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Seroprevalance Of Herpes Simplex Virus Type 1 And Type 2 Among Antenatal Women In A Tertiary Care Hospital

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Abstract:
Background*: Herpes simplex virus (HSV) is a common viral infection worldwide, with two types: HSV-1, usually causing orolabial infections, and HSV-2, mainly associated with genital herpes. Herpes simplex virus (HSV) infection during pregnancy poses a significant risk for maternal morbidity and neonatal herpes. HSV-1 and HSV-2 infections are often asymptomatic, making serological screening essential for early detection and management of herpes simplex infection among antenatal women.*
Materials and Methods*: A prospective study was conducted over 6 months (March – August 2025) in the Department of Microbiology, Government General Hospital, Guntur among 60 antenatal women. Serum samples were collected and tested for HSV 1 and HSV 2 IgG and IgM antibodies using ELISA. Data were analyzed using appropriate statistical methods*
Results*: The seroprevalence of HSV-1 IgG was 35%, HSV-2 IgG was 3%, HSV-1 IgM was 3%, and HSV-2 IgM was 1.7%. IgM positivity was predominantly observed in the second and third trimesters. A statistically significant association was noted between HSV seropositivity and trimester*
Conclusion: *A considerable proportion of antenatal women had prior exposure to HSV-1, while active infections were low but clinically significant. Routine screening and awareness programs are recommended to prevent vertical transmission.*
Key Word: *HSV 1, HSV 2, antenatal women, seroprevalance, ELISA.*

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I. Introduction

Herpes simplex virus (HSV) is a double-stranded DNA virus belonging to the alpha subfamily of the Herpesviridae family, existing as two types: HSV-1 and HSV-2. HSV-1 is primarily associated with orolabial infections presenting as herpes labialis, gingivostomatitis, and may also cause central nervous system manifestations such as encephalitis. HSV-2 is more commonly linked to genital infections, presenting with painful vesicular or ulcerative genital lesions, although overlap between the two types is increasingly recognized. Following primary infection, the virus establishes lifelong latency in sensory ganglia—HSV-1 in the trigeminal ganglion and HSV-2 in the sacral ganglion. Reactivation occurs periodically, with the virus traveling via axonal transport to peripheral sites, leading to recurrent lesions and asymptomatic viral shedding, which facilitates transmission. The seroprevalence of HSV**,** particularly HSV-2, is a marker of sexually transmitted infection (STI) burden in a population Diagnosis is based on clinical features mainly while laboratory confirmation is by serological tests using ELISA to detect type specific IgG or IgM antibodies, antigens or by nucleic acid amplification tests like PCR.

In pregnancy, HSV infection is of significant clinical importance due to the risk of vertical transmission, particularly during delivery in the presence of active genital lesions. Primary or reactivated infection can result in adverse outcomes such as miscarriage, intrauterine fetal demise, and preterm labor. Neonatal herpes, most commonly associated with HSV-2, is a serious condition with high morbidity and mortality, presenting as localized skin, eye, and mouth disease, central nervous system involvement, or disseminated infection. In developing countries like India, HSV seroprevalence varies widely due to socio-demographic and behavioral factors, and routine antenatal screening is not universally practiced. This study aims to assess the seroprevalence of HSV among antenatal women in a tertiary care setting to aid in early detection and prevention of maternal and neonatal complications.

III. Material And Methods

This prospective study was conducted over a period of six months (March–August 2025) in the Department of Microbiology at Government General Hospital, Guntur. A total of 60 antenatal women attending the outpatient Department of Obstetrics were included in the study. Participants from all trimesters were enrolled, and demographic as well as clinical details were recorded.

Study Design: Prospective observational study

Study Location: Department of Microbiology, Department of Obstetrics, Government General Hospital, Guntur.

Study Duration: March 2025 to August 2025.

Sample size: 60 antenatal women.

Sample size calculation: Sample size was calculated using the formula $n = Z^2pq/d^2$ with Z = 1.96 (95% confidence), p = 6%, q = 94%, and d = 6%(considering feasibility). The calculated sample size was approximately 60, and hence 60 antenatal women were included in the study.

Ethical approval: The study was approved by the Institutional Ethics Committee and Scientific Committee of Government General Hospital, Guntur. Informed consent was obtained from all participants.

Inclusion criteria:

1. Pregnant women aged 18 to 45 years
2. Any trimester
3. Attending the antenatal outpatient and the inpatients in Department of Obstetrics, Government General Hospital, Guntur
4. History of genital ulcers with vesicles or recurrent similar history, oral blisters
5. Willing to give written informed consent.
6. Willing to provide 5ml of venous blood sample for serological analysis.

Exclusion criteria:

1. Non Pregnant women;
2. Pregnant women with HIV, HBV, or other immunocompromised conditions
3. Pregnant women with history of genital warts
4. Pregnant women with history of carcinoma genitalia.
5. Pregnant women who have taken antiviral therapy in past 6 months
6. Those unwilling to give consent or provide blood sample.

Procedure methodology

After obtaining approval from the Institutional Ethics Committee and informed written consent from the participants, antenatal women attending the outpatient and inpatient departments were enrolled in the study. Relevant demographic and clinical details, including age, trimester, obstetric history, and any history suggestive of herpes infection, were recorded using a structured proforma. Under strict aseptic precautions, 3–5 mL of venous blood was collected from each participant, allowed to clot, and centrifuged at 3000 rpm for 10 minutes to separate serum, which was then aliquoted and stored at −20°C until testing. Serological analysis for HSV-1 and HSV-2 specific IgG and IgM antibodies was performed using commercially available ELISA kits (MERILISA Diagnostics and Calbiotech) as per the manufacturers' instructions. Briefly, serum samples, calibrators, and controls were added to antigen-coated microtiter wells and incubated, followed by washing to remove unbound components. Enzyme-conjugated antibodies were then added, followed by substrate solution, and the reaction was stopped after incubation. Optical density was measured using an ELISA reader at the recommended wavelength, and results were interpreted based on the cut-off values provided in the kit manuals. Quality control was ensured by including positive and negative controls in each run, and the results obtained were recorded and subjected to statistical analysis.

IV. Result

The study cohort comprised 60 antenatal women with a mean age of 24.9 ± 3.6 years (range: 18–33 years). The majority of participants were in their second trimester (71.7%) and were residents of urban areas (48.3%), followed by rural (36.7%) and semi-urban (15.0%) locations. Notably, 96.7% (n=58) of the

participants were asymptomatic for herpetic lesions at the time of sample collection, underscoring the predominantly subclinical nature of the infections in this population.

Serological screening revealed that the prevalence of HSV-1 IgG antibodies was significantly higher than that of HSV-2, with 35.0% (n=21) of women testing positive for past HSV-1 exposure compared to only 3.3% (n=2) for HSV-2 IgG. Markers of recent or active infection were infrequent; HSV-1 IgM was detected in 3.3% (n=2) of cases, while HSV-2 IgM was present in 1.7% (n=1). Dual seropositivity for both HSV-1 and HSV-2 IgG was observed in only one participant (1.7%), suggesting low rates of viral co-infection within this specific demographic.

Table no 1: Table 1 summarizes the serological status of the 60 antenatal women screened for Herpes Simplex Virus. The data reveals that **HSV-1 IgG** is the most frequent marker, with a prevalence of **35.0% (n=21)**, indicating a high level of previous exposure to the virus within the community. In contrast, the prevalence of **HSV-2 IgG** is substantially lower at **3.3% (n=2)**. Markers of acute or recent infection (IgM) were rare, with **3.3% (n=2)** positive for HSV-1 IgM and only **1.7% (n=1)** positive for HSV-2 IgM. This baseline data suggests that HSV-1 is the primary driver of herpes seropositivity in this cohort.

Table no 1: Overall Seroprevalence of HSV-1 and HSV-2.

Serological Marker	Positive (n)	Percentage (%)
HSV-1 IgG	21	35.0%
HSV-1 IgM	2	3.3%
HSV-2 IgG	2	3.3%
HSV-2 IgM	1	1.7%

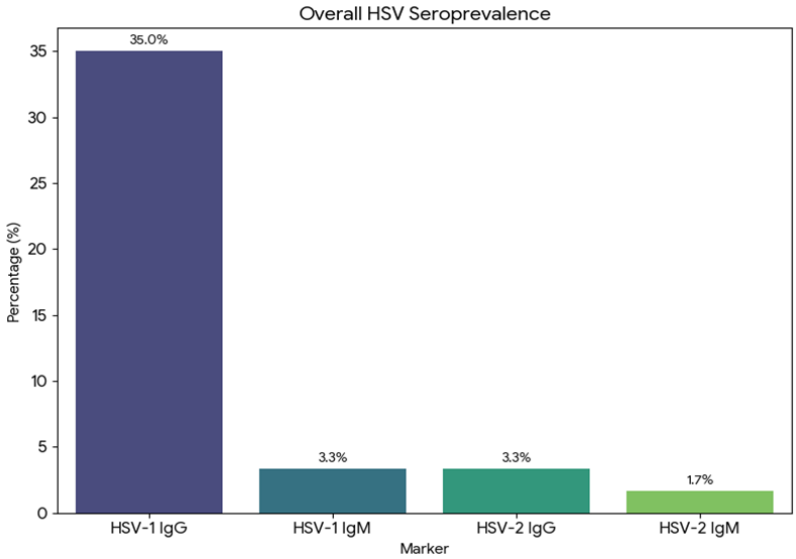

Figure 1: illustrates the comparative seroprevalence of HSV-1 and HSV-2 among the study population (n=60). HSV-1 IgG was the most prevalent marker at **35.0%**, indicating a high rate of lifetime exposure. In contrast, HSV-2 IgG prevalence was significantly lower at **3.3%**. Acute or recent markers (IgM) were rare for both types, with HSV-1 IgM at **3.3%** and HSV-2 IgM at **1.7%**. This disparity suggests that HSV-1 is the dominant serotype in this cohort The bar chart illustrates the dominance of HSV-1 IgG (35.0%) compared to other markers. The low prevalence of IgM markers for both HSV-1 (3.3%) and HSV-2 (1.7%) indicates that most infections in this cohort were chronic or latent rather than acute.

Table 2: Distribution of HSV 1 and 2 among different trimesters.

Trimester	HSV-1 IgG Positive (n)	HSV-1 IgM Positive (n)	HSV-2 IgG Positive (n)	HSV-2 IgM Positive (n)	Total Participants (N)
1st Trimester	2	0	0	0	5
2nd Trimester	17	1	2	0	43
3rd Trimester	2	1	0	1	12
Total	21	2	2	1	60

Table no2: represents the distribution of Herpes Simplex Virus (HSV) serological markers across the three trimesters of pregnancy. The data indicates that while HSV-1 IgG remains the most prevalent marker throughout pregnancy, IgM positivity—indicative of recent infection or reactivation—was most notably identified in the third trimester (n=2, 16.7% of the trimester subgroup). This finding is of clinical significance as the presence of IgM in the late third trimester carries a higher risk for vertical transmission during delivery. The study population was predominantly in the second trimester (n=43, 71.7%), reflecting the period of most frequent antenatal screening at this tertiary care facility.

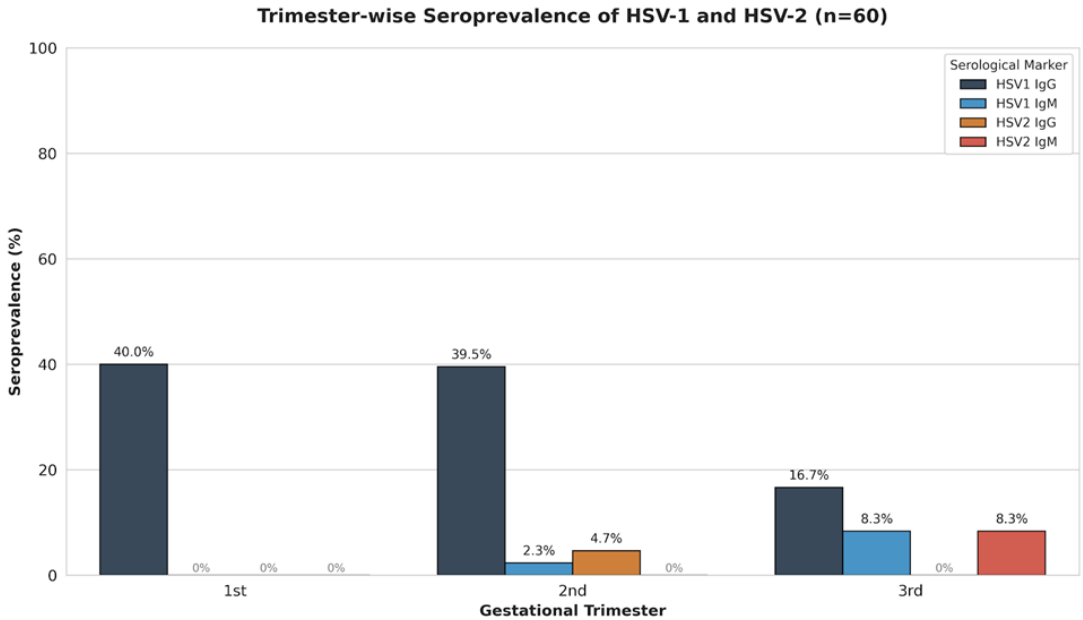

Figure 2 The figure depicts the percentage seroprevalence of HSV markers stratified by gestational trimester.**HSV-1 IgG** prevalence remained consistently high in the first (**40.0%**) and second (**39.5%**) trimesters, indicating significant chronic exposure. There is observed decrease in this marker during the third trimester (**16.7%**). **Acute Markers (IgM)** showed a notable presence in the later stages of pregnancy. Both HSV-1 IgM and HSV-2 IgM reached their peak prevalence in the **third trimester (8.3% each)**, which is clinically significant for the risk of neonatal transmission.**HSV-2 IgG** was only detected during the second trimester, with a prevalence of **4.7%** in that subgroup. This visualization highlights that while chronic HSV-1 exposure is prevalent early on, the markers for potentially active or recent infections (IgM) are more frequently detected as the pregnancy progresses into the final trimester.

Table no 3: Socioeconomic Distribution and Positivity Rates. This table explores the association between socioeconomic status (SES) and overall HSV positivity (defined as testing positive for any of the four markers).

Socioeconomic Status	Total (N)	Any HSV Positive (n)	Positivity Rate (%)
Low	23	14	60.9%
Middle	20	6	30.0%
High	17	2	12.5%

Figure 3: Association between socioeconomic status(SES) and overall HSV positivity.

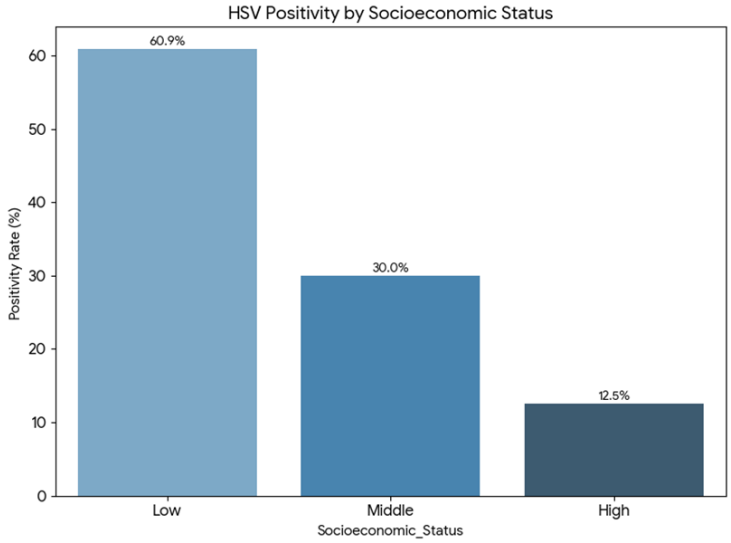

Figure 3: highlights a strong correlation between socioeconomic status (SES) and the likelihood of HSV infection. The **Low SES** group demonstrated the highest vulnerability, with **60.9% (14 out of 23)** of participants testing positive for at least one HSV marker. This positivity rate drops to **30.0%** in the **Middle SES** group and further declines to **12.5%** in the **High SES** group. These findings suggest that environmental factors, living conditions, or differences in health literacy associated with socioeconomic background may play a critical role in the transmission dynamics of HSV among antenatal women in this region.

Table 4: Obstetric and Clinical History in Relation to HSV Seropositivity (N=60)

Obstetric/Clinical Parameter	Total (N)	HSV Positive (n)	Positivity Rate (%)
Number of Sexual Partners			
1 Partner	33	10	30.3%
2 Partners	11	5	45.5%
3+ Partners	16	8	50.0%

Obstetric/Clinical Parameter	Total (N)	HSV Positive (n)	Positivity Rate (%)
History of Abortions			
0 Abortions	20	7	35.0%
1 Abortion	22	9	40.9%
2 Abortions	18	7	38.9%
Clinical Presentation			
Asymptomatic	58	21	36.2%
Symptomatic (Genital Ulcer)	2	2	100.0%

Table 4: delineates the association between clinical presentation, obstetric history, and HSV seropositivity among the study participants ($N=60$). A clear correlation was observed between the number of sexual partners and seroprevalence, with the highest positivity rate (**50.0%**) identified in women reporting three or more partners. While the vast majority of the cohort was asymptomatic (**96.7%**), it is noteworthy that **36.2%** of these asymptomatic individuals were seropositive for HSV markers, highlighting a significant reservoir of subclinical infection. In contrast, all participants presenting with clinical symptoms (genital ulcers, $n=2$) were HSV positive (**100%**). The distribution of abortion history remained relatively uniform, with positivity rates ranging from **35.0%** to **40.9%**, suggesting that in this specific cohort, the number of prior abortions was not a primary differentiator for HSV status.

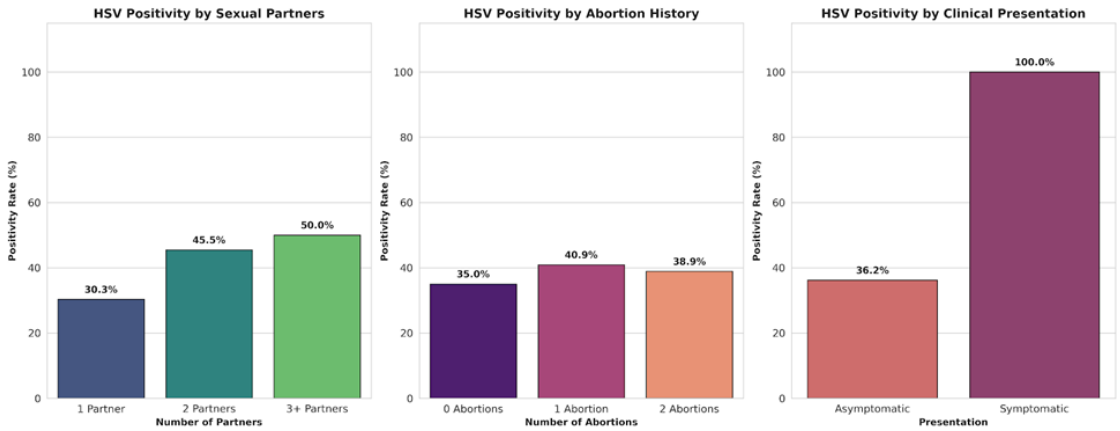

Figure 4: highlights a significant correlation between clinical presentation and HSV seropositivity; while **96.7%** of the study population was asymptomatic, **100%** of symptomatic patients (presenting with genital ulcers) tested positive for HSV markers. Furthermore, a trend of increasing seroprevalence was observed with a higher number of sexual partners, rising from **30.3%** in the single-partner group to **50.0%** in those with three or more partners. Interestingly, history of abortion did not show a statistically dominant variance, with positivity rates remaining relatively stable between **35.0%** and **40.9%** across all subgroups. These findings underscore the high prevalence of latent, asymptomatic HSV infections within the antenatal population.

The graphical representation illustrates the trends in HSV seropositivity across key clinical and obstetric parameters. The bar charts emphasize the rising trajectory of HSV infection risk associated with an increased number of sexual partners, which serves as a significant behavioral predictor in this population. The clinical presentation graph visually underscores the diagnostic challenge posed by HSV in pregnancy: although symptomatic cases show a absolute correlation with seropositivity, the high percentage of positive results among asymptomatic women (**36.2%**) confirms that clinical signs alone are insufficient for identifying maternal infection. This visual data supports the necessity of integrating serological screening into routine antenatal care to mitigate the risk of undiagnosed viral shedding and subsequent neonatal transmission.

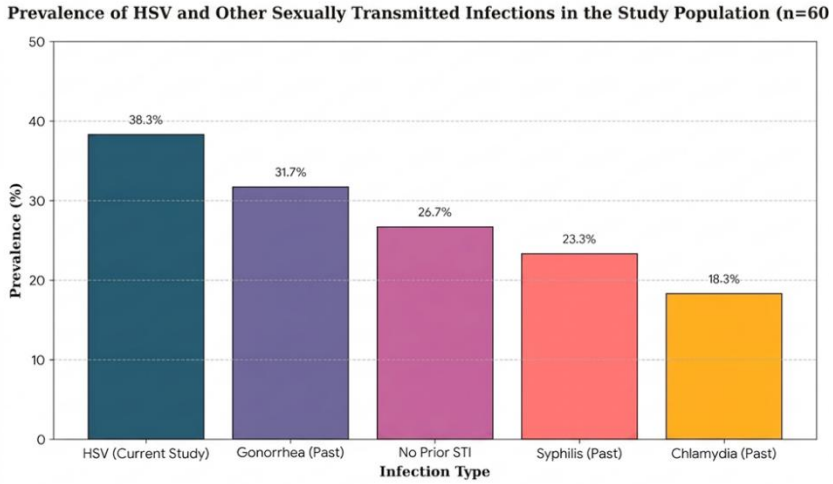

Figure 5: illustrates the prevalence of Herpes Simplex Virus (HSV) in comparison with the history of other sexually transmitted infections (STIs) within the study cohort ($n=60$). HSV seropositivity was found to be the most prevalent infection at **38.3%**, followed by a significant history of past Gonorrhea (**31.7%**), Syphilis (**23.3%**), and Chlamydia (**18.3%**). Notably, **73.3%** of the participants reported a history of at least one other STI, suggesting a high rate of co-morbidity and common risk factors within this antenatal population. The high seroprevalence of HSV, often co-existing with other past STIs, underscores the need for comprehensive screening and counseling for multiple infections in high-risk groups to prevent vertical transmission and adverse gestational outcomes.

V. Discussion

The seroepidemiological profile of Herpes Simplex Virus (HSV) in this study indicates a significant public health burden among antenatal women, with an overall seropositivity rate of **38.3%**. A critical finding is the peak in acute infection markers during the final stages of pregnancy, where both **HSV-1 IgM** and **HSV-2 IgM** reached their highest prevalence of **8.3%** in the third trimester. This timing is of particular clinical concern because the presence of IgM in late pregnancy serves as a marker for recent primary infection or viral reactivation, posing the highest risk for vertical transmission to the neonate during delivery. While **HSV-1 IgG** remained relatively stable in the first (**40.0%**) and second (**39.5%**) trimesters, suggesting a baseline of chronic, latent infection, the surge in IgM markers highlights a window of vulnerability that requires active management.

When compared to broader Indian literature, our findings fall within a diverse range of reported seroprevalence. Our results are lower than the benchmarks set in North India and the Gangetic plain, where studies have reported overall IgG rates as high as **66.66%** and **64.9%**, respectively. However, our detection of **HSV-2 IgG** at **4.7%** aligns more closely with findings from rural South India (**6.7%**) and Northeast India (**8.7%**). These regional variations likely reflect differences in socio-economic status, population density, and the prevalence of other sexually transmitted infections (STIs) within specific geographical cohorts.

The study further underscores the profound challenge of diagnosing HSV based on clinical presentation alone. An overwhelming **96.7%** of the participants were asymptomatic, yet **36.2%** of this asymptomatic reservoir was seropositive for HSV. While the small symptomatic group—those presenting with genital ulcers—showed a **100%** correlation with seropositivity, they represented only a tiny fraction of the infected population. This disparity confirms that physical examinations are insufficient for identifying the majority of carriers who may still be capable of subclinical viral shedding.

Furthermore, the data establishes a clear link between behavioral factors and infection risk. HSV seropositivity showed a step-wise increase in relation to the number of sexual partners, rising to **50.0%** for women reporting three or more partners. The high prevalence of co-morbidities, including past history of **Gonorrhea (31.7%)** and **Syphilis (23.3%)**, suggests that HSV is frequently part of a broader profile of STI

exposure. Collectively, these results advocate for the implementation of universal serological screening in tertiary care settings to identify asymptomatic carriers and implement antiviral prophylaxis, thereby reducing the risk of neonatal herpes and improving maternal health outcomes.

VI. Conclusion

In conclusion, this study demonstrates a high burden of latent and acute HSV infection among antenatal women, characterized by a predominantly asymptomatic clinical profile and a strong association with other sexually transmitted infections. The high rate of asymptomatic seropositivity (**36.2%**) and the peak of IgM markers in the third trimester emphasize that routine clinical examinations are inadequate for comprehensive risk assessment. To safeguard neonatal health, it is essential to integrate HSV serological testing into standard antenatal care protocols in tertiary hospitals. Such a strategy would facilitate the early identification of at-risk pregnancies, allowing for timely clinical intervention and counseling to minimize the risk of vertical transmission.

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