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Socio-Demographic Determinants of Cancer in South Sudan: A Cross-Sectional Analytical Study

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Abstract: Cancer is an emerging public health and socioeconomic challenge in South Sudan, driven by the interaction of biological, social, cultural, and healthcare-related factors. The paper was conducted to determine the level and pattern of cancer and identify the major socio-demographic factors associated with cancer in South Sudan. The study reveals that increasing age, gender differences, hereditary factors, poverty, low education, cultural practices, occupational exposures, and weak healthcare infrastructure significantly influence cancer occurrence and progression. Women face elevated reproductive cancer risks linked to cervical, breast, and ovarian cancers, while men show higher overall cancer exposure due to hazardous occupations, smoking, alcohol use, and delayed healthcare-seeking behaviour. Rural populations and low-income groups experience limited access to screening, diagnosis, and treatment services, leading to late-stage diagnosis and poor survival outcomes. The findings further indicate that low awareness, limited preventive services, weak oncology systems, and ongoing conflict intensify the cancer burden. The study concludes that reducing cancer in South Sudan requires comprehensive strategies involving public awareness, HPV vaccination, early screening, improved reproductive health services, occupational safety measures, rural healthcare expansion, and strengthened diagnostic and oncology services.

Keywords: *Cancer, Socio-Demographic, South Sudan.*

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I. INTRODUCTION

Globally, burden of cancer is increasing rapidly, particularly in low- and middle-income countries, where health systems often face significant constraints in prevention, diagnosis, and treatment (Shah *et al.*, 2019).

Regionally, cancer burden is rising due to demographic transitions, increased life expectancy, and changes in lifestyle and environmental exposures (Ngwa *et al.*, 2022). In addition, infection-related cancers, such as cervical cancer associated with human papillomavirus (HPV), remain highly prevalent (De Flora and Bonanni, 2011). Limited access to screening services, delayed diagnosis, and inadequate treatment facilities contribute to poor cancer outcomes in the region (Shah *et al.*, 2019)

In South Sudan, cancer represents an emerging public health concern. However, reliable data on cancer incidence, prevalence, and risk factors remain scarce due to weak health information systems and limited research infrastructure (Mwanje, 2023). Available evidence from the World Health Organization (2022) reported that cancers such as cervical, breast, prostate, and liver cancer are among the most common, often diagnosed at advanced stages. The country's prolonged conflict, fragile healthcare system, and low awareness of cancer further exacerbate the burden.

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Cancer is a leading cause of morbidity and mortality worldwide, accounting for millions of new cases and deaths annually (Sung *et al.*, 2021). Despite the growing importance of cancer as a public health issue, there is a lack of comprehensive studies examining its determinants within the South Sudanese population.

The study aims to determine the level and pattern of cancer and identify the major socio-demographic factors associated with cancer in South Sudan.

II. EMPIRICAL STUDIES ON SOCIO-DEMOGRAPHIC FACTORS

Maggen *et al.* (2020) conducted a study to examine the interaction between pregnancy and cancer, with a particular focus on maternal treatment outcomes, fetal safety, and long-term child development among women diagnosed with cancer during pregnancy. The study utilized Descriptive statistical analyses, longitudinal follow-up methods, and comparative outcome assessments. The findings revealed that cancer treatment during pregnancy, particularly chemotherapy administered after the first trimester, was generally feasible and relatively safe for fetal development when carefully monitored. The study concluded that pregnancy-associated cancer can often be managed effectively without terminating the pregnancy and that appropriately timed cancer treatment can preserve maternal health while minimizing fetal risks.

Bray *et al.* (2018) conducted a study to assess the worldwide burden of cancer by examining variations in cancer occurrence and deaths according to sex, geographic region, and level of socioeconomic development. The authors used statistical estimation techniques that integrated data from population-based cancer registries, national mortality databases, and demographic information obtained from the World Health Organization and the United Nations. The findings revealed that cancer constituted a major global public health challenge in 2018, with an estimated 18.1 million new cancer cases and 9.6 million cancer-related deaths worldwide. The study concluded that the global cancer burden was rapidly increasing and posed a significant threat to health systems worldwide, especially in countries with fragile healthcare infrastructures.

Singh and Jemal (2017) conducted a study to assess how cancer incidence, mortality, and survival differed according to social class, income, education, race, and ethnicity, while also identifying whether inequalities had narrowed or widened over time. The study applied descriptive and comparative analytical methods. The findings revealed substantial and persistent socioeconomic and racial/ethnic inequalities in cancer outcomes in the United States. The study concluded that cancer disparities in the United States are strongly rooted in socioeconomic inequality and structural racial disadvantages rather than biological differences alone.

Cutler *et al.* (2006) conducted a study to examine the major determinants of mortality and explain why mortality rates differ across populations and over time. The study employed a comprehensive analytical review model grounded in health economics and demographic transition theory. The findings showed that mortality decline is strongly associated with improvements in education, income growth, public health interventions, nutrition, sanitation, and advances in medical technology. The study concluded that mortality is determined by a multidimensional interaction of economic, social, behavioural, and healthcare-related factors rather than by income alone.

Marmot (2005) conducted a study to explain why individuals with lower social status experience poorer health, higher rates of disease, and shorter life expectancy even in societies where basic medical services and material resources are available. The model used in the study was primarily the social determinants of health framework combined with epidemiological and psychosocial models of disease causation. Also, the study utilized statistical model. The findings revealed a strong and consistent association between lower social status and increased risks of cardiovascular disease, mental illness, reduced immunity, poor quality of life, and premature mortality. The study concluded that improving population health requires addressing the broader social and economic conditions that produce inequality rather than focusing only on medical treatment.

Bayo *et al.* (2002) conducted a study to investigate the major risk factors associated with invasive cervical cancer among women in Mali. The study utilized multivariate logistic regression analysis. The findings revealed that persistent infection with high-risk HPV types was the strongest predictor of invasive cervical cancer among Malian women. The study concluded that invasive cervical cancer in Mali is strongly influenced by both biological and socioeconomic risk factors, particularly HPV infection and reproductive patterns.

III. MATERIALS AND METHODS

The study utilized a cross-sectional descriptive survey in which the data were collected using a structured questionnaire in Juba, November 2025. The study utilized a sample size of 384 participants. The target population was males and females who had been diagnosed with cancer and were aged 15 to 55+ years. It is distributed to five medical centers, such as Juba Medical Complex, Juba Teaching Hospital, Afia Medical Clinic Center, Gudele Hospital, and Catherina Medical Center, from 7th November to 23rd December 2025 by well-qualified investigators. Consent was obtained from the Ministry of Health –Research Ethics Review Board (MOH-RERB) in Juba, South Sudan.

The dependent variable was cancer in both males and females, classified as follows: Individuals without cancer (including prostate, breast, cervical, and ovarian cancers)

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affecting both sexes were designated 0, while those with cancer (including lung, colorectal, skin (melanoma), lymphoma, kidney, leukaemia, liver, stomach, nasopharyngeal carcinoma, esophageal, bladder, brain tumour, pancreatic, multiple myeloma, Kaposi's sarcoma, tongue, malignant, umbilical, rhabdomyosarcoma, and malignant neck) affecting both sexes were designated 1. The independent variables were: age, gender, occupation, residence, marital status, educational level, family income, family history, age at first marriage/sexual contact, number of childbirths, number of times married, and age at birth of first child.

The Statistical Package for the Social Sciences (SPSS), version 21, was used for bivariate analysis. The biostatistical models used for analysis were descriptive statistics to compute the mean, standard deviation, and sum values. Additionally, multivariate analysis using the binary logistic regression was conducted, where the outcome variable is binary (e.g., cancer: yes/no).

IV. RESULTS

- *Socio-Demographic Factors of the Study Population*

The findings in Table 1 show that the age group variable had the highest mean (Mean = 6.01, SD = 2.234), suggesting that respondents were distributed across several age categories with substantial variability. This indicates the presence of participants from different reproductive and biological risk groups. Biologically, age is strongly associated with the development of cancers, especially cervical, breast, and ovarian cancers, because prolonged exposure to hormonal, environmental, and infectious risk factors increases with advancing age. In the South Sudan context, limited access to early screening services and delayed healthcare-seeking behaviour among older women may increase vulnerability to late-stage cancer diagnosis.

Gender had a mean of 1.51 with a very low standard deviation (SD = 0.501), indicating a relatively balanced but less variable distribution of respondents by sex. Since many reproductive cancers are female-related, the dominance or concentration of women in the study may reflect the public health burden of female cancers in South Sudan. Socially, women in South Sudan often face barriers such as low health awareness, poverty, cultural stigma, and limited access to reproductive healthcare services, which may contribute to increased cancer risk and delayed treatment.

Occupation showed a mean of 1.48 and a low standard deviation (SD = 0.500), suggesting that most respondents belonged to similar occupational categories. This may indicate limited economic diversity among participants. Socially and economically, occupation influences access to healthcare, nutrition, and information. In South Sudan, many households depend on subsistence farming, informal employment, or unstable income-generating activities, which may reduce the ability to afford cancer screening, diagnosis, and treatment services.

Residence had a mean of 1.77 and a relatively low standard deviation (SD = 0.421), indicating moderate concentration within specific residential categories. Residence is an important social determinant of health because urban and rural populations differ in access to healthcare infrastructure. In South Sudan, rural residents often experience inadequate health facilities, long travel distances, a shortage of healthcare workers, and poor transportation systems, all of which negatively affect early cancer detection and treatment outcomes.

Marital status recorded a mean of 1.99 with moderate variability (SD = 0.662). Marriage patterns are socially and biologically relevant in reproductive health studies because marital status may influence sexual behaviour, reproductive exposure, emotional support, and healthcare utilization. In South Sudan, early marriage and polygamous practices remain common in some communities, potentially increasing exposure to sexually transmitted infections such as human papillomavirus (HPV), a major biological risk factor for cervical cancer.

Educational level had a mean of 3.01 and a relatively higher standard deviation (SD = 1.315), indicating substantial variation in educational attainment among respondents. Education is one of the strongest social determinants of health because it influences health literacy, awareness of cancer prevention measures, and healthcare-seeking behaviour. In the South Sudan context, low female literacy rates and interrupted education due to conflict and poverty may reduce awareness about cancer symptoms, screening, vaccination, and preventive reproductive practices.

Family income showed a low mean (Mean = 1.55, SD = 0.717), suggesting that many respondents belonged to lower-income groups. Economically disadvantaged populations are often unable to access preventive healthcare services or afford specialized cancer treatment. In South Sudan, high poverty levels, unemployment, and dependence on humanitarian support contribute to poor healthcare access and delayed diagnosis of chronic diseases, including cancer.

Family history of cancer disease had a mean of 1.54 with low variability (SD = 0.499), indicating that respondents had relatively similar responses regarding hereditary cancer exposure. Biologically, family history is an important predictor of genetic susceptibility to certain cancers, such as breast and ovarian cancer. The finding may suggest the need for increased awareness and family-based screening approaches within communities in South Sudan.

Age at first marriage or sexual contact had a mean of 2.63 and moderate variability (SD = 0.939). Early sexual debut and early marriage are biologically associated with prolonged

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exposure to reproductive risk factors and increased vulnerability to HPV infection. In South Sudan, cultural practices promoting early marriage among girls may contribute significantly to reproductive health complications and cervical cancer risk.

The number of childbirths had a mean of 3.15 and moderate variation (SD = 1.167), indicating relatively high fertility levels among respondents. High parity has biological implications because repeated childbirth may influence hormonal exposure and reproductive tract changes associated with some cancers. In South Sudan, high fertility rates are socially encouraged and often linked to cultural expectations, limited contraceptive access, and low reproductive health education.

The number of times married recorded a mean of 1.93 and a relatively high standard deviation (SD = 1.129), suggesting greater diversity in marital experiences among participants. Multiple marriages may increase exposure to sexually transmitted infections and reproductive health risks. Socially, instability caused by conflict, widowhood, displacement, and customary marriage practices in South Sudan may contribute to repeated marital transitions.

Age at birth of first child had a mean of 2.02 with relatively high variability (SD = 1.126). Biologically, early childbearing may increase or decrease risks for different cancers depending on hormonal and reproductive exposure patterns. In South Sudan, adolescent pregnancies remain common due to early marriage, limited reproductive health services, and inadequate sexual health education, which may influence long-term maternal health outcomes.

Table 1: Distribution of Socio-Demographic Factors of the Study Population.

Variables	Mean	Std. Deviation	Sum
Age group	6.01	2.234	2307
Gender	1.51	0.501	578
Occupation	1.48	0.500	569
Residence	1.77	0.421	680
Marital Status	1.99	0.662	764
Educational level	3.01	1.315	1156
Family income (Monthly)	1.55	0.717	594
Family history of cancer disease	1.54	0.499	593
Age at first marriage/sexual contact	2.63	0.939	1009
Number of Childbirths:	3.15	1.167	1210
Number of times married	1.93	1.129	740
Age at birth of first child	2.02	1.126	776

➢ *Binary Logistic Regression Model of the Study Variables*

Table 2 presents the binary logistic regression results examining the association between gender and cancers affecting both males and females. In this model, females were used as the reference category (RC), while males were compared against them. The regression coefficient for males was positive and statistically significant ($B = 2.987$, $p < 0.001$), indicating that being male substantially increased the likelihood of having cancers classified under the "bisex" category. The odds ratio, $Exp(B) = 19.827$, shows that males were nearly 20 times more likely than females to suffer from these cancers. The 95% confidence interval (9.991–39.344) is wide but entirely above 1, confirming a very strong and reliable association between male gender and the occurrence of these cancers.

Biologically, these findings may be explained by sex-related differences in hormonal regulation, immunity, occupational exposure, and lifestyle behaviours. Men are generally more exposed to carcinogenic risk factors such as tobacco smoking, alcohol consumption, industrial chemicals, and environmental toxins, all of which are strongly linked to cancers such as lung, liver, bladder, kidney, stomach, and esophageal cancers. Male sex hormones, particularly testosterone, may also influence cellular proliferation and tumour progression in some malignancies. Furthermore, studies suggest that females often possess stronger immune surveillance mechanisms due to estrogen-related immune protection, which can reduce susceptibility to some cancers. Men are also more likely to delay health-seeking behaviour, causing cancers to be detected at advanced stages when the disease burden becomes more severe.

Within the context of South Sudan, the findings are particularly important because many men are engaged in high-risk occupations such as mining, transportation, military service, fuel handling, construction, and agricultural activities involving smoke, dust, pesticides, and petroleum products. Long-term exposure to biomass smoke, untreated industrial waste, and contaminated water may contribute to increased risks of lung, liver, kidney, and gastrointestinal cancers. Tobacco and alcohol use among men in urban centers such as Juba is increasingly becoming common, further elevating cancer risks. In addition, limited cancer screening services, weak diagnostic infrastructure, and poor awareness among men often result in late diagnosis and poor prognosis.

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Socially, cultural norms in South Sudan may discourage men from seeking preventive healthcare or early medical consultation. Many men only attend hospitals when symptoms become severe, leading to delayed cancer detection. Economic hardship, displacement due to conflict, poor nutrition, chronic infections, and limited access to specialized oncology services also intensify vulnerability among males. These structural and behavioural factors likely amplify the strong association observed in the regression model.

Table 2: Socio-Demographic Factors by Binary Logistic Regression Model.

Variable	B	S.E.	Sig.	Exp(B)	95% C.I	
					Lower	Upper
Gender (RC = Females) Males	2.987	0.350	0.000	19.827	9.991	39.344

V. DISCUSSION

The findings in Table 1 reflect the combined influence of biological vulnerability, reproductive behaviour, socioeconomic inequalities, and weak health systems. These findings are consistent with international cancer epidemiology studies, but they are intensified in the context of South Sudan because of prolonged conflict, poverty, weak healthcare infrastructure, gender inequality, and limited cancer prevention services.

The age group variable had the highest mean and variability, showing that respondents were spread across several age categories. Worldwide studies confirm that increasing age is one of the strongest predictors of cancer development because cancer risk accumulates over time through prolonged exposure to carcinogens, hormonal changes, chronic inflammation, infections, and genetic mutations. The World Health Organization (2024) and International Agency for Research on Cancer studies confirm that the incidence of cervical, breast, and ovarian cancers rises with age, particularly after reproductive maturity and menopause. Similarly, Bray *et al.* (2018) in the GLOBOCAN report showed that cancer burden increases substantially among older adults worldwide. Biologically, aging weakens immune surveillance and increases cumulative exposure to HPV, reproductive hormones, and environmental toxins. In South Sudan, these biological risks are worsened by delayed diagnosis, the absence of routine screening programs, and limited oncology services. Older women often seek care only when symptoms become severe because healthcare facilities are distant, expensive, or unavailable. Consequently, cancers are frequently diagnosed at advanced stages, increasing mortality.

The relatively balanced gender distribution confirms that both males and females were represented, although women remain more vulnerable to reproductive cancers. Worldwide evidence by the World Health Organization (2023) and Sung *et al.* (2021) demonstrated that women in low-income countries face higher cervical cancer mortality due to poor access to screening and HPV vaccination. In South Sudan, gender inequality strongly shapes women's health outcomes. Women often depend economically on male family members, limiting their ability to seek medical care independently. Cultural stigma surrounding reproductive illnesses discourages open discussion of symptoms such as vaginal bleeding or breast abnormalities. Additionally, low literacy and poor reproductive health awareness reduce participation in preventive healthcare. These social barriers increase the likelihood of delayed diagnosis and poor treatment outcomes.

Occupation influences health through income stability, nutrition, health literacy, and healthcare affordability. Studies by Marmot (2005) and the World Health Organization (2010) confirmed that low socioeconomic occupations are associated with poorer cancer outcomes because disadvantaged populations have limited healthcare access and higher exposure to environmental risks. In South Sudan, most people depend on subsistence farming, informal trading, or unstable labour. These occupations generate limited income and provide no health insurance or employment protection. Individuals prioritize food, shelter, and security over preventive healthcare. Consequently, cancer screening and early diagnosis are often financially impossible. Occupational exposure to smoke, chemicals, and biomass fuels may also increase long-term cancer risk.

Global studies consistently show rural-urban disparities in cancer outcomes. Singh and Jemal (2017) reported that rural populations experience poorer cancer survival because of limited healthcare access and delayed diagnosis. This pattern is highly relevant in South Sudan, where rural communities face severe shortages of hospitals, laboratories, specialists, and transport systems. Many villages are geographically isolated, especially during rainy seasons. Women may travel long distances to access screening or treatment services, causing delays in diagnosis. Rural health facilities often lack trained personnel and diagnostic equipment, forcing patients to rely on traditional healers before seeking formal medical care.

The association between marital status and reproductive cancers has been widely documented. Bayo *et al.* (2002) confirmed that HPV infection, strongly linked to cervical cancer, is associated with sexual behaviour patterns, including early marriage and multiple sexual partnerships. In South Sudan, early marriage and polygamy remain culturally accepted in many communities. Girls married at young ages are biologically more vulnerable to HPV infection because the

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cervical epithelium is still developing during adolescence. Polygamous unions may increase sexual network exposure, facilitating transmission of HPV and other sexually transmitted infections. These cultural practices, therefore, contribute to elevated cervical cancer risks.

Education strongly influences health knowledge, preventive behaviour, and healthcare utilization. Cutler *et al.* (2006) found that higher educational attainment improves disease prevention, screening participation, and treatment adherence. In South Sudan, decades of armed conflict disrupted educational systems, particularly for girls. Female literacy remains low in many regions, limiting awareness about cancer symptoms, HPV vaccination, breast self-examination, and reproductive health practices. Low education also increases susceptibility to myths and misinformation about cancer. As a result, many women present late to healthcare facilities after complications become severe.

The low mean family income reflects widespread poverty. Diaz-Bonilla and Sabatino (2022) and the World Health Organization (2021) confirm that poverty is linked to delayed cancer diagnosis, limited access to treatment, and poorer survival outcomes. In South Sudan, healthcare costs are largely paid out of pocket. Cancer investigations, transport, surgery, chemotherapy, and medication are unaffordable for many households. Economic hardship, therefore, forces patients to delay or abandon treatment. Poverty also contributes to malnutrition, weakened immunity, and poor living conditions, all of which worsen disease progression.

Family history is a globally recognized predictor of hereditary cancers. Studies by Miki *et al.* (1994) identified BRCA1 mutations as major hereditary risk factors for breast and ovarian cancers. Later studies by Hall *et al.* (1990) confirmed the importance of genetic susceptibility in familial cancers. In South Sudan, awareness about hereditary cancer risk is extremely limited, and genetic testing services are almost nonexistent. Families may not recognize patterns of inherited disease because diagnoses are rarely confirmed by medical testing. This finding highlights the need for community education and family-centered screening interventions.

Worldwide evidence shows that early sexual debut increases cervical cancer risk through prolonged exposure to HPV infection. de Sanjose *et al.* (2003) demonstrated that early age at first intercourse is strongly associated with persistent HPV infection and cervical cancer development. In South Sudan, early marriage is driven by poverty, bride wealth traditions, insecurity, and cultural expectations. Girls entering marriage early often lack reproductive health knowledge and have limited autonomy over sexual decisions. This increases vulnerability to HPV infection, repeated pregnancies, and reproductive tract complications, thereby elevating long-term cancer risk.

High parity has been linked globally to cervical cancer and some reproductive cancers. Studies (Troisi *et al.*, 2018; Maggen *et al.*, 2020) found that repeated childbirth influences hormonal exposure and cervical tissue changes that may promote carcinogenesis. In South Sudan, large family size is culturally valued and often associated with social status and economic security. Limited contraceptive availability and low reproductive health education contribute to high fertility rates. Frequent childbirth, often without adequate maternal healthcare, may increase physical stress on the reproductive system and reduce opportunities for preventive screening.

Studies by Barker *et al.* (2022) suggest that multiple marital or sexual partnerships increase exposure to sexually transmitted infections, including HPV. Repeated partnerships may therefore indirectly increase cervical cancer risk. In South Sudan, conflict-related displacement, widowhood, remarriage, and customary marriage practices contribute to multiple marital transitions. Social instability resulting from war may disrupt family structures and increase reproductive health vulnerabilities. These conditions may contribute to higher exposure to infectious and psychosocial risk factors.

A study by MacMahon *et al.* (1970) found that reproductive timing influences hormonal exposure and long-term cancer risk. Early childbirth may reduce breast cancer risk in some populations but may also be associated with adverse reproductive health outcomes when combined with poor maternal healthcare. In South Sudan, adolescent pregnancy remains common because of early marriage, poverty, interrupted education, and limited contraceptive services. Young mothers often experience obstetric complications, malnutrition, and inadequate antenatal care. These reproductive health challenges may contribute to long-term gynaecological and cancer-related vulnerabilities.

The findings in Table 2 appear because gender differences in cancer occurrence are influenced by a combination of biological susceptibility, behavioural exposure, occupational risk, social norms, and weaknesses in healthcare systems. The very high odds ratio (Exp(B) = 19.827) suggests that, in this study population, males were disproportionately exposed to cancer-promoting conditions compared with females. The findings are strongly supported by worldwide studies. Global cancer statistics by Bray *et al.* (2018) showed that males bear a significantly higher burden of lung, liver, bladder, and colorectal cancers because of smoking, alcohol consumption, workplace exposures, and delayed healthcare utilization. Similarly, studies by Jemal *et al.* (2011) confirmed that men have higher cancer mortality rates globally due to both increased exposure to carcinogens and lower participation in preventive healthcare services. A study by Caubel (2018) also demonstrated that occupational and environmental exposures disproportionately affect men in low- and middle-income countries. Furthermore, Wardle *et al.* (2015) indicated that men are less likely to engage in cancer screening and early diagnosis

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programs, contributing to more advanced disease at presentation.

In the context of South Sudan, the association becomes even stronger because of the country's social, economic, and environmental realities. Many men are employed in physically demanding and hazardous occupations, such as military service, fuel transportation, mining, welding, construction, brick making, mechanical work, and commercial driving. These occupations expose them to smoke, petroleum fumes, heavy metals, dust, asbestos-like particles, pesticides, and industrial chemicals, all of which are associated with cancers of the lungs, liver, bladder, skin, and gastrointestinal tract. In rural areas, men are also highly exposed to biomass smoke from charcoal burning, bush burning, and indoor cooking environments with poor ventilation. Long-term exposure to contaminated water and chronic infections such as hepatitis B and C further increase liver cancer risks. The findings may also reflect changing lifestyle patterns in urban centers, such as Juba, where tobacco smoking, alcohol consumption, processed food intake, and sedentary lifestyles are increasing among men. According to global evidence from the World Health Organization (2023), smoking remains one of the strongest predictors of lung, bladder, esophageal, and stomach cancers, and men are more likely than women to engage in these behaviours in many African societies. Alcohol consumption additionally contributes to liver, colorectal, and esophageal cancers through chronic tissue inflammation and immune suppression.

Social and cultural explanations are equally important in interpreting these findings within South Sudan. Masculinity norms often encourage men to tolerate pain and avoid seeking medical attention until illness becomes severe. Preventive healthcare and routine medical screening are uncommon among men, partly because healthcare-seeking behaviour is culturally perceived as unnecessary unless symptoms become disabling. Consequently, cancers are often diagnosed at advanced stages when survival chances are reduced. Similar findings were reported by Stefanek *et al.* (2009), who found that delayed healthcare utilization among men contributes significantly to higher cancer mortality worldwide.

The wide confidence interval (9.991-39.344) suggests some variability in the magnitude of risk, but because the entire interval is far above 1, the association remains statistically strong and reliable. This may indicate substantial heterogeneity in male exposure patterns within the study population, where some men experience extremely high levels of occupational and behavioural risk compared with others.

In South Sudan, additional structural factors likely intensify the observed association. These include prolonged armed conflict, displacement, poverty, food insecurity, weak environmental regulation, and limited oncology infrastructure. Specialized cancer diagnostic services remain scarce, and many patients travel long distances for diagnosis or treatment. Pathology laboratories, radiotherapy services, and screening programs are limited, causing delayed detection and underdiagnosis. Chronic stress associated with conflict and economic instability may also weaken immune function and indirectly contribute to cancer progression. Therefore, the findings do not merely indicate a biological difference between males and females; they reflect the interaction of biological vulnerability, occupational exposure, harmful lifestyle behaviours, cultural norms, poverty, weak healthcare systems, and environmental risk conditions. The exceptionally high odds ratio observed in this study suggests that males in South Sudan are living within a high-risk environment where preventive systems are inadequate and carcinogenic exposures remain largely uncontrolled.

VI. CONCLUSION AND RECOMMENDATIONS

- *Conclusion*

The study concludes that cancer in South Sudan is driven by the interaction of biological, reproductive, socioeconomic, cultural, environmental, and healthcare-related factors, with the burden intensified by poverty, conflict, weak health systems, gender inequality, and limited cancer services. Age, gender, reproductive practices, low education, poverty, and rural residence significantly increase cancer vulnerability and worsen outcomes through delayed diagnosis and poor access to care. The study further highlights the need for comprehensive, gender-sensitive, and context-specific interventions, including improved screening, HPV vaccination, oncology infrastructure, public awareness, and equitable healthcare access, to reduce the growing cancer burden in South Sudan.

- *Recommendations*

The study recommends a comprehensive cancer control approach in South Sudan that strengthens cancer prevention, screening, HPV vaccination, public awareness, reproductive health services, female education, poverty reduction, healthcare infrastructure, oncology training, occupational and environmental safety, community outreach, hereditary cancer awareness, and national cancer surveillance systems to improve early detection, treatment access, and overall cancer outcomes.

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REFERENCES

[1]. Barker, E. K., Malekinejad, M., Merai, R., Lyles, C. M., Sipe, T. A., DeLuca, J. B., ... and Kahn, J. G. (2022). Risk of human immunodeficiency virus acquisition among high-risk heterosexuals with nonviral sexually transmitted infections: a systematic review and meta-analysis. Sexually Transmitted Diseases, 49(6), 383-397.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/26may1520

[2]. Bayo, S., Bosch, F. X., de Sanjosé, S., Muñoz, N., Combita, A. L., Coursaget, P., ... and Meijer, C. J. (2002). Risk factors of invasive cervical cancer in Mali. International journal of epidemiology, 31(1), 202-209.
[3]. Bray, F., Ferlay, J., Soerjomataram, I., Siegel, R. L., Torre, L. A., and Jemal, A. (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians, 68(6), 394-424.
[4]. Caubel, J. J. (2018). Solving the Air Pollution Crisis: Mitigation and Monitoring (Doctoral dissertation, University of California, Berkeley).
[5]. Cutler, D., Deaton, A., and Lleras-Muney, A. (2006). The determinants of mortality. Journal of economic perspectives, 20(3), 97-120.
[6]. De Flora, S., and Bonanni, P. (2011). The prevention of infection-associated cancers. Carcinogenesis, 32(6), 787-795.
[7]. de Sanjose, S., Almirall, R., Lloveras, B., Font, R., Diaz, M., Muñoz, N., ... and Bosch, F. X. (2003). Cervical human papillomavirus infection in the female population in Barcelona, Spain. Sexually transmitted diseases, 30(10), 788-793.
[8]. Diaz-Bonilla, C., and Sabatino, C. (2022). April 2022 Update to the Multidimensional Poverty Measure: What's New (No. 22). The World Bank.
[9]. Hall, J. M., Lee, M. K., Newman, B., Morrow, J. E., Anderson, L. A., Huey, B., and King, M. C. (1990). Linkage of early-onset familial breast cancer to chromosome 17q21. Science, 250(4988), 1684-1689.
[10]. MacMahon, B., Cole, P., Lin, T. M., Lowe, C. R., Mirra, A. P., Ravnihar, B., ... and Yuasa, S. (1970). Age at first birth and breast cancer risk—Bulletin of the World Health Organization, 43(2), 209.
[11]. Maggen, C., Wolters, V. E., Cardonick, E., Fumagalli, M., Halaska, M. J., Lok, C. A., ... and International Network on Cancer, Infertility and Pregnancy (INCIP). (2020). Pregnancy and cancer: the INCIP project. Current oncology reports, 22(2), 17.
[12]. Marmot, M. (2005). Status syndrome: How your social standing directly affects your health. A and C Black.
[13]. Miki, Y., Swensen, J., Shattuck-Eidens, D., Futreal, P. A., Harshman, K., Tavtigian, S., ... and Skolnick, M. H. (1994). A strong candidate for the breast and ovarian cancer susceptibility gene BRCA1. Science, 266(5182), 66-71.
[14]. Mwanje, J. (2023). Cervical cancer screening in resource-poor settings of South Sudan: access coverage, associated factors and health system interventions.
[15]. Ngwa, W., Addai, B. W., Adewole, I., Ainsworth, V., Alaro, J., Alatise, O. I., ... and Kerr, D. (2022). Cancer in sub-Saharan Africa: a Lancet Oncology Commission. The Lancet Oncology, 23(6), e251-e312.
[16]. Shah, S. C., Kayamba, V., Peek Jr, R. M., and Heimburger, D. (2019). Cancer control in low-and middle-income countries: is it time to consider screening?. Journal of global oncology, 5, 1-8.
[17]. Singh, G. K., and Jemal, A. (2017). Socioeconomic and racial/ethnic disparities in cancer mortality, incidence, and survival in the United States, 1950–2014: over six decades of changing patterns and widening inequalities. Journal of environmental and public health, 2017(1), 2819372.
[18]. Stefanek, M. E., Andrykowski, M. A., Lerman, C., Manne, S., Glanz, K., and AACR Behavioural Science Task Force. (2009). Behavioural oncology and the war on cancer: Partnering with biomedicine. Cancer Research, 69(18), 7151-7156.
[19]. Sung, H., Ferlay, J., Siegel, R. L., Laversanne, M., Soerjomataram, I., Jemal, A., and Bray, F. (2021). Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: a cancer journal for clinicians, 71(3), 209-249.
[20]. Troisi, R., Bjørge, T., Gissler, M., Grotmol, T., Kitahara, C. M., Myrtveit Saether, S. M., ... and Glimelius, I. (2018). The role of pregnancy, perinatal factors and hormones in maternal cancer risk: a review of the evidence. Journal of Internal Medicine, 283(5), 430-445.
[21]. Wardle, J., Robb, K., Vernon, S., and Waller, J. (2015). Screening for prevention and early diagnosis of cancer. American psychologist, 70(2), 119.
[22]. World Health Organization. (2010). A conceptual framework for action on the social determinants of health.
[23]. World Health Organization. (2021). Global monitoring report on financial protection in health 2021. World Health Organization.
[24]. World Health Organization. (2022). Regional strategic framework for vaccine-preventable diseases and immunization in the Western Pacific 2021-2030.
[25]. World Health Organization. (2023). Global breast cancer initiative implementation framework: assessing, strengthening and scaling-up of services for the early detection and management of breast cancer. World Health Organization.
[26]. World Health Organization. (2023). Tobacco and chronic obstructive pulmonary disease (COPD): WHO tobacco knowledge summaries. World Health Organization.
[27]. World Health Organization. (2024). WHO global survey on the inclusion of cancer care in health-benefit packages, 2020–2021. World Health Organization.