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Table of Contents

Drug Induced Neuroleptic Malignant Syndrome: A Case Report	1-3
A complications of traditional therapy of neonatal conjunctivitis in Somalia: A Case report	4-7
Upper Limb Salvage Surgery Due to Explosion Using Vacuum-Assisted Closure: A Case Report	8-14
A Case report of Cardiac Beriberi: A Commonly Misdiagnosed Disease	15-21
Cutaneous Anthrax After a Cat Scratch: A Case Report	22-25

Drug-Induced Neuroleptic Malignant Syndrome: A Case Report

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Abstract: Neuroleptic malignant syndrome (NMS) causes fever, muscle rigidity, and impaired mental status. Drugs that influence central dopaminergic neurotransmission and almost all neuroleptics, including newer atypical antipsychotics, are also associated with it. While uncommon, NMS remains a critical differential diagnosis for patients with fever and mental status changes due to the requirement for prompt resuscitation to prevent morbidity and mortality. We present a case of a 21-year-old man with schizophrenia who attended the emergency room with generalized muscle rigidity, high-grade fever, and disturbed mental status for 12 days. His serum creatine phosphokinase was elevated (CPK). The computed tomography (CT) of the brain was normal, and the CSF was clear and cell-free. The patient was given muscle relaxants, dopamine agonists, and biperiden. After three days, rigidity, fever, and consciousness improved. A few cases of antipsychotic-induced NMS have been reported. Healthcare professionals should be aware of this fatal side effect.

Keywords: Antipsychotic; Neuroleptic; Dopamine; Haloperidol

Introduction

An unfavorable reaction to drugs with dopamine receptor antagonist characteristics or the abrupt discontinuation of dopaminergic treatments might result in the severe illness known as a neuroleptic malignant syndrome (NMS). In 1956, the first instance of NMS was documented shortly after the release of

the antipsychotic medication chlorpromazine (Thorazine) (1). Additional case reports soon followed, and in a 1960 report, French clinicians reported the negative effects of the recently developed neuroleptic haloperidol and described a "disease malin des neuroleptiques," giving the syndrome its current name (2). Pooled data from 1966 to 1997 suggested that the incidence of NMS ranged from 0.2% to 3.2% of psychiatric inpatients receiving neuroleptics (3). However, more recently, the incidence has decreased to roughly 0.01% to 0.02% as doctors have become more aware of the syndrome and newer neuroleptic agents have become available. Even though NMS is rare, physicians must be able to recognize it as a neurological disorder because early diagnosis and proper medical treatment are essential for better patient outcomes.

Case report

A 21-year-old man with a history of schizophrenia presents to the emergency room with generalized muscle rigidity, a high-grade fever, and a change in the mental state that has persisted for 12 days after he received haloperidol and risperidone. His temperature was 39.10°C, but all other vital signs were normal. The semiconscious patient's muscles were all tense on physical and neurological testing. His laboratory results significantly elevated serum creatine phosphokinase (CPK). The CT scan of the brain was normal, and his CSF was cell-free. The patient was admitted to the neurology department after receiving an NMS diagnosis. The patient was given Biperiden, dopamine agonists, and muscle relaxants. After three days, the stiffness and fever diminished, along with an improvement in the level of consciousness. The patient's NMS symptoms subsided, and his CPK level returned to normal after a short period. The dosage of the biperiden and dopamine agonists was reduced when his symptoms subsided. The patient's symptoms of continuing psychosis were managed with valproic acid 500 mg twice daily. He was discharged from the hospital without experiencing any more complications.

Discussion

Many medical diseases, including heat stroke, central nervous system infections, serotonin syndrome, status epilepticus, and more benign drug-induced extrapyramidal symptoms, might mimic the presentation of NMS (2). Heatstroke differs from other causes of fever and altered levels of awareness by its more abrupt onset and more frequent occurrence of dry skin. The prodromal phases of CNS infections have historically included headache, meningeal symptoms, and frequently positive CSF and neuroimaging findings, both of which are negative in this instance (3). Numerous similarities exist between NMS and serotonin syndrome, which manifests as altered mental status, autonomic alterations, and motor symptoms associated with

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excessive serotonin. However, gastrointestinal symptoms, the absence of leukocytosis, a raised CPK, and the patient's medical history can usually help separate them.

Additionally, the patient had no seizures before and after admission. As a result, status epilepticus is ruled out. Extrapyrarnidal disorders brought on by drugs were disregarded because there was no prior use of these drugs. Only antipsychotic drugs were identified as the cause of this illness.

Conclusion

Neuroleptic malignant syndrome is considered a neurologic emergency requiring prompt treatment to prevent complications and impending death. A few incidences of NMS caused by antipsychotics have been documented. Healthcare professionals should understand the risk of NMS.

Consent

Written and informed consent was obtained from the patient for publication of this case.

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A Complication of Traditional Therapy for Neonatal Conjunctivitis in Somalia: A Case Report

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Abstract: Contact dermatitis is common in the pediatric population and affects nearly 25% of all children, but it was previously underdiagnosed. It is usually divided into allergic and irritant contact dermatitis. In this case report, we present a 2-month-old infant who presented with egg-associated allergic contact dermatitis, which is complicated by bacterial superinfection. Allergic contact dermatitis can occur commonly in pediatrics due to many causes, one of them being egg; it can be managed by removing the causative agents and treating its complication.

Keywords: Allergic contact dermatitis; Allergy; Egg allergy

Introduction

Contact dermatitis is a common inflammatory skin disease, the etiology of which can be categorized as allergic or irritant. Irritant contact dermatitis is well understood and affects children; it is a common and historical misconception that allergic contact dermatitis (ACD) is rare in children (1). Allergic contact dermatitis occurs less frequently in the first few months of life and increases in prevalence with increasing age. Children as young as six months of age may be sensitized to contact allergens. A recent study of asymptomatic general pediatric patients less than five years of age found a sensitization rate

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of 24.5%. Two recent studies on adolescents demonstrated a significantly increased risk for allergic contact dermatitis in females compared with males (2). The classic clinical presentation of ACD is that of pruritic eczematous dermatitis with geometric or linear configurations. The gold standard for definitive diagnosis of allergic contact dermatitis is epicutaneous patch testing (2). In this case report, we present a case of infantile contact dermatitis caused by an egg, which was applied to the eyes as a traditional treatment for neonatal conjunctivitis, presenting bilateral conjunctivitis with bacterial superinfection.

Case report

A 2-month-old infant boy came to the pediatric outpatient department in Somalia Turkiye Training and Research Hospital, complaining of eyedischarge and fever for one month. The baby was term, delivered by a traditional birth attendant through normal vaginal delivery.

She didn't attend any antenatal visits during her pregnancy, but she had itching and purulent vaginal discharge since the last trimester. At birth, the baby had bilateral conjunctivitis with purulent discharge; after 20 days baby developed a high-grade fever. The mother managed him traditionally with an egg shower, and the baby developed purulent facial dermatitis (Figure 1). After that, they came to the pediatric outpatient department. After admission, we took a laboratory investigation (complete blood count and C-reactive protein), which revealed elevated CRP; other investigations were normal.

After admission, we started intravenous antibiotics for skin lesions, topical eye drops, corticosteroid cream, and antibiotics cream. Five days later, the patient's condition improved, and was discharged from the hospital.



Figure 1. 2-month-old infant presented with egg-caused allergic contact dermatitis with bacterial superinfection in the face

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Discussion

Population-based studies show that the prevalence of allergy to eggs among children is between 1.5 and 3.2%. Egg white allergens include ovalbumin, ovomucoid, ovomucin, ovotransferrin, and lysozyme (1). There are also multiple allergenic proteins in egg yolk, the most common being alpha-livitin. The reduction in allergenicity by heat or gastric digestion explains those children who react to uncooked but not cooked eggs and subjects who react to eggs after cutaneous contact but not after ingestion. It is also observed that children allergic to hen's eggs are not allergic to chicken. Children are mostly found to be sensitized without having a previous history of egg ingestion. The clinical onset is mainly in the first year of life, often with the first start of food, and is always associated with atopic eczema.

Many foods are frequently involved in children, but allergy to only one or two foods is normal from around five years (3).

Most children outgrow milk, egg, soy, and wheat allergies before they reach school age. Egg allergy generally has a good prognosis. Despite recent advances in oral immunotherapy trials, the treatment of egg allergy currently relies on avoiding egg-containing foods until tolerance has developed. It remains unclear whether the ongoing low-dose exposure to egg proteins in processed foods improves the natural history of egg allergy (3).

Families of children with food allergies need good guidance on how to prevent accidental exposure to allergens, recognize symptoms of anaphylaxis, and respond appropriately. Since most children will outgrow their allergies to milk, egg, soy, and wheat, follow-up testing will help monitor the development of tolerance and indicate when these foods can be safely restarted into the child's diet. Egg avoidance advice is the most important for management. Egg allergy often resolves, and re-introduction can be achieved at home if reactions have been mild and there is no asthma. Patients with a history of severe reactions or asthma should have re-introduction guided by a specialist. All children with egg allergies should receive a vaccination for measles, mumps, and rubella (MMR). Influenza and yellow fever vaccines should only be considered in egg-allergic patients under the guidance of an allergy specialist. This guideline was prepared by the standards of care committee (SOCC) of the British Society for allergy and clinical immunology (BSACI) (3).

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Conclusion

Contact dermatitis is a common inflammatory skin disease, the etiology of which can be categorized as allergic or irritant. The gold standard for definitive diagnosis of allergic contact dermatitis is epicutaneous patch testing.

Consent

Written and informed consent was obtained from the patient for publication of this case.

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Upper Limb Salvage Surgery Due to Explosion Using Vacuum-Assisted Closure: A Case Report

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Abstract: High trauma injuries of the forearm frequently present with complex bone and soft tissue defects. Early repair is required to retrieve the extremity and restore its function. Surgical reconstruction can save limbs damaged by high-energy trauma that would have been amputated in the past. This is a case report of a 36-year-old man with a left upper limb injury after high-energy explosion trauma. He had a large soft tissue defect of the forearm with exposed vital structures, ulna, and radius fractures. Radius and ulna fractures were fixed with elastic nails to maintain alignment and length, and a cerclage was used to hold a radius fragment. A primary tendon reconstructed the large soft tissue and muscle repair, with vacuum-assisted closure followed by a split-thickness skin graft. At six weeks, physiotherapy was started with a dynamic hand splint by slightly flexing the fingers. Vacuum-assisted closure helps condition and close large upper-limb tissue defects.

Keywords: Upper limb salvage; Trauma; Vacuum-assisted closure

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Introduction

High trauma injuries of the forearm frequently present with complex bone and soft tissue defects. Early repair is required to retrieve the extremity and restore its function (1). With the advance of surgical repair and reconstruction technology, limbs damaged by high-energy trauma that might have needed to be amputated in the past can now be saved by surgical reconstruction; severe upper limb crush injuries differ from lower limbs, as upper limbs have fewer muscles, longer ischemic tolerance times, and complex functions that artificial limbs cannot replace compared to lower limbs. At this time, no proper criteria have been established to decide whether amputation or salvage is the most suitable therapy in cases of complex upper limb injury, and this remains a dilemma for both surgeons and patients (2).

Vacuum-assisted closure has provided a way to manage these wounds until definitive surgery can be achieved efficiently. Vacuum-assisted closure has simplified reconstruction in many patients with large injuries. Now, skin grafts are performed in many cases that would have otherwise required major rotational flaps or free flaps prior to the advent of vacuum-assisted closure therapy (3).

This is a case report of 36-year-old man with left upper limb injury after high trauma energy which is explosion where a large soft tissue defect of the forearm with exposure of the vital structures was reconstructed by a primary tendon and muscle repair, with vacuum-assisted closure followed by a split-thickness skin graft. This was an example of successful limb salvage with functional preservation after seven surgeries over two months period.

Case report

A 36-year-old man came to an emergency after an explosion, and his forearm was deformed with crushed flexor muscles and exposed fracture ends and musculature (Figure 1). At emergency, the wound was washed

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and covered with a dressing, and blood investigations and x-ray were sent. X-ray showed fractures of his left radius and ulna. Upon examination, he wasn't able to flex his wrist and fingers. After preparation, the patient was taken to the operating theatre. The ulnar artery and nerve were cut and repaired, radial artery, cephalic, and basilic veins were intact. The median nerve was only mildly contused and appeared to have good continuity, and the flexor mechanism from the 2nd to 5th fingers were cut (Figure 1).

After irrigation and debridement, the radius and ulna fractures were fixed by elastic nail to maintain their alignments and length, and put a cerclage on the fracture site of the radius to hold a fragment (Figure 2). Then started repairing the flexor tendons, repaired as tendon to tendon and tendon to muscle using a modified Kesler suture with proline 4-0, then closed the wound starting on the center; the laterodorsal aspect closed completely, but the medio-volar aspect, there was a large defect with muscle and skin loss cannot be repaired with primary closure then the wound was covered and drained using a vacuum-assisted closure and applied flexion cast on the dorsal aspect (Figure 3).

He underwent a debridement five times, at 1st after five days and others every week for debridement, re-approximating the wound, and closing with vacuum-assisted closure until granulation occurs. For the sixth time, the wound was covered with split-thickness skin graft. Every time the wound was debrided and closed as much as possible by suturing at the peripheries and putting vacuum-assisted closure (Figure 4).

After six weeks, the wound healed, granulated, and closed with split-thickness skin graft taken from lateral thigh and sutured it with staplers (Figure 4). Started physiotherapy after six weeks from the operation with slightly flexing and extending the fingers using dynamic hand splint. 7 days after graft the wound was opened and inspected, it was going well and healing (Figure 5). At 14 days after the graft, the sutures and staplers were removed (Figure 5).

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Figure 1. Ulna fracture ends exposed and intraoperative images

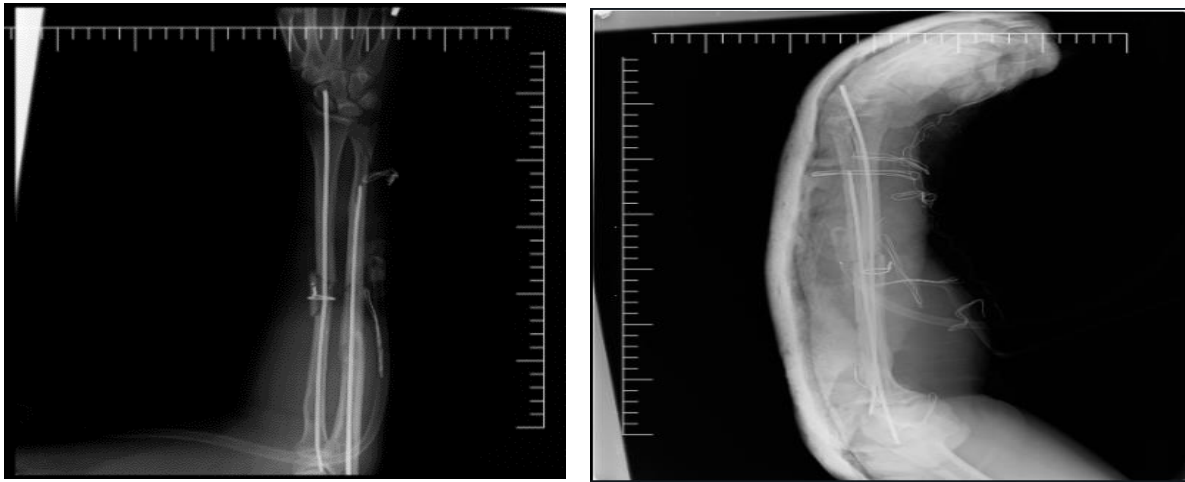


Figure 2. Post-operative x-ray

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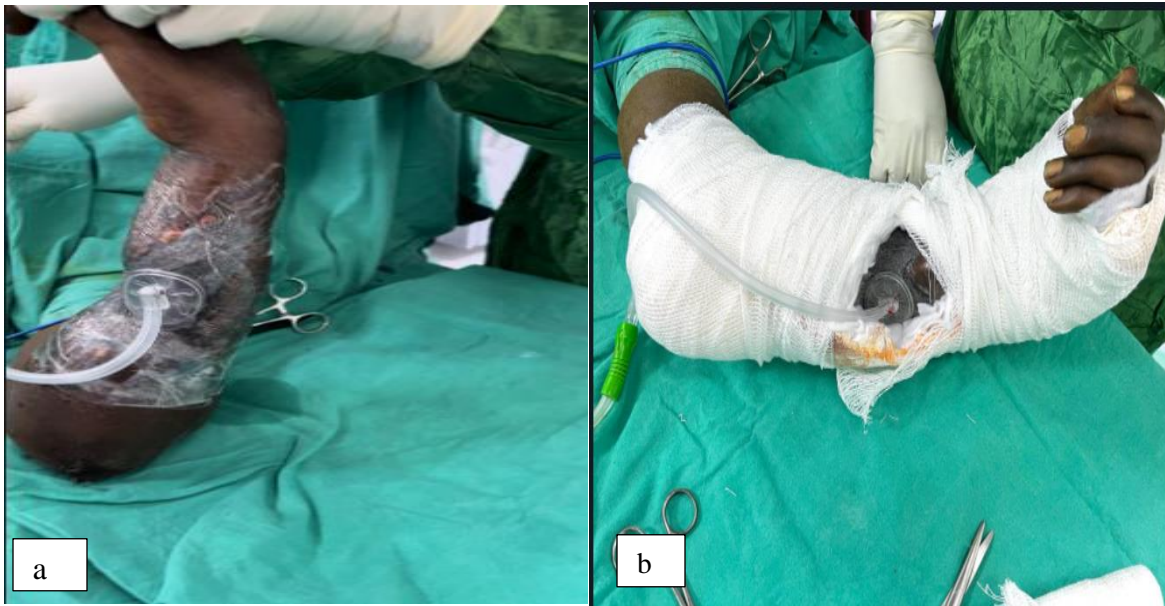


Figure 3. a- Showing wound closure with vacuum-assisted closure and **b-**vacuum-assisted closure with a splint



Figure 4. Wound healing after serial vacuum-assisted closure and Skin graft surgery

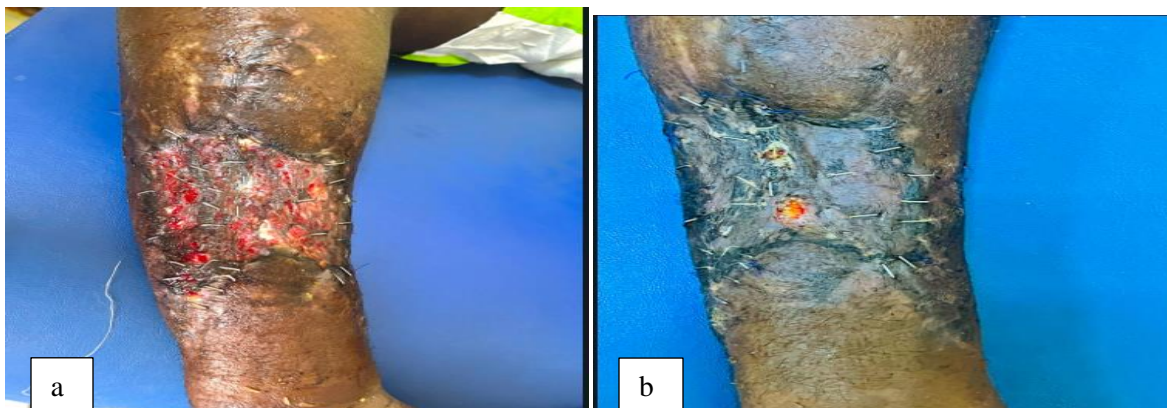


Figure 5. a-Skin graft after one week, **b-** skin graft after two weeks

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Discussion

Severe limb injuries are emergency events that require clinicians to decide whether to amputate or salvage the limb within a short time. Treatment option selection needs to evaluate the extent of the injury (2).

At Wang C and Hayashida K used a perforator-based sural neurocutaneous flap for the reconstruction of complex forearm injuries. However, due to the lack of availability of microsurgery and when raising a flap needs to be well vascularised to avoid pedicle torsion or compression (1,5), this technique could not be performed in a country with low healthy infrastructure, like Somalia.

Zeng Q and Yao YZ cooperated with multiple vacuum-assisted closures dressing up to five times to prevent infection and promote the growth of granulation tissue. Followed by autologous skin grafting OR secondary suturing or local flap and then open reduction and internal fixation of the fracture (2,6).

Using vacuum-assisted closure facilitates decreasing wound edema and can drain the wound surface completely. Reduces bacterial colonization, increases hemoperfusion, promotes vascularization, decreases wound fibrosis, as well as improves the survival rate of skin grafting (4).

So, we preferred vacuum-assisted closure because it is a simple and effective method of treating traumatic soft tissue defects instead of doing free flap transplantation, which is unavailable due to the inaccessibility of microsurgery. At the same time, vacuum-assisted closure is part of daily routine procedures.

Conclusion

High-energy trauma causing severe soft tissue injuries requires multiple operative debridements to avoid high morbidity and mortality rates. The application of vacuum-assisted closure as temporary coverage of significant tissue defects in upper limbs supports wound conditioning and facilitates definitive wound closure.

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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A Case report of Cardiac Beriberi: A Commonly Misdiagnosed Disease

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Abstract: Thiamine deficiency, or beriberi, is relatively rare in countries like Somalia, where alcohol consumption is uncommon and is usually related to alcohol abuse and chronic illnesses such as cancer. Despite that fact, it is necessary to ask the patients about their bad habits to unmask the etiology of the disease. A 30-year-old male who had been abusing alcohol and smoking heavily for the last six years presented with lower extremity edema, fatigue on exertion, and heart palpitations within a month. Previously there was no known chronic disease and immunosuppression drugs use, nor any documented family history of any heart disease. Upon inspection, He had a chronically ill-looking appearance but was oriented to time, place, and person. His vital signs were a blood pressure of 115/80 mm Hg, heart rate of 110 beats/min, and body temperature of 36.5°C. Peripheral oxygen saturation was around 97% without oxygen support, despite having subjective dyspneic

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symptoms. Transthoracic echocardiography showed LV global hypokinesia with severe reduction in LV systolic function (as demonstrated by an LV ejection fraction of 30%). Empirical oral Thiamine 200mg replacement was initiated emergently as a thiamine test was not available. Within ten days of thiamin supplement and heart failure medications, including furosemide 20mg, Aldactone 25mg, and carvedilol 6.25mg, the ejection fraction improved up to 45% also, the fatigues and dyspnea were also highly improved. We identified that heavy alcoholic drinking induced heart failure with reduced ejection fraction and that thiamine supplements improved these circumstances.

Keywords: Wet beri beri; Heart failure; Thiamine deficiency

Introduction

There are two main classifications of thiamine deficiency (beriberi): wet beriberi, which includes Wernicke-Korsakoff syndrome and lactic acidosis, and dry beriberi, which involves peripheral neuropathy (1).

This vitamin may be nutritionally deficient or result from alcohol consumption. A thiamine deficit (TD) may result in changes in cardiac metabolism because thiamine (vitamin B1) is a cofactor of important metabolic enzymes. But little is recognized about how TD affects the myocardium. Thiamine is regarded as having a clinically significant role in heart function, and it has been suggested that heart failure might result from its shortage (2).

Due to the body's limited capacity to store thiamine and its short half-life of 10 to 20 days, high-risk individuals might develop thiamine deficiency very quickly. The harmful effects of thiamine shortage on the myocardium are made worse by coexisting hypomagnesemia, which is probably caused by long-term alcohol addiction (3).

Due to the complex clinical presentation and lack of diagnostic tests, particularly in non-drinkers, thiamine deficiency is still going misdiagnosed (4).

We report a case of heart failure with a reduced ejection fraction that demonstrate some factors that may confound and clarify the presence of wet beriberi.

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Case report

A 30-year-old male who had been heavily abusing alcohol and smoking for the previous six years, presented lower extremity edema, fatigue on exertion, and heart palpitations within a month. On admission, the patient was on oral furosemide 40 mg and spironolactone 25 mg for the past two weeks as he visited a local health facility. The patient was diagnosed with alcoholic liver disease because he had abdominal ascites and a history of heavy alcohol consumption. The lower limb edema and abdominal distension improved, but the patient's fatigue and dyspepsia remained unchanged. There is no past medical history of chronic diseases like hypertension, diabetes, and immunosuppression disease; likewise, there is no documented family history of heart disease.

On examination, he appeared chronically ill-looking but alerted with mild hyperventilation. His vital signs were a blood pressure of 120/90 mm Hg, heart rate of 83 beats/min, and body temperature of 36.5°C. Peripheral oxygen saturation was approximately 97% without oxygen supplementation despite the subjective dyspneic complaint. Anemia and jaundice were not revealed on physical examination. The liver and spleen were not palpable. His jugular vein was not distended (the vertical distance between the sternal angle and the highest pulse point was 6 cm H₂O), and 2+ peripheral edema was noted. Vesicular breathing was heard in both lungs with normal heart sounds. His cognition and cerebellar examinations were normal. Laboratory tests revealed WBC 3.5 x1000/mm³, RBC 5.8 x10⁶/mm³ HGB 16.5g/dl, MCV 85.4fl, MCH 28.2 pg/cell, MCHC 33.4 g/dl. Aspartate aminotransferase and alanine aminotransferases were 81 IU/L (normal range: 0 IU/L to 35 IU/L) and 47 IU/L (normal range: 0 IU/L to 45 IU/L), respectively. Alpha-fetoprotein were 2.17 ng/ml (normal range: 0 ng/ml to 20 ng/ml), CA-19-9 7.8 u/ml (normal range: 0 u/ml to 37 u/ml), Serum albumin was 3.1 g/dL (normal range: 3.5 g/dL to 5.5 g/dL).

Remaining tests like renal function test, electrolytes, HBsAg, Anti HCV, and Anti-HIV were seen in normal ranges. An abdominal ultrasound revealed normal abdominal ultrasound. A chest x-ray was unremarkable on the patient's admission (Figure 1). Transthoracic echocardiography showed LV global hypokinesia with severe reduction in LV systolic function (as demonstrated by an LV ejection fraction of 30%) and normal LV size (end-diastolic dimensions: 49 mm and end-systolic dimensions: 44mm). The patient was given oral thiamin 200mg as a thiamine test was not available then. Within ten days of thiamine supplement and heart failure medications like furosemide 20 mg orally once daily, spironolactone 25 mg orally once daily, and carvedilol 6.25mg oral twice daily, the ejection fraction

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improved up to 45% also, the fatigues and dyspnea were also highly improved. After three months, the patient showed up for a follow-up with no cardiac complaint.



Figure 1. As shown in this PA view chest X-ray, there was no obvious lung pathology.

Discussion

Thiamine is a water-soluble B vitamin that functions as a cofactor in the metabolism of carbohydrates and energy synthesis. Additionally, the synthesis of neurotransmitters requires thiamine (5). A severe thiamine deficiency may result in cognitive decline (Wernicke's encephalopathy), peripheral neuropathy (dry beriberi), or heart failure (cardiac, or "wet beriberi"). Cardiac beriberi develops due to decreased cellular metabolism, which lowers cardiac function. Adenosine triphosphate (ATP) generation is impaired by thiamine deficiency, which results in adenosine accumulation. Thiamine deficiency impairs the production of adenosine triphosphate (ATP), leading to the accumulation of adenosine. This increase causes a reduction in systemic vascular resistance via direct vasomotor depression, leading to a compensatory high-output state with increased blood volume (6). Eventually, myocardial weakness develops, leading to systolic dysfunction and a low-output state. Ultimately, patients develop hypotension and complete cardiovascular collapse unless thiamine is provided (7). Shoshin beriberi, a severe form of cardiac beriberi, can potentially cause more sudden cardiogenic shock and death. Patients with cardiac beriberi typically have upper-body cachexia but significant lower-extremity edema due to heart failure. However, patients with calorie-rich but nutritionally deficient diets or those whose diets have recently changed

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may not appear malnourished. Echocardiography may show a decreased ejection fraction similar to other dilated cardiomyopathies. Some studies recommend using cardiac magnetic resonance imaging to make a diagnosis based on high T2 signal intensity caused by myocardial edema; however, further investigations discover that myocardial edema may not always be present.

The patient's medical history is very important for a wet beriberi diagnosis. Long-term drinking can lead to decreased vitamin B1 absorption and storage dysfunction and can increase damage; long-term drinking is the most common cause of wet beriberi. According to whether the patient has a history of long-term drinking or not, beriberi can be divided into alcohol-related beriberi and non-alcohol-related beriberi (8). Similarly, our case has long-term alcohol drinking, which strongly supports the possibility of heart failure secondary to thiamine deficiency.

Furosemide administration is related to thiamine deprivation, as it causes increased urinary thiamine excretion and is thus frequently associated with low thiamine intake levels (12, 13). In our case, there is no history of furosemide use before the illness. Acute renal failure was the most common wet beriberi complication, with some patients requiring CRRT (9, 10).

However, in our case, the renal function test was normal, and the patient did not mention a previous history of renal failure. Watson et al. reported that 39.4% (13/33) of wet beriberi patients had acute renal failure with high levels of blood lactate and pyruvate, which produced peripheral arteriovenous shunts, renal vascular contraction and blood flow reduction, resulting in a decreased glomerular filtration rate.

Treatment with vitamin B1 is helpful for the diagnosis and treatment of wet beriberi. It is generally accepted that suspected patients should be given a therapeutic administration of thiamine. Thiamine therapy is thought to be safe, even though measuring blood thiamine content is challenging, complex, and unusual. As a result, data frequently come late and lack specificity. When the blood level of thiamine was very high, there were no recorded signs of toxicity (8). Authors differ in how they administer thiamine for wet beriberi. Since alcohol can prevent the absorption of vitamin B1 and the phosphorylation of its active form (TPP), patients with beriberi caused by alcohol often received a larger dose of thiamine than those with non-alcohol-related beriberi (11, 12). Currently, daily intravenous therapy of 100 to 200mg of thiamine is the most common treatment for those with alcohol-related wet beriberi. In our case, the condition significantly improved after thiamine administration. Although the patient was previously on

some heart medications, this makes the case more interesting and strongly indicates thiamine deficiency was the underlying cause of the heart failure.

Conclusion

In conclusion, cardiac beriberi related to thiamine deficiency is difficult to diagnose due to its nonspecific symptoms, signs and rarity, particularly, in countries like Somalia, where alcohol consumption is uncommon. However, cardiologists should still consider cardiac beriberi a possible diagnosis in young patients with unexplained LV systolic dysfunction and heart failure.

Consent

Written informed consent was obtained from the patient for the publication of this case report and accompanying images. On request, a copy of the written consent is available for review by the editor-in-chief of this journal.

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Cutaneous Anthrax After a Cat Scratch: A Case Report

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Abstract: Despite a global decline, Central Asia and Africa remain vulnerable to anthrax. Anthrax is usually caused by bacteria that enter the body through a wound from slaughtering sick animals. 95% of anthrax cases are skin-related. After 1 to 7 days, the spores in skin abrasion become vegetative. We present a 42-year-old woman with a cat scratch history who had small itchy blisters and swelling around a painless skin ulcer with a black core, low-grade fever, and hypotension. She had anemia, hypotension, and bilateral lower limb ulcers. Wound culture showed gram-positive bacilli compatible with *B. anthracis*. Blood transfusion, Ciprofloxacin 200mg/100ml twice daily, Meropenem 1g three times daily, and Clindamycin 600mg three times daily was given. Her amputated gangrene-infected finger helped her recover. Early diagnosis, antibiotic therapy, and preventive measures like immunization help control epidemics. This sporadic case of cutaneous anthrax alerts physicians.

Keywords: Anthrax; Cutaneous anthrax; Skin lesions

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Introduction

Anthrax is a zoonotic disease caused by a bacterium, *Bacillus Anthracis*. This bacterium, capable of producing spores, can be quite resistant to heat and chemicals and is observed to live through the years. It can grow after contact with diseased animals and animal products (1). Cattle, horses, sheep, goats, and swine are the most commonly affected animals (2). Anthrax manifests in three primary forms: cutaneous, respiratory, and gastrointestinal (3). Cutaneous anthrax is the most common form (approximately 95% of all cases), and most cases are seen on hands and faces where exposure is more likely (4). Cutaneous anthrax is a fatal disease (20% to 30%) if not treated properly. However, antibiotic therapy has decreased mortality to less than 1% (5). Surgery should be postponed until the microorganism is completely eradicated (6).

Case report

A 42-year-old female with a cat scratch history was admitted to our infectious diseases department complaining of a group of small, itchy blisters, swelling around painless skin ulcers with a black center that appeared after the small blisters (Figure 1), low-grade fever, low hemoglobin level, and hypotension.

On examination, she was a wasted female with evidence of severe anemia; her vitals were unremarkable, except a blood pressure of 74/42mmHg sitting; she had bilateral lower limb ulcers (black in central, some pain on touching). Her blood test results revealed: WBC; 26,000, Hgb; 4.6g/dl, platelet count of 476, MCV of 62fl, MHC of 22 pg/cell, Neutrophils (95 percent), and CRP of 228mg/l. Gram-positive bacilli compatible with *B. anthracis* was observed in gram staining performed with the wound culture taken from the lesion.

Ciprofloxacin 200mg/100ml two times a day, meropenem 1g 3 times a day, clindamycin 600mg 3 times a day, and blood transfusion was given. One of her fingers was amputated due to gangrene with good debridement, and she gradually improved.

She was discharged with the plan of daily wound dressing and antibiotics for up to two months.

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Figure 1. Cutaneous anthrax lesions on the lower extremities.

□

Discussion

Although anthrax is decreasing worldwide, it is still an important public health problem in Central Asia and Africa (7).

Anthrax is most often caused by the transfer of bacteria into the body from abrasion during the slaughtering of infected animals or the skinning of dead animals (8). Skin anthrax composes 95% of all anthrax cases. The spores from a bruise on the skin become vegetative; their incubation time is approximately 1–7 days. A typical ulcerous lesion's basin characteristically becomes black. This lesion was called “anthrax,” which means coal in Greek. Depending on the severity of the disease, edema, lymphadenopathy and fever may occur (9). The diagnosis of cutaneous anthrax can be made by taking the epidemiological story and observing characteristic skin lesions; in our case, the diagnosis was based on clinical suspicion and on gram staining of the sample taken from the lesion, which showed *Bacillus Anthracis* under the microscope.

Due to the reports of beta-lactamase strains of *Bacillus Anthracis*, the American Academy of Dermatology had published guidelines to treat the patients with ciprofloxacin 500 mg 12 hourly or doxycycline 100 mg 12 hourly and one or two additional antimicrobial groups for 60 days (10).

Conclusion

Early diagnosis, treatment with antimicrobial therapies, and preventive measures like a vaccination against the spread are essential to help control outbreaks swiftly and effectively. This sporadic case of cutaneous anthrax is reported to create awareness among physicians.

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Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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Assessment of Physicians' Awareness of Radiation Exposure and Patient Radiation Protection in Mogadishu, Somalia

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Abstract **Objectives:** Diagnostic investigations using radiation have become a critical feature of medical practice in recent times, and the possibility of doctors' underestimation of over-exposure risks to patients from diagnostic radiation is a matter of concern. Therefore, this study aimed to evaluate medical doctors' awareness of radiation exposure in selected diagnostic radiology centers in Mogadishu, Somalia.

Methods: Online questionnaires were distributed to 200 medical doctors working in 3 state and seven private hospitals in Mogadishu. In addition, the level of radiation awareness and its relationship with other variables was analyzed.

Results: There were 200 participants. Sixty-two % had no formal training on radiation exposure. Eighty-six % of the respondents had no idea regarding the radiation dose of commonly performed diagnostic studies.

Conclusions: Therefore, basic principles of diagnostic imaging, including radiation exposure associated with frequently performed imaging studies, radiation-related risks, and cautions that should be taken during these studies, should be taught during medical training and residency training.

Keywords Awareness of radiation; radiation protection; radiation exposure; patient safety; Somalia

Introduction

Medical diagnostic radiation has been the fastest-growing source of human exposure to ionizing radiation in the last three to four decades (1).

Diagnostic studies that involve radiation have become a critical part of standard medical practice over the last 100 years (2,3). Studies such as X-rays or mammograms are frequently used to diagnose and treat medical conditions before they become clinically evident (4).

Unrestricted exposure to ionizing radiation has been scientifically demonstrated to cause harm to healthy tissues, such as skin burns and radiation sickness, at high doses (deterministic effects) and to increase the risk of cancer and genetic damage at low doses (stochastic effects) (4).

Clinicians are expected to have full knowledge of the potential benefits and drawbacks associated with medical radiation exposure to justify exposure, according to the 2007 International Commission on Radiological Protection recommendations (5). Medical procedures utilizing radiation represent the most rapidly increasing radiation source (6). The primary medical procedures utilizing radiation are related to diagnostic radiology, nuclear medicine, and radiation therapy. Diagnostic radiology includes simple radiographic procedures, fluoroscopic procedures, diagnostic computed tomography (CT) scans, and fluoroscopically or CT-guided interventional procedures. The administration of unsealed radioactive medicines for diagnostic or therapeutic purposes is known as nuclear medicine. It involves using either external radiation or internal placement of sealed radioactive sources to treat cancer or benign conditions.

According to recent surveys, the radiation dose has not been given the importance it deserves by clinicians when referring patients for diagnostic radiological exams (7). As a result, doctors frequently underestimate the dangers of diagnostic radiation exposure to patients (8).

The significance of these findings stems from the fact that clinicians with a poor understanding of the radiation risk associated with diagnostic radiology examinations will be unable to counsel their patients and consider alternative diagnostic studies based on the benefits outweighing the risks principle.

It should also be considered that pediatric patients should be exposed to the tiniest radiation dose possible since their tissues are highly radiosensitive. It is known that they may also pass on radiation-induced genetic

abnormalities to future generations as future parents. Even in well-developed countries, the education of medical professionals in radiation safety has been a persistent challenge (9).

In this study, we aimed to examine the physicians' knowledge of radiation doses in Mogadishu, Somalia.

Methods

Subject Selection

A total of 200 health professionals were enrolled in the study. Online questionnaires about radiation exposure in diagnostic radiology investigations in Somalia were distributed to 200 volunteer participants between July 2021 and December 2021. The questionnaires were distributed selectively through various online platforms to increase visibility among our respondents.

Interns, general practitioners, resident physicians, consultants, and physicians and surgeons working at public or private hospitals in Mogadishu were included. Nurses and other allied health professionals were excluded. Ethical approval was obtained from the Ethical Review Committee of Somalia Turkiye Training and Research Hospital (02.11.2020, MSTH/4781). Confidentiality of the participants was maintained as the names, and other identifying data were not required during the data collection process. A self-reported questionnaire was used as the assessment method, and it was based on three previously published relevant studies (11-13). The survey comprised 30 questions about clinicians' awareness of diagnostic radiation exposure in Somalia. For awareness scoring, one point was awarded for each correct answer.

Statistical Analysis

All statistical analyses were performed using SPSS v23.0. Scores of less than 50% were judged poor, those between 50% and 75% were considered fair, and scores of more than 75% were regarded as good awareness. Due to the non-normal distribution of the sample, Kruskal–Wallis tests were used to compare the responses among groups. The characteristics of the participants were obtained through descriptive analysis using frequencies and percentages, and Fisher's exact test was performed to determine the relationship between doctors' demographic characteristics and their awareness of diagnostic radiation exposure. The cut-off point of significance level was set at a p-value of less than 0.05.

Results

In this study, we found that 62% of the physicians had no formal training in radiation exposure. The quantity of radiation a patient absorbs during a CXR (0.02 mSv) was only correctly estimated by 14% of respondents, whereas more than 46% still needed to learn. Nearly 40% of our respondents still needed to learn about the effective dose received by a patient in a two-view CXR (Tables 1 and 2).

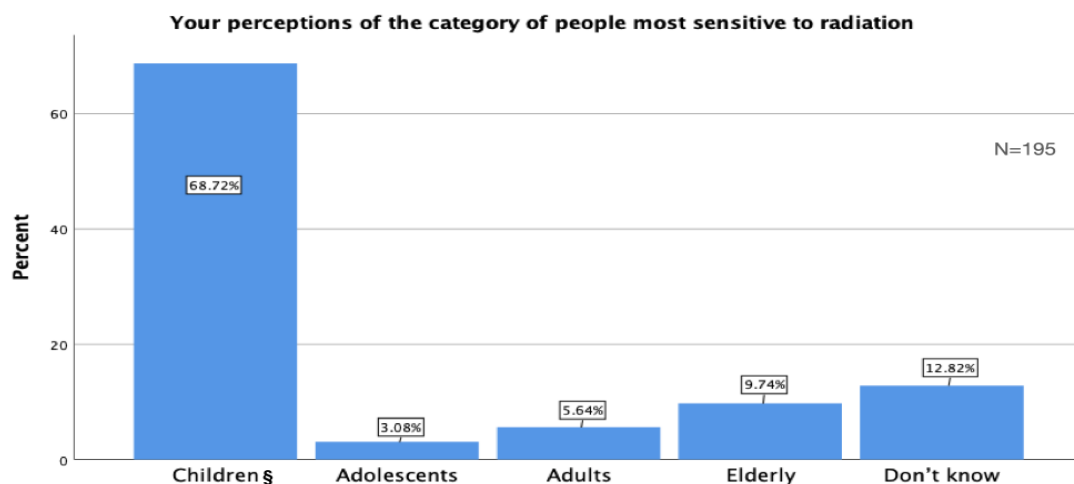
Table 1: Distribution of physicians' awareness of exposure to diagnostic radiation.

Parameters	Frequency	%
<i>Have ever had any formal training about ionizing radiation?</i>		
Yes	122	62.2
No	74	37.8
<i>Average natural background radiation is in the range?</i>		
0.2–0.3 mSv	23	11.9
2–3 mSv	33	17
20–30 mSv	24	12.4
200–300 mSv	6	3
I don't know	108	54.3
<i>Comparison of the radiation dose from a chest X-ray to the annual dose a person receives from background radiation?</i>		
1/100	34	17.6
1/10	23	11.9
Equal	22	11.4
10 Times	20	10.4
I don't know	94	48.7
<i>Quantity of radiation a patient absorbs during a chest X-ray is?</i>		
0.02 mSv	27	14
0.2 mSv	40	20.7
2 mSv	23	11.9
20 mSv	13	6.7
200 msV	1	0.5
I don't know	89	46.1
<i>Approximate effective dose received by a patient in a two-view chest X-ray is?</i>		
Almost equal to single view chest X-Ray	32	16.4
Twice the single view chest X-Ray	69	35.4
Five times the single view chest X-Ray	14	7.2
10 times the single chest X-Ray	6	3.1
I don't know	74	37.9

Table 2: Distribution of physicians' awareness of exposure to diagnostic radiation doses.

Parameters	Frequency	%
Effective dose from a single-view AXR is equivalent to ?		
0-1CXR	31	16
1-10 CXR	42	21.6
10-50 CXR	12	6.2
50-100 CXR	6	3.1
I don't know	103	53.1
CT abdomen single phase gives a dose of ?		
1 mSv	16	8.3
10 mSv	38	19.7
100 mSv	29	15
I don't know	100	51.8
None	10	5.2
Dosage from a two-view unilateral mammogram is?		
Almost equal to single-view chest X-ray	33	17
Twice the single-view chest X-ray	27	13.9
10–20 times the single-view chest X-ray	25	12.9
50–100 times the single-view chest X-ray	5	2.6
I don't know	104	53.6

Regarding radiation safety, more than 68% of physicians agreed that children are the most vulnerable patient population, while over 10% thought elderly patients were relatively more sensitive. (Figure 1).

**Figure 1.** Physicians' perceptions of which members of the populations are most sensitive to radiation.

According to the American College of Radiology (ACR) guidelines, in a situation where a pregnant woman had already undergone CT abdomen and pelvis with contrast without the radiologist's knowledge of her pregnancy, the most commonly recommended actions were to perform an MRI of the fetus to look for central nervous system (CNS) anomalies (11-13). However, in our study, only 8.4% of the participants responded to the relevant question correctly (Figure 2).

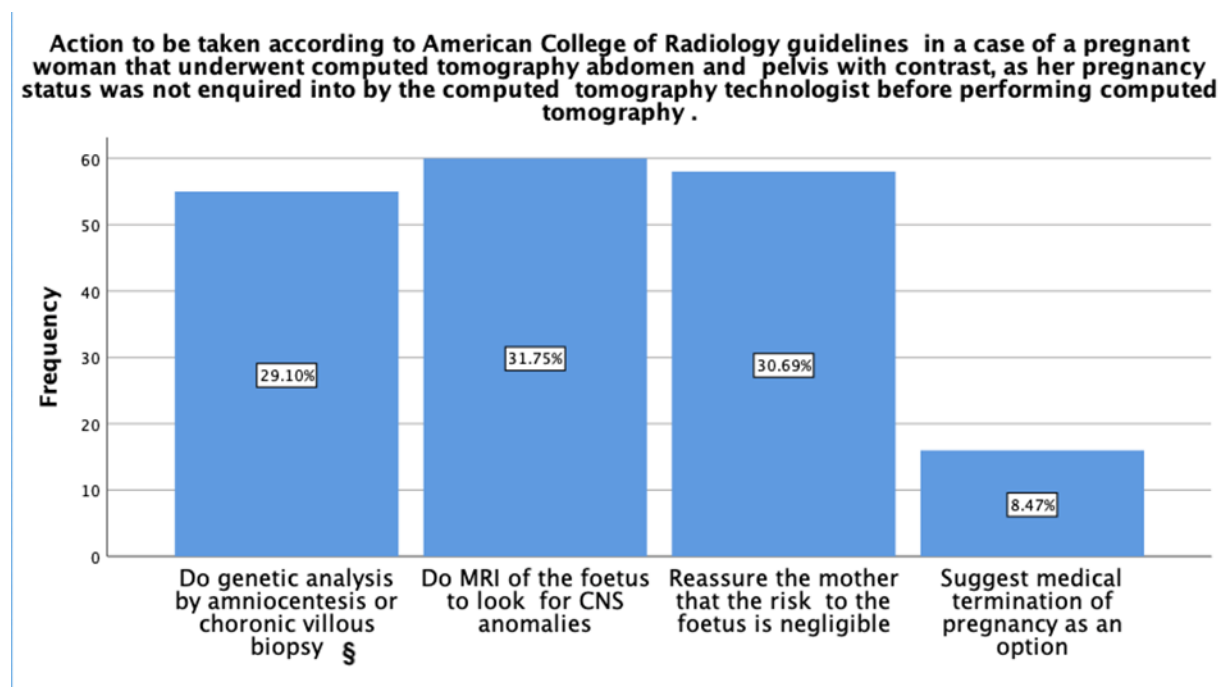


Figure 2. Physicians' awareness of action to be taken in case a pregnant woman needed a contrast abdominal computed tomography.

Around 62.4% of the respondents had no idea of the doses of radiation absorbed during intravenous urography (IVU). Only 13.9% of the doctors correctly stated that the doses of radiation absorbed during intravenous urography were equivalent to 10–50u. Furthermore, more than 62% of the attendees were unaware of the radiation dose during a ventilation/perfusion scan (V/Q). More than 50% of participants did not know about the dose of abdominal ultrasound (US). Likewise, 57% of our respondents did not know the radiation dose of non-contrast magnetic resonance imaging (MRI) of the brain. Nearly 55% of the respondents did not know the dose of radiation absorbed during the abdomen CT with intravenous (IV) contrast. Only 11% of the participants correctly estimated the radiation dose of the abdomen CT with IV contrast (Table 3).

Table 3: Distribution of physicians' awareness of radiation exposure using different imaging modalities.

Parameters	Frequency	%
<i>How confident are you in your knowledge of the ionizing radiation dose of common diagnostic imaging techniques?</i>		
Not at all confident	16	8
Not really confident	56	28.1
Somewhat confident	81	40.7
Very confident	46	23.1
<i>How often do you discuss radiation-related issues, including long-term risks, with patients when offering radiological investigations?</i>		
Always	38	19.5
Never	19	9.7
Often	47	24.1
Sometimes	91	46.7

Our analysis also revealed that, due to their lack of knowledge of ionizing radiation, more than 36% of participants have low confidence while ordering diagnostic imaging procedures (Table 4).

Table 4: Confidence and knowledge levels of physicians during referral of patients to the imaging procedures.

Parameters	Frequency	%
<i>How confident are you in your knowledge of the ionizing radiation dose of common diagnostic imaging techniques?</i>		
Very confident	46	23.1
Somewhat confident	81	40.7
Not really confident	56	28.1
Not at all confident	16	8
<i>How often do you discuss radiation-related issues, including long-term risks, with patients when offering radiological investigations?</i>		
Always	38	19.5
Often	47	24.1
Sometimes	91	46.7
Never	19	9.7
<i>Do you inform the patients you refer for imaging studies the risks of use ionizing radiation Very frequently?</i>		
Frequently	62	32
Occasionally	57	29.4
Rarely	50	25.8
Never	25	12.9
<i>Do you think knowledge of ionizing radiation in the different radiological exams you request for is important for your practice?</i>		
Very important	88	46.1
Important	60	31.4
Moderately important	15	7.9

Least importance	9	4.7
Not importance at all	19	9.9
Which of the following educational methods do you think would help to raise awareness of radiation related issues?		
Lectures	39	20.4
Tutorials and workshops	40	20.9
Web-based learning modules	16	8.4
All above	96	50.3
How important would you rate having knowledge of the radiation dose of common radiological investigations?		
Very important	128	66
Somewhat important	36	18.6
Not really important	12	6.2
Not importance at all	18	9.3

Nearly 46.7% of our respondents stated that they rarely discussed radiation-related issues with their patients, including long-term risks, when offering radiological investigations. However, most (77%) of our respondents agreed that knowledge regarding ionizing radiation is essential for their practice. Approximately 40% of the respondents agreed that tutorials, lectures, and workshops were the optimal educational methods that would help raise doctors' awareness about radiation-related issues. Almost 30% of the respondents reported that they occasionally referred their patients for imaging, although they knew it would not impact their management. More than half of the participants had no idea about the ALARA principle, which stands for "as low as reasonably achievable" and is one of the principles of radiation protection (Figure 3) (n= 191).

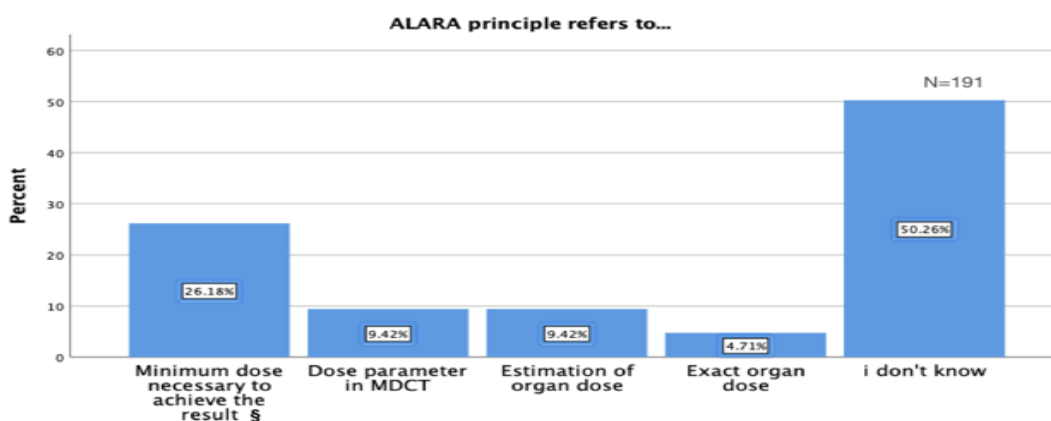


Figure 3. Physicians' knowledge of "As Low As Reasonably Achievable" (ALARA) principle.

Forty-seven % of our respondents did not know that radiologists were legally responsible for unnecessary exposure to ionizing radiation (Figure 4) (n=189).

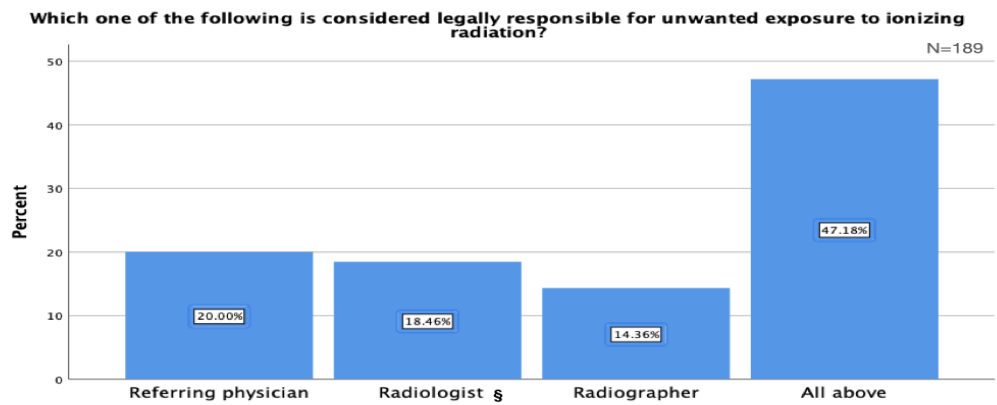


Figure 4. Physicians’ knowledge of unwanted exposure to ionizing radiation.

Also, 47% of our respondents correctly stated that the thyroid gland was the most radiation-sensitive organ, followed by the gonads (Figure 5).

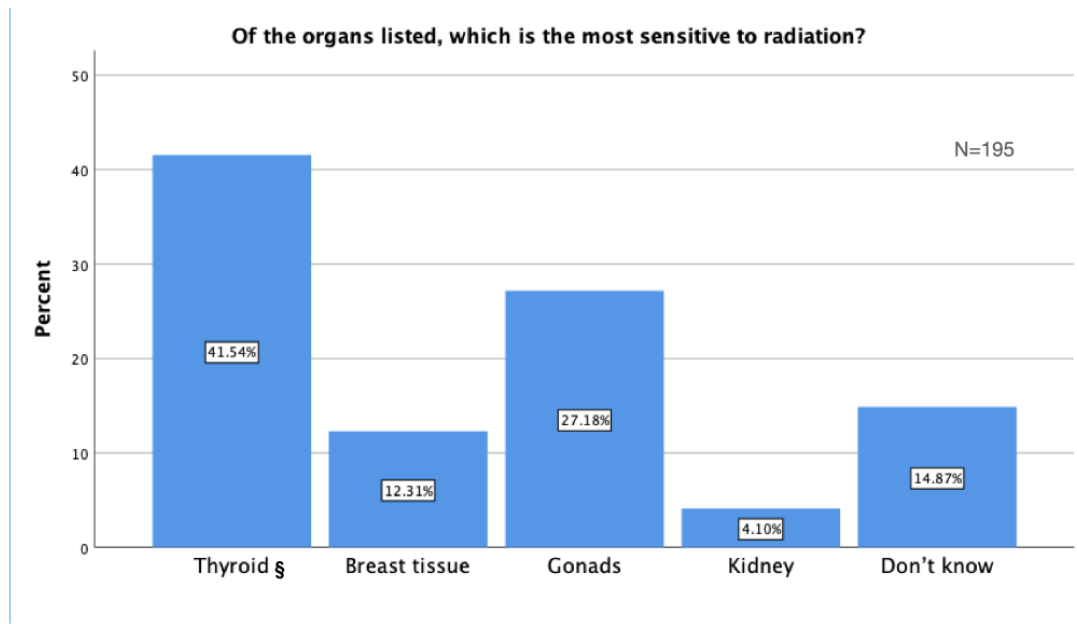


Figure 5. Physicians’ knowledge of the most sensitive organs to radiation

Almost all participants (96.10%) demonstrated poor awareness regarding radiation risks (Figures 6-8).

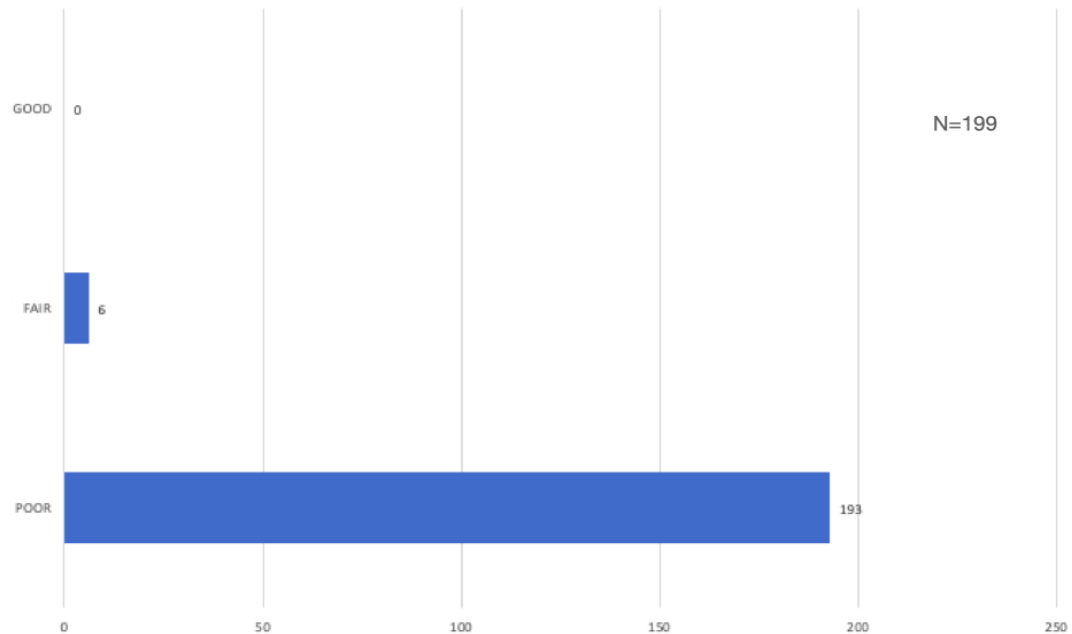


Figure 6. Physicians' awareness of radiation risk in diagnostic imaging.

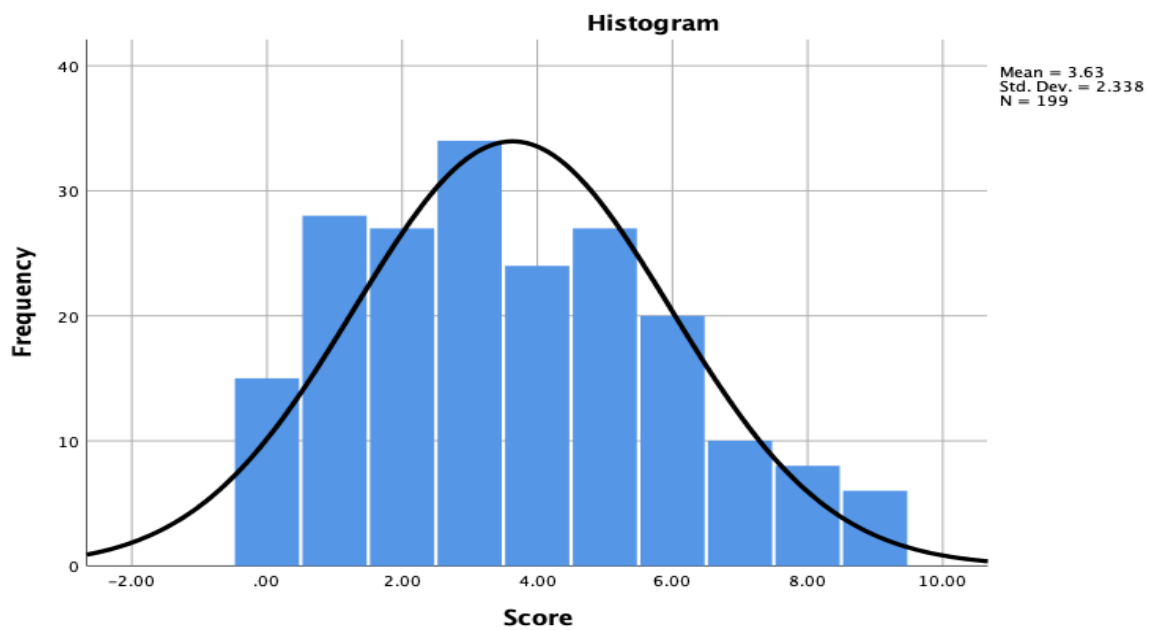


Figure 7. Distribution of physicians based on their awareness of exposure to radiation.

Confidence Level (n=199)	Mean Score	Standard Deviation	<i>p-value</i>
Very confident (n=46)	4.56	1.86	p<0.0001
Somewhat confident (n=81)	4.06	2.49	
Not really confident (n=56)	3.01	1.92	
Not at all confident (n=16)	0.93	1.43	

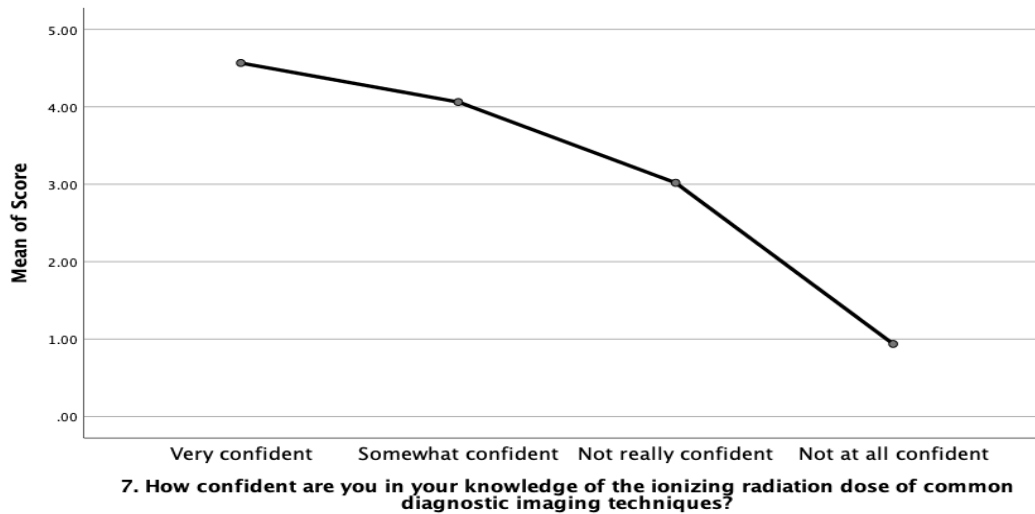


Figure 8. Physicians' confidence in awareness of exposure to diagnostic radiation.

We did not find a significant association between respondents' awareness of exposure to diagnostic radiation and gender, clinical experience, residency program, and area of expertise (Table 5). However, there was a significant association between the respondents' awareness of exposure to diagnostic radiation and age. Respondents aged between 25 and 29 had significantly poor awareness of exposure to diagnostic radiation compared to the older participants ($p<0.01$).

Table 5: Correlations between respondents' characteristics and their awareness of exposure to diagnostic radiations

Parameters		Variables		Awareness				Test of Significance P value	
				Poor		Fair			
Gender				n	%	n	%		
		Male (n=140)		135	96.4	5	1.2	0.626	
		Female (n=56)		55	98.2	1	1.8		
Age									
		25-29 (n=111)		111	100	0	0		
		30-34 (n=48)		44	91.7	4	8.3	0.008*	
		35-40 (n=20)		19	95	1	5		
		>40 (n=17)		16	94.1	1	5.9		
Years of clinical practice									
		<5 (n=107)		106	99.1	1	0.9		
		5-10 (n=61)		57	93.4	4	6.6	0.067	
		11-20 (n=19)		19	100	0	0		

Residency Program	>20 (n=10)	10	90	1	10	0.732
	Family medicine (n=25)	24	96	1	4	
	Medical specialties (n=82)	79	96.3	3	3.7	
	Surgical specialties (n=38)	38	100	0	0	
Departments of Participants	Other specialties (n=46)	45	97.8	1	2.2	0.167
	Radiology (n=31)	27	87.1	4	12.9	
	Pediatrics (n=21)	20	95.2	1	4.8	
	Urology (n=5)	5	100	0	0	
	Anesthesiology (n=6)	6	100	0	0	
	Cardiology and cardiovascular (n=7)	6	85.7	1	14.3	
	ENT(n=3)	3	100	0	0	
	Ophthalmology (n=7)	7	100	0	0	
	Emergency unit (n=10)	10	100	0	0	
	General surgery (n=15)	15	100	0	0	
	Orthopedics (n=5)	5	100	0	0	
	Internal medicine (n=24)	24	100	0	0	
	Gynecology and Obstetrics (n=23)	23	100	0	0	
	Others (n=39)	39	100	0	0	

Discussion

In this study, we examined the physicians' awareness of radiation exposure and found that over 62% of physicians had never had formal training on ionizing radiation. In a study from South Africa, this rate was calculated as 80% (13). In addition, our respondents' knowledge regarding the radiation doses of primary diagnostic studies such as CXR was also in line with the literature (14-16). Finally, most of our respondents stated that children were more sensitive to radiation than other patient populations. This finding is also consistent with the literature (17).

In addition, our participants' approach to the pregnant patients inadvertently exposed to radiation due to an abdominal CT scan was also in line with the previous studies (18,19).

In our study, 96.1% of the respondents showed poor awareness of radiation exposure. This finding was also consistent with the literature (20,21). In our cohort, male and female participants showed similar awareness levels. However, Kamble et al. reported that female physicians had a significantly higher level of awareness than their male colleagues (22).

Although some studies reported that physicians working in radiology departments had a higher awareness regarding radiation and associated risks, this finding was not confirmed in our study (23). This difference can be due to the fact that because of terrorism and war-related conditions, there are no structured residency curricula in

radiology or other residency programs in Somalia. In addition, there are no organizations, such as the atomic energy agency, which could manage all radiation-related activities in the country.

Conclusions

We conclude that the awareness regarding radiation exposure and related risks is poor among the health professionals in Somalia. Therefore, basic principles of diagnostic imaging, including radiation exposure associated with frequently performed imaging studies, radiation-related risks, and cautions that should be taken during these studies, should be taught during medical training and residency training.

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Consent to participate: The purpose of the study was explained to the subjects by the examiner, and a voluntary informed consent form was obtained from the participants.

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