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The Cost of The Use of Prophylactic Anticoagulant Drugs in the Covid-19 Pandemic on the Late Period of Neurosurgery Practice

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Abstract

Objective: After being reported for in Wuhan, China, -stranded RNA coronavirus, COVID-19 leading to the deaths of thousands of people. Patients hospitalized in intensive care units (ICUs) who develop acute respiratory distress syndrome (ARDS) due to COVID-19 typically exhibit respiratory and digestive system symptoms. However, coagulopathy, which indicates a poor prognosis, may also develop in some patients receiving care in ICUs.This article aims to examine the economic consequences of prophylactic anticoagulant and antiplatelet drug use on neurosurgery practice during the late period of the COVID-19 pandemic.

Methods: This study retrospectively examined patients hospitalized for surgical treatment in the Neurosurgery Clinic of Ordu University Training and Research Hospital between January 1 and December 31, 2022. A total of 38 out of 320 patients were diagnosed with COVID-19, and cost analysis was specifically performed on these patients. Data were obtained from the hospital's data system.

Results: An increase in costs was observed in both spine surgery and cranial surgery due to drug use. The Kruskal-Wallis Test showed a significant difference in bed costs between patients who received anticoagulant or antiplatelet-anticoaggregant medication and those who did not (P=.000).

Conclusion: The use of prophylactic anticoagulant and antiplatelet drugs significantly extended the length of hospital stay for patients in both pre-operative and post-operative periods, resulting in increased costs for the social security institution.

Keyword: COVID-19, anticoagulant drugs, antiplatelet drugs, treatment cost, spinal surgery, cranial surgery, healthcare economics

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INTRODUCTION

After being reported for the first time in Wuhan, China, the single-stranded RNA coronavirus, COVID-19, has spread rapidly around the world, leading to the deaths of thousands of people (1, 2). Patients hospitalized in intensive care units (ICUs) who develop acute respiratory distress syndrome (ARDS) due to COVID-19 typically exhibit respiratory and digestive system symptoms (3, 4). However, coagulopathy, which indicates a poor prognosis, may also develop in some patients receiving care in ICUs (5).

The devastating effects of pandemics throughout history have impacted not only human health but also various social, economic, and political spheres. Although these effects generally diminish after a pandemic end, they can persist for many years (6). The COVID-19 pandemic has had far-reaching and detrimental consequences, affected individuals and caused disruptions in the economic infrastructure of insurance companies, social security institutions, and entire nations. The social and economic impacts of COVID-19 are already worse than those of the Second World War (7).

The COVID-19 pandemic has profoundly impacted the field of neurosurgery and the dedicated professionals within it. The pandemic necessitated a significant overhaul of surgical and medical treatment protocols at neurosurgery clinics (8). New issues were encountered when returning to routine neurosurgery not only during the pandemic but also afterward. One of these issues was the complications caused by anticoagulant drugs administered to patients at risk of thrombosis during the COVID-19 pandemic. The association between COVID-19 infection and thrombosis has been demonstrated in many clinical studies (9). Consequently, COVID-19 treatment includes thrombosis therapy using anticoagulants and antiplatelet drugs (10).

Anticoagulant and antiplatelet medications, administered to protect COVID-19 patients from thrombotic complications, have been found to prolong the time it takes for blood to clot (11). This extended bleeding and clotting time can further elevate the risk of complications in cranial and spinal interventions during neurosurgical procedures. As a result, neurosurgical clinics experienced disruptions during the pandemic, including the postponement of elective surgeries and the suspension of outpatient services, except for emergencies. These challenges have had adverse economic effects on hospitals. One significant drawback was the extended hospital stays of patients who began anticoagulant treatment during the pandemic.

The aim of this study is to investigate the economic consequences of prolonged hospitalization for neurosurgery patients who do not require emergency surgical intervention

but need hospital monitoring and undergo elective surgeries.

METHODS

Patients who were hospitalized for surgical treatment in the Neurosurgery Clinic of Ordu University Training and Research Hospital between January 1 and December 31, 2022, and who had been started on prophylactic anticoagulant or antiplatelet therapy for COVID-19 by other departments were retrospectively examined. A total of 320 patients underwent surgery during this period. Cranial surgery was performed on 41 patients, while spinal surgery was performed on 279 patients. It was determined that 38 of the 320 operated patients had been prophylactically started on anticoagulant and antiplatelet drugs by other departments after being diagnosed with COVID-19. Among these 38 patients, 8 were cranial cases and 30 were spinal cases.

Table 1. Number of patients performed cranial and spinal surgery

Surgery Type	Patients Receiving Prophylactic Anticoagulant Drugs	Patients Not Receiving Prophylactic Anticoagulant Drugs
Cranial Surgery (N=41)	8	33
Spinal Surgery (N=279)	30	249

In the routine practice of our clinic, the preoperative hospitalization period for both spinal and cranial cases was typically 2 days. However, this period extended to 7 days for patients using prophylactic anticoagulants due to the increased risk of bleeding. Under normal circumstances, spinal cases are hospitalized for an average of 2 days postoperatively, while cranial cases are hospitalized for 5 days. However, the use of prophylactic anticoagulants increased the risk of bleeding, leading to longer postoperative hospitalization periods—4 days on average for spinal cases and 10 days for cranial cases.

The costs associated with the prolonged hospitalization periods were calculated based on the Health Practice Communiqué (SUT). All variables were analysed using the SPSS statistical analysis program.

Table 2. Duration of hospitalization (days) of patients who underwent cranial and spinal surgery

Surgery Type	Period	Patients Receiving Prophylactic Anticoagulant Drugs	Patients Not Receiving Prophylactic Anticoagulant Drugs
Cranial Surgery (N=41)	Pre-operative	7	2
	Post-operative	10	5
Spinal Surgery (N=279)	Pre-operative	7	2
	Post-operative	4	2

RESULTS

The economic impact of using anticoagulant or antiplatelet drugs and the subsequent prolongation of hospital stays on treatment costs were investigated (Table 3). According to the Health Implementation Communiqué (SUT), the Social Security Institution provides a daily payment of 53 Turkish Lira (₺) to healthcare institutions as a bed fee per patient in 2023.

As shown in Table 3, the total bed cost for a patient undergoing spinal surgery under normal conditions is 212 ₺. However, for a patient with spinal pathology whose surgery was delayed due to anticoagulants or antiplatelet drug use, the total bed cost increased to 583 ₺. For the 30 spinal cases included in this study, the total bed cost under normal conditions, covering both preoperative and postoperative periods, was 6,360 ₺. This cost rose to 17,490 ₺ due to the prolonged hospital stays associated with the use of these drugs.

Similarly, for cranial surgery cases, the total bed cost under normal conditions was 371 ₺ per patient. However, for patients with cranial pathology whose surgeries were delayed due to anticoagulants or antiplatelet drug use, the total bed cost increased to 901 ₺. A significant difference was observed between the patient groups receiving and not receiving anticoagulant or antiplatelet-antiaggregant drugs, as determined by the Kruskal-Wallis Test (P = .000) (Table 4).

Table 4. The Relationship Between Costs of Patients Using and Not Using Prophylactic Anticoagulants (Non-Parametric Kruskal Wallis Test)

	Chi-Square	df	P
Spinal Surgery	268,677	1	,000
Cranial Surgery	34,880	1	,000

Table 3. Cost of Patients Receiving and Not Receiving Prophylactic Anticoagulant Drug Treatment (₺)

Category	Spinal Surgery (N=30)	Cranial Surgery (N=8)	Total Cost
Patients not using anticoagulants			
Total	6,360 ₺	2,968 ₺	9,328 ₺
Cost per patient	212 ₺	371 ₺	583 ₺
Patients using anticoagulants			
Total	17,490 ₺	7,208 ₺	24,698 ₺
Cost per patient	583 ₺	901 ₺	1,484 ₺
Difference between the two groups			
Total difference	11,130 ₺	4,240 ₺	15,370 ₺
Difference per patient	371 ₺	530 ₺	901 ₺

LIMITATION

In both groups, direct or indirect medical and non-medical expenses, such as medication and meals during the hospital stay, were not included in the study. Only the bed fee paid per patient was considered as a cost. This limitation should be considered when interpreting the results of the study.

DISCUSSION

To our knowledge, this is the first study to investigate the economic impact of using prophylactic anticoagulant drugs in the later stages of neurosurgery practice during the COVID-19 pandemic. Our findings demonstrate that the prolonged hospitalization due to the use of these drugs has led to significant economic consequences, increasing treatment costs.

Globally, the COVID-19 pandemic has caused substantial cost escalations in healthcare, not only during its initial phases but also in its later stages. The administration of anticoagulant and

antiaggregant medications during the pandemic's late period significantly extended the length of hospital stays, both pre- and post-operatively, adding to the financial burden on social security institutions. Previous studies have similarly reported a considerable economic impact on hospitals due to increased admissions and extended hospitalization times caused by the pandemic (12, 13, 14).

Aghajani et al. (15) found that during the pandemic, the majority of costs associated with COVID-19 patients were attributed to hospitality services and medications. Furthermore, their study identified brain surgery as an independent factor increasing hospitalization costs. This is consistent with our findings, where the prolonged hospital stays caused by prophylactic anticoagulants in brain surgery patients significantly raised treatment expenses.

Another study revealed that the financial burden of COVID-19 hospitalizations on Spain's public health budget (12.3% of total public health expenditure) surpassed the costs of managing conditions such as multiple sclerosis, cancer, and diabetes (12). Prolonged hospital stays during the pandemic have strained healthcare budgets worldwide. Di Fusco et al. (13) specifically highlighted intensive care unit (ICU) admissions and invasive mechanical ventilation as major drivers of cost increases. Similarly, research conducted in the United States emphasized the rising costs associated with ICU utilization during the pandemic (14). Additionally, these studies observed that costs tend to decrease when patients are discharged or pass away, as hospital stays are shortened. Our study aligns with this observation, as the use of prophylactic anticoagulants also prolonged hospital stays and increased overall costs.

During the pandemic, hospitals in the United States faced significant financial challenges due to rising costs and the cancellation of elective surgeries (16). In China, gross domestic product (GDP) contracted by 6.8% in the first quarter of 2020 due to the pandemic's economic impact (17). In Brazil, the cost of elective neurosurgery operations increased by 65.06% during the pandemic (18). Globally, the pandemic has led to a significant reduction in surgical income levels (19).

The pandemic also prompted individualized assessments of risks associated with delaying surgeries for certain neurological conditions (20). Neurosurgery practices underwent substantial adjustments, including changes in surgical case planning and academic studies in the field (21). Furthermore, neurosurgery protocols were revised to adapt to the challenges posed by the pandemic (22).

CONCLUSION

The initiation of prophylactic medication to mitigate thromboembolic risks during the COVID-19 pandemic significantly prolonged

the pre- and post-operative hospitalization periods of patients admitted to our neurosurgery clinic for surgical treatment in the pandemic's late phase. This extended hospitalization resulted in substantial economic burdens on treatment costs. As demonstrated in this study, the increase in healthcare expenses caused by the COVID-19 pandemic reached critical levels globally, not only during the initial phases but also in its later stages.

The restrictions imposed during the pandemic disrupted healthcare systems and highlighted vulnerabilities, including the economic strain on hospitals. Given the challenges brought about by the pandemic, it is essential to explore and implement alternative strategies to address similar issues that may arise in future health crises. Additionally, a comprehensive reorganization of surgical training programs, particularly for neurosurgery trainees, is needed to adapt to potential disruptions and ensure continuity in medical education and care delivery. By addressing these challenges proactively, healthcare systems can be better prepared to manage the multifaceted impacts of future pandemics effectively.

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