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Kaposi Sarcoma and its Healthy Effects: A Real Global Analysis

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Abstract

A total Background: Herpes virus 8 infection results in the tumor known as Kaposi sarcoma. Which is a concomitant disease of AIDS and arises through a viral infection, which is a systemic disease whose complications include shortness of breath with severe cough and swelling in the legs. This paper seeks to analyze the global indicators by regions for this disease and make the necessary comparisons. Material & Methods: The data on Kaposi sarcoma disease for the year 2022 was used according to the availability of the source, the National Agency for Research on Cancers / Global Cancer Observatory, giving an accurate analysis of incidence, mortality and prevalence. Comparisons by regions for both sexes have been done. Results: The results of the investigation showed that the male disease rates were much higher than the female, African countries have the highest numbers and percentages, and the best survival rates were in Northern America, Oceania, and Europe. Conclusion: Kaposi sarcoma poses a serious public health challenge, especially in areas where AIDS is common. The paper describes the general trends of the disease and their indicators by region. Improving health care related to Positive effects of AIDS on reducing effects this disease, and early diagnosis leads to early treatment.

Keywords: global indicators, incidence; prevalent; global regions; mortality; cumulative risk; crude rate.

Introduction

Kaposi Kaposi sarcoma is a kind of cancer that grows in the lymphatic and blood vessel walls and manifests as skin sores. The face, arms, and legs are frequently affected by these lesions. and can also

appear on the mouth and genitals, and critical cases of this type can reach the gastrointestinal tract and lungs. Kaposi's sarcoma cancer is directly related to human herpes virus type (HHV-8); it affects people with weakened immune systems, which leads to Kaposi's sarcoma cancer (Wu et al., 2023). four types of this cancer. first is related to the AIDS virus, the second is related to organ transplantation, the third affects the elderly in Eastern Europe, and the fourth type affects young people in Africa. This paper highlights one of the infectious cancers, its incidence, prevalence, and mortality, and makes the necessary comparisons by region (Marshall et al., 2024).

Diagnosis and Treatment

The diagnosis is made by taking a swab from the skin and examining it in a laboratory, and other tests can be performed to detect its presence in the lungs or the digestive system, and it can also be done through computed tomography, X-ray or periscope. There is no specific treatment for this type (Hull et al., 2022). Of cancer, but there are a range of options that can help control it, and since the disease is associated with Acquired Immunodeficiency treatments (AIDS), this type has become less dangerous, and radiation, laser and chemical treatments can be used. Figure (1).

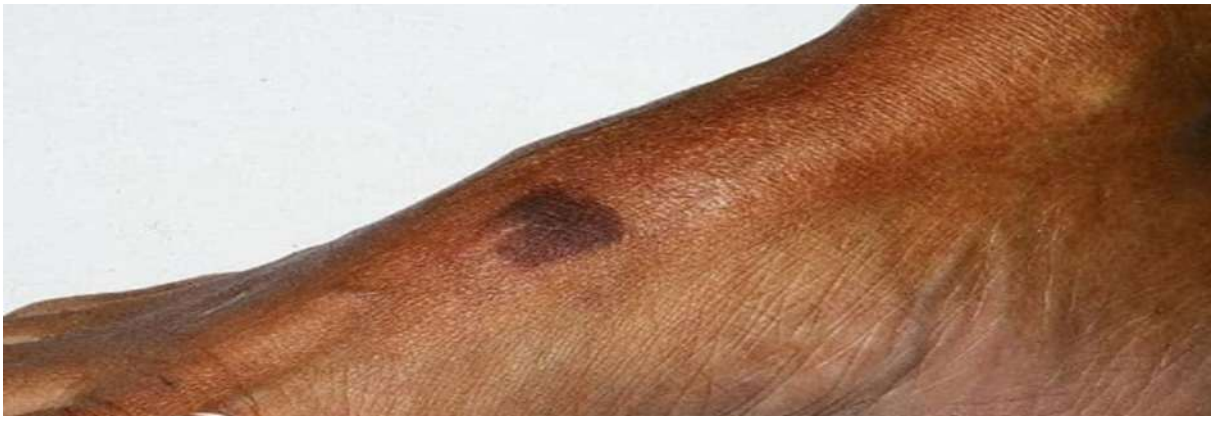

Figure 1. Kaposi Sarcoma on the Foot.

Table (1) shows incidence, mortality, and prevalence by regions; the countries of the African continent were the highest, followed by Oceania, North America, Europe, Asia, Latin America, and the Caribbean; the highest survival rate was in North America (91%), Oceania (85%), Europe (84%), Latin America and the Caribbean (80%), Asia (50%); and the lowest are the countries of the continent of Africa (48%), Figure (2).

Table 1. Absolute numbers, incidence, mortality & prevalence both sexes, by continents, 2022

	Incidence	**Mortality**	**Prevalence**	**Survival Rate**
Africa	26538	13914	55323	0.48
Latin America & Caribbean	2814	550	7811	0.80
Europe	2702	438	8184	0.84
Asia	2472	1123	6452	0.50
North America	1225	115	4165	0.91
Oceania	62	9	187	0.85

Source: WHO, National Agency for Research on Cancers / Global Cancer Observatory, 2022

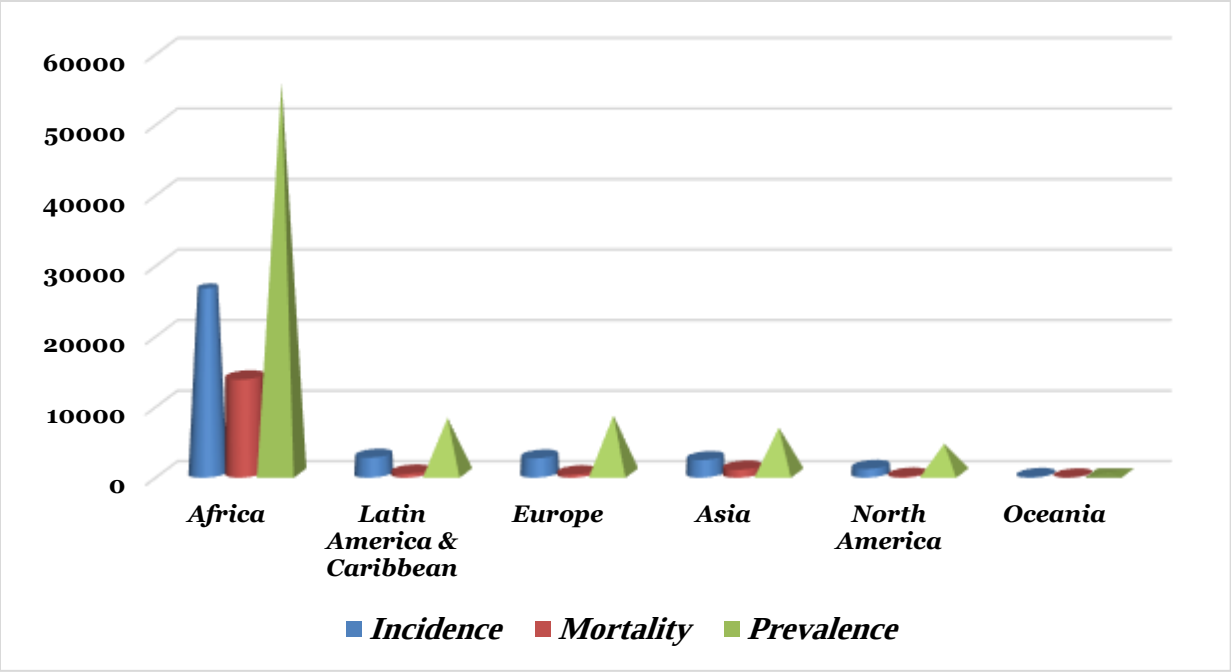

Figure 2. Comparison of Disease Incidence, Mortality, and Prevalence.

The global age-standardized rate (per 10000) prevalence and mortality rate for both sexes by regions were in all regions of the African continent (South, East, Central, and West), and the lowest was in eastern, northern, and western Europe, Australia and New Zealand, Melanesia, and East and Southeast Asia, with no mortality in these less widespread regions. Table (2), figure (3).

Table 2. Global age standardized rate (per 10000), incidence & mortality, both sexes by regions 2022.

Regions	Incidence	Mortality	Regions	Incidence	Mortality
South Africa	6.40	1.60	Northern America	0.23	0.02
Eastern Africa	4.30	2.60	Northern Africa	0.18	0.08
Middle Africa	1.80	0.99	Eastern Europe	0.13	0
Southe Europe	0.40	0.04	Western Europe	0.13	0
South America	0.38	0.07	Australia – New Zeland	0.10	0
Western Asia	0.35	0.06	Melanesia	0.05	0
Central America	0.29	0.07	South Eastern Asia	0.05	0
Caribbean	0.28	0.08	Eastern Asia	0.02	0

Source: WHO, National Agency for Research on Cancers / Global Cancer Observatory, 2022

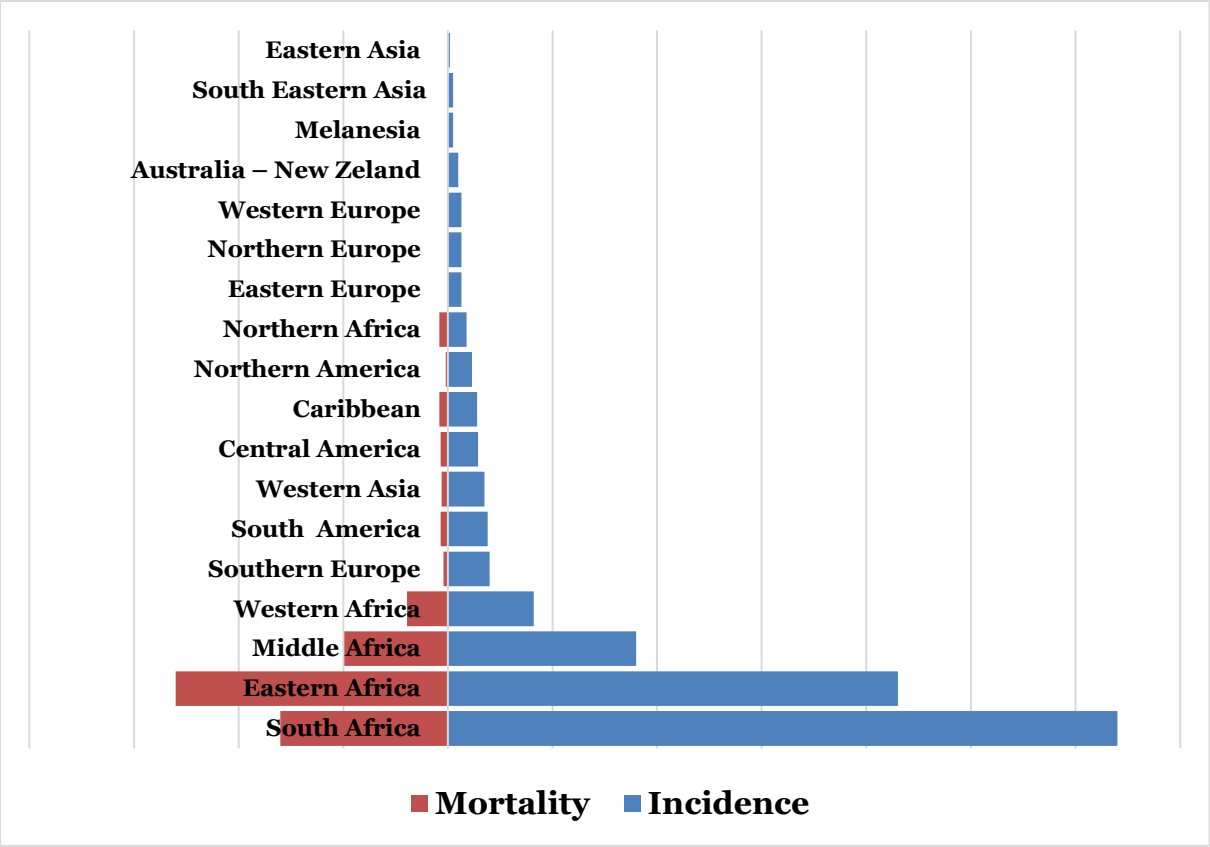

Figure 3. Regional Distribution of Kaposi Sarcoma Incidence and Mortality.

Table (3) shows that the global age standardized rate (per 10000), incidence for male were higher than the prevalence rates for female, the highest regions were the four regions of the African continent, and the lowest were East and Southeast Asia, with no female prevalence cases in the Caribbean, Eastern, Northern, Western Europe, Australia and New Zealand, Melanesia, East and Southeast Asia. Figure (4).

Table 3. Global age standardized rate (per 10000), incidence for male & female by regions 2022.

Regions	Male	Female	Regions	Male	Female
South Africa	8.20	4.80	Northern America	0.42	0.14
Eastern Africa	5.90	2.90	Northern Africa	0.29	0.08
Middle Africa	2.60	0.95	Eastern Europe	0.24	0
Western Africa	1.20	0.46	North Europe	0.23	0
South Europe	0.69	0.13	Western Europe	0.19	0
South America	0.69	0.11	Australia – New Zealand	0.16	0
Western Asia	0.52	0.07	Melanesia	0.13	0
Central America	0.52	0.21	South Eastern Asia	0.13	0
Caribbean	0.44	0	Eastern Asia	0.11	0

Source: WHO, National Agency for Research on Cancers / Global Cancer Observatory, 2022

Table (4) shows that the global crude rate (per 100000) incidence, and estimated cumulative risk (0 – 74) for male were higher than female, the highest regions were the four regions of the African continent, and the lowest were East and Southeast Asia, with no female crude rate in the Northern Europe, Melanesia, and South Eastern Asia. Also, no female cumulative risk in southern Europe, southern America, Northern America, Central America, Caribbean, Western Asia, Melanesia, Northern Africa, Western Europe, the northern part of Figure (4).

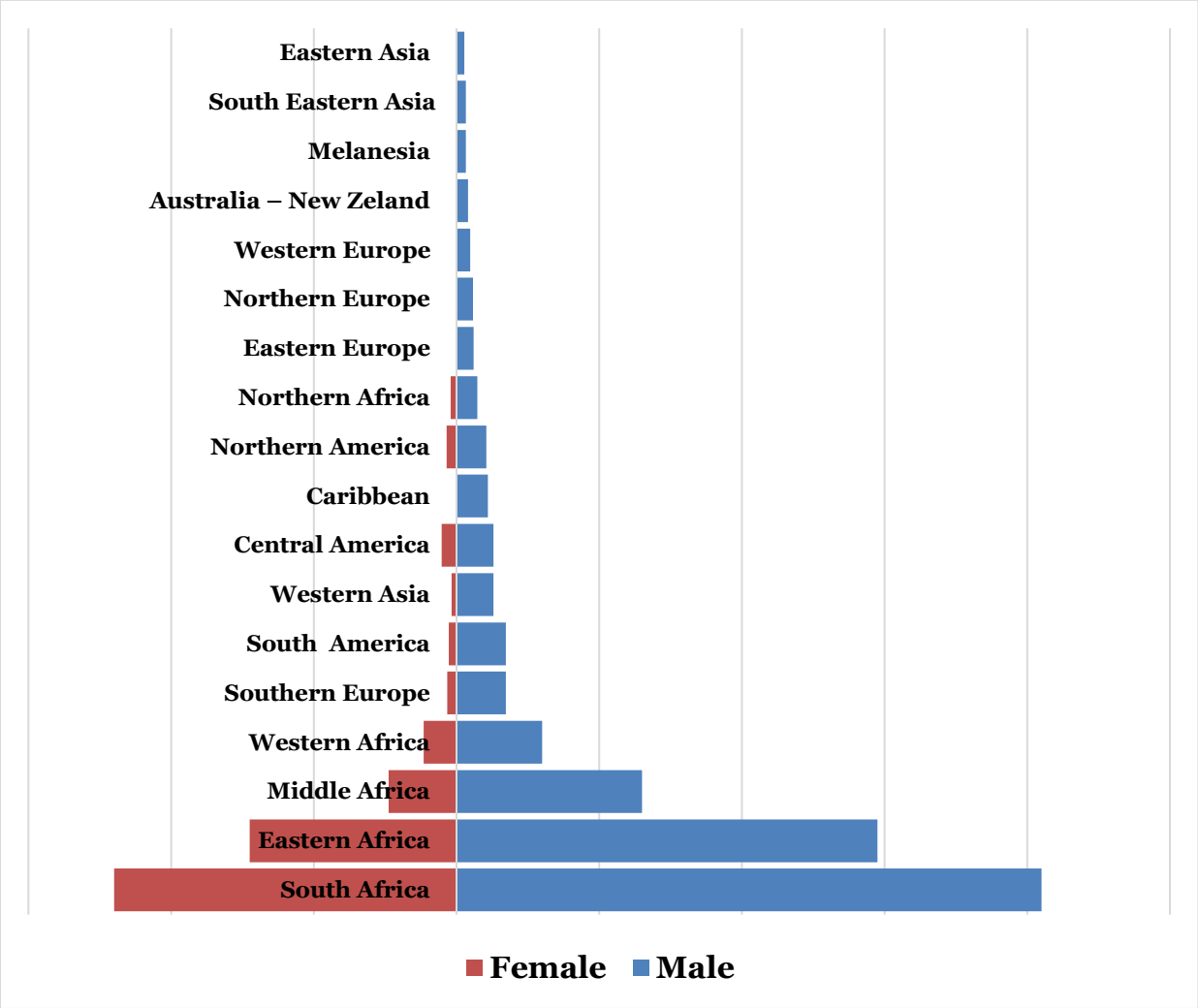

Figure 4. Sex Distribution of Kaposi Sarcoma by Global Region.

Table 4. Global crude rate (per 100000) incidence, and estimated cumulative risk (0 – 74), 2022

Region	Crude Rate		Cumulative Risk	
	Male	Female	Male	Female
Southern Africa	8.9	5.3	0.72	0.39
Eastern Africa	4.6	2.5	0.53	025
Middle Africa	1.6	0.69	0.27	0.09
Southern Europe	1.4	0.38	0.07	0
Southern America	0.83	0.14	0.06	0
Western Africa	0.78	0.36	0.13	0.04

Northern America	0.59	0.07	0.04	0
Central America	0.56	0.08	0.04	0
Caribbean	0.46	0.18	0.04	0
Western Asia	0.44	0.22	0.02	0
Western Europe	0.41	0.08	0.02	0
Northern Europe	0.33	0	0.02	0
Eastern Europe	0.32	0.15	0.02	0
Australia & New Zealand	0.25	0.10	0.02	0
Northern Africa	0.24	0.07	0.03	0
Melanesia	0.14	0	0.01	0
South Eastern Asia	0.03	0	0.01	0

Source: WHO, National Agency for Research on Cancers / Global Cancer Observatory, 2022

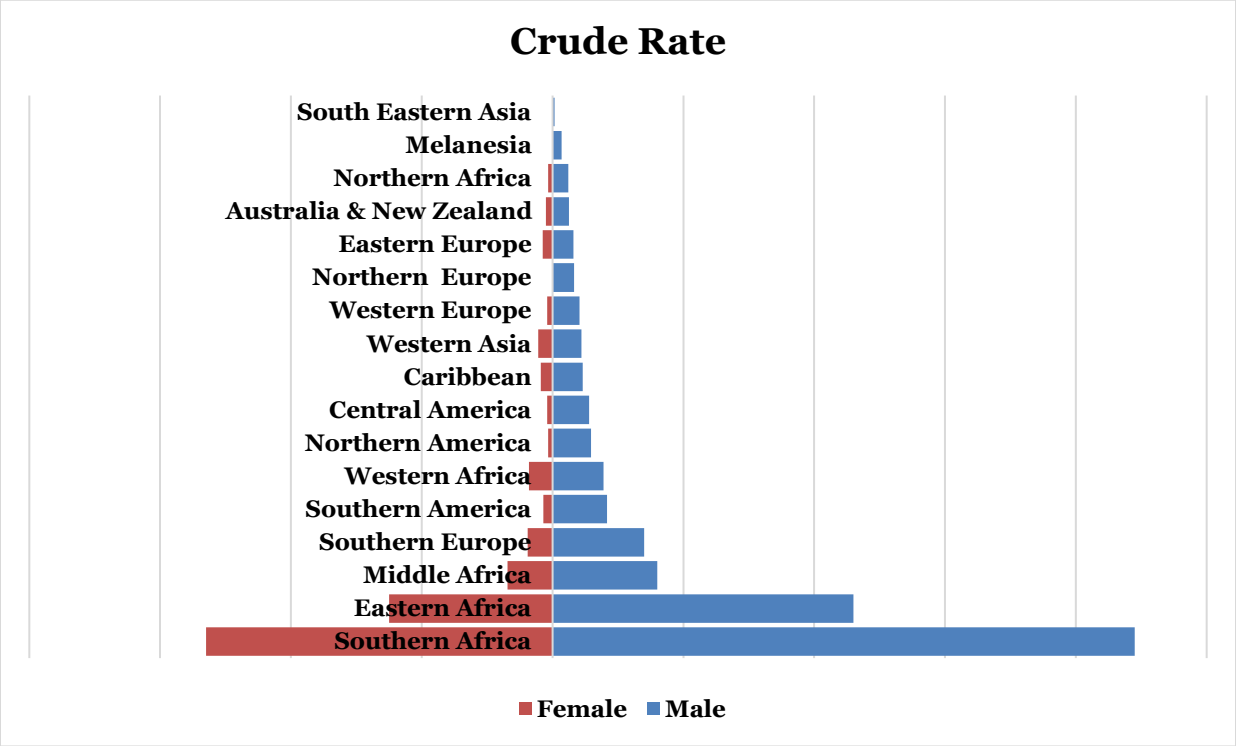

Figure 5. Crude Rate of Kaposi Sarcoma by Sex and Region.

The essential of miRNAs in Kaposi's sarcoma

MicroRNAs regulate the degradation or modification of target mRNAs after their transcription (also known as post-transcriptional regulation). They are typically very short sequences of nucleotides (including 19 - 24), are not translated and represent the non-coding sections of one or more genes (i.e., mRNA). Individual species of microRNAs are also found in genera of other organisms (including viruses) each typically having distinct sequences and therefore functions compared to human microRNAs (Esser et al., 2022). Additionally, multiple oncogenic herpesviruses, such as Kaposi's sarcoma-associated herpesvirus (KSHV), are known to contain a variety of microRNA-encoding genes in their genomes. KSHV harbours genes for the production of at least 18 microRNAs known as miR-K12 (K12-1 through

K12-12). As an example, KSHV is implicated in several human cancers including multicentric Castleman's Disease (MCD), primary effusion lymphoma (PEL) and Kaposi's sarcoma (KS) (Cronin et al., 2024; Hou, 2024; Htet et al., 2022).

Researchers published the presence of viral-derived microRNAs (miRNAs) in viromes from infected humans in studies conducted by Fu et al. (2023) and Marando et al. (2022). As with KSHV encoded latent proteins, it has been shown that KSHV encoded miRNAs found in the KSHV latency-associated regulatory region (KLAR) provide support for the maintenance of KSHV's genome and assist with KSHV associated cancerigenesis. There is also considerable evidence from multiple other researchers who have shown that research has shown large amounts of KSHV-associated miRNAs have been found in multiple KSHV-positive cell types that have been infected with KSHV and are developing into KSHV-associated malignancies (Motlhale et al., 2022; Nalwoga et al., 2020; Salyards et al., 2024). There is also evidence that specific KSHV-associated miRNAs are significantly involved in the pathogenesis and development of malignancies from KSHV (Motlhale et al., 2022; Nalwoga et al., 2020; Salyards et al., 2024). Examples of KSHV-associated miRNAs that correspond to cellular human miRNAs include KSHV miR-K12-11, K12-10a and K12-3; thus, KSHV miR-K12-11 is homologous to cellular human miR-155; KSHV miR-K12-10a homologous to cellular human miR-142-3p; and, KSHV miR-K12-3 homologous to cellular human miR-23. Because the "seed" sequence in KSHV associated miRNAs bears a great deal of similarity to that present in their equivalent human cellular miRNA genes, the genes which are subject to regulation by the KSHV miRNAs are likely to be the same as those which are subject to regulation by the analogous human cellular miRNAs (Tullis & Jewell, 2021). Researchers have provided support for the idea that KSHV regulated miRNA genes and those of human cellular origin are likely to be the same (Grabar & Costagliola, 2021; Ngalamika et al., 2021; Ramaswami et al., 2022; Stiller et al. 2021).

A study conducted by Serfecz et al. (2022), showed that miR-126-3p functions as a tumor suppressor by suppressing PIK3R2 exclusively in KS cells. The levels of mature KSHV-encoded microRNAs expressed in KS lesions from individual patients was also related to variations in non-canonical RNA structures that could result in alternative secondary and tertiary structures of RNA (Meng et al., 2025). Kaposi's sarcoma is a highly vascular lymphatic endothelial neoplasm. Three_KSHV-miRNAs (miR-K12-1, miR-K12-11, and miR-K3-3p) inhibit the production of thrombospondin 1—an anti-angiogenic—factor, KSHV-miRNAs can also influence angiogenesis and KS metastasis (Chu et al., 2023). The KSHV miRNA v-miR-K6-3p promotes KS cell migration and invasion by activating the STAT3 pathway. Additionally, KSHV miRNAs regulate the cell cycle and increase cell survival and transformation (Q. Chen et al., 2021). Similarities between the sequences of the molecular RiboNucleoAcids (RNAs) that are produced by KeratoSclerosis Herpes virus (KSHV) and MiRNA-Cellular produced MicroRNAs (miR) have been reported using studies that include Dittmer & Damania (2013). The findings indicate evolution via shared seed base pairing and support evolutionary relationships between the access and endogenous miR families in the KSHV virus and host cells. KSHV is known to utilize a distinct network of long non-coding RNAs and MiRNAs controlled by its vIRF1; lnc-OIP5-AS1 and miR-218-5p, to promote the ability of tumor cells to move to distant locations in the body (L. Chen et al., 2020). Other studies have demonstrated that pathogenicity and virulence of the KSHV miRNA, miR-K12-1, are mediated via the activation of the NF-κB/IL-6/STAT3 signaling pathway (Wu et al., 2023).

Another study confirmed that KSHV communicates with host cell pathways for growth & survival via both redundant mechanisms (Marshall et al., 2024), and provides a new antiviral treatment for KSHV through Silencing Virus miRNA (Grabar & Costagliola, 2021)). For instance, miRNA K12-1 was revealed to induce NF-κB/IL-6/STAT3 pathway promoting cellular proliferation and causing cells to become oncogenically transformed (Ngalamika et al., 2021). Also, miR-126-3p repressed PIK3R2 in KS cells and inhibited their growth (Motlhale et al., 2022).

MicroRNA-126-3p represents the single most specific endothelial cell ('EC') microRNA, playing vital roles in maintaining vascular stability and promoting angiogenesis. MicroRNA-126-3p is elevated in KS lesion tissue compared to normal reference biopsy tissue (Salyards et al., 2024). In addition, miR-126-3p suppresses SLK cellular invasiveness, cellular proliferation, and cellular cycle progression, and induces SLK apoptosis (Hou, 2024).

Various miRNAs expressed in KSHV-infected cells, including miR-K6-3p, can activate the STAT3 pathway as well as promote migration and invasion of KA cells. In addition, miR-K12-1 was identified as an oncogene through its use of NF-κB/IL-6/STAT3 signaling (Fu et al., 2023), and the oncogenic miRNA cluster mir-17-92 is largely upregulated in KSHV-infected endothelial cells. Lastly, both vFLIP and vCyclin have been shown to enhance miR-17-92 cluster miRNA expression in order to inhibit the TGFβ signaling pathway (Lee et al., 2016). MiR-17-92 cluster miRNAs have also been shown to target the TGFβ signaling pathway while repressing KSHV-infected cell expression of TGF-β and SMAD2. MiR-K3 can also directly inhibit G-protein-coupled receptor kinase 2 (GRK2), which activates the AKT signaling pathway when CXCR2 is stimulated and facilitates KA cell migration and invasion (Hull et al., 2022). Researchers have recently confirmed that the GRK2-miR-K3-CXCR2-AKT signal transduction pathway is a key regulator of angiogenic responses induced by KSHV and that this pathway promotes KSHV latency (Ramaswami et al., 2022). This information demonstrates a complicated role for miRNA in the pathophysiology of KS and lends additional support for the perspective that developing miRNA-based therapies may represent a viable strategy for treating KS (Nalwoga et al., 2020)..

Conclusion

It turned revealed that the majority of accidents and fatalities from Kaposi sarcoma cancer occur in African countries, particularly in the South African region. The analysis shows that, in contrast to poor nations, industrialized nations have achieved significant strides in the diagnosis and treatment of this illness, and the number of people who have survived as a result of it is rather high.

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