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Epidemiology of HIV (AIDS) and Its Complications among the Saudi Population in Riyadh: A Retrospective Analysis

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Abstract

The study aims to investigate the epidemiology and complications of HIV/AIDS among Saudis in Riyadh, using data from King Khalid University Hospital and other governmental hospitals. A retrospective analysis was conducted using data from positive HIV/AIDS cases reported to King Khalid University Hospital and other governmental hospitals. The study found a higher prevalence of HIV/AIDS among males, with most cases occurring in the 15-29 and 30-44 age groups. Employed individuals and those with higher educational levels showed a higher prevalence of infection. Sexual contact was identified as the major transmission mode. Individuals without a registered medical history had the highest prevalence, followed by those with lung and diabetes conditions. Ocular manifestations, such as CMV retinitis, were noted among HIV-positive patients, highlighting the need for comprehensive healthcare services. The study highlights gender differences in HIV/AIDS prevalence, with males being more affected. The most impacted age group is 30-44 years, suggesting a need for targeted interventions. Factors like occupation, education, and ocular complications underscore the necessity for comprehensive HIV/AIDS prevention and care strategies in the Saudi population.

Keywords: HIV, Public health, Saudi citizens, Epidemiology

Introduction

In 2013, the World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) estimated that 35.3 million people were living with HIV globally, with 2.3 million newly diagnosed cases in the same year (UNAIDS, 2013; Grant & Wallace, 2024). In the Middle East and North Africa (MENA) region, data on HIV/AIDS epidemiology, behavioral patterns, and societal factors remain incomplete, requiring improvement to enhance understanding and inform effective prevention and treatment programs (Shawky *et al*., 2009; Kunie *et al*., 2025). Advances in notification and surveillance systems are revealing the true local prevalence of HIV infections. Information about HIV in the Middle East remains limited, as many countries historically suppressed such data due to societal stigma and moral concerns. Moreover, HIV testing, especially among high-risk groups such as injecting drug users (IDU) and men who have sex with men (MSM), has been a sensitive issue, constraining screening strategies in the region (Obermeyer, 2006; Osluf *et al*., 2024).

The first case of HIV in Saudi Arabia was diagnosed in 1984 (Ellis *et al*., 1993; Morgan *et al*., 2025). However, 20 years later, there was still no reasonable estimate of the real statistical and epidemiological state of HIV infections in the country, and there were few publications. Only two countries in the MENA region did not provide estimates of the number of HIV/AIDS patients to the Joint United Nations Programme on HIV/AIDS and the WHO Regional Office of the Eastern Mediterranean: these were the Kingdom of Saudi Arabia (KSA) and Afghanistan (Alrajhi 2004; Csep *et al*., 2024; Lindstrom *et al*., 2025). Al-Mazrou *et al*. published a study of the epidemiological data on HIV/AIDS available in Saudi Arabia in 2003 (Al-Mazrou *et al*., 2005; Anunziata *et al*., 2024; Clark *et al*., 2025). They found that there had been 1743 HIV positive Saudi patients and 6064 non-Saudi HIV positive patients identified in the Kingdom. Moreover, 872 (50%) of the Saudi HIV patients had AIDS, and 77% were males, with a male-to-female ratio of 3:1. Most of the cases (about 67%) were reported in Jeddah, Riyadh, and Dammam. No recent cases were reported to be infected through an infected blood transfusion. 46% of the cases were infected through sexual routes (Al-Jabri *et al*., 2010; Ganea *et al*., 2024).

There were 505 newly diagnosed cases of HIV in Saudi Arabia in 2008, a 34.6% annual increase from the previous year. The Jeddah region had the highest proportion of HIV cases in the country (37%) (Madani 2004; Ming *et al*., 2025; Raza *et al*., 2025). Since 2001, the Saudi Ministry of Health (MOH) has published an annual report specifically for HIV/AIDS in the country. This report included good-quality statistics and data about HIV/AIDS in the Kingdom. By 2009, the official MOH reports indicated there had been a total of 3538 HIV/AIDS cases in Saudi Arabia (Alothman *et al*., 2010; Ribeiro *et al*., 2024; Cuenca-Martínez *et al*., 2025).

This review showed that a total of 10217 new HIV cases, of which 2958 (29%) were Saudi nationals (Kabbash *et al*., 2012; Mickevičius et al., 2024; Jabin & Guthrie, 2025). The discrepancy from the 3538 patients described by Al-Othman *et al*. 2 years previously emphasized problems with data consistency in the Kingdom. The incidence was 1.5 cases per 100,000 for Saudi

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national patients. Case notifications were increasing yearly until 2009, when they levelled off.

Fortunately, there has been more openness and better understanding in the last 5 years, and Saudi society has begun to change these old barriers. In addition, there is now full support from the government, which provides free antiretroviral therapy. Since the eighties, when HIV infection was reported in KSA, there have been few systematic clinical descriptions of HIV cases that have been insufficient. Only two studies had been published in the whole region on the use of antiretroviral therapy (ART) and the emergence of ART resistance, in Oman in 2004 (Hsiao *et al*., 2024; Wong *et al*., 2025) and in Saudi Arabia in 2010 (Jamjoom, Azhar *et al*., 2010; Alhossan *et al*., 2024).

Objectives of the Study

The current study aims to assess the current prevalence of HIV/AIDS within the Riyadh District, considering different demographic and geographic parameters. Understand the modes of transmission, including high-risk behaviors, routes of transmission, and potential factors contributing to the spread of HIV/AIDS within this specific population. Investigate the complications associated with HIV/AIDS within this demographic, including co-infections, the effect of HIV on vision, and the impact on the overall health status of affected individuals.

Materials and Methods

Study Design

Study Sample

The study sample was 102 records of Saudi and non-Saudi populations from King Khalid University Hospital. Riyadh. KSA and other governmental hospitals (40 from KKUH, 35 from PSMMC, and 27 from KSMC). Subgroups based on age, gender, occupation, and other relevant factors had been considered as 102 positive patient samples for more detailed analysis.

Study Setting

Geographic Scope

The study focuses on hospitals in Riyadh, the capital city of Saudi Arabia, providing a comprehensive overview of the epidemiological landscape of HIV in the Kingdom of Saudi Arabia.

Selection Criteria

Inclusion Criteria

- Hospitals with a significant HIV patient caseload
- Patient records from a defined time period (1-5 Years, 5-10 Years, 10-15 Years, and 15 >…).
- Residency: Individuals who are Saudi and non-Saudi reside in the Kingdom of Saudi Arabia.
- Age: 15- 60 and above, diagnosed with HIV.

Exclusion Criteria

- Individuals aged less than 15 Years.
- Individuals who are not diagnosed with HIV/AIDS.
- Individuals who do not live in Saudi Arabia.

Data Collection

Sampling Strategy

A sampling technique was employed to ensure representation from various hospitals in Riyadh. Stratification will be based on hospital size and specialty. Using an examination form including different variables.

Data Sources

The primary data source was hospital patient files and medical records covering the HIV positive patients. Variables of interest include demographic information, HIV diagnosis details, treatment history, and complications.

Data Analysis

Data analysis was done using descriptive statistics and the Statistical Package for Social Sciences (SPSS) version 20 statistical software for Windows. Pearson's chi-square was used to calculate a *P* - value significant at < 5 % at a 95% confidence interval to find the relationship between any two given variables of the study.

Results and Discussion

The current study explored the epidemiology and distribution of the positive HIV patients in Riyadh (KSA), in which the data were collected from 102 HIV/AIDS positive patients' reports from King Khalid University Hospital. Riyadh. KSA and other governmental hospitals (40 from KKUH, 35 from PSMMC, and 27 from KSMC). The patients were males and females (Saudi and non-Saudi nationalities).

Gender and Features in HIV/AIDS Infection

The dataset includes both male and female patients.

The distribution of HIV/AIDS infection status among individuals based on their gender (78.4%) males, while (21.6%) females were HIV/AIDS positive. This means that there were no negative cases for either gender. This result suggests a strong association between gender and HIV/AIDS infection status in the sample population. The chi-square test yielded a significant p-value ($p < 0.001$), indicating that the observed distribution of HIV/AIDS infection status differs significantly between males and females **(Table 1)**. The chi-square test yielded a significant p-value of less than 0.001.

Table 1. Prevalence of positive male and female HIV/AIDS:

Gender	HIV/AIDS Positive	Percentage (%)	p-value
Male	80	78.4%	≈0.8725
Female	22	21.6%	≈0.1275
Total	102	100	

The SD is the same for both genders and equals ≈0.334.
The p-value for male ≈is 0.8725, while the p-value for female ≈is 0.1275

Age and Features of HIV Infection

Patients span various age groups, from 15-29 years to 60 and above.

Those aged 45-59 make up approximately 19.61% of the cases, and individuals aged 60 and above represent only 2.94% **(Table 2)**. The SD measures the spread or variability of the age distribution within the HIV-positive population. It provides insight into how dispersed the ages are around the mean age within each group. The p-value from the statistical test indicates whether there is a significant difference in infection rates across different age groups. A low p-value (typically ≤ 0.05) suggests significant differences, while a higher p-value suggests no significant difference.

Table 2. Distribution of HIV/AIDS infection status among different age groups.

	Positive	Percentage	
15-29	27	26.47%	
30-44	52	50.98%	
45-59	20	19.61%	
60 and above	3	2.94%	
Chi-Square			11.29
p-value			0.010

Chi-square value and the associated p-value, indicating the statistical significance of the relationship between age and HIV/AIDS infection status.

Occupation

The results in **Table 3** present the distribution of HIV/AIDS infection status across different occupational statuses. It categorizes individuals into five groups: employed, not employed, health provider, students, and Not Available. The percentages provided offer insights into the prevalence of HIV/AIDS within each occupational category. The majority of HIV-positive patients are employed, comprising (56.9%) of the total cases. A small percentage of patients are not employed (4.9%), while a significant portion has an occupational status listed as "Not Available" (38.2%).

The resulting chi-square value of 16.233 and the associated p-value of 0.0003 indicate a statistically significant relationship between occupation and HIV/AIDS infection status. This suggests that occupation may be a contributing factor to the risk of HIV/AIDS infection.

Table 3. Distribution of HIV/AIDS infection status across different occupational statuses.

Occupation	Positive Cases	Percentage (%)
Employed	58	56.9%
Not Employed	5	4.9%
Not Available	39	38.2%
Health Provider	0	0%
Students	0	0%
Total	102	100

Chi-square value: 16.233 and p-value: 0.0003. These results suggest that occupation alone may not be a significant predictor of HIV/AIDS status in this population.

Degree of Education

The data represented in **Figure 1** displays the distribution of HIV/AIDS infection status across different levels of education.

A chi-square test was performed to examine the relationship between education level and HIV/AIDS infection status. The resulting chi-square value of 28.402 and the p-value of < 0.0001 suggest a statistically significant association between education level and HIV/AIDS infection status **(Figure 1)**. This implies that education level may play a role in determining the risk of HIV/AIDS infection, with certain educational backgrounds being associated with higher or lower infection rates.

The standard deviation for each education level is as follows:

Bachelor's Degree: SD = 3, Postgraduate: SD = 5, Diploma: SD = 1, Not Available: SD = 3

Not Educated: SD = 7, High School: SD = 1 and University Student: SD = 2

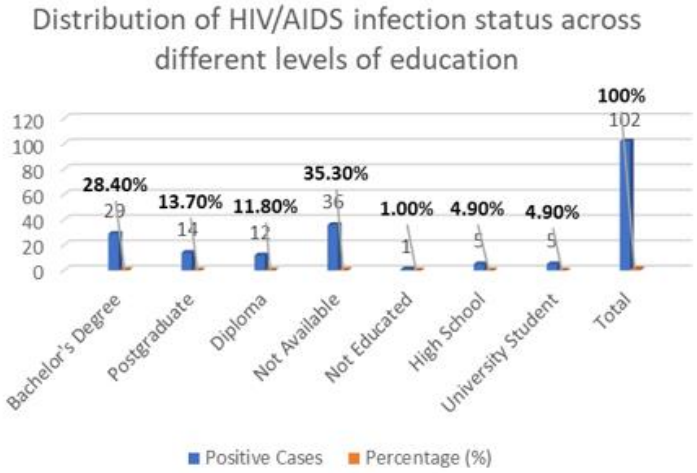

Figure 1. Distribution of HIV/AIDS infection status across different levels of education

Method of Transmission

Results in **Figure 2** explore the frequency of HIV-positive patients in Riyadh based on the method of transmission. The detailed interpretation of the results is as follows: the majority of HIV-positive cases, 45.09% in Riyadh, were attributed to sexual contact. This suggests that unprotected sexual activity is a significant mode of transmission for HIV in the region. A smaller proportion of cases 10.78% were associated with intravenous drug use. Only a few cases 2.94% were attributed to perinatal transmission, indicating that mother-to-child transmission of HIV is relatively rare in Riyadh. A significant portion of cases 31.37% had an unknown method of transmission. This could be due to various factors, such as patients' lack of awareness about their HIV status or incomplete medical records.

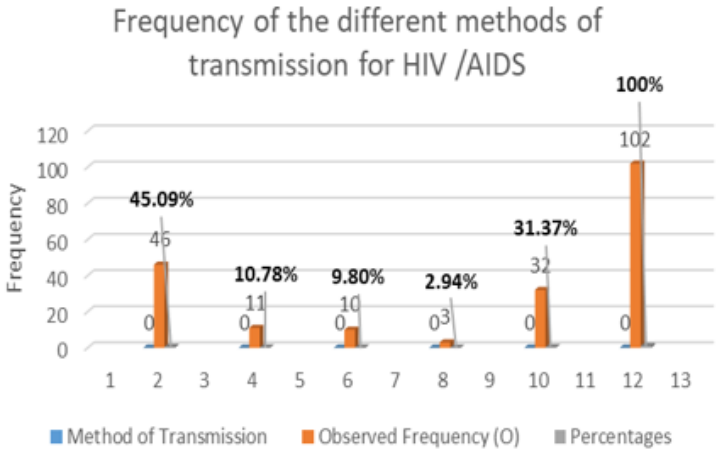

Figure 2. Frequency of the different methods of transmission for HIV /AIDS patients

Medical History

Various medical histories are present, including lung diseases, hypertension, diabetes, hyperlipidemia, and others.

The results in **Figure 3** present the distribution of HIV/AIDS infection status among 102 positive patients based on their medical history, specifically focusing on diabetes, hypertension, heart disease, and individuals with no history of these conditions.

A chi-square test was conducted to assess the relationship between medical history and HIV/AIDS infection status. The chi-square value obtained was 7.382, with a corresponding p-value of 0.1171. This indicates that there is no statistically significant association between medical history and HIV/AIDS infection status among the positive patients. The lack of significance suggests that having a medical history of diabetes, hypertension, heart disease, or tuberculosis does not appear to influence the likelihood of HIV/AIDS infection among the positive patients. However, it's essential to interpret these results cautiously and consider other factors that may contribute to HIV/AIDS transmission and progression, such as lifestyle and healthcare access.

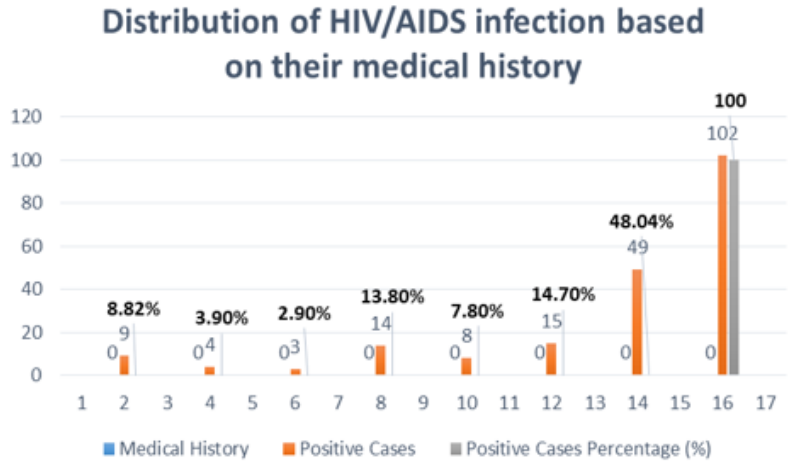

Figure 3. Distribution of HIV/AIDS infection based on their medical history

So, the standard deviation for each medical history category is as follows:

Diabetes: SD ≈ 11.43, hypertension: SD ≈ 5.2, heart disease: SD ≈ 12.61, Tuberculosis: SD ≈ 15.59, and None of the Above: SD ≈ 44.86

Ocular Manifestation

Some patients exhibit ocular manifestations such as retinopathy, retinitis, and other complications.

The results in **Table 4** present the distribution of ocular manifestations among 102 HIV-positive patients. A chi-square test was conducted to evaluate the relationship between the presence of ocular manifestations and HIV/AIDS infection.

CMV retinitis is a common ocular manifestation in HIV-positive individuals with advanced immunosuppression. It is caused by the cytomegalovirus (CMV) and can lead to significant vision loss if left untreated. CMV retinitis typically presents as white patches or lesions in the retina and may progress rapidly without intervention. Prompt diagnosis and treatment with antiviral medications are essential to prevent vision loss and preserve visual function (Jabs, 2011). The results suggest that HIV-positive patients are significantly more likely to exhibit ocular manifestations compared to HIV-negative patients. While conjunctivitis is not specific to HIV/AIDS, it can occur as a result of viral or bacterial infections, allergies, or irritants. In HIV-positive individuals, conjunctivitis may be more severe or recurrent due to immune dysfunction (Azari & Barney, 2013).

Table 4. Distribution of ocular manifestations among HIV-positive patients:

Ocular Manifestation	Difficulty Number of Occurrences	Percentage of Total Cases
CMV Retinitis	8	7.84%
Decrease in CD4 and T Lymphocyte	4	3.92%
Conjunctivitis	1	0.98%
Keratitis	0	0%
Not available	13	12.75 %
Other	6	5.88%
Total Ocular Manifestations/Complications	32	31.37%

Chi-square value: 82.04 for the p-value: < 0.001

Effective health care interventions in the field of HIV/AIDS epidemiology require a thorough understanding of the disease's incidence and related consequences within certain populations. Because of many religious and social concerns in the Kingdom, HIV had been difficult to tackle or even to discuss. The current study explored risk factors and implications for healthcare strategy as it explored the epidemiological picture of HIV/AIDS and its consequences among the Saudi population in Riyadh. The prevalence and the annually reported HIV infections in Saudi Arabia were limited. More than three-quarters of HIV cases were among immigrants. Emigrants are routinely tested for HIV upon arrival in Saudi Arabia and then regularly every 2 years to have their legal residence permits renewed. Therefore, one possible explanation for the higher prevalence of HIV infections among emigrants is that HIV testing rates might be higher among emigrants compared to Saudi citizens. The number of HIV infections diagnosed annually among Saudi citizens gradually increased per year (Madani *et al*., 2004; Solmell *et al*., 2024; Novak & Dvorak, 2025).

This was a significant limitation during the data collection period (secondary data limitations), although I attempted to overcome this by reviewing all available medical notes to pick up missing or deficient data for each case.

Gender Discrepancies in HIV/AIDS Infection

The findings in this study revealed differences in the prevalence of HIV/AIDS infection between males and females within the Riyadh affected population. Male individuals in the sample (78.4%) tested positive for HIV/AIDS, while a smaller proportion of females (21.6%) were similarly affected.

Similar to this study, about two-thirds of all HIV patients in a review in Saudi Arabia from 2000 to 2009 were males, with a male-to-female ratio of 4.4:1 (Kabbash *et al*., 2012; Iriti *et al*., 2024; Rani & Gehrke, 2025). The same results were mentioned by (Madani *et al*., 2004; Miciak & Jurkiewicz, 2024; Schneider & Krüger, 2025) as they mentioned the population in Jeddah HIV infection was predominantly affected men.

Age Distribution and HIV/AIDS Incidence

Similar age patterns have been reported in studies from Asia, Latin America, and other parts of the world (Ghys *et al*., 2019; Jaafar *et al*., 2024; Shen & Bao, 2025), with a median (range) age for the cohort of 41 (18 – 80) years. Nearly similar results were explored by (Madani *et al*., 2004; Alnabulsi *et al*., 2025) as they mentioned the population in Jeddah is multi-cultural and inhomogeneous from a religious point of view. HIV infection in Saudi Arabia, as the case worldwide, was more common in the age group 20–40 years. Individuals in their 30s to 44s may be more likely to be in long-term or multiple sexual partnerships, increasing their risk of exposure to HIV. People in this age group might be more mobile or migrate for work or other reasons, potentially increasing their exposure to HIV in different regions or communities.

Occupation and Risk of HIV/AIDS

The statistical analysis, characterized by a chi-square test, revealed a significant association between occupation and HIV/AIDS infection status, as evidenced by a chi-square value of 16.233 and a p-value of 0.0003. This statistical significance suggested that occupation may indeed play a role in determining the risk of HIV/AIDS infection within this demographic area. Research by Bekker *et al*. (2015) repeated the observed trend of higher HIV/AIDS prevalence among employed individuals, verifying the idea that occupational factors may contribute to HIV/AIDS risk. Similarly, Obermeyer *et al*. (2019) and Uneno *et al*. (2024) found significant associations between certain occupational groups and HIV/AIDS incidence, underscoring the importance of considering occupational exposures in HIV/AIDS prevention efforts. These

studies collectively supported the notion that occupation can serve as a significant determinant of HIV/AIDS risk within diverse populations.

Education Level and HIV/AIDS Incidence

The education challenges to the implementation of HIV/AIDS prevention strategies, including safe sex education. A recent study published by Al Othman *et al*. (2010) confirmed that new HIV case notification is increasing every year in the Kingdom. They suggested that the lack of detailed education about safe sex was contributing to this annual increase. (Al-Othman *et al*., 2010) mentioned that improving education should help to decrease HIV transmission, even in such a conservative society. Educational programs and strategies should focus on young adults, especially males, as they represented the majority of Saudi HIV positive patients (Durevall & Lindskog, 2012; Mishra *et al*., 2014). Education empowers individuals with knowledge and skills to make informed decisions regarding sexual health, access healthcare services, and adopt preventive behaviors, thereby reducing their risk of HIV/AIDS acquisition.

Ocular Manifestations and HIV/AIDS

CMV retinitis, caused by cytomegalovirus infection, is a well-known complication in individuals with advanced immunosuppression and can lead to significant vision loss if left untreated. Its prevalence among HIV-positive patients underscores the importance of regular ophthalmologic screening and early intervention in HIV/AIDS care settings. Prompt diagnosis and treatment with antiviral medications are essential to prevent vision loss and preserve visual function in affected individuals. The findings highlighted the importance of ophthalmologic care as part of comprehensive HIV/AIDS management. Regular screening, early detection, and prompt treatment of ocular manifestations are essential to preserve vision and improve clinical outcomes in HIV-positive individuals. Additionally, (Bajhmoum, 2015) in Jeddah, Saudi Arabia, the significant association between HIV/AIDS infection and ocular complications emphasizes the need for integrated care approaches that address both medical and ophthalmologic aspects of HIV/AIDS treatment.

The current study findings are consistent with existing research on HIV/AIDS epidemiology and transmission dynamics, and stress the importance of addressing gender differences, age-specific liabilities, occupational risks, educational achievement, modes of transmission, and ocular manifestations in HIV/AIDS prevention and care efforts. By synthesizing findings from various research studies, healthcare providers and public health practitioners can develop evidence-based strategies to fight HIV/AIDS and promote the health and well-being of affected populations worldwide.

Conclusion

One of the most important findings is that men are more likely than women to have HIV/AIDS, which may be due to different risk factors and unequal access to healthcare. In a similar vein, the disparate effect on those between the ages of 30 and 44 highlights the necessity of focused preventative initiatives catered to this demographic. Higher educational achievement is linked to lower infection rates, suggesting that education is a critical factor in determining HIV/AIDS risk. The study also emphasizes the frequency of ocular symptoms in HIV-positive people, underscoring the significance of integrated care strategies that take into account both the medical and ophthalmologic facets of HIV/AIDS treatment.

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