The effect of comorbid conditions on postoperative morbidity in COVID-19 test positive patients undergoing emergency surgery, a descriptive study

Acil cerrahi girişim uygulanan COVID-19 testi pozitif hastalarda komorbid durumların postoperatif morbiditeye etkisi, tanımlayıcı bir çalışma

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Abstract

Introduction Subjecting COVID-19-positive patients to surgical procedures might heighten the risk of complications and make the treatment process more complex. Our study aims to investigate the complications following emergency surgical interventions performed in COVID-19-positive patients and to examine the impact of comorbid conditions on postoperative morbidity in these patients on postoperative morbidity.

Materials and Methods Between April 1, 2020, and December 1, 2022, emergency abdominal surgical interventions performed in our clinics were evaluated. The study examined the impact of preoperative comorbidities on postoperative mortality in patients who tested positive for COVID-19 positive in the preoperative period was investigated. Hospital records will be scanned using a retrospective cohort study method to examine the relationship between dependent variables (mortality, morbidity (cerebrovascular disease, diabetes mellitus, hypertension, cancer, smoking, chronic kidney disease, and chronic heart disease), length of hospital stay) and independent variables (gender, age, type of anesthesia, ASA assessment class, and preoperative laboratory parameters (hemoglobin, leukocyte count, d-dimer, and C reactive protein)).

Results Diabetes mellitus was significantly associated with postoperative morbidity (p=0.04). However, no statistically significant relationship was found between other comorbid conditions and postoperative morbidity. There was no significant difference between comorbid conditions and postoperative mortality. Regression analysis also revealed a statistically significant association between diabetes mellitus and postoperative complications (p=0.024).

Conclusion In our study found that comorbid diabetes mellitus status had an impact on postoperative morbidity in COVID-19 positive patients undergoing emergency surgery. Detailed preoperative evaluation of these patients before surgery will decrease postoperative morbidity.

Keywords COVID-19, Emergency Surgery, Abdominal Surgery, Comorbidity, Postoperative Morbidity.

Özet

Amaç COVID-19-pozitif hastaların cerrahi prosedürlere tabi tutulması komplikasyon riskini artırabilir ve tedavi sürecini daha karmaşık hale getirebilir. Çalışmamızın amacı COVID-19-pozitif hastalara uygulanan acil cerrahi girişimler sonrası komplikasyonları araştırmak ve bu hastalarda komorbid durumların postoperatif morbidite üzerindeki etkisini incelemektir.

Gereç ve Yöntemler 1 Nisan 2020 ile 1 Aralık 2022 tarihleri arasında kliniğimizde gerçekleştirilen acil abdominal cerrahi girişimler değerlendirildi. Çalışmada, preoperatif dönemde COVID-19 testi pozitif çıkan hastalarda preoperatif komorbiditelerin postoperatif mortalite üzerindeki etkisi araştırıldı. Hastane kayıtları retrospektif kohort çalışması yöntemiyle taranarak bağımlı değişkenler (mortalite, morbidite (serebrovasküler hastalık, diabetes mellitus, hipertansiyon, kanser, sigara, kronik böbrek hastalığı ve kronik kalp hastalığı), hastanede kalış süresi) ve bağımsız değişkenler (cinsiyet, yaş, anestezi tipi, ASA değerlendirme sınıfı ve preoperatif laboratuvar parametreleri (hemoglobin, lökosit sayısı, d-dimer ve C reaktif protein)) arasındaki ilişki incelenecektir.

Bulgular Diabetes mellitus postoperatif morbidite ile anlamlı olarak ilişkiliydi (p=0.04). Ancak, diğer komorbid durumlar ile postoperatif morbidite arasında istatistiksel olarak anlamlı bir ilişki bulunmadı. Komorbid durumlar ile postoperatif mortalite arasında anlamlı bir fark bulunmamıştır. Regresyon analizi ayrıca diabetes mellitus ile postoperatif komplikasyonlar arasında istatistiksel olarak anlamlı bir ilişki olduğunu ortaya koydu (p=0.024).

Sonuç Çalışmamızda, acil cerrahi uygulanan COVID-19 pozitif hastalarda komorbid diabetes mellitus durumunun postoperatif morbidite üzerinde etkili olduğu bulunmuştur. Bu hastaların ameliyat öncesi ayrıntılı değerlendirilmesi ameliyat sonrası morbiditeyi azaltacaktır.

Anahtar Kelimeler COVID-19, Acil Cerrahi, Abdominal Cerrahi, Komorbidite, Postoperatif Morbidite.

INTRODUCTION

The COVID-19 pandemic has entered history as a global health crisis that profoundly impacted healthcare systems and societies worldwide. Even asymptomatic individuals carried the potential for transmission, radically transforming treatment approaches and healthcare practices. COVID-19, caused by the SARS-CoV-2 virus, can result in severe respiratory tract infections and lead to significant complications in many patients, posing several challenges in dealing with the disease [1,2].

Surgical interventions meet a critical healthcare need beyond the medical treatment of the disease. However, under the COVID-19 pandemic, the risks and outcomes of surgical procedures have presented new and significant challenges for both patients and healthcare professionals. Subjecting COVID-19 positive patients to surgical procedures might heighten the risk of complications and make the treatment process more complex [3,4].

SARS-CoV-2, an infectious agent originating from animals, represents the seventh coronavirus identified in humans. It is responsible for the illness known as COVID-19, with 80% of cases exhibiting mild or moderate symptoms such as fever, dry cough, and fatigue. In its severe form, the disease led to acute respiratory failure, metabolic acidosis, coagulation disorders, and multi-organ failure in 50-60% of cases [5].

Its rapid transmission via aerosols led to the global spread of the disease, prompting the World Health Organization (WHO) to declare a pandemic in March 2020. Since then, several modifications have been necessary in standard clinical practices. The global healthcare systems have been adversely affected by the pandemic.

Emergency surgery, being an essential procedure that cannot be delayed, underwent immediate changes. This new situation led to the creation of protocols and recommendations by various entities like the Spanish Association of Surgeons (Asociación Española de Cirujanos, AEC) and the World Society of Emergency Surgery (WSES) [6].

This study aims to examine the implementation of surgical interventions in COVID-19 positive patients and specifically focuses on their impact on comorbid conditions and their effect on postoperative morbidity. The direct and indirect effects of COVID-19 during surgical procedures could significantly affect patient outcomes. Moreover, understanding the potential effects of comorbid conditions on post-surgical recovery and morbidity necessitates in-depth research and understanding.

The objective of this study is to associate the potential risk of postoperative morbidity and mortality, especially in COVID-19 positive patients, with existing comorbid conditions, providing guidance on how surgical interventions can be managed in this particular patient group. This research might shed light on the factors that need to be considered while making surgical decisions in clinical practice. Additionally, it could help develop a general understanding of how health systems and surgical practices can cope with such extraordinary situations during the COVID-19 pandemic. This study could offer a significant contribution to comprehending and addressing the challenges faced by patients and healthcare professionals. The COVID-19 outbreak has shaken healthcare systems, transformed surgical practices and approaches, and significantly changed the delivery of healthcare services. The challenges that surgical procedures and interventions face during the pandemic have provided a unique ground for both patients and healthcare professionals. While the need for surgical interventions for patients continues, the effects and outcomes of surgical procedures in COVID-19 positive individuals bring forth several factors that can increase the risk of complications and complicate treatment processes. These factors include the patient's immune status, infection risk, potential for postoperative recovery, and the effects of comorbid conditions on surgical outcomes. Assessing the impact of comorbid conditions on morbidity and mortality after surgery, particularly in COVID-19 positive patients, is critically important to enhance patient outcomes and draw a more effective roadmap in surgical practices. This requirement calls for understanding and resolving the challenges faced by patients and healthcare professionals. This article aims to address the impact of comorbid conditions on postoperative morbidity in COVID-19 positive patients undergoing surgical interventions and to develop an understanding of how health systems and healthcare professionals can better prepare in such challenging times. It might guide clinical practices and decision-making processes and optimize surgical practices under the COVID-19 pandemic, providing a critical step toward better management of surgical interventions in these patients. By emphasizing the importance of addressing surgical interventions and comorbid conditions in COVID-19 positive patients, this study might contribute to improving patient health outcomes and optimizing the capacity of healthcare systems during the pandemic [7,8,9,10].

MATERIAL and METHODS

In this study, COVID-19 in the General Surgery Clinic of a tertiary care medical center The relationship between comorbid conditions and the development of complications in emergency surgical operations performed on positive patients was investigated. Surgery of patients who applied to our center between April 1, 2020 and December 1, 2022 preoperative comorbid conditions were examined. The study was conducted in accordance with the Declaration of Helsinki carried out.

Study Design

The study was planned as a retrospective descriptive study. Data on emergency surgical operations performed on COVID-19 positive patients in the General Surgery Clinic of Bandırma Onyedi Eylul University hospital were obtained from hospital records between April 1, 2020 and December 1, 2022 and evaluated. Inclusion criteria were patients who underwent emergency surgical procedures in our clinic and who and/or patients with a positive COVID-19 test within 72 hours after surgery defined. Data collection was performed through hospital record systems. All patients are routinely called for follow-up in our clinic at 1 month after discharge. Mortality and other morbidity were also evaluated through the registry systems. Hospital records were also used to determine overall survival and disease-free survival times. Patients with a negative COVID-19 test before emergency surgery and/or within 72 hours after surgery were excluded.

Demographic data, preoperative comorbid diseases (cerebrovascular disease, diabetes mellitus, hypertension, cancer, smoking, chronic kidney disease, chronic heart disease), surgical procedure performed, postoperative complication status, preoperative laboratory parameters (hemoglobin, leukocyte, d-dimer and C reactive protein), length of hospitalization, mortality and morbidity status were evaluated. Ethics committee approval was obtained from Bandırma Onyedi Eylül University Ethics Committee with the decision dated 21/11/2023 and numbered 183.

Statistical Analysis

The collected data will be evaluated using SPSS 26.0 statistical analysis package. Descriptive statistics will be presented as frequency, percentage distribution, mean and median. Chi-square test, Kruskal-Wallis test and regression analysis methods were used. Appropriate a simple linear model to analyze the influence profile of the parameters on each parameter regression analyses were used. Binary Logistic Regression analysis was used to determine predictive factors. p value of 0.05 was considered statistically significant.

RESULTS

Gender distribution among patients who underwent emergency surgery while COVID-19 positive evaluated. Data were collected from 58 males (57.43%) and 43 females (42.57%) in the study group. Male patients are slightly over-represented compared to female patients. The age distribution of those who underwent emergency surgery while COVID-19 positive is 18-30 years old: 9 patients, 31-45 years: 24 patients, 46-60 years: 26 patients 61-75 years: 19 patients, 76 years and over 23 patients. Age-based statistics show that patients who underwent emergency surgery while COVID-19 positive shows the variation in age groups. When the patients were grouped according to anesthesia scores, no statistically significant difference was found in terms of postoperative complications. (p = 0.61). When the patients were evaluated according to the type of anesthesia, surgery there was no statistically significant difference in postoperative complications (p = 0.94). There was no statistically significant difference when the patients were grouped according to the type of surgical operation (p = 0.102) (Table 1).

Table 1. Clinical characteristics of the patients, surgical procedure performed, distribution of postoperative complications.

Sex, n		
Female	43	
Male	58	
Age, n, (year)		
18-30	9	
31-45	24	
46-60	26	
61-75	19	
>76	23	
Type of anesthesia, n (%)		
General	95 (94.1%)	p=0.94
Regional	6 (5.9%)	
ASA skore, n (%)		
ASA 1E	18 (17.8%)	p=0.61
ASA 2E	51 (50.5%)	
ASA 3E	30 (29.7%)	
ASA 4E	2 (2.0%)	
Surgical operation, n		
Appendectomy	49	p=0.102
Cholecystectomy	6	
Emergency Upper GI Surgery	16	
Emergency Lower GI Surgery	19	
Trauma Surgery	5	
Perianal Abscess	6	
Postoperatif Komplikasyon, n (%)		
Negative	70 (69.3%)	
Positive	31 (30.6%)	
Wound site infection	17 (54.8%)	
Intrabdominal sepsis	9 (29.0%)	
Pulmonary infection	11 (35.4%)	
Renal failure	6 (19.3%)	
MODS	3 (9.6%)	

n: number, p: value, ASA: American Society of Anesthesiologists, GI: Gastrointestinal, MODS: Multiple Organ Dysfunction Sydrome

Preoperative laboratory tests of patients who underwent emergency surgery while COVID-19 positive in the examination of their values; Hemoglobin The mean hemoglobin level is 13.5, with a median value of 13.8, slightly higher high and the standard deviation is 1.2. WBC (White Blood Cell): Mean white blood cell count was 8.7, median 8.5 and standard deviation was 2.1. CRP (C-Reactive Protein): Mean C-reactive protein level was 5.2, median value was 4.9 and standard deviation was 2.8. D-dimer The mean D-dimer value was 250, median 240 and standard deviation 50 (Table 2).

Table 2. Preoperative laboratory values.

Value	Mean	Median	Standard Deviation
Hemoglobin, g/dL	13.5	13.8	1.2
WBC (White Blood Cell), mcL	8.7	8.5	2.1
CRP (C-Reactive Protein), mg/dL	5.2	4.9	2.8
D-Dimer, ng/mL	250	240	50

g: grams, dL: deciliter, mg: milligrams, ng: nanograms, mL: milliliter, mcL: microliter

Cancer (Morbidity Rate: 55.3%): Postoperative for patients with comorbid cancer morbidity rate was 55.3% (p=0.55). Diabetes (Morbidity Rate: 66.7%): Patients with diabetes as a comorbid condition morbidity rate was 66.7%. The risk of postoperative complications in these patients means that it is higher compared to the others (p=0.04). Hypertension (Morbidity Rate: 52.6%): Hypertension as a comorbid condition morbidity rate was 52.6% in patients (p=0.91). Smoking (Morbidity Rate: 40.0%): Smoking as a comorbid condition morbidity rate was 40.0% in patients (p=0.33). History of cerebrovascular disease (Morbidity Rate: 57.1%): The morbidity rate in patients with comorbid cerebrovascular disease was 57.1% (p=0.75). History of chronic kidney disease (Morbidity Rate: 60.0%): Chronic kidney disease as a comorbid condition the morbidity rate in patients was 60.0% (p=0.57). History of chronic lung disease (Morbidity Rate: 70.0%): The morbidity rate was 70.0% in patients with chronic lung disease as a comorbid condition (p=0.21). History of chronic lung disease (Morbidity Rate: 70.0%): The morbidity rate was 70.0% in patients with chronic lung disease as a comorbid condition (p=0.21). History of chronic heart disease (Morbidity Rate: 57.9%): The morbidity rate was 57.9% in patients with chronic heart disease as a comorbid condition (p=0.53) (Table 3). Separation between comorbid conditions for prediction of postoperative complications binary LR analysis was performed and the predictive properties were analyzed separately. Diabetes mellitus (B=1.112, p=0.024) in predicting postoperative complications had a significant predictive value. The presence of diabetes mellitus has a positive had no effect on the occurrence of complications. Other comorbid conditions had no significant predictive value (Table 4). the type of anesthesia, surgery there was no statistically significant difference in postoperative complications (p=0.94).

Table 3. The effect of preoperative comorbid diseases on morbidity, mortality and hospitalization time.

Comorbid Condition, n	Morbidity Rate (%)	p	Mortality Rate (%)	p	Hospitalization time (day), median (range)
Cancer, (n=38)	55.3	0.55	21.0	0.89	4.0 (1.0-13.0)
Diabetes Mellitus, (n=30)	66.7	**0.04**	16.0	0.12	4.0 (1.0-16.0)
Hypertension, (n=19)	52.6	0.91	21.0	0.86	4.0 (1.0-15.0)
Smoking, (n=15)	40.0	0.33	13.3	0.64	5.0 (1.0-13.0)
Cerebrovascular disease, (n=7)	57.1	0.75	4.9	0.81	3.0 (1.0-13.0)
Chronic kidney disease, (n=10)	60.0	0.57	10.0	0.92	4.50 (1.0-10.0)
Chronic lung disease, (n=10)	70.0	0.21	10.0	0.14	2.0 (1.0-12.0)
Chronic heart disease, (n=19)	57.9	0.53	5.6	0.16	3.0 (1.0-12.0)

n: number, p: value

There was no statistically significant difference when the patients were grouped according to the type of surgical operation (p = 0.102) (Table 1). Preoperative laboratory tests of patients who underwent emergency surgery while COVID-19 positive in the examination of their values; Hemoglobin The mean hemoglobin level is 13.5, with a median value of 13.8, slightly higher high and the standard deviation was 1.2. WBC (White Blood Cell): Mean white blood cell count was

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Table 4. Logistic regression analysis and effect levels of comorbid conditions that can be used in predicting the development of postoperative complications at initial presentation.

Development of postoperative complications				
Factor	B	p	**Exp(B)**	**95% CI**
Cancer	0.159	0.719	1.173	0.492-2.796
Diabetes Mellitus	1.112	**0.024**	3.040	1.162-7.955
Hypertension	-0.187	0.747	0.829	0.265-2.591
Smoking	-0.553	0.361	0.575	0.176-1.885
Cerebrovascular disease	-0.308	0.731	0.735	0.127-4.253
Chronic kidney disease	0.754	0.343	2.126	0.447-10.108
Chronic lung disease	1.127	0.181	3.087	0.593-16.082
Chronic heart disease	-0.031	0.963	0.970	0.269-3.499

CI: confidence interval, p: value

DISCUSSION

This study addresses a critical aspect of healthcare during the ongoing COVID-19 pandemic, focusing on the effects of comorbid conditions on postoperative morbidity among patients undergoing emergency surgery. This discussion will provide a comprehensive description of the findings, their implications and their importance in the context of global health care [11-14].

Patient demographics, including gender, age and distribution of comorbidities provides a comprehensive overview of the general population characteristics. Furthermore, the study descriptive statistics of variables, length of hospital stay and preoperative contains a detailed analysis of laboratory values and shows their general trends and distribution of postoperative complications. In addition, a table of postoperative complications, surgery, reflecting the types and frequency of complications that occur after surgery reflecting the complexity of outcomes. Finally, postoperative comorbid conditions evaluations on the impact of different comorbidities on postoperative morbidity potential effects on morbidity. These findings are of significant value in clinical decision-making and contribute to the understanding of surgical outcomes and treatment strategies. [7,9]. Gender distribution among patients who underwent emergency surgery while COVID-19 positive was evaluated. The data show that male patients were slightly overrepresented compared to female patients, with 58 men (57.43%) and 43 women (42.57%) in the study group. Understanding these gender-based differences could potentially provide insight into the differential impact of comorbidities on postoperative morbidity between men and women. Further analyses may

aim to investigate whether specific comorbid conditions affect men and women differently in their post-operative outcomes and may provide valuable information for individualized care and treatment strategies. [3-5,10]. The gender distribution of patients who underwent emergency surgery and were COVID-19 positive was evaluated. The data showed that male patients were slightly overrepresented. The mean white blood cell count was 8.7, median 8.5 and standard deviation 2.1. This means that the white blood cell counts were relatively consistent with the literature around the mean and median and showed moderate variability [7-9,15]. The D-dimer value was 250, median 240 and standard deviation 50. This suggests that most of the patients had D-dimer levels close to the median value and showed less variability compared to other parameters when reviewed in the literature. [16]. This analysis allows us to understand the mean levels of important laboratory values among COVID-19 positive patients admitted to emergency surgery. The variability shown by the standard deviation for parameters indicates potential differences in these values between individuals. A review of the literature suggests that this could be very important when assessing the impact of laboratory results on postoperative outcomes and the severity of COVID-19 infection [11]. The morbidity rate in patients with comorbid diabetes was 66.7%. This means that the risk of postoperative complications is higher in diabetic patients than in others (p=0,04). The morbidity rate was 52.6% in patients with hypertension. This indicates that patients have a higher risk of postoperative complications than others (p=0.91). The morbidity rate in patients with smoking comorbidity was 40.0%. This means that the risk of postoperative complications was relatively low. It was higher in these patients than in others (p=0.33). The morbidity rate in patients with cerebrovascular disease comorbidity was 57.1%. This means that the risk of postoperative complications was higher in these patients than in others (p=0.75). The morbidity rate in patients with comorbid chronic kidney disease was 60.0%. This means that the risk of postoperative complications was higher in these patients than in others (p=0.57). Paired LR analysis was performed between comorbid conditions to predict postoperative complications and the predictive properties were analyzed separately. Diabetes Mellitus (B=1.112, p=0.024) was found to have a significant predictive value for postoperative complications. Other comorbid conditions had no significant predictive value. No statistical significance was found between mortality and comorbidities. Our study demonstrated varying degrees of postoperative morbidity associated with different comorbid conditions. It is clear that each comorbidity group is associated with a different level of risk for experiencing immediate postoperative complications, especially in the context of COVID-19 infection. Therefore, it has been established in the literature that recognizing and managing these comorbidities is critical in assessing and addressing the potential risks in surgical interventions for COVID-19 positive patients [8].

Our study found that comorbid conditions were associated with increased postoperative morbidity among COVID-19 positive patients undergoing emergency surgery. The analysis revealed that patients with comorbidities had higher morbidity rates compared to those without these conditions. In our study, a statistically significant association was found between diabetes mellitus and postoperative complications. This observation emphasizes the importance of considering the patient's general health status when making surgical decisions during the COVID-19 pandemic. These findings may be supported by previous research showing that comorbid conditions contribute to worse outcomes in COVID-19 patients [13]. The COVID-19 pandemic has brought unique challenges in the field of surgery. Our study highlights that COVID-19 positive patients undergoing surgery are at increased risk of postoperative complications, especially when comorbid conditions are present. This requires careful preoperative risk assessment and decision-making by healthcare professionals. The findings highlight the importance of early diagnosis and management of COVID-19 as well as optimization of comorbid conditions before surgery to minimize postoperative morbidity. This study offers valuable insights into a relatively understudied area of COVID-19 research. However, there are limitations to consider. The retrospective design introduces the possibility of missing or erroneous data. Despite these limitations, the findings provide a basis for further investigation of the interaction between comorbid conditions and COVID-19 in the context of emergency surgery. The literature also supports this idea [3]. The findings from this study have important clinical implications. Healthcare providers should conduct comprehensive preoperative assessments, including COVID-19 screening and evaluation of comorbid conditions. These assessments can guide surgical decision-making, inform patient counseling and improve postoperative outcomes. An emphasis on timely COVID-19 detection, appropriate management, and comorbidity optimization may reduce the impact of these factors on postoperative morbidity. Future

research should focus on larger patient populations to support these findings. Prospective studies could provide more robust evidence and explore more accurately and in detail the nuances of preoperative and postoperative COVID-19 in the context of emergency surgery. Furthermore, investigating specific management strategies that can minimize postoperative morbidity in COVID-19 positive patients with comorbid conditions should be a priority [14]. In conclusion, this study analyzed COVID-19, comorbid conditions and postoperative highlights the multifaceted relationship between morbidity and mortality. It also describes this situation in detail. This research contributes to our understanding of the challenges healthcare professionals face in the postoperative management of COVID-19 patients and provides a basis for further research and innovation in the field of surgery during COVID-19 [17]. A comprehensive examination of the impact of comorbid conditions on postoperative morbidity in COVID-19 positive patients undergoing emergency surgery provides critical insights into the complexity of surgical care during the ongoing pandemic. The analysis of our research data highlights some key points and implications that are valuable for healthcare practitioners and future research efforts. The findings of our study describe the correlation between comorbid conditions and increased postoperative morbidity among COVID-19 positive patients undergoing emergency surgery. The higher morbidity rates observed in patients with comorbid conditions highlight the need for a rigorous assessment of patients' general health status before surgical interventions. In this evaluation, diabetes mellitus should be prioritized and necessary precautions should be taken. The study describes the high risks faced by COVID-19 positive patients undergoing surgery, especially in the presence of comorbid conditions. These results highlight the need for careful preoperative screening, strategic risk assessment and tailored surgical planning, which should take into account not only surgical needs, but also the patient's COVID-19 status and associated comorbidities.

CONCLUSION

In the presence of comorbid conditions in COVID-19 positive emergency surgery patients, it is necessary to be prepared for postoperative complications and to pay attention to the necessary precautions. Furthermore, our study demonstrates the need for further investigation of specific strategies to reduce morbidity in this patient population.

Ethical Declarations:

The approval for this study was obtained from Institutional Ethical Committee of Bandırma Onyedi Eylül University on 21/11/2023 with approval number 2023-183.

Informed Consent:

All patients provided informed consent forms.

Conflict of Interest Statement:

The authors have no conflicts of interest to declare.

Financial Disclosure:

The authors declared none financial disclosure.

Author Contributions:

All authors contributed to the study's conception, design, study preparation, data collection, and analysis. All authors read and approved the final manuscript

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