or because of its medication. This is supported by previous cohort studies confirming similar findings (**Zhou et al and Docherty et al., 2020**)

In agreement with this study, **Yan (2020)** who conducted a study entitled "Clinical characteristics and prognosis of 218 patients with COVID-19" who reported that diabetes and other chronic comorbidities were associated with poor prognosis.

Smoking is a controversial factor in COVID-19. It is remarkably associated with dose-dependent up regulation of ACE2 expression causing more harm in developing critical outcomes among the patients (***Smith* et al & Zheng et al, 2020**). On the contrary, some reports have not found smoking to be associated with COVID-19 severity (***Lippi, Henry*, 2020**). The present study showed that only around fourth of recorded cases were smokers. **Fouad, et al (2021)** reported higher percentage of smokers (42.86%) in a study among ICU admitted covid-19 cases.

Regarding association between clinical outcomes and Comorbidities**,** this study formulated that there was highly significant relationship between hypertension and diabetes mellitus and risk of death.

In agreement with the result of the current study **Huang *et al*.,(2020)** reported that diabetes was associated with an increased relative risk of death due to COVID-19 in a study entitled Diabetes mellitus is associated with increased mortality and severity of disease in COVID-19 pneumonia – A systematic review, meta-analysis, and meta-regression".

Tavakolifard et al (2022) also reported that having CVDs and diabetes were associated with a higher risk of death due to COVID-19 compared to respiratory diseases and liver disorders. This was to some degree contradicted with the result of the current study that revealed non-significant relationship between CVDs and death. The increased risk of death observed in the single variable model was due to the effect of older age.

The current study also showed that there was no a statistical significant relationship between Chronic obstructive lung disease, carcinoma and liver disease. It was also found that there was no statistical significant relationship between smoking and death. This is in agreement with some reports that have not found smoking to be associated with COVID-19 severity (***Lippi, Henry*, 2020**).

Conclusion

In the light of the present study, it was concluded that the majority of confirmed covid-19 patients were old males. Hypertension and diabetes mellitus were the most reported comorbid diseases of confirmed covid-19 patients.

There was highly significant relationship between hypertension, diabetes mellitus and risk of death. A significant relationship between serum ferritin level and death was formulated. There was significant relationship between blood group A and death ($p<0.001$).

Recommendations:

Based on the findings of this study the following recommendations are suggested:

- Develop targeted interventions for vulnerable groups such as the elderly and those with underlying conditions which can reduce morbidity and mortality.

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