

Estimated Burden and Risk Factors of Ischemic and Hemorrhagic Stroke in a Tertiary Hospital, Mogadishu-Somalia: A Cross-Sectional Study

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Abstract **Introduction:** In Somalia, a country in East Africa, no data is available about key features of stroke, such as incidence, prevalence, mortality, or stroke subtypes. The objective of this study is to show the burden of stroke, both ischemic and hemorrhagic stroke, and its risk factors in Somalia. **Materials and Methods:** We conducted a hospital-based retrospective study. Patients were recruited from January 1, 2019, to December 31, 2019, at the Mogadishu Somali Turkey Recep Tayyip Erdogan Training and Research Hospital. **Results:** A total of 292 participants with stroke (65.4% male and 34.6% women) were analyzed; the prevalence of ischemic and hemorrhagic strokes was 66.8% and 33.2%, respectively. A system for categorization of subtypes of ischemic stroke mainly base on etiology has been developed for the Trial of Org 10172 in Acute Stroke Treatment (TOAST). The most prevalent was a stroke of other determined etiology (28.7%), while the least common was lacunar stroke (11.3%), and cardio-embolic (13.3%). The most prevalent hemorrhagic stroke was in the basal ganglia. **Conclusions:** In Somalia, there is no previous data on the prevalence and risk factors of stroke. We concluded that the prevalence of hemorrhagic stroke in Somalia is higher compared to other countries in the region.

Keywords Cardio-embolic; Basal ganglia; Computed tomography; Lacunar; Thalamus

Introduction

The prevalence of stroke remains a noteworthy concern in the global public health domain (1, 2). It is anticipated that the significance of this issue will escalate in the future due to persistent demographic changes, including the aging of the population and the health-related transformations observed in developing nations (3, 4). As per the definition provided by the World Health Organization (WHO), a stroke is characterized by the swift onset of clinical

indications of localized or widespread disruption of cerebral function that persists for a minimum of 24 hours or results in mortality. The aforementioned symptoms can arise due to either ischemic or hemorrhagic disruptions of cerebral blood flow (5). A cerebrovascular accident has the potential to result in mortality. Around 80% of all strokes in Caucasian populations are attributed to ischemic strokes, whereas approximately 20% of all strokes are caused by intracerebral and subarachnoid hemorrhage, known as hemorrhagic strokes (6). The Global Burden of Disease study conducted in 2013 revealed that cerebrovascular diseases were the second most prevalent cause of mortality, with ischemic heart disease ranking first (7, 8). According to the World Health Organization (WHO), stroke is responsible for the demise of 15 million individuals annually, with African nations contributing to 86% of all stroke fatalities (9, 10). Currently, there exists a dearth of information regarding crucial facets of stroke within the East African country of Somalia. The aforementioned factors encompass the frequency of occurrence, overall occurrence rate, and fatality rate, along with varying classifications of cerebrovascular accidents. Consequently, it was deemed imperative to conduct this investigation to determine the prevalence of stroke in our population and establish a foundation for future research.

Materials and Methods

A retrospective analysis was performed on data pertaining to stroke patients who sought medical attention or were referred to the neurology department at Mogadishu, Somalia Turkiye Training and Research Hospital between January 2019 and December 2019. The type of stroke, whether hemorrhagic or ischemic, is ascertained through the utilization of CT or MRI. The study will encompass all stroke patients, both hemorrhagic and ischemic, who were admitted to the neurology department from January 2019 to December 2019. Exclusion criteria encompassed patients who presented at the outpatient department, emergency room patients who declined admission, and patients in the intensive care unit.

The study received ethical clearance from the Ethical Review Board of the Mogadishu-Somali-Turkey Recep Tayyip Erdogan Training and Research Hospital with the reference number MSTH/12/3792. The management of Referral Hospital granted us permission to access the patient's medical records, as evidenced by the presentation of a letter of permission. In order to

maintain the confidentiality of patient data, identifying information such as names and addresses was omitted from the data collection process. The study comprised 292 stroke patients who were admitted to the hospital between January 2019 and December 2019. The study conducted a review of the medical records of patients to examine their demographic characteristics, risk factors, and types of stroke. The statistical software package, SPSS version 20.0, was utilized for data entry and analysis. The patients' characteristics were summarized using descriptive statistics, specifically percent, and frequency.

Results

A total of 292 participants (65.4 male and 34.6 female) were analyzed. The prevalence of ischemic and hemorrhagic strokes was 66.8% and 33.2%, respectively (Table 1).

Table 1. The risk factors for the participants and distribution of their age and gender.

Variable	Ischemic Stroke	Hemorrhagic Stroke	χ^2 (<i>p</i> -value)
	N (%)	N (%)	
Age			
18-39 years	15 (45.5)	18 (54.5)	36.674 (0.001)
40-64 years	72(56.7)	55 (43.3)	
≥65 years	108 (81.8)	24 (18.2)	
Sex			
Male	116 (60.7)	75 (39.3)	9.104 (0.003)
Female	79 (78.2)	22 (21.8)	
Hypertension			
Yes	121 (61.4)	76 (38.6)	7.840 (0.005)
No	74 (77.9)	21 (22.1)	
Diabetes mellitus			
Yes	37 (80.4)	9 (19.6)	4.589 (0.032)
No	158 (64.2)	89 (35.8)	
Previous Stroke			
Yes	32 (80.0)	8 (20.0)	3.651 (0.056)
No	163 (64.7)	89 (35.3)	
Total Cholesterol (mg/dl)			
<200	68 (98.6)	1 (1.4)	0.381 (0.537)
>200	26 (100.0)	0 (0.0)	
KEY: AOR (Adjusted Odd Ration), CI (Confidence Interval=95%), P-value <0.05 is significant			

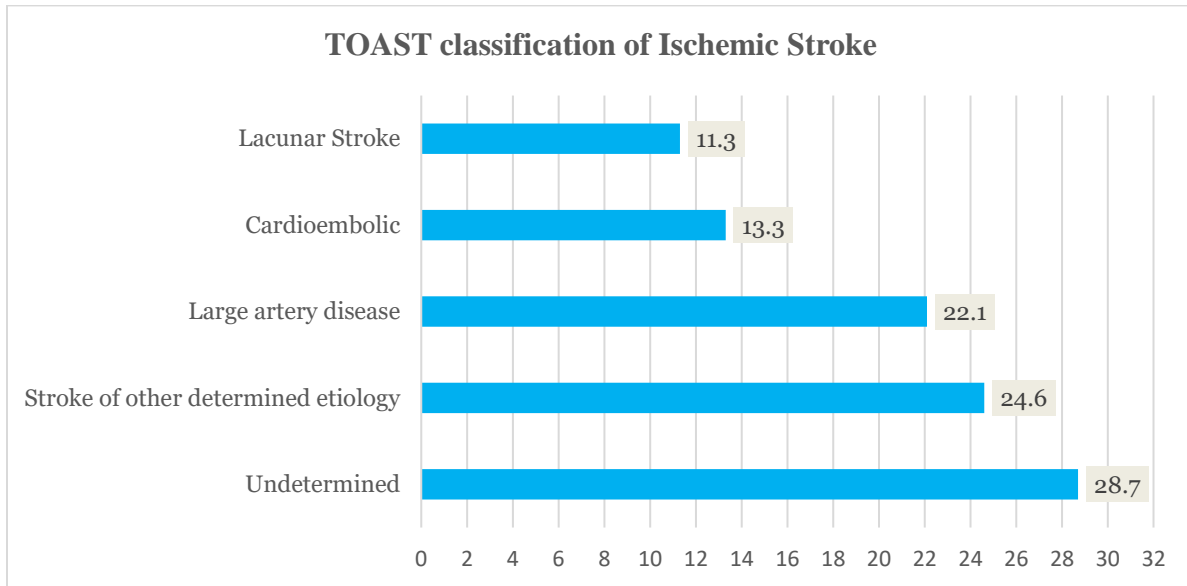


Figure 1. Classification of Ischemic Stroke

The data presented in Figure 1 Indicates that the ischemic strikes with the highest prevalence were those of other determined etiologies (28.7%), undetermined (24.6%), and large arterial disease (22.1%), and cardio-embolic (13.3%). Figure 2 illustrated that the basal ganglia (59.8%) and lobular stroke (18.6%) were the most frequently occurring hemorrhagic stroke, whereas cerebellar (1.0%) and pons 2.1%) were the least prevalent.

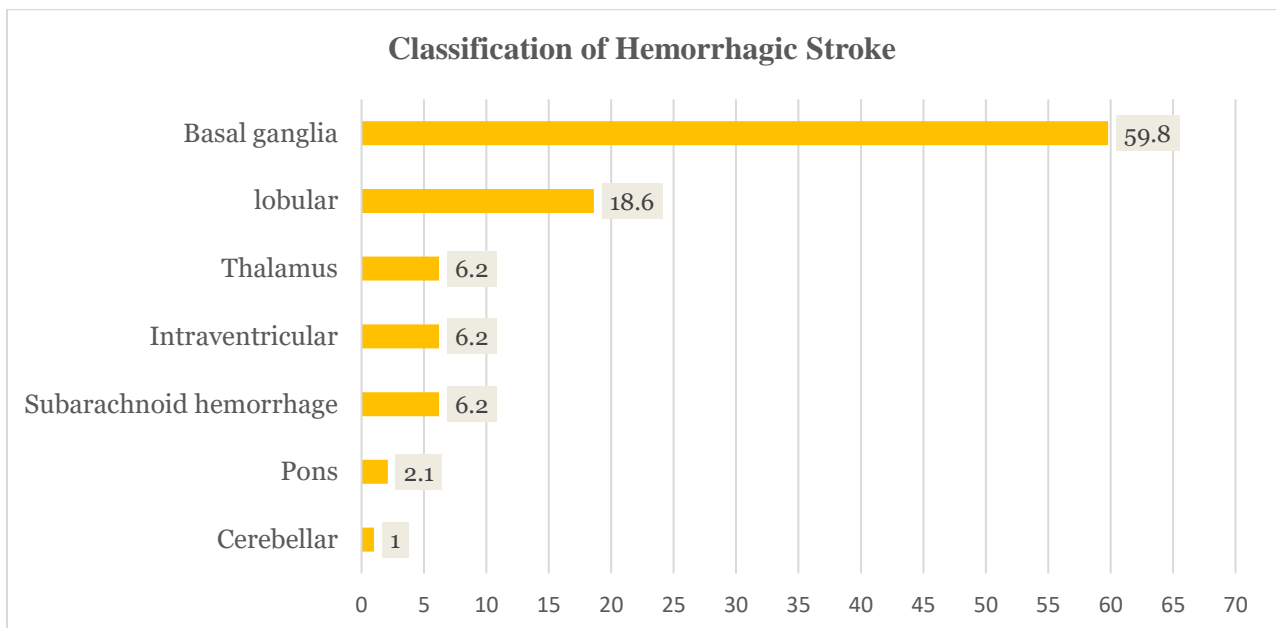


Figure 2. Classification of Hemorrhagic Stroke

Age group ($X^2=36.674$, $p\text{-value}=0.001$), Sex ($X^2=9.104$, $p\text{-value}=0.003$), History of diabetes ($X^2=4.589$, $p\text{-value}=0.032$), and History of hypertension ($X^2=7.840$, $p\text{-value}=0.005$) were found to be associated risk factors of stroke (Table 1).

The Trial of ORG 10172 in Acute Stroke Treatment (TOAST) has devised a system for the classification of subtypes of ischemic stroke primarily centered on etiology. The study found that the highest proportion of ischemic strokes was attributed to other determined etiologies (28,7%), followed by undetermined (24,6%) and large artery disease (22,1%). Conversely, the least frequent types of ischemic stroke were lunar stroke (11,3%) and cardio-embolic (13,3%). In contrast, the basal ganglia (59,8%) and lobular stroke (18,6%) were found to be the most frequently occurring hemorrhagic strokes, whereas the cerebellar (1,0%) and pons (2,1%) were identified as the least prevalent types.

Discussion

Stroke is a non-communicable disease experiencing a notable rise in prevalence within sub-Saharan Africa, despite being frequently overlooked. This has been documented in various studies (11, 12). Currently, there is a dearth of recorded epidemiological data pertaining to stroke in Somalia, and correspondingly, there is a lack of information regarding its associated burden. The study's outcomes furnish a robust basis for forthcoming publications on stroke within the nation.

The prevalent type of stroke was identified as ischemic stroke, which constituted 66.2% of the total cases, whereas hemorrhagic stroke accounted for 33.2% of the total cases. The study was carried out on a cohort of 292 individuals who had suffered a stroke and were admitted to a tertiary medical facility located in Mogadishu, Somalia, over a period of one year. The data suggest that the prevalence of hemorrhagic stroke in Somalia surpasses that of other nations, with a rate of 33.2% compared to the global average of 20%. The prevalent risk factors for ischemic stroke were hypertension, which accounted for 61.4% of cases, and diabetes, which accounted for 80.4% of cases. On the other hand, high blood pressure was the most common risk factor for hemorrhagic stroke, accounting for 38.6% of cases, followed by diabetes mellitus, which accounted for 19.6% of cases. The study findings indicate that a medical history of diabetes and hypertension is significantly linked to factors that heighten the probability of

experiencing a stroke. According to the study, 10% of the participants exhibited total cholesterol levels exceeding 200 mg/dl. A prevalence rate of 13.6% was observed among the population with a history of stroke. Furthermore, the potential impact of smoking and khat consumption on arterial blood pressure, as indicated by previous research (9, 10), was examined. However, the available data was deemed inadequate for conclusive analysis. According to the Trial of Org 10172 in Acute Stroke Treatment (TOAST) (13, 14), the predominant form of ischemic stroke was determined to be of other etiology (28.7%), trailed by undetermined (24.6%) and large artery disease (22.1%). Conversely, the types of strokes that exhibited the lowest frequency were lunar stroke (11.3%) and cardioembolic stroke (13.3%).

Basal ganglia strokes were found to be the predominant form of hemorrhagic stroke, accounting for 59.8% of cases, while lobular strokes were the second most frequent type, comprising 18.6% of cases. The incidence of cerebellar and pons strokes was found to be relatively low, with rates of 1.0% and 2.1%, respectively, among cases of hemorrhagic strokes. This study exclusively utilized the Mogadishu-Somalia Turkey Training and Research Hospital as the sole tertiary healthcare facility. One of the study's limitations is that it pertains solely to the center that possesses the necessary resources to provide treatment for individuals who have experienced a stroke. Secondly, due to the absence of comprehensive healthcare coverage in the nation, certain patients lacked the necessary financial resources to meet the financial responsibilities linked to MRI or tomography procedures as well as hospitalization charges. The present article has been reported in accordance with the PROCESS criteria (14). The medical records of certain patients lacked crucial particulars, such as their cigar-smoking or khat-chewing habits. The country of Somalia lacks pre-existing data on critical facets of stroke, such as its incidence, prevalence, mortality rates, and stroke subtypes. Consequently, we refrained from comparing the prevalence outcomes and the results of prior local studies. This research endeavor will serve as the sole source of information regarding the frequency of strokes and the corresponding risk factors in Somalia.

Conclusion

Stroke is a significant contributor to the incidence of disability. The prevalence and risk factors of stroke in Somalia have not been previously documented. The findings of our study indicate that the incidence of hemorrhagic stroke in Somalia is comparatively greater than that of other

nations, with a global prevalence ranging from 20% to 33.2% in Somalia. The preeminent risk factors for ischemic stroke were identified as hypertension, accounting for 61.4% of cases, and diabetes, accounting for 80.4% of cases. In contrast, for hemorrhagic stroke, the primary risk factors were hypertension, accounting for 38.6% of cases, and diabetes mellitus, accounting for 19.6% of cases.

Conflict of interest

The authors declare no conflict of interest.

Ethical approval

Ethical clearance was obtained from the Ethical Review Board of Mogadishu-Somalia Turkey Training and Research Hospital with the reference number of MSTH/12/3792.

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Transudative Tuberculous Pleural Effusion Mimicking Massive Pericardial Effusion: A Case Report

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Abstract The presentation of a patient with a pleural effusion can range from an incidental finding to a serious condition, which can lead to being hemodynamically compromised. Here, we discuss a 24-year-old male with a history of childhood tuberculosis who presented with shortness of breath (SOB), a non-productive cough, and recent weight loss. On examination, he was dyspnoeic but alert. On echocardiographic evaluation, a massive effusion that looked like a massive pericardial effusion was seen, while a further CT scan of the thorax showed a massive unilateral left-sided pleural effusion. Although no tuberculosis (TB) was seen in the sample of thoracocentesis, the patient was referred to a TB centre because of a history of previous tuberculosis and recent weight loss. Pleural effusion and pericardial effusion can be differentiated using echocardiography. In conditions where it is impossible, further imaging, like computer tomography, may be needed to differentiate between them.

Keywords Pleural effusion; Tuberculosis; Pericardial effusion; Cardiac tamponade

Introduction

Pleural effusion is characterized by an abnormal accumulation of fluid between the wall of the chest cavity and the thin layers of tissue (pleura) lining the lung. A condition known as pericardial effusion occurs when excess fluid accumulates between the heart and the pericardium (the sac around the heart). In

the poor world, tuberculosis (TB) is the most frequent infectious cause of effusion. TB results in recurrent pericarditis and pleuritis, the ultimate causes of constructive pleuro-pericarditis. Any patient who presents with a moderate to significant pericardial effusion in Africa should have tuberculous pericarditis examined as a possible differential diagnosis (1, 2).

The first stage in the differential diagnosis or etiology for pleural fluid is determining if the patient has exudative or transudative pleural effusion (3).

Transudates (such as hepatic hydrothorax) can be brought on by increased hydrostatic pressures, such as those brought on by heart failure, decreased oncotic forces, such as those brought on by hypoproteinemia, increased negative intrapleural pressure, such as those brought on by atelectasis, or ascitic fluid moving through the diaphragm (4).

To make an echocardiographic diagnosis of pericardial effusions, a sonolucent circum cardiac space of variable dimension is generally seen. However, interpretation mistakes may arise if sonolucent regions close to the heart (pleural effusions, ascites, and pericardial cysts) are mistaken for pericardial effusions (5). In this example, only thoracentesis was used to treat a large pleural effusion that seemed to be a pericardial effusion on echocardiography.

Case Report

A 24-year-old male came to the cardiology outpatient clinic with shortness of breath (SOB), a nonproductive cough for six days, and recent weight loss. He had a history of successfully treated tuberculosis in his childhood. Vital signs were unremarkable except for a SpO₂ of 91%. On examination, he was dyspneic but otherwise alert. Bedside echocardiography showed massive effusion, which looked like pericardial effusion, and the patient was admitted for diagnostic and therapeutic pericardiocentesis. The admission electrocardiogram showed sinus tachycardia, and otherwise was normal (Figure 1). Basic laboratory tests like a complete blood count, liver function test, and renal and thyroid function tests were requested for further evaluation and showed normal results.

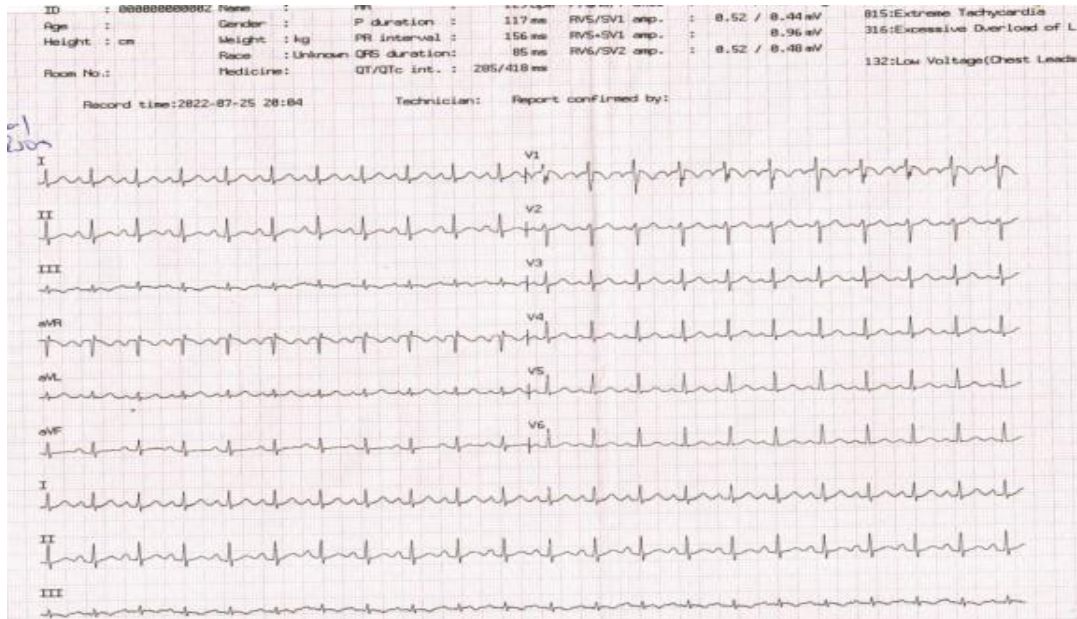


Figure 1. Electrocardiogram of the patient showing sinus tachycardia without low voltage

No drainage was seen during the procedure, so emergency echocardiography was performed again, revealing a large pleural effusion that mimicked a pericardial effusion with a swimming heart (Figure 2).

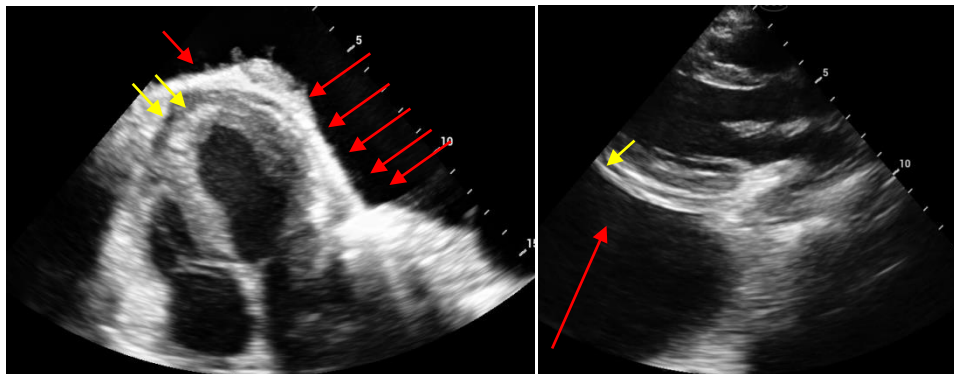


Figure 2. Echocardiography **A:** Para-sterna long axis four-chamber view Showing massive pleural effusion looking like pericardial effusion (red arrow) and minimal pericardial effusion (yellow arrow). **B:** Parasternal short-axis view minimal pericardial effusion (yellow arrow) and massive pleural effusion (red arrow).

A chest computed tomography was sent for additional evaluation of the effusion, which revealed diffuse parenchymal infiltration and tree-in-bud areas in the right lung upper lobe and posterior segment lower lobe. An effusion reaching 15 mm in the deepest part of the left lung was observed, and secondary to this, the left lung almost completely collapsed. Pleural thickening was observed in the right hemithorax. All the findings were compatible with post-primary tuberculosis reactivation in the first place (Figure 3).

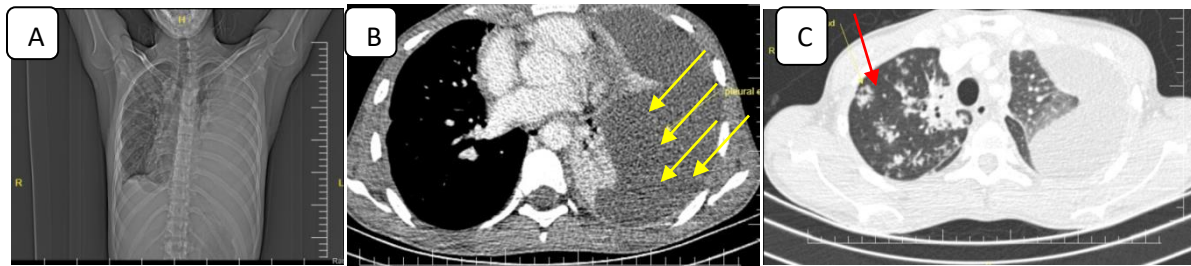


Figure 3. **A:** shows the collapse of the left lung with opacification. **B:** unilateral massive pleural effusion (yellow arrow). **C:** Tree-in-bud areas in the right lung upper lobe (red arrow).

Therapeutic thoracentesis was done under local anesthesia with drainage of 3 liters of fluid of the transudate type. The samples of pleural fluid microbiology and gene-expert testing were negative for TB. Five days later, a chest x-ray showed minimal pleural effusion, with no further collapse of the lung and no further swimming heart on echocardiography (Figure 4), and the patient was transferred to a TB center due to the high likelihood of TB from the history of previous TB and the CT scan report.

Discussion

The most common organ affected by the potentially severe infectious illness tuberculosis (TB) is the lung. By sneezing or coughing and dispersing microscopic droplets of germs into the air, people can spread TB to one another. Globally, an estimated 10.0 million people became sick with tuberculosis in 2019, with 1.2 million TB deaths among HIV-negative people and 208,000 deaths among HIV-positive individuals (6).

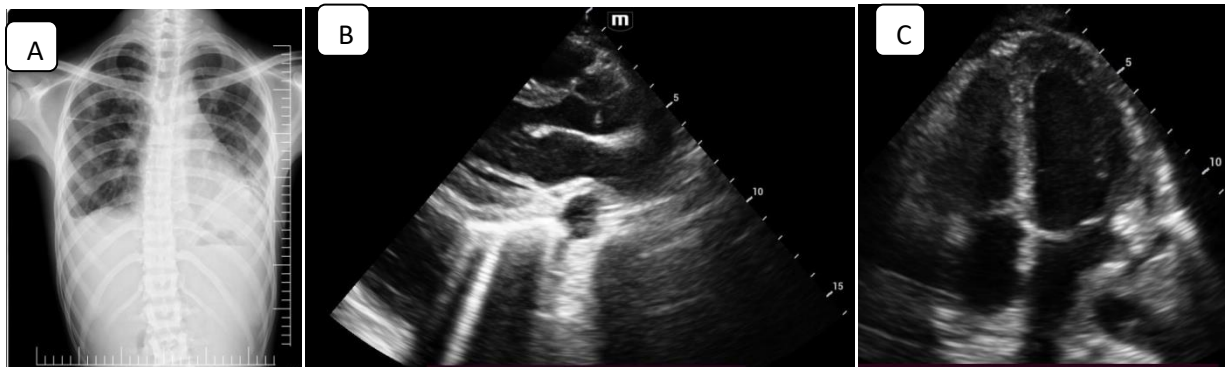


Figure 4. A: Discharge chest x-ray showing minimal pleural effusion. B & C: PSAX and APICAL 4 chamber view minimal pericardial effusion, respectively.

About 5% of those who have Mycobacterium tuberculosis infection get TB pleural effusion. Due to the HIV pandemic, the incidence of extrapulmonary TB has increased by 50% (7). TB pleural effusions, commonly unilateral and modest to moderate in size, typically constitute just slightly more than two-thirds of the hemothorax (8). The most prevalent form of extrapulmonary TB, tuberculous pleural effusion (TPE), often contains exudates that are mostly lymphocyte-based.

Fever, cough, and pleuritic chest discomfort are significant symptoms of TPE (9). As described in several case reports (10), it was transudative in our case, a rare instance of tuberculous pericardial effusion. In order to rule out probable causes, the biochemical analysis of pleural fluid appears to be the initial step in pleural effusion diagnosis (11). The accurate diagnosis of tuberculous pleural effusion (TPE) can frequently be challenging. Because TPE is a paucibacillary disease, mycobacterial culture-positive pleural fluid samples are unusual (1,12). A sample of our case was negative for tuberculosis.

Although a biopsy is an invasive procedure and not routinely performed, it frequently demonstrates the characteristic caveating granulomatous inflammation or even mycobacterium (13).

Although echocardiography is the preferred diagnostic imaging method for pericardial effusion assessment (5), massive pleural effusion can be confused with cardiac tamponade. Pleural effusion mimics pericardial effusion on TTE and is associated with echocardiographic complications because it can occasionally be a sign of tamponade physiology (14).

Sometimes, sonolucent areas near the heart other than the left pleural effusion, such as the descending aorta, are misinterpreted as posterior pericardial effusions (2,15). Left pleural effusion, mitral annulus calcification, anterior mediastinal space-occupying lesions, fibrinous pericardial responses, and right heart catheters can all mimic pericardial effusion and must be carefully excluded (16).

Therefore, compared to other conditions that appear similarly on routine imaging, such as pleural effusions, lower lobe atelectasis, and mediastinal abnormalities, pericardial effusion can be distinguished with a CT scan (17).

Conclusion

Pleural diseases are widespread and significantly affect the prognosis of patients. Transudate tuberculosis pleural effusion should be suspected, especially in high epidemic areas. Early diagnosis and selection of the optimal management strategy can produce positive results and considerably lower rates of morbidity and mortality.

Ethical approval

Based on the regulations of the review board of the Mogadishu Somali Turkish Training and Research Hospital, institutional review board approval is not required for case reports.

Informed consent

Written informed consent was obtained from the patient to have the case details and any accompanying images published.

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