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An Analysis of Patients Presenting to the Emergency Department Due to Severe Southwester Wind: 21-22 November 2024

Melih YUKSEL[1], Mehmet Oguzhan AY[1], Yesim ISLER[1], Halil KAYA[1], Can KARAKOC[1]

[1] *Department of Emergency Medicine, University of Health Sciences, Bursa Faculty of Medicine, Bursa Yuksek Ihtisas Training and Research Hospital, Bursa/Türkiye*

Abstract

Aim: In Türkiye, the southwesterly wind known as Lodos wind, which is prevalent during the winter and spring months, is known to disrupt maritime, air, and land transportation in certain regions and negatively impact both the natural and built environment. This study aims to investigate the general characteristics, exposure causes, and emergency department (ED) outcomes of patients presenting due to severe southwester wind events.

Methods: Patients presenting to a tertiary ED between November 21 and 22, 2024, with trauma or carbon monoxide (CO) poisoning symptoms attributed to the Southwester wind were retrospectively evaluated.

Results: A total of 35 patients were included in the study. The mean age was 42.14±19.74 years, and 22 of them (62.9%) were male. It was found that 3 patients (8.6%) presented with signs of CO poisoning, while 29 patients (91.4%) presented with trauma-related complaints. The most frequently observed trauma was extremity injury (n=21, 65.6%). Two patients (5.7%) were admitted to the intensive care unit (ICU), and eight patients (22.9%) were hospitalized in inpatient wards. Of the ICU admissions, one was due to CO poisoning and the other due to trauma. No mortality was observed in the first 24 hours or within 28 days. Patients transported to the ED by ambulance had significantly higher rates of ICU and inpatient ward admissions ($p<0.05$).

Conclusion: This study highlights the impact of sudden meteorological events such as severe Southwester wind on the healthcare system. It provides insights for both clinical management and disaster preparedness.

Keywords: emergency department, trauma, southwester wind, carbon monoxide poisoning

Correspondence: Assoc. Dr. Melih YUKSEL, Department of Emergency Medicine, University of Health Sciences, Bursa Faculty of Medicine, Bursa Yuksek Ihtisas Training and Research Hospital, Bursa/Türkiye
E-mail: melihdr@gmail.com **ORCID-ID:** orcid.org/0000-0002-0793-3693
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Introduction

Windstorms are among the most threatening natural phenomena and have significant impacts on both society and the economy. Severe storm winds regularly affect the northwestern part of Türkiye, particularly the Marmara region. Strong southerly winds pushing against the sea surface, combined with reduced atmospheric pressure within a low-pressure system, can cause water to accumulate above normal sea levels. Typically, the Bosphorus and Dardanelles straits in the Marmara region are closed to all marine traffic during strong southerly winds. There have been several dramatic incidents caused by strong southwesterly winds in and around the Aegean and Marmara regions. These events have led to the sinking of boats in the Sea of Marmara, the removal of rooftops, the collapse of minarets, the uprooting of trees, the overflowing of streams, and the accumulation of rainwater in streets [1].

Southwester wind, a type of local wind associated with general atmospheric circulation, is effective in Türkiye during the winter and spring seasons. On days when Southwester wind blows as a "stormy wind," "storm," or "violent storm," it disrupts maritime, air, and land transportation in various parts of Türkiye and negatively affects the natural and cultural environment. These winds are characterized by dry and warm conditions and can slightly increase ambient temperatures. They may also cause fatigue, nausea, and upper respiratory tract symptoms [2, 3].

The aim of this study is to investigate the general characteristics, exposure causes, and emergency department (ED) outcomes of patients presenting due to severe Southwester wind.

Methods

Study Design and Data Collection

Patients who presented to a tertiary ED between November 21 and 22, 2024, with trauma or carbon monoxide (CO) poisoning symptoms attributed to the Southwester wind were included in the study.

A standardized data collection form was created for recording information on the included patients. The form contained variables such as age, sex, nationality, occupation, presence of comorbidities, type of trauma, CO poisoning status, vital signs, and ED outcomes. Meteorological data for the study period were obtained from the Provincial Directorate of Meteorology and documented accordingly. Trauma cases were confirmed through patient statements and clinical records.

Compliance with ethical requirements

This was a single-center retrospective study conducted with the approval of the Medical Sciences Research Ethics Committee of the University of Health Sciences, Bursa Yüksek İhtisas Training and Research Hospital (Protocol number: 2024-TBEK 2025/01-07).

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics for numerical variables were expressed as mean ± standard deviation, median with range, and/or interquartile range (IQR), while categorical variables were presented as counts and percentages. The Kolmogorov–Smirnov test was used to assess normality of the data. Homogeneity of variance was assessed using the Levene test. The Chi-square test or Fisher’s exact test was applied to analyze the associations between categorical variables. A p-value < 0.05 was considered statistically significant. All results were presented with 95% confidence intervals.

Results

A total of 35 patients were included in the study. The mean age of the patients was 42.14 ± 19.74 years; 22 (62.9%) were male and 14 (40%) were workers. Of these, 3 patients (8.6%) presented with CO poisoning symptoms, while 29 (91.4%) presented due to trauma. The most frequently observed type of trauma was extremity injury (n=21, 65.6%). Two patients (5.7%) were admitted to the intensive care unit (ICU), and eight

(22.9%) were admitted to inpatient wards. One ICU admission was due to CO poisoning, and the other due to trauma. No mortality occurred within the first 24 hours or at 28 days (Table 1).

The two-day average meteorological values were as follows: temperature 14.7 ± 5.6 °C, wind speed 4.3 ± 3.4 m/s, humidity 66.1 ± 18.4%, and atmospheric pressure 997.4 ± 5.0 hPa (Table 2).

Chi-square or Fisher's exact tests were used to evaluate whether ED outcomes were associated with sex, nationality, occupation, mode of arrival, presence of comorbidities, trauma status, and type of trauma. A statistically significant association was found between mode of arrival and ED outcome ($p < 0.05$). Patients transported by ambulance had significantly higher rates of ICU and inpatient ward admissions (Table 3).

Table 1. Clinical and Demographic Information

Age (years) *		42.14±19.74
Gender #	Male	22 (62.9)
	Woman	13 (37.1)
Nationality #	Turkish	29 (82.9)
	Foreigner	6 (17.1)
Occupation#	Worker	14 (40.0)
	Student	4 (11.4)
	Retired	5 (14.3)
	Officer	1 (2.9)
	Other	11 (31.4)
Additional Disease#		5 (14.3)
Additional Diseases#	Hypertension	3 (8.6)
	Diabetes Mellitus	4 (11.4)
	Coronary Artery Disease	3 (8.6)
Type of Application to the Emergency Department#	Ambulance	18 (51.4)
	Other	17 (49.6)
Reason# for Admission to the Emergency Department#	Trauma	29 (90.4)
	Carbon monoxide poisoning	3 (8.6)
Type of Trauma #	Head and neck	14 (43.8)
	Thorax	6 (18.8)
	Abdomen	1 (3.1)
	Extremity	21 (65.6)
	Other	7 (21.9)
Emergency Department Outcome#	Hospitalization	7 (20.0)
	Intensive Care Unit Admission	2 (5.7)
	Discharged	26 (74.3)
Mortality within 28 hours#		0
Mortality within 28 days#		0
Total#		35 (100)

n (%), * mean ± standard deviation.

Table 2. Clinical and Laboratory Data of the Patients

Variables	Value
Fever. C^0 Mean ± SD	36.36 ± 0.25
Pulse rate/min Mean ± SD	81.3 ± 7.1
SBP mm/Hg Mean ± SD	120.6 ± 7.4
DBP mm/Hg Median IQR (25-75)	78 (75-82)
Oxygen Saturation Median IQR (25-75)	98 (98-99)
Respiratory Rate /min Median IQR (25-75)	12 (12-13)
CO level Median IQR (25-75)	22 (11-33)
Temperature °C Mean ± SD	14.7 ± 5.6
Wind speed mt/sec Mean ± SD	4.3 ± 3.4
Humidity % Mean ± SD	66.1 ± 18.4
Pressure hPa Mean ± SD	997.4 ± 5.0

GCS; Glasgow Coma Scale. SBP; Systolic Blood Pressure. DBP; Diastolic Blood Pressure. CO: Carbon monoxide

Table 3. Analysis Table of Variables with Emergency Department Outcome

Variables			Service Hospitalization	ICU Hospitalization	Other	Total	Fisher's exact test
Gender	Woman	n (%)	3 (23.1)	1 (7.7)	9 (69.2)	13 (100)	p>0.05
	Male	n (%)	4 (18.2)	1 (4.5)	17 (77.3)	22 (100)	
Nationality	Turkish	n (%)	6 (20.7)	2 (6.9)	21 (72.4)	29 (100)	p>0.05
	Other	n (%)	1 (16.7)	0	5 (83.3)	6 (100)	
Student	No	n (%)	7 (22.6)	1 (3.2)	23 (74.2)	31 (100)	p>0.05
	Yes	n (%)	0	1 (25.0)	3 (75.0)	4 (100)	
Worker	No	n (%)	3 (14.3)	2 (9.5)	16 (76.2)	21 (100)	p>0.05
	Yes	n (%)	4 (28.6)	0	10 (71.4)	14 (100)	
Officer	No	n (%)	7 (20.6)	2 (5.9)	25 (73.5)	34 (100)	p>0.05
	Yes	n (%)	0	0	1 (100)	1 (100)	
Retired	No	n (%)	5 (16.7)	2 (6.7)	23 (76.7)	30 (100)	p>0.05
	Yes	n (%)	2 (40.0)	0	3 (60.0)	5 (100)	
Other	No	n (%)	6 (25.0)	1 (4.2)	17 (70.8)	24 (100)	p>0.05
	Yes	n (%)	1 (9.1)	1 (9.1)	9 (81.8)	11 (100)	
How to Apply to the ED	Other	n (%)	1 (5.9)	0	16 (94.1)	17 (100)	***p<0.05***
	Ambulance	n (%)	6 (33.3)	2 (11.1)	10 (55.6)	18 (100)	
Additional Disease	No	n (%)	6 (20.0)	1 (3.3)	23 (76.7)	30 (100)	p>0.05
	Yes	n (%)	1 (20.0)	1 (20.0)	3 (60.0)	5 (100)	
Hypertension	No	n (%)	7 (21.9)	1 (3.1)	24 (75.0)	32 (100)	p>0.05
	Yes	n (%)	0	1 (33.3)	2 (66.7)	3 (100)	
Diabetes Mellitus	No	n (%)	6 (19.4)	1 (3.2)	24 (77.4)	31 (100)	p>0.05
	Yes	n (%)	1 (25.0)	1 (25.0)	2 (50.0)	4 (100)	
Coronary Artery Disease	No	n (%)	7 (21.9)	1 (3.1)	24 (75.0)	32 (100)	p>0.05
	Yes	n (%)	0	1 (33.3)	2 (66.7)	3 (100)	
Reason for Admission to the ED	CO Poisoning	n (%)	0	1 (33.3)	2 (66.7)	3 (100)	p>0.05
	Trauma	n (%)	7 (21.9)	1 (3.1)	24 (75.0)	32 (100)	
Head and Neck Trauma	No	n (%)	3 (16.7)	0	15 (83.3)	18 (100)	p>0.05
	Yes	n (%)	4 (28.6)	1 (7.1)	9 (64.3)	14 (100)	
Thoracic Trauma	No	n (%)	5 (19.2)	0	21 (80.8)	26 (100)	p>0.05
	Yes	n (%)	2 (33.3)	1 (16.7)	3 (50.0)	6 (100)	
Abdominal Trauma	No	n (%)	6 (19.4)	1 (3.2)	24 (77.4)	31 (100)	p>0.05
	Yes	n (%)	1 (100)	0	0	1 (100)	
Extremity Trauma	No	n (%)	1 (9.1)	0	10 (90.9)	11 (100)	p>0.05
	Yes	n (%)	6 (28.6)	1 (4.8)	14 (66.7)	21 (100)	
Other Traumas	No	n (%)	6 (24.0)	1 (4.0)	18 (72.0)	25 (100)	p>0.05
	Yes	n (%)	1 (14.3)	0	6 (85.7)	7 (100)	
Total		n (%)	7 (20.0)	2 (5.7)	26 (74.3)	35	

ICU; Intensive Care Unıt. ED; Emergency Department. CO; Carbon Monoxide

Discussion

The impact of natural disasters and extreme weather events on human health has gained increasing attention in recent years. Particularly, sudden and unpredictable meteorological events can lead to acute overloads in healthcare systems. Sudden wind shifts such as Southwester wind storms may result in trauma due to falling objects, slips, or CO exposure, thereby increasing ED admissions. Although there are limited studies in the literature examining the healthcare burden of regional meteorological events such as Southwester wind, our study provides valuable data, particularly in terms of trauma types and modes of presentation.

The demographic characteristics of the patients in our study are consistent with patterns reported in similar disaster-related scenarios. Approximately 63% of the cases were male, which supports the general epidemiological trend that males are more frequently involved in trauma cases. In one ED trauma series, 74% of the patients were reported to be male [4]. This may be attributed to the higher likelihood of men being outdoors and exposed to risk during storm conditions. Although all age groups can be affected by such disasters, our data showed that the median age was concentrated in the middle-aged population. The average age of 42 years in our cohort suggests that individuals in this age group are particularly vulnerable to storm-related trauma. A study analyzing injuries from Hurricane Maria showed a significant increase in fall-related injuries in the 40–64 age group [5]. This finding supports the notion that middle-aged individuals may be at greater risk of injury during Southwester wind events compared to younger populations. Additionally, the literature emphasizes that elderly individuals are also at higher risk during severe storms. A comprehensive analysis in New York State reported a significantly higher rate of ED visits due to injury during windstorms among individuals aged ≥65 years [6], suggesting that older adults may suffer more serious consequences from falls and trauma.

In our study, the majority of Southwester wind-related ED presentations were trauma cases (91.4%). This high rate underscores the dominant role of traumatic injuries in the acute health effects of windstorms. As noted in the literature, wind-related disasters can cause widespread physical injuries [7]. For example, in a post-Hurricane Maria observational study conducted in Puerto Rico in 2017, 11% of ED visits were due to trauma, and approximately half of these injuries were found to be directly related to the hurricane [8]. The same study reported that abrasions, cuts, and lacerations were the most common types of injuries (43%), followed by mechanisms such as falls, slips, and trips (47%). Similarly, in our study, the majority of trauma cases involved falls or being struck by objects. Extremity injuries were the most frequent trauma type (65.6%), consistent with fractures and soft tissue injuries resulting from falls or impacts. Indeed, it has been reported that 80% of trauma cases during tropical cyclones are limited to the lower extremities and feet [7]. Given that Southwester winds produce a localized cyclone-like effect, the high frequency of extremity trauma is an expected finding. Conversely, head and neck injuries were the second most common type in our series (43.8%). These injuries typically resulted from mechanisms such as falling trees or flying roof fragments. In more severe wind events like tornadoes, head trauma has been reported as the most common cause of death, with mortality most often attributed to brain injuries [7, 9]. For example, an analysis of a series of tornado disasters in the United States in 2011 revealed that 96% of deaths were trauma-related, with head trauma being the leading cause [9]. The absence of mortality in our cohort may reflect the relatively moderate severity of injuries and the timely access to medical care. Fatalities related to Southwester wind events typically occur at the scene due to structural collapse or severe head trauma, preventing patients from reaching medical facilities. Indeed, in one tornado disaster, most deaths were reported to have occurred at the scene [7]. The absence of in-hospital mortality in our study suggests that the injuries presenting to the ED were manageable; however, it is possible that the most severe cases never reached the hospital. Therefore, it should be considered that actual mortality related to Southwester wind events may be higher than reported in ED-based data.

Another hallmark of Southwester wind storms is the increased incidence of CO poisoning. Although only three patients (8.6%) in our study presented with CO intoxication, this number indicates that despite public warnings and preventive measures, Southwester wind events still pose toxicological risks. In the Marmara region, CO accumulation due to back-

draft from stoves and chimneys during Southwester winds is a well-known problem. The sudden rise in temperature and reduced chimney draft during such events can lead to CO buildup, especially in homes using coal or wood-burning stoves. Between 1990 and 2006, a total of 2,303 CO poisoning cases were reported during Southwester wind storms in Bursa, while the number of trauma cases was only 107 during the same period, indicating that toxicological effects may actually surpass traumatic injuries [10, 11]. Thanks to increased awareness and preventive efforts, the number of CO cases in our 2024 event remained lower relative to trauma. Nevertheless, the risk remains significant as long as Southwester wind persists. One of our CO poisoning cases required ICU admission. The literature has reported increased CO exposure due to the use of generators and alternative heating methods during power outages following storms [7]. However, in our region, Southwester wind itself, even in the absence of generator use, poses a direct threat by impairing stove and chimney function. Therefore, ED physicians should consider CO intoxication in patients presenting with dizziness, nausea, or altered mental status during Southwester wind episodes. While our study showed a low number of CO cases, public education and timely warnings remain critical to preventing such poisonings during windstorms.

Our ED outcome data provide important insights into the clinical course of patients injured during Southwester wind events. Approximately three-quarters (74.3%) of patients were treated and discharged from the ED, while one-quarter required hospital admission (20% to inpatient wards, 5.7% to ICU). These findings indicate that most injuries during Southwester wind events were of mild to moderate severity, with only a minority requiring intensive care or hospitalization. Similarly, it is well documented that minor injuries are more frequent than severe ones during major disasters. For example, a study on tornado-related injuries reported that 79.5% of 1,111 patients treated in hospitals sustained non-life-threatening injuries [12]. In our cohort, superficial lacerations, contusions, and simple fractures that could be managed on an outpatient basis comprised a large portion of the cases. Notably, more than half (55.6%) of patients transported by ambulance required hospitalization, whereas the vast majority (94.1%) of those who arrived by their own means were discharged from the ED. This difference was statistically significant and suggests that ambulance-transported patients were in more critical condition. It is already expected in emergency medicine that patients requiring ambulance transport are generally more severely injured than those presenting spontaneously. In fact, a study analyzing over 21 million ED visits from 2015–2020 found significantly higher hospitalization rates among patients arriving by ambulance compared to those arriving on foot [13]. Our findings are consistent with this data. Among Southwester wind-related trauma patients, nearly all self-presenting individuals were discharged after outpatient treatment, while a significant proportion of those brought by ambulance were admitted to the ICU or inpatient wards. Thus, mode of arrival may serve as an important indicator in the triage and management of disaster-related patients. Effective use of ambulance services in disaster situations plays a crucial role in rapidly transporting critically injured patients to appropriate healthcare facilities, potentially reducing both mortality and morbidity. The absence of mortality in our study may partly be attributed to the prompt transfer and early intervention of patients to our tertiary care center.

Limitations

This study has several limitations. It was conducted at a single center over a two-day period, which may limit the generalizability of the findings. Additionally, its retrospective design relied on existing medical records, potentially leading to incomplete or missing data.

Conclusions

This study demonstrates that severe Southwester wind events impose a measurable burden on emergency departments, predominantly through trauma-related presentations and, to a lesser extent, carbon monoxide poisoning. Although most patients were managed on an outpatient basis, a substantial proportion required hospitalization, particularly those transported by ambulance, underscoring the importance of effective prehospital triage during meteorological disasters. The predominance of extremity and head injuries highlights predictable injury patterns that should be considered in emergency preparedness planning. Enhanced public awareness, timely meteorological warnings, and targeted preventive measures may reduce both trauma and carbon

monoxide–related morbidity during future Southwester wind events. These findings emphasize the need for integrated disaster preparedness strategies at both clinical and public health levels.

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Declaration of competing interest

The authors have no conflicts of interest to declare.

Data availability

All data generated or analysed during this study are included in this published article.

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