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ANALYSING RETROSPECTIVE DATA: AGE AND GENDER DISPARITIES IN HSV-2 INFECTION PREVALENCE AMONGST PATIENTS IN KWAZULU-NATAL.

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ABSTRACT

Background
Herpes simplex virus type 2 (HSV-2) is a significant global public health concern, contributing to a substantial disease burden. Understanding the prevalence of HSV-2 infections and potential gender disparities is crucial for developing effective prevention and control strategies. This study compares the prevalence of HSV-2 infections between men and women aged 15-49 years.

Methods
This retrospective study analyzed data from 182 patients, both men and women aged 15-49 years, who tested positive for HSV-2. The data were sourced from the Inkosi Albert Luthuli Central Hospital laboratory database. Descriptive statistics calculated prevalence rates, and chi-square tests determined significant gender differences. The age groups were divided into five-year intervals to assess prevalence variations across different stages of adulthood.

Results
The analysis revealed notable differences in infection rates between genders. Among females, HSV-2 prevalence ranged from 4.9% in the 15-19 age group to 20.3% in the 20-24 age group, displaying a significant increase during early adulthood. The rates stabilized around 10.4% for ages 25-34, increased to 12.6% for ages 35-39, declined to 8.2% for ages 40-44, and further decreased to 3.6% for ages 45-49. In contrast, among males, HSV-2 prevalence started at 3.3% for ages 15-19, decreased to 2.7% for ages 20-24, steadily increased to 6.6% for ages 30-34, and slightly declined but remained relatively high at 4.4% for ages 35-39, 3.8% for ages 40-44, and 2.7% for ages 45-49.

Conclusion
The study demonstrates a substantial gender disparity in HSV-2 infection rates among individuals aged 15-49 years, with a significantly higher prevalence observed in females. These findings highlight the need for targeted interventions and public health strategies to address the higher burden of HSV-2 infections in women.

Recommendations
Targeted public health strategies and education campaigns should focus more on women, particularly in early adulthood, to reduce HSV-2 transmission rates.

Keywords: *Epidemiology; Africa; Genital herpes; Genital ulcer; HSV-2; Herpes simplex virus; Prevalence; Sexually transmitted infection.*
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Introduction and background
Herpes Simplex Virus Type 2 (HSV-2) is a widespread sexually transmitted infection with global prevalence (Looker et al., 2020). It belongs to the Herpesviridae family and is double-stranded (Ouedraogo et al., 2023). HSV-2's prevalence varies across populations, influenced by various factors (Madebe et al., 2020). During its latent phase, HSV-2 is asymptomatic, but reactivation results in pruritic vesicles and genital ulcers lasting two to four weeks (Akinyi et al., 2017). Initial infection episodes can be severe, particularly in immunocompromised individuals (Ahmed et al., 2020). HSV-2 causes genital ulcer diseases (Peiknik et al., 2019).

HSV-2 infection increases the risk of Human Immunodeficiency Virus (HIV) acquisition 2-4 times, even with treatment (Sunur et al., 2021). Transmission occurs through oral, anal, or vaginal sex, and maternal transmission during childbirth is possible (Van Wagoner et al., 2023). Acquisition of HSV-2 is influenced by age, sex, and ethnicity (Derby et al., 2018), with higher prevalence in females (Marcus et al., 2014). The World Health Organization (WHO) estimates 491 million HSV-2 infections in individuals aged 15-49 globally (James et

al.,2020). Approximately 23.6 million new infections occur annually (Kimberlin et al., 2013). Prevalence is higher in women (Beydoun et al., 2010), with SSA women having the highest rates (Looker et al., 2015). In the US, 572,000 new genital herpes cases are reported yearly, with women more affected (Silverberg et al.,2022).

SSA reports significantly higher HSV-2 prevalence, with adults aged 15-49 showing rates from 10 to 80% (Abbai et al., 2015). Among 13-24-year-olds, prevalence ranges from 5-53% for both genders (Abbai et al., 2018). In Uganda, men aged 15-19 have a 10% prevalence, increasing to 27% for men aged 20-24 (Nyirenda et al., 2010). Ugandan women aged 15-19 have a 35% prevalence, rising to 74% for women aged 20-24 (Abbai et al., 2018). In South Africa, HSV-2 prevalence among women aged 15-26 is 31% (Bestien et al., 2012). Female commercial sex workers in KwaZulu-Natal have an 84% prevalence, and the MIRA study in Durban reports a 73% prevalence with a threefold increase in HIV co-infection (Daniels et al., 2016).

HSV-2 is a major cause of genital infections, with a threefold increased risk of HIV transmission (Hammad et al., 2021). Preventing HSV-2 infection is vital due to its severe health impacts, including vaginal ulcers, meningoencephalitis, and neonatal herpes (Delegard et al., 2023). Stigma exacerbates its effects (Joppa et al., 2021). Over 400 million people have HSV-2, with a higher prevalence in women, especially in KwaZulu-Natal (Looker et al., 2016). Understanding HSV-2 prevalence is crucial for targeted prevention and intervention effectiveness monitoring (Castor et al., 2023). A study compared HSV-2 prevalence in men and women aged 15-49 to raise awareness and reduce transmission risk. This study examined HSV-2 prevalence in individuals aged 15-49, focusing on KZN regions. Data was retrieved from the Inkosi Albert Luthuli Central Hospital virology laboratory database. While limited to KZN, this study aligns with prior global HSV-2 prevalence research.

Objectives

The study aimed to examine the prevalence of Herpes Simplex Virus Type 2 (HSV-2) infections and their relationship with age and gender, with specific objectives to assess HSV-2 infection prevalence in men and women, and to compare HSV-2 infection prevalence between men and women aged 15-49 years.

Methods

Study Design

The study adopted a quantitative and descriptive approach. Data regarding patients diagnosed with HSV-2 infections were retrieved from the laboratory database of the Department of Virology at Inkosi Albert Luthuli Central Hospital.

Study Setting

The study was conducted from January to October 2023 at the National Laboratory Health Services (Virology), situated within Inkosi Albert Luthuli Central Hospital in Durban. The laboratory is a centralized facility within the hospital, equipped with state-of-the-art virology testing equipment and staffed by experienced laboratory technologists and scientists. It serves as a regional reference laboratory for the public sector of the entire KwaZulu-Natal (KZN) province of South Africa, receiving and analyzing virology specimens from healthcare facilities across the region for diagnostic and surveillance purposes.

Participants

The study population included 182 individuals of both genders, aged 15-49, who tested positive for HSV-2 infection.

Bias

The study aimed to minimize bias by retrieving data directly from the laboratory database, ensuring the inclusion of all patients diagnosed with HSV-2 during the specified period. Additionally, efforts were made to prevent duplication of patient records, with only the first positive result considered in cases of duplication.

Study Size

Data were sourced from the Inkosi Albert Luthuli Central Hospital laboratory database, specifically from all patients diagnosed with HSV-2 infection between January 2021 and January 2022.

Statistical Methods

Stratified analysis using the following formula nh= (Nh/N) *n whereby nh is a frequency % = Nh which is gender or age size respectively, N is total sample size and n is strata which is 100%. This was applied on Microsoft Excel was employed to calculate the percentage of men and women aged 15-49 with HSV-2 diagnoses at Inkosi Albert Luthuli Central Hospital. Descriptive statistics, including tables and graphs, were used for data presentation. A stratified analysis formula was applied to calculate HSV-2 prevalence in women and men separately. Missing data were addressed through sensitivity analyses and multiple imputation techniques.

Ethical Considerations

Approval was obtained from the National Health Laboratory Services Head of the Department of Virology to access the laboratory database. A non-disclosure agreement was signed to ensure confidentiality. Patient results were protected through the use of study numbers, and informed consent was not required since the data was anonymous and study numbers were assigned. Patient details and results were stored in a password-protected folder. Data were disseminated in a manner ensuring confidentiality and ethical clearance was obtained from the Mangosuthu University of Technology Research Committee *(Ref: RD5/18/2023).*

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Results

In an analysis of 182 patients with positive HSV-2 infection data, a notably higher prevalence was found among females, accounting for 70.1%, while males constituted 29.5%. These findings encompass individuals aged 15-49 who tested positive for HSV-2 infection at IALCH, NHLS, which caters to the public sector in the entire KZN province. The table below elaborates more on the results analyzed from this study. **Total population (n): 182 (100%)**

Table 1: Overall prevalence of Herpes simplex virus type–2 (HSV-2) in men and women aged 15 to 49.

Age	Female	Frequency %	Male	Frequency %
15-19	09	4.9	06	3.3
20-24	37	20.3	5	2.7
25-29	19	10.4	11	6.0
30-34	19	10.4	12	6.6
35-39	23	12.6	08	4.4
40-44	*15*	8.2	07	3.8
45-49	06	3.3	05	2.7
Total	128	70.1	54	29.5

A total of 128 females diagnosed with HSV-2 infection were distributed across age groups as follows: 9 (15-19), 37 (20-24), 19 (25-29), 19 (30-34), 23 (35-39), 15 (40-44), and 6 (45-49). Among the 54 males diagnosed, distribution was as follows: 6 (15-19), 5 (20-24), 11 (25-29), 12 (30-34), 8 (35-39), 7 (40-44), and 5 (45-49).

Figure 1: Compares the prevalence of Herpes Simplex Virus type -2 in men and women aged 15 to 49 years.

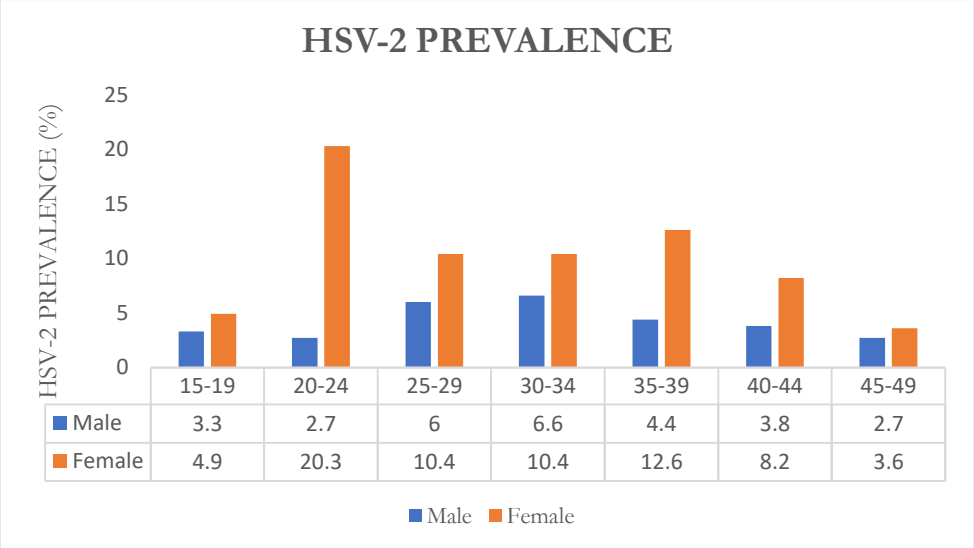

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Figure 2: Prevalence of Herpes Simplex Virus type -2 according to gender

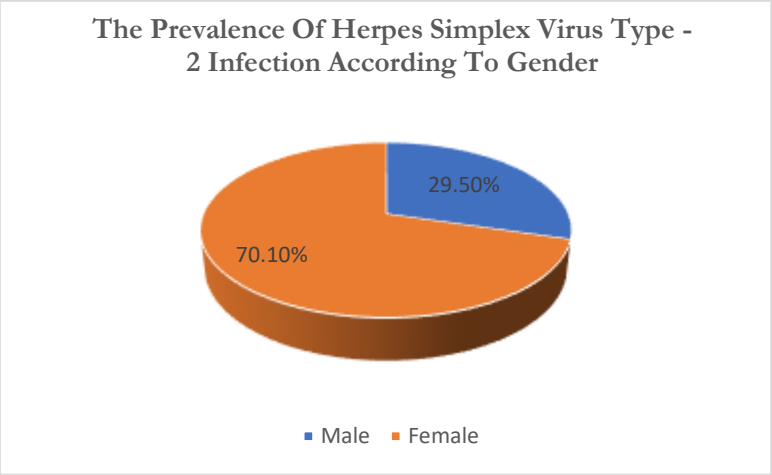

Table 2: Statistical analysis: Expected values

	Expected Values						
Age	15-19	20-24	25-29	30-34	35-39	40-44	45-49
Female	10.549	29.538	21.099	21.802	21.802	15.473	7.736
Male	4.452	12.462	8.901	9.198	9.198	6.527	3.264

Table 3: Statistical analysis by Chi-Square

Chi-Square (x^2)	Degrees of freedom	P-value	Yates Chi-Square	Yates p-value
10.621	6	0.10082026	7.851	0.24922398

Statistically, the chi-square value of 10.621, 6 degrees of freedom, and a p-value of 0.10082026 suggest no significant difference in HSV-2 infection prevalence between men and women aged 15-49. The p-value of 0.10082026 indicates a 10.08% chance of obtaining these results if no true difference exists. Thus, the data does not provide enough evidence to reject the null hypothesis, concluding no significant difference in HSV-2 infection prevalence between genders in this age range.

Discussion

The analysis of HSV-2 infection data from 182 individuals across various age groups reveals intriguing patterns of prevalence in Table 1 and Figure 1**.** Among females aged 15-19, the infection rate was 4.9%, notably lower than the 28% reported in a previous African study by Rajagopal et al. (2014). However, this rate significantly increased to 20.3% among females aged 20-24, suggesting a substantial rise in transmission during early adulthood. This finding is comparable with the health reports from the United States of America's National Health Centre for Statistics, which also reported a higher prevalence of HSV-2 among females than males (James et al., 2020). In later age groups, the rates somewhat stabilized, with 10.4% for ages 25-29 and 30-34, followed by a slight increase to 12.6% for ages 35-39. However, this contrasts with findings from a European study by Alareeki et al. (2023), which reported increasing HSV-2 seroprevalence with age among general populations. The prevalence then declined to 8.2% in the 40-44 age group and significantly dropped to 3.6% among females aged 40-49.

The findings regarding HSV-2 infection rates among females across different age groups align with existing literature on the epidemiology of herpes simplex virus type 2. The substantial increase in infection rates observed among females aged 20-24 corresponds to a well-documented trend where young adulthood is identified as

a high-risk period for HSV-2 transmission (Akinyi et al., 2017; Zulaika et al., 2021). This is often attributed to increased sexual activity and higher numbers of sexual partners during this life stage. The subsequent stabilization of infection rates in the 25-29 and 30-34 age groups may reflect a reduction in risky sexual behaviors or an increasing level of immunity developed among those previously exposed. However, a historical cohort study suggests that the risk of herpes simplex virus type 2 acquisition increases over early adulthood, recommending health promotion and treatment to control HSV-2 infection be aimed at all ages, not just the young (Dickson et al., 2007).

In contrast, male HSV-2 infection rates followed a different pattern. Among males aged 15-19, the prevalence was 3.3%, slightly decreasing to 2.7% in the 20-24 age group. However, rates steadily increased in subsequent age groups, peaking at 6.6% in males aged 30-34. Prevalence then decreased slightly but remained relatively high, with rates of 4.4% for ages 35-39, 3.8% for ages 40-44, and 2.7% for ages 45-49. Notably, the highest prevalence of HSV-2 infections among women occurred in the 20-24 age group, a critical reproductive age range with potential implications for maternal and child health. This finding is in alignment with that conducted by Anzivino et al. (2009), which found age and sex are important risk factors associated with the acquisition of genital HSV-2 infection. The prevalence of HSV infection was found very low in childhood and early adolescence but it rises with age, reaching the maximum of around 40 years. Various factors, including hormonal changes and cervicovaginal micro-abrasions during menstruation, may contribute to the higher prevalence in this specific age group. In contrast, male infection rates peak at ages 30-34, suggesting complex social and behavioral factors. The data highlights the need for targeted interventions in reproductive age groups to address this public health concern.

The study results provide valuable insights into HSV-2 infection rates among a specific sample population. However, caution should be exercised when generalizing these findings to broader populations due to potential variations in demographics, geographical locations, and cultural factors. Further research involving diverse populations and settings is warranted to enhance the external validity of the study results.

Conclusion

To conclude, our analysis of HSV-2 infection data from 182 individuals across various age groups reveals intriguing patterns. Among females, there is a notable surge in infection rates from the 15-19 age group to the 20-24 age group, with potential implications for maternal and child health. In contrast, males exhibit a different trajectory, with lower prevalence in younger age groups followed by a gradual increase in older age groups. While statistical analysis suggests no significant difference in HSV-2 infection prevalence between men and women aged 15-49, caution is warranted due to potential limitations in sample size and data representativeness. Nonetheless, these findings emphasize the importance of targeted interventions to address this public health concern across reproductive age groups.

Limitations of the study

The study's findings on HSV-2 infection prevalence among different age and gender groups offer valuable insights, but limitations must be considered. A relatively small sample size, reliance on laboratory data, and the absence of key demographic and behavioral factors restrict the study's generalizability and robustness. While statistical analysis suggests no significant difference in HSV-2 prevalence between genders aged 15-49, the marginally above-threshold p-value raises questions about statistical power. Nonetheless, the study underscores the need for targeted interventions, particularly among young adults and reproductive-age women, to address the public health implications of HSV-2. It also emphasizes the importance of conducting larger, more diverse research to enhance understanding in this complex field.

Recommendations

The study highlights the need for targeted preventive initiatives to reduce HSV-2 prevalence among females aged 20-24, emphasizing comprehensive sexual education, accessible testing, and treatment services. Additionally, further research is warranted to better understand HSV-2 prevalence dynamics across demographic groups, identify additional risk factors, and address disparities in healthcare access. By implementing these recommendations, we can mitigate the burden of HSV-2 infections and improve sexual and reproductive health outcomes.

Future research should explore the effectiveness of targeted preventive interventions in high-risk populations, socio-economic factors influencing HSV-2 transmission, and the development of novel diagnostic and therapeutic approaches. Longitudinal studies and comparative analyses across different populations and regions would enhance our understanding of HSV-2 epidemiology and inform tailored public health strategies.

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List of abbreviations

Abbreviation	Meaning
HSV	Herpes Simplex Virus
HIV	Human Immunodeficiency Virus
IALCH	Inkosi Albert Luthuli Central Hospital
KZN	KwaZulu-Natal
LIS	Laboratory Information System
MIRA	Methods of Improving Reproductive Health in Africa
NHLS	National Health Laboratory Service
PCR	Polymerase Chain Reaction

Conflict of interest

The authors declare no conflict of interest.

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Author Biography

Philile Moyane is a Bachelor of Health Science in Medical Laboratory Science graduate and a registered Virology specialist with the Health Professions Council of South Africa. With a strong background in medical laboratory science, Philile has dedicated her career to advancing knowledge and expertise in virology. Her professional pursuits encompass research, diagnostics, and public health initiatives aimed at combating infectious diseases.

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