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Dear Our Valuable Readers,

As we celebrate the release of the first issue of the Intercontinental Journal of Emergency Medicine's second year, it is with great pleasure that we reflect on the progress and contributions made by our authors, reviewers, and the editorial team. This issue serves as a testament to the growing importance of interdisciplinary collaboration and knowledge sharing in the field of Emergency Medicine.

The articles and case reports presented in this issue demonstrate the depth of research and clinical practice in Emergency Medicine. From the comparison of muscle relaxants during electroconvulsive therapy to the introduction of a novel biomarker for predicting in-hospital mortality in acute myocardial infarction, these studies highlight the need for continuous innovation and improvement in our understanding and management of various medical emergencies.

The comparative analysis of violence incidents in the emergency departments of two different tertiary hospitals in Ankara provides a stark look into the varying socio-cultural factors that influence such events. It underscores the need for tailored approaches to prevent violence and protect healthcare workers.

Additionally, a retrospective study examines the infectious causes of high fever in patients presenting to the emergency department. By identifying patterns and outcomes, this research contributes to a more nuanced understanding of patient care in high-fever scenarios.

The case reports, focusing on atypical presentations of normal pressure hydrocephalus and chronic aortic dissection, remind us of the importance of rapid intervention and early recognition in emergency medicine. These contributions not only enrich our clinical knowledge but also serve as valuable learning resources for healthcare professionals, ultimately leading to better patient outcomes.

The Intercontinental Journal of Emergency Medicine continues to serve as a platform for academicians, researchers, and practitioners worldwide to share their insights, experiences, and innovations in Emergency Medicine. As the field evolves and expands, we remain dedicated to fostering interdisciplinary collaboration and knowledge sharing to drive progress and enhance patient care.

In conclusion, the diverse and high-quality contributions in this issue reflect the vibrant state of Emergency Medicine research and practice. We express our deepest gratitude to the authors, reviewers, and the editorial team for their unwavering commitment to advancing the field.

Let us continue to work together, learn from each other, and strive for excellence in Emergency Medicine.

Sincerely,

Assoc. Prof. Umut OCAK, MD

Chief Editor

Intercontinental Journal of Emergency Medicine

The Intercontinental Journal of
Emergency Medicine

CONTENTS

Volume: 2 Issue: 1 Year: 2024

ORIGINAL ARTICLES

CASE REPORTS

The Intercontinental Journal of Emergency Medicine

Original Article

DOI: 10.51271/ICJEM-0026

A comparison of the effects of succinylcholine and rocuronium on recovery time from anesthesia and vital signs in electroconvulsive therapy

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ABSTRACT

Aims: Electroconvulsive therapy (ECT) is based on stimulation of brain tissue with an electrical current and the induction of generalized convulsions. The aim of this study was to compare the use of rocuronium as a muscle relaxant and sugammadex as an antidote during ECT with succinylcholine in terms of its effect on adequate anesthesia, hemodynamics, and recovery.

Methods: This study was planned as a single-center prospectively collected and retrospectively analyzed observational cohort study. Patients were divided into two groups as group S (succinylcholine) and group R+S (rocuronium and sugammadex). Patients were premedicated with 0.5 mg of atropine intramuscularly (IM) half an hour before the procedure. Propofol 1mg/kg was administered as an induction agent in both groups, succinylcholine 1 mg/kg in Group S, and rocuronium 0.4 mg/kg in Group R+S. Sugammadex 2 mg/kg was administered as a rocuronium antidote. Vital signs were monitored throughout the procedure with electrocardiography (ECG,) oxygen saturation (SpO_2), and blood pressure monitoring.

Results: There was a statistically significant difference between the two groups (Group S and Group R+S) in the time to return for spontaneous respiration (p=0.002). The mean spontaneous breathing time (SBT) value was 111.78 seconds in Group S and 88.82 seconds in Group R+S. There was a statistically significant difference between the spontaneous eye-opening times between Group S and Group R+S. (p=0.017) The mean spontaneous eye-opening time (SEO) value was 211.42 seconds in Group S and 173.12 seconds in Group R+S. There was a statistically significant difference between Group S and Group R+S in the duration of modified Aldrete score 9 (p=0.000<0.05). The mean duration of modified alderete score (MAS) 9 was 542.60 seconds in Group S and 410.54 seconds in Group R+S.

Conclusion: Although the high cost of rocuronium sugammadex limits its routine use in ECT anesthesia, it can be used as an ideal alternative agent in cases where succinylcholine is contraindicated or anticholinesterases are not suitable because it shortens the recovery time and the time to return of spontaneous respiration compared to succinylcholine.

Keywords: Electroconvulsive therapy, anesthesia recovery period, succinylcholine, rocuronium, vital signs

INTRODUCTION

Electroconvulsive therapy (ECT) is one of the oldest biological treatment methods used in modern psychiatry. ECT is based on the stimulation of brain tissue with electrical current to induce generalized convulsions and is used in the treatment of many psychiatric disorders, especially major depression.

As a result of generalized motor convulsions and cardiovascular adverse cardiovascular responses caused by the electrical current given to patients during ECT, various damages occur in patients. These include severe musculoskeletal system damage, myocardial ischemia caused by a sudden and excessive increase in the oxygen demand of the heart, infarctions, and similar conditions that can lead to severe morbidity and even mortality. Because of this, the need for stabilization and adequate monitoring of patients has come to the fore over the years, and ECT procedures have been performed under general anesthesia since the seventies.[1-4] Many general anesthetic drugs have been used for this purpose over the years.

The duration of general anesthesia to be applied in ECT is very short (1-5 minutes). In order to minimize the traumatic effect of the convulsive seizure during the procedure, it is necessary to administer an anesthetic drug to create short-term amnesia until the effect of the muscle relaxant wears off. For this reason, anesthetics such as thiopental (Thiopental sodium), ketamine, etomidate, and short-acting propofol, which have recently increased in frequency, can be used to provide superficial anesthesia.[5-9] Following superficial anesthesia, succinylcholine (a depolarizing muscle relaxant) or (nondepolarizing) muscle relaxants such as mivacurium, atracurium, and rocuronium can be used to provide muscle paralysis until the end of convulsive activity.[8,9] In ECT

anesthesia, short-acting muscle relaxants are preferred to avoid long apnea periods. Succinylcholine is a short-acting, depolarizing muscle relaxant that has been used in ECT anesthesia for many years. However, its side effects (myalgia, headache, increase in plasma potassium level, increase in intragastric and intraocular pressure, malignant hyperthermia) and contraindications (musculoskeletal system disease, pseudocholinesterase deficiency, or cardiac disease) have led to the trial of new alternatives.

Currently, rocuronium is increasingly used as an alternative to succinylcholine in ECT. Rocuronium is a steroidal, nondepolarizing neuromuscular blocker with a moderate duration of action. When used at appropriate doses, it is an agent that provides rapid neuromuscular blockade in a manner closest to succinylcholine, making it a good alternative to succinylcholine. The application of rocuronium as a neuromuscular blocker has restricted the use of anticholinesterases as antidotes in patients who are anesthetized outside the operating room and mask ventilation, in whom we want rapid termination of the effect of the muscle relaxant that is not intubated, and has led to the increasing use of sugammadex in anesthesia practice.[10] Gamma-cyclodextrin derivative sugammadex is a new generation reversal agent used to terminate the effects of nondepolarizing neuromuscular blockers (vecuronium and rocuronium). Its mechanism of action is to form a complex with the muscle relaxant in the circulation and at the neuromuscular junction and terminate its effect.[11]

In this study, we aimed to compare whether rocuronium, which is a short-acting muscle relaxant, and sugammadex, which is its antidote, can provide adequate muscle relaxation against succinylcholine and its effect on hemodynamics and recovery during and after the procedure.

METHODS

Study Design and Participants

This study was planned as a single-center prospectively collected and retrospectively analyzed observational cohort study. This study is a specialty thesis in the field of anesthesiology and reanimation. Before 2020, institutional approval was obtained, and ethics committee decisions were not taken for that period. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Our study was conducted in the ECT application room of the psychiatry clinic of the hospital. The necessary equipment for daily anesthesia was available in the room. All patients were informed about anesthesia, and their written and verbal consents were obtained. The study included 100 adult patients aged between 18 and 75 years, in the American Society of Anesthesiologists (ASA) 1-2-3 classification, undergoing elective procedures.

Study Exclusion Criteria

- ASA 4,5
- pregnant patients
- patients allergic to the medicines used

Cases were selected from patients in whom a psychiatric physician gave an indication for ECT, regardless of clinical pathology. Anesthetic consent was routinely obtained from the patients before general anesthesia was started. 50 patients received propofol+succinylcholine, and 50 patients received propofol+rocuronium+sugammadex, totaling 100 patients.

GROUP S (Succinylcholine) (n=50)

GROUP R+S (Rocuronium + sugammadex) (n=50)

Patients were administered routine general anesthetic drugs and premedicated with 0.5 mg atropine IM half an hour before the procedure. Propofol 1mg/kg was administered as an induction agent in both groups, succinylcholine 1mg/kg in Group S, and rocuronium 0.4mg/kg in Group R+S. Sugammadex 2mg/kg was administered as a rocuronium antidote. The vital signs of the patients were monitored throughout the procedure with electrocardiography (ECG), oxygen saturation (SpO_2), and blood pressure monitoring.

Blood pressure, pulse rate, and oxygen saturation (SpO_2) values recorded before and after the procedure, duration of spontaneous respiration, spontaneous eye opening, modified Aldrete score (MAS) of 9, and seizure duration after ECT were analyzed.

Group S (n=50) was premedicated with 0.5 mg of intramuscular atropine approximately 30 minutes before the procedure for each session. ECG, peripheral SpO_2, systolic blood pressure SBP, and diastolic blood pressure (DBP) were recorded noninvasively when the patients were taken to the ECT room. Intravenous infusion of isotonic fluid was started with a 22 G cannula in the dorsal side of the left hand. Electroencephalography (EEG) and electromyography (EMG) electrodes were placed by the psychiatrist, and a blood pressure cuff was tied to the right elbow and inflated to the minimum pressure where the radial artery pulse could not be felt just before induction of anesthesia. After inflating the blood pressure cuff on one arm of the patient, propofol 1 mg/kg IV and succinylcholine 1 mg/kg IV were administered while the patient was preoxygenated. After the patient's fasciculations have passed, the patient's preoxygenation is interrupted by placing a mouth tampon or airway, and the ECT procedure is started; the patient is not ventilated during the procedure. In the follow-up of seizure activities, both EEG recordings, EMG recordings and records of the duration of contraction in the extremity to which the cuff is attached are kept. In our study, we used EEG recordings as the seizure duration. After the procedure is completed, the patient is ventilated again.

In group R+S (n=50), patients were premedicated with 0.5 mg intramuscular atropine approximately 30 minutes before the procedure for each session. ECG, peripheral SpO_2, SBP, DBP was recorded noninvasively when the patients were taken to the ECT room. Intravenous infusion of isotonic fluid was started with a 22 G cannula in the dorsal side of the left hand. Electroencephalography (EEG) and electromyography (EMG) electrodes were placed by the psychiatrist and a blood pressure cuff was placed on the right elbow and inflated to the minimum pressure at which the radial artery pulse could not be felt just before induction of anesthesia. Propofol is administered at a dose of 1 mg/kg intravenous (IV) and rocuronium at a dose of 0.4 mg/kg IV Meanwhile, the patient is preoxygenated. When sufficient muscle relaxation is achieved, preoxygenation is interrupted by placing a tampon or airway in the patient's mouth. The ECT procedure is started, the patient is not mask ventilated during the procedure. After the end of the procedure, the patient is started to be ventilated with a mask again and sugammadex is administered at a dose of 2 mg/kg IV

Blood pressure, pulse rate, and saturation values of the patients before and after the procedure, the duration of spontaneous breathing, spontaneous eye opening, and a

MAS of 9 after the ECT procedure, and seizure durations were recorded in our study.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) 23 package program was used for statistical analysis. In quantitative data analysis, variables determined by measurement for descriptive findings were indicated with a mean, median, minimum (min.) value, and maximum (max.) value. The distribution characteristics of the variables specified by measurement were evaluated by the Kolmogorov-Smirnov test. Paired Samples T test was used to compare the differences between the groups (Group S and Group R+S) before and after the procedure, and the Student's T test was used for comparisons between the two groups. P<0.05 was considered statistically significant.

RESULTS

Demographic and Clinical Findings

The study was completed with a total of 100 patients. The mean spontaneous breathing time (SBT) value was 111.78 seconds in Group S and 88.82 seconds in Group R+S. The mean spontaneous eye-opening time (SEO) value was 211.42 seconds in Group S and 173.12 seconds in Group R+S. The mean duration of MAS 9 was found to be 542.60 seconds in Group S and 410.54 seconds in Group R+S. The mean seizure duration was 28.72 seconds in Group S and 31.02 seconds in Group R+S.

There was no statistically significant difference between saturation values and SBP values in Group S before and after the procedure (p=0.346>0.05). There was a statistically significant difference in SBP and DBP, peak heart rate, and heart rate before and after the procedure in Group S (p<0.05) (Table 1).

Table 1. Comparison of pre-procedure and post-procedure vital findings in group S

Groups	Vitals	n (Patient count)	Min	Max	Mean	SD	P
Group S	PrPS	50	95	100	97.94	1.3	0.346
Group S	PoPS	50	96	100	98.22	1.329	
Group S	PrPSBP	50	90	140	111.6	13.265	0,000
Group S	PoPSBP	50	100	170	132.8	15.191	
Group S	PrPDBP	50	60	90	68.9	9.274	0.000
Group S	PoPDBP	50	60	100	78.9	11.486	
Group S	PrPPHR	50	56	119	83.42	14.722	0.000
Group S	PoPPHR	50	63	109	92	11.42	

SD: standart deviation, PrPS: pre-procedure saturation, PoPS: post-procedure saturation, PrPSBP: pre-procedure systolic blood pressure, PoPSBP: post-procedure systolic blood pressure, PrPDBP: pre-procedure diastolic blood pressure, PoPDBP: post-procedure diastolic blood pressure, PrPPHR: pre-procedure peak heart rate, PoPPHR: post-procedure peak heart rate

Group R+S showed a statistically significant difference in systolic blood pressure and peak heart rate before and after the procedure (p<0.05). However, no statistical difference was observed in Group R+S in terms of saturation values and diastolic blood pressure values before and after the procedure (Table 2). The effects of Group S and Group R+S on SBT, SEO, MAS9, and seizure durations were compared in Table 3.

A statistically significant difference was found between the two groups (Group S and Group R+S) in terms of time to return of spontaneous respiration, time to spontaneous eye opening, and time to a MAS of 9 (p<0.05).

Table 2. Comparison of pre-procedure and post-procedure vital findings in group R+S

Groups	Vitals	n (Patient count)	Min	Max	Mean	SD.	P
Group R+S	PrPS	50	96	100	99.1	0.974	0.113
Group R+S	PoPS	50	90	150	99.4	0.969	
Group R+S	PrPSBP	50	90	140	113.5	13.637	0.024
Group R+S	PoPSBP	50	60	90	117.9	14.711	
Group R+S	PrPDBP	50	50	80	67.4	6.869	0.212
Group R+S	PoPDBP	50	59	111	69.1	8.311	
Group R+S	PrPPHR	50	96	100	85.96	12.728	0.001
Group R+S	PoPPHR	50	72	110	91.76	9.224	

SD: standart deviation, PrPS: pre-procedure saturation, PoPS: post-procedure saturation, PrPSBP: pre-procedure systolic blood pressure, PoPSBP: post-procedure systolic blood pressure, PrPDBP: pre-procedure diastolic blood pressure, PoPDBP: post-procedure diastolic blood pressure, PrPPHR: pre-procedure peak heart rate, PoPPHR: post-procedure peak heart rate

Table 3. Comparison of the effects of group S and group R+S on SBT, SET, MAS9, and seizure durations

	Groups	n (Patient count)	Min	Max	Mean	SD	P
SBT	Group S	50	15	223	111.78	45.242	0.002
SBT	Group R+S	50	55	173	88.82	25.541	0.003
SET	Group S	50	75	440	211.42	97.49	0.017
SET	Group R+S	50	91	327	173.12	53.214	0.017
MAS9	Group S	50	310	780	542.6	116.958	0.000
MAS9	Group R+S	50	305	602	410.54	74.741	0.000
SD	Group S	50	12	52	28.72	10.912	0.243
SD	Group R+S	50	19	55	31.02	8.506	0.243

SD: standart deviation, SBT: spontaneous breathing time, SET: spontaneous eye-opening time, MAS9: duration of modified Aldrete score of 9 SD: seizure duration

DISCUSSION

In this study, we compared the effects of succinylcholine and sugammadex rocuronium on vital signs and recovery time in ECT anesthesia. Since seizure duration plays a role in the effectiveness of the procedure, the agents used in anesthesia affect this duration, patient-related factors, and the pharmacological properties of neuromuscular blockers affect the success and safety of ECT, drug selection is important.

Today, ECT is an effective method used in the treatment of many psychiatric disorders. The anesthesia method used during ECT affects both the success of ECT and the oxygenation of the patient during the procedure. Since succinylcholine (SCH), which is frequently used during ECT, causes serious side effects and increases the risk of malignant

hyperthermia, especially in risky patient groups, the need for alternative neuromuscular blockers has increased. Traditionally, cholinesterase inhibitors are used to reverse the nondepolarizing block caused by rocuronium, but these agents have serious side effects, inadequate reversal of deep block, and a risk of recurrence. Sugammadex, on the other hand, is frequently used in anesthesia practice as a new-generation agent that rapidly reverses nondepolarizing block.[12] Its mechanism of action is that it terminates the effect by forming a complex with a muscle relaxant in the circulation and at the neuromuscular junction.[13] For this reason, the use of the new generation reverser sugammadex in ECT anesthesia is increasing.

Turkkal et al.[14] compared rocuronium and succinylcholine for ECT application, as a result of the study, the time to return to spontaneous breathing was found to be longer in patients using rocuronium than succinylcholine; however, no difference was found between both agents in terms of their effects on electroconvulsive therapy. In our study, we found that the time to return to spontaneous respiration was shorter in the group using rocuronium + sugammadex than in the group using succinylcholine. The mean seizure duration was 28.72 seconds in Group S and 31.02 seconds in Group R+S. In our study, no significant difference was found in terms of seizure durations.

In a multicenter study, Lee et al.[15] compared the time to return to spontaneous breathing after administration of succinylcholine at a dose of 1 mg/kg (58 patients) and rocuronium at a dose of 1.2 mg/kg (57 patients) in 115 patients. It was reported that patients who received high-dose sugammadex (16 mg/kg) recovered faster and returned to spontaneous breathing compared to succinylcholine. In our study, succinylcholine 1 mg/kg IV and rocuronium 0.4 mg/kg I.V were used, and sugammadex was administered at a dose of 2 mg/kg. We found that rocuronium and sugammadex were more successful than succinylcholine in restoring spontaneous respiration, even at lower doses.

Sarıçiçek et al.[16] compared the combination of rocuronium +sugammadex with succinylcholine and reported that the patients in the rocuronium + sugammadex group had a shorter time to wake up after anesthesia compared to those in the succinylcholine group, and recovery was faster. In our study, we considered the time to 9 MAS in terms of recovery and concluded that it was significantly shorter in the rocuronium+sugammadex group. There is a study by Batistaki et al.[17] recommending the use of the rocuronium-sugammadex combination in cases where succinylcholine or anticholinesterases as reversal agents are contraindicated. In our study, we showed that the use of rocuronium+sugammadex is a suitable alternative in cases where succinylcholine or anticholinesterases are contraindicated or cannot be used. Trzepacz et al.[18], Mitchell et al.[19] and Avramov et al.[20], showed that propofol anesthesia shortens the seizure duration without affecting the efficacy of ECT when compared with methohexital, etomidate, and thiopental anesthesia. In our study, we preferred propofol, which has a short duration of action and has little effect on seizure efficacy, as the induction agent. This agent has side effects such as nausea and vomiting, but we did not encounter such side effects in our study.

Şanlı et al.[21] used 1 mg/kg rocuronium and 16 mg/kg sugammadex as antidotes during ECT sessions in a patient who developed neuroleptic malignant syndrome after antipsychotic drug use. The patient underwent 11 sessions of ECT, and the duration of spontaneous eye opening was 7 minutes. They observed that there was no significant change in the vital signs of the patient before and after the procedure. Both studies show the safety of rocuronium as an alternative muscle relaxant and sugammadex as an antidote, which can be used without increasing the risk of malignant hyperthermia during ECT in patients with neuroleptic malignant syndrome.

CONCLUSION

Although the high cost of sugammadex limits its routine use in ECT anesthesia, it can be used as an ideal alternative agent in cases where succinylcholine is contraindicated or anticholinesterases are not suitable because it shortens the recovery time and the return of spontaneous respiration compared to succinylcholine.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study is a specialty thesis in the field of emergency medicine. Before 2020, institutional approval was obtained, and ethics committee decisions were not taken for that period.

Informed Consent

Written informed consent was obtained from the patients participating in this study.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declared that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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The new biomarker that predicts in-hospital mortality in myocardial infarction: glucose/potassium ratio

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ABSTRACT

Aims: Acute myocardial infarction (AMI) remains one of the leading causes of cardiovascular mortality. However, the parameters used to predict short-term mortality are limited. Glucose-potassium ratio (GPR) is a new biomarker that has been recently used. This study aimed to investigate the usefulness of GPR in predicting short-term mortality in patients diagnosed with AMI in the emergency department.

Methods: This retrospective cohort study was conducted between January 1, 2022, and June 30, 2022, and included patients registered in the hospital emergency health system with IRB (Institutional Review Board) approval. Patients were identified based on inclusion criteria, and their demographic data, laboratory findings, and outcomes were recorded in the hospital registration system. Data comparisons between deceased and non-deceased patients were performed using the Student's t-test. Correlation analysis was performed using Spearman's correlation coefficients. A binary logistic regression model was created to determine the predictive parameters, and odds ratios and 95% confidence intervals (CI) were presented.

Results: A total of 665 patients diagnosed with AMI were included in the study, with 75.9% of all patients being male and an average age of 62.14±11.62. A total of 6.6% of the patients included in the study died due to various causes during hospitalization. When laboratory values of deceased AMI patients were examined, statistically significant increases in glucose, urea, creatinine, WBC, neutrophil, lymphocyte, troponin, ckmb, and lactate levels were observed. The effects of GPR, Neutrophil-to-lymphocyte ratio (NLR) , Platelet to Lymphocyte ratio (PLR), lactate, and troponin levels on in-hospital mortality were analyzed using univariate logistic regression. GPR (95% CI 1.015-1.036, p=0.000), troponin (95% CI 1.001-1.001, p=0.000), and lactate (95% CI 1.437-1.908, p=0.000) were found to be the most important factors associated with mortality in patients with AMI. The ability to predict in-hospital mortality in AMI was compared, and GPR was found to have a higher predictive ability than troponin, a biomarker of myocardial damage (area under the curve (AUC): 0.729; p=0.000; Sensitivity: 70%; Specificity: 70%; Cut-off: 38.21).

Conclusion: GPR, as a new and inexpensive biomarker, can be used to determine in-hospital mortality in patients with AMI. This index has a better predictive ability than troponin, NLR, and PLR, but is weaker than lactate.

Keywords: Acute myocardial infarction, glucose-potassium ratio, short-term mortality

INTRODUCTION

Acute myocardial infarction (MI) ranks among the top three causes of cardiovascular deaths along with acute pulmonary embolism and stroke, and its mortality rate remains quite high. Approximately 5.5% to 18.2% of patients who experience myocardial infarction die in the hospital, while long-term follow-up shows that this mortality rate can reach up to 15%.[1-4]

Studies have shown that inflammation plays a significant role in the development of cardiovascular disease and atherosclerosis.[5,6] Therefore, inflammation and oxidative stress may cause plaque rupture that leads to cardiovascular events.[7,8] In particular, an inflammatory and neuroendocrine response occurs after acute stress. This response leads to an increase in the release of counter-regulatory hormones as a result of the activation of the hypothalamic-pituitary-adrenal system by stressor factors. The release of these hormones affects glucose and potassium metabolism.[9] In response to stress hormones, the release of inflammatory mediators and procoagulation factors increases, and as a result, glucose utilization decreases in peripheral tissues. Hyperglycemia further increases due to the release of counter-regulatory hormones. This event creates a vicious cycle that increases proinflammatory and procoagulation cytokine secretion, inflammatory response, and oxidative stress.[10] A study

showed that the glucose-potassium ratio (GPR) could be a good indicator of vasospasm and stress response in patients with subarachnoid hemorrhage.[11] Hyperglycemia is frequently observed in patients who present with acute myocardial infarction (AMI), regardless of whether they have a previously documented diabetes mellitus (DM).[12] Particularly, significant hyperglycemia is present in approximately 10% to 20% of non-diabetic AMI patients.[13]

As a result of the increased release of counter-regulatory hormones secondary to this hyperglycemia, a decrease in extracellular potassium level will occur. Taking all these physiological responses into account, we believe that the evaluation of glucose and potassium values together can be very useful in understanding the endocrine and metabolic effects on the disease and its consequences. This study aimed to investigate whether GPR has the potential to predict prognosis and whether it would be useful in predicting the risk of in-hospital mortality when used routinely.

METHODS

Study Design and Participants

The study was designed as a retrospective cross-sectional clinical cohort. All patients diagnosed with myocardial infarction in the emergency department and undergoing emergency coronary angiography by the cardiology department between January 1, 2022, and June 30, 2022, were included in the study. Patients' demographic data (age, gender) were investigated through the hospital registration system. Standard treatment protocols were applied to all patients in the emergency department. This study was conducted with the approval of our institution's Ethics Committee (Date: 05.01.2023, Decision No: 01-21). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Patients under the age of 18, patients whose demographic characteristics and medical history could not be obtained from the hospital registration system, patients whose parameters at the first laboratory values in the emergency department could not be obtained, patients whose outcome status could not be reached, pregnant patients, and patients who did not undergo emergency angiography were excluded from the study. After applying inclusion and exclusion criteria, 158 patients were excluded and 665 patients were included in the study (**Figure 1**).

For all patients who were diagnosed with AMI before coronary angiography, blood samples were taken from the antecubital vein with atraumatic insertion and immediately sent to the laboratory. Peripheral venous blood samples were taken from all patients for glucose, sodium, potassium, urea, creatinine, CK-MB, cardiac troponin, lactate, white blood cells (WBC), neutrophils, lymphocytes, platelets, and other routine laboratory parameters at the time of admission. An EDTA (ethylenediaminetetraacetic acid)-containing blood tube was used for hematological evaluation. The complete blood count, including differentials, was calculated using an automated blood cell counter (Sysmex xn1000 series, USA). The biochemical panel was measured with a Cobas 6000 (Roche Diagnostics, USA) autoanalyzer. GPR was obtained by dividing glucose levels by potassium levels using the MS Excel program.

Statistical Analysis

In this study, a p value of <0.05 was considered statistically significant. Therefore, statistical analysis was performed using IBM Company's SPSS Statistics for Windows program version 20. The normality of distribution was evaluated using the Kolmogorov-Smirnov test, and since continuous variables were normally distributed, all results were presented as mean±standard deviation. All categorical variables were analyzed using chi-square test and presented as frequency (%). Data comparisons between non-fatal AMI and fatal AMI were performed using the Student's t-test. Correlation analysis was performed using Spearman correlation coefficients. To determine predictive parameters, we constructed a binary logistic regression model containing significant variables according to univariate evaluation, and presented odds ratios and 95% confidence intervals (CI) (**Table 1**). Receiver operating characteristic (ROC) curve analysis was performed to evaluate the prognostic accuracy of GPR for fatal AMI compared to non-fatal AMI, and the area under the curve (AUC) was estimated.

RESULTS

Demographic and Clinical Findings

During the study period, 823 patients who were diagnosed with myocardial infarction and underwent coronary angiography in the emergency department were identified. Subsequently, 158 patients were excluded due to the specified reasons (**Figure 1**).

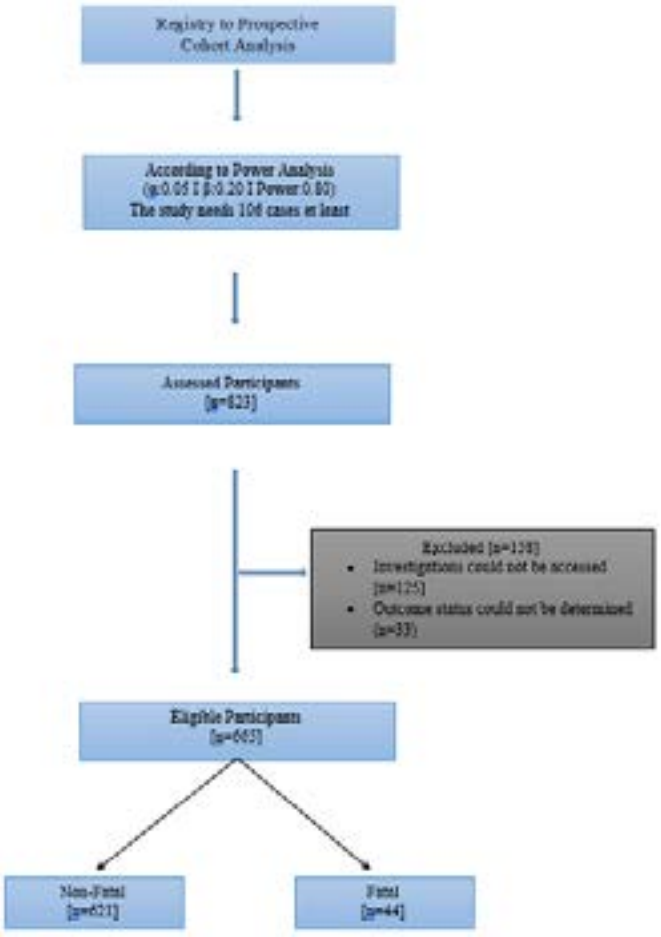

Figure 1. The flow chart for the selection and enrollment of study participants

665 patients were recorded for analysis. During hospitalization, 44 of the included patients died due to various reasons. Among all patients, 75.9% were male and 24.1% were female, with a mean age of 62.14±11.62. The demographic characteristics and laboratory values of the patients are presented in **Table 1**.

Table 1. Main characteristics of patients

Variables	Acute myocardial infarction (AMI)		
	Non-fatal AMI	Fatal AMI	P value
Gender (M/F)	475/30	146/14	.213
Age,year	61.70±11.84	68.27±11.62	**.000**
Glucose, mg/dl	164.47±96.73	266.52±162.98	**.000**
Sodium, mmol/L	138.91±2.76	137.65±3.70	**.005**
Potassium, mmol/L	4.47±0.51	4.66±0.76	**.031**
Urea, mg/dl	17.50±8.07	23.88±10.25	**.000**
Creatinine, mg/dl	0.98±0.39	1.25±0.39	**.000**
WBC, 10^3 /µL	10.95±3.73	17.04±8.28	**.000**
Platelet, 10^3 /µL	254.75±75.04	238.38±91.12	**.020**
Neutrophil, 10^3 /µL	7.86±3,58	12.52±6.83	**.000**
Lymphocyte, 10^3 /µL	2.26±1.24	3.45±3.13	**.000**
Troponin, ng/L	311.78±585,38	1534.68±2217.41	**.000**
CK-MB, µg/L	23.70±40.57	61.22±84.89	**.000**
Lactate, mmol/L	2.35±1.27	5.36±4.23	**.000**
NLR	4.83±4.41	6.41±4.59	**.022**
PLR	145.15±104.13	149.13±113.73	.808
GPR	36.82±19.93	57.60±34.23	**.000**

WBC: White blood cell, CK-MB: Creatine kinase-myocardial band, NLR: Neutrophil to lymphocyte ratio, PLR: Platelet to lymphocyte ratio, GPR: Glucose to potassium ratio. Bold values means the significance of p<0.005. "Gender" parameter was analyzed by the Chi-Square test, while the others (mean ± standart deviation) were done using the independent Student T-test

When comparing fatal and non-fatal AMI, no significant difference was observed between the two groups in terms of gender. However, when other parameters were compared between the two groups, it was found that glucose, potassium, urea, creatinine, WBC, neutrophil, lymphocyte, troponin, ckmb, and lactate values significantly increased in fatal AMI patients, while sodium and platelet values decreased.

In this study, we analyzed the effect of glucose-to-potassium ratio, neutrophil-to-lymphocyte ratio, platelet-to-lymphocyte ratio, lactate ratio, and troponin ratio on in-hospital mortality in AMI patients using univariate logistic regression (**Table 2**). The results indicated that GPR (95% CI 1.015-1.036, p=0.000), troponin (95% CI 1.001-1.001, p=0.000), and lactate (95% CI 1.437-1.908, p=0.000) were the most significant factors associated with mortality in patients with AMI.

Table 2. Logistic regression analysis for in-hospital mortality in AMI

Variables	Odds ratio (95% confidence interval)	P value
Troponin, ng/L	1.001 (1.001-1.001)	.000
Lactate, mmol/L	1.656 (1.437-1.908)	.000
NLR	0.999(0.992-1.006)	.823
PLR	1.000 (0.998-1.003)	.776
GPR***	1.026 (1.015-1.036)	.000

GPR: Glucose to Potassium ratio, NLR: Neutrophil to Lymphocyte ratio, PLR: Platelet to Lymphocyte ratio, AMI: Area under the curve.
*Results are presented as odds ratios (95% confidence interval).

Furthermore, we compared the ability of these indicators to predict in-hospital mortality in AMI patients. GPR showed a high predictive ability for in-hospital mortality in AMI patients, which was similar to troponin, a biomarker of myocardial damage. When compared to NLR and PLR, which have been suggested as indicators of in-hospital mortality in recent studies and have a direct effect on thrombus formation, GPR was found to have a higher predictive ability for mortality (**Table 3** and **Figure 2**). Therefore, we believe that GPR is an important predictor of in-hospital mortality in AMI patients and requires further investigation.

Table 3. Comparison of the effects of group S and group R+S on SBT, SET, MAS9, and seizure durations

Variables	Area	SE[a]	Sig[b]	95% CI		SN (%)	SP (%)	Cut-off
				Lower	Upper			
Troponin, ng/L	0.726	0.042	0.000	0.643	0.808	65	63	171.3
Lactate, mmol/L	0.782	0.037	0.000	0.709	0.855	77	69	2.55
NLR	0.591	0.053	0.044	0.488	0.694	59	59	4.17
PLR	0.465	0.057	0.435	0.353	0.577	45	45	111.56
GPR	0.729	0.041	0.000	0.649	0.808	70	70	38.21

NLR: Neutrophil to lymphocyte ratio, PLR: Platelet to lymphocyte ratio, GPR: Glucose to potassium ratio, SE: Standart error, SN: Sensitivity, SP: Specificity.
[a] Under the nonparametric assumption.
[b] Null hypothesis: true area=0.5.

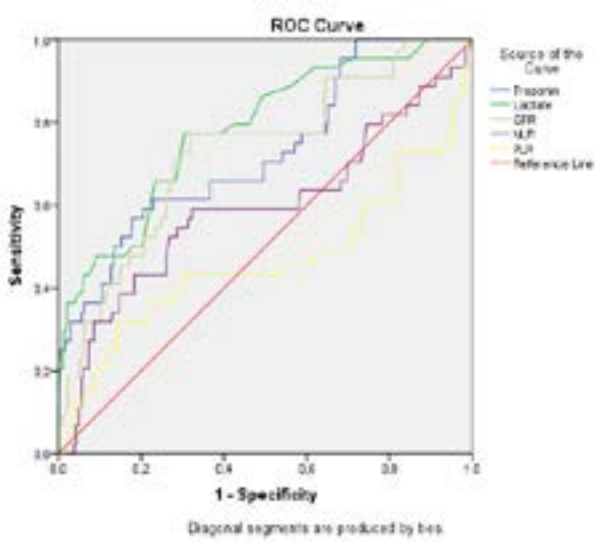

Figure 2. ROC Curve showing the diagnostic effectiveness of Troponin, lactate, NLR, PLR, and GPR for AMI

DISCUSSION

Upon reviewing the literature, this study is the first to investigate the role of GPR in AMI. We found that GPR, a new ratio, is at least as useful as troponin in assessing in-hospital mortality in patients diagnosed with AMI, but weaker than lactate. Additionally, we found that GPR has a superior predictive rate compared to other blood parameters that play an effective role in thrombus formation. We believe that GPR can be used as a diagnostic index to predict in-hospital mortality in patients diagnosed with AMI and can open up new horizons in this field.

Many studies have shown that hyperglycemia in the context of AMI is an independent determinant of heart failure and mortality, regardless of diabetic status.[14-17] Keiichi et al.[18] investigated the effect of glycemic variability on myocardial infarction size in patients with ST-segment elevation myocardial infarction and showed that patients with high glycemic variability had larger infarct sizes than expected. In addition, in studies on the control of hyperglycemia in intensive care unit follow-up of patients with acute coronary syndrome, it has been shown that keeping the glucose level between 1.26 g/L and 1.80 g/L reduces 3-month, 1-year, and 3-year mortality. Moreover, the results of this study were independent of the insulin protocol used.[19] All of these findings support the notion that controlling stress hyperglycemia to a certain degree can reduce mortality and morbidity rates.

Potassium levels, which are abundant in cells, are regulated by the Na/K ATP pump located on the cell surface. Increasing adrenergic hormones in stress up-regulate this pump, resulting in a decrease in K+ levels.[20,21] The hyperglycemic state that occurs due to increased catecholamine discharge in AMI results in increased insulin secretion and intracellular K+ uptake. The serum GPR index is a very new parameter analyzed in circulation diseases such as stroke and hemorrhage. Matano et al.[22] reported that GPR has a strong relationship with vasospasm occurring in cerebral infarctions. Wu et al.[23] reported in a recent study that increased serum GPR in intracerebral hemorrhage was associated with the severity of hemorrhage and poor clinical prognosis. Fujiki et al.[24] analyzed the GPR index in patients with subarachnoid hemorrhage. They reported that calculating glucose and potassium values together as GPR is more useful in evaluating the prognosis of this disease, rather than calculating these values separately.

In our study, we aimed to demonstrate the predictive ability of the GPR index for in-hospital mortality in patients diagnosed with AMI, by utilizing Troponin, NLR and PLR indexes that have been previously studied in this field, as well as lactate values that increase in the case of hypoxia. While the similarity of gender in demographic characteristics reduced bias formation a bit, the age factor showed a significant difference. Troponin levels were higher in fatal AMI in group comparison. Again, Lactate, NLR, and PLR were found to be high in the fatal AMI group. GPR showed a very strong increase in the fatal AMI group like troponin and lactate. In the diagnostic value analysis of the fatal AMI group compared to the non-fatal AMI group, Lactate showed the strongest potential. GPR showed a stronger diagnostic value than troponin.

Limitations

There are several limitations to this study. This study was initially planned as a retrospective cohort study. Therefore, we could not obtain data to compare insulin, glucagon, corticosteroid, insulin, and catecholamine levels with GPR, as well as HbA1c levels. The analysis was performed with a limited sample size at a single center. Despite all limitations, this is the first study to investigate the relationship between GPR and in-hospital mortality of AMI and will shed light on prospective studies in the future. The efficacy of GPR can be evaluated more clearly with prospective and multicenter studies by adding a control group.

CONCLUSION

GPR showed a strong increase in the fatal AMI group, consistent with Troponin, Lactate, and NLR. Additionally, GPR showed a stronger diagnosis than Troponin and NLP. GPR as a new, inexpensive biomarker may be useful in predicting in-hospital mortality of fatal and non-fatal AMI. However, it is weaker than Lactate but better than Troponin.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was conducted with the approval of Health Ministry of Turkish Republic Konya City Hospital Institution's Ethics Committee (Date: 05.01.2023, Decision No: 01-21).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declared that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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Comparative analysis of codes white given by the emergency departments of two different third level hospitals in Ankara

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ABSTRACT

Aims: In our study, we aimed to compare the codes white given by the emergency services of two tertiary hospitals in Ankara, to reveal the significant differences between them and to discuss the reasons that may lead to these differences.

Methods: In our study, we compared the codes white data given from the Emergency Medicine Department of Bilkent Ankara City Hospital (ABCH) and Ankara Training and Research Hospital (ATRH) between 01.01.2021 and 31.12.2022. We classified the data according to the gender, occupation, working hours of the violence, the person who caused the violence, and the type of violence. For research analysis, we grouped the data using Windows-based Microsoft 365 Excel, and for statistical analysis, we used IBM SPSS version 26.

Results: The gender that was exposed to violence more in ABCH was women, the most frequent perpetrators were the relatives of the patients, and the type of violence experienced was verbal violence. In ATRH, male health workers were the most frequently exposed to violence, while the most frequent perpetrator was the patient himself, and more cases of physical violence were reported.

Conclusion: There are significant differences between the incidents of violence in the emergency departments of the two hospitals, which have different socio-cultural environments due to their location.

Keywords: Emergency medicine, code white, violence

INTRODUCTION

Healthcare workers are at risk of violence around the world. In the World Health Organization's (WHO) report on violence and health, violence is defined as the intentional use of physical force or power, threatened or actual, against oneself, another person, or a group or community, resulting in injury, death, psychological harm, or deprivation, or having a high likelihood of resulting in such outcomes.[1]

It has been observed that healthcare workers experience physical violence at variable rates, ranging from 8% to 38% at different points in their careers. Additionally, more healthcare workers are subjected to threats and verbal attacks than those reflected in the reported data. Most violence is perpetrated by patients and visitors. Among the categories of healthcare workers most at risk are nurses, emergency room personnel, healthcare aides, and auxiliary staff responsible for hospital security. On October 3, 2002, the World Health Organization (WHO) published its first global report on violence in healthcare. This report is significant because it represents the first comprehensive examination of violence in healthcare on a global scale. The report includes information about the definition of violence, its classification, who it affects, and what needs to be done about it.[1]

A meta-analysis that included sixty articles published between 2007 and 2017 revealed that emergency department healthcare workers who encounter psychiatric patients or individuals under the influence of drugs or alcohol face a higher risk of physical violence than patients in a normal state of consciousness. These findings support the hypothesis that emergency departments should have an action plan aimed at assessing the risk of violence from each patient and notifying colleagues if a patient is at risk of violence.[2]

In some studies, healthcare workers who experienced verbal, physical, and sexual violence reported experiencing anger, a decline in job performance, deterioration in mental health, disruption in social life, and strained interpersonal relationships. It was also found that healthcare workers who

experienced physical violence were more likely to consider leaving their jobs than those who experienced other forms of violence.[3]

In our study, we compared the qualitative and quantitative characteristics of "code white" incidents reported as a result of violence in two emergency departments serving different socio-cultural communities with different physical conditions. Among our hypotheses was the expectation that the type of violence experienced in these two hospitals would be proportionally different. We also anticipated that the tertiary care hospital, which operates under more challenging socio-cultural conditions, would experience more cases of physically oriented violence. Furthermore, considering the hospital's proximity to residential areas, we believed there would be more outpatient visits at this hospital, and thus, the person responsible for the "code white" incident would often be the patient themselves.

METHODS

The study was carried out with the permission of Ankara City Hospital Clinical Researches Ethics Committee (Date: 22.03.2023, Decision No: E1-23-3403). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This study was an observational, retrospective, and cross-sectional multicenter study. A comparative analysis was conducted on white code data provided following incidents of violence that occurred in the emergency departments of Ankara City Hospital (ABCH) and Ankara Training and Research Hospital (ATRH) between January 1, 2021, and December 31, 2022. The main reason for selecting these two hospitals was their service to different socio-cultural communities due to their geographical locations and different physical facilities. White codes provided outside the emergency department were not included in the study.

When all white code data from the emergency department were examined, a total of 83 white code records for 2021 and 121 white code records for 2022 were included in the study. The data were obtained through official correspondence from the occupational health units of both hospitals, resulting in 204 white code records in the data pool. The parameters in our study were grouped as follows: gender of the assaulted staff, occupation, type of violence, and time interval in which the violence occurred. Regarding the type of violence, we categorized it as verbal, verbal and physical, and physical violence without a verbal component. We divided the time intervals as 08:00-16:59, 17:00-23:59, and 00:00-07:59. In some cases of violence, multiple genders and occupational influences were involved in a single incident. Therefore, to ensure accurate statistical analysis, we created a gender group in which both male and female genders were affected and similarly, we specified a new group for cases with multiple occupational influences.

Statistical Analysis

The data were organized using Microsoft 365 Excel on a Windows-based platform. For statistical analysis, Pearson's chi-squared test and Fisher 's exact test from IBM SPSS Version 26 were employed. Results are presented as percentages (%), and data resulting in $p<0.05$ were considered statistically significant.

RESULTS

Based on the data, we observed that a total of 236 healthcare personnel were affected by these incidents of violence. Among them, 139 (58.8%) were doctors, 54 (22.8%) were nurses, and 28 (11.8%) were security personnel. The amount of female healthcare personnel affected by the violence was 120 (50.8%), while the amount of male personnel was 116 (49.1%). The cases of violence were categorized as follows: 168 (82.3%) verbal, 27 (13.2%) verbal and physical, and 9 (4.4%) physical.

When the perpetrators of violence were examined, it was found that out of 204 cases, 118 (57.8%) were caused by relatives of the patients, 79 (38.7%) by the patients themselves, and 5 cases (2.4%) involved both the patient and their relative causing the violence. In two cases of violence, it was reported that 112 healthcare personnel were responsible for the violence. Among the 204 cases, 171 (83.8%) were related to ABCH, whereas only 33 (16.1%) were related to ATRH. Among the 204 white code incidents, 103 cases (50.4%) involved only female victims, 92 cases (45%) involved only male victims, and in 9 white code cases (4.4%), both female and male genders were affected together. In ABCH, where the perpetrator of violence was more often a patient 's' relative (62.6%), in ATRH, it was observed that the patient themselves (57.6%) more frequently caused the violence ($p=0.002$).

When considering the gender of the healthcare personnel exposed to violence, it was found that female personnel predominated for ABCH (52.6%), while for ATRH, male personnel (42.4%) were more likely to report codes white ($p<0.001$). Regarding the type of violence, verbal violence was more prevalent in ABCH (86%), whereas physical violence incidents (36.3%) were proportionally higher in ATRH ($p=0.002$).

In terms of codes white given in 2021, ABCH 's Emergency Medicine Clinic had 74 codes white, whereas ATRH's Emergency Medicine Clinic had only 9. Based on the 2021 data, ABCH's s codes white consisted of 46 (63.3%) females and 29 (38.6%) males, with 83.7% being verbal violence and 16.1% being physical violence. When codes white were examined in terms of working hours, they were most frequently given during the hours of 08:00-16:59, accounting for 43.2% of the total. In the ranking of healthcare workers most frequently exposed to violence, doctors were at the top with 62.6%, followed by nurses at 21.3%, and security personnel at 10.6%. Among the perpetrators of violence, relatives of patients were the most frequent (64.8%) in ABCH. In contrast, in ATRH's Emergency Medicine Clinic, the patients themselves were more often responsible for the violence (**Table 1**).

According to the data for 2022, from the Emergency Medicine Clinic of ABCH, there were 48 codes white (47.5%) for females and 53 (52.4%) for males. Among these, 88.6% were cases of verbal violence, whereas 11.2% involved physical violence. When codes white were examined in terms of working hours, it was observed that they were most frequently given during the hours of 17:00-23:59, accounting for 39.1% of the total. In the ranking of healthcare workers most frequently exposed to violence, doctors were at the top with 57.4%, followed by nurses at 24.7%, and security personnel at 11.8%. Among the perpetrators of violence, relatives of patients were the most frequent, accounting for 60.8% of cases.

Table 1. Distribution of white code data given from Ankara Bilkent City Hospital and Ankara Training and Research Hospital Emergency Departments in 2021, according to the researched parameters

Year 2021	ABCH n (%)	ATRH n (%)
The person causing violence		
Patient	25 (33.%7)	6(66%)
Patient's relative	48 (64.8%)	3(33%)
Patient and relative	0	0
Other (Staff working in ambulance)	1 (1.3%)	0
Occupation		
Doctor	47 (62.6%)	6 (50%)
Nurse	16 (21.3%)	3 (25%)
Radiology technician	1 (1%)	0
Security guard	8 (10.6%)	3 (25%)
Sars-cov-2 PCR recruitment personnel	1 (1%)	0
Data recording personnel	2 (2%)	0
Gender of the victim of violence		
Female	46 (61.3%)	5.36±4.23
Male	29 (38.6%)	7 (58%)
Type of violence		
Physically	5 (6.7%)	57.60±34.23
Verbal	62 (83.7%)	57.60±34.23
Verbal and physical	7 (9.4%)	0
Event time		
08:00-16:59	32 (43.2%)	2 (22%)
17:00-23:59	29 (39.1%)	2 (22%)
00:00-07:59	13 (17.5%)	5 (55%)

ABCH: Ankara Bilkent City Hospital, ATRH: Ankara Training and Research Hospital

Table 2. Distribution of white code data given from Ankara Bilkent City Hospital and Ankara Training and Research Hospital Emergency Departments in 2022, according to the researched parameters

Year 2022	ABCH n (%)	ATRH n (%)
The person causing violence		
Patient	35 (36%)	13 (54.1%)
Patient's relative	59 (60.8%)	8 (33.3%)
Patient and relative	2 (2%)	3 (12.5%)
Other (112 staff)	1 (1%)	0
Occupation		
Doctor	58 (57.4%)	28 (58.3%)
Nurse	25 (24.7%)	10 (20.8%)
Radiology technician	4 (3.9%)	2 (4.1%)
Security guard	12 (11.8%)	5 (10.4%)
Sars-cov-2 PCR recruitment personnel	0	0
Data recording personnel	2 (1.9%)	1 (2%)
	0	2 (4.1%)
Gender of the victim of violence		
Female	48 (47.5%)	19 (39.5%)
Male	53 (52.4%)	29 (60.4%)
Type of violence		
Physically	3 (3%)	1 (4.1%)
Verbal	86 (88.6%)	16 (66.6%)
Verbal and physical	8 (8.2%)	7 (29.1%)
Event time		
08:00-16:59	24 (24.7%)	6 (25%)
17:00-23:59	38 (39.1%)	9 (37.5%)
00:00-07:59	35 (36%)	9 (37.5%)

ABCH: Ankara Bilkent City Hospital, ATRH: Ankara Training and Research Hospital

The difference in ATRH data was that the patient was the most frequent perpetrator of violence with 54.1% and the victim was male with 60.4% (Table 2).

It appears that the highest number of codes white was issued in January 2022 from the Emergency Medicine Clinic of ABCH. The months with the lowest number of codes white issued for ABCH were February, April, and September in 2021, and October in 2022. In contrast, for ATRH, no codes white were issued in January, March, May, July, November, and December in 2021. In 2022, there were no codes white issued in May alone. Additionally, we observed an increase in the number of codes white issued between 2021 and 2022 for both hospitals. It is notable that ABCH 's Emergency Medicine Clinic consistently experienced more incidents of violence each month (Figure 1).

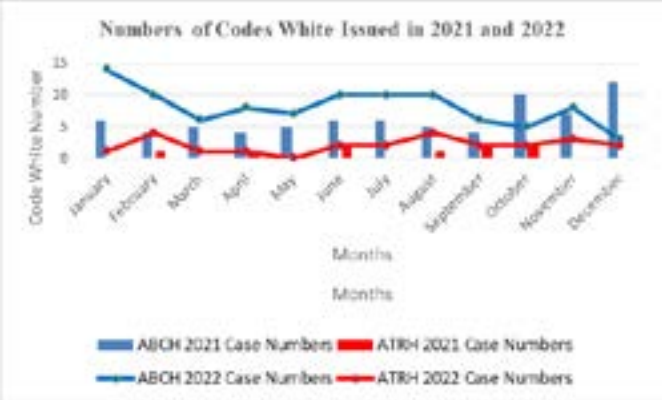

Figure 1. Number of Code White

When considering incidents of violence among healthcare workers based on gender in the two hospitals, it was observed that female healthcare workers (52.6%) were more frequently exposed to violence in the Emergency Medicine Clinic of ABCH, whereas male healthcare workers (42.4%) were more likely to report codes white in ATRH. In both years, a total of 204 white code cases were reported, indicating that 236 healthcare workers experienced violence in their workplace. Of these, 52.2% were female. Because multiple genders were involved in some incidents of violence, a combined group of both male and female genders was specified for statistical interpretation. Pearson 's's chi-square test was used ($p<0.001$), and a statistically significant difference between the hospitals was detected (Table 3).

From a statistical analysis perspective, it was noted that there were multiple occupational groups affected by the same incidents of violence; therefore, a separate variable was specified. While Pearson's chi-squared test may have appeared significant in SPSS data analysis, the analysis result was deemed unreliable due to the non-homogeneous distribution of the data volume (Table 3).

When the codes white given by the emergency medicine clinics of both hospitals for the years 2021 and 2022 are examined, it is seen that the person who caused the code white is the patient's relatives with 62.6%, the patient himself with 35.1%, and the patient himself with relatives 1.2%. we reported that he was a relative. In the ATRH Emergency Medicine Clinic, we observed that 57.6% of the patients themselves, 33.3% of the patients' relatives, and 9.1% of the patients and their relatives caused the code white. While the person who causes violence in AHD is often the patient's relatives, it was reported that the patient himself caused the violence in AHD (Table 3).

In the comparison made between hospitals based on the sum of the data of both years, in the ABCH Emergency Medicine Clinic, 86.0% was verbal violence, 4.7% was physical violence, 9.4% was verbal and physical violence. At the ATRH Emergency Medicine Clinic, we reported 63.6% as verbal violence, 3% as physical violence, and 33.3% as verbal and physical violence. Of all the violent incidents in the two hospitals, 82.2% were reported as verbal, 12.7% as physical, and 4.4% as verbal and physical violence. There was a significant difference when the type of violence in the code white cases experienced during the period when data was collected in the two hospitals subject to our study was statistically examined. According to this result, more cases of physical violence are reported in the ATRH Emergency Medicine Clinic than in the ABCH Emergency Medicine Clinic (**Table 3**).

When the time interval in which the total violent incidents occurred within two years is most frequently experienced, it is seen that in the ABCH Emergency Medicine Clinic, the most common time is between 17:00 and 23:59, with a rate of 39.2%, and in the ATRH Emergency Medicine Clinic, this rate is 42%. It appeared to be between 4 and 00:00-07:59. When examined statistically, no significant difference was detected between them (**Table 3**).

Table 3. Comparison of ABCH and ATRH in terms of the gender of the perpetrators of violence, the profession of the healthcare personnel exposed to violence, the perpetrators of violence, the type of violence and the time interval of the event

		Hospital				
		ABCH		ATRH		
		n	%	n	%	p
Gender of the victim of violence	Female	90	52.6	13	39.4	<0.001
	Male	78	45.6	14	42.4	
	Male and female together	3	1.8	6	18.2	
Professional group	Doctor	101	59.1%	19	57.6%	0.012
	Nurse	38	22.2%	8	24.2%	
	Security Staff	20	11.7%	1	3.0%	
	Radiology technician	4	2.3%	1	3.0%	
	More than one medical staff	2	1.2%	4	12.1%	
	IT personnel	6	3.5%	0	0.0%	
Perpetrator of violence	Patient	60	35.1%	19	57.6%	0.002
	The relatives of the patient	107	62.6%	11	33.3%	
	Patient and relative	2	1.2%	3	9.1%	
	Other	2	1.2%	0	0.0%	
Type of violence	Verbal violence	147	86.0%	21	63.6%	0.002*
	Verbal and physical violence	16	9.4%	11	33.3%	
	Physical violence	8	4.7%	1	3.0%	
Event time range	08:00-16:59	56	32.7%	8	24.2%	0.251
	17:00-23:59	67	39.2%	11	33.3%	
	00:00-07:59	48	28.1%	14	42.4%	

ABCH: Ankara Bilkent City Hospital, ATRH: Ankara Training and Research Hospital, *Fisher's Exact test

DISCUSSION

Emergency departments are high-risk environments for violence in healthcare compared with all other healthcare settings. Emergency healthcare workers deal with a wide range of acute and chronic issues every day, including sudden deaths, trauma, and hospital overcrowding. They often face unpredictable stressors and frequently deal with patients who can exhibit aggressive behavior because of factors such as the urgency of their condition, long waiting times, substance intoxication, or alcohol poisoning.[4]

The consequences of violence against healthcare workers include not only physical injuries but also psychological outcomes. Problems such as outbursts of anger, fear, or anxiety, symptoms of post-traumatic stress disorder, guilt, self-blame, shame, decreased job satisfaction, and increased rates of leaving work have been reported as short- and long-term effects of violence in the healthcare sector.[5,6]

Among the research hypotheses, we expected that there would be more white code incidents in the ABCH Emergency Medicine Clinic, which is assumed to have a higher patient volume. Another hypothesis was that the ATRH Emergency Medicine Clinic, which is considered to work under challenging socio-cultural conditions due to its location, would have a higher percentage of codes white with physical violence content. In addition, we predicted that violence incidents would occur more frequently during daytime working hours when patient volume is higher. We did not expect any gender differences in the health workers affected by violence; however, we expected that more white code incidents would involve patient relatives in the hospital where more yellow and red triage code patients were treated. We also expected that nurses would be the most frequent group to report codes white, and that codes white would be most common during working hours.

When we compared the data from our study with studies conducted worldwide and in Turkey, we found both similarities and notable differences. In a joint report by WHO, ILO (International Labour Organization), and ICN (International Council of Nurses) in 2002, when the frequency of violence against healthcare workers in different countries was examined, it was determined that healthcare workers were exposed to physical violence in the range of 3% to 17%, verbal violence in the range of 27% to 67%, psychological violence in 23%, sexual violence in the range of 0.7% to 8%, and ethnic violence (racism) in the range of 0.8% to 2.7%.[7]

In a study by Torun N.[8] in Turkey in 2018, white code data obtained from the Ministry of Health between 2012 and 2018 were retrospectively examined and grouped. Verbal violence was reported as the dominant type of violence, with July (11%) being the month with the highest incidence of violence, and December (5%) as the month with the lowest incidence. In our study, however, it was observed that the winter months (December and January) had the highest incidence of violence. This may be because of the prolonged length of stay for patients in ABCH, especially during the winter months. Patients with COPD (Chronic obstructive Pulmonary Disease) or asthma exacerbations who visit the emergency department have a higher need for hospitalization during this period, and the length of stay for inpatients also increases. The number of admission queues for service or intensive care in our hospital increases during the winter months.

In a white code study conducted by Polat and Çırak[9] at Bakırköy Dr. Sadi Konuk Training and Research Hospital, when 345 white code notifications between January 2016 and December 2018 were categorized into three categories: verbal violence, physical violence, and verbal and physical violence, it was reported that there were 312 cases of verbal violence, 31 cases of verbal and physical violence, and 2 cases of physical violence. In the analysis of 345 violence incidents,

218 (63.1%) female and 127 (36.8%) male healthcare personnel were exposed to violence. It was observed that 71.8% of those exposed to violence were doctors, 20.8% were nurses. The highest number of White Code notifications was reported to be between 08:00 and-16:59 hours. In our study, the occupational group most frequently exposed to violence in the ABCH Emergency Medicine Clinic was doctors (59.6%), followed by nurses (23.2%), security personnel (11.3%), radiology technicians (2.8%), and IT personnel (2.2%). In the ATRH Emergency Medicine Clinic, the percentages of occupational groups giving codes white were 56.6% doctors, 21.6% nurses, and 13.3% security personnel. In our study, we found that verbal violence was the most common type of violence and that women were more frequently exposed to violence.

In a study conducted by Devebakan et al.[10], it was reported that doctors were the most victims of violence and the most common type of violence was verbal violence. The same study also showed that the most common causes of violence are communication problems, misunderstandings, treatment dissatisfaction and long waiting time.Similarly in our study, we found that verbal violence was the most common type of violence and that women were more frequently exposed to violence.

In a study published by Albay and Nizam[11] in 2022, a retrospective analysis of 180 white code data between January 2014 and December 2021 was conducted at Fırat University, and it was reported that the most intense hours of violence were between 08:00 and 17:00 hours (52.2%). It was also reported that the most frequent victims of violence were females, the most common profession giving codes white was research assistant doctors, and the most common type of violence was verbal violence. In our study, we did not find any significant differences in terms of the number of hours when violence occurred between hospitals.

Limitations

One limiting factor in our study was the limited data pool for ATRH. The different patient volumes in the emergency departments of the two hospitals may have contributed to this situation. Additionally, this situation can be questioned in terms of factors that may cause hospital employes to refrain from giving codes white, factors that may affect the knowledge levels of employes from both hospitals regarding giving codes white, or whether the infrastructure necessary for giving codes white is provided. In future multicenter studies, the average daily patient admission numbers between hospitals can be included in the studies in detail.

CONCLUSION

The data obtained from our study showed similarities with studies conducted worldwide and in Turkey. Furthermore, our study holds the distinction of being the first to compare white code data from two different emergency departments in multicenter hospitals based on a literature review. In studies conducted in Turkey, violence incidents in the hospital where the study was conducted are generally compared with violence incidents nationwide. As emphasized in previous studies, emergency departments are the most common locations for violence incidents.

It has been reported that violence in the healthcare sector is on the rise worldwide. Violence is, first and foremost, a public health issue with primary and secondary consequences. Both patients and healthcare workers suffer from it. Therefore, to improve the quality of healthcare services, strategies should be developed to prevent violence, taking into account the physical conditions and socio-cultural environments of all hospitals in terms of potential violence incidents. Plans should be made to raise public awareness about preventing violence, and healthcare policies should be reviewed and improved.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Ankara City Hospital Clinical Researches Ethics Committee (Date: 22.03.2023, Decision No: E1-23-3403).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declared that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Infectious causes and outcomes of patients with high fever in the emergency department

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ABSTRACT

Aims: The aim of this study is to investigate the reasons for presentation, diagnoses, and outcomes of patients with high fever in the emergency department.

Methods: This research is a retrospective study conducted by examining the file data of patients who applied to our emergency department between 01.03.2021 and 01.03.2023 and whose body temperature was above 38°C. Patient data were obtained from patient files and Hospital Information Management System (HIMS). With the data obtained from patient files and HBYS, the demographic characteristics of the patients, vital signs at the time of admission, reasons for admission, diagnoses and outcomes were investigated.

Results: Of the 288 patients included in the study, 151 (52.4%) were male and the average age was 47.04±18.75. The reasons for applying to the emergency department were examined and it was determined that 79 (27.4%) patients complained of sore throat and 44 (15.3%) patients complained of fever. When the final diagnoses of the patients were examined, the most common diagnosis was acute tonsillitis in 99 (34.4%) patients, followed by COVID-19 in 30 (10.4%) patients. The outcomes of the patients were as follows; 190 (66%) patients were discharged from the emergency department, 63 (21.9%) patients were admitted to the ward, and 26 (9%) patients were admitted to the intensive care unit.

Conclusion: Cases with high fever in the emergency department encompass a wide range of conditions, ranging from mild viral upper respiratory tract infections to potentially fatal infections such as meningoencephalitis and myocarditis. Therefore, in febrile cases in the emergency department, serious infectious causes should be considered in terms of the focus of fever. Additionally, non-infectious causes should also be kept in mind as they can cause high fever.

Keywords: Body temperature changes, fever, fever etiology

INTRODUCTION

One of the common reasons for admission to emergency departments is high fever. Fever is an increase in body temperature above normal values controlled by the central nervous system, in response to a certain stimulus. These stimuli are active substances called pyrogens, which can be endogenous or exogenous.[1] Fever is defined as a measured body temperature above 38°C rectal, 37.8°C oral, 37,5°C tympanic, and 37.2°C in the axillary region.[2]

Fever can be a clinical finding in a wide range of different patient groups. The most common cause is infections. Infections are associated with diseases caused by bacteria, viruses, fungi, or parasites, and fever is part of the body's defense system response to these pathogens. Viral infections take the first place among the causes of infection.[3] However, the etiology of high fever may not be limited to infections only. Many different conditions, such as immunological, inflammatory states, malignancies or drug reactions, can also cause high fever.[4] For this reason, it is of great importance to comprehensively analyze and make the correct diagnosis of cases with high fever in the emergency department. Most patients who apply to the emergency department with high fever have a good prognosis and outpatient treatment is possible. However, some of the patients with high fever have important pathologies such as central nervous system infections, pneumonia, and neutropenic fever, and they need to be hospitalized and treated due to the high risk of morbidity and mortality.[4] Therefore, it is important to evaluate the differential diagnoses in patients with high fever.

This study aimed to evaluate and analyze the reasons for admission, diagnosis and outcomes of patients who applied to the emergency department of a university hospital with complaints of high fever or were detected to have high fever.

METHODS

Study Design and Participants

The study was carried out with the permission of Manisa Celal Bayar University Faculty of Medicine Clinical Researches Ethics Committee (Date: 20.03.2023, Decision No: E-85252386-050.04.04-512096). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

This retrospective study was conducted by examining the data of patients who applied to the Emergency Department of Manisa Celal Bayar University Faculty of Medicine Hospital between 01.03.2021 and 01.03.2023 and whose body temperature was above 380C in two consecutive measurements. Body temperature measurements were made using Covidien® brand temperature measurement devices that provide measurements from the tympanic membrane. Patient data were compiled through patient files and HIMS. The demographic characteristics, reasons for admission, vital signs at the time of admission, diagnoses and outcomes of the patients with complete data were determined and analyzed.

Criteria for Inclusion in the Study

- Those aged 18 and over
- Having a fever higher than 38°C
- Patients with complete data from patient files and HIMS

Exclusion Criteria from the Study

- Trauma patients
- Pregnant women
- Those under the age of 18
- Unstable patients

Statistical Analysis

The data we obtained was recorded in the SPSS 21 (Statistical Package for Social Sciences) program. First, demographic analyzes were performed. Categorical variables are shown with numbers and percentages, and continuous numerical variables are shown with center and prevalence measures such as mean, standard deviation values.

RESULTS

Demographic and Clinical Findings

288 patients who met the study criteria and whose data were fully accessible were included in the study. The average age of the patients was 47.04±18.75, 151 of them (52.4%) were male. The average vital signs of the patients are given in Table 1.

Table 1. Average age and vital signs of the patients

	Average	Standard deviation (SD)
Age	47.04	18.75
Fever (°C)	38.52	.51
Systolic blood pressure (mmHg)	125.70	20.32
Diastolic blood pressure (mmHg)	75.08	10.83
Pulse (beats/min)	101.90	18.55

We examined the reasons why patients applied to the emergency department and found that 79 patients (27.4%) complained of sore throat and 44 patients (15.3%) complained of fever. When we examined the final diagnoses, we found that the first place was acute tonsillitis (99 patients (34.4%)), while the second place was COVID-19 (30 patients (10.4%)) (Table 2). When the cases with non-infective causes were examined, dehydration was detected in 5 patients, tachyarrhythmia in 2 patients, rheumatic disease in 1 patient, hyperthyroidism in 1 patient, epileptic attack in 1 patient, and malignancy in 1 patient. The diagnosis of COVID-19 was established based on the PCR result. All diagnoses were obtained by reviewing patient records and hospital information systems. A total of 11 (3.8%) patients are defined as 'other' in Table 2.

Table 2. Reasons for admission and final diagnosis of patients

	Number (n)	Percentage (%)
Reason		
Sore throat	79	27.4
Fever	44	15.3
Chills and shivering	40	13.9
Weakness	25	8.7
Abdominal pain	22	7.6
Shortness of breath	22	7.6
Cough- sputum	16	5.6
Diarrhea	10	3.5
General condition impairment	10	3.5
Burning while urinating	9	3.1
Headache	7	2.4
Swelling and redness on the leg	4	1.4
Overall	288	100
Final diagnoses		
Acute tonsillopharyngitis	99	34.4
COVID-19	30	10.4
Pneumonia	25	8.7
Urinary system infection	21	7.3
Gastroenteritis	15	5.2
Acute Sinusitis	14	4.9
Meningoencephalitis	13	4.5
Acute otitis media	11	3.8
Other	11	3.8
Pyelonephritis	10	3.5
Cellulite	8	2.8
Appendicitis	5	1.7
COVID 19 vaccine side effect	5	1.7
Febrile neutropenia	5	1.7
Fever of unknown cause	4	1.4
Bronchitis	3	1.0
Diverticulitis	3	1.0
Perimyocarditis	3	1.0
Cholecystitis	2	0.7
Orbital cellulitis	1	0.7
Overall	288	100

We examined patient outcomes and found that 190 patients (66%) were discharged from the emergency department, 63 patients (21.9%) were admitted to the ward, and 26 patients (9%) were admitted to the intensive care unit (Table 3).

When the diagnoses of 63 patients admitted to the ward were examined, it was determined that the most common diagnosis was COVID-19 (n=11), followed by pneumonia and pyelonephritis (n=8).

Table 3. Emergency department outcomes of the patients

	Number (n)	Percentage (%)
Discharge from the emergency room	190	66
Ward admission	63	21.9
Intensive care hospitalization	26	9
Treatment refusal	7	2.4
Referral to external center	2	0.7

Table 4. Final diagnoses of patients hospitalized in the ward and intensive care unit

Diagnoses of patients admitted to the department (n=63)			Diagnoses of patients admitted to intensive care (n=26)		
Diagnose	Number (n)	Percentage (%)	Diagnose	Number (n)	Percentage (%)
COVID-19	11	17.5	Pneumonia	10	38.5
Pneumonia	8	12.7	Meningoencephalitis	8	30.8
Pyelonephritis	8	12.7	COVID-19	3	11.5
Appendicitis	5	7.9	Other	3	11.5
Urinary infection	4	6.3	Febrile neutropenia	1	3.8
Meningoencephalitis	4	6.3	Urinary infection	1	3.8
Febrile neutropenia	4	6.3	**Overall**	26	100
Gastroenteritis	3	4.8			
Cellulite	3	4.8			
Perimyocarditis	3	4.8			
Other	3	4.8			
Cholecystitis	2	3.2			
Diverticulitis	2	3.2			
Orbital cellulitis	1	1.6			
Fever of unknown cause	1	1.6			
COVID-19 vaccine side effect	1	1.6			
Overall	63	100			

The diagnoses of 26 patients admitted to the intensive care unit were examined and it was observed that the most common diagnosis was pneumonia (n=10), and the second most common diagnosis was meningoencephalitis (n=8). The final diagnoses of patients admitted to the ward and intensive care unit are given in Table 4.

DISCUSSION

The most common reason for admission to the emergency department in which we detected high fever was sore throat (27.4%), which is consistent with the literature.

In their study, Süer et al.[5] found that the most common reason for admission to the emergency department in patients with high fever was sore throat, with a rate of 29.3%. When the reasons for admission of the pediatric age group with high fever were examined, the most common reason was found to be sore throat.[6-8]

In a surveillance study examining patients applying to the emergency department, the most common diagnosis in patients presenting with head and neck complaints was found to be upper respiratory tract infections in 11.5%.[9]

In a study examining emergency department patient characteristics, the frequency of patients diagnosed with upper respiratory tract infections was reported as 24.1%.[10] In a similar study, this rate was determined as 29.4%.[11] When the final diagnoses of the patients were examined, it was seen that the most common diagnosis was acute tonsillitis (34.4%), followed by COVID-19 disease (10.4%), pneumonia (8.7%) and urinary tract infection (7%). The fact that those diagnosed with COVID-19 disease are in the second place may be due to the continuation of the COVID-19 pandemic, especially in the first half of the two-year period in the study.

In our study, 21.9% of the patients were admitted to the ward (n=63) and 9% to the intensive care unit (n=26), and the hospitalization rates were found to be high compared to the literature.[3,5] Additionally, diagnoses such as meningoencephalitis (4.5%) and pyelonephritis (3.5%) were detected at a high rate in our study. We think that the reason for this high rate may be that our hospital is the only center that provides tertiary emergency department in our city and is the reception center for patients with comorbid diseases, undiagnosed or high-risk patients.

In their review, Wright et al.[12] stated that the source of fever could not be determined in approximately 8% of patients. In the study conducted by Colpan et al.[13], it was found that there was a similar rate of fever cases of unknown cause. However, it is known that this rate is higher in children. In particular, in a review by Chow and Robinson[14] that analyzed 18 articles, it was shown that 23% of the etiology of fever in children could not be detected and 9 to 20% were non-infectious etiologies. In their study, Seguin et al.[15] found infectious causes in 62% of hospitalized patients with high fever lasting more than 5 days, non-infectious causes in 31%, and fever of unknown cause in 7%. In our study, the rate of non-infectious causes was found to be 3.8%, and the rate of fever of unknown cause was 1.4%. These rates are low compared to the literature. This may be because the study was retrospective and only examined patients who applied to the emergency department.

Limitations

There are some limitations in our study. Since our study was retrospective and the data were obtained from patient files and HIMS records, some febrile cases may have been missed. Additionally, since the study was conducted in a single-center university hospital emergency department that provides tertiary emergency departments, the rates do not include all febrile cases.

CONCLUSION

As a result, cases with high fever detected in the emergency department may have a wide range of etiologies, from mild viral upper respiratory tract infections to potentially fatal infections such as meningoencephalitis and myocarditis. Additionally, non-infectious etiologies can also cause high fever. For this reason, in cases with fever in the emergency department, non-infectious causes should also be kept in mind, as well as infectious causes that may be serious in terms of the focus of fever.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Manisa Celal Bayar University Faculty of Medicine Clinical Researches Ethics Committee (Date: 20.03.2023, Decision No: E-85252386-050.04.04-512096).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declared that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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The Intercontinental Journal of Emergency Medicine

Case Report

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An atypical presentation of normal pressure hydrocephalus: a detailed case study of Hakim-Adams syndrome in a young adult

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ABSTRACT

Normal pressure hydrocephalus (NPH), historically termed Hakim-Adams syndrome, is predominantly diagnosed in older adults. This case report details an atypical presentation in a 32-year-old male, underscoring the importance of differential diagnosis in younger patients exhibiting NPH-like symptoms. The patient presented with dizziness and mild ataxia, without the classical triad of gait disturbance, dementia, and urinary incontinence typically associated with NPH. Computed tomography (CT) and magnetic resonance imaging (MRI) revealed ventricular dilation and a suspected fourth ventricle lesion, leading to a provisional diagnosis of Hakim-Adams syndrome. This report highlights the need for heightened clinical vigilance and comprehensive imaging in atypical presentations of NPH.

Keywords: Ataxia, dizziness, Hakim-Adams syndrome, normal pressure hydrocephalus, young adult

INTRODUCTION

Normal pressure hydrocephalus (NPH), first defined in 1965 by Hakim and Adams, is a form of chronic hydrocephalus characterized by ventriculomegaly without increased cerebrospinal fluid (CSF) pressure.[1] The condition is predominantly observed in the elderly and is marked by a symptom triad of gait disturbance, cognitive impairment, and urinary incontinence.[2] NPH is categorized into idiopathic NPH, which arises spontaneously, and secondary NPH, often following trauma or hemorrhage.[3] This case report illustrates an uncommon presentation of NPH in a young patient, challenging the conventional demographic and symptomatic parameters typically associated with the syndrome.

CASE

A 32-year-old male with no significant medical history presented to the emergency department with complaints of dizziness. Upon examination, the patient was alert, oriented, and cooperative. Vital signs were within normal limits, except for mild ataxia observed during physical examination. Blood tests and CT imaging of the brain were conducted. The CT scan indicated dilation of the third and lateral ventricles, along with a possible space-occupying lesion at the level of the fourth ventricle. An MRI was performed for further evaluation, which confirmed tetra ventricular dilation and raised suspicion of Hakim-Adams Syndrome (Figure 1). Consultations with neurosurgery and ophthalmology were sought for papilledema and optic nerve assessment. The patient was admitted to neurosurgery for further management and potential surgical intervention.

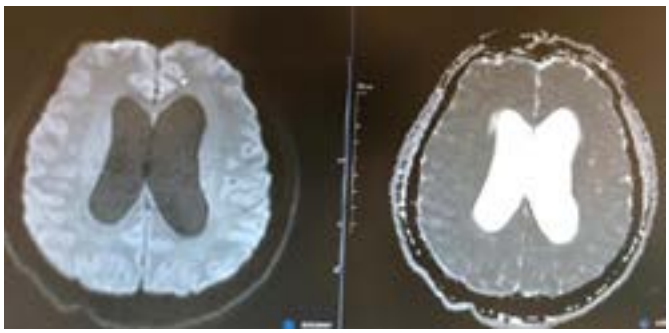

Figure 1. The patient's brain MRI axial image

DISCUSSION

NPH is typically a condition of the elderly, with the first sign often being gait disturbances.[2] In contrast, our patient's initial symptom was dizziness, a less common presentation that paralleled Shamov's findings of ataxia and apraxia as early symptoms of NPH.[4] The pathophysiological mechanisms behind the ventricular dilation characteristic of NPH remain under investigation.[5]

The increasing prevalence of NPH in older populations, and its potential co-occurrence with psychiatric disorders, further complicates the diagnostic process.[6,7] The presentation of NPH in a younger adult, as in our case, emphasizes the need for a comprehensive diagnostic approach, even in atypical patient demographics.

Recent studies have delved into the underlying pathophysiology of NPH. One theory suggests that

altered CSF dynamics, particularly impaired absorption at the arachnoid granulations, play a central role in its development.[2] The condition's progression is insidious, often leading to misdiagnosis or late diagnosis, especially in cases where classic symptoms are absent or subtle.

The diagnostic challenge is further compounded by the similarity of NPH symptoms to other neurodegenerative conditions, particularly in the elderly. Distinguishing NPH from diseases like Alzheimer's or Parkinson's requires careful clinical evaluation and often, reliance on imaging studies. CT and MRI are pivotal in diagnosing NPH, with MRI providing more detailed information on ventricular size and morphology, as well as the identification of potential comorbid conditions.[8]

Treatment options for NPH typically involve surgical intervention, most commonly ventriculoperitoneal shunting, which has shown varying degrees of success in alleviating symptoms.[9] The decision to operate is based on a careful evaluation of potential benefits versus risks, particularly in younger patients where the presentation and progression of the disease may differ from the elderly population.

CONCLUSION

This case underscores the complexity of diagnosing NPH in younger individuals, particularly when the presentation deviates from the classic symptom triad. Early recognition and appropriate management of NPH, even in atypical cases, can significantly alter patient outcomes. This report contributes to the growing understanding of NPH as a condition with a broader clinical spectrum than previously recognized and highlights the importance of clinical vigilance and comprehensive imaging in its diagnosis.

ETHICAL DECLARATIONS

Informed Consent

The patient signed the free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The author has no conflicts of interest to declare.

Financial Disclosure

The author declared that this study has received no financial support.

Author Contributions

The author declared that she has approved the final version.

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Case Report

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Chronic aortic dissection in the emergency department: a case report

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ABSTRACT

Chronic aortic dissection is a complex and potentially life-threatening condition characterized by the separation of the aortic wall layers. It causes diagnostic difficulties especially in the emergency department (ED) setting due to its different presentations and critical need for rapid treatment. In this case report, we describe a 79-year-old man with a history of hypertension and oral anticoagulant use who presented to the ED with atypical chest pain, nausea and dyspnea. Initial complaints, medical history, clinical evaluation and imaging were suggestive of chronic aortic dissection. The patient's clinical course, diagnostic work-up in the emergency department, including computed tomography angiography (CTA), and management strategy are discussed. The diagnostic challenges and decision-making processes in the emergency department are highlighted. The successful outcome in this case is to demonstrate the importance of a high index of suspicion and rapid imaging in the emergency department for patients presenting with atypical symptoms and risk factors for aortic dissection. This case report aims to highlight the critical role of emergency medicine in the early recognition and management of chronic aortic dissection. It emphasizes the need for awareness and rapid action in the emergency department to improve patient outcomes in this potentially dangerous condition.

Keywords: Aortic dissection, chronic, conservative management, emergency service

INTRODUCTION

Aortic dissection is a severe and potentially life-threatening condition characterized by the tearing of the intimal layer of the aorta, allowing blood to flow between the layers of the aortic wall. This condition can present acutely or chronically, with the chronic phase typically defined as surviving the initial event for more than four weeks.[1] While acute aortic dissection is a well-recognized emergency with a high mortality rate, chronic aortic dissection presents unique challenges in diagnosis and management, particularly in the ED setting.[2]

The incidence of aortic dissection is estimated at 0,5 to 3 per 100,000 person-years, with chronic cases being less common but equally significant.[1] The diagnosis is often missed or delayed due to its nonspecific presentation and the prevalence of other more common conditions mimicking its symptoms, such as myocardial infarction or pulmonary embolism.[3] Therefore, maintaining a high index of suspicion is crucial, especially in patients with predisposing factors like hypertension, connective tissue disorders, or a history of cardiac surgery. Although the DeBakey classification system is surgical and older, the current and functional Standford system classifies dissections anatomically involving the ascending aorta as Type A and all dissections not involving the ascending aorta as Type B.[1,4] According to the time of onset of symptoms, aortic dissections are divided into acute (occurring within 1 week), subacute (1 week to 1 month) and chronic (more than 1 month).[4]

The management of chronic aortic dissection in the ED requires a multidisciplinary approach involving emergency physicians, cardiologists, and cardiothoracic surgeons. The primary goals are to stabilize the patient, manage pain, control blood pressure, and prevent complications such as aortic rupture or organ ischemia.[5]

This case report presents a patient with chronic aortic dissection who presented to the ED with atypical symptoms. It underscores the diagnostic challenges and emphasizes the importance of a systematic approach in the emergency management of this complex condition. Through this report, we aim to contribute to the growing literature on chronic aortic dissection, providing insights into its effective management in an emergency setting.

CASE

A 79-year-old male patient presented to the emergency department with complaints of chest pain, dyspnea and nausea for 6 hours. He said his complaints started 2-3 months ago and were intermittent. The patient had a history of chronic obstructive pulmonary disease (COPD), hypertension (HT), gout and aortic valve replacement (AVR) surgery. He was taking losartan, hydrochlorothiazide, warfarin, allopurinol, esomeprazole. Vital signs were as follows: temperature 36.7°C, pulse rate

87/min arrhythmic, arterial blood pressure 170/105 mmHg in the right arm and 145/85 mmHg in the left arm, SpO2 95. On physical examination; general condition was moderate to good, consciousness was clear and oriented, Glasgow Coma Score (GCS) was 15, 2/4 diastolic murmur in the aortic focus and mechanical prosthetic valve sound was heard on cardiovascular system examination. Peripheral pulses were open and palpable. Abdominal examination revealed epigastric tenderness. Atrial fibrillation (AF) and right bundle branch block (RBBB) were detected on electrocardiography (ECG). Chest radiography showed that the mediastinum was enlarged and the cardiothoracic index was increased. Transthoracic echocardiography showed the ejection fraction of 50%, a functional prosthetic valve in the aortic position, and moderate mitral and tricuspid valve insufficiency. A dissection flap was observed starting from the aortic arch. Transesophageal echocardiography also revealed a dilated aortic arch and thrombosis in the false lumen. In contrast-enhanced thoracoabdominal computed tomographic angiography: The diameter of the pulmonary trunk was 33 mm, the diameter of the right main pulmonary artery was 27 mm, and the diameter of the left main pulmonary artery was 32 mm. No significant thrombus was detected in the pulmonary conus, main pulmonary arteries and their proximal branches. Heart sizes have increased. AVR was monitored. There is circular material for the operation in the ascending aorta, and a focal contrast filling extending towards the vessel wall through the flap appearance in the protruded area on the right side wall, adjacent to the circular metallic material in the proximal aortic arch, and a thrombus with a thickness of approximately 3 cm were observed. (Postoperative pseudoaneurysm was considered) A dissection flap starts from the aortic arch and extends to the iliac bifurcation and the right common iliac artery (Standford Type B, DeBakey Type 3) (**Figure 1,2**).

Truncus brachiocephalicus, left CCA, left subclavian artery show filling from the true lumen, Celiac, SMA and left renal artery, IMA show filling from the true lumen. The right renal artery shows filling from the false lumen. In late-phase images, although weak filling was observed in the false lumen. There is an aneurysm reaching 6.3 cm in diameter in the descending aorta (**Figure 2**). An aneurysm of approximately 2 cm in diameter and dilatation reaching 14 mm in its distal part were observed in the left main femoral artery.

The patient was given antihypertensive treatment in the emergency department. He was admitted to the cardiovascular surgery intensive care unit to be planned for surgery due to chronic Stanford Type B aortic dissection along with aneurysm and thrombus. However, since it was a high-risk operation and the patient and his relatives did not accept it, the surgery could not be performed and he was taken to the outpatient clinic for follow-up.

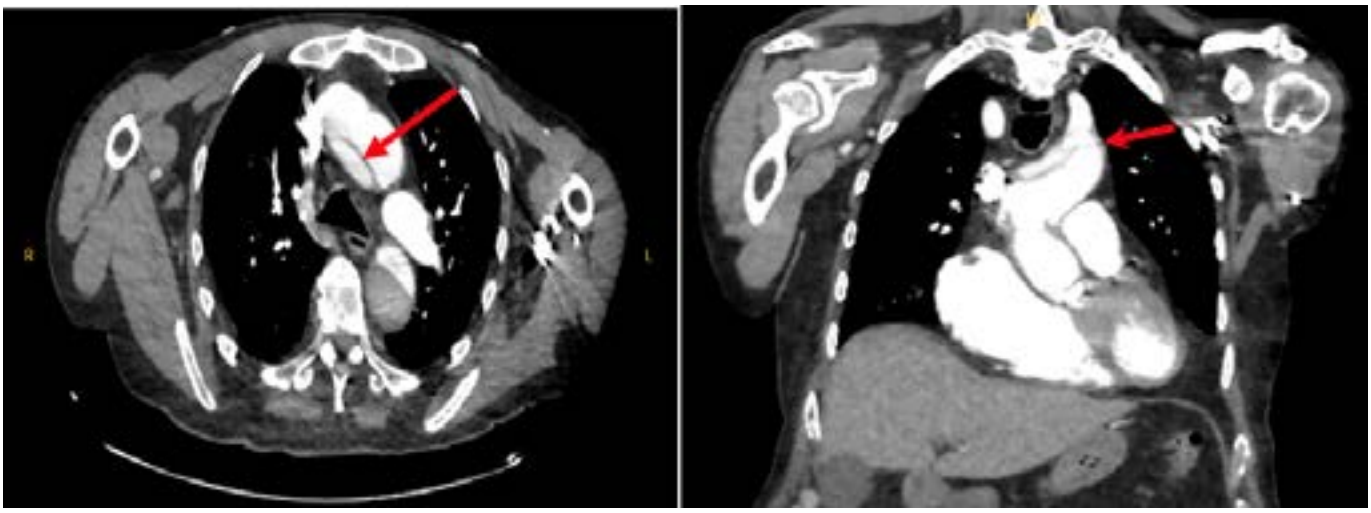

Figure 1. Standford type B, DeBakey type 3 aortic dissection

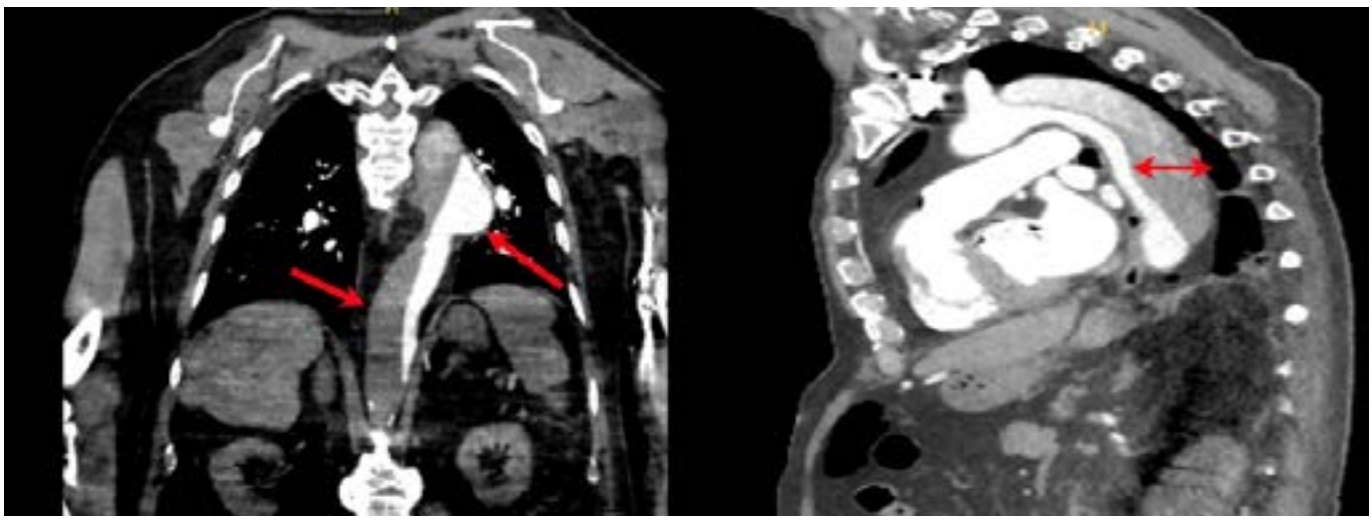

Figure 2. Aortic aneurysm in the descending aorta

DISCUSSION

The case of chronic aortic dissection presented in this report provides valuable insights into the complexities associated with diagnosing and managing this condition in the emergency department (ED). Chronic aortic dissection, while less common than its acute counterpart, poses significant challenges due to its often atypical presentation and potential for severe complications.[6]

The initial presentation of chronic aortic dissection can be misleading, as exemplified in our case. This patient's nonspecific symptoms underscore the importance of considering aortic dissection in the differential diagnosis of patients presenting with chest pain, particularly those with risk factors such as hypertension or a history of connective tissue disorders. Delayed or missed diagnosis is a critical concern, as it can lead to devastating outcomes, including aortic rupture and death.[7]

Imaging plays a pivotal role in the diagnosis of aortic dissection. Chest X-ray, computed tomography angiography (CTA), magnetic resonance imaging (MRI) and trans-oesophageal echography (TEE) are the most commonly used imaging modalities for diagnosis.[1] In this case, CTA was instrumental in confirming the diagnosis. CTA is widely recognized for its high sensitivity and specificity in diagnosing aortic dissection.[1,8] However, the patient's clinical status should guide the choice of imaging modality and the availability of diagnostic tools in the ED.[8]

The management of chronic aortic dissection in the ED focuses on stabilizing the patient, controlling blood pressure, and pain management, followed by prompt referral to specialized care.[9] Antihypertensive medication and close follow-up are at the forefront of primary treatment.[9] In this case, the multidisciplinary approach involving emergency physicians, cardiologists, and cardiothoracic surgeons was crucial in providing comprehensive care and determining the appropriate intervention.

This case also highlights the importance of a systematic approach and the need for heightened awareness among emergency medicine practitioners. Education and training in recognizing the atypical presentations of aortic dissection can enhance diagnostic accuracy and improve patient outcomes. The need for high suspicion, detailed history, rapid diagnostic imaging and a coordinated multidisciplinary approach in the emergency department's early recognition and management of chronic aortic dissection should be underlined.

CONCLUSION

This case report of chronic aortic dissection in the emergency department underlines the critical importance of considering this diagnosis in patients presenting with atypical symptoms, especially those with risk factors such as hypertension or atypical chest pain. This report may raise awareness of the various presentations of aortic dissection to emergency medicine practitioners and suggest the need for a systematic approach in the emergency department for timely, correct diagnosis and management.

ETHICAL DECLARATIONS

Informed Consent

The patient signed the free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The author has no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

The author declared that she has approved the final version.

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