

Pattern of Adult Malignancies in Aden, Yemen

Mahmoud M. Al-Sakkaf¹, Safa A. Shukry², Akram M. Al-Sakkaf¹

Abstract

Introduction: Epidemiological information on cancer including its pattern is an important basis for determining the priorities for cancer control and prevention in any population group. The present study was conducted to investigate the pattern of adult malignancies in Aden governorate, Yemen.

Methods: This retrospective and descriptive study included the review the information of all cancer patients registered in the period 2016 through 2017 obtained from the National Oncology Centre-Aden, Yemen database and individual patient files. The major types of cancer were ranked in order of relative frequency and the average annual incidence rates: crude (CIR), age standardized (ASR) and age specific (ASIR) per 100,000 populations were then calculated.

Results: Out of a total of 486 new adult cancer cases, females accounted for 294 cases (60.5%) and males for 192 (39.5%), with male to female ratio of 1:1.7. The CIR and ASR for both genders were 48.4 and 47.0 cases per 100,000 populations respectively, which were lower for male than in female's population (CIR 37.2 and ASR 38.5 vs CIR 60.4 and ASR 56.3, respectively). Breast cancer was the commonest cancer (142 cases; 29.2%) in both genders; followed by colorectal (51; 10.5%), leukemias (38; 7.8%); non-Hodgkin lymphomas (26; 5.3%) and stomach (25; 5.1%). In male patients, colorectal (28; 14.6%), followed by leukemias (24; 12.5%), nasopharynx (17; 8.9%), stomach; lungs (16; 8.3% each), and non-Hodgkin's lymphomas (13; 6.8%) while in female patients, breast (142; 48.3%), followed by colorectal (23; 7.8%); ovary (22; 7.5%); corpus uteri (15; 5.1%) and leukemias (14; 4.8%) were the commonest malignancies.

Conclusion: Cancer appears as a significant health problem in Aden, Yemen. Development of active cancer registration activities in order to collect and unify all cancer data in one system as a mandatory procedure is highly recommended to form the basis for future studies and strategies for cancer control and prevention.

Keywords: Breast, Cancer, Colorectal, Epidemiology, Incidence.

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انماط الأورام السرطانية في الكبار في عدن، اليمن

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ملخص الدراسة

المقدمة: المعلومات الوبائية عن مرض السرطان بما في ذلك النمط هو أساس مهم لتحديد أولويات مكافحة مرض السرطان في أي مجموعة سكانية. أجريت الدراسة الحالية للتحقق من وتيرة السرطان في الكبار في عدن، اليمن.

المنهجية: خلال هذه الدراسة الاسترجاعية والوصفية تم مراجعة جميع بيانات مرضى السرطان المسجلين في المركز الوطني لمكافحة الأورام، عدن اليمن ما بين عامي 2016 و2017. تم تصنيف الأنواع الرئيسية من السرطان حسب التكرار النسبي ومتوسط معدلات الإصابة السنوية. ثم تم حساب معدل الإصابة الخام ومعدل الحدوث المعياري للعمر ومعدل الحدوث حسب العمر.

النتائج: من إجمالي 486 حالة سرطان في الكبار، شكلت الإناث 294 حالة (60.5%) و192 حالة (39.5%) للذكور حيث أن نسبة الذكور إلى الإناث 1: 1.7. وقد بلغ المتوسط السنوي لمعدل الحدوث الخام 48.4 حالة لكل 100.000 من السكان في كلا الجنسين ومعدل الحدوث المعياري 47.0، وكان معدل الحدوث الخام والمعياري في الذكور أقل منه في الإناث (37.2 و38.5 مقابل 60.5 و56.3 على التوالي). وكان سرطان الثدي أكثر أنواع السرطانات شيوعاً في كلا الجنسين حيث يشكل 142 حالة (29.2%) ويليه سرطان القولون والمستقيم (51 حالة؛ 10.5%)، الدم (38 حالة؛ 7.8%)، الأورام اللمفاوية اللاهودجكينية (26 حالة؛ 5.3%) والمعدة (25 حالة؛ 5.1%). وفي الذكور، كانت الحالات القسوى هي القولون والمستقيم (28 حالة؛ 14.6%)، يليها الدم (24 حالة؛ 12.5%) البلعوم الأنفي (17 حالة؛ 8.9%)، المعدة؛ الرئتين (16 حالة؛ % لكل منهما)، والأورام اللمفاوية اللاهودجكينية (13 حالة؛ 6.8%) بينما في الإناث، الثدي (142 حالة؛ 48.3%)، يليها القولون والمستقيم (23 حالة؛ 7.8%)؛ المبيض (22 حالة؛ 7.5%)؛ بطانة الرحم (15 حالة؛ 5.1%) والدم (14 حالة؛ 4.8%).

الاستنتاج: يظهر ان مرض السرطان يعد مشكلة صحية كبيرة في عدن، اليمن. وعلية يوصى وبشدة بتطوير أنشطة تسجيل نشطة للسرطان وذلك من أجل تجميع وتوحيد جميع بيانات السرطان في نظام واحد كإجراء إلزامي والذي سيشكل أساساً للدراسات والاستراتيجيات المستقبلية لمكافحة مرض السرطان والوقاية منه.

الكلمات المفتاحية: الثدي، السرطان، القولون والمستقيم، الوبائيات، حدوث الإصابة.

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Introduction

Cancer is a global health problem; is expected to rank as the leading cause of death and the single most important barrier to increasing life expectancy in every country of the world in the 21st century [1-4]. Globally, an estimated 19.3 million new cancer cases and almost ten million cancer deaths occurred in 2020 and nearly one-half of the cases and over one-half of the cancer deaths occurred in less developed countries because of the growth and aging of the population, in which approximately 82% of the world's population resides [1,2,4].

Breast is the most commonly diagnosed cancers worldwide followed by lungs, colorectal, prostate and stomach. By gender, lungs cancer is the most frequent cancer and the leading cause of cancer death among males, followed by cancers of prostate, colorectal, stomach and liver while among females, breast cancer is the most commonly diagnosed cancer and the leading cause of cancer death, followed by colorectal, lungs, cervix uteri and thyroid cancers [1]. The most frequently diagnosed cancer and the leading cause of cancer death, however, substantially vary across countries and within each country depending on the degree of economic development and associated social and life style factors [1-4].

In some European countries and United State of America (USA), the most common cancers in both genders are lungs, breast, prostate, colorectal and bladder while in West Asia and North Africa, cancers of lungs, breast, colorectal, bladder and stomach [1]

and in most of Middle Eastern countries, such as Jordan, Iraq, Morocco, Egypt, Yemen and Gulf Cooperation Council (GCC) member countries breast cancer is by far the most prevalent cancer, followed by cancers of lungs, cervix uteri, colorectal and prostate [1,5-11].

Profound demographic, socioeconomic, and behavioural changes have taken place in the Eastern Mediterranean Region over the past three decades. Longevity has progressively increased, and there has been steady shift from traditional and rural ways of life to more urbanized and modern lifestyle. With modernization, life styles linked with increased physical inactivity, smoking, and new eating habits have emerged which promote non communicable disease (NCDs), including cancer [1,2,5,9,12].

Yemen, being a Middle Eastern country with many cultural characteristics in common, has experienced some economic, social, and cultural changes resulting in significant modification to lifestyle. However, the true cancer incidence is unknown due to many reasons including the facts that large proportions of the population never seek professional medical care and resource deficiencies that ranged from scarcity of trained health care workers, inadequate health care budget, insufficient diagnostic facilities, and until recently, lack of national wide population-based cancer registry (PBCR) [5,8,13]. Furthermore, national cancer-specific statistics and information on cancer patterns is still very limited. Nonetheless, the heterogeneity in cancer incidence in Yemen is very marked with a general agreement that

colorectal is the most common cancer in males; and breast cancer is the most common among females [8,13-15]. The present study was conducted to investigate the pattern of adult malignancies in the National Oncology Centre (NOC), Aden, Yemen as a prelude to determine the pattern of malignancies in Aden governorate, Yemen. The statistical details of the scales and profiles of cancer in different, genders and age groups can be used to effectively promote evidence-informed health policymaking public health action and in providing a reference material for other researchers.

Methods

This retrospective and descriptive study carried out in NOC, Aden, Yemen by analysing the information of all new cancer cases diagnosed/registered between the period from January 1st, 2016 to December 31st, 2017. NOC offers free treatment for cancer patients and therefore, cancer patients who require chemotherapy or/and radiotherapy treatment are predominately transferred to the NOC. Most new cases diagnosed with cancer in other hospitals or centres are referred to the NOC for confirmation of diagnosis and/or free treatment, therefore, it can be presumed that almost all cancer cases in Aden are referred and registered in the centre [15].

Data were collected through using an observational checklist form included demographic information (gender, age, and address) and details of cancer diagnosis were checked. Cancers were coded and classified according to the international classification of diseases for Oncology, third edition

(ICD-O-3) convinced by the International Agency for Research on Cancer (IACR)-World Health Organization (WHO) [16]. Patients aged <20 years, those with unconfirmed cancer diagnosis, did not reside in Aden governorate at the time of cancer diagnosis or had an unspecified place of residence were not included in the study. Estimation of the population of Aden governorate during 2016 and 2017 by different genders and age groups were obtained from the Department of Statistics, at the Ministry of Planning and International Cooperation (MOPIC Yemen), which projected using census 2004 [17] population and annual exponential growth rate (Figure 1).

Data entry and analysis were performed using an Excel spreadsheet, Version 2013 (Microsoft Corp., Redmond, Washington, USA) then data were processed by the Statistical Package for Social Science (SPSS) Version 20, IBM incorporation and licensors 1989, 2011, New York, USA. Patients ages at time of diagnosis were recorded and the average age and incidence rates: crude incidence rate (CIR), age-specific incidence rate (ASIR) and the world age-standardized incidence rate (ASR) through using the direct method of standardization and the world standard population to facilitate national and international comparisons in populations of different age groups (five years interval), genders and cancer types were calculated and expressed as average annual ones per 100,000 population [18]. Further, all records were confidentially handled, and patients' name were coded into numbers to guarantee their anonymous and property.

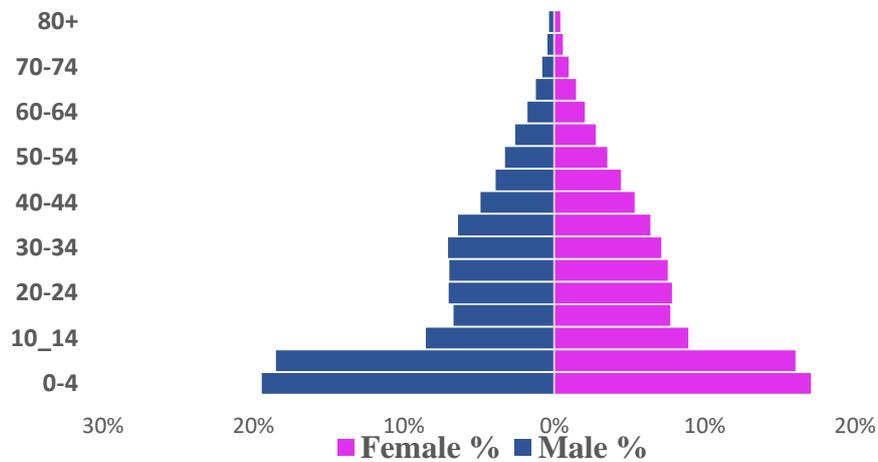


Figure 1: Estimated Midpoint (2016–2017) Population Pyramid, Aden, Yemen.

Results

From the year 2016 to year 2017, a total of 486 adult patients of various malignancies were registered, out of these, there was a female preponderance with 294 cases, (60.5%) versus 192 cases, (39.5%) cases in males, yielding a male-to-female ratio of 1:1.7. The mean age of presentation of cancer patients was 52.6 ± 13.9 Standard Deviation (SD)

years with median of 54.0 years (ranged 18 to 90 years). The average annual CIR was 48.8 cases per 100,000 populations, and world ASR was 47.2. The cancer incidence rate per 100,000 people was highest among patients aged ≥ 80 years and (53.9%) of the cases were 45–64 years old (Table 1 and Figure 2).

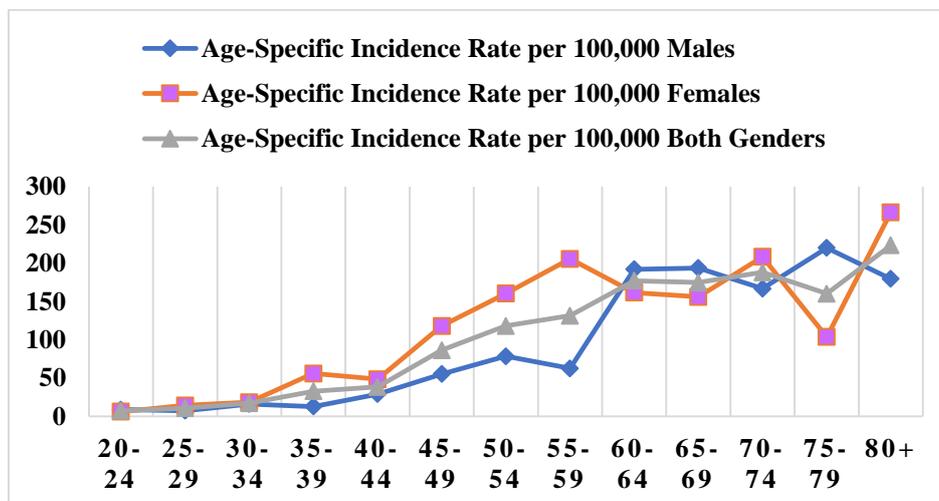


Figure 2: ASIR Per Population of 100,000 Per Age Group (Five Years' Interval) for all Cancer Diagnosed among adults in Aden, Yemen in 2016-17 Per Gender

Breast cancer was the most common cancer, constituting 142 cases (29.2%) with average annual CIR of 14.2 per 100,000 people; world ASR of 12.4; followed by colorectal cancer accounted for (51,10.5%), with average annual CIR and world ASR

of 5.1 cases per 100,000 people. Leukemias was the third (38;7.8%) with average annual CIR 3.8 and world ASR 3.3, followed by non-Hodgkin lymphomas and stomach cancers (Table 1).

Table 1: Frequency of Occurrence and Incidence Rates Per 100,000 Population (in both Genders) for Cancer Diagnosed among Adult in Aden, Yemen in 2016-17. (n=486)

	Site (ICD-O-3) ¹	n (%)	CIR ²	ASR ³	Mean±SD ⁴	Median (Rang)
R A N K	1 Breast (C50)	142(29.2)	14.2	12.4	49.9±10.7	49.0 (26-80)
	2 Colorectal (C18-20)	51(10.4)	5.1	5.1	54.3±12.5	54.0 (28-80)
	3 Leukemias ⁷ (C91-5)	38(7.8)	3.8	3.3	45.5±15.6	46.5 (20-80)
	4 NHL ⁵ (C82-5, 96)	26(5.3)	2.6	2.4	51.7±15.3	55.0 (20-78)
	5 Stomach (C16)	25(5.1)	2.5	2.8	59.1±12.8	60.0 (25-80)
	6 Ovary (C56)	22(4.5)	2.2	2.2	55.2±10.3	54.5 (35-75)
	Nasopharynx (C11)	22(4.5)	2.2	2.2	53.1±16.6	53.0 (21-75)
	8 Lungs (C34)	17(3.5)	1.7	1.8	60.7±07.9	62.0 (45-77)
	9 Corpus Uteri (C54)	15(3.1)	1.5	1.3	48.3±14.1	54.0 (23-70)
	10 Hodgkin disease(C81)	14(2.9)	1.4	1.2	45.2±16.0	46.0 (20-66)
	11 Pancreas (C25)	12(2.5)	1.2	1.3	58.3±13.0	55.0 (42-90)
	12 Cervix Uteri (C53)	11(2.3)	1.1	1.2	58.6±14.4	61.0 (38-90)
	13 Prostate (C61)	10(2.1)	1.0	1.4	67.5±11.2	66.0 (50-90)
	Skin (C44)	10(2.1)	1.0	1.1	55.9±14.5	57.5 (32-80)
	14 Brain (C70-2)	8(1.6)	0.9	0.7	49.5±13.6	51.0 (32-65)
	Buccal Cavity (C6)	8(1.6)	0.8	1.1	63.4±18.6	66.0 (36-90)
	15 Thyroid (C73)	7(1.4)	0.8	0.7	47.6±18.4	51.0 (33-82)
	Tongue (C2)	7(1.4)	0.7	0.6	47.6±08.2	46.0 (38-60)
	16 Esophagus (C15)	6(1.2)	0.6	0.6	54.8±14.6	57.5 (35-70)
	PU ⁶ (C26,39,48,76-80)	6(1.2)	0.6	0.7	60.8±10.9	59.0 (48-77)
	17 Liver (C22)	5(1.0)	0.5	0.5	56.8±10.7	60.0 (45-67)
C.T Sarcoma ⁷ (C49)	5(1.0)	0.5	0.5	54.0±15.0	51.0 (34-75)	
18 Gum (C3)	4(0.8)	0.4	0.5	63.8±13.2	67.5 (45-75)	
Larynx (C32)	3(0.6)	0.3	0.4	68.0±08.5	67.0 (60-77)	
Gallbladder (C23-4)	3(0.6)	0.3	0.3	51.3±18.5	51.0 (33-70)	
19 Kidney (C64-6)	3(0.6)	0.3	0.2	47.3±19.4	58.0 (25-59)	
Bladder (C67)	3(0.6)	0.3	0.3	61.0±12.1	59.0 (50-74)	
20 Testis (C62)	2(0.4)	0.2	0.1	30.0±14.1	30.0 (20-40)	
21 Adrenal gland (C74)	1(0.2)	0.1	0.1	68	68	
All Sites	486	48.7	47.0	52.8±13.6	54.0 (20-90)	

Note: ¹(ICD-O-3) indicates International Classification of Diseases for Oncology, 3rd edition; ²CIR: crude incidence rate; ³ASR: age-standardized incidence rate (World Standard Population); ⁴SD standard deviation; ⁵NHL: Non-Hodgkin Lymphomas; ⁶PU: Primer uncertain; ⁷C.T Sarcoma: Connective Tissue Sarcoma

Pattern of malignancy was different in the two genders. In male patients, the mean age of diagnosis was 54.3±14.6, median 55.5 years (ranged 20 to 90 years), with average annual CIR of

37.2 per 100,000 male's population and world ASR was 38.5 (Table 2). The cancer incidence rate per 100,000 male population was highest among patients aged 75-79 years and 51.0%

of the cases were 50–69 years old (Figure 2). The highest number of cases were of colorectal cancer which accounted for (28; 14.6%) with annual average CIR of 5.4 per 100,000 male's population and world ASR of 5.3, and leukemias (24;

12.5%) with annual average CIR of 4.7 per 100,000 male's population and world ASR of 4.3. This followed by cancers of nasopharynx, stomach; lungs and non-Hodgkin lymphomas as shown in Table 2.

Table 2: Frequency of Occurrence and Incidence Rates Per 100,000 Males' Population for Cancer Diagnosed among Adult in Aden, Yemen in 2016-17 (n=192)

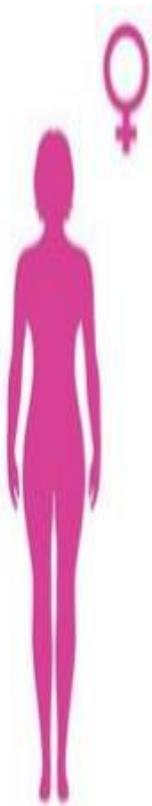


	Site (ICD-O-3) ¹	n (%)	CIR ²	ASR ³	Mean±SD ⁴	Median (Rang)
R A N K	1 Colorectal (C18-20)	28(14.6)	5.4	5.3	54.7±10.3	54.5 (32-72)
	2 Leukemias' (C91-5)	24(12.5)	4.7	4.3	46.3±17.1	45.0 (20-80)
	3 Nasopharynx (C11)	17(8.9)	3.3	3.4	53.6±16.4	52.0 (23-75)
	4 Stomach (C16)	16(8.3)	3.1	3.5	60.3±09.5	60.5 (43-80)
	Lungs (C34)	16(8.3)	3.1	3.5	61.3±07.7	62.0 (45-77)
	5 NHL ⁵ (C82-5, 96)	13(6.8)	2.5	2.4	51.0±16.4	55.0 (20-70)
	6 Prostate (C61)	10(5.2)	1.9	2.8	67.5±11.2	66.0 (50-90)
	7 Pancreas (C25)	9(4.7)	1.7	2.0	58.6±14.9	55.0 (42-90)
	8 Skin (C44)	8(4/2)	1.6	1.5	52.8±13.3	53.0 (32-72)
	9 Hodgkin disease (C81)	7(3.7)	1.4	1.0	39.6±16.0	32.0 (20-66)
	10 Tongue (C2)	6(3.1)	1.2	0.9	48.0±08.9	47.5 (38-60)
	11 Brain (C70-2)	5(2.6)	1.0	0.9	52.4±15.4	60.0 (32-65)
	12 UP ⁶ (C26,39,48,76-80)	5(2.6)	1.0	1.2	61.4±12.1	60.0 (48-77)
	12 Thyroid (C73)	4(2.1)	0.8	0.9	58.8±16.4	54.5 (44-82)
	Esophagus (C15)	3(1.6)	0.6	0.7	59.7±17.0	69.0 (40-70)
13	Liver (C22) (C22)	3(1.6)	0.6	0.6	57.7±10.7	60.0 (46-67)
	C.T Sarcoma ⁷ (C49)	3(1.6)	0.6	0.7	62.0±12.1	60.0 (51-75)
	Bladder(C67)	3(1.6)	0.6	0.6	61.0±12.1.	59.0 950-74)
14	Buccal Cavity (C6)	3(1.6)	0.6	0.4	43.3±06.7	45.0 (36-49)
	Larynx (C32)	2(1.0)	0.4	0.5	68.5±12.0	68.5 (60-770)
	Gum (C3)	2(1.0)	0.4	0.4	55.0±14.1	55.0 (45-65)
	Kidney (C64-6)	2(1.0)	0.4	0.3	42.0±24.0	42.0 (25-59)
15	Testis (C62)	2(1.0)	0.4	0.3	30.0±14.1	30.0 (20-40)
	Gallbladder (C23-4)	1(0.5)	0.2	0.1	33.0	33.0
	All Sites	192	37.2	38.5	54.3±14.6	55.5 (20-90)

Note: ¹(ICD-O-3) indicates International Classification of Diseases for Oncology, 3rd edition; ²CIR: crude incidence rate; ³ASR: age-standardized incidence rate (World Standard Population); ⁴SD standard deviation; ⁵NHL: Non-Hodgkin Lymphomas; ⁶PU: Primer uncertain; ⁷C.T Sarcoma: Connective Tissue Sarcoma

The mean age of diagnosis for females was 51.8±12.9, median 52.0 years (range 20 to 90 years). The average annual CIR was 61.0 per 100,000 female's population and world ASR was 56.7 (Table 3). The cancer incidence rate per 100,000 female's population was highest among patients aged ≥80 years and 56.6% of the patients were 45–64

years old (Figure 2). Breast cancer was the first ranking cancer (142; 48.3), with average annual CIR of 29.2 per 100,000 female population and world ASR of 25.4 and colorectal cancer (23; 7.8%) with annual average CIR of 4.7 per 100,000 female's population and world ASR of 4. followed by cancers of ovary, corpus uteri and leukemias (Table 3).

Table 3: Frequency of Occurrence and Incidence Rates Per 100,000 Females' Population for Cancer Diagnosed among Adult in Aden, Yemen in 2016-17 (n=294)


	Site (ICD-O) ¹	n (%)	CIR ²	ASR ³	Mean±SD ⁴	Median (Rang)
	1 Breast (C50)	142(48.3)	29.2	25.4	49.9±10.7	49.0 (26-80)
	2 Colorectal (C18-20)	23(7.8)	4.7	4.8	53.7±14.7	54.0 (28-80)
	3 Ovary (C56)	22(7.5)	4.5	4.4	55.2±10.3	54.5 (35-75)
	4 Corpus Uteri (C54)	15(5.1)	3.1	2.7	48.3±14.1	54.0 (23-70)
	5 Leukemias' (C91-5)	14(4.8)	2.9	2.3	44.1±13.1	47.0 (20-65)
R	6 NHL ⁵ (C82-5, 96)	13(4.4)	2.7	2.5	52.4±14.8	55.0 (24-78)
A	7 Cervix Uteri (C53)	11(3.7)	2.2	2.4	58.6±14.4	61.0 (38-90)
N	8 Stomach (C16)	9(3.1)	1.9	2.1	57.0±17.7	60.0 (25-80)
K	9 HD ⁸ (C81)	7(2.4)	1.4	1.3	50.9±15.1	57.0 (25-65)
	10 Nasopharynx (C11)	5(1.7)	1.0	1.0	51.6±19.3	61.0 (21-70)
	Buccal Cavity (C6)	5(1.7)	1.0	1.7	75.4±10.2	75.0 (65-90)
	11 Brain (C70-2)	3(1.0)	0.6	0.5	44.8±11.0	52.0 (32-52)
	Thyroid (C73)	3(1.0)	0.6	0.5	42.3±13.8	43.0 (33-51)
	Pancreas (C25)	3(1.0)	0.6	0.6	57.3±6.8	55.0 (52-65)
	Esophagus (C15)	3(1.0)	0.6	0.6	50.0±13.2	55.0 (35-60)
	12 Skin (C44)	2(0.7)	0.4	0.7	68.5±16.3	68.5 (57-80)
	Gallbladder (C23-4)	2(0.7)	0.4	0.4	60.5±13.4	60.5 (51-70)
	Liver (C22)	2(0.7)	0.4	0.4	55.5±14.9.	55.5 (45-66)
	Gum (C3)	2(0.7)	0.4	0.6	72.3±3.5	72.5 (70-75)
	C.T Sarcoma ⁶ (C49)	2(0.7)	0.4	0.3	42.0±11.3	42.0 (34-50)
	13 UP ⁷ (C26,39,48,76-80)	1(0.3)	0.2	0.2	58.0	58.0
	Larynx (C32)	1(0.3)	0.2	0.2	67.0	67.0
	Kidney (C64-6)	1(0.3)	0.2	0.2	58.0	58.0
	Adrenal gland (C74)	1(0.3)	0.2	0.2	68.0	68.0
	Lungs (C34)	1(0.3)	0.2	0.2	50.0	50.0
	Tongue (C2)	1(0.3)	0.2	0.2	45.0	45.0
	All Sites	294	60.4	56.3	51.8±12.9	52.0 (20-90)

Note: ¹(ICD-O-3) indicates international classification of diseases for oncology, 3rd edition; ²CIR: crude incidence rate; ³ASR: age-standardized incidence rate (World Standard Population); ⁴SD standard deviation; ⁵NHL: Non-Hodgkin Lymphomas; ⁶C.T Sarcoma: Connective Tissue Sarcoma; ⁷PU: Primer uncertain

Discussion

Cancer is a major public health challenge worldwide, with significant improvement in management of cardiovascular diseases, as well as population aging, cancer is bound to become the number one killer across the globe soonest [1,4]. Its incidence however has shown great variation across various countries, and over time, attributed to differences in socioeconomic, environmental, genetic and lifestyle factors [1-4]. There is therefore need to understand the peculiarity in each region, for

effective planning and optimal utilization of scarce resources.

Gender distribution in cancer incidence is an important aspect of cancer epidemiology. Globally, the incidence rate for all cancers combined was 19% higher in males (222.0 per 100,000) than in females (186.0 per 100,000) in 2020, although rates varied widely across regions [1]. In Western countries such as the European Union and USA, cancer affects males more than females. In contrast, cancer was higher among females more than males, as observed in the current study as well as previous studies focused on different

parts of Yemen, and Mediterranean countries [1,5-7,9,10,19]. This increase in the number of female's cancer incidence may be attributed to the number of breast cancer registered and under diagnosis of prostate cancer. Meanwhile, females' preponderance might have some critical individual and social concerns such as female work, family commitments that include raising children, and other life matters that should be considered in programs created for patient's care. Thus, while establishing cancer care programmes, special support services should be taken in consideration, include but not limited to children care services, home care, transport services, financial support, protecting work policies and community support centres.

This study also highlighted the difference in average age of cancers cases in both genders. of which the mean age for cancer diagnosis in males was higher than that of females, and the majority of the cases was observed among patients age >40 years (about 81.7% of male cases) and (about 76.9% of female cases) which was similar to the previous study conducted in Yemen [15] but was at variance with other studies conducted elsewhere [20,21]. This finding might be biologically explainable due to the multiple hit theory, which suggest that the cumulative effect of genetic assault manifest over time [22].

In Yemeni studies, the heterogeneity in cancer incidence is very marked. The summary statistics from the GLOBOCAN project for 2018 on data in Yemen [2] showed the five most frequent cancers among both genders were breast, colorectal, stomach, oesophagus, and finally

leukemias; these rankings were inconsistent with our finding as well as with those reported by Aden Cancer Registry (ACR) (1997-2011) which is a PBCR covering four Yemeni governorates (Aden, Lahej, Abyan, and Al-Dhale); in which the top five cancer sites are breast, non-Hodgkin lymphomas, colorectal, leukemias, and stomach cancer, for male: leukemias, non-Hodgkin lymphoma, colorectal, Hodgkin diseases, and stomach, whereas for females breast, leukemias, non-Hodgkin lymphomas, colorectal, and ovary are topped the list [8] and Hadhramout Cancer Registry's data (2002-2011) which is PBCR covering three Yemeni governorates (Hadhramout, Shabwah and Al-Mahrah), in which the top five cancer sites breast, leukemias, liver, bone, and lungs in which, leukemias, non-Hodgkin lymphomas, Hodgkin's diseases, liver and lungs were the major cancers in males while in females, breast, cervix uteri, non-Hodgkin lymphomas, leukemias and ovary [12]. Moreover, in GCC member countries including Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates (UAE), non-Hodgkin lymphomas, colorectal, leukemias, lungs and liver were the major cancers in males, whereas in females, breast cancer was the commonest cancer followed by thyroid cancer, colorectal, non-Hodgkin lymphomas and leukaemia [11]. This obviously marked variation across countries and even within countries which might be due to variation in risk factors, degree of economic development, population structure as well as genetic susceptibility [1-4,22].

Breast cancer ranked the first of all cancers and of cancers among females

in this study. This finding is similar to the vast majority of the studies across the global [1] and with the general observation in scientific publications in Yemen [8,12,15,23]. The mean age for breast cancer among females in this study was 49.9 ± 10.7 years which correlates with findings in other Yemeni and Arab studies where females diagnosed with breast cancer are almost ten years younger than those diagnosed in the western countries [1,8,23]. Furthermore, in the Mediterranean countries, most females diagnosed with breast cancer are diagnosed with advanced stages of the disease [5,9]. Being an exposed organ, diseases of the breast easily attract attention, hence the relatively high rate, also, the lower mean among the Yemeni population may be explained by the younger population structure.

Gastrointestinal malignancies are common in Yemen [8,13,14,15]. In this study, colorectal cancer was the second most common cancer in both genders, first for males and second among female cases. Colorectal cancer can be considered a marker of socioeconomic development, and, in countries undergoing major transition, incidence rates tend to rise uniformly [1]. Stomach cancer was the fifth most common cancer in this study, fourth for males and eighth among female cases. Worldwide, stomach cancer remains an important cancer and is responsible for over one million new cases in 2020, ranking fifth for incidence. Rates are two-fold higher in male than in female. In male, it is the most commonly diagnosed cancer and the leading cause of cancer death in several South-Central Asian countries, including Iran, Afghanistan, Turkmenistan, and Kyrgyzstan.

Incidence rates are highest in Eastern Asia (Japan and Mongolia, the countries with the highest incidence in men and females, respectively) and Eastern Europe whereas rates in Northern America and Northern Europe are generally low and equivalent to those seen across the African regions [1]. The relatively high incidence of those cancers may be related to genetic and environmental factors [1,2,4]. In Yemen, another risk factor is the organophosphorus compounds which used in agriculture especially Qat "*Catha Edulis*" as fertilizer, pesticides and insecticides and may have increased the magnitude of cancers. Improvements in diet habits and storage, public health education, reducing tobacco and Qat usage and control of *Helicobacter pylori* infection are likely to offer great potential for the prevention of cancer of the gastrointestinal organs in this area [14].

Leukemias are an important group of the malignancies and the 15th most common cancer in the world and also found to be more in developed countries versus than in less developed countries. Leukemias incidence appeared to be slightly higher in males than females [1]. In the present study leukemias was the third most common cancer, second for males and fifth among female cases. Previous local studies showed that, leukemias is most common cancer in males and the second one in females [9].

Worldwide, the incidence of lymphoma is increasing, largely due to non-Hodgkin lymphomas which encompasses a wide variety of disease subtypes for which incidence patterns are vary. Non-Hodgkin lymphomas is

more common in developed areas, with the highest incidence rates found in North America; Australia/ New Zealand; and Northern, Western and Southern Europe whereas the lowest rates are found in South-Central and Eastern Asia and the Caribbean [1]. In the present study, non-Hodgkin lymphomas ranked the fourth of all cancers cases and the fifth reported among male and sixth among female cases. A previous study by Al-Nabhi *et al*, [15] non-Hodgkin lymphomas was ranked the first among male cases and second among all cases and female cases and while according to ACR ranked second among males and third among females [8].

Gynaecological malignancies accounted for 16.2% of all cancer cases diagnosed among female cases in this study. This is high compared to the locally reported figure [24]. Cancer of the ovary and corpus uteri were among the most frequent cancers in the female in the current study ranked third and fourth respectively while cervix uteri ranked the seventh. These ranking was inconsistent with those reported in most developing countries where organized screening programmes do not exist [1] in which cervix uteri cancer come first.

In the present study, lungs cancer ranked the fourth among male and lower among cancers affecting both males and females. Although lung cancer is the most common cancer among both genders worldwide [1], our finding is consistent with data of Mediterranean countries and some African countries where the incidence of lungs cancer is lower than international rates and the overall rate of lungs cancer in Yemen was the lowest compared to other nearby countries [1,5,6,7,9,10]. This low

incidence of lung cancer is surprising, since the prevalence of smoking in Yemeni males over the age of 15 is increasing especially during chewing Qat [25]. This however calls for further research.

A major limitation of the current study is that, as this was a hospital-based registry, the calculated cancer incidence might not be as accurate as a PBCR. However, hospital-based cancer registries have value as tools for policy formulations and region-specific data creation, especially in resource-poor regions such as Yemen [19-21]. Due to the descriptive nature of the study, the findings do not statistically predict the future incidence of cancer in Aden and it is only possible to speculate about the potential explanations for the observed cancer incidence and magnitude in Aden, Yemen. The heavy focus on the epidemiological aspects of cancer resulted in not collecting data pertaining to risk factors influencing cancer such as smoking habits, social and economic status, marital status and the presence of comorbidities and not provide information relating to mortality. Nevertheless, findings of this study might provide an essential basis for evaluating cancer incidence pattern and determining the priorities for cancer control and prevention in Aden, Yemen.

Conclusion

Cancer remains a poorly addressed public health problem with marked local and international variation in incidence. In the current study, a hospital-based cancer registry was analysed for the pattern of cancer in Aden, Yemen, in 2016-2017. Breast

cancer was the most frequent cancer type among adults and adult females, and colorectal cancer were the most frequent cancer types among adult males. Finding of this study could serve as an empirical guide for cancer control and prevention in Aden, Yemen till further evaluation is available. There is a need for development of national cancer registry centres, upgrading to an active registry system, and obtaining all cancer data from health institutions and unifying it in a single organization are mandatory to achieve reliable data. In addition, multi-institutional research, population-targeted cancer screening programme, cancer literacy, access to critical cancer diagnostic tools and treatment facility are highly required to ensure reduce cancer morbidity and its related mortality.

Competing Interests

Authors have declared that no competing interests exist.

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