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Contraceptive failure prediction framework: A veritable tool for reducing incidence of unintended pregnancies among HIV-positive women

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Racheal T. Oguntade[1], Akebe LK. Abia[2], Modupe O. Ogunrombi[3] and Elizabeth B. Ojewole[1]*

Discipline of Pharmaceutical Sciences, College of Health Sciences, University of KwaZulu-Natal, Durban, South Africa[1]; Antimicrobial Research Unit, College of Health Sciences, University of KwaZulu-Natal, Durban, South Africa[2]; Department of Clinical Pharmacology and Therapeutics, School of Medicine, Sefako Makgatho Health Sciences University, Ga-rankuwa, South Africa[3].

***For Correspondence**: Email: *218088004@stu.ukzn.ac.za ; rachealoguntade1088@gmail.com*

Abstract

Contraceptive failure remains a global public health challenge among HIV positive women. Therefore, this study aimed to propose a contraceptive failure prediction framework based on the findings from HIV-positive women of reproductive age in South Africa and the perception of their healthcare providers**.** A mixed-methods approach was utilized, with participants purposively selected based on their knowledge and experiences. Qualitative data gathered from two focus group discussions (FGDs) involving seven (n = 7) healthcare workers (HCWs) and in-depth interviews involving ten (n = 10) HIV-positive women as well as quantitative data comprising a cohort of one hundred and seventy-three (n = 173) HIV-positive women who participated in the South African National HIV Prevalence, Incidence, Behavior Survey (SABSSM) were used to identify contraceptive failure determinants. Participant demographic information was analyzed using descriptive statistics, while inferential analysis was done using multiple regression statistics. The qualitative data were thematically analyzed. Healthcare workers' (HCWs') support, knowledge of contraceptive use, access to preferred contraceptives, and income collectively predicted contraceptive failure. These findings facilitated the development of a Contraceptive Failure Prediction Framework (CFPF), interpreted here as a determinants framework. *(Afr J Reprod Health 2026; 30 [11]: 20-27).*

Keywords: Contraceptive failure; HIV-positive women; South Africa; Contraceptive Failure Prediction Framework (CFPF).

Résumé

L'échec contraceptif reste un défi de santé publique mondial parmi les femmes séropositives. Par conséquent, cette étude visait à proposer un cadre de prédiction de l'échec contraceptif basé sur les résultats des femmes séropositives en âge de procréer en Afrique du Sud et la perception de leurs prestataires de soins de santé. Une approche mixte a été utilisée, avec des participants sélectionnés de manière ciblée en fonction de leurs connaissances et expériences. Les données qualitatives recueillies lors de deux discussions de groupe focalisées (DGF) impliquant sept (n = 7) travailleurs de la santé (TS) et des entretiens approfondis impliquant dix (n = 10) femmes séropositives, ainsi que des données quantitatives comprenant une cohorte de cent soixante-treize (n = 173) femmes séropositives ayant participé à l'Enquête nationale sud-africaine sur la prévalence, l'incidence et les comportements liés au VIH (SABSSM), ont été utilisées pour identifier les déterminants de l'échec contraceptif. Les informations démographiques des participantes ont été analysées à l'aide de statistiques descriptives, tandis que l'analyse inférentielle a été réalisée à l'aide de statistiques de régression multiple. Les données qualitatives ont été analysées thématiquement. Le soutien des travailleurs de la santé (TDS), la connaissance de l'utilisation des contraceptifs, l'accès aux contraceptifs préférés et le revenu prédisaient collectivement l'échec contraceptif. Ces résultats ont facilité le développement d'un Cadre de Prédiction de l'Échec Contraceptif (CFPF), interprété ici comme un cadre de déterminants.
(Afr J Reprod Health 2026; 30 [11]: 20-27).

Mots-clés: Échec contraceptif ; Femmes séropositives ; Afrique du Sud ; Cadre de Prédiction de l'Échec Contraceptif (CFPF).

Introduction

Contraceptive use is a vital tool for family planning, allowing individuals and couples to make informed decisions about childbearing and the spacing of pregnancies.[1] Effective contraception not only provides numerous benefits but also serves as an essential strategy for family planning.[2] Certain methods, such as dual contraception, which combines the use of condoms with hormonal methods, play a significant role in reducing the risks of both sexual transmission and vertical transmission of HIV, while also preventing unintended pregnancies.[3,4] Moreover, contraception is a cost-effective alternative compared to many programs aimed at preventing mother-to-child transmission of HIV.[5]

However, the prevalence of contraceptive failure among HIV-positive women—particularly in sub-Saharan Africa—poses a significant public health challenge.[6,7] Recent data from UNAIDS indicates that women of reproductive age (15 to 49 years) living with HIV represent 61% of the overall population of people living with HIV in Eastern and Southern Africa.[8] Despite a relatively high rate of contraceptive use, approximately 64.6%, many HIV-positive women still report experiencing unwanted pregnancies while using contraceptive methods.[9-11]

In South Africa, a variety of contraceptive options, including oral contraceptives, injectable progestogens, sub-dermal implants, intra-uterine devices (IUDs), and condoms, are available free of charge at public facilities.[12,13] Nonetheless, evidence suggests that a considerable number of HIV-positive women utilizing these methods still face unintended pregnancies.[6,1]

The rate of contraceptive failure resulting in unwanted pregnancies is notably higher among HIV-positive women than in their HIV-negative counterparts.[15] A study conducted in South Africa revealed that half of the pregnancies among HIV-positive women were unintended, compared to one in three among HIV-negative women.[16] This high rate raises concerns about the increased risk of unsafe abortions, mother-to-child transmission, and a growing number of pediatric HIV-positive orphans, along with heightened maternal morbidity and mortality.[17] These findings highlight the urgent need for improved contraceptive interventions tailored to HIV-positive women in comparison to those without HIV.

To address this issue, developing a framework to predict contraceptive failure could serve as an effective means to design and implement interventions aimed at reducing unintended pregnancies and their associated consequences. This study seeks to identify the factors influencing contraceptive failure, specifically focusing on unintended pregnancies and the practices that contribute to this challenge. The research questions guiding this study include: What factors influence contraceptive failures among HIV-positive women of reproductive age, and what are their experiences with contraception? How do healthcare professionals perceive contraceptive use among HIV-positive women who report pregnancies while using contraceptives? What model can be developed to incorporate clinical, behavioral, and sociodemographic variables to identify the key determinants of contraceptive failures among HIV-positive women, thereby serving as a tool to predict future occurrences of contraceptive failures?

Methods

A mixed methods research design was adopted to gather and analyze qualitative and quantitative data from three major sources and triangulate the findings.

Qualitative data was gathered from two focus group discussions (FGDs) involving seven (n=7) Healthcare workers (HCWs) who were providing reproductive health services to HIV-positive women in two healthcare facilities in the Gauteng province, South Africa. Qualitative data was also gathered from in-depth interviews involving ten (n=10) HIV-positive women of reproductive age (15 to 49 years),[18] who were using a contraceptive method and had previous experiences of unintended pregnancies while using contraceptives. The participants were purposively selected based on their knowledge and experiences. A semi-structured interview guide was used to gather relevant data that provided insight into the experiences of HIV-positive women regarding their choice of contraceptives and factors that may impact

contraceptive failures. Voice recorders were used to capture every detail of each interview session. Quantitative data was extracted from the South African National HIV Prevalence, Incidence, and Behaviour Survey (SABSSM) 2012 dataset. A sample of 173 responses from HIV-positive women of reproductive age were used to identify contraceptive failure determinants among the cohort.[19]

Ethical approval

Approval to conduct this study was obtained from the Biomedical Research Ethics Committee (BREC) of the University of KwaZulu-Natal – Reference number (BREC/00003621/2021). Authorization to use the SABSSM dataset was obtained from the Human Sciences and Research Council (HSRC).

Data analysis

Qualitative data were transcribed, anonymized and thematically analyzed. Two rounds of coding identified relevant patterns and connections, resulting in twenty sub-themes. Informed consent was obtained from all participants.

For quantitative analysis, the IBM SPSS Statistical Software Package, Version 22, was used. Descriptive statistics (i.e., frequencies and percentages) were used to analyze participants' sociodemographic information. Regression statistics were explored for inferential analysis, focusing on identifying factors associated with contraceptive failures in the cohort.

Results

Qualitative analysis

Factors and experiences

Thematic analysis revealed factors impacting contraceptive failures among this cohort. Women reported experiences like missed contraceptive doses (e.g., forgetting pills or shots) as expressed by some respondents:

"…so sometimes I'll forget to take my pill." [Participant 5, In-depth Interview,38yrs] " I failed myself. Because I was supposed to go back for a shot. I did not go back. I went back after maybe three weeks, and I was already pregnant..." [Participant 2, In-depth Interviews, 40yrs]

"I was confused... Like you know, I actually lost faith in contraceptives because it was like so what's the point of all this? You take this thing you know for so many years. Just one day of not taking it, you know. I was like, these things are useless somehow."[Participant5, In-depth Interview,38yrs]

Other influencing factors included accessibility of preferred contraceptive choices and affordability:

"Sometimes when you go, they have only for three months. Sometimes when you go, they say the three months is finished. You take for two months. So, it depends." [Participant 1, In-depth Interview, 31yrs]

"Yes. You are working, it's affordable. But when you're not working, it becomes a problem" [Participant 2, In-depth Interview, 40yrs]

The HCWs perceived major concerns regarding education on contraceptives and patient compliance. They complained that patients do not want to listen to education on family planning, preferring quick service:

"Patients don't want to listen to education on family planning. They want to come in and leave in two minutes." [Health Care Worker, Focus Group Discussion 1]

"Yet, family planning services require details and quality time is involved. Some of them come during their lunch hour or free time and they say 'sister, I don't need your test or advice, just give me the injection." [Health Care Worker, Focus Group Discussion 1]

The HCWs often gave *"limited information" due to "pressure around work", which might have hindered patient understanding and compliance:*

"I don't think it's comprehensive enough not to say that we don't know what to do, but because of the pressure around our work, so you find that you give a limited information and as a result, patients do not comply and do not understand what's

happening." [Health Care Worker, Focus Group Discussion 1]

The HCWs further asserted that non-compliance and non-adherence were major challenges created specifically by the patients' attitude towards contraceptive use:

"The major challenge we are having is patients – they don't adhere. They don't come to the clinic. They just stay away." [Health Care Worker, Focus Group Discussion 1]

"The patient must be responsible for her decision" [Health Care Worker, Focus Group Discussion 1]
"The main problem with contraceptives lies with the patients and not the drugs we are using" [Health Care Worker, Focus Group Discussion 1]

Follow-ups by the HCWs were hampered by patients relocating and the fact that the clinics were hectic and short-staffed, thereby limiting time for patient education on myths and misconceptions of contraceptive use:

"Some relocate most of the time, and when they get to their homes, they don't use the service there because they prefer to come to this side and continue the service. That is why they experience pregnancy, which is unplanned." [Health Care Worker, Focus Group Discussion 1]

"sometimes the clinics are hectic, very hectic. You'll find that the person who's doing family planning is doing ARVs and acute at the same time. When somebody's coming into the clinic then you have to educate them, you know, you have to tell them about the side effects. You need to make them understand their bodies and hormones. [Health Care Worker, Focus Group Discussion 1]

Quantitative analysis

Table 1 presents the sociodemographic characteristics of the 173 HIV-positive women extracted from the dataset. Most participants (90.8%) were between the ages of 20-39 years. Monthly income was generally low, with 46.2% not stating their income. Multiple regression analysis, presented in Table 2, shows that the independent the contraceptive ffailure determinants identified from

Table 1: Demographic characteristics of participants

Variables	Frequency	Percent (%)
SEX:		
Female	173	100
Age (in Years)		
15-19	2	1.16
20-24	27	15.6
25-29	45	26.01
30-34	54	31.21
35-39	31	17.92
40-44	11	6.36
45-49	3	1.76
Province:		
Western Cape	9	5.2
Eastern Cape	19	11.0
Northern Cape	9	5.2
Free State	10	5.8
KwaZulu Natal	32	18.5
North-West	27	15.6
Gauteng	19	11.0
Mpumalanga	19	11.0
Limpopo	29	16.8
Monthly Income in Rand:		
Below 1000	55	31.8
Above 1000	35	20.2
Above 5000	3	1.7
Nil	80	46.2
Using contraceptives	173	100

variables (HCWs' support, knowledge, access, and income) jointly demonstrate a strong influence on contraceptive failure. A unit increase in the HCWs' support reduces contraceptive failure by 0.203 units ($\beta = -0.203$, $p = 0.008$). Knowledge of contraceptive use, the HCWs' support, and monthly income were significant independent influencers of contraceptive failure, with p values of 0.000, 0.008, and 0.000, respectively.

However, access to preferred methods was not found to be a significant independent factor for failure ($p = 0.314$). The result further shows 91.3% of the variance ($R^2 = 0.913$), with an F-statistic of 421.155 ($p = 0.000$). Multicollinearity is not a concern, as indicated by VIFs below 2. The findings highlight the importance of HCWs' support and contraceptive knowledge in preventing failure. A Contraceptive Failure Prediction Framework (CFPF), shown in Figure 1, was developed using both qualitative and quantitative findings.

Table 2: Multiple regression statistics showing joint and independent predictions of contraceptive failure

Variable	β	SE	t	p-value	95% CI for β	VIF	Tolerance
HCWs Support	**-0.203**	**0.075**	**-2.700**	**0.008**	**[-0.351, -0.055]**	**1.5**	**0.667**
Knowledge of Contraceptives	**0.874**	**0.050**	**17.562**	**0.000**	**[0.776, 0.972]**	**1.2**	**0.833**
Access to Preferred Methods	**-0.068**	**0.067**	**-1.010**	**0.314**	**[-0.200, 0.064]**	**1.7**	**0.588**
Income	**0.304**	**0.061**	**4.984**	**0.000**	**[0.184, 0.424]**	**1.3**	**0.769**

- F-statistic: 421.155
- R: 0.955 ; R^2: 0.913
- p-value for F: 0.000

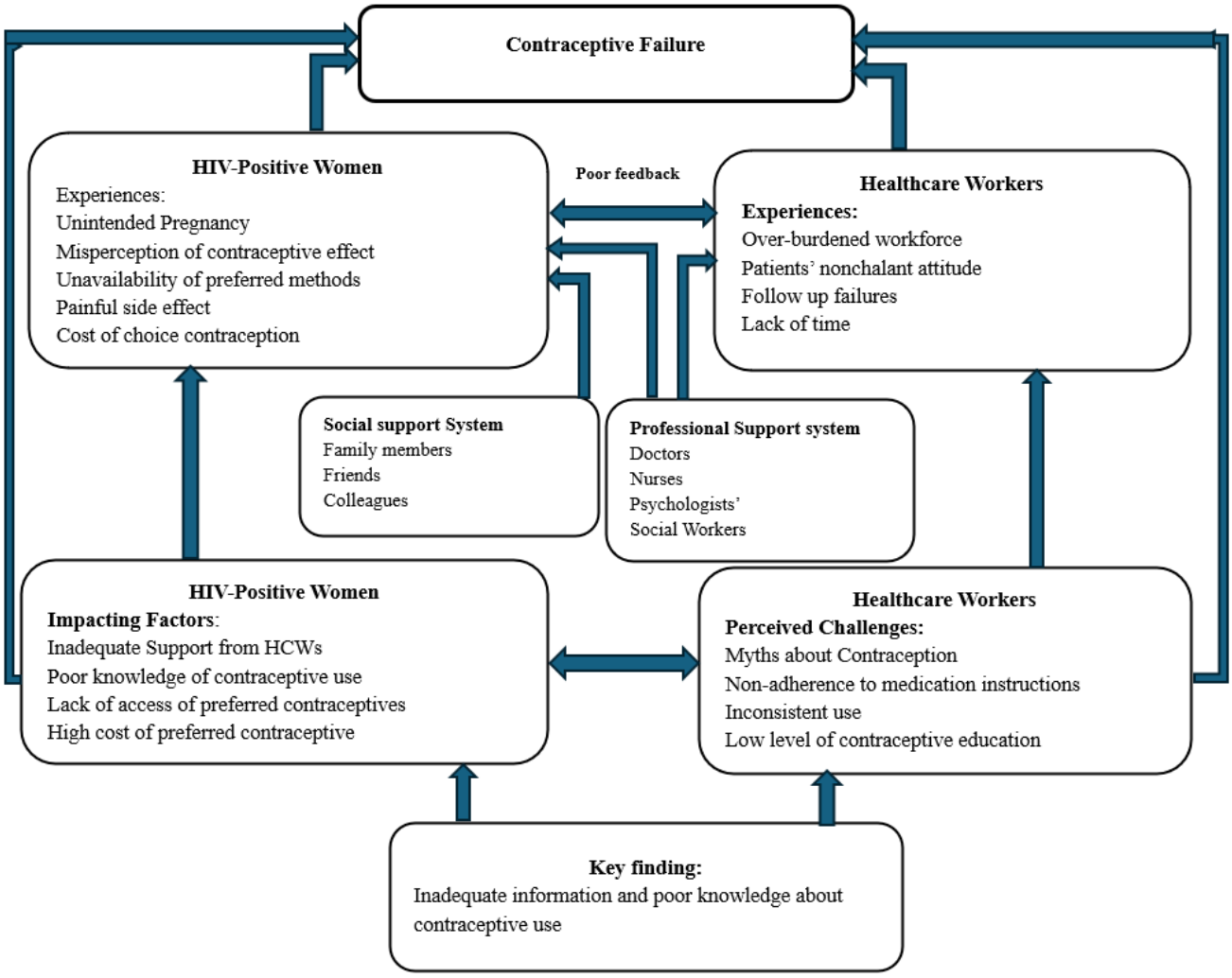

Figure 1: Contraceptive failure prediction framework (CFPF

A Contraceptive Failure Prediction Framework (CFPF), shown in Figure 1, was developed using the contraceptive failure determinants identified from both qualitative and quantitative findings. Triangulation of findings from multiple sources helps to strengthen or consolidate research findings.[20']

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Discussion

The Contraceptive Failure Prediction Framework (CFPF) is developed through the triangulation of qualitative and quantitative findings, implying that inferences are drawn from multiple data sources, thereby consolidating research findings.[20,21] The CFPF explains how Impacting Factors, Perceived Challenges, and Experiences of both HIV-positive women and the HCWs contribute to contraceptive failure.

A key finding from this study reveals that inadequate information and poor knowledge about contraceptive use form the basis of contraceptive failure. Contraceptive education, including emergency contraception, is crucial in making efficient sexual and reproductive health decisions.[22] Sufficient knowledge of a contraceptive method was found to be a key factor that determined contraceptive use.[7]

The support from the HCWs was found to be pivotal in impacting contraceptive failure among HIV-positive women. The framework incorporates challenges faced by the HCWs, such as an overburdened workforce, lack of time, and follow-up failures. The absence of adequate support from the HCWs leads to low uptake and failures of contraceptives.[23]

Furthermore, monthly income was found to be a significant independent factor associated with contraceptive failure. The quantitative analysis revealed that access was not statistically significant ($p = 0.314$). However, the framework incorporates accessibility challenges, as qualitative findings highlighted a lack of access to choice contraceptives and cost as major factors contributing to failure. This is in resonance with previous studies that have shown that cost is a barrier to contraceptive uptake by both users and non-users.[24-26] The negative value for HCWs' support ($\beta = -0.203$) suggests that less support is associated with higher contraceptive failure, which is expected and supported by the qualitative findings. Alternatively, confounding factors could influence both the HCWs' support and contraceptive failure, such as limited resources or time at healthcare facilities, also confirmed from qualitative findings. Reverse causality is another possibility, where contraceptive failure may lead to perceived lower support from the HCWs.[23,27]

The major challenges perceived by the HCWs contributing to failure include non-adherence to medication instructions, inconsistent use, and myths about contraception. Previous studies found that rumours, myths, and misperceptions were reported as barriers against reproductive health practices in South Africa. [28,29] Research has also shown that misperceptions about the contraceptive effect are associated with low uptake and failure.[30,31]

The CFPF identifies professional support (Doctors, Nurses, etc.) and social support (family, friends/colleagues) as important networks. Social support from family members is recognized as important to reproductive health decisions for both HIV-positive and HIV-negative populations.[32] However, the high incidence of contraceptive failure in the study population suggests that these support systems might have been weak and ineffective.

A major strength of the CFPF is that it incorporates the perspectives of the major stakeholders (i.e., the HCWs, HIV-positive women) in contraceptive use and provides a comprehensive and context-specific understanding of the major factors that are contributing to contraceptive failure among HIV-positive women in South Africa.

Conclusion

This study affirmed that contraceptive failure is driven by a complex interplay of factors, including inadequate support from the HCWs, poor knowledge, non-adherence, and socio-economic challenges. The CFPF is premised on the empirical argument that reducing contraceptive failure requires the HCWs to provide adequate contraceptive education and follow-up support, while HIV-positive women must seek sufficient knowledge and strictly adhere to instructions. The CFPF could serve as an effective planning tool to reduce the incidence of contraceptive failure.

Limitation

Future studies intended to validate the CFPF should involve a larger sample size across all provinces for both qualitative and qualitative data. This would help to improve the outcome and generalizability of the findings.

Author contributions

RO, EO, and MO conceptualized the work. RO wrote the manuscript draft. EO, MO, and ALK supervised the draft's write-up and final editing. All authors approved the final edition of the manuscript for submission.

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Conflict of interest

All authors declare that there are no conflicts of interest in this work.

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