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Epidemiology of cancer in Saudi Arabia: a systematic review 2024

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Abstract

Background

Cancer is emerging as a major global health-care system challenge with a growing burden worldwide. Due to the inconsistent cancer registry system in Saudi Arabia, the epidemiology of cancer is still dispersed in the country. Consequently, cancer (BC) has a major impact on health of women worldwide and the Kingdom of Saudi Arabia (KSA) is no exception. It is considered the most common malignancy and embodies the second leading cause of cancer deaths after lung cancer. The malignancy carries tremendous socio-economic, emotional, and public health implications. Disease and treatment confound abilities to successfully achieve age-related developmental tasks, such as establishing autonomy and making independent decisions about employment, education, relationships, and starting a family. All of these stressors may interfere with adherence to therapy and ultimately impact emotional and social maturation. Emerging evidence suggests that the biomedical risks and psychosocial issues for are distinct from those of both patients and older adult populations and those patients with cancer may be served inadequately or inappropriately by existing cancer services**.** For example, disparities in survival outcomes for patients with cancer have been observed, favouring patients who are treated on protocols as opposed for the same disease**. Aim of the study**: To review the epidemiology of cancer in Saudi Arabia and pattern of cancer in the Kingdom of Saudi Arabia 2024.**Method:**This systematic review utilized the PubMed database for data extraction, including freely accessible studies published in the last 5 years. 7 articles from different study designs were included, while awareness and non-English language studies were excluded. **Results:**In recent years, the concept of epidemiology of cancer in Saudi Arabia a systematic review 2024. With regard to age-standardized rates (ASR), the incidence of all cancers excluding non-melanoma skin cancer was estimated to be 17,522 cases (8,296 males and 9,226 females) in Saudi Arabia. **Conclusion**: The overall incidence of cancer in Saudi Arabia has been rising. To lower the incidence and mortality of cancer in Saudi Arabia, primary, secondary, and tertiary prevention are all very important. The most crucial aspect is to concentrate on primary prevention, which may involve raising public awareness of cancer risk factors and strategies for reducing or eliminating them and health-related concerns about the future are particularly distressing.

Keywords: Epidemiology, cancer, Saudi Arabia.

Background:

Cancer has a major impact on health of populations and patients worldwide and the Kingdom of Saudi Arabia (KSA) is no exception. (1) It is considered the most common embodies the second leading cause of cancer deaths after lung cancer (2). The malignancy carries tremendous socio-economic, emotional, and public health implications. It is estimated that more than one million new cases of are diagnosed annually (3). cancer incidence rates in Arab populations have increased during the last 24 years, but women are still being diagnosed with BC at more advanced stages of the disease.(4) Morbidity and mortality have been shown to be effectively reduced by early detection of populations through screening activities.(5) Despite this finding, low participation rates in populations screening activities have been reported among Arab populations.(6) cancer is reported from developed nations and Western countries, while data on relevant reports from KSA appears either scattered, or not brought to the limelight.(7) Regarding risk factors, populations with a family history of Cancer should obtain as much information as possible on those relatives, including age at onset, and type of cancer .(8)

Cancer is responsible for more than 9.6 million deaths in about 185 countries, ranked as the second leading cause of mortality worldwide (9). Many risk factors have been implicated in the etiology of cancer including; tobacco and alcohol consumption, unhealthy diet, physical inactivity, viral infection, bacterial infection, urban air pollution, ionizing radiation and indoor smoke (10). It is expected that, due to changes in population demographics in the next decades, cancer will continue rising to 21.4 million deaths worldwide, by 2030 (11). Overall cancer burden, as well as, increased survival rates can be achieved through cancer prevention, early detection strategies (12)

In 2020, there 10518 cancer deaths with 24,485 new cancer cases in Saudi Arabia (total population = 33,554,333) (13). The most common cancers include breast cancer, colon-rectum (CRC), and prostate (14). Frequently reported risk factors associated with breast cancer were hormonal variations, diet, lifestyle, and obesity (15). Recent researches reported increasing trends of Cancer in Saudi Arabia. In 2020, Cancer accounts for 14.6% of total cancers in the country (16). The risk factors for Cancer may be genetic, environmental, age, gender and other inflammatory conditions of the digestive tract . (17)

Prostate cancer is the other major cause of death in males. Alteration in lipid metabolism, HPV infection and racial difference are some of the risk factors linked with prostate cancer (18)

Renal cell carcinoma (RCC) is one of the most prevalent renal malignancies responsible for approximately 2-3% of all cancers, with 431,000 new diagnoses and around 180,000 deaths reported globally in 2020. It is a silent cancer, with incidence rising every year (19) RCC is the ninth and 14th most common cancer in malesand females worldwide, respectively (20). Most RCCs arise in the renal cortex, consisting of the glomerulus, collecting duct, and tubular apparatus. In contrast, cancers originating in the renal pelvis exhibit similarities to urothelial cancer histologically and behaviorally (17). Renal cancer screening and diagnosis has become a top research priority internationally due to its significantly large number of asymptomatic patients, high mortality, and increasing incidence (21).

Renal cancers have become more prevalent in developed countries during past decades. It is the ninth most common cancer in the United States, with its incidence doubled since 1975 (22). The majority of RCC patients belong to North America and Europe. In addition, there is also an expected increase in RCC cases in Africa and Asia due to lifestyle changes. The RCC incidence in the United Kingdom increased by 3.1% per

year from 1993 to 2014 (23). RCC incidence ranges from 1/100,000 in females to 2/100,000 in males in India (24). The prevalence of renal cancer in Saudi Arabia is 4.6% (25).

Methodology

Aim of the study:

To review the epidemiology of cancer in Saudi Arabia and pattern of cancer in the Kingdom of Saudi Arabia 2024 .

Study design:

Systematic reviews Using multiple databases, including PubMed, Web of Science, Up-to-date and Google Scholar data extracted from published articles were systematically to epidemiology of cancer in Saudi Arabia .

Search strategy:

Reference lists of the included studies were searched to identify additional potentially relevant studies. Studies in systematic reviews of epidemiology of cancer in Saudi Arabia . The strategy of interest in this review was objectively epidemiology of cancer in Saudi Arabia. The same methods were used for searching the Scopus databases .

Searches and Data Sources

Literature from Saudi Arabia related to various cancer types were collected by electronic search in Medline/PubMed, Cochrane Library, Scopus, Web of Knowledge, Google Scholar and public database (GLOBOCAN 2012, IARC) that meet the inclusion criteria. Data from the Saudi cancer registry were also collected. Relevant keywords (breast cancer, colon-rectum (CRC), prostate, Hodgkin's and non-Hodgkin's lymphomas, brain/CNS, kidney, thyroid, etc.) were used in affiliation to Saudi Arabia. No filters were used during the electronic searches **.**

Inclusion criteria

Only literature published during 2020–2024 from Saudi Arabia and related to the epidemiology of cancer and factors were included. Data from the Saudi National cancer registry were also considered. All sources which demonstrate the type of malignant neoplasm with possible factors were put under inclusion criteria. All relevant articles (including case-control, cohort, cross-sectional, etc.) were included, as they permit the estimation of odds ratios.

Exclusion Criteria

Publications are written in a language other than English and those focussed on survivors of cancer, pharmacological research, qualitative studies, and reviews and meta-analysis were excluded. Publications on laboratory research including animal trials were also excluded.

Data Extraction

The extracted data are summarized in table 1 includes the Findings of the Selected Studies based epidemiology of cancer in Saudi Arabia , the Author, Date, Country, result, region and type of organization where the study was performed. Focuses on the results of the epidemiology of cancer in Saudi Arabia and lists which dimension of Saudi Health care System epidemiology of cancer .

Table1: Summary of Findings of the Epidemiology of cancer in Saudi Arabia.

Author, Date, Country	Region	Study design	Study aim	Results
Alessa et al. (2024)(26)	Saudi Arabia	narrative review	To review the epidemiology of CRC in Saudi Arabia, focusing on prevalence, incidence, risk factors, preventive measures, and outcomes..	According to IAR on Cancer in 2020, CRC is the second leading cancer in Saudi Arabia, with a crude incidence rate (CIR) of 11.5 per 100,000, 13.7 for males and 8.5 for females. The age-standardized incidence rate (ASIR) was 13.9 with a cumulative risk of 3.07%, second only to breast cancer, which had a CIR of 26.9 and an ASIR of 28.8 with a cumulative risk of 4.38 per 100,000. Saudi Arabia also had the highest crude mortality rate (CMR) among Gulf Cooperation Council countries at 5.7, and the age-standardized mortality rate (ASMR) was 7.3 per 100,000 with a cumulative risk of 1.99% in 2020. Saudi guidelines for CRC screening strongly recommend screening individuals between 45 and 70 years of age. In comparison, the United States Preventive Services Task Force (USPSTF) strongly recommends screening individuals between 50 and 75 years of age, and those between 45 and 49 years with moderate net benefit . The Saudi guidelines do not recommend screening individuals over 70 years old unless the person could benefit from the screening. Similarly, the USPSTF conditionally recommends screening for adults between 76 and 85 years. **Conclusions** Given that CRC is the second most common cancer in Saudi Arabia, the Ministry of Health will need to invest more funds and treat a larger number of patients. Therefore, it is crucial to prioritize cancer prevention, particularly primary prevention, over secondary and tertiary prevention. Increasing public knowledge of CRC risk factors and strategies for avoiding or managing them could be the first step in the primary prevention of CRC. Also, prevention of socioeconomic factors is very important which could be done by physical activity and healthy diet. The role that calcium

				and vitamin D intake play in preventing CRC still requires further investigation. Regular publications of updated CRC data, including incidence, mortality, and survival rates, are warranted.
Alharbi et al (2024) (27)	Saudi Arabia	Retrospective observational	To analyze the demographics and clinical profiles, histopathological presentations, and treatment outcomes of 73 RCC patients at a hospital in Qassim region, Saudi Arabia..	Renal cell carcinoma is an aggressive but silent cancer that accounts for 90% of renal cancers and is rising in prevalence every year. This study demonstrates that the prevalence of renal cancer is higher in males than females, older individuals, and patients with other comorbidities such as diabetes, obesity, and hypertension. Thirty-eight percent of cancer patients have been reported to have hypertension as the most commonly occurring comorbidity. The increasing prevalence of RCC and hypertension might be because of the following two reasons: the occurrence of hypertension as a risk factor of RCC, and RCC can also be caused by nephrectomy, Para neoplastic syndrome, and targeted therapies. Although no associationwas found between diabetes and RCC in the Vitamins and Lifestyle (VITAL) study, an increased risk of RCC was observed in diabetic women and men with high glucose in the Nurses' Health Study. In the present study, it was found that 61.6% of the individuals diagnosed with renal cell carcinoma

				(RCC) were male, consistent with prevailing global patterns. Furthermore, a separate investigation noted a consistently higher incidence of RCC in males, ranging from 1.5 to 2 times higher, across diverse age groups . **Conclusions** Extensive information on the global trends and regional distinctions of RCC in the Qassim region has been provided in this study. ccRCC has the highest prevalence among all types of renal cancer, with incidental diagnosis in most cases. Comorbidities such as hypertension and obesity are commonly associated with RCC. RCC management is a complex phenomenon in the region, and further studies are required to investigate longitudinal outcomes, focusing on the long-term effectiveness of medical and surgical therapies and lifestyle interventions.
Basudanet al (2024) (28)	Saudi Arabia	Analysis of the Saudi Cancer Registry (SCR) data for various incidence metrics from 2001 to 2020 was conducted	This study provides a two-decade detailed assessment of lymphoma incidence trends in the Saudi population	The general distribution of HL and NHL in our study population diverges notably from several other countries. In our analysis, HL accounted for 43.5%of all lymphoma cases, whereas NHL accounted for 56.5%. According to the GLOBOCAN report for 2020, the global distribution of HL was 13%, while it was 86.8%for NHL . The increased prevalence of HL in Saudi Arabia could be explained by the high percentage of the population with younger age (60% are under 30). In addition, family history and inherited mutations are genetic risk factors for HL and NHL. It is possible that the high consanguinity among the Saudis can add more predisposing variants to HL . This study represents the longest and most extensive examination of lymphoma incidence patterns in the Saudi population. Nevertheless, additional information on mortality and survival rates is vitally needed. With lower NHL ASR observed in our investigation, it would be plausible that fatality rates have also fallen. **Conclusions** The overall incidence of lymphoma has been rising among Saudis, especially HL, which continues to comprise a proportion of all malignancies. Overall, the majority of the patients were presented with

				advanced-stage disease and at a younger age. Our model indicated that HL trends were increasing annually. For most age categories, males have significantly higher AIR than females. Therefore secondary preventions, such as screening programs to offer early detection, coupled with efficient tertiary management of the disease post-diagnosis, are warranted.
Katib, et al (2023) (29)	Saudi Arabia	Retrospective analysis	To describe the epidemiological and genetic landscapes of LC in Al-Madinah city in Saudi Arabia	The prevalence and incidence of lung cancer in Saudi Arabia is underrated. According to SCR, two studies have estimated the incidence of lung cancer in Saudi Arabia; 452 cases diagnosed in 2014 (3.9% of all cancers per year) and 458 cases diagnosed in 2020 (3.4% of all cancers per year) . The incidence of lung cancer in the Al-Madinah region of Saudi Arabia has not been accurately estimated for the past two decades. In our study, we retrospectively analyzed 65 cases of lung cancer diagnosed at the main oncology center affiliated with King Fahad Hospital in Al-Madina City in Saudi Arabia, over a period of 6 years from 2015 to 2021. We compared our findings to previous results from Surveillance, Epidemiology, and End Results (SEER) registries from 2014 to 2018 , as well as studies conducted in different racial populations, including East Asia and Europe . Overall, our study found that lung cancer was more prevalent in older individuals (>50 years), Saudi males, and smokers . **Conclusions** Lung cancer is not as common in Saudi Arabia as in other parts of the world. However, our study has stated that lung cancer has a significant burden on the Saudi community. If the risk factors and the challenges that we have mentioned are not addressed, the number of cases will increase drastically. Health education and awareness about the risk factors and cancer prevention methods will help in early lung cancer detection. Although significant advances in the management of this disease have been realized, there are many plans underway to enlist more resources to be better prepared to control this fatal disease through prevention and effective treatment.

Alghamdi et al . (2023), (30)	Saudi Arabia.	Retrospective descriptive epidemiological analysis	To investigate the prevalence of GC across all administrative regions in Saudi Arabia.	It is essential to continuously monitor and update the CIRs and ASIRs of cases of GC across all regions in Saudi Arabia. The aim of the present retrospective study was to examine the trends in CIR and ASIR of GC in Saudi Arabia between 2004 and 2017. To the best of the authors' knowledge, this descriptive epidemiological study on the spatial and temporal distribution of GC that has been performed among both men and women in various regions of Saudi Arabia, based on the PubMed database. The present study has provided valuable insights into the incidence rates of GC in Saudi Arabia and has provided information which should help inform future research and public health initiatives. However, it is important to acknowl- edge the limitations of the present study, such as the absence of a comparison group and the inability to assess the statistical association between potential risk factors and GC. The lack of information on GC-associated deaths in the SCR reports prevented the determination of average death rates of GC in various regions of Saudi Arabia. Additionally, the limitation of not being able to collect TNM staging information at the initial diagnosis of GC from the SCR is acknowledged. The SCR only provides TNM staging data for the top ten cancer types in Saudi Arabia, and GC is not among those reported. As a result, it was not possible to provide a specific description of the change in TNM stage in the initial diagnosis of GC based on SCR data. **Conclusion** The present study has demonstrated that there has been a small decline in the CIRs and ASIRs of GC in the Saudi population between 2004 and 2017. Riyadh, Najran and the Eastern Region were revealed to have the highest overall ASIRs of GC among male and female Saudis, whereas Jazan had the lowest rates for both sexes. Between 2004 and 2017, the ratio of cases of GC in male Saudis was detected to be double that of female Saudis. Further epidemiological studies,however, are required to determine the potential risk factors for GC in Saudi Arabia.

Algarni,et al (2022) (31)	Saudi Arabia	We searched the medical records by using a combination of free text search	To explore the pattern of skin cancer, specifically among the Saudi population residing in the Aseer region.	Despite the relatively low incidence of skin cancer compared with light-skinned Caucasians, the Saudi population still faces a significant risk and the potential for higher morbidity and mortality due to late presentations resulting from a lack of awareness. In this study, we aimed to outline the epidemiological trends in skin cancer in the Aseer region of KSA from 2011 to 2021. We utilized electronic medical records as a valuable source of data. SCC emerged as the most frequently diagnosed type, followed closely by BCC. For SCC, invasive SCC constituted the prevailing subtype. Among the less commonly diagnosed skin tumors, we observed vascular neoplasms, melanoma, and cutaneous metastasis. Our findings unveiled a significant correlation between age and the type of skin cancer, with a higher prevalence among adults aged > 60 years. However, our analysis did not indicate any association between skin cancer and sex. Moreover, we noted a link between the type of skin cancer and its distribution. Specifically, the head and neck region emerged as the most frequently affected area, followed by the lower limbs. **Conclusions** By describing the epidemiological pattern of skin cancer in this specific region, our study contributes to a better understanding of the disease's incidence and characteristics. To promote the early detection and prevention of skin cancer, it is crucial to implement public awareness campaigns that can educate the general population about the risk factors, signs, and symptoms of skin cancer, as well as the importance of regular self-examinations and seeking medical attention for any suspicious skin lesions. Customized prevention strategies could concentrate on distinct age groups. We found that the skin cancer incidence varied from 2011 to 2021 in the Aseer Region, KSA, ranging from 1.6% to 11.6%.

Almatroudi, et al (2021) (32)	Saudi Arabia	A retrospective observational population-based epidemiological study on lung cancer	To analyzing the frequency of diagnosed lung cancer cases, age-standardized incidence rate (ASIR), and crude incidence rate (CIR) classified by year of diagnosis, age group, and different administrative regions of Saudi Arabia	In this study, the highest overall ASIRs for lung cancer among males were documented in the Eastern and Tabuk regions. Males of these regions are greatly exposed to lung-cancer-associated risk factors as compared to other regions, which can be the most probable explanation. Additionally, an increase in ASIR among males in Eastern and Tabuk region can also be related to other factors such as genetics, lifestyle habits, and environmental risk factors. Hence, to better understand the key risk factors linked to the rise of ASIR for lung cancer in the Eastern and Tabuk region, there is a necessity of detailed epidemiological analysis. Another likely justification for the high incidence rate in these regions may be the existence of industries, an advanced healthcare facility and its accessibility, and Vitamin D deficiency. Two studies demonstrated that increased concentration of circulating vitamin D may decrease lung cancer risk. The most probable reason could be the presence of more particular protective factors in the Jazan and Najran region than for males of higher ASIR regions. Other possible explanations may include a lesser healthcare facility and less accessibility, lesser industrialization, less. Westernization, and less screening in comparison to regions with higher incidence . **Conclusions** The present study concludes a rise in crude incidence rates and age-standardized incidence rates for lung cancer among the Saudi population. Among males, the Eastern region reported the highest overall ASIR, followed by the Tabuk region, and among females, the highest overall ASIR was reported in the Eastern region, followed by Riyadh and the Northern region. The incidence of lung cancer was reported highest in the age group of more than 75 years. The study will aid in generating lung-cancer-related epidemiological information about the Saudi Arabian population and will ultimately help in understanding cancer trends. Furthermore, this study will help to manage the incidence and mortality of cancer in the future and be implemented in screening and cancer prevention strategy in Saudi Arabia.

Results and discussion

In recent years, the concept of epidemiology of cancer in Saudi Arabia a systematic review 2024. With regard to age-standardized rates (ASR), the incidence of all cancers excluding non-melanoma skin cancer was estimated to be 17,522 cases (8,296 males and 9,226 females) in Saudi Arabia with ASR incidence rates of 0.3–12.6 in males and 0.2–29.5 in females. The estimated mortality was 9,134 cases across all ages and gender. The ASR mortality rates range from 0.1–7.3 in males and 0.1–9.1 in females. Saudi Arabia ranks second in cancer mortality rates amongst all Arabian Gulf countries.

The highly recognized risk factors for cancer as revealed by most of the literatures are lack of lifestyle healthy habit, obesity, low vitamin D intake, use of oral contraceptives, abortion, ulcerative colitis, genetic polymorphism, high serum PSA, radioactive exposure, low physical activity, Epstein-Barr viral infection, diabetes, iodine deficiency, smoking, and high leptin levels. Besides these, ambient air pollution is another risk factor for most of the malignancies in Saudi Arabia due to frequent exposure to dust storms containing particulate matters (20) However, the present study predict that, almost all meta-analyses were highly heterogeneous, which might be attributed to the diverse cancer causes factors, lack of the studies, and intermittence of cancer reporting registries.

Also renal cell carcinoma is an aggressive but silent cancer that accounts for 90% of renal cancers and is rising inprevalence every year. This study demonstrates that the prevalence of renal cancer is higher in males than females, older individuals, and patients with other comorbidities such as diabetes, obesity, andhypertension. Thirty-eight percent of cancer patients have been reported to have hypertension as the most commonly occurring comorbidity (23). The increasing prevalence of RCC and hypertension might be because of the following two reasons: the occurrence of hypertension as a risk factor of RCC, and RCC can also be caused by nephrectomy, Para neoplastic syndrome, and targeted therapies (24-26). Although no association was found between diabetes and RCC in the Vitamins and Lifestyle (VITAL) study, an increased risk of RCCwas observed in diabetic women and men with high glucose in the Nurses' Health Study (27)

Within the context of literature pertained to observational studies (assessing perception, attitude, and awareness), many Saudi community-related factors can contribute to the escalating burden of cancer. These increasing trends may be due to changing lifestyles, lack of awareness, embarrassment, and fear of testing or non-accessibility to advanced treatment and due to a multitude of factors. Although most of these cancers are preventable, early detection by trained health practitioners is of utmost importance and paramount responsibility. Effective techniques for screening and diagnosis using modern up-graded instruments may minimize the burden of cancer in Saudi Arabia (32) The present review has direct implications in improving the health component of cancer patients through the inspiration of health providers towards implementing effective cancer-related health management strategies. These should include; prevention, early detection, proper treatment, and better palliative care. Such strategies will recruit a healthy lifestyle, raised awareness (decreasing cancer morbidity), early detection resulting, appropriate treatment, and better palliative care (decrease mortality).

Multiplepieces of evidence support that cigarette smoking is associated with the development of CRC (28). Some studies report that reduced serum vitamin D and calcium levels increase the risk of CRC, while other studies do not (29) .Reviewedthat dietary vitamin D3 intake or sunlight exposure has an inverse association with CRC (30) . Additionally, calcium intake has been shown to reduce the risk of developing CRC and improve the survival rate (31). Saudi guidelines for CRC screening strongly recommend screening individuals between 45 and 70 years of

age. In comparison, the United States Preventive Services Task Force (USPSTF) strongly recommendsscreening individuals between 50 and 75 years of age, and those between 45 and 49 years with moderate net benefit (29). The Saudi guidelines do not recommend screening individuals over 70 years old unless the person could benefit from the screening. Similarly, the USPSTF conditionally recommends screening for adults between 76 and 85 years (23).

Conclusion

Within the diverse cancers reported from Saudi Arabia, the epidemiology of some cancers magnitude 3-fold in the latest years. This increase might be attributed to the changing in the Saudi population lifestyle (adopting western model), lack of cancer awareness, lack of screening & early detection programs, social barriers toward cancer investigations. Obesity, genetics, sedentary lifestyle, tobacco use, viral infection, and iodine & Vit-D deficiency represent the apparent cancer risk factors in Saudi Arabia.

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