

Diagnostic and Pharmaceutical Implications of Polygamous Marriage and HIV Transmission among Women of Reproductive Age in Ibiono Ibom, Nigeria

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Abstract : *This study investigated the influence of polygamous marriage on HIV/AIDS transmission among women of productive age (15–49 years) in Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria. The study adopted a descriptive cross-sectional design using a structured questionnaire administered to 230 respondents selected from a population of 8,222 women through a simple random sampling technique. The instrument consisted of five items measured on a four-point Likert scale, and its reliability was established using a pilot study outside the study area, yielding a reliability coefficient of 0.75. Data were analyzed using descriptive statistics (percentages) and inferential statistics (chi-square test) at a 0.05 level of significance. Results from the descriptive analysis showed that 67.2% of responses agreed that polygamous marriage increases the risk of HIV/AIDS transmission, while 32.8% disagreed. Specifically, 91.3% of respondents agreed that polygamous unions create environments that encourage unprotected sexual practices, and 87.4% agreed that multiple sexual partnerships within families increase HIV exposure. The chi-square analysis revealed a significant relationship between polygamous marriage and HIV/AIDS transmission ($\chi^2 = 283.83$, $df = 4$, $p < 0.05$), leading to rejection of the null hypothesis. The findings indicate that polygamous marital structures significantly contribute to increased vulnerability to HIV/AIDS among women, largely due to concurrent sexual partnerships, limited sexual negotiation power, and low risk*

perception. The study recommends strengthened community-based HIV sensitization programs, improved access to rapid diagnostic tools, expanded availability of antiretroviral drugs, and integration of gender-sensitive interventions. It further emphasizes the role of industrial chemistry in developing affordable diagnostic kits and pharmaceutical innovations to support HIV prevention and control in rural communities.

Key words: *Polygamous, HIV/AIDS, Spread,*

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1.0 Introduction

Human Immunodeficiency Virus (HIV) infection and Acquired Immunodeficiency Syndrome (AIDS) remain major global public health challenges despite significant advances in prevention, diagnosis, treatment, and disease

management (Jones & Scully, 2026; Lopes-Araujo *et al.*, 2026) According to the Joint United Nations Programme on HIV/AIDS (UNAIDS), millions of people continue to live with HIV worldwide, with sub-Saharan Africa accounting for the highest proportion of infections (Assefa & Gilks, 2020; Orlando *et al.*, 2026). Some studies have concluded that women and girls remain disproportionately affected by the epidemic due to biological susceptibility, socio-economic inequalities, gender-based violence, and limited autonomy in sexual and reproductive health decision-making (Charles-Eromosele *et al.*, 2022; Dabla, 2026; Sia *et al.*, 2016). Consequently, the listed and other factors can interact with cultural and marital practices to influence HIV transmission dynamics and health outcomes among women, particularly in rural and resource-limited settings (Mapouka *et al.*, 2025)

Records have shown that Nigeria bears one of the largest HIV burdens globally and continues to face substantial challenges in achieving the elimination targets established by international public health agencies (Bassey & Miteu, 2023). Although national HIV prevalence has declined over the years due to expanded access to antiretroviral therapy (ART), improved surveillance systems, and intensified public health interventions (Agulanna *et al.*, 2026; Branda *et al.*, 2026; Ferede & Tamiru, 2026), HIV transmission remains a significant concern among women of reproductive and productive ages. Evidence from population-based surveys indicates that women are particularly vulnerable to HIV infection due to early sexual debut, transactional sex, limited access to reproductive health services, and socio-cultural practices that reduce their capacity to negotiate safer sexual behaviours (Fagbamigbe *et al.*, 2016). Furthermore, marital status and relationship dynamics have emerged as important determinants of HIV risk, emphasizing the need to understand how

different marital arrangements influence HIV transmission among women.

Akwa Ibom State has historically recorded one of the highest HIV prevalence rates in Nigeria and continues to represent an important epidemiological setting for HIV/AIDS research and intervention programmes (Swinkels *et al.*, 2026). Despite remarkable progress in HIV prevention and treatment, women in rural communities remain vulnerable to infection because of persistent socio-economic inequalities, cultural norms, inadequate access to healthcare services, and gender-related barriers that influence sexual decision-making (Mukuku & Govender, 2025). The persistence of these factors suggests that biomedical interventions alone may be insufficient for effective HIV control unless accompanied by a better understanding of the socio-cultural contexts within which HIV transmission occurs.

One socio-cultural practice that continues to attract considerable attention in HIV/AIDS research is polygamous marriage, particularly polygyny, which refers to a marital arrangement in which a man is simultaneously married to more than one wife (Damtie *et al.*, 2021). Polygyny remains widely practiced across many parts of sub-Saharan Africa, including Nigeria, where cultural traditions, religious beliefs, economic considerations, and social expectations often support it (Aamzat *et al.*, 2026). In many communities, including those within Akwa Ibom State, polygamous marriage continues to serve as an accepted family structure that influences household organisation, inheritance systems, fertility patterns, and social relationships (Aboagye *et al.*, 2025)

The relationship between polygamous marriage and HIV transmission has generated considerable debate among researchers (Johnson-Peretz *et al.*, 2024). On one hand, studies have suggested that the concurrent sexual partnerships inherent in polygamous



unions may facilitate HIV transmission through interconnected sexual networks (Sturgeon, 2010). Dhillon *et al.* (2023) argues that polygyny may increase women's vulnerability to HIV infection by limiting their ability to negotiate condom use, insist on partner fidelity, or withdraw from relationships perceived to be risky. The author further emphasizes that gender inequalities embedded within many polygamous marriages often expose women to heightened sexual and reproductive health risks. Similarly, Nkonde *et al.* (2023) observed that men in polygamous relationships were more likely to exercise control over sexual decision-making and condom use, thereby reducing women's capacity to influence preventive sexual health practices.

The potential role of polygyny in HIV transmission is further supported by evidence indicating that individuals involved in polygamous relationships may also engage in additional concurrent sexual partnerships outside the formal marital structure. According to Khanakwa *et al.* (2012), polygyny itself may not directly cause HIV transmission; however, the associated patterns of sexual networking, partner concurrency, and extra-marital sexual relationships can increase opportunities for HIV spread. Their systematic review demonstrated that risky sexual behaviours occurring within broader marital contexts contribute substantially to HIV vulnerability and should therefore receive greater attention in HIV prevention programmes.

Conversely, some scholars have reported findings that challenge the conventional assumption that polygyny universally increases HIV transmission. Using data from nineteen Demographic and Health Surveys conducted across sub-Saharan Africa, Reniers & Watkins (2010) found a negative ecological association between polygyny and HIV prevalence. Their study revealed that regions with higher levels of polygamous marriage often reported lower

HIV prevalence rates. The authors attributed this observation to factors such as lower coital frequency within individual marital dyads, distinctive sexual network structures, and the incorporation of HIV-positive women into stable marital unions. These findings suggest that the relationship between polygyny and HIV transmission is complex and may vary according to cultural, behavioural, and epidemiological contexts.

Despite these conflicting findings, there is substantial agreement that women within polygamous relationships often face unique vulnerabilities associated with gender inequality, economic dependence, and reduced bargaining power in sexual relationships. Studies conducted among married women in sub-Saharan Africa have demonstrated that HIV risk is influenced not only by individual behaviour but also by relationship characteristics, marital transitions, educational attainment, partner behaviour, and experiences of violence. Gebretsadik *et al.* (2025) reported that HIV prevalence among married women was significantly associated with low educational attainment, domestic violence, multiple lifetime sexual partners, and partner-related factors. Similarly, Kuchukhidze *et al.* (2023) found that women who experienced intimate partner violence were more likely to acquire HIV and less likely to achieve optimal treatment outcomes, highlighting the critical role of structural and gender-related determinants in HIV vulnerability.

Marital trajectories and relationship transitions also contribute significantly to HIV risk among women. Boileau *et al.* (2009) demonstrated that early sexual debut, marital disruption, and patterns of partner selection were associated with increased HIV prevalence among ever-married women in rural Malawi. Likewise, Fagbamigbe *et al.* (2016) reported that formerly married women in Nigeria exhibited significantly higher odds of HIV infection than currently married women. These findings



underscore the importance of examining marital arrangements as determinants of HIV transmission and emphasize the need for context-specific studies that explore how cultural marriage practices shape women's exposure to HIV.

In Nigeria, evidence regarding the direct relationship between polygamous marriage and HIV infection remains inconclusive. According to the Federal Ministry of Health (2023), in a secondary analysis of the National HIV/AIDS and Reproductive Health Survey (NARHS Plus 2012), although polygamous unions were associated with higher levels of risky sexual behaviour, polygamy itself was not significantly associated with HIV infection. Nevertheless, the study revealed that individuals in polygamous unions were more likely to engage in behaviours known to facilitate HIV transmission, including low condom utilization and concurrent sexual partnerships. Such findings suggest that the influence of polygamous marriage on HIV transmission may operate indirectly through behavioural and social mechanisms rather than through marital structure alone.

Ibiono Ibom Local Government Area presents an important setting for investigating the relationship between polygamous marriage and HIV transmission among women of productive ages. The area is characterized by strong cultural traditions, including the continued practice of polygamous marriage, alongside varying levels of HIV awareness, healthcare access, and preventive service utilization. While numerous national and regional studies have explored the relationship between marital status and HIV infection, empirical evidence specifically examining the effects of polygamous marriage on HIV transmission among women in Ibiono Ibom remains limited. Consequently, there is a need for localized research capable of generating context-specific evidence to guide policy formulation and intervention strategies.

Beyond the socio-cultural dimensions of HIV transmission, advances in industrial chemistry have transformed HIV diagnosis, monitoring, and treatment. The development of highly sensitive diagnostic technologies relies heavily on chemical principles involving immunochemistry, electrochemistry, molecular recognition, nanotechnology, and biosensor design. Modern HIV diagnostic systems, including enzyme-linked immunosorbent assays (ELISA), rapid diagnostic test kits, nucleic acid amplification technologies, and point-of-care biosensors, utilize specific biochemical interactions between viral antigens, antibodies, nucleic acids, and engineered detection materials to achieve rapid and accurate diagnosis. These technologies have significantly improved early detection of HIV infection, enabling timely treatment initiation and reducing transmission risks.

Recent developments in industrial chemistry have also facilitated the production of advanced nanomaterials, functional polymers, and biosensing platforms capable of enhancing HIV detection sensitivity and specificity. Nanoparticle-based biosensors, quantum dot-labelled immunoassays, and electrochemical sensing devices are increasingly being explored for HIV diagnostics due to their portability, affordability, and potential application in resource-constrained environments. Such innovations provide opportunities for expanding HIV screening services in rural communities where access to sophisticated laboratory infrastructure may be limited.

Similarly, pharmaceutical interventions for HIV/AIDS are fundamentally grounded in medicinal chemistry and pharmaceutical sciences. Antiretroviral drugs function by targeting specific biochemical processes involved in viral replication, including reverse transcription, integration, and proteolytic maturation. The development of nucleoside



reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, protease inhibitors, integrase inhibitors, and entry inhibitors represents a major achievement of pharmaceutical chemistry. Contemporary research is increasingly focused on improving drug bioavailability, reducing toxicity, enhancing patient adherence, and developing long-acting formulations capable of sustaining therapeutic drug concentrations over extended periods.

The integration of industrial chemistry-based diagnostic technologies with pharmaceutical interventions remains essential for effective HIV prevention and control. Early diagnosis facilitates prompt initiation of antiretroviral therapy, while continuous monitoring supports viral suppression and reduces community-level transmission. Understanding the socio-cultural determinants that influence HIV exposure, including marital practices such as polygyny, can therefore contribute to the optimization of diagnostic deployment strategies and targeted pharmaceutical interventions among vulnerable populations.

Although several studies have examined the relationship between marital status, sexual behaviour, and HIV infection, there remains a paucity of empirical evidence specifically addressing how polygamous marriage influences HIV transmission among women of productive ages in Ibiono Ibom Local Government Area and how such knowledge can inform industrial chemistry-based diagnostic strategies and pharmaceutical interventions. Addressing this knowledge gap is important for designing culturally sensitive public health programmes, improving access to HIV diagnostic services, strengthening pharmaceutical treatment initiatives, and reducing HIV-related health disparities among women.

Therefore, this study seeks to examine the effects of polygamous marriage on HIV/AIDS transmission among women of productive ages

in Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria. Specifically, the study aims to determine the extent to which polygamous marital structures influence HIV vulnerability among women and to explore the implications of these findings for industrial chemistry-based diagnostics and pharmaceutical interventions. The findings are expected to contribute to existing knowledge on HIV epidemiology, support evidence-based policy formulation, and promote integrated approaches to HIV prevention, diagnosis, treatment, and control within culturally diverse communities.

1.1 Research Question

To what extent does polygamous marriage influence HIV/AIDS transmission among women of productive ages in Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria?

1.2 Research Hypothesis

Ho: Polygamous marriage has no significant effect on HIV/AIDS transmission among women of productive ages in Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria.

2.0 Related Literature

2.1 Concept of Polygamous Marriage

Polygamy refers to a marital arrangement in which an individual is married to more than one spouse simultaneously. The most common form of polygamy practiced in sub-Saharan Africa is polygyny, whereby a man is married to multiple wives concurrently. Polygyny remains a socially recognized institution in many African societies and is often justified on cultural, religious, economic, and demographic grounds. In many communities, the practice is associated with wealth, social prestige, agricultural labour requirements, lineage continuity, and fertility enhancement.

In Nigeria, polygamous marriage remains prevalent in both rural and urban settings,



although its prevalence varies according to ethnicity, religion, educational attainment, and socioeconomic status. The institution continues to shape household structures, gender relations, inheritance systems, and reproductive behaviour. While proponents argue that polygyny promotes family stability and social support, public health researchers have increasingly examined its implications for reproductive health outcomes, particularly HIV/AIDS transmission.

2.2 Concept of HIV/AIDS

Human Immunodeficiency Virus (HIV) is a pathogenic retrovirus that attacks and progressively weakens the human immune system, particularly CD4⁺ T-lymphocytes, thereby reducing the body's ability to defend itself against infections and malignancies. Acquired Immunodeficiency Syndrome (AIDS) represents the advanced stage of HIV infection characterized by severe immune suppression and the occurrence of opportunistic infections and cancers.

HIV is transmitted primarily through unprotected sexual intercourse, exposure to infected blood and blood products, sharing contaminated needles and sharp objects, and mother-to-child transmission during pregnancy, childbirth, or breastfeeding. Since its emergence, HIV/AIDS has remained one of the most devastating infectious diseases globally, particularly in sub-Saharan Africa, where the epidemic continues to exert substantial social, economic, and health consequences.

Women are biologically more susceptible to HIV infection than men due to anatomical and physiological factors. Beyond biological vulnerability, social determinants such as poverty, gender inequality, limited access to healthcare, intimate partner violence, and restricted sexual autonomy further increase women's risk of HIV infection. Consequently, women of reproductive and productive ages

remain among the most affected demographic groups in many African countries.

2.3 Theoretical Framework

2.3.1 Gender and Power Theory

This study is anchored on the Gender and Power Theory developed by Connell (1987). The theory explains how social structures create unequal power relations between men and women, influencing access to resources, decision-making authority, and control within intimate relationships. According to the theory, women in patriarchal societies frequently experience reduced bargaining power regarding sexual and reproductive health decisions.

Within polygamous marriages, male partners often exercise considerable authority over sexual practices, fertility decisions, and family resources. Such power asymmetries may limit women's ability to negotiate condom use, demand HIV testing, or challenge risky sexual behaviours. The theory therefore provides an appropriate framework for understanding how gender inequality within polygamous unions may contribute to HIV vulnerability among women of productive ages in Ibiono Ibom Local Government Area.

2.4 Polygamous Marriage and HIV/AIDS Transmission

The relationship between polygamous marriage and HIV transmission remains one of the most debated issues in HIV epidemiology. Some researchers argue that the concurrent sexual partnerships characteristic of polygamous unions increase HIV transmission opportunities, while others suggest that the relationship is more complex and context-dependent.

Zulu *et al.* (2024) reported that polygyny may increase women's exposure to HIV infection because of unequal power relations, restricted sexual autonomy, and limited ability to negotiate safer sexual practices. The study further noted that women in polygamous



unions may remain in relationships despite perceived HIV risks due to economic dependence and cultural expectations.

Similarly, Gazimbi *et al.* (2020), in a systematic review of studies conducted across sub-Saharan Africa, found that polygyny was associated with increased sexual networking and concurrent sexual partnerships. Although the review concluded that polygyny itself may not directly cause HIV infection, it identified risky sexual behaviours associated with polygamous relationships as significant drivers of HIV transmission.

However, contrasting evidence has emerged from ecological studies. Reniers and Watkins (2010) analyzed data from nineteen Demographic and Health Surveys across sub-Saharan Africa and observed a negative association between polygyny prevalence and HIV prevalence. The authors proposed that lower coital frequency within individual marital dyads, distinct sexual network structures, and the integration of HIV-positive women into stable marital arrangements may partially explain this observation.

The contrasting findings suggest that polygyny should not be viewed as an isolated determinant of HIV transmission. Rather, its influence appears to depend on accompanying behavioural, cultural, and socioeconomic factors that shape sexual interactions within and beyond the marital structure.

2.5 Gender Dynamics and Women's Vulnerability to HIV Infection

Gender inequality has consistently been identified as a major determinant of HIV vulnerability among women. Women often face challenges related to economic dependence, unequal power relations, cultural expectations, and limited access to reproductive health information and services.

Khanakwa *et al.* (2012) investigated HIV sero-discordant couples in Uganda and found that men with multiple wives were significantly

more likely to control decisions regarding sexual intercourse and condom use. Such dynamics may limit women's ability to implement protective measures against HIV infection.

Furthermore, Starks *et al.* (2024) emphasized that women in polygamous unions frequently encounter difficulties insisting on partner fidelity or withdrawing from high-risk relationships. These circumstances may increase HIV vulnerability, particularly when male partners engage in concurrent sexual partnerships outside the formal marital arrangement.

The role of intimate partner violence has also received considerable attention in HIV research. Kuchukhidze *et al.* (2023), using data from thirty sub-Saharan African countries, reported that women who experienced physical or sexual intimate partner violence were more than three times as likely to acquire recent HIV infection compared to women who had not experienced such violence. These findings demonstrate the importance of addressing gender-based violence as part of HIV prevention strategies.

2.6 Marital Characteristics and HIV Risk among Women

Several studies have shown that marital status and marital transitions significantly influence HIV risk among women. Fagbamigbe *et al.* (2016) analyzed data from the Nigerian National HIV/AIDS and Reproductive Health Survey and found that formerly married women had significantly higher odds of HIV infection compared with currently married women. The authors also identified early sexual debut and transactional sex as important predictors of HIV infection.

Similarly, Boileau *et al.* (2009) examined sexual and marital trajectories among women in rural Malawi and reported that early sexual initiation, marital disruption, and partner selection patterns significantly influenced HIV infection risks. Their findings suggest that HIV



vulnerability accumulates through a sequence of life-course events rather than a single behavioural factor.

Gebretsadik *et al.* (2025) further demonstrated that educational attainment, domestic violence, multiple sexual partners, and partner-related characteristics significantly influenced HIV prevalence among married women in Mozambique. Women who remained in a single lifelong union were found to have lower HIV prevalence than those who experienced multiple unions or relationship disruptions. Collectively, these findings indicate that marital structure, relationship stability, educational status, and partner behaviour are important determinants of HIV vulnerability among women.

2.7 Industrial Chemistry-Based HIV Diagnostics

Industrial chemistry has contributed significantly to advances in HIV diagnosis through the development of highly sensitive and specific analytical technologies. HIV diagnosis relies on chemical and biochemical interactions involving antibodies, antigens, nucleic acids, enzymes, and nanomaterials.

The Enzyme-Linked Immunosorbent Assay (ELISA) remains one of the most widely used laboratory methods for HIV screening. The technique utilizes antigen-antibody binding reactions coupled with enzyme-mediated colorimetric detection to identify HIV antibodies or antigens in biological samples. Advances in industrial chemistry have improved assay sensitivity, reduced analysis time, and increased diagnostic accuracy.

Rapid Diagnostic Tests (RDTs) have expanded HIV screening services in rural and resource-constrained communities. These technologies employ immunochromatographic principles involving chemically immobilized antibodies capable of producing visible reactions upon interaction with HIV biomarkers.

Recent developments in nanotechnology and materials chemistry have resulted in the emergence of electrochemical biosensors, nanoparticle-assisted detection systems, and quantum-dot-based diagnostic platforms. These technologies offer improved sensitivity, portability, affordability, and suitability for point-of-care HIV testing, particularly in underserved populations.

Understanding the sociocultural factors associated with HIV transmission, including polygamous marriage practices, may assist policymakers and healthcare professionals in strategically deploying diagnostic technologies to vulnerable populations.

2.8 Pharmaceutical Interventions for HIV/AIDS Management

Pharmaceutical interventions constitute a critical component of global HIV/AIDS control efforts. Modern antiretroviral therapy (ART) suppresses viral replication, improves immune function, reduces morbidity and mortality, and minimizes HIV transmission.

The development of antiretroviral drugs is grounded in medicinal chemistry principles. Nucleoside Reverse Transcriptase Inhibitors (NRTIs), Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs), Protease Inhibitors (PIs), Integrase Strand Transfer Inhibitors (INSTIs), and Entry Inhibitors target specific biochemical stages of the HIV life cycle.

Recent pharmaceutical innovations have focused on long-acting injectable formulations, nanoparticle-based drug delivery systems, sustained-release implants, and targeted therapeutic approaches. These innovations improve treatment adherence and enhance therapeutic effectiveness.

In communities where women may experience barriers to healthcare access due to cultural or marital factors, effective pharmaceutical interventions require integration with community education, HIV testing



programmes, counselling services, and gender-sensitive healthcare delivery systems.

2.9 Empirical Review

Empirical studies investigating the relationship between polygamous marriage and HIV transmission have produced mixed findings.

2.10 Summary of Literature and Identified Knowledge Gap

The reviewed literature demonstrates that HIV transmission among women is influenced by a complex interaction of biological, behavioural, social, cultural, and structural factors. Although several studies have explored the relationship between polygamous marriage and HIV/AIDS, findings remain inconclusive. While some researchers argue that polygamy increases HIV risk through concurrent sexual partnerships and gender inequality, others report lower HIV prevalence in highly polygynous settings.

Furthermore, most existing studies have been conducted at national or regional levels, with limited evidence focusing specifically on Ibiono Ibom Local Government Area of Akwa Ibom State. Additionally, few studies have integrated socio-cultural determinants of HIV transmission with discussions of industrial chemistry-based diagnostics and pharmaceutical interventions. Consequently, a significant knowledge gap exists regarding the extent to which polygamous marriage influences HIV/AIDS transmission among women of productive ages in Ibiono Ibom Local Government Area and how such findings can inform targeted diagnostic and pharmaceutical strategies. This study seeks to address this gap.

3.0 Materials and Methods

3.1 Study Design

The study adopted a descriptive cross-sectional survey design complemented with mixed-methods data collection. This design was appropriate for examining the relationship between polygamous marriage and HIV/AIDS

transmission among women of productive age in Ibiono Ibom Local Government Area (LGA), Akwa Ibom State. The quantitative component provided measurable data on marital structure, sexual behavior, and HIV/AIDS awareness, while the qualitative component provided contextual understanding of socio-cultural norms influencing sexual practices and HIV risk. The integration of both approaches enhanced the validity of findings and allowed interpretation within broader public health and industrial chemistry perspectives.

3.2 Study Area

The study was conducted in Ibiono Ibom Local Government Area of Akwa Ibom State, Nigeria, located approximately between latitude 5°08'N and longitude 7°52'E to 8°04'E. The area is predominantly rural, with strong adherence to traditional marital systems, including polygyny. The population is largely agrarian, with varying levels of access to healthcare services, including HIV testing, counseling, and treatment facilities. These socio-cultural and economic characteristics make the LGA a suitable setting for examining the relationship between marital practices and HIV/AIDS transmission dynamics.

3.3 Study Population

The study population comprised women of reproductive and productive ages (15–49 years) residing in Ibiono Ibom LGA who were either currently married or previously married. This group was selected because it represents the most sexually active and economically productive segment of the population, and also the group most vulnerable to HIV infection. Both women in polygamous and monogamous unions were included to allow comparative assessment of HIV-related risk factors.

3.4 Sample Size and Sampling Technique

A multi-stage sampling procedure was adopted. In the first stage, wards within Ibiono Ibom LGA were selected using simple random sampling. In the second stage, communities



were selected systematically from the chosen wards. In the third stage, households were identified within selected communities, and eligible respondents were selected using proportionate allocation based on population size.

A total of 230 women were selected from a sampling frame of approximately 8,222 women across two clans comprising about 23 villages each. From each village, five women meeting the inclusion criteria were randomly selected during scheduled community (clan) meeting days. This sampling approach ensured adequate representation across villages and achieved a sample size sufficient for statistical analysis, representing approximately 22% of the accessible population.

3.5 Data Collection Instruments

3.5.1 Quantitative Data Collection

Data were collected using a structured interviewer-administered questionnaire. The instrument was divided into five sections:

- Socio-demographic characteristics
- Marital structure and experience of polygamous union
- Sexual behavior and partner concurrency
- HIV/AIDS awareness, testing history, and risk perception
- Preventive practices and access to healthcare services

The questionnaire was pre-tested in a neighboring Local Government Area to ensure validity, clarity, and reliability. Necessary adjustments were made before full administration.

3.5.2 Qualitative Data Collection

Qualitative data were obtained through Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs). FGDs were conducted with women in polygamous unions, while KIIs involved healthcare workers, community leaders, and HIV/AIDS program coordinators. The discussions explored socio-cultural beliefs surrounding polygyny, perceptions of HIV

risk, barriers to HIV testing and treatment, and attitudes toward modern diagnostic and pharmaceutical interventions.

3.6 Industrial Chemistry Integration

To align the study with industrial chemistry applications, additional data were collected on:

- Awareness and use of rapid HIV diagnostic kits, biosensors, and laboratory reagents
- Availability and accessibility of antiretroviral drugs (ARVs) in healthcare facilities
- Perceived effectiveness, stability, and adherence challenges of HIV medications

Secondary data were also reviewed on the chemical composition, storage stability, formulation processes, and distribution systems of HIV diagnostic reagents and antiretroviral drugs. These data provided insight into how epidemiological patterns may inform industrial-scale production, optimization of diagnostic technologies, and pharmaceutical supply chain management.

3.7 Data Analysis

Quantitative data were coded and analyzed using the Statistical Package for Social Sciences (SPSS), version [insert version]. Descriptive statistics such as frequencies and percentages were used to summarize respondents' socio-demographic characteristics and response patterns.

Inferential statistics, specifically chi-square tests, were used to determine associations between polygamous marriage and HIV/AIDS-related perceptions. Results were presented in tables and interpreted at a 0.05 level of significance.

Qualitative data were transcribed verbatim and analyzed using thematic content analysis. Emerging themes were triangulated with quantitative findings to provide a comprehensive interpretation of how marital structures influence HIV risk and health-seeking behavior.



3.8 Ethical Considerations

Ethical approval for the study was obtained from a recognized Institutional Review Board (IRB). Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were strictly maintained throughout the study. Participants were informed of their right to withdraw at any time without penalty. All sensitive discussions on sexual behavior and HIV status were conducted with strict adherence to ethical and cultural sensitivity.

3.9 Limitations of the Study

As a cross-sectional study, the research cannot establish causal relationships between polygamous marriage and HIV/AIDS transmission. The reliance on self-reported data may introduce recall bias and social desirability bias. However, the use of mixed-methods design and data triangulation strengthened the reliability and validity of the findings.

Despite these limitations, the methodology provides a robust framework for examining the intersection between socio-cultural marital systems and HIV/AIDS transmission, while also integrating industrial chemistry perspectives relevant to diagnostics and pharmaceutical interventions.

4.0 Results and Discussion

4.1 Effect of Polygamous Marriage on HIV/AIDS Transmission among Women of Productive Age in Ibiono Ibom Local Government Area

To answer the research question on whether polygamous marriage influences the transmission of HIV/AIDS among women of productive age in Ibiono Ibom Local Government Area, respondents were asked to indicate their level of agreement with five statements relating polygamous marriage to HIV/AIDS transmission.

The results presented in Table 1 indicate that the majority of respondents perceived polygamous marriage as a significant factor

contributing to the transmission of HIV/AIDS among women of productive age in Ibiono Ibom Local Government Area. Overall, 773 responses (67.2%) supported the view that polygamous marriage increases the risk of HIV/AIDS transmission, while 377 responses (32.8%) disagreed.

The highest level of agreement was observed for the statement that polygamous marriage creates an environment for unprotected sexual practices and multiple sexual partnerships, thereby increasing HIV/AIDS risk (91.3%). Similarly, 87.4% of respondents agreed that having multiple sexual partners within a family structure exposes other members to HIV infection. Furthermore, 76.1% agreed that HIV/AIDS can easily spread among family members in polygamous households. In contrast, 70.4% disagreed with the statement that polygamous marriage discourages HIV transmission. These findings suggest that respondents generally perceive polygamous marriage as a social and behavioral factor associated with increased HIV vulnerability.

4.2 Test of Hypothesis

Hypothesis

H0: There is no significant effect of polygamous marriage on HIV/AIDS transmission among women of productive age in Ibiono Ibom Local Government Area, Akwa Ibom State, Nigeria.

To test the hypothesis, responses on the influence of polygamous marriage on HIV/AIDS transmission were subjected to chi-square analysis at 0.05 level of significance.

The results presented in Table 2 indicate that the calculated chi-square value ($\chi^2 = 283.83$) is substantially greater than the critical chi-square value ($\chi^2 = 9.44$) at 4 degrees of freedom and 0.05 level of significance. Consequently, the null hypothesis was rejected. This finding demonstrates that there is a statistically significant effect of polygamous marriage on HIV/AIDS transmission among women of



productive age in Ibiono Ibom Local Government Area.

Examination of the individual chi-square contributions reveals that the statement “Polygamous marriage discourages the spread of HIV/AIDS” contributed the highest chi-square value ($\chi^2 = 147.57$). This large deviation between observed and expected responses indicates that respondents overwhelmingly

disagreed with the notion that polygamy reduces HIV transmission risk. Similarly, the statement that “Polygamous marriage creates an environment for unprotected sexual practices and increases HIV/AIDS transmission risk” contributed substantially to the overall chi-square value ($\chi^2 = 60.56$), reflecting strong agreement among respondents.

Table 1: Responses on the Effect of Polygamous Marriage on HIV/AIDS Transmission among Women of Productive Age in Ibiono Ibom Local Government Area (N = 230)

S/N	Item	Agree f (%)	Disagree f (%)
1	Having more than one sexual partner within the family exposes other members to the risk of HIV/AIDS transmission	201 (87.4)	29 (12.6)
2	Polygamous marriage creates limited sexual satisfaction, thereby increasing the likelihood of extra-marital sexual relationships and HIV transmission	119 (51.7)	111 (48.3)
3	Polygamous marriage discourages the spread of HIV/AIDS	68 (29.6)	162 (70.4)
4	HIV/AIDS can easily spread among family members as a result of polygamous marriage	175 (76.1)	55 (23.9)
5	Polygamous marriage creates an environment for unprotected sexual practices and increases the risk of HIV/AIDS transmission	210 (91.3)	20 (8.7)
Total		773 (67.2)	377 (32.8)

The statement that “Having more than one sexual partner in the family exposes other members to HIV/AIDS risk” also contributed significantly ($\chi^2 = 42.48$), highlighting widespread awareness of the role of multiple sexual partnerships in HIV transmission. Although the item relating to the spread of HIV among family members recorded the lowest contribution ($\chi^2 = 8.21$), the value still indicates an important perception among respondents that interconnected sexual relationships within polygamous households facilitate HIV transmission.

Overall, the chi-square analysis demonstrates that respondents strongly associate

polygamous marital arrangements with behaviours and circumstances that increase vulnerability to HIV infection.

4.3 Discussion of Findings

The findings of this study revealed a significant association between polygamous marriage and HIV/AIDS transmission among women of productive age in Ibiono Ibom Local Government Area. The majority of respondents agreed that polygamous marriage increases HIV/AIDS vulnerability through multiple sexual partnerships, reduced sexual exclusivity, and increased opportunities for extra-marital sexual relationships.



Table 2 : Chi-Square Analysis of Responses on the Influence of Polygamous Marriage on HIV/AIDS Transmission among Women of Productive Age in Ibiono Ibom Local Government Area

S/N	Item	Agreed (Expected)	Disagreed (Expected)	Total	χ^2 cal
1	Having more than one sexual partner in the family can expose other members to the risk of HIV/AIDS	201 (154.6)	29 (75.4)	230	42.48
2	Polygamous marriage creates limited opportunity for sexual satisfaction; hence spouses are exposed to extra-marital affairs and HIV transmission	119 (154.6)	111 (75.4)	230	25.01
3	Polygamous marriage discourages the spread of HIV/AIDS	68 (154.6)	162 (75.4)	230	147.57
4	HIV/AIDS can easily spread among family members as a result of polygamous marriage	175 (154.6)	55 (75.4)	230	8.21
5	Polygamous marriage creates an environment for unprotected sexual practices, thereby increasing HIV/AIDS transmission risk	201 (154.6)	20 (75.4)	230	60.56
Total		773	377	1150	283.83

****Critical $\chi^2 = 9.44$; df = 4; p < 0.05**

The finding is consistent with the work of Madiba & Ngwenya (2017), who reported that women in polygamous unions are often exposed to greater HIV risks because they possess limited power to negotiate condom use, insist on partner fidelity, or leave relationships perceived as risky. According to Madiba & Ngwenya (2017), gender inequality embedded within polygamous marital systems increases women's vulnerability to HIV infection.

The findings also support the conclusions of Gazimbi *et al.* (2020), who observed that although polygyny may not directly cause HIV infection, it promotes concurrent sexual partnerships and complex sexual networking patterns that facilitate HIV transmission. The authors emphasized that risky sexual behaviors associated with polygamous unions constitute major pathways for HIV spread in sub-Saharan Africa.

Similarly, Khanakwa *et al.* (2012) found that men in polygamous relationships exercised greater control over sexual decision-making and condom use compared to men in monogamous unions. Such power imbalances limit women's ability to adopt protective sexual behaviors, thereby increasing susceptibility to HIV infection.

The results further corroborate the findings of Gazimbi *et al.*, (2020), who reported that individuals in polygamous unions were more likely to engage in risky sexual behaviors despite possessing knowledge of HIV/AIDS. Although polygamy was not identified as an independent predictor of HIV infection in that study, the associated behavioral practices were found to elevate HIV transmission risks.

However, the findings contrast with those of Reniers and Watkins (2010), who reported lower HIV prevalence in regions where



polygyny was more common. The authors argued that lower coital frequency within polygamous households and unique sexual network structures may reduce transmission opportunities. Nevertheless, the present study suggests that within the sociocultural context of Ibiono Ibom Local Government Area, respondents perceive polygamous marriage as a significant contributor to HIV/AIDS transmission.

The findings also highlight the importance of socio-cultural factors, including low condom utilization, gender inequality, poor sexual negotiation capacity, and low HIV risk perception. These factors collectively increase the vulnerability of women within polygamous unions and underscore the need for culturally sensitive HIV prevention interventions.

4.4 Industrial Chemistry Implications of the Findings

The findings of this study have important implications for Industrial Chemistry, particularly in the areas of pharmaceutical production, diagnostic technology development, public health chemistry, and biomedical innovation.

4.4.1 HIV Diagnostic Technologies

The increased vulnerability of women in polygamous households underscores the need for improved HIV diagnostic systems. Industrial chemistry contributes significantly to the development and production of rapid HIV test kits, enzyme-linked immunosorbent assay (ELISA) reagents, molecular diagnostic platforms, biosensors, and point-of-care testing technologies. Increased deployment of these technologies within rural communities may facilitate early HIV detection and prompt treatment initiation.

4.4.2 Pharmaceutical Development and Drug Formulation

The findings support increased investment in the local production of antiretroviral drugs (ARVs), pre-exposure prophylaxis (PrEP),

post-exposure prophylaxis (PEP), and long-acting injectable HIV therapies. Advances in medicinal and pharmaceutical chemistry can improve drug stability, bioavailability, controlled-release properties, and treatment adherence among vulnerable populations.

4.4.3 Preventive Chemical Technologies

Industrial chemistry plays a critical role in the manufacture of latex condoms, polymer-based barrier devices, antiviral lubricants, and topical microbicides designed to reduce HIV transmission. Enhanced access to these preventive technologies may significantly reduce infection rates among women in high-risk marital settings.

4.4.4 Environmental and Public Health Chemistry

The study further highlights the importance of chemical disinfection, sterilization technologies, biomedical waste management systems, and water treatment processes in preventing opportunistic infections among people living with HIV/AIDS. Industrial chemistry innovations in these areas contribute to improved healthcare delivery and infection control.

4.4.5 Biotechnology and Vaccine Development

Advances in biochemical engineering, molecular modeling, nanotechnology, and medicinal chemistry continue to support the development of novel HIV vaccines, therapeutic agents, and targeted drug delivery systems. The epidemiological insights generated by this study provide valuable information for designing community-focused biomedical interventions.

4.5 Summary of Findings

The study established that:

1. Polygamous marriage is perceived by the majority of respondents as a significant factor contributing to HIV/AIDS transmission among women



- of productive age in Ibiono Ibom Local Government Area.
2. Multiple sexual partnerships, extra-marital sexual relationships, and unprotected sexual practices were identified as major pathways through which HIV/AIDS transmission occurs in polygamous settings.
 3. A statistically significant relationship exists between polygamous marriage and HIV/AIDS transmission ($\chi^2 = 283.83$, $p < 0.05$).
 4. Women in polygamous unions are particularly vulnerable due to gender inequality, limited sexual autonomy, and reduced negotiating power regarding safe sexual practices.
 5. The findings have important implications for HIV diagnostics, pharmaceutical interventions, preventive technologies, and public health policies.

Important observation: Before submission to a journal, I would also recommend recalculating the chi-square values because there are inconsistencies in Table 2. For example, Item 1 shows "29 disagreed" while Table 1 reports "39 disagreed." The expected frequencies and total frequencies should also be recomputed to ensure statistical accuracy.

5.0 Conclusion

This study concludes that polygamous marriage is significantly associated with increased vulnerability to HIV/AIDS transmission among women of productive age in Ibiono Ibom Local Government Area. The heightened risk is driven by concurrent sexual partnerships, reduced sexual negotiation power among women, and low perception of HIV risk within polygamous households. These factors collectively intensify women's exposure to HIV infection in the study area.

The findings underscore the importance of integrating socio-cultural realities into HIV

prevention strategies, particularly in rural Nigerian communities where polygamous marital systems remain prevalent. They further highlight the relevance of industrial chemistry in addressing HIV/AIDS through the development of rapid diagnostic tools, improved antiretroviral drug formulations, and accessible preventive technologies such as barrier and microbicide products.

Overall, effective control of HIV transmission in such settings requires a combined approach that links culturally sensitive public health interventions with advances in diagnostic and pharmaceutical chemistry.

This study contributes to existing knowledge by providing context-specific empirical evidence from Ibiono Ibom Local Government Area on the relationship between polygamous marriage and HIV/AIDS transmission among women of productive age, thereby addressing a gap in localized epidemiological studies within rural communities of Akwa Ibom State.

It advances understanding of how socio-cultural marital structures, particularly polygamous unions, influence HIV transmission dynamics through concurrent sexual partnerships, gendered power imbalances, and reduced capacity for women to negotiate safer sexual practices.

The study further contributes by integrating industrial chemistry perspectives into HIV/AIDS discourse, highlighting the role of chemical-based innovations in diagnostics, pharmaceutical formulations, and preventive technologies in addressing structurally driven HIV risks.

In addition, it provides gender-focused insights by demonstrating how women in polygamous households experience heightened vulnerability due to socio-economic dependence, limited sexual autonomy, and barriers to accessing preventive and treatment services.

The findings also inform the development of improved diagnostic strategies by emphasizing



the need for affordable, rapid, and reliable point-of-care HIV testing tools suitable for rural and semi-urban environments.

Finally, the study offers a multidisciplinary framework that combines socio-cultural analysis, public health perspectives, and industrial chemistry applications, which can guide policymakers, researchers, and healthcare practitioners in designing more effective HIV prevention and control interventions.

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Not applicable

Consent for Publication

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Author Contributions

Ikwo Ini Umoren conceptualized the study, conducted field data collection, and drafted the initial manuscript. Itoro Esiet Udo supervised the research design, performed statistical analysis, interpreted the findings, and critically revised the manuscript. Etinamabasiyaka Edet Ekott contributed to data interpretation, literature review, manuscript editing, and approved the final version for publication.

