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Cancers in Red Sea State, Sudan: A Decade of Incidence, Distribution and Trends: Estimates for (2016 - June 2025)

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ABSTRACT

Cancer incidence refers to the rate at which new cancer cases occur in specific population over a defined period, it is a key measure for understanding the burden of cancer and tracking trends in cancer occurrence. These are is generally regarded as an important measure for public health planning, monitoring trends and researches and resource allocation purposes.

The number of new cases in a year is an indicator of the need for resources for diagnostic investigations and first-line treatment. While the prevalence of cancer in a population, the number or proportion of people alive at a specific date who have been diagnosed with cancer prior to that date. The annual number of cancer deaths is an indicator of the need for resources for palliation and terminal care. However, data on prevalence, which is generally regarded as an important measure for health planning and resource allocation, are relatively scarce.

Materials and Methods: This review is the first papers that focuses up-to-date on adult cancer, its distribution, trend and cancer Prevalence in Red Sea State (RSS) at Eastern Sudan, based upon, registry data of Port Sudan Oncology Centre (POC) results in a period between 2016 up to thirty of June 2025. These reviews are meant to provide a better understanding and knowledge required to plan appropriate cancer-control and prevention strategies in this state, and whole country. this paper provided cancer statistics of 3265 patients registered from all districts of Red Sea State diagnosed at the (POC). This Centre established in 2016 to covers approximately all adult patients with cancer in this state, therefore, it considered representative for the cancer situation in this state, to develop a system that will facilitate creation and maintenance of local and regional data and assemble these data into a single centrally accessible system. Also, this study has reviewed and addressed the impact of war conflict setting of Sudan in April 2023 and the displacement of patients with cancer, where access to healthcare and resources of cancer management is disrupted in many affected states and the changes in statistic measures made by displacement of patients with cancer from war conflict-affected states to POC. Cancer diagnoses were made by standard clinical, pathological and radiological methods. Epidemiological data were categorized by age, gender, resident state, marital status etc. and subjected to statistical analyses by SPSS.

Population Data: Red Sea State is one of 18 states of Sudan, it lies at eastern of the country, bordering the Red Sea, and has an area of 212,800 km2 and an estimated urban/rural population of approximately 1482,053. The sex ratio are slightly more females than males with sex ratio of approximately 98.34 male per 100 females, (Sudan demographics 2024- Statistics Times.com) Port-Sudan is the capital of the state. The original inhabitants of the state are Beja people, tribes who constitute above 60% of current population.

Results: The cancer prevalence rate per year was 300-350 among adult patients, female were more affected than male. The five most common tumour types in both sexes were breast cancer, leukemia, head and neck tumours, prostatic carcinoma, and esophageal cancer.

Remarkably, most of the patients was in the age period (59-78) years, regarding ethnic varsities (49,8%) of patients were descendants of Bni aamer tribes, (22.3%) of patients from Northern Sudan, and (19.0%) were Hadandawa tribe. Most of the patients (84,6%) lived in Port Sudan, the capital of the state.

Conclusion: This is the largest survey on cancer burden in Red Sea State. It may serve as basis for local governmental programs for assessing risk factors, improving cancer prevention (e.g. by educational and vaccination programs) and cancer therapy in the future.

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Introduction

Cancer is one of the leading causes of death worldwide. It is estimated that the global cancer burden will even grow in years to come and will reach 21.4 million new cases and 13.2 million deaths by 2030 [1]. The international Agency for Research on Cancer (IARC) projects that by 2050, the number of cancer cases could reach 35 million. According to a projection of the World Health Organization, also highlights that cancer is considered as the second cause of death in developing countries (10.4%), Where as it is the first cause of death in developed countries (26.6%) [2]. The WHO reports estimates that around a third of cancers are caused by several leading environmental and behavioral risk factors, specifically tobacco being the biggest culprit among all causative factors [3]. IARC,S also shows that 10 types of cancer collectively comprised around two-third of new cases and death globally in 2024, Lung cancer was the most commonly occurring cancer worldwide with 2.5 million new cases accounting for 12.4% of the total new cases. Female breast cancer ranked second (2.3million cases 11.6%), followed by colorectal cancer (1.9 million cases, 9.6%), prostate cancer (1.5 million cases ,7.3%) and stomach cancer (970000cases,4.9%) of the total new cases. Lung cancer was the leading cause of cancer death (18.7% of total cancer death), followed by colorectal cancer (9.3%), liver cancer (7.8%), breast cancer (6.9%) and stomach cancer (6.8%) of total cancer death, for women, the most common leading cause of cancer death was breast cancer, whereas it was lung cancer for men. Globally for men, prostate and colorectal cancers were the second and third most commonly occurring cancer, while lung and colorectal cancer were the second and third most common cancer for women [4,5]. In Africa, in 2020 Africa experienced an estimated 1.1 million new cancer cases and 711,429 cancer - related death [6]. And expected to increase significantly by 2040, with an estimated 2.1 million new cases and 1,4 million deaths [6]. Despite lower overall incidence. Africa cancer mortality rate is relatively high compare to other regions, suggesting issues with diagnosis and treatment. Breast cancer is leading cancer among women in Africa while Prostate cancer is the leading cancer in men in many sub-Saharan African countries. Cancer continues to receive low public health priority. Thus, cancer poses tremendous burden for the health system, as well as the entire economy, throughout Africa because of both treatment costs and drop-out of working power of patients. Sudan's cancer burden is not well-documented because the attention of the health system mainly focuses on communicable diseases such as malaria, tuberculosis and human immunodeficiency virus (HIV)/AIDS, which is comparable to all developing countries in Africa. Sudan has its share of cancer burden, a high incidence of advanced, difficult-to-treat, linked to infectious diseases. Political and economic instabilities in Sudan led to in-efficiency and inadequacy of health system. A survey of Sudanese hospitals conducted in 2000 revealed that cancer was the third leading cause of death after malaria and viral pneumonia, accounting for 5% of all deaths [7]. Breast cancer is the most common cancer, followed by colorectal cancer, prostate cancer, and non-Hodgkin lymphoma. Cancer incidence is increasing among adults, while remaining more or less stable in children. Several factors contribute to the cancer burden in Sudan, including a history of conflict and displacement, limited access to health care, late-stage diagnosis and lack of resources for cancer treatment and prevention [8]. However, population-based data in cancer incidence, prevalence, and mortality in Sudan were not available and most published cancer cases were based on estimates from hospital-based information sources. Most of these sources are maintained by individual health institutions and are mostly paper based [9]. The first National Cancer Registry (NCR) in Sudan started in 1967, unfortunately it is no longer acting now due to lack of financial and technical support. the lack of proper cancer registration systems was reflected in the type of published data as it was mainly hospital-based studies [10]. The first report about cancer in Sudan, "Malignant epithelial tumors in the Sudanese," was published by Hickey in 1959 following a lecture presented to the Royal College of Surgeons, England on 13 March 1958 [11]. The report presented data on 1335 malignant epithelial neoplasms histo pathologically diagnosed at the Stack Medical Research Laboratories (NHL) from 1935-1954. At that time, the most common tumor sites were the skin (32.8%) followed by the breast (22.9%). Basic as well as clinical research is limited in Sudan and many reasons could be cited but mainly a lack of financial and technical support. Because of this, very few studies so far have attempted to determine cancer etiology in Sudan [12, 13]. The main sources of cancer data are: the Radiation and Isotope Center in Khartoum (RICK), handle- 80% of cancer cases and serving as Sudan's primary data source since the 1960. and the National Cancer Institute of the University of Gezira in Wad Medani, Capital of the Gazira State; Founded in 2008, it supports regional data collection in central Sudan (9,11), In 2009, Sudan established the first National Cancer Registry (NCR), to develop a system that will facilitate creation and maintenance of local and regional data and assemble these data into a single centrally accessible system [14]. Recently The Federal Ministry of Health created many new cancer institutes in different states of the country for cancer treatment, within which a regional cancer registry would establish.

Port Sudan Oncology Centre (POC). A center was established in 2015 to cover approximately all adult patients with cancer in the state, to provide cancer management for all adult patients (Chemotherapy, Hormonal therapy, Immunotherapy, and supportive medications).

And cancer screening and awareness, to improve targeted interventions, including improvement of healthcare access, early detection, and multidisciplinary approach management, In the hope, that the POC will provide data on burden of cancer in Red Sea State allowing policy makers to implement cancer control measures and prevention strategies. The ongoing war in Sudan on April 2023 has created a cancer crisis, severely disrupting cancer treatment and care. Displacement, disrupted supply chains, and a lack of essential medication, including chemother-

apy, and the collapse of the healthcare infrastructure, particularly in major cancer centers in Khartoum and Wad Medani, has further exacerbated the situation and lead to migration of a large number of cancer patients to a relatively save center like in Red Sea Center (POC) for treatment.

Results
A total of 3265 patients with cancer were registered in this study between 2016- up to thirty of June 2025. All the patients were Sudanese, i.e. they were all exposed to more or less similar environmental, dietary and genetic factors. The prevalence rate per year was 300-350 cancer cases. (the incidence rate is 23.3 per 100,000). Cancer prevalence increased steeply with age, reaching values of 43.9% in age group (59-78) but start to drop after that. females were more diagnosed with cancer than males with ratio (1.74: 1). All tumors types and locations were diagnosed by standard pathological and clinical procedures. Histological subtypes of tumours were summarized to the corresponding main tumour type. For example, Hodgkin and Non- Hodgkin lymphoma were listed as "lymphoma", acute/chronic myeloic/lymphoblastic leukaemia as "leukaemia". Epithelial tumours at different locations in the head region as "head and neck tumours", and so on.

Top 10 Most Common Primary Cancer sites in PCO
The Top ten most common primary cancer sites in both sex in Red Sea State were breast cancer (26%), leukemia (12.4%), head and neck cancers (7.7%), prostatic carcinoma (7.5%), esophageal cancer (6.5%), non-Hodgkin lymphoma (5.5%), Colorectal cancer (5.3%), Endometrial Carcinoma (3.8%), Ovarian Cancer (3.4%), and liver cancer (3.3%), accounting for (81.4%) of all malignancies. Table (1) Figure (1) Figure (2)

Table 1: Prevalence of Most Common Primary Cancer Sites in POC from (2016 up to May 2025)

1	Breast Cancer	847	26 %
2	Leukemia	404	12.4%
3	Head and Neck cancer	250	7.7%
4	Prostatic Carcinoma	246	7.5 %
5	Esophageal Cancer	211	6.5 %
6	Non-Hodgkin lymphoma	181	5.5 %
7	Colorectal cancer	173	5.3 %
8	Endometrial Carcinoma	124	3.8 %
9	Ovarian Cancer	111	3.4 %
10	Liver Cancer	107	3.3 %
11	Cervical Cancer	102	3.1 %
12	Pancreatic Cancer	71	2.2%
13	Gastric cancer	67	2.1%
15	Ca un known primary	50	1.5%
16	Vagina cancer	44	1.3%
17	Thyroid cancer	36	1.1%
18	Skin cancer	33	1%
19	Lung cancer	33	1%
20	Bone cancer	30	.9%
21	Soft tissue sarcoma	28	.9%
22	Urinary bladder cancer	19	.6%
23	Gall bladder cancer	16	.5%
24	Small bowel cancer	13	.4%
25	Brain cancer	11	.2%
26	Testicular cancer	8	.3%
27	Multiple myeloma	7	.2%
28	Anal cancer	5	.2%
29	Adrenal gland cancer	4	.1%
30	Molar pregnancy	3	.1%
18	Skin cancer	33	1%
19	Lung cancer	33	1%
20	Bone cancer	30	.9%
21	Soft tissue sarcoma	28	.9%
22	Urinary bladder cancer	19	.6%
23	Gall bladder cancer	16	.5%
24	Small bowel cancer	13	.4%

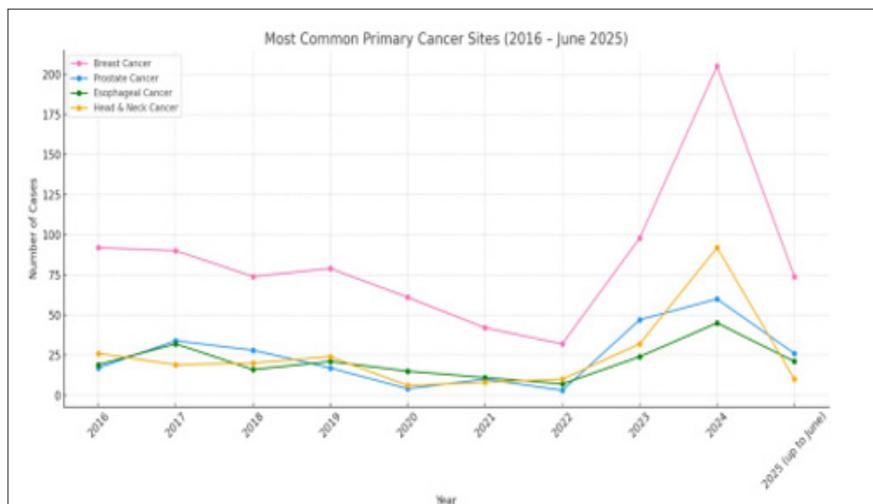| 25 | Brain cancer | 11 | .2% |
26	Testicular cancer	8	.3%
27	Multiple myeloma	7	.2%
28	Anal cancer	5	.2%
29	Adrenal gland cancer	4	.1%
30	Molar pregnancy	3	.1%

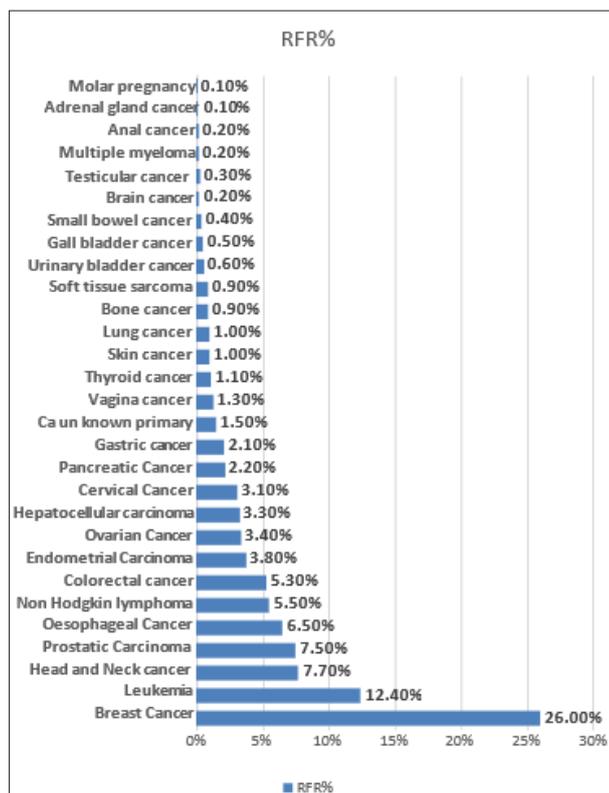**Figure 1:** Prevalence of Common Primary Cancer Sites in POC from (2016 to June2025)

**Figure 2:** Prevalence of Most Common Primary Cancer Sites in PCO from (2016 to June 2025)

Gender and Age-Specific Cancer Incidence Rates

The women to men ratio were (1.74: 1). When the tumour distribution was specified according to gender, the gender-related tumors types were top ranked, i.e. prostatic carcinoma as most frequent male cancer (20.7%) followed by head and neck tumours (13.4%), non-Hodgkin lymphoma (10.2%), colorectal cancer (8%) and esophageal carcinoma (6.4%) that represented approximately (58.7)

% of all male cancers. Figure (3) Table (3) While in female breast carcinomas as leading female tumours (40%) followed by esophageal cancer (6.5%), endometrial carcinoma (6%), ovarian cancer (5.4%) and cervical carcinoma (4.9%) accounting for (62.8%) of

all female cancers. Figure (4) Table (3), most common age group was (59–78) years they were 43.9%, a mean age at diagnosis of 49.5 years. Focusing on the age of patients with cancer at diagnosis revealed interesting gender-related differences. The most common age group in men at diagnosis was (59 –78) years they were 47.9%, while the most common age group in women at diagnosis (39-58) years and they were 43.9%. This may, at least in part, be due to the later onset of prostatic carcinoma (median age=68-75 years) compared to breast cancer (median age=34-48years) Table (2). Remarkably, the cancer incidence differed considerably between the cities of the state, most of patients lives in the capital of the state (84.6%), this may be due to higher levels of exposure to carcinogenic chemicals .and, with increased urbanization, industrialization, accompanied by changes in lifestyle, cigarette smoking, and environmental pollution might play a role, more detailed analyses are required to identify the corresponding risk factors. Also, that it was a significant correlation between the number of cancer cases, marital status and the occupation of patients. Cancer was significantly more frequently diagnosed among those who were married, whereas housewives (42.3 %) of all patients and (64.6%) of all female in this study. In last two years due to impact of Armed Conflict in Sudan on April 2023 has displaced over 40000 patients with cancer for peripheral oncology centers for treatment, and this increased the flow of those patients for POC for treatment. Since the beginning of 2024 about 305 displaced patients with cancer (21.4% of all new patient number during this period) received cancer treatment on POC.

Table 2: Age-Adjusted Cancer Prevalence in PCO from (2016 to June 2025)

Age	Frequency	Percent
Less than 18	41	1.3 %
18 – 38	405	12.4 %
39 – 58	1092	33.5 %
59 – 78	1539	47%
79 +	188	5.8 %
Total	3265	100 %
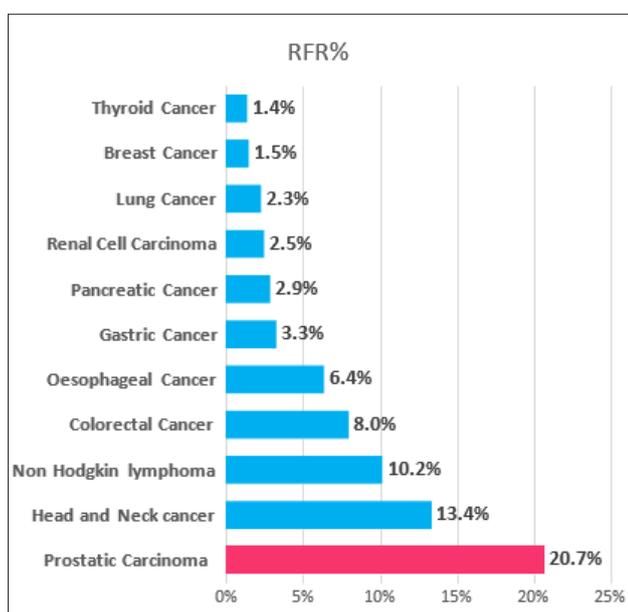
Figure 3: Incidence of Different Tumour Types Among Male Gender in PCO from (2016 to June 2025)
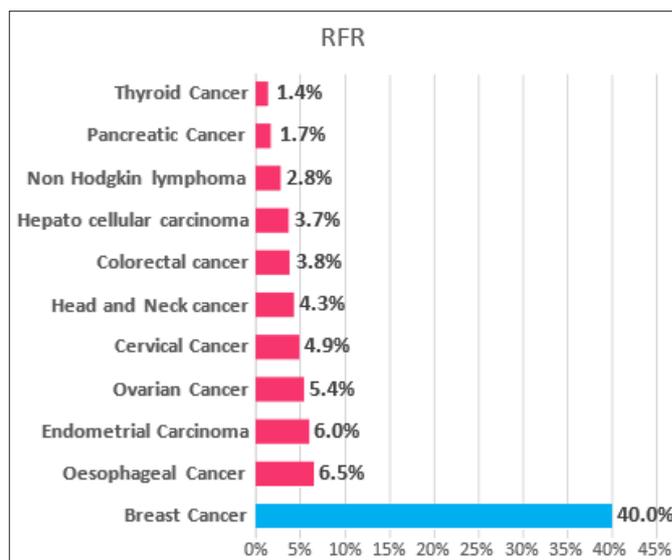
Figure 4: Incidence of different Tumour types Among Female Gender in PCO from (2016 to June 2025)

Table 3: Cancer Prevalence by Gender in PCO (2016 to June 2025)

Year	Patient	Number	RFR (%)
2016	Male Female	53 133	1.6 % 4.2 %
2017	Male Female	114 185	3.5 % 5.8 %
2018	Male Female	95 194	3 % 5.9 %
2019	Male Female	78 176	2.4 % 5.4 %
2020	Male Female	34 108	1 % 3.3 %
2021	Male Female	28 125	.9 % 3.8 %
2022	Male Female	37 69	1.2 % 2 %
2023	Male Female	150 262	4.7% 8%
2024	Male Female	362 729	11.1% 22%
Up to June 2025	Male Female	112 221	3.4% 6.8%
Total		3265	100 %

Ethnic and Tribal-Specific Cancer Incidence Rates

Regarding ethnic varieties (49.8%) of patients were descendants of bane Amer tribes, (19 %) Hdandawa tribes, (1.8%) Rashaida tribes, (22.3%) from Northern Sudan, (6.2%) were western and (1%) were others.

Discussion

This study focused on the cancer cases diagnosed and treated in (POC) Red Sea State during the period 2016 thirty June 2025. being based on results of one registry in a single state (Red Sea State) and may have an impact on understanding the current situation of cancer at the national level. We reported on 3265 cancer cases recorded at PCO during study period. This is the largest study yet on the burden of cancer in Red Sea State. during study

time Striking changes from one year to the next may occur in some cancers. The overall numbers of cancers diagnosed in Red Sea State increased from around 260 cases between 2003-2006 to more than 3265 cases between 2016-may June 2025 [15]. During the study period, more women have cancer than men, with women to men ratio (1.74: 1). However, this ratio resembles the national records but is very modest compared to what was reported by Jedy-Agba et al. for Nigerian as the number of women was twice the number of men [7, 16]. The increase in the number of women cancer incidence may be attributed to the number of breast cancer registered and under diagnosis of prostate cancer. And despite more females than males being diagnosed with cancer during study period, the risk of cancer has always been higher in males than females. The contrasting patterns between the numbers and rates between the sexes is partly due to there being more females living longer than males, although the population of both sexes continues to increase. To understand the implications of these trends over time, each cancer needs to be considered separately. The most frequent types of cancer in both sexes were breast cancer, leukemia, head and neck cancers, prostatic carcinoma, and esophageal cancer that accounting for 60.1% of all malignancies. The prevalence of these tumour types in these records is partially different from those developed countries. While breast and prostatic carcinoma belong to the top leading cancer types worldwide leukemia and esophageal cancer occurred much more frequently in this study than in the U.S.A [4,5,17]. And also, in different from that of old local records done in 2006 but similar to National in Sudan and African records [15, 18-20]. On the other hand, lung cancer as the second leading cause of morbidity and top leading cause of mortality in the U.S.A. Lung cancer ranks only the 20th frequent tumors in Sudanese patients and the nineteenth (1%) frequent tumors in PCO records [4,16,21]. The reason for the low frequency of lung carcinoma in this study, may be that cigarette smoking is not that common in Sudan compared to the U.S.A. and other developed countries. This result also in accordance with the low frequency of lung cancer in the Arab world [22].

Although some risk factors for breast cancer may be similar in Sudan (Red Sea State) and other developing countries (e.g. obesity, early menarche, decreased detection awareness, late and few births), which may be attributed to increase in urbanization rate and economic development in developing countries, Breast cancer dominates the pattern of cancer prevalence for females because it is the most commonly diagnosed tumor in PCO. Nearly 40% of all female patients with cancer in this study, has been diagnosed with breast cancer. The ASRs of breast cancer in women living in Red Sea State were 66.8 per 100,000 which were higher than what reported in black women in Harare, Zimbabwe (46.8 per 100,000, 2006–2010), and in Kampala, Uganda (31.0 per 100,000, 1991–2006) in East Africa [23, 24]. The incidence rate of breast cancer in women in Red Sea State was also higher compared to North Africa, such as in Benghazi, Libya with an ASR of (22.9 per 100,000 in 2003), (24.1 per 100,000) in Tunis, Tunisia (1993-1997), and (49.6 per 100,000) in Garbiah, Egypt (1999– 2000) [25-27]. Unfortunately breast cancer occurs in young age and it is frequently more in advanced stage at diagnosis than in western countries [28, 29].We recorded more than 13% of the patients are under the age of 35 years, and more than 60% of female with the diagnosis of breast cancer was in Age group (39-58) years ,only (4,2%) of female developed breast cancer after age of 75 years and this was similar to the national records [29]. and the longer a woman lives without cancer, the lower her risk of developing breast cancer. The most common stages of breast cancer at the time of diagnosis was locally advanced or metastatic stage (stages 3:53% followed by stage 2: 21%), and no recorded cases with stage1.The proportion of patients with an unknown stage was (26%) .The late diagnosis of breast cancer in this state is largely due to many factors: (1) lack of a screening programs, there is no well-known screening program or guidelines in Sudan up to now. (2) Also, many women in this state seeking medical attention after noticing symptoms, (3) loss of awareness of breast cancer symptoms among the community and hence late referral of suspected breast cancers to diagnostic services or seeking traditional healer, (4) Socioeconomic constraints factors.

prostatic carcinoma is a common malignancy in men, with incidence varying significantly across the globe. The risk of prostate cancer increases with age. Prostate cancer in this study ranked the fourth most frequent among all cancer sites in Red Sea State in both sexes.

However, by gender it ranked the first among study population men. represented 20.7 % of all male cancers in POC. While prostate cancer was less frequent in the past, its incidence has recently increased, possibly due to improved diagnostic technique. It is equally distributed among different ethnic group of this study. Although prostate cancer, which is the most common site overall, has by far the highest rate in the age group > 59, with ASRs was 22.4 per 100,000. This figure was similar to the national records in Sudan, and incidence rates reported in Western states of the Sudan, but were relatively lower compared to other African countries [17,19,20,30]. Recent data from Harare, Zimbabwe (1991-2010); Kampala, Uganda (1991-2006); Ibidjan, Ivory Coast (1995-1997); and Ibadan and Abuja, Nigeria reported much higher ASRs for prostate cancer [26,27,31]. Most African populations reported higher rates of prostate cancer compared to red sea state and Sudan in general. The low incidence rate in this study may reflect less diagnosis and lack of screening programs than disease occurrence. The common potential risk factors for prostate cancer among patients referred to PCO, included age, and history of tobacco and alcohol consumption. Risk factors for prostate cancer in Sudan was examined by Hamad and Abuidris in Gezira state and found to include age, education level, occupation, unhealthy habit such as smoking and high fat intake and obesity, and were found to be similar to other parts of Africa [32].

Colorectal cancer is the seventh most common cancer tumour in both sex of these studies. And this figure is not far away of the national records in Sudan and African records [9,14,32]. but indifferent from that in developed countries, colorectal cancer is the third the most commonly occurring cancer worldwide (1.9 million cases, 9.6%) after lung cancer and breast cancer [4,5]. Colorectal cancer is a significant health concern; it has received less attention compared to other cancers like breast cancer in Sudan. A 55% of patients were in age group above 59 years, 27.5% of the patients were in age group less than 38 years and a one recorded case at 17teen years of his age. A notable feature of colorectal in Sudan and in Red Sea State is the tendency for the disease to affect younger population than what is typically reported internationally [33]. the Risk of colorectal carcinoma may be obesity, a fat-rich diet for that Interestingly, human papilloma virus (HPV) infection may also be involved in the development of breast and colorectal carcinoma [32]. Lower incidence rate, presentation in advanced stage and aggressive pattern are the famous pattern of colorectal cancer in Red Sea State. The younger age presentations, potential misdiagnosis, government efforts that has prioritized breast cancer, And the need for screening program are the major challenges.

Epithelial head and neck cancer (HNC) including oral tumours is the third most frequent tumour in both sex, accounting for 7.7% of all cancer incidence in this study. Male affected more than female, this was similar to national records in Sudan and were more frequent than that in the U.S.A [18,34]. Rather than cigarette smoking, smokeless- tobacco that traditionally used in Sudan and in Red Sea State in a moist form called toombak that widely used in wide manner by local tribes and by both sexes. Nasopharyngeal (24%), hypo pharyngeal (20.7%), and oral cavity cancers (17.4%) being the most common subtypes. A significant proportion are diagnosed at advanced stage.

Esophageal carcinoma ranked fifth most frequent tumour in both sex and the second most frequent tumour in female gender in this study, it was ranked third most frequent in previous years. It constituted 46.7% of all gastrointestinal (GI) cancers in POC, these records were more frequent than that in the U.S.A [21]. And other developed countries this results more frequent than old local record in 2006 but keeping closely with national records in Sudan [15,16, 34-36]. Most patients were female (64%) compared to male (36%). The female-to- male ratio was approximately 1.7:1. The disease common at age group 59-78 years (47.4%), and often diagnosed at advanced stage due to lack of early symptoms and access to health care. Tumors were primarily located in the middle (46.4%) and lower esophagus (41.2%). Histopathological analysis revealed SCC as the most frequent subtype (82.2%), followed by ADC (17.4%) and one case (.4%) registered as adeno squamous histology which was a rare type. And it is important to mentioned that the prevalence of esophageal cancer was observed more in specific tribes in this state. More than 78.2% of esophageal cancer occurred among Bani Aamir tribes patients who belong to Toker City , Beja tribe (18.4%), and these tribes are linked to customs that play a clear role as risk factors for esophageal cancer, such as drinking coffee with ginger and pepper and eating spicy foods and hot drinks also more are alcohol intake ,poor oral health, cigarette smoking, tobacco is traditionally used in Sudan in a moist form called toombak, with widespread use among Sudanese males [37,38]. Tobacco nitrosamines may be released during consumption and may account for the high numbers of oral and esophageal tumours [38]. HPV also contributes to head and neck tumours in Sudan [39].

The uncommonly high prevalence of non-Hodgkin lymphoma is difficult to explain, it is the sixth most frequent tumour in this study, the disease in males was 67.4 % of all NHL cases. Although immune suppression has been associated with the development of NHL, (non- Hodgkin lymphoma by HIV) which is become major health problem in this state with very high records of infected population, NHL much has still to be understood about the causes of this disease.

Cervical carcinoma, being among the most frequent tumour types in females in sub-Saharan Africa [40]. In Red Sea State cervical cancer was the fifth most diagnosed cancer in women after breast, esophageal, endometrial and ovarian cancers, nearly 4.9% of all female patients with cancer in this study and 22.2% of all genital cancers. However, compared to the neighboring countries in East African, the incidence rate of cervical cancer in these reports was lower compared with national reports. The ASR of cervical cancer in Harare, Zimbabwe (2006-2010) was 103.8 per 100,000 [41]. and was 52.4 per 100,000 in Kampala, Uganda [42]. Furthermore, it was lower than what were reported by West African countries. For example, the ASR of cervical

cancer reported in Ibidjan, Ivory Coast (1995-1997) was 6.8 per 100,000, was 36.0 per 100,000 in Ibadan, Nigeria, and was 30.3 per 100,000 in Abuja, Nigeria [43,44]. The highest incidence rate of cervical cancer in this study was Observed more in women aged between 59 and 78 years followed by women aged 39-58 years and older. (middle and advanced age 90% of the cases) unlike the incidence rate in Europe and Scotland which most common cancer in women under the age of 35 High-risk HPV genomes have also been identified in patients with cervical carcinoma from Sudan [45-47]. Screening and prevention programs may help reduce the number of patients with cervix carcinoma in the future [46-48]. Other tumour types with viral involvement are liver cancer that accounting for 3.3% of cancer incidence in PCO (hepatitis B virus and hepatitis C virus) and nasopharyngeal carcinoma (HPV and EBV) [48-50].

Leukemia ranked as the second most common malignancy, while breast cancer is the most common cancer overall in this study (POC). It was 12.4% off all cancers registered by the center. this record is similar to national records [51].

Cancer Trends in POC

Through an analysis of recent trends in observed cancer incidence. The following assumptions were raised:

1. Cancer prevalence increased steeply with age, but breast cancer and some esophageal cancer exceptionally occurred early.
2. Note on trends It may be misleading to focus too much attention on any apparent changes in incidence between 2024and 2025 as indicative of cancer trend in Red Sea State, this was the duration of armed conflict and displacement of patients with cancers to Red Sea State (21.4% of all new patient number during that period); it is more informative to examine trends in incidence observed over a number of years.
3. Striking increase of incidence records of this study compared with old local records in 2006, this is indicating the Red Sea State experiencing a growing cancer burden, attributed to a population growth and aging, urbanization, and life style changes and improvement in patient awareness and diagnostic measures.
4. The COVID-19 pandemic has caused disruption in cancer diagnosis and treatment, potentially leading to delays in diagnosis and impacting the cancer statistic in POC.
5. The number of new cases in a year is an indicator of the need for resources for diagnostic investigations and first-line treatment. Similarly, the annual number of cancer deaths is an indicator of the need for resources for palliation and terminal care.
6. infection agents (HPV, HBV, HIV). Toombak, smoking tobacco, alcohol, local meals and drinks are most common risk factors.

Conclusion

This is the first report in cancer incidence in Red Sea State (POC). demonstrated the seriousness of the cancer problems with gender and age-adjusted incidence rates. Despite the study limitations, the POC data gave a fair representation of cancer profile of Red Sea State The study was based on data of one single Sudanese hospital (POC) and a bias in patient recruitment cannot be excluded. Another disadvantage is that data on cancer mortality were not available. This should be considered by future follow-up studies to allow comparisons between survival prognosis in local and in industrialized countries. we cannot exclude that some patients suffering from cancer did not present at POC,

giving cause for data bias. Based on the findings of this study, the following Enhance Early Detection and Screening. Improve Access to Diagnostic Services, Promote Prevention Strategies are the main solutions.

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