Pattern and Distribution of Cancer Cases in Marib, Yemen, during 2022/2023

نمط وتوزيع حالات السرطان في مأرب –اليمن خلال 2023/2022

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Abstract

Background: Cancer is a global public health issue with a higher mortality rate than other diseases. Cancer has become a significant public health problem in Yemen and the ongoing influence of conflict has led to a decline in cancer care. This study is aimed to describe the patterns of cancer among 172 cases in Marib, Yemen, between 2022/2023.

Methods: Detailed information on 172 cases was collected from the histo-pathological records of patients registered in the Department of Histopathology at the National Center for Public Health Laboratories, Marib, Yemen, between January 2022 and December 2023. These cases were calculated based on sex, age, and tumor location, and separate analyses were performed for the major cancer types.

Results: The results showed that a total of 172 cancers were included, 40.7% were males and 59.3% female with a female –to– male ratio of 1.5:1. The most frequent cancer in the Yemeni population in Marib was colorectal cancer (n = 26, 15.1%), followed by breast cancer (n = 24, 14%), lymphoma (n = 17, 9.9%), head and neck cancer (n = 15, 8.7%), and gastric cancer (n = 14, 8.1%). The most common cancer among males was colorectal cancer (n =15, 8.7%), while females had breast cancer (n = 23, 13.4%).

Conclusion: Our findings showed that gastrointestinal tract cancers were the most frequent sites of cancer in general and breast cancers in females. Colorectal and gastric cancers were the most frequent types in males. This may explain why healthcare collapse with ongoing conflict and pesticide use has been observed in agricultural products, including khat. Marib should have an oncology center with essential diagnostic and therapeutic services that are freely available to all cancer patients.

Keywords: Cancer, Marib, Yemen, Age, Sex, Site

الملخص:

الخلفية: يعد السرطان مشكلة صحية عامة عالمية، حيث أن معدل الوفيات فيه أعلى من الأمراض الأخرى. لقد أصبح السرطان مشكلة صحية عامة كبيرة في اليمن، وأدى التأثير المستمر للصراع إلى انخفاض رعاية مرضى السرطان. هدفت هذه الدراسة إلى وصف أنماط السرطان لدى 172 حالة في مدينة مأرب باليمن بين عامي 2023/2022.

الطرق: تم جمع معلومات تفصيلية عن 172 حالة من السجلات التشريحية المرضية للمرضى المسجلين في قسم التشريح المرضي في المركز الوطني لمختبرات الصحة العامة، مأرب، اليمن، في الفترة ما بين يناير 2022 وديسمبر 2023. وتم حساب هذه الحالات على أساس الجنس والعمر والحالة الصحية. موقع الورم، وتم إجراء تحليلات منفصلة لأنواع السرطان الرئيسية.

النتائج: أظهرت النتائج أنه تم تضمين 172 حالة سرطان، 40.7% ذكور و59.3% إناث، بنسبة 1.5:1 للإناث إلى الذكور. كان السرطان الأكثر شيوعًا بين سكان مأرب اليمنيين هو سرطان القولون والمستقيم (ن = 26، 15.1٪)، يليه سرطان الثدي (ن = 24، 14٪)، سرطان الغدد الليمفاوية (ن = 17، 9.9٪)، وسرطان الرأس والرقبة (ن = 15، 8.7٪)، وسرطان المعدة (ن = 14، 8.1٪). وكان السرطان الأكثر شيوعا بين الذكور هو سرطان القولون والمستقيم (ن = 15، 8.7٪)، في حين أن الإناث لديهن سرطان الثدي (ن = 23، 13.4٪).

أظهرت النتائج أنه تم تضمين 172 حالة سرطان، 40.7% منها للذكور و59.3% للإناث، وبلغت نسبة الإناث إلى الذكور 1.5:1. كان السرطان الأكثر شيوعاً بين السكان اليمنيين في مأرب هو سرطان القولون والمستقيم (ن = 26، 15.1٪)، يليه سرطان الثدي (ن = 24، 14٪)، سرطان الغدد الليمفاوية (ن = 17، 9.9٪)، وسرطان الرأس والرقبة (ن = 15، 8.7٪)، وسرطان المعدة (ن = 14، 8.1٪). وكان السرطان الأكثر شيوعاٍ بين الذكور هو سرطان القولون والمستقيم (ن = 15، 8.7٪)، في حين أن الإناث كان سرطان الثدي الأكثر شيوعاً (ن = 23، 13.4٪).

الاستنتاج: أظهرت النتائج التي توصلنا إليها أن سرطانات الجهاز الهضمي كانت أكثر مواقع السرطان شيوعًا بشكل عام وسرطان الثدي لدى الإناث. وكانت سرطانات القولون والمستقيم والمعدة هي الأنواع الأكثر شيوعاً بين الذكور. وقد يفسر هذا سبب انهيار الرعاية الصحية مع استمرار الصراع واستخدام المبيدات الحشرية في المنتجات الزراعية، بما في ذلك القات. ينبغي أن يكون في مأرب مركز للأورام يقدم الخدمات التشخيصية والعلاجية الأساسية التي تكون متاحة مجانًا لجميع مرضى السرطان.

الكلمات المفتاحية: السرطان، مأرب، اليمن، العمر، الجنس، الموقع

Introduction

The World Health Organization (WHO) has estimated that the rate of cancer will be higher than that of coronary heart disease and stroke by 2025. It is estimated that there are more than 20 million new cases of cancer each year in low- and middle-income countries owing to global epidemiological changes, such as Yemen [1]. In 2020, the Global Cancer Project (GCP) reported that the crude incidence rate (CIR) for all cancers in Yemen stood at 55.2 per 100,000. Additionally, the crude mortality rate (CMR) for all cancers was 40.6 per 100,000[2]. The most common cancers in 2020 were breast, lung, and colorectal cancers, which are ranked as the primary cause of mortality. Colorectal cancer is the 3rd most widespread cancer worldwide and the 4th most predominant cause of cancer-related mortality, including Yemen Cancer, which is a significant public health problem in which breast cancer was most prevalent in Yemen, followed by colorectal cancer and leukemia in the last few years during the war period [1-3].

Previous studies have indicated that a broad group of medical oncologists and cancer researchers from different countries and continents have discussed and assessed the devastating consequences of the unexpected armed conflict that currently occurs within Ukraine's boundaries and the general civilian population. They stated that war breeds cancer, delays diagnosis, prevents treatment, and increases risk [4]. Thus, the ongoing conflict in Yemen has transformed an already vulnerable country into the largest man-made humanitarian crisis in the world, depriving its people of necessities such as healthcare, which has collapsed and restricted imports. Vital medicines and equipment readily available in other countries are scarce in Yemen. The Republic of Yemen does not have a national cancer registry, and no reliable data are available. However, considering the WHO recommendations for cancer assessment, approximately 35,000 Yemenis are currently diagnosed with cancer, with over 11,000 new diagnoses annually. This surge in cases can be attributed to the closure of numerous cancer clinics since 2016 owing to deficiencies in medical staff,

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medications, and essential equipment [5, 6]. In recent years, the Arab World, including Yemen, has witnessed protracted conflicts that have affected several regions, and cross-border therapeutic geographies have produced disastrous expenditures for families previously suffering from dislodgment and loss of living [2, 7, 8].

Site-specific cancers and the distribution of disease vary greatly between regions; global differences in cancer incidence, mortality, and prevalence are evident among the eight most common cancers (lung, breast, colon, rectum, stomach, prostate, liver, cervix, and esophageal cancer). Likely due to non-modifiable risk factors (e.g., genetic susceptibility and aging) and modifiable risk factors (e.g., tobacco, infectious agents, diet, etc.) and physical activity) [9]. Several studies conducted in Yemen found that the most common type of cancer was gastrointestinal cancer, followed by breast cancer, leukemia in children, and lymph node cancer [2, 10-12]. The preclusion and management of non-communicable diseases result in making thousands of people face death sentences owing to a lack of access to medical care in Yemen [5, 13]. Therefore, we described the pattern of cancer in Marib, Yemen, during 2022/2023 and explored the association with age, sex, and location of cancers according to the International Classification of Diseases for Oncology (ICD-O).

Materials and Methods

Site of the Rgistry:

This retrospective study was conducted at the Faculty of Medicine, University of Saba Region, Department of Pathology, and Department of Histopathology at the National Center for Public Health Laboratories, Marib, Yemen. It included samples obtained for histopathological examination between January 2022 and December 2023. This study was approved by the Ethics Committee of the Faculty of Medicine at the University of Saba Region.

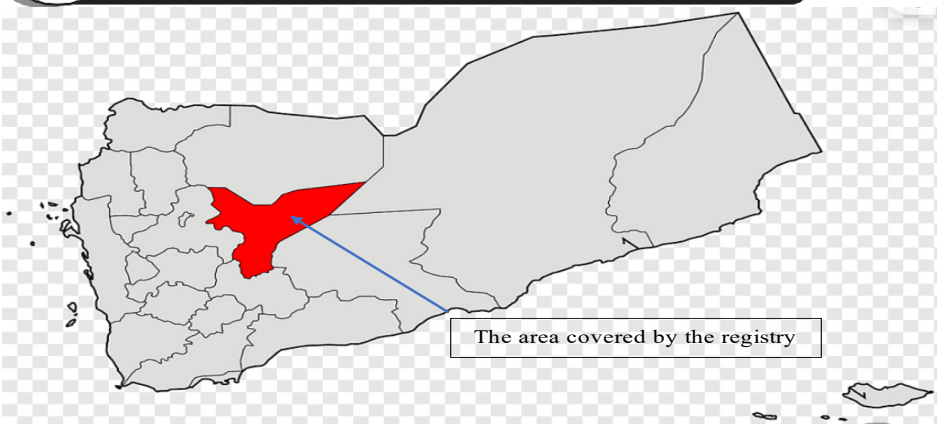

Figure 1: Map of the covered area of the registry (Marib Governorate of Yemen). Source: https://www.pngwing.com/en/free-png-dweql).

Study Design:

Histopathological records in the archives of the Department of Histopathology at the National Center for Public Health Laboratories were reviewed to obtain the following demographic characteristics: age, sex, tumor location, morphological histopathology, and year of diagnosis. The different types of cancer were grouped into 20 major diagnostic groups based on the International Classification of Diseases for Oncology (ICD-O). This study included 172 patients diagnosed with cancer based on complete histopathological investigation.

Statistical Analysis:

Statistical analyses included quantitative descriptive analysis and summary statistics to describe the frequency of cancer diagnosis. Quantitative analysis of the study variables included Chi squares by gender and age and was statistically analysed using SPSS Statistics (IBM).

Results

A total of 172 cancers in both sexes were registered at the National Center for Public Health Laboratories, Marib, Yemen, between January 2022 and December 2023. Males comprised 70 (40.7%) and 102 (59.3%) females with a female -to- male ratio of 1.5:1. as presented in Table 1 and Figure 2.

Table١ : Frequency Distribution–Gender of patient

Gender	Frequency	Percent
Male	70	40.7%
Female	102	59.3%
Total	**172**	**100.0%**

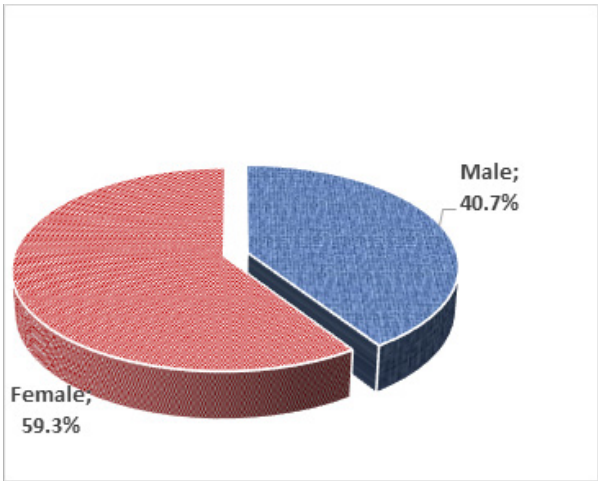

Figure 2: Frequency Distribution–Gender of Patients

The age distribution results revealed that the majority of patients were (25–49 years), with a total number of (76) individuals representing (44.2%) followed by the age group (50–69 years) with a total number of (48) individuals representing (27.9%) of the total patients. A total of (21) participants (24.4%) were

aged group of (70 years or more), while the age group was (0–14 years) the least, with (13) participants representing (7.6%) of the total patients, as shown in Figure 3.

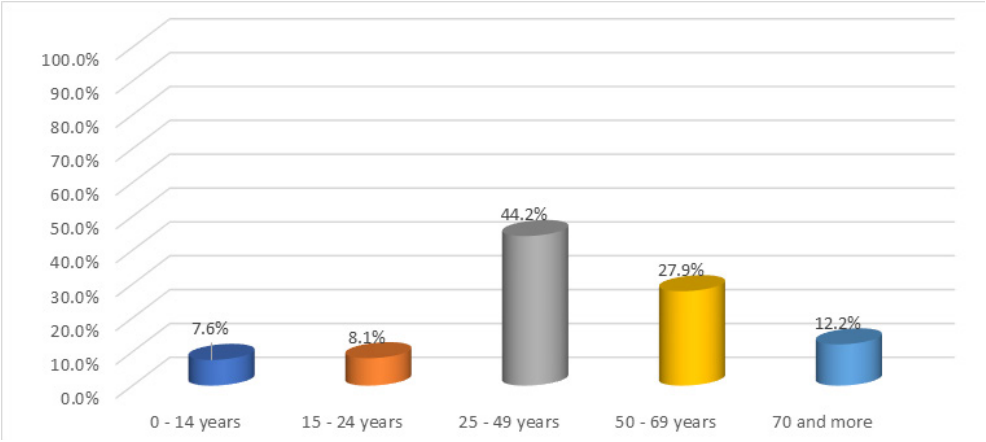

Figure 3: Frequency Distribution–Age of Patients

The most frequent systemic cancer was gastrointestinal (GIT) cancer, with a total of 68 individuals (39.5%), including 38 females (22.1%) and 30 males (17.4%). Of these, 24 individuals (14.0%) were in the age category (50–69 years), followed by breast cancer with a total number of (24) individuals (14%) with breast cancer, 23 females (13.4%), and 1 male (0.6%). Most of them were in the age category (25–49 years,) about 18 females (10.5%) were aged 25–49 years. Lymph system (LS) cancers were present in 17 individuals, with 10 females representing (5.8%) and 7 males representing (4.1%) most of them in the age category (25–49 years), and approximately 9 individuals represented (5.2%). Skin cancer was found in 16 individuals, 9 males (5.2%) and 7 females (4.1%), most of them in the age category (25–49 years), and approximately 9 individuals (5.2%). Also, Endocrine system (ENS) cancers were seen in 13 individuals (7.6%), were 10 females representing (5.8%) and 3 male representing (1.7%) most of them at age category (25 - 49 years) about 8 individuals representing (4.7%), and at the last groups was Cavity (Mediastinum) and Central nervous system (CNS) with (1) participant and representing (0.6%) of the total

patients The result of organ system distribution of cancer is shown in Figure 4.

The different types of system cancers among females and males and their distribution within the five age groups were statistically significant (p = 0.000*) and (p = 0.002*, respectively), as shown in Tables 2 and 3.

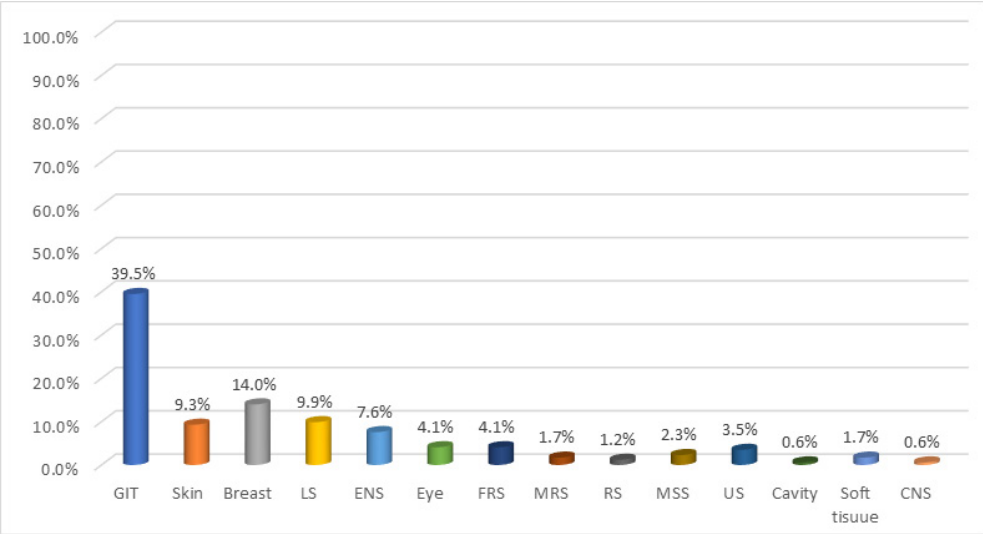

Figure 4: Frequency Distribution–System of Patients

GIT, gastrointestinal; LS, lymphatic system; ENS, Endocrine system; FRS, Female Reproductive system; MRS, Male Reproductive system; RS, Respiratory system; MSS, Musculoskeletal system; US, Urinary system; CNS, Central nervous system.

Table2 : Results of Chi-Square -Test the comparison between the system and gender

Variables	Gender				Chi-Square	P- val-ue
System	Male		Female			
	N	%	N	%		
GIT	38	22.1%	30	17.4%	35.55	*0.001
Skin	9	5.2%	7	4.1%		
Breast	1	0.6%	23	13.4%		
LS	7	4.1%	10	5.8%		
ENS	3	1.7%	10	5.8%		
Eye	2	1.2%	5	2.9%		
FRS	0	0.0%	7	4.1%		
MRS	3	1.7%	0	0.0%		
RS	1	0.6%	1	0.6%		
MSS	1	0.6%	3	1.7%		
US	3	1.7%	3	1.7%		
Cavity	1	0.6%	0	0.0%		
Soft tissue	1	0.6%	2	1.2%		
CNS	0	0.0%	1	0.6%		

*Significant at $p < 0.05$ level (2-tailed).

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Table 3: Results of Chi-Square -Test the comparison between system and age

Vari-ables	Age										Chi-Square	P- value
	14 – 0 years		24 – 15 years		49 – 25 years		69 – 50 years		and 70 more			
System	N	%	N	%	N	%	N	%	N	%		
GIT	3	1.7%	6	3.5%	21	12.2%	24	14.0%	14	8.1%	93.83	*0.000
Skin	1	0.6%	0	0.0%	8	4.7%	5	2.9%	2	1.2%		
Breast	0	0.0%	0	0.0%	18	10.5%	6	3.5%	0	0.0%		
LS	3	1.7%	0	0.0%	9	5.2%	3	1.7%	2	1.2%		
ENS	0	0.0%	2	1.2%	8	4.7%	1	0.6%	2	1.2%		
Eye	2	1.2%	0	0.0%	2	1.2%	2	1.2%	1	0.6%		
FRS	1	0.6%	2	1.2%	3	1.7%	1	0.6%	0	0.0%		
MRS	1	0.6%	0	0.0%	1	0.6%	1	0.6%	0	0.0%		
RS	0	0.0%	1	0.6%	1	0.6%	0	0.0%	0	0.0%		
MSS	0	0.0%	2	1.2%	2	1.2%	0	0.0%	0	0.0%		
US	0	0.0%	0	0.0%	2	1.2%	4	2.3%	0	0.0%		
Cavity	1	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%		
Soft tissue	0	0.0%	1	0.6%	1	0.6%	1	0.6%	0	0.0%		
CNS	1	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%		

*Significant at $p < 0.05$ level (2-tailed).

The most Common Types of Cancer

The most common types of cancer were colorectal cancer, with a total of (26) individuals representing (15.1%) followed by cancer of the breast with a total number of (24) individuals representing (14%) of the total patients (17) respondents (9.9%) had lymphoma, 15 (8.7%) had head and neck cancer, and 14 (8.1%) had gastric cancer. The last type of cancer was ovarian, vulvar, brain, and vaginal, with (1) participants representing (0.6%) of the total patients, as shown in Table 4.

Colorectal and breast cancers were the most common cancers in all age groups. Breast cancer was ranked first within 25–49 years in 18 (10.5%) patients, followed by colorectal cancer in 11 (6.4%). In the 50–69 years age group, 8 (4.7%) had colorectal cancer and 6 (3.5%) had breast cancer, as shown in Table 5. In males, the five most common types of cancer were colorectal cancer (8.7%), gastric cancer (6.4%), skin cancer (4.7%), lymphoma (4.1%), and head and neck cancer (4.1%). For females, there were breast (13.4%), colorectal (6.4%), lymphoma (5.8%), thyroid (5.8%), and head and neck (4.7%) cancers.

Table 4:Frequency Distribution– Type cancer of patients

Type cancer	Percent	Frequency
Colorectal	26	15.1%
Skin	13	7.5%
Soft tissue	8	4.7%
Breast	24	14.0%
Thyroid	13	7.6%
Esophageal	12	7.0%
Gastric	14	8.1%
Head and Neck	15	8.7%
Eye	7	4.1%

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Lymphoma	17	9.9%
Renal Cell	3	1.7%
Liver	3	1.7%
Uterine	4	2.3%
Small Intestine	3	1.7%
Urinary bladder	3	1.7%
Testicular	3	1.7%
Ovary	1	0.6%
Vulvar	1	0.6%
Brain	1	0.6%
Vaginal	1	0.6%
Total	**172**	**100.0%**

The cases were divided into five age-group cohorts to understand the most common cancers in both the male and female study populations. The cohort structures were as follows: 0–14, 15–24 years, 25 - 49, 50–69, and ≥ 70 years. Accordingly, each cohort showed some specifications in the most common type of cancer, with similarities or differences between males and females. For example, among males, colorectal cancer was the most common cancer in the age group of more than 25 years, followed by gastric cancer. Meanwhile, in females, breast cancer was the most common type of cancer in the same age group, followed by colorectal cancer. The different types of cancer and their distribution within the five age groups and sexes were statistically significant ($p = 0.000^*$) ($p = 0.002^*$, respectively), as shown in Tables 5 and 6.

Table٥ : Results of Chi-Square -Test the comparison between cancer type and gender

Variables	Gender				Chi-Square	P-value
Type cancer	Male		Female			
	N	%	N	%		
Colorectal	15	8.7%	11	6.4%		
Skin	8	4.7%	5	2.9%		
Soft tissue	4	2.3%	4	2.3%		
Breast	1	0.6%	23	13.4%		
Thyroid	3	1.7%	10	5.8%		
Esophageal	5	2.9%	7	4.1%		
Gastric	11	6.4%	3	1.7%		
Head and Neck	7	4.1%	8	4.7%		
Eye	2	1.2%	5	2.9%		
Lymphoma	7	4.1%	10	5.8%	39.65	*0.002
Renal Cell	1	0.6%	2	1.2%		
Liver	1	0.6%	2	1.2%		
Uterine	0	0.0%	4	2.3%		
Small Intestine	1	0.6%	2	1.2%		
Urinary bladder	2	1.2%	1	0.6%		
Testicular	3	1.7%	0	0.0%		
Ovary	0	0.0%	1	0.6%		
Vulvar	0	0.0%	1	0.6%		
Brain	0	0.0%	1	0.6%		
Vaginal	0	0.0%	1	0.6%		

*. Significant at the < 0.05 level (2-tailed).

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Table 6 Results of Chi-Square -Test the comparison between type cancer and age

Variables	Age										Chi-Square	P- value
	14 – 0 years		24 – 15 years		49 – 25 years		69 – 50 years		and 70 more			
Type cancer	N	%	N	%	N	%	N	%	N	%		
Colorectal	0	0.0%	3	1.7%	11	6.4%	8	4.7%	4	2.3%	140.04	*0.000
Skin	1	0.6%	0	0.0%	6	3.5%	4	2.3%	2	1.2%		
Soft tissue	1	0.6%	3	1.7%	3	1.7%	1	0.6%	0	0.0%		
Breast	0	0.0%	0	0.0%	18	10.5%	6	3.5%	0	0.0%		
Thyroid	0	0.0%	2	1.2%	8	4.7%	1	0.6%	2	1.2%		
Esophageal	0	0.0%	0	0.0%	1	0.6%	5	2.9%	6	3.5%		
Gastric	0	0.0%	0	0.0%	3	1.7%	8	4.7%	3	1.7%		
Head and Neck	0	0.0%	4	2.3%	7	4.1%	3	1.7%	1	0.6%		
Eye	2	1.2%	0	0.0%	2	1.2%	2	1.2%	1	0.6%		
Lymphoma	3	1.7%	0	0.0%	9	5.2%	3	1.7%	2	1.2%		
Renal Cell	0	0.0%	0	0.0%	0	0.0%	3	1.7%	0	0.0%		
Liver	2	1.2%	0	0.0%	0	0.0%	1	0.6%	0	0.0%		
Uterine	0	0.0%	1	0.6%	2	1.2%	1	0.6%	0	0.0%		
Small Intestine	1	0.6%	0	0.0%	2	1.2%	0	0.0%	0	0.0%		
Urinary bladder	0	0.0%	0	0.0%	2	1.2%	1	0.6%	0	0.0%		
Testicular	1	0.6%	0	0.0%	1	0.6%	1	0.6%	0	0.0%		
Ovary	0	0.0%	1	0.6%	0	0.0%	0	0.0%	0	0.0%		
Vulvar	1	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%		
Brain	1	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%		
Vaginal	0	0.0%	0	0.0%	1	0.6%	0	0.0%	0	0.0%		

*. Significant p < 0.05 level (2-tailed).

Discussion

TThis is the first report of data on 172 Yemeni patients with cancer in Marib from January 2022 to December 2023 obtained from the Department of Histopathology at the National Center for Public Health Laboratories and is comparable to reports from developed countries. The female-to-male ratio of 1.5:1 was similar to the trends in the Middle East, Africa, and Asia, but different from those in Western countries over the last decade [11, 14-16]. This study describes the pattern of cancer association with age, sex, and site of cancer and the effect of conflict on oncology human resources, facilities, and available therapies necessary for cancer services. This was comparable to reports from countries that have experienced war [7, 13, 17-19]. Furthermore, changes in eating habits and tobacco and pesticide use have been observed in agricultural products, including khat. In addition, housing in displacement camps and other factors in low-income countries, such as Yemen, increase the incidence of cancer. Therefore, this study established an increase in gastrointestinal system cancers and breast cancer in Marib as a model in Yemen of the samples that were diagnosed in the center within only two years, unlike in past decades, as referred to in other studies [12, 20, 21].

Cancer constitutes a major disease burden, increases in incidence with age, and affects more females than males. Our study showed that colorectal cancer was the most common cancer among males (8.7%), followed by gastric (6.4%), skin (4.7%), lymphoma (4.1%), and head and neck (4.1%) cancers. Among females, the most common cancers were breast (13.4%), colorectal (6.4%), lymphoma (6.4%), thyroid (5.8%), and head and neck (4.7%) cancers, which is similar to reports in other regions of Yemen, such as Aden, Lahej, Abyan, Hadramout, and Al Dhale [2, 10, 21]. The increase in cancer incidence may be due to the discovery of cancer at late stages, misdiagnosis of some cancerous tumors, limited resources for pathology, scarcity of epidemiological and statistical studies, and scarcity of medical registries. In general, a variable age-specific pattern of cancer in Yemeni Patients was documented with the highest frequency

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of colorectal cancer at the age of 25-49 years among males, while the breast within 25-49 years of age in females has a similar report that studied cancer incidence and mortality rates in both sexes and all ages in Yemen [2, 10]. This result may be related to genetic factors and psychosocial stress, which may be risk factors for breast cancer in women because stressful life actions in women have been reported to be related to an increased incidence of breast cancer [22, 23].

In addition, the increase in colorectal cancer and gastric cancer among older males is mainly due to the rise in life expectancy, physical inactivity, and eating habits, with decreased intake of fruits and vegetables and random use of pesticides, which is in contrast to studies published by Basra in Iraq [3], but similar to a recent study on the incidence of cancer in Yemen and Western countries that found a higher incidence in older men than in women [2, 11, 12]. This may be attributed to a lack of access to the best cancer surgery, diagnosis, radiation therapy, chemotherapy services, and malnutrition in patients. Moreover, current data suggest that consuming high amounts of meat, animal fat, and refined grains and low amounts of vegetables and fiber may contribute to the risk of colorectal cancer, as in Yemen [24-26].

Conclusion

The findings of our study showed an increase in cancer incidence rates in the gastrointestinal tract, as the most common cancers in Marib were colorectal cancer, breast cancer, lymphoma, head and neck cancer, and gastric cancer, which may be due to an increase in the population, decrease in healthcare, Western-style diet, that is, one high in meat, animal oil, refined grains, and sugar also sprayed with vegetables and fruit with pesticides randomly. Thus, there is a need for more support for cancer registries and pathology diagnosis in Marib to contribute to cancer care.

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Conflict of interest

None declared

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