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Annals of Medicine & Health
مجلة الطب والصحة

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Contents

Original Research

Civilian Gunshot Injuries of the Abdomen at Hajjah Governorate in Yemen

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Abstract

Background: Civilian gunshot injuries of the abdomen become a global problem and constitute enormous emotional, physical, financial and social burden. The true magnitude of this problem in Yemen is not explored yet.

Aim: The purpose of this study is to identify the pattern of civilian abdominal gunshot injuries and evaluate outcome of the management.

Methods: All patients operated for penetrating gunshot of the abdomen in Saudi hospital at Hajjah governorate from June 2013 to September 2016 were included. Data of patients were prospectively recorded and analyzed to identify the pattern of abdominal gunshot injuries and evaluate the management outcome. Patients assigned to observation were excluded.

Results: Eighty-five patients were enrolled. They were 71 men and 14 women with age ranging from 10 to 60 years. Small bowel was the most common affected organ, 52 patients (61.1%) followed by the colon in 24 patients (28.2%), then diaphragm in 19 patients (22.3%) and then comes liver in 15 patients (17.8%). Spleen, kidneys, great vessels and rectum were at 11.7%, 9.4%, 8.2% and 5.9% respectively. Duodenum, pancreas and urinary bladder were the least affected organs, 2 cases for each. Forty patients (47%) had bullets' entrance through anterior abdominal wall. Personal conflicts and tribal clashes were the leading events of abdominal gunshot, 48 cases (56.5 %) followed by mishandling with handguns, 11cases (12.9%). The commonest surgical procedures performed were resection and anastomosis for small bowel, resection and colostomy for the colon and primary repair for diaphragmatic injury. Splenectomy was performed in 6 patients, partial gasterectomy in 5 patients, and nephrectomy in one patient. Chest tubes were inserted in 44 patients. Postoperative complications were recorded in 35 patients (41.1%). The death rate was at 8.2%. Wound infection was recorded in 16 patients.

Conclusion: Small bowel was the most common organ involved by gunshot, followed by colon, diaphragm and liver respectively. Duodenum, pancreas and urinary bladder were the least. The majority of patients were injured during personal conflicts or tribal clashes. Lack of sufficient laws governing the firearms possession and easy access to weapons without restriction is the primary cause of the problem. Therefore, serious regulations of the use of firearms to settle disputes and strict enforcement of laws to combat this trend are extremely important and needed.

1. Introduction

Firearm injuries are increasingly seen in many developing countries which have been attributed to spates of communal and ethnic clashes, political violence and armed robberies [1]. The use of guns in assaults, homicide and suicide becomes dominant because of their easy availability and lack of laws governing the possession of the firearms [2,3]. Firearm injuries are

associated with substantial emotional, physical and financial burden that cause an enormous human toll and imposing huge costs on the society with outcomes that could be lethal [4]. This is associated with long term physical and psychological disability for individuals, families, communities and societies [5]. The socioeconomic cost of civilian gunshot trauma is enormous, especially in developing nations. Civilian gunshot injuries become a significant cause of serious morbidity and mortality [6]. Endless wars, tribal armed clashes and political violence within and around Yemen encourage easy access to different types of weapons. This leads to a high incidence of gunshot injuries even in peace times. It is believed that more than 50 million legal and illegal weapons in circulation in Yemen. However; true magnitude of this problem in Yemen has not been studied and explored yet. The purpose of this prospective study is to identify the pattern of abdominal gunshot wounds among civilian and to evaluate the outcome of the management at Hajjah governorate in Yemen over period from June 2013 to September 2016.

2. Methods

All patients admitted and operated for penetrating gunshot injuries of the abdomen in Saudi hospital at Hajjah governorate between June 2013 and September 2016 were included in this prospective hospital-based study. Data pertaining patients' demographics, assault events, symptoms and signs, general condition at the presentation, entry and exit wounds, operative procedures and findings, postoperative complications, length of hospitalization were prospectively recorded on proforma sheets. Preoperative investigations including laboratory, chest and abdominal radiography and ultrasound were performed before shifting patients to the operation room. Indications for abdominal exploration

were all gunshot wounds penetrating the abdominal wall with or without chest co-injury. These indications were based on positive signs of peritoneal irritation, presence of free air under diaphragm and free fluid collection in the peritoneal cavity proved by ultrasound. Hemoglobin level was evaluated as co-factor than independent factor. The penetration is understood as when the bullet penetrates the entire thickness of abdominal wall from the skin to the peritoneum. Gunshot wounds confined to the abdominal wall were not regarded as penetrating and were excluded from the study. The exclusion criteria were: 1) Patients that were subjected to conservative management because of the absence of signs of peritonitis and absence of free air under diaphragm or absence of free fluid collection within peritoneal cavity during serial abdominal examinations. 2) Patients with deep coma at the time of presentation that didn't response to resuscitative measures. 3) Gunshot wounds that were confined to abdominal wall- the peritoneum is intact.

The abdominal area is anatomically delineated superiorly by nipples line to the symphysis pubis

inferiorly. On the back, from the line joining scapular angles superiorly to gluteofemoral crease inferiorly.

Patients indicated to laparotomy were taken directly from emergency room into operation room after stabilization of patient general condition. Analgesics, antibiotics, intravenous fluid and antitetanous toxoids were given. Blood transfusions were given when hemoglobin is <100g/l. The approach to the abdominal cavity was always through midline incision. The collected data was analyzed using IBM statistics SPSS version 22.

3. Results

The total number of patients, who were admitted and operated in Saudi hospital at Hajjah governorate for abdominal gunshot over period from June 2013 to September 2016, was 85 patients. They were 71 men and 14 women with age ranging from 10 to 60 years. The majority of injured were between 11-40 years (Figure 1).
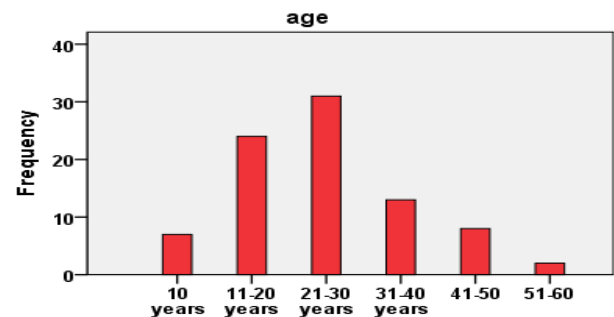
Figure 1: Frequency of abdominal gunshot according to age

All performed laparotomies for gunshot wounds of the abdomen were positive. Of 85 patients, 43 patients (50.58%) had moderate to huge hemoperitoneum, the remnant had slight to mild hemoperitoneum in association with the injury of intra-abdominal organs. Forty-four patients (51.76%) had concomitant hemopneumothorax requiring insertion of chest tube. Thirty-two patients (37.64%) were shocked (systolic pressure less than 100 and pulse rate more than 100 per min) at the time of presentation. Interpersonal civil conflicts and tribal clashes were the most common reasons of civil gunshot of the abdomen, 48 cases (56.5%) (Table 1).

Table 1: Events leading to gunshot injuries

Injuries' events	n (%)
Tribal clashes and interpersonal conflicts	48 (56.5)
Mishandling	11 (12.9)
Festival celebrations	9 (10.6)
Family disputes	6 (7.0)
Accidental discharge	5 (5.9)
Stray bullets	4 (4.7)
Road hijacking	2 (2.4)

Unfortunately, stray bullets, tribe clashes and use of weapons during marriage and birth celebrations comprises considerable rate of abdominal gunshot. Unlike others there was no suicidal trial recorded. Sixty-seven

patients (78.8%) had single entrance, while 18 patients (21.1%) had multiple wound entrances. Out of 85 patients, 14 patients (16.5%) had retained bullets, while through and through wound were recorded in 71 patients (83.5%) (Figures 2 and 3).

Figure 2: Through and through gunshot through anterior abdominal wall and exit at right flank

Figure 3: Gunshot entrée at left flank of retained bullet

Small bowel was found to be the most common organ involved followed by the colon and then diaphragm (Table 2 and Figure 4). Duodenum, urinary bladder, perineum and pancreas were the least injured. The distribution of gunshot wounds to the body is very variable. Forty patients (47%) had inlet wounds at anterior abdominal wall, of which 24 were at left side and 16 were at right side.

Table 2: Distribution and frequency of organs' injury

Organ injured	n (%)
Small bowel	52 (61.1)
Colon	24 (28.2)
Diaphragm	19 (22.3)
Stomach	16 (18.8)
Liver	15 (17.6)
Spleen	10 (11.7)
Kidney	8 (9.4)
Major vessels	7 (8.2)
Rectum	5 (5.9)
Pancreas	4 (4.7)
Perineum	3 (3.5)
Urinary bladder	2 (2.4)
Duodenum	2 (2.4)

The remnant entrance wounds were in the chest wall in 23 patients (27%), posterior trunk in 17 patients (20%), at the perineum in 3 patients (3.5%) and 2 patients (2.3%) in right gluteal region. Complications were recorded in 35 patients (41.1%) (Table 3).

Table 3: Types of complications

Complications	n= 35	%= 41.1
Wound infection	16	18.8
Chest infection	3	3.5
Enterocutaneous fistula	2	2.3
Peritonitis including Intra-abdominal Abscess.	7	8.2
Death	7	8.2
Total	35	100.0

Of these, 7 patients (8.2%) died due to either peritonitis complicated by septicemia or pulmonary embolisms. One patient died early postoperatively due to severe preoperative hemorrhage from inferior vena cava. The time interval between injury and arrival to the hospital ranged from 1 to 24 hours, most of them arrived too late. Different types of conventional surgical procedures were performed as it is shown in (Table 4). Regarding hospitalization stay, it ranged from 1 to 6 weeks with the majority between 1-2 weeks (Table 5).

Table 4: Surgical procedures performed

Organ	Procedure	n
Small bowel		**52**
	Resection and repair	32
	Debridement and repair	20
Colon		**28**
	Resection with colostomy	16
	Debridement and repair	7
	Resection and repair +Ileostomy	5
Diaphragm repair		**19**
Stomach		**16**
	Debridement and repair	11
	Partial gasterectomy	5
Liver		**15**
	Primary repair	7
	Segmentectomy	3
	No intervention	5
Spleen		**10**
	Splenectomy	6
	Splenoraphy	4
Chest tube		**44**
Great vessels ligations		**3**
Nephrectomy		**1**
Appendectomy		**61**

Table 5: Duration of hospitalization(n=85)

Number of weeks	n (%)
One week	35 (41.1)
Two weeks	30 (35.2)
Three weeks	12 (14.1)
Four weeks	4 (4.7)
Five weeks	3 (3.5)
Six weeks	1 (1.1)

4. Discussion

Worldwide gun-related violence is increasing and the use of guns becomes dominant [3,7]. The easy availability and unrestricted purchase of firearms and lack of laws

governing the firearms possession constitute the primary reason for violence, homicide, and suicide [3,8]. Consequently, socioeconomic cost of civilian gunshot trauma is enormous, especially in developing nations [6]. Our country (Yemen) is deeply suffering from illegal possession and distribution of different types of light and moderate weapons, which are used during tribal clashes, political conflicts and even during personal and communal disputes. There is also a tradition of celebrating the marriage ceremonies or the birth of a male child by way of opening fires on such occasions especially in the tribal areas [9].

It is believed that more than 50 million legal and illegal handguns in circulation in Yemen. This causes for Yemeni society enormous emotional, physical, social and financial burden as the violence involves the most active and productive population of society-between 11-40 years (80.1%). This is also reported by other similar studies [8, 10-12].

In our study, male patients predominated (83.5%). This finding is well compared with similar other studies [3, 8, 11, 12] Chamisa [3] reported (87.1%), Feliciano et al [8] reported (85.3%) while Musau et al [11] reported (95%) male predominance. This male predominance might be explained that men are more engaged in violence and military clashes and weapons handling and using than women.

Our finding conformed that small bowel was the most common affected organ by gunshots. It accounts for (61.1%). This high rate might be explained because the majority of bullets' entrances were through anterior abdominal wall (47%) where the thickness of the muscles and interposed bony structures are less than posterior aspect of the trunk. This deprived intra-abdominal organs considerable protection [13]. Another explanation is because of face to face mechanism of clashes. The colon came in the second place with rate at 28.2% and then diaphragm 22.3%. Stomach and liver came in 4th and 5th places (18.8% and 17.6%) respectively. This finding is consistent with other studies [3, 8, 12].

Clashes between clans and tribes and personal conflicts were the most common events that led to gunshot injuries in current study. They comprised up to 56.5% (48 patients) followed by mishandling and playing with handguns, 11 cases (12.9%). Festival occasions such as marriage and birth celebrations came in 3rd place, 9 cases (10.6%). This is expected in poor society with high illiteracy and unemployment among young. Ibrahim et al [10] and Ogunlusi et al [14] reported armed robberies as the leading events causing gunshot injuries (65.5% and 50% respectively). Elach et al [15] reported rate as high as (29%). Despite poverty and political instability in Yemen, the armed robberies were not found to be leading event to gunshot injuries. The absence of suicidal gunshot and low rate of armed robberies (2.3%) in this study might reflect the positive impact of religion among people in Yemeni society. Instead of this, interpersonal conflicts and assaults and clashes between the tribes are the predominating events. For limiting these harms, it needs discouragement of gunshots in the midst of crowds

during celebrations, avoidance of the use of live bullets if it must be done at all and ensuring that such gunshots are well directed away from the gathering [16].

The management of gunshot injuries of the abdomen varies from center to center [8] Those centers supplied with modern and sensitive imaging facilities such as modern ultrasound, CT with contrast, MRI and laparoscopy could afford beside emergency mandatory laparotomy, the so called selective conservative management (SCM) [3]. The so called "selective conservatism" is based on careful initial and subsequent serial clinical examinations [3]. The proponents of selective conservative management claim that the policy of this approach has been re-appraised by many authors and advocated by a number of trauma centers [17-21]. According to these studies, SCM is safe and shortens the length of hospital stay, minimizes the hospital expenses and it is associated with minimal morbidity and mortality. They claim also that the mandatory exploration of gunshot wounds of the abdomen has negative laparotomy rate as high as 27% [21] and complications rate at 41% [17]. However; the conditions in our hospital are different. Despite the lack of modern diagnostic facilities such as CT, MRI, angiography or laparoscopy we didn't have negative laparotomy at all. The indication to laparotomy was based mainly on the finding of the physical examination of the abdomen and the results of abdominal ultrasound and plain x-ray investigations.

The presence of guarding and rigidity of anterior abdominal wall associated with penetrating gunshot wounds was regarded as strong criteria for mandatory laparotomy. The presence of free air under diaphragm was confirmed by plain x-ray of the abdomen, while free fluid collection within peritoneal cavity was confirmed by abdominal ultrasound. The level of hemoglobin was evaluated in conjugation with other criteria. Therefore, we were necessitated to perform the emergency laparotomy based on above mentioned criteria with zero negative laparotomy. All performed laparotomies were positive in 100%. This is may be attributed to clear inclusion criteria for the emergency laparotomy and surgical team that is familiar with gunshot injuries of the abdomen. The penetrating gunshot wound of the abdomen is understood as when bullet or shrapnel penetrates the entire thickness of the abdominal wall from the skin to the peritoneum. With this definition of penetrating gunshot wound of the abdomen, it is very rare to have negative laparotomy.

The reported rate of negative laparotomy by others might reflect gap in experience of the staff dealing with gunshot injuries of the abdomen. Nineteen cases (22.35%) with injury of diaphragm were managed by primary repair (phrenoraphy) and chest tubes. The injured colon was managed preferably by resection and colostomy. Only stable patients with minimal contamination of peritoneal cavity were managed by debridement and primary repair. Of this group, 2 patients developed enterocutaneous fistula that required reconstruction of ileostomy. Sometimes more than one procedure in one organ was performed; for example: colon resection + colostomy in

one segment and debridement and repair of another segment of the colon. Resection and anastomosis of small bowel was carried out for multiple lacerations confined to short segment, otherwise debridement and primary repair was the choice. Injuries of the stomach were managed often by debridement and repair, only view cases required partial gasterectomy. Hemopneumothorax was diagnosed in 44 patients (51.7%) and required insertion of chest tubes at the presentation. Of these, one case needed endotracheal intubation and bilateral chest tubes for enormous bilateral surgical emphysema due to multiple ribs' fractures on both sides. Damage control surgery was applied in one case with burst retroperitoneal hematoma from injured inferior vena cava. This patient unfortunately died 12 hours postoperatively. Injury of the pancreas was managed conservatively just by drainage, nasogastric tubes and parenteral feeding, antibiotics and administration of somatostatin with good result. Unfortunately, the patient with duodenal injury has died due to retroperitoneal abscess and septicemia. Injuries of the rectum and perineum required temporary colostomy (Hartmann's procedure) that were closed after 4 months. Splenectomy in our study was performed only in 6 of 85 patients (7%). However; Adejumo et al [22] reported splenectomy as the most common procedure performed (29.0%), followed by colostomy (15.0%).

The complications in this study were recorded in 35 patients (41.1%). Of these, 16 patients (18.8%) had wound infections, which are lower than reported by other similar studies [10,22]. Mortality rate was at (8.2%). Comparing with poor diagnostic facilities in our hospital, this rate of mortality is acceptable. Same mortality rate was reported by others [9, 22]. However, Ibrahim et al [10] reported a mortality rate as low as 3.3%. In contrast to other continents where the average delay from injury to hospital admission is about 30 min. [23], patients in our country suffer a prolonged delay before medical care is reached. It was longer than 24 hours in some cases that came from rural mountain areas. This is because of poor information communication, primitive transport systems and roads and inadequate pre hospital trauma care. This may explain the deaths at or before presentation. Therefore, a pre hospital trauma care system has been emphasized by world health organization [24, 25]. An adequate pre hospital care would have prevented complications such as hemorrhage, shock, sepsis and renal failure, thereby improving final outcome [26].

4. Conclusion

In conclusion, small bowel was the most common abdominal organ sustained civilian gunshot injury, followed by colon, diaphragm and liver respectively. Duodenum, pancreas and urinary bladder were the least. Personal conflicts and tribal clashes were the most common cause of abdominal gunshot among civilians. Lack of sufficient laws governing the possession of firearms, easy access to and purchase of weapons without restriction is among others the primary cause of the problem. Therefore, serious regulations of the use of firearms and strict enforcement of laws to combat this trend are extremely important and needed. Good governance, poverty alleviation, education, and gun control policy by governments are essential in reducing the danger. Efforts should be made to address the root causes of terrorism globally. Children need to be prevented from handling, using and carrying guns. The guns should be always kept away from their reach. Since it is difficult to obtain the true magnitude of the problem, a national database to which all gunshot wounds should have been reported is urgently required in order to clarify and assess the magnitude of the problem.

Conflicts of interest
There are no conflicts of interest.

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Original Research

Prevalence of Refractive Errors Among Patients Attending Al-Wahdah Teaching Hospital, Ophthalmic Clinic in Dhamar Governorate, Yemen

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Abstract

Background: Refractive errors (REs) are one of the major causes of visual impairment and health problem worldwide particularly in developing countries including Yemen.
Aim: This study was aimed to estimate the prevalence of refractive errors among patients attending the ophthalmic clinic at Thamar University Al-Wahdah Teaching Hospital (TUWTH), Yemen.
Methods: A cross sectional descriptive study was conducted on 534 patients (aged 6- 40 years) attending the ophthalmology out-patient clinic at TUWTH during the period of 1st February to 1st May 2019. For each patient, detailed Ophthalmology examination including visual acuity (VA) assessment, objective and subjective refraction were done. The data were collected using a pretested and structured questionnaire included demographic characteristics, present medical history and clinical investigations.
Results: The results showed that the overall prevalence rate of REs was 32.02% (171/534). The rates of different types of RE were 10.67%, 7.87%, 7.30%, 3.37% and 2.81 % for Myopia, Myopic astigmatism, Hyperopic astigmatism, Mixed astigmatism and Hyperopia respectively. The overall prevalence of RE was significantly higher among females than males (36.96% *vs* 26.74%., *P*= 0.012). The highest rate of RE significantly observed among who having primary education followed by ≥ secondary education, and illiterates (37.80%;29.79% and 24.49 %. respectively, *P*=0.019).
Conclusion: This study provides hospital-based information on the prevalence rate of RE among patients in Dhamar governorate, Yemen. The results demonstrate that females and educated patients have higher prevalence rate of REs.

Keywords: Prevalence, Refractive errors, Myopia, Astigmatism, Yemen

1. Introduction

Refractive errors (REs) are defined as a condition in which the optical system of the eye (at rest) fails to bring parallel rays of light to focus on the retinal fovea resulting in formation of a blurred image [1]. In case of Myopia (short sightedness) the optical system of the eye brings parallel rays of light entering the eye into a focus anterior to the retina while in Hypermetropia (hyperopia) the optical system of the eye brings parallel rays of light into a focus behind the fovea, both conditions resulting in formation of blurry image. In case of astigmatism the optical system of the eye forms a focal line instead of focal point resulting in

image distortion. [2-4]. Astigmatism is classified into regular and irregular. Various types of regular astigmatism have been identified on the basis of the refractive power and position of the two principal meridians termed as; myopic astigmatism (simple or compound), hyperopic astigmatism (simple or compound) and mixed astigmatism [5].

RE represent an established problem worldwide. It is estimated that 2.3 billion individuals live with these errors [6]. WHO reports and recent studies carried on prevalence of RE indicate that these errors of the eye are the first cause of visual impairment and ranks second to cataracts as a cause of treatable and preventable blindness [7,8]. It has reported that 43% of visual loss worldwide are caused by

REs. REs considered one of the WHO five priorities of global initiatives for vision 2020 (the right to sight) because uncorrected REs have a huge socioeconomic and physiological impacts and accounts for visual impairment in 153 million people all over the world [7].

In addition, uncorrected RE is a public health concern which hampers performance, reduces productivity and affect quality of life. Lack of knowledge, stigma and erroneous beliefs towards REs plays a major role in uptake of refractive services [9-10]. REs can be effectively corrected with many ways as spectacles, contact lenses and refractive surgery such as LASIK, PRK or Intraocular Lens Implantation. Correction with spectacles is the simplest, most common and cost-effective form of treatment [11]. The international cost of visual impairment correction caused by uncorrected RE has been estimated to be 2800 million US dollars and the global burden of uncorrected RE resulting from productivity loss costs about 121.4 billion US dollars [12,13].

Knowledge about the prevalence and pattern of REs and their visual impacts is essential to set programs, policies and priorities and to evaluate global eye health [14]. This study was done in Republic of Yemen which is located in the south west part of the Arab Peninsula with an area of 555,000 square kilometres. Yemen's population is around 25.3 Million distributed in 21 Governorates in addition to the capital city of Sana'a. About 68.2% of the population lives in rural areas. Yemen is one of the WHO Eastern Mediterranean Region countries; the estimated prevalence of blindness in this region is 0.7%, and Yemen is regarded as one of the countries with high prevalence rate of blindness [15]. In Yemen there is no sufficient data regarding the prevalence of RE. Therefore, a hospital based-study was conducted to find out the magnitude of REs in different age groups.

2. Methods

Study area
The study was conducted at Thamar University Al-Wahdah Teaching Hospital (TUWTH) which is located in Dhamar Governorate, Yemen.

Study design
A cross sectional descriptive study was conducted on 534 patients attending the ophthalmology out-patient clinic during the period of 1st February to 1st May 2019. All Patients aged 6 to 40 years who were phakic and whose unaided visual acuities were worse than 6/6 in one or both eyes but improved with pinhole were included in the study. Any patient had a previous history of eye surgery or eye trauma was excluded from the study. Assessment of visual acuity (VA) using a standard illuminated Snellen's VA chart or E chart with and without pinhole was done for all the patients. Automated refraction with Kerato-Refractometer (Topcon) were done by an ophthalmologist. Cycloplegic refraction using three drops of cyclopentolate 1% 10 minutes apart was done for children up to 16 years of age.

Subjective refraction was performed for all the patients. The anterior and posterior segments of these patients were examined in detail using slit lamp and Volk 90D non-contact lens. Normal patients and patients having organic lesions in anterior segment or posterior segment impairing the vision were considered as other diagnosis. REs were defined as: myopia <−0.50 diopters (D), hyperopia > +0.50 diopters for adults and > +2.0 diopters for children (up to 16 years; after cycloplegic refraction) and astigmatism > 0.50 cylinder diopters.

Data collection
Patients data were collected using a pretested structured questionnaire included Demographic data (age, gender, education level, etc.), Present medical history, and Clinical investigations.

Statistical analysis
Data were analysed by Statistical Package for the Social Sciences SPSS, version 25, Windows 8. For the analysis purpose, the age groups were divided into three groups, namely; 6–16, 17–28 and 29–40 years. Associations between categorical variables were analysed using the Chi-square test or Extract fisher test. P value ≤ 0.05 was considered statistically significant.

Ethical consideration
Ethical approval was obtained from Thamar University Medical Ethics Committee (TUMEC-19010). Verbal consents were taken from the patients and the parents of children prior to questionnaire filling. All of the information was collected and kept strictly confidential.

3. Results

Patients' Characteristics
Table 1 shows the general characteristics of studied patients. Out of 534 patients included in the study, 276 (51.69%) were females, and 258 (48.31%) males. Most of the patients (47.75%) were in age group of (28-40) years, 153 (28.65%) aged 6-16 years, and (23.60%) aged 17-27 years. Most of the patients had primary education (46.07%).

Table 1: General characteristics of studied patients (n=534)

Variable	Frequency (%)
Age/year	
6-16	153(28.65)
17-27	126(23.60)
28-40	255(47.75)
Gender	
Male	258(48.31)
Female	276(51.69)
Education level	
Illiterate	147(27.53)
Primary	246(46.07)
≥ Secondary	141(26.40)

Overall Prevalence of RE
The results of this study showed that the overall prevalence rate of REs among studied patients during the

study period was 32.02% (171/534). While, the rest of studied patients 67.98% (363/534) had other diagnosis (Normal, cataract, glaucoma, conjunctivitis, pterygium, diabetic retinopathy etc.).

Demographic Distribution of RE

The prevalence of RE was higher among females 36.96% than males 26.74%. The highest prevalence of RE 37.80% observed among primary educated patients followed by patients having secondary education or above 29.79% (42/141).

Table 2: Prevalence of RE among the studied patients (n=534) according to demographic characteristics

Variable	Refractive Error n(%)	X^2	P
Gender		6.39 [a]	0.012
Male	69(26.74)		
Female	102(36.96)		
Age/year		2.08	0.353
6-16	42(27.45)		
17-27	42(33.33)		
28-40	87(34.12)		
Education level		7.93	0.019
Illiterate	36(24.49)		
Primary	93(37.80)		
≥ Secondary	42(29.79)		
Total	171(32.02)		

[a] Extract fisher test.

Distribution of RE according to gender and education level were associated with statistical significance (P <0.05). The prevalence of RE increased with patients' age groups of study group (Table 2).

Demographic Distribution of RE Types

Figure 1 shows the overall prevalence of different types of RE among the studied patients. Myopia was the most prevalent error recorded 10.67% (57) followed by Myopic astigmatism, Hyperopic astigmatism, Mixed astigmatism and Hyperopia respectively. However, the prevalence rate of Astigmatism (all types) 18.54% (99) was higher in comparison to Myopia, or Hyperopia, or both of them.
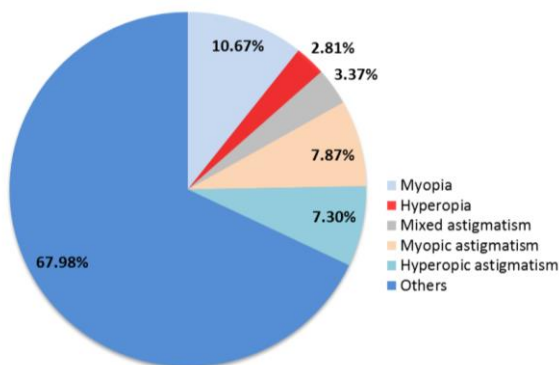

Figure 1: Prevalence of different types of RE among the studied patients (n=534)

Table 3 shows that the prevalence of Myopia, Hyperopic astigmatism, and Myopic astigmatism (10.87%, 9.78%, and 8.70% respectively) were higher among females

compared to males (9.47%, 4.21%, and 6.32% respectively). Distribution of RE types according to gender was associated with statistical significance (P <0.05).

Table 3: Prevalence of different types of REs according to gender of patients (n=534)

Refractive Errors	Gender Male (n=258) n(%)	Female (n=276) n(%)	Total	X^2	P
Myopia	27(9.47)	30(10.87)	57	11.78	0.04
Hyperopia	12(4.21)	3(1.09)	15		
Mixed astigmatism	0(0.00)	18(6.52)	18		
Myopic astigmatism	18(6.32)	24(8.70)	42		
Hyperopic astigmatism	12 (4.21)	27(9.78)	39		
Other [a]	189(66.32)	174(63.04)	363		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Table 4 shows distribution of types of RE according to education level. Myopic astigmatism had the highest prevalence rate among primary educated patients (13.41%) followed by myopia (12.20%). Among patients who had higher education level (≥ secondary level), Myopia was the highest prevalence error (14.89%). While, Prevalence of Myopia increased with education level of patients: 4.08%,12.20% and 14.89% for illiterate, primary education and secondary education or above patients, respectively. The prevalence of Mixed astigmatism and Hyperopic astigmatism decreased with education level of patients. Distribution of RE types according to education level was associated with statistical significance (*P* <0.05).

Table 4: Prevalence of the different types of REs according to education level of patients (n=534)

Refractive Errors	Education level Illiterate (n=147) n(%)	Primary (n=246) n(%)	≥Secondary (n=141) n(%)	X^2	P
Myopia	6(4.08)	30(12.20)	21(14.89)	34.97	<0.001
Hyperopia	6(4.08)	3(1.22)	6(4.26)		
Mixed astigmatism	6(4.08)	9(3.66)	3(2.13)		
Myopic astigmatism	6(4.08)	33(13.41)	3(2.13)		
Hyperopic astigmatism	12(8.16)	18(7.32)	9(6.38)		
Other [a]	111(75.51)	153(62.20)	99(70.21)		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Table 5 shows distribution of types of RE according to age. Myopia was the highest prevalent error among patients aged 6-16 years and patients aged 17-27 years (13.73% and 11.90%, respectively). For older patients (28-40 years), the most prevalent REs were Myopic astigmatism and Hyperopic astigmatism (9.41% for each). Distribution of RE types according to age categories was not associated with statistical significance (*P* < 0.05).

Table 5: Prevalence of the different types of REs according to age groups of patients (n=534)

Refractive Errors	Age/year			X²	P
	6-16 (n=153)	17-27 (n=126)	28-40 (n=255)		
	N(%)	N(%)	N(%)		
Myopia	21(13.73)	15(11.90)	21(8.24)	11.87	0.29
Hyperopia	3(1.96)	0(0.00)	12(4.71)		
Mixed astigmatism	0(0.00)	12(9.52)	6(2.35)		
Myopic astigmatism	9(5.88)	9(7.14)	24(9.41)		
Hyperopic astigmatism	9(5.88)	6(4.76)	24(9.41)		
Other [a]	111(72.55)	84(66.67)	168(65.88)		

[a] Other: Other diagnosis (not RE) include: Normal, Cataract, Glaucoma, Conjunctivitis, Pterygium, Diabetic Retinopathy etc.

Figure 2 shows the proportion of different types of REs among affected patients with RE. Most of them had Myopia (33.33%) and Myopic astigmatism (24.56%), while Hyperopia was the least recorded error (8.77%). Out of 171 affected patients with RE, 19% had positive family history of RE.
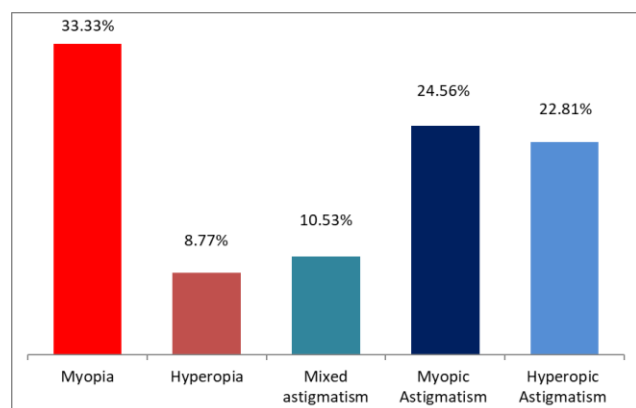

Figure 2: Proportion of different types of REs among affected patients (n=171)

4. Discussion

Refractive error (RE) is an established and significant public health problem. Uncorrected RE can lead to the development of unwanted complications such as squint and amblyopia which are difficult to treat once developed. Therefore, it is important that these are diagnosed and treated early. The present study provides a hospital-based data on the prevalence of REs among patients presenting to the ophthalmology OPD of TUWTH. Since different methods have been used to determine prevalence of REs in different studies, comparison of the results must be done with caution.

The overall prevalence of REs in the present study was 32% which is less than that found by Parrey et al. study which was conducted in Saudi Arabia for adults aged 16-39 years [16] and Sheeladevi et al study [17]. A hospital based study done in the North-East India by Natung et al [18] found that the over prevalence of RE was 55.56% which is much higher to that found in the present study. Another study done in Nigeria found that the prevalence of

RE was 44.6% [19], which is incomparable to the present study. Many factors can explain these variances such as different number of patients included in the study and used methods, race differences, life style, different developmental levels and access to health services. Many patients in our society consider glass wearing as a shame and many other patients do not aware that they have visual impairment specially those illiterates. These false beliefs prevent them to seek health services.

The most affected age group in this study was (28–40 years) which represent the working and productive individuals. If these errors are not corrected or the correction is inadequate, they can have immediate and long-term consequence such as lost educational and employment opportunities, lost economic gain for individuals, families and societies, and impaired quality of life.

The prevalence of REs correlated significantly with educational level in the present study indicating that an increase in studying activity could lead to increases in myopia and astigmatism occurrences. In this study the prevalence of REs among females was significantly higher than that among males which is similar to different studies done in other countries like Iran, Egypt, Saudi Arabia, Nigeria and India [20-24]. Dissimilar to this study gender did not correlate with the prevalence of REs in studies conducted in Chile [25] and Japan [26].

In the present study more than one third of patients aged 28-40 years (34.12%) had RE while the prevalence of RE among children (aged 6-16 years) was 27.45%. Several studies in different countries addressed the prevalence of RE among children. Some studies recorded prevalence rate close to that found in the present study as those studies conducted in Saudi Arabia (22%) and Egypt (24%) [27-28]. On the other hand, the prevalence of RE among children in Qatar (19.7%), Nepal (8.6%), India (13.09%), Ethiopia (3.5%), Uganda (11.6%) and Taiwan were lower than that of our study [29-34].

Similar to some other studies [35-38], Myopia was the predominant RE observed in this study, it represented about one third of all recorded errors. Although Myopia was the most prevalent RE among children (6-16 years) in the present study and other studies done in many countries for RE among schoolchildren aged 6-14 years such as Saudi Arabia, Malaysia , India , Jordan , and Qatar [39-43],   some researchers found that the most prevalent RE among this age group was hyperopia [27].

5. Conclusion

This study provides the hospital-based data on the prevalence rate of REs of patients attending the ophthalmology OPD at TUWTH in Dhamar Governorate, Yemen. REs are common and significant cause of visual impairment. About one third of patients have REs causing treatable visual impairment. Distribution of RE correlated significantly with gender and education level of patients, where females affected by RE more than males and

educated patients affected by RE more than uneducated patients. The preschool vision test should be considered, and periodic vision examination should be applied to detect vision problems as early as possible. Population based study is recommended to further estimate the magnitude of REs in Yemen.

Conflicts of interest
The authors declare that there are no conflicts of interest.

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Original Research

Pregnancy Associated Cancer in Yemen: An Observational Study

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Abstract

Background: Cancer in pregnancy is not uncommon and represents a complex problem requiring consideration for both the mother and fetus.

Aim: The objective of this study is to analyze the frequency, the clinical feature of cancer diagnosed during pregnancy and the obstetric outcomes.

Methods: This is a single-center, retrospective analysis of women who were diagnosed with cancer during pregnancy at Saudi Hospital Hajjah (SHH) between Jan 2016 and Dec 2017. Maternal sociodemographic, and obstetrical data including age, parity, gestational age at diagnosis, type, stage, symptoms and signs of cancer for each patient were retrieved from the hospital database.

Results: Among 32400 pregnant women seen in antenatal care clinic, there were 17 women diagnosed with cancer. The mean age of women was 33.94 ± 4.80 years, the mean gestational age was 26.88 ± 7.5 weeks and the mean parity was 4.0 ± 2. The most frequent cancer found was ovarian cancer (23.5%), gastrointestinal cancer (23.5%) and cervical cancer (17.6%). Stage II was the most frequently found in 9 women (52.9%). Therapeutic abortion was performed for 9 cases (52.9%) and induced preterm labor for 8 cases (47.0%). Among those induced birth, 6 fetuses were liveborn and 2 deaths. (25.0%). All patients were referred to specialized centers after delivery.

Conclusion: Based on these results, the incidence of cancer complicated pregnancy was 0.052 % (52.4/100000 pregnancies). Gynecological cancer such as ovarian, cervical and breast are more frequent and the gestational age at diagnosis is the most important factor both for the choosing the appropriate obstetrical management and also for the mother prognosis.

Keywords Cancer in pregnancy, Yemen, Outcome

1. Introduction

Pregnancy associated cancer (PAC) is uncommon but nowadays is increasing because there is a trend for women to delay child bearing [1]. Also, the increasing prevalence of obesity contributes to the increasing risk of several age-dependent malignancies [2]. PAC is defined as the cancer diagnosed from the first day of pregnancy to one year postpartum [3]. The incidence of PAC ranges from 0.02 to 0.1% (1:200 to 1 in 1000) of pregnancies [4].

Breast cancer, cervical, thyroid, melanoma, lymphoma and acute leukemia are the most common diagnosed malignancies during pregnancy [5,6]. Coexistence of cancer with pregnancy is a complex and challenge in terms of diagnosis and treatment as both mother and fetus are affected.

The diagnosis of PAC is frustrating for many reasons: firstly, earlier detection of cancer seems difficult because they are often asymptomatic, even if symptoms and signs do appear, they may be overlapped with the signs and symptoms of normal pregnancy. Fatigue, nausea and vomiting are common in the first trimester of normal pregnancy. Additionally, breast tenderness and engorgement make palpable lump is difficult and small lump might be confused with breast engorgement [7,8]. Slight rectal bleeding could be overlooked or attributed to hemorrhoids which are common in pregnancy. Secondly, some diagnostic tools are not always safe. For example, X-ray, CT scan, and to lesser extent magnetic resonance

imaging (MRI) should be avoided during the first trimester [9,10]. Gadolinium used with CT scan found to cross placenta resulting in high fetal concentration and therefore, it is contraindicated [11,12]. Moreover, nuclear medicine such as positron emission tomography (PET), bone scan and thyroid scanning are contraindicated [13]. Finally, tumor markers such as α-fetoprotein, hCG, CA– 125 among others are elevated in pregnancy thus, have no diagnostic value and should not be used during pregnancy [13].

In Yemen as well as many other countries, there is no local data about the size of PAC problem, and there has been limited experience in the management of this clinical situation. The objective of this study is to analyze the frequency and clinical features of PAC in a single-center.

2. Methods

This is a retrospective study conducted in Saudi Hospital Hajjah (SHH) carried out between Jan 2016 and Dec 2017. The hospital records of pregnant women who diagnosed with cancer were reviewed and the medical charts of those women were retrieved. Women who had cancer before pregnancy or developed cancer after delivery was excluded from this study.

Maternal age, parity, gestational age at diagnosis, and the type, stage, symptoms and sings of cancer were retrieved from the patients' charts. The cancers were grouped into ovarian, cervical. gastrointestinal, breast, hematologic and thyroid cancers. Each cancer was staged initially according to the universal staging system. Obstetrical management was classified into two approaches; 1) termination of pregnancy (TOP) defined as therapeutic abortion before fetal viability (24 weeks of gestation) for the purpose of acceleration of cancer management; 2) Iatrogenic (induced) preterm labor (IPL) after fetal viability and then immediate referral for comprehensive management. Pregnancy outcomes included abortion, preterm delivery, sex and birth weight of the neonates, and perinatal mortality were identified.

Data analysis
Data analysis was performed using SPSS statistical version 21. Evaluated variable were analyzed using descriptive statistics. Data are shown as frequencies, mean ± standard deviation (SD) and percentage.

3. Results

There were 17 cases diagnosed with cancer during pregnancy giving prevalence as 0.052%. The most common cancer was ovarian cancer (n=4), and gastrointestinal (n=4), followed by cervical (n=3), hematologic (n=2), breast (n=2), and thyroid (n=2). The site, type, and clinical presentation are described in Table 1. The mean age of patients is 33.94±4.87 years and gravidity between 2-5 was the most frequently affected accounted for 70.6%. The stage II was observed among 52.9% (9/17), Table 2.

Table 1: Site, type and clinical presentation of women having PAC

Site	Type	Clinical features
Ovarian (n = 4)	Serous (n = 2)	Accidently mass by US [4]
	Mucinous (n = 1)	Minimal ascites [2]
	Dsygerminoma (n = 1)	
GIT (n = 4)	Gastric adCa (n = 1)	Nausea, vomiting [3], indigestion [2]
	HCC (n = 2)	Jaundice [2], abdominal pain [2]
	CRC (n = 1)	palpable mass [2], loss of weight [3], bloody stool (1), diarrhea [2]
Cervical (n = 3)	SCC (n = 2) adCa (n = 1)	Vaginal bleeding [2], contact bleeding [3], non-specific
Hematology (n= 2)	HL (n = 2)	Neck swelling [2], dyspnea [1], sore throat [1], wt. loss [2], fever, chills [2]
Breast (n = 2)	Ductal Ca (n = 2)	Palpable lump [2], bloody nipple discharge [1]
Thyroid (n = 2)	Papillary nodCa (n = 2)	Accidental thyroid nodule left [2]

HCC: Hepatocellular carcinoma, CRC: Colorectal carcinoma, US: ultrasound; SCC: Squamous cell carcinoma, adCa: Adenocarcinoma, HL: Hodgkin`s lymphoma, nodCa: nodular carcinoma.

Table 2: Characteristics of women with PAC

Variable	Frequency	%
Age (year)	33.94±4.8	
Gravidity		
Primigravida	1	5.9
2 –5	12	70.6
> 5	4	23.5
Gestational age (week)		
First trimester	1	5.9
Second trimester	8	47.0
Third trimester	8	47.0
Staging		
I	2	11.8
II	9	52.9
III	1	5.9
IV	0	0.0
N/A	5	29.4

Table 3: Distribution of women with PAC according to the obstetric variable

Cancer histology	Age	Gravidity	Gestational age	Stage
Ovarian				
Serous	40	4	26	IIb
Serous	38	5	35	IIa
Mucinous	39	3	34	Ic
Dysgerminoma	21	1	19	IIa
GIT				
Gast adCa	39	9	25	N/A
HCC	35	4	18	II
HCC	27	3	32	III
CRC	38	6	36	N/A
Cervical				
SCC	36	2	33	Ib1
SCC	29	2	27	IIb1
AdCa	34	3	34	IIa
Hematology				
HL	30	4	17	N/A
HL	38	7	21	N/A
Breast				
Ductal	32	2	32	II
Ductal	36	3	12	N/A
Thyroid				
Papillary	33	6	34	II
Papillary	36	5	22	II

The distribution of cancer type according to the obstetric variables is shown in Table 3. The mean gestational age is

26.88± 7.5 weeks. Therapeutic abortion was carried out for 53% while induced preterm birth was performed for 47% of patients. Table 4 describes the obstetric management and outcomes.

Table 4: Obstetric management and outcome

Variable	Value
Mean gestational age (week)	26.88 ± 7.5
Therapeutic abortion	9 (53 .0)
Induced preterm delivery	8 (47.0)
Cesarean section	4 (23.5)
Vaginal delivery	4 (23.5)
Gender	
Male	3 (17.60)
Female	5 (29.40)
Birth weight (g)	2225 ± 755
Perinatal mortality	2 (25.0)

Data presented as n (%) or mean ± SD.

4. Discussion

Based on the findings of this study the incidence of PAC is 0.052% (52.4 per 100000) pregnancies. The most frequent PAC in this study was the ovarian cancer (OC). Gastrointestinal tract (GIT), cervical, breast and hematological cancers ranked as the other most common types of cancer. Although malignancy during pregnancy can arise from any site, the most common cancer reported are breast, cervical, lymphoma, ovarian cancer and melanoma [14,15,16]. It is reported in most studies that the incidence of ovarian malignancy among all adnexal tumors detected by ultrasound during pregnancy is 1: 15000 to 1: 32000 [17], which is lower than that noted in our study (> than2: 15000). We have no local data to compare both the actual rate as well as the trend, however, the genetic and environmental factors in our setting could contribute to this difference.

The high frequency of OC in this study could be explained by the wide use of ultrasound during antenatal care for evaluating the pregnancy and fetal status therefore, the accidentally finding of adnexal mass is increasing as supported by another study [18]. In review of the literature, up to one third of OC during pregnancy were identified incidentally by ultrasound, making it the most common method of tumor detection [19,20]. Results of this study showed the most histologic type of OC was epithelial ovarian cancer (EOC) 75% and germ cell dysgerminoma (25%), and most patients (75%) had stage II. These findings are in contrast to other studies reported the most common OC during pregnancy are non-epithelial germ cell, sex-cord and tumors of low malignant potential [21,22,17]. These differences could be explained by the relatively older age of women (mean = 39 years), by asymptomatic characters of these cancers and lack of women`s periodic health check-up. However, other unknown risk factors could be present and further larger studies are required.

In the present study, 50% of patients with OC had induced preterm labor (IPL) and had live birth. The result of this study shows that 17.6% of all PAC were cervical cancers with mean age of 33 years indicating an increase of the prevalence of cervical cancer (CC) among younger women which could be attributed to the advancement in the diagnostic methods and early age of the first sexual activity. Generally, the incidence of CC during pregnancy is 0.1 to 12 / 10000 births [23] and at least 1 – 3% of all CC are diagnosed in pregnancy [24]. In our situation, Pap smear is not routinely performed in most centers during prenatal check-up thus, this test is strongly recommended for each pregnant woman unless screening has been recently updated. Taking in account that at least 5 – 8 % of cervical cytology during pregnancy are abnormal [24], we suggest that the pregnancy is the best time for obstetrician to make early diagnosis of abnormal cervix.

The current study found one pregnant patient had advanced gastric cancer (GC) at 25-week gestation. Termination of pregnancy was decided and referred for further management. GC during pregnancy is very rare accounting for only 0.025% to 0.1% of all pregnancies [25]. While most patient are middle aged or elderly, approximately 10% are under 45 years of age [26]. The diagnosis of GC is often delayed during pregnancy due to non-specific symptoms that are similar to that of the normal pregnancy, invasive endoscopy and biopsy are often deferred either by physician or patient, and tumor marker such as α-fetoprotein is increased during pregnancy [27]. The prognosis of GC during pregnancy is poor [28].

Breast cancer (BC) is the second most common cancer diagnosed in pregnancy and post-partum. It occurs in approximately 1 in3000 pregnant women. The average age is between 32 to 38 years old [29], and the incidence is likely increasing. BC in pregnancy is often present in advanced stage since small lump cannot be easily detected due to natural tenderness and engorgement during pregnancy [30]. The present study found two women with BC, in advanced stage and their average age was 34 years old. Breast ultrasound is the ideal diagnostic tools because it can distinguish between cystic and solid mass along with axillary lymph node evaluation without risk of radiation exposure [4]. Breast MRI during pregnancy is not yet evaluated and mammography is associated with a high rate of false negative and low sensitivity [4]. The definitive diagnosis is achieved by tissue biopsy which should be performed for any clinically suspicious lump [4].

Hepatocellular carcinoma (HCC) is extremely rare during pregnancy, since 1957 less than 50 cases have been reported worldwide [31] but must be considered in population with a high prevalence of exposure to hepatitis B virus (HBV). The results of this study found 2 cases with HCC, one of them diagnosed before 20 weeks gestational age and the another after 30 weeks, both of them have advanced disease at diagnosis and one patient had history of long use of combined contraceptive pill more than 12 years. Moreover, it is noted that this hospital serves patients mainly from plains of Hajjah and Al Hudaydah governorates where there are many instances of HBV prevailed.

The first case of colorectal carcinoma (CRC) during pregnancy was diagnosed in 1842 [32] and fewer than 350 cases have been reported till now [33]. The incidence of CRC is 1 in 13000 gestations (34), and the mean age was 31 years [35] with range of 16 – 48 years [36]. For its rarity, there is a limited experience on the management of CRC during pregnancy. The current study found one patient with CRC aged 39 years and virtually at 36 weeks of gestation.

Lymphoma is the fourth most frequent cancer seen in pregnancy with Hodgkin lymphoma (HL) being more commonly seen compared with non-Hodgkin lymphoma (NHL) perhaps because HL generally occurs in younger adulthood [37] and approximately 3% of HL are pregnancy associated [13]. Despite the symptoms which might be confused with that of normal pregnancy such as dyspnea and hyper metabolism, HL in pregnancy is mostly first diagnosed at about the same disease stage as in non-pregnant patients [13]. This study found two pregnant women with HL during early second trimester. TOP was performed and referred for proper staging and management.

Thyroid cancer (TC) is the most frequent endocrine malignancy, usually detected in women of child bearing age and about 10% of TC are diagnosed during pregnancy or early after delivery [38]. At present, there are still no reliable data available supporting a specific management of pregnancy associated TC. During pregnancy, patient with TC do not require surgery except in case of rapid nodular growth, and / or the appearance of lymph node metastasis [38]. Two patients found in this study with TC, at 34- and 22-weeks gestations, one delivered vaginally alive female 2.4 kg, while TOP was performed for another patient.

Generally, when PAC is diagnosed, coordination of team approach is required and the most important step is deciding whether to terminate or continue the pregnancy. This major decision depends on the gestational age, stage and type of cancer, the treatment option, and the mother`s wish [38]. However, the treatment of PAC is beyond the scope of this study because the hospital is an emergency one, and all patients were referred to specialized centers which considered a major limitation of this study.

5. Conclusion

Coexistence of malignancy during pregnancy represents two opposite phenomena, the developmental of a new life one and life threatening of the other one. Cancer complicating pregnancy is a rare health problem but needs more attention to differentiate between the signs and symptoms of pregnancy and those related to cancer. Missing such recognition could lead to delay of the cancer management and therefore poor prognosis.

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Original Research

Dyslipidemia and Atherogenic Index of Plasma among Type 2 Diabetes Mellitus in Dhamar, Yemen

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Abstract

Background: Dyslipidemia is a recognized major risk factor leading to atherosclerotic cardiovascular disease (CVD) in patients with type2 diabetes mellitus(T2DM). Atherogenic index of plasma (AIP) is expected to be excellent lipid index for predicting CVD.
Aim: This study was aimed to evaluate the prevalence of dyslipidemia and determine atherogenic index of plasma (AIP) among T2DM patients in Dhamar city, Yemen
Methods: This was a cross- sectional study carried out on T2DM patients visiting the outpatient's clinics at public and private hospitals in Dhamar city during the study time. A total of 365 patients were enrolled in this study. Sociodemographic and clinical data were obtained using pretested questionnaire. Blood samples were withdrawn after overnight fast; blood sugar and lipid profiles were spectrophotometrically analyzed.
Results: The overall prevalence of dyslipidemia was found to be 68.5 %. An elevated serum total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), low high-density lipoprotein (HDL) and High non-HDL-C were detected in 32.1 %, 38.6 %, 18.6 %, 26.6% and 36.8% of study subjects, respectively. Multivariable logistic regression revealed significant independent association between dyslipidemia and male diabetic patients (AOR = 1.98; CI = 1.11-3.53; $P = 0.021$), unemployed (AOR = 2.077; CI% = 1.15-3.77; $P = 0.016$) and patients with mean FBS >180 mg/dl (AOR = 2.39; CI% = 1.29-4.42; $P = 0.005$), respectively. Regarding of AIP, the results showed that 78.36 % of diabetic patients had high risk, 10.68% had a moderate risk and 10.96 % had low risk levels of AIP. Accordingly, AIP was found to be positively correlated with BMI (r = 0.105; $P = 0.044$), LDL-C (r = 0.138; $P = 0.008$), and non-HDL-C (r = 0.316; $P < 0.001$).
Conclusion: The prevalence of dyslipidemia is high among type2 diabetic patients and the majority are at high risk level of AIP. Therefore, an effective screening and therapeutic processes is required to manage dyslipidemia and to protect its serious complication in diabetic patients.

Keywords: Diabetes, Dyslipidemia, Atherogenic index, Yemen

1. Introduction

Diabetes mellitus prevalence has increased steadily throughout the world and expected to further increase to 9.9% representing 628.6 million individuals by the year 2045 [1]. Atherosclerotic cardiovascular disease remains the principal cause of death and disability among patients with diabetes mellitus. It has been reported that atherosclerosis in patients with type 2 diabetes mellitus occurs earlier with greater severity compare to individuals without diabetes mellitus [2,3]. Multiple

factors include obesity, hypertension, dyslipidemia, oxidative modification of lipoproteins and insulin resistant contribute to the accelerated atherosclerosis in diabetes [4].

Dyslipidemia is defined as abnormality in any one of the serum lipids profile including TC, LDL-C, HDL-C, and TG. It is a modifiable risk factor for cardiovascular disease and commonly associated with Diabetes mellitus. Previous study found that lipid abnormalities affecting 60% to 70% of type 2 diabetes mellitus (T2DM) [5]. The mechanism of dyslipidemia in T2DM is mediated by insulin resistance causes increased free fatty-acid release from fat cells into the liver which in turn stimulates triglyceride production and secretion of apolipoprotein B (Apo-B) and very low-density lipoprotein cholesterol (VLDL-C) [6]. Combination of Hypertriglyceridemia and increased VLDL-C particles alter the lipid exchange between VLDL-C and high-density lipoprotein cholesterol (HDL.C) leading to increased production of atherogenic small dens LDL.C and small size HDL-C [7,8].

The contribution of lipid abnormalities and atherosclerosis have long been studied. Several studies found association between cholesterol, LDL-C, and low HDL-C with atherosclerosis [9,10]. On the other hand, epidemiological and clinical studies have shown that elevation of TG and decreasing HDL-C level in association with elevated Apo-B and small dense LDL-C particles, is strongly predictive of coronary heart diseases (CHD) [11,12]. Recently an increasing number of studies have found that Lipid ratios or atherogenic indices such as Castelli's Risk Index-I and II (CRI-I &II), atherogenic index of plasma (AIP), atherogenic coefficient (AC), and non-HDL-C fraction (non-HDL-C) are valuable predictors of CVD risk better than traditional lipid profiles measurement [13,14,15]. Among those atherogenic indices, AIP which is defined as logarithm [log] of the ratio of plasma concentration of TG to HDL-C was demonstrated to be a sensitive marker associated with HDL-C, LDL-C, and VLDL-C particle sizes and predicted the CVD risk [16,17].

Given the fact that diabetic dyslipidemia has received much attention over the last two decades worldwide. There is also high prevalence of dyslipidemia in developing countries due to urbanization, changing lifestyle, and food habits. In Yemen, this issue has not been dealt with in depth. Additionally, no previous study, to the best of our knowledge, has studied burden of AIP among type 2 diabetes. Therefore, this study was designed to evaluate the prevalence of dyslipidemia and determine the patterns of atherogenic index of plasma (AIP) among type 2 diabetes mellitus patients in Dhamar city, Yemen.

2. Methods

Study design
This was a cross sectional study carried out in Dhamar City, Dhamar Governorate, located 100 km away to the

south from Sana'a, capital of Yemen. The study was conducted on T2DM patients attending outpatient clinics in Dhamar General Hospital, Dr. Mohammed Almusaly Hospital and Taiba Consultative Hospital, during a period from February to July 2019. Patients participated in this study were already diagnosed during their previous routine visit, as type 2 diabetic based on American Diabetic Association (ADA) criteria [18]. A total of 365 diabetic patients were selected randomly. All subjects were informed of study proposes and written consents were obtained from them. The sample size was calculating based on 39% global prevalence of hypercholesterolemia [19]. Confidence level of 95% with margin of error of 5% and significance level of 0.05 were considered in this study. The including criteria was T2DM patients (male and female) willing to participate in the study. Patients with type 1 diabetes, cardiac failure, renal failure and those who are not willing to participates were excluded.

Data collection
A semi-structured questionnaire was used to collect data on sociodemographic characteristics, life style, and clinical history of the patients. The patients were requested to present the FBS reports of the previous three months. Anthropometric measurements including body weight, height, and blood pressure were carried out by trained nurses. Body mass Index (BMI) was calculated as weight in kg/(height in meters)^2. Subjects were categorized according to their BMI as the criteria of World Health Organization (WHO) and cut-off point for obesity is accepted as BMI > 29.9 kg/m2 [20]. Blood pressure was measured in sitting position after 10 minutes rest on right arm using standard mercury sphygmomanometer [21].

Serum Lipid and glucose analysis
Blood samples were collected from all participants after an overnight fasting. Fasting blood sugar, TC, HDL-C and TG were measured using commercially available reagents on COBAS INTEGRA 400 analyzer Roche Diagnostics. LDL cholesterol was calculated according to Friedewald's formula [22].

Definition of variables
Lipid abnormalities were defined as TC >200 mg/dl, TG >150 mg/dl, LDL-C >130 mg/dl, HDL-C <40 mg/dl and non-HDL-C < 150 mg/dl according to the criteria set by the National Cholesterol Education Program-Adult Treatment Panel III (NCEP ATP III) [23]. Atherogenic index was calculated by using the following formula: $\log_{10}$ (TG/HDL-C). It can be classified according to the risk predictions of CVD as: low risk (<0.1), medium risk (0.1 to 0.24) and high risk (> 0.24) [24]. Physical activity was defined as > 90 minutes per week of regular exercise or occupational physical activity [25].

Data analysis
Data were analyzed using Statistical Package for Social

Science (SPSS) version 23. Categorical variables were expressed as frequencies and percentages. Continuous variables were presented as mean ±S.D. and were compared using one-way ANOVA. Multiple logistic regression analysis was used to find out independent association between dyslipidemia and various risk factors. Adjusted odds ratio (AOR) and 95% confidence intervals were calculated. Pearson correlation was used to evaluate the correlation between AIP and other variables. P <0.05 was considered to be statistically significant.

3. Results

General characteristics of the study population
General characteristics of diabetic patients participated in this study are shown in Table 1.

Table 1: General characteristics of the type 2 diabetes mellitus (T2DM) patients participated in this study (n=365)

Variable	Frequency (%)
Age (year)	
<50	146 (40.0)
≥ 50	219 (60.0)
Resident	
Urban	287 (78.6)
Rural	78 (21.4)
Gender	
Male	177 (48.5)
Female	188 (51.5)
Occupation	
Employed	154 (42.2)
Unemployed	211 (57.8)
Hypertension	
Yes	131 (35.9)
No	234 (64.1)
Diabetic duration/ year	
<5	258 (69.3)
>5	112 (30.7)
Mode of treatment	
Diet	70 (19.2)
OAHGA	295 (80.8)
FBS status (mg/dl)	
<126	137 (37.5)
126-180	121 (33.2)
>180	107 (29.3)
BMI (Kg/m2)	
Normal	138 (37.8)
Over weight	143 (39.2)
Obesity	84 (23.0)
Diabetic State	
<180	198 (54.2)
≥ 180	167 (45.8)
Physical activity	
Active	133(36.4)
Inactive	232 (63.6)
Smoking	
Yes	150 (41.1)
No	215 (58.9)

The mean age was 51.3±12, about half (51.5%) of the study participants were female, 60% were ≥ 50 years, 78.6% were urban, 57.8% were unemployed, 35.9% were hypertensive patients, 69.3% were with diabetic duration <5 years and 80.8% were using oral antihyperglycemic agents. The distribution of BMI of the study population were 37.8% normal, 39.2% overweight and 23.0% obese. Status of FBS was calculated as a mean of results obtained through last three months. Based on the mean of FBS levels, 37.5% of the diabetic patients had normal levels (<126 mg/dl), 33.2% had levels between 126 and 180 mg/dl and 29.3 % had mean FBS above 180 mg/dl. About two third of the participants were physically inactive and 41.1% were smokers.

Prevalence and patterns of dyslipidemia among diabetic patients
The overall prevalence of dyslipidemia (at least one lipid profile abnormal) among T2DM patients in this study was 68.49% Figure 1. The patterns of dyslipidemia as shown in the Figure 2 indicating that 32.1% of diabetic patients were presented with hypercholesterolemia, 38.6 were having hypertriglyceridemia, 18.6 were having high LDL.C 26.6% were having low HDL.C, and 36.8% of the study population had high non-HDL-C. The highest lipid abnormalities in type 2 diabetes were triglyceride, followed by non-HDL-C and the lowest was LDL.C.

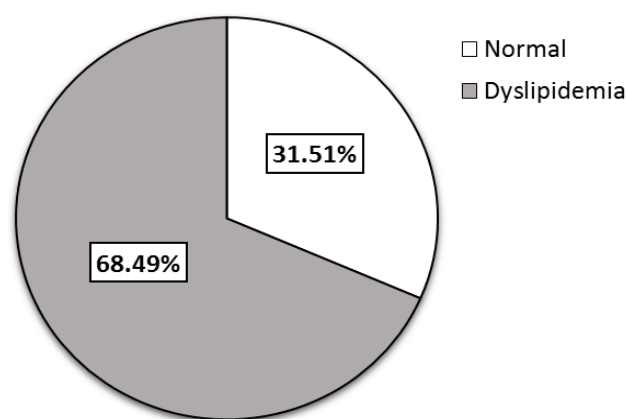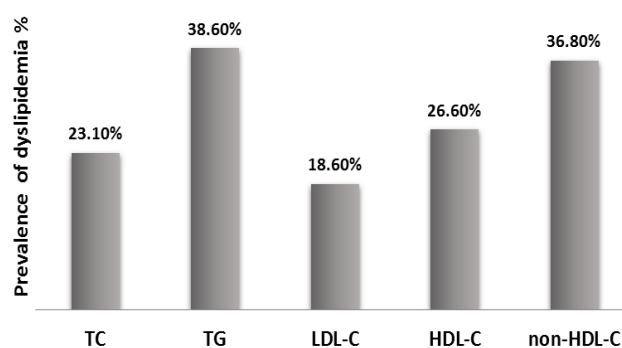**Figure 1: Prevalence of dyslipidemia among T2DM patients in Dhamar city, Yemen**

Figure 2: Patterns of dyslipidemia among type2 diabetic patients in Dhamar city, Yemen

Associations of socio-demographic characteristics and cardiovascular disease risk factors with dyslipidemia
Associations of socio-demographic characteristics and cardiovascular disease risk factors with dyslipidemia is

shown in Table 2. Multivariate logistic regression exhibited the independent risk factors associated with dyslipidemia. The results indicated that diabetic patients being male (AOR = 1.98; CI = 1.11-3.53; *P* = 0.021), unemployed (AOR = 2.08; CI = 1.15-3.77; *P* = 0.016) and with mean FBS more than 180 mg/dl (AOR = 2.39; CI=1.29-4.42; *P* = 0.005) were significantly associated with higher prevalence of dyslipidemia. Diabetic patients with mean FBS 126-180 md/dl and patients were not using oral antihyperglycemic agent and depend on diet for controlling their blood sugar were more likely to develop dyslipidemia (AOR = 1.36; CI = 0.78-2.38; *P* = 0.29 and AOR = 1.60; CI = 0.85- 3.00; *P* = 0.145, respectively). Patients with duration of diabetes more than five years (AOR = 0.41; CI = 0.24-0.70; *P* =0.001) and overweight diabetic patient (AOR = 0.53; CI = 0.31-0.91; *P* = 0.020) seemed to have significant less probability of developing dyslipidemia. Hypertension, smoking and physical activity were found to be not associated with dyslipidemia in this study population.

Level of lipid profiles and AIP based on glycemic status of diabetic patients

Level of lipid profiles and AIP in different glycemic status are summarized in Table 3. In comparison with diabetic patients having mean FBS less than 126 mg/dl, those with mean FBS more than 180 mg/dl were presented with high total cholesterol (189 ± 60, *P*= 0.001), high LDL-C (102 ±52; *P* = 0.012) and high non-HDL-C (132 ± 57; *P* = 0.006). In contrast, TC, TG, LDL-C, non-HDL-C, AIP in diabetic patient's category with FBS between 126 and 180 mg/dl were not showing significantly higher levels in compression to patients with mean FBS less than 126 mg/dl. Accordingly, all lipid profiles except TC and HDL-C were not statistically differ among diabetic patients in the categories mean FBS 126-180 and >180 mg/dl.

Patterns of atherogenic index of plasma (AIP) among type2 diabetes mellitus patients

Atherogenic index of plasma is shown in the Figure 3. According to the concentration of AIP patients were classified into three categories. Low risk (AIP < 0.10), medium risk (AIP = 0.10-0.24) and high risk (AIP > 0.24). The results showed that 78.36 % of diabetic subjects had high risk level of AIP, 10.68% had a moderate risk level of AIP and 10.96 % had low risk level of AIP.

Table 2: Associations of socio-demographic characteristics and cardiovascular disease risk factors with dyslipidemia

Variable	Dyslipidemia Prevalence n (%)	Univariate Analysis		Multivariable Analysis	
		OR (CI%)	*P*	OR (CI%)	*P*
Age (years)					
< 50	103 (70.5)	Ref.		Ref.	
≥ 50	147 (67.1)	0.85 (0.54-1.34)	0.490	0.82 (0.49-1.36)	0.438
Resident					
Rural	127 (71.8)	Ref.		Ref.	
Urban	193 (67.2)	0.76 (0.43-1.32)	0.327	0.87 (0.48-1.59)	0.653
Gender					
Female	123 (65.4)	Ref.		Ref.	
Male	127 (71.8)	1.34 (0.86-2.09)	0.194	1.98 (1.11-3.53)	0.021*
Occupation					
Employed	102 (66.2)	Ref.		Ref.	
Unemployed	148 (70.1)	1.20 (0.77-1.87)	0.428	2.08 (1.15-3.77)	0.016*
Hypertension					
No	162 (69.7)	Ref.		Ref.	
Yes	88 (67.2)	0.91 (0.58-1.44)	0.685	0.82 (0.49-1.37)	0.447
Mode of treatment					
AHGA	198 (67.1)	Ref.		Ref.	
Diet	52(74.3)	1.42 (0.79-2.55)	0.247	1.60 (0.85-3.00)	0.145
FBS (mg/dl)					
< 126	86 (62.8)	Ref.		Ref.	
126 -180	82 (67.8)	1.25 (0.75-2.09)	0.401	1.36 (0.78-2.38)	0.285
> 180	82 (76.6)	1.95; 1.10-3.43)	0.021*	2.39 (1.29-4.42)	0.005*
Diabetic duration (years)					
< 5	184 (72.7)	Ref.		Ref.	
> 5	66 (58.9)	0.54 (0.34-0.86)	0.009*	0.41 (0.24-0.70)	0.001*
Physical activity					
Active	89 (66.9)	Ref.		Ref.	
Inactive	161 (69.4)	1.12 (0.71-1.77)	0.624	1.17 (0.71-1.93)	0.541
BMI					
Normal	104 (75.4)	Ref.		Ref.	
Over weight	86 (60.1)	0.49 (0.30-0.82)	0.007*	0.53 (0.31-0.91)	0.020*
Obesity	60 (71.4)	0.82 (0.44-1.51)	0.518	0.97 (0.51-1.85)	0.925
Smoking					
Non smoker	147(68.4)	Ref.		Ref.	
Smoker	103 (68.7)	1.01 (0.65-1.59)	0.952	0.96 (0.59-1.57)	0.869

FBS: Fasting Blood Sugar; BMI: Body Mass Index; AHGA: Oral Antihyperglycemic Agents
*Significant association (*P* <0.05); OR (CI%): Odd Ratio (Confidence Interval%)

**Table 3: Fasting blood sugar status and lipid profiles in the study population**

Parameters	Glycemic status			Significance level
mean ± SD	<126 mg/dl	126-180 mg/dl	>180 mg/dl	
TC	168 ±45	185 ± 48	189 ± 60	P^a = 0.560, P^{b*} = 0.001, P^{c*} = 0.007
TG	142 ±73	152 ±76	153 ±72	P^a = 0.883, P^b = 0.223, P^c = 0.270
LDL.C	86 ± 46	94 ±48	102 ±52	P^a = 0.218, P^{b*} = 0.012, P^c = 0.197
HDL.C	53 ± 28	60 ± 29	56 ± 25	P^a = 0.250, P^b = 0.351, P^{c*} = 0.029
non-HDL.C	114 ± 47	124 ± 47	132 ± 57	P^a = 0.218, P^b = 0.006*, P^c=0.120
AIP	0.43 ± 0.29	0.41 ± 0.29	0.43 ± 0.26	P^a = 0.332, P^b = 0.954, P^c = 0.330

P^a= difference between <126 mg/dl and 126-180 mg/dl categories
P^b = difference between <126 mg/dl and >180 mg/dl categories
P^c = difference between 126-180 mg/dl and >180 mg/dl categories
*Significant difference (P <0.05)
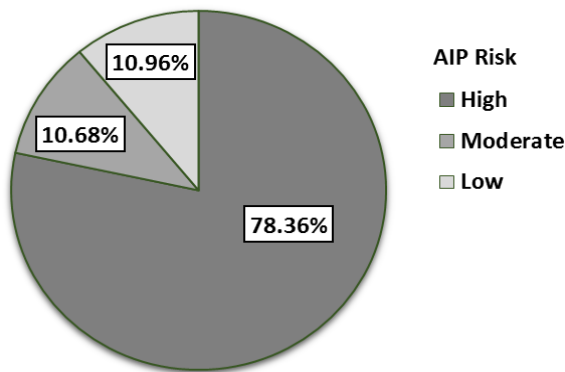
Figure 3: Patterns of Atherogenic Index of Plasma (AIP) among T2DM Patients in Dhamar, Yemen

Correlation of AIP with dyslipidemia and CVD risk factors

Correlation analysis revealed that AIP was positively correlated with BMI (r=0.105; P = 0.044), LDL-C (r=0.138; P = 0.008) and non-HDL-C (r=0.316; P < 0.001). On the other hand, this study found that there was no significant correlation of AIP with patients age, duration of diabetes mellitus and status of FBS.

Table 4: Correlation of AIP with lipid profiles and CVD risk factors

Risk factors	AIP Pearson Correlation (r)	P value
Age	-0.051	0.335
Diabetic duration	-0.057	0.277
BMI	0.105	0.044*
FBS	-0.030	0.565
TC	-0.052	0.325
LDL-C	0.138	0.008*
non-HDL-C	0.316	< 0.001*

*Significant correlation (P < 0.05)

4. Discussion

Dyslipidemia is a recognized major risk factor leading to atherosclerotic cardiovascular disease (CVD) and its treatment has been shown to reduce the incidence of CVD morbidity and mortality. The present study revealed a critical information on the patterns of dyslipidemia and AIP among T2DM patients in Dhamar, Yemen. The present study showed that the overall prevalence of dyslipidemia among Yemeni T2DM patients in Dhamar was 68.49%. This result is lower than studies carried out in Jordan(90%) [26] and Thailand (88.9%) [27]. On the other hand, the prevalence of dyslipidemia in this study was comparable to the data from Emirates (72.5%) [28]

and China (67.1%) [29]. Concerning the patterns of dyslipidemia, this study indicated that 38.6% of study population had hypertriglyceridemia, 32.1% had hypercholesterolemia, 26.6 % had low HDL-C, 18.6% had high LDL-C and 36.8 % had High non-HDL-C. The prevalence of hypercholesterolemia in this study was consistent with rate reported in Thailand (35.1%), Bangladesh (35.69%), UAE (36%), Kuwait (37%), Oman (35%) and higher than Qatar (29%) and previously reported in Yemen (12%) [27,30,31].

Hypertriglyceridemia is common manifest of type 2 diabetes patients [6]. In this study hypertriglyceridemia (38.6%) was comparable with data from other studies [27,29,30]. High LDL-C in this study (18.6%) was lower than that reported from Ethiopia (43.8 %) [32], Bangladesh (72.92%) [30] and Thailand (56.5%) [27]. The low level of HDL-C (26.6%) among the study population was comparable with the results reported from Indonesia (23%), and lesser than that in Saudi Arabia (48.7%) Thailand 47.1% Philippines (71.3%) and Jorden (83.9%) [26,27,33].

The variations between the present study and those studies may have been due to socioeconomic status, lifestyle, race/ethnic and genetic factors. Previous study among Iranian population indicated that the prevalence of hypercholesterolemia was 11.4%, hyper-low-density lipoprotein cholesterol was 9.6%, hypertriglyceridemia was 25% and hypo-high-density lipoprotein was 34.3% [34]. A report of the National Health and Examination Survey (NHANES) from 2003–2006 estimated that 53% of U.S. adults have dyslipidemia, 27% have high LDL-C, 23 % have low HDL-C, and 30% have high TG [35]. Furthermore, the dyslipidemia in Western populations is predominantly characterized by high levels of LDL-C, while in Asia and the Middle East population there is evidence of a predominance of low levels of HDL-C, as well as an increased prevalence of hypertriglyceridemia [33].

The multivariate analysis showed significant independent association between dyslipidemia with sociodemographic. Male diabetic patients, unemployed, and patient with FBS > 180mg/dl were significantly associated with higher prevalence of dyslipidemia. Association of gender with dyslipidemia have been reported in many studies. Prevalence of the hyperlipidemia is reported to be more in male populations than female population [28]. Our findings appear to be well controverted by previous systemic

review conducted on adult population of gulf countries from 1999 to 2004 reported that hypercholesterolemia was higher in females [31]. Unemployed diabetic patient in this study were found to be more disposed to dyslipidemia. The reasons for high dyslipidemia prevalence in these patients can be explained by stress, sedentary life style and level of education which plays an important role in disease management for those people.

Consistent with previous study fasting plasma glucose > 180 mg/dl was found to be risk factor of dyslipidemia. Abundant epidemiological data support the association between hyperglycemia, dyslipidemia and increased risk of cardiovascular diseases [5,6]. Hyperglycemia is intrinsically linked to insulin resistance, which facilitates hyperlipidemia by converting excess carbohydrates into free fatty acids (FAs) and TG which finally leads to increased production of VLDL-C and other atherogenic subtypes of lipoproteins [6,7]. Obesity has been reported to be one of risk factors for dyslipidemia [26-28]. Different mechanism behind the obesity and abnormalities in lipid metabolism; Increased visceral and subcutaneous waist adipose tissues, insulin resistance and poor physical activity among diabetic obese patients are associated with abnormal lipoprotein levels [28]. Unlike other research carried out in this area our result shows that overweight diabetic patients are significantly less likely to have dyslipidemia.

For many years research has tended to focus on LDL-C levels as objective to prevent atherothrombosis and plaque rupture, which portend high CV morbidity and mortality rather than other types and subtractions which recently have also been implicated in the atherogenic process. The ratio of triglycerides to HDL-cholesterol ratio (TG/HDL-c) correlates inversely with the plasma level of small, dense LDL and HDL-C subtraction. Moreover, recent evidence demonstrated that atherogenic index of plasma (AIP) strongly predicting the risk of cardiovascular diseases and extensive coronary heart disease among all the lipid variables examined [16,36]. In our study we found that 78.36% of diabetic subjects had high risk level of AIP, 10.68% had a medium risk level of AIP and 10.96% had low risk level of AIP. It has been reported that individuals with high AIP have a higher risk of coronary heart disease (CHD) than those with low AIP. The close association of the AIP and cardiovascular risk has been mainly explained by lipoprotein particle size, insulin resistance, and metabolic syndrome, all of which are important risk factors for cardiovascular disease [37]. It has been reported that AIP can be used as a stand-alone index for cardiac risk estimation [38]. The finding of this study of high-risk level of AIP among type 2 diabetic patient is in agreement with previous study carried out in Iran which indicated that all diabetic participants and 90 % of person with impaired fasting glucose were in AIP increased risk category [39].   In Yemen, people suffering catastrophic consequences because of the country's conflict, and nowhere is that more visible than in the health care system. All of such circumstances leading to lack of medicines for chronic diseases like high blood pressure and diabetes as well as reducing the panel of diabetic investigation in public hospitals. Therefore, most diabetic patient's incapable to do their regular investigation and poorly control their diabetes. Although most patients with poorly controlled diabetes develop hypertriglyceridemia, this reflect the higher proportion of diabetic patient at a high-risk category of AIP.

The results of the current study also identified the mean differences of lipid profiles according to the status of FBS. We found that people with high level of mean FBS (> 180 mg/dl) had significant higher levels of TC, LDL-C and non-HDL-C. These findings are in agreement with previous studies that showed strong association between abnormalities of blood lipoproteins and FBS [5,6]. It is understandable that diabetic patients with poor glycemic control have determined higher level of atherogenic particles such as TC, LDL and non-HDL-C. Furthermore, it is well known that non–HDL-C is a measure of all potentially atherogenic lipoprotein particles (LDL, VLDL, intermediate-density lipoprotein, and lipoprotein[a]) which more accurate predictor of CHD risk [40].

The correlation analysis of AIP and cardiovascular risk factors revealed that AIP was positively correlated with BMI, LDL-C and non-HDL-C. This finding was in agreement with study carried out by Bo et al. [41]. AIP has been reported to be associated with HDL, LDL, and VLDL particle sizes and predicted the CVD risk [16]. On the other hand, positive correlation of AIP with Non-HDL-C which is a strong predictor of CVD reflect the important clinical significance of AIP. Generally, this study did have some limitations. Firstly, some of the clinical history of the patients such as diabetic duration, previous FBS, and physical activity were self-reported by the patients. Secondly, LDL-C was calculating using Friedewald's formula, we belief it would be better if it was estimated directly using commercially kit.

5. Conclusion

Dyslipidemia is one of the major risk factors for developing CVD in diabetic patients. The present study provides for the first time reliable epidemiological information regarding dyslipidemia and associated risk factors among the T2DM patients in Dahmar city, Yemen. The study reveals high prevalence of dyslipidemia and the most predominant lipid abnormality is TG followed by non-HDL-C. Majority of diabetic patients are having a high-risk level of AIP. Gender, sedentary life style, hyperglycemia, diabetic duration and BMI are independent risk factors for dyslipidemia. This study indicates a significant positive correlation between AIP and LDL-C, non-HDL-C, and BMI. The results are expected to be useful to develop appropriate strategies for controlling the identified risk factors in order to reduce

the prevalence of dyslipidemia and its complication in diabetic patients.

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Case Report

Sacrococcygeal Ewing Sarcoma: A Case Report

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Abstract

In this report, we present a rare case of Ewing's sarcoma with a peripheral primitive neuroectodermal tumor (ES/PNET) arising from presacral soft tissue in a 14-year-old boy. He had a previous long history for 2 years ago: dramatically started by progressive, worsening low back pain three months of trauma; to ending with a paraplegia associated with urine and stool incontinence. He was presented to a hospital in the capital Sana'a, Yemen. Computed tomography (CT) scan and magnetic resonance imaging (MRI) showed a soft tissue mass in presacral area with bone erosion and destruction; staging chest radiographs and CT showed no evidence of metastatic disease. While, his histologic testing confirmed presence of " ES " as small, round, blue cells. The patient subjected to chemotherapy for one year followed by radiotherapy and he got improved. He stopped radiotherapy for four months led to rapid progressive deterioration ended by brain metastasis and the patient died through three months.

Keywords: Ewing's sarcoma, Presacral soft tissue, Case report, Yemen

1. Introduction

Ewing's sarcoma/primitive neuroectodermal tumor (ES/PNET) is a highly malignant neoplasm which belongs to group of closely related tumors share some common features and called typically Ewing sarcoma family of tumors that commonly arise from the bones and rarely in soft tissue. These groups of small, blue, round cell neoplasm include the well-known Ewing sarcoma (EWS), PNET, and Askin tumor [1]. Ewing's sarcoma (ES) has unknown cause. The chromosomal translocation t(11;22)(q24;q12) is present in more than 85% of cases that diagnosed as ES [2].

ES occurs in a wide range of ages from infants to the elderly [3], generally affects white population [4], and has a predilection for the male sex (male/female ratio, 1.3-1.5:1) [3,4]. We reported here a rare case presented by unusual presentation (paraplegia: stool and urine incontinence) diagnosed as presacral soft tissue Ewing sarcoma.

2. Case report

A 14-year-old boy, nonsmoker, with low socioeconomic level from Yemen is diagnosed with sacrococcygeal Ewing sarcoma. The case started in more than two years ago with a history of progressive, worsening low back pain which was burning in nature associated with weakness and tingling sensation in both legs. These symptoms and signs happened three months after trauma (accident). The case couldn't be controlled by analgesic and his condition complicated through six months to end by paraplegia associated with urine and stool incontinence. So, the patient was taken to a hospital in Sana`a for investigations. CT and MRI showed a soft tissue mass in presacral area with bone erosion and destruction (Figure 1).

The case showed no evidence of metastatic disease at presentation as determined by staging chest radiographs and CT (Figures 2,3). He had histologic confirmation of " ES " small, round, blue cells showed in histopathologic reports and immunohistochemistry. The patient

subjected to chemotherapy for one year followed by radiotherapy. When he got improved with tumor regressed as reported in MRI (Figure 4), and has started to walk again, but stopped radiotherapy for four months. So, he relapsed and his condition worsened and developed paraplegia again associated with legs muscles wasting (Figure 5).
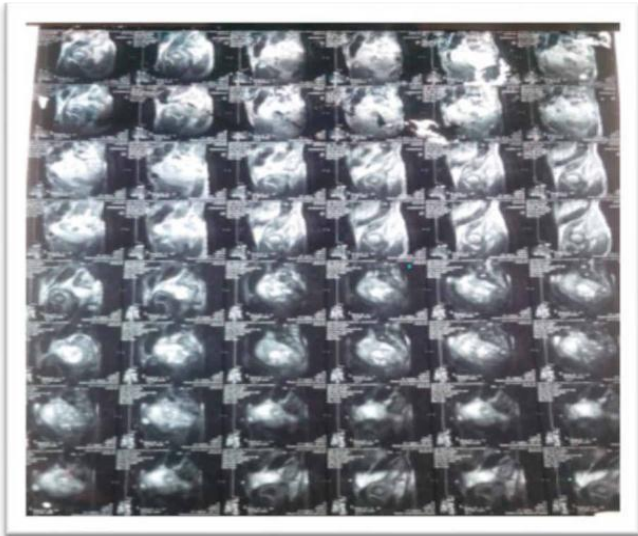

Figure 1: CT of the pelvis shows tissue mass in presacral area

Figure 2: CT of the chest shows no lung metastasis

He developed bed sore due to prolong immobility (Figure 6), then he started to develop a brain mass increased with the time through two months (Figure 7) also he suffered chronic constipation. So, he returned to radiotherapy with continuous using of laxative. Consequently, he was taken to hospital where he subjected to laparotomy and colostomy operation, then he was shifted to ICU. The patient's condition continued to deteriorate and he died.

Figure 3: Chest radiograph shows normal chest appearance
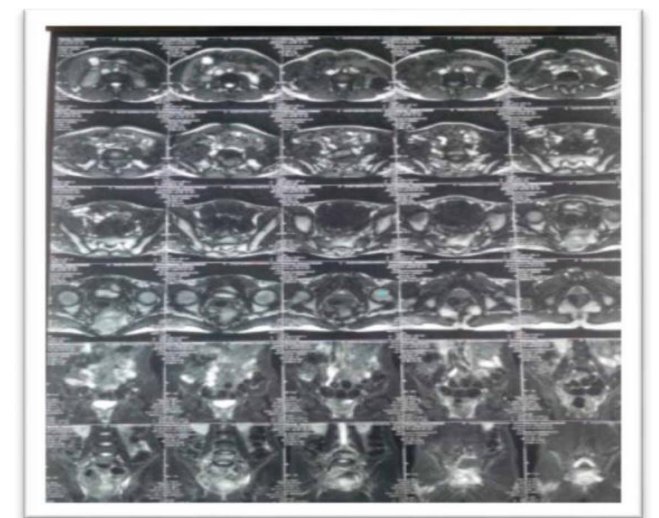
Figure 4: MRI post radiotherapy

Figure 5: Patient with lower limb weakness

Figure 6: Patient with bed sore

Figure 7: Patient with cranial metastasis

3. Discussion

The ES of presacral lesions are rare [5]. Ewing sarcoma occur in about 1 % of all childhood cancers [6]. In the family of PNET/ ES, they are part of rare group of nonhereditary malignant tumors [7] which are generally originating in bone, but they can sometimes originate in soft tissue, known as extraosseous and predominantly observed in adolescents and young adult between 10-30 of age [3]. It is considered as aggressive course and high relapse rate [7]. Extraosseous ES/PNET occur mainly at paravertebral region, lower limbs and chest wall and less commonly in the pelvic cavity, retroperitoneal region or the upper limbs [8], head and neck [9].

Our patient has presacral soft tissue ES diagnosed by pelvic CT with differential diagnosis was sacral chordoma, sacrococcygeal teratoma [10]. Hence, it is confirmed by histopathology and histoimmunochemistry workup [6]. The main clinical presentation of this disease is deep soft tissue mass that not show redness, swelling and other inflammatory signs in the surface and, local pain may occur. The tumors that are near the spine rarely can cause weakness, numbness, or paraplegia in the legs [11]. Our patient presented by low back pain associated with paraplegia and, urine & stool incontinence. This is a rare presentation. Almost the first treatment of ES is the chemotherapy as systemic control in case of micro-metastasis [12] that can't appear by imaging [11] followed by localized therapy as surgery and/or radiotherapy [13].

Once the ES has been diagnosed and staged chemotherapy started, this is called neoadjuvant chemotherapy. It is given before any surgery or radiation therapy. So, imaging tests are done at least 12 weeks post chemotherapy to see if the tumor is shrinking and can be surgically removed [3]. Localized tumors, smaller tumor size, and primary tumor in arms or legs (opposite to chest or pelvis), normal LDH and, age younger than 10 years in addition to good response to chemotherapy have a better prognosis [11]. Our patient was diagnosed initially as ES

with no metastasis appeared, he responded to chemotherapy and started to improve. The tumor followed unusual course after our patient was neglected at the end of the course of treatment when he stopped radiotherapy. Therefore, he showed rapid progressive deterioration ended by brain metastasis and he died after three months.

4. Conclusion

Although, the ES/PNET in the soft tissue is very rare. It can mimic to a great extent some malignant neoplasm. It demands early detection followed by early investigations using radiography, CT, and MRI followed by histopathology and immunohistochemistry. These investigations are necessary for early accurate diagnosis that is vital for the patient. The tumor presents at a younger age and is very aggressive. It usually has a poor prognosis. Here the patient has been died in spite of treatment by chemotherapy and radiotherapy.

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