Mental Health Effects on Breastfeeding practices among women living with HIV who started antiretroviral therapy in pregnancy in Cape Town, South Africa

By

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Submitted to the University of Cape Town in partial fulfilment of the requirements for the degree of **Master of Public Health** (Epidemiology and Biostatistics)

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(13 February 2023)

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Preamble

Declaration

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Abstract

Background

Mental illness as a determinant of non-adherence to breastfeeding recommendations among women living with Human Immunodeficiency Virus (HIV) remains an understudied phenomenon in low- and middle-income countries like South Africa. Our aim was to investigate the relationship between postpartum women living with HIV experiencing mental illness and adherence to breastfeeding practices as per the World Health Organization standards in Cape Town, South Africa.

Methods

A secondary analysis was performed on data from 411 women living with HIV (WLHIV) who initiated ART in pregnancy. The women had participated in the 2016 – 2018 Postpartum Adherence Clubs for Antiretroviral Therapy (PACART) trial, which compared viral suppression up to 24 months postpartum in women randomized to two different models of HIV care delivery.

All 411 women were examined for the incidence of breastfeeding initiation and its association with postnatal depression using a bivariate analysis and a log-binomial regression. We also examined factors associated with breastfeeding duration and compared this duration in women at high risk of depression and those who were at low risk, using the cox proportion hazard model, Kaplan-Meier curves and the log rank test. Breastfeeding practices were assessed through an administered questionnaire and the Edinburgh postnatal depression scale had been used to identify the risk of depression. All women in the PACART trial were eligible for our study .

Results

A large proportion of mothers were breastfeeding within 72 hours postpartum, and this was similar among those with an increased risk of postnatal depression (n=99; 96.1%) and those with a decreased risk of postnatal depression (n=300; 97.4%). No significant factors were found that were associated with breastfeeding. Breastfeeding duration was similar in women at high risk of postnatal depression (91 days; interquartile range [IQR] 30 – 180) and those at low risk of postnatal depression (90 days; IQR 1 – 180), and this was not statistically significant (p-value = 0.69). Furthermore, we found no factors associated with breastfeeding duration.

Conclusion

We found no association between risk of postnatal depression and breastfeeding among women living with HIV initiating ART in pregnancy. Though breastfeeding initiation was at an optimal level, the duration was short indicating non-adherence to WHO standards. More effort needs to be made to address breastfeeding non-adherence.

Acknowledgements

This work would have not been possible without my faith in God as through prayer and perseverance he has been my strength to carry on in difficult times when this journey became hard. I would also like to thank my mother as without her financial support and encouragement this would have also not been possible.

I would like to further extend my gratitude to my supervisor Jasantha Odayar for guiding me through this process of completing my dissertation. Thank you for assisting me in navigating my way through this process, in contextualizing my research and ensuring that I analysed my data appropriately. You have played a pivotal role in the completion of this dissertation and I am grateful.

Last but not least I would like to thank my dearest friend Naomi Chitsa. Thank you for the constant words of encouragement, for the company during some late nights while I was writing.

List of Abbreviations

ART	Antiretroviral therapy
EBF	Exclusive Breastfeeding
EPDS	Edinburgh Postnatal Depression Scale
HIC	High-Income Countries
HIV	Human Immunodeficiency Virus
LMIC	Low- and middle- income countries
PLWHIV	People living with HIV
WHO	World Health Organization
WLHIV	Women living with HIV
MSPSS	Multidimensional Scale for perceived Social support

Thesis Organisation

This thesis is divided into three sections:

Part A contains the research protocol which contains the background, study rationale, study overview, research design, methodology and ethical considerations.

Part B contains the findings which have been presented in the format of the targeted journal *Women's Health Issues* (Appendix C).

Part C contains all the supplementary documents which are relevant to the study as appendices. These supplementary materials include the breastfeeding practices questionnaire and EPDS questionnaire, ethics clearance certificate to conduct the study, the ethics clearance for parent study, and the *Women's Health Issues* journal submission guidelines.

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Part A: Protocol

Mental Health Effects on Breastfeeding practices among women living with HIV who started antiretroviral therapy in pregnancy in Cape Town, South Africa

Introduction

South Africa's HIV epidemic

South Africa is facing the largest burden of Human Immunodeficiency Virus (HIV) in the world (Satoh & Boyer, 2019). Currently the overall prevalence rate in the population is estimated at 13.7% which accounts for 8.4 million people. This has increased from the year 2012, where a national representative population-based household survey estimated 6.4 million people living with HIV (PLWHIV), accounting for 12.2% of the population (Mabaso, Makola, Mlangeni, Jooste, & Simbayi, 2019).

The HIV epidemic In South Africa disproportionally affects women, with women being twice as likely to be infected as men (Karim & Baxter, 2019). Many of these women are in the prime of their lives between the ages of 15 – 24 and are at the beginning of their reproductive years. This has contributed to the high prevalence of HIV among pregnant women. The Antenatal HIV Sentinel Survey (ANCHSS) in South Africa which is conducted biennially to monitor trends among women attending antenatal clinics, surveyed 37 116 pregnant women from 1 589 public health facilities in 2019. Of these pregnant women, 11 321 (30%) were found to be HIV positive. Though this was a 0.7% decrease from the previous survey in 2017, the prevalence of HIV among pregnant women remains high.

The implications of having HIV and experiencing pregnancy can be emotionally taxing, as both events impact quality of life. Pregnant WLHIV must quickly transition to a lifetime commitment of constantly planning to meet the physical needs of their baby, and for some women this is coupled with adapting to a lifetime commitment to ART treatment upon learning of their status during pregnancy (Malhotra, et al., 2015). A systematic review of 12 studies among women living with HIV in Brazil and the United States of America (USA) found that when women are diagnosed with HIV they experience shock, limited social support, hope and loneliness. In addition, they experience psychological distress as they must deal with the pregnancy, the positive diagnosis, fear of vertical transmission of HIV to the baby, taking ART, stigma and the need to disclose their status to their significant others (Mdiba, 2021). These emotions can be exacerbated during the postpartum period when they are recovering from delivery and having to take care of the infant day and night (Hodgson, et al., 2014).

WLHIV have thus been found to be vulnerable to depressive and anxiety disorders during pregnancy and in the postpartum period (Ngocho, et al., 2019). A systematic review of studies conducted among pregnant African WLHIV indicated that the prevalence of antenatal depression ranged between 23% and 44%, which was more than double the estimated rates in the general population of pregnant women (Ngocho, et al., 2019). Antenatal depression and anxiety are associated with various HIV-related maternal outcomes which also affect the child. For instance, women with antenatal depression and anxiety have increased risks of not adhering to treatment and breastfeeding practices that are essential for the child's development (Ngocho, et al., 2019). The implications of these are faster disease progression which can lead to an AIDS -related death for the women and poor health outcomes for the childhood development (Ngocho, et al., 2019).

Breastfeeding practices

Current guidelines recommend that WLHIV exclusively breastfeed in the first six months, with the introduction of complementary foods from six months while continuing to breastfeed for up to 24 months, irrespective of HIV status (West, Schwartz, Yende, Schwartz, & Parmley, 2019). Since then, estimates of exclusive breastfeeding (EBF) rates among WLHIV range from 26% – 99%, however the duration of EBF was brief at 1 – 3 months and in some instances weaning occurred as early as 2 months (Chakona, 2020 & Vitalis, Vilar-Compte, Nyhan, & Perez-Escamilla, 2021). Non-adherence to breastfeeding practices is an ongoing challenge for women particularly among those living with HIV in South Africa, despite evidence-based guidelines and policy support (Thomas, et al., 2017). In a recent large observational study of 4172 mothers or caregivers of 14 week-old infants in Kwa-Zulu Natal, results showed that 54% of WLHIV practiced EBF and this group was also most likely not to ever attempt to breastfeed compared to women who are not HIV (Remmert, Mosery , Goodman, Bangsberg , & Smit, 2020). These results were similar to those of a cohort study conducted among 8116 women attending postnatal care at Witkoppen Health and Welfare center, where WLHIV were less likely to EBF or initiate breastfeeding. Furthermore, the proportion of mothers who reported exclusively breastfeeding also decreased over time from 83.3% at day 7 to 73.1% at week 12 and 51.7% at six months (West, Schwartz, Yende, Schwartz, & Parmley, 2019). A community-based cluster randomized trial (Promise EBF) promoting EBF in three South African sites (Paarl, Umlazi and Rietvlei) indicated that 40% of WLHIV completely discontinued breastfeeding at 12 weeks postpartum compared to 20% of HIV-negative women (Doherty, et al., 2012). These results clearly highlight a problem of non-adherence to existing WHO guidelines particularly when it comes to duration of breastfeeding, as there is a paucity of studies that document breastfeeding until 24 months.

Implications of non-adherence to breastfeeding guidelines

The process of breastfeeding offers numerous health benefits to infants and mothers (Thomas, et al., 2017). Breast milk provides essential nutrients, immunological components and other bioactive substances for the growth and development of the infant. It also reduces the risk of malnutrition and diarrheal illnesses, which are among the leading causes of infant mortality in low and middle income countries, particularly among children under 5 (West, Schwartz, Yende, Schwartz, & Parmley, 2019). Moreover, mothers who breastfeed have reduced risk of developing chronic diseases such as ovarian and breast cancer, type 2 diabetes and hypertension (Vitalis, Witten , & Perez-Escamilla, 2022).

Currently, South Africa has a high coverage of antiretroviral therapy for pregnant and breastfeeding WLHIV, together with the infant and young child feeding policy which provides a suitable context for supporting breastfeeding. However, breastfeeding still remains a great challenge (Doherty , et al., 2019).

One of the greatest challenges pertaining to breastfeeding particularly among WLHIV is early breastfeeding cessation or non-initiation as documented previously. In the case of non-initiation, infants are therefore introduced to replacement feeding which leads to malnutrition, diarrhoea and respiratory illness, because of exposure to water that has been contaminated by enteric pathogens. Furthermore, they also fail to receive protective maternal antibodies and adequate nutritional value from the milk, making them vulnerable to illnesses (Mallampati, et al., 2018 & WHO, 1988). For instance, infants subjected to foods other than breastmilk have increased risk of infections and allergies; they may also experience lethargy, convulsions and brain damage. This is also coupled with long term effects such as the development of obesity, arteriosclerosis and hypertension in their later years (WHO, 1989).

Studies have also shown that in low-income countries, early cessation of breastfeeding has caused HIV exposed infants to succumb to high rates of morbidity and mortality. In Zambia, early breast feeding cessation was associated with higher diarrheal episodes for infants between 4 and 6 months and older children had more severe outcomes including diarrheal-related hospitalization or death (Fawzy, et al., 2011). Similarly in Malawi, the rates of gastroenteritis increased with cessation of breastfeeding at 6 months (Chaponda, Goon, & Hoque, 2017). The implications of non-adherence to breastfeeding practices is of major concern both for the infant and the mother.

Study Rationale

The number of women living with HIV (WLHIV) of child-bearing age is rapidly increasing globally. Approximately 1.49 million HIV-exposed infants are born annually, emphasizing the need for promoting and ensuring adequate breastfeeding practices for these infants (Kapetanovic, et al., 2014). As previously discussed, the current breastfeeding guidelines require WLHIV to breastfeed their infants for up to 24 months, however, current evidence has shown non-adherence to these guidelines and so there is a need to understand the barriers leading to non-adherence and non-initiation.

Current literature examining barriers to breastfeeding in low- and middle-income countries including South Africa have largely reported on barriers such as nulliparity, caesarean section, infant male gender, low birth weight, HIV infection, high viral load, low socio-economic status and large family size (Thomas, et al., 2017). Other studies also frequently described caregiver factors particularly around attitudes and knowledge (Kinshella, et al., 2021). However there are no studies that have examined mental illness as a barrier to breastfeeding among WLHIV (Thomas, et al., 2017).

Mental health related issues like depression are one of the many factors that have been found to potentially undermine effective delivery of ART based protocols for maternal and antenatal well-being (Kapetanovic, et al., 2014). Studies have found that women experiencing depression are less likely to breastfeed and to cease breastfeeding earlier. Furthermore anxiety has been found to be negatively associated with breastfeeding duration, initiation and exclusivity. However, these findings are from studies conducted in high income countries as low- and middle-income countries have understudied this phenomenon (Jiang, et al., 2022).

The prevalence of depression is a common issue among pregnant WLHIV in low-middle incomes (LMIC) such as South Africa. These women are generally exposed to risk factors for poor mental health such as traumatic events and HIV, thus they are prone to experience depression and anxiety (Thomas, et al., 2017). As a result, these women tend to not cope with effectively managing the disease alongside dealing with the changes brought about by pregnancy. One of the most important aspects that are negatively affected is breastfeeding practices (Thomas, et al., 2017).

Breastfeeding is a crucial aspect of an infant's development particularly in the early months after childbirth. It provides nutritional benefits for infants and reduces the risk of malnutrition and diarrheal illnesses (West, Schwartz, Yende, Schwartz, & Parmley, 2019). Not only is it beneficial for the infant but it is also beneficial for the mother as it can reduce the mother's risk of ovarian and breast cancer, type 2 diabetes and high blood pressure (CDC, 2022). However, despite these benefits, evidence based breastfeeding recommendations for WLHIV as stipulated by the WHO and continuous programs centred around promoting breastfeeding practices within prevention of mother to child transmission of HIV programs, the prevalence of breastfeeding in South Africa remain significantly low (Tuthill, et.al., 2016). For instance, a retrospective study

conducted in Kwa-Zulu Natal among WLHIV in their third trimester showed that prenatal depression was negatively associated with exclusive breastfeeding at 6-weeks postpartum. However, this study was only conducted on a small sample and had large confidence intervals which indicated a low precision regarding the study results. In addition, there is generally limited research about the relationship between mental health illness and breastfeeding practices during the perinatal period among pregnant WLHIV even though there is a vast amount of literature documenting high rates of mental illness among WLHIV (Tuthill, et.al., 2016).

Given the substantial evidence on the effects of breastfeeding in promoting maternal and infant health among pregnant WLHIV, assessing barriers to these practices like that of depression is of great interest in public health. This knowledge will aid in the improvement of existing interventions on infant and maternal HIV programs or the development of complementary programs to address mental health issues among pregnant WLHIV with the aim of promoting appropriate breastfeeding practices as stipulated by the WHO.

Therefore, this protocol aims to assess whether there is a relationship between pregnant WLHIV who are experiencing depression; and breastfeeding practices in Cape Town, South Africa.

Study Overview

Hypothesis

WLHIV with postnatal depression will be less likely to follow the WHO's breastfeeding guidelines compared to those without mental illness.

Study Objective

To examine the association between risk of postnatal depression and breastfeeding practices including duration of breastfeeding up to 24 months.

Specific Aims

1. To determine the incidence of breastfeeding initiation and its association with postnatal depression in WLHIV who started ART in pregnancy.
2. To describe the duration of any form of breastfeeding up to 24 months in WLHIV who started ART in pregnancy
3. To ccompare the duration of any form of breastfeeding up to 24 months in WLHIV who initiated ART during pregnancy with and without an increased risk of postnatal depression post-delivery
4. To determine factors associated with breastfeeding duration up to 24 months, including risk of postnatal depression, in WLHIV who started ART in pregnancy.

Research Design and Methodology

Study Design

This study will involve the analysis of secondary data from the Postpartum Adherence Clubs for Antiretroviral Therapy (PACART) trial. The trial compared maternal viral suppression up to 24 months postpartum among WLHIV, who were randomized to either receiving clinic-based care or care in adherence clubs for ART delivery postnatally.

Study Population

A total of 412 mother-infant pairs were enrolled and randomized. All 412 participants enrolled in the PACART RCT study will be eligible for inclusion in this analysis. This population comprised of consenting WLHIV seeking postnatal care at the Gugulethu Maternal Obstetrics Unit (GMOU). Mother-infant pairs were recruited at routine postnatal visits that usually occurred within 1 month of delivery.

The population in this informal settlement found in Cape Town is predominantly of low socioeconomic status with approximately half of its residents unemployed. The HIV prevalence among women in this population is 28%. The GMOU provides antenatal and prevention of mother to child transmission services to this population including ART initiation and follow-ups.

Inclusion Criteria for the PACART study

- Women 18 years or older
- Documented HIV infection with ART initiation during the preceding antenatal period
- within 70 days post-delivery.
- Viral suppression documented in pregnancy with the most recent viral load <400 copies/mL within the last 3 months

- Willingness to be randomized and return for study measurement visits
- Able and willing to attend service visits at either a local ART treatment center or the adherence club at Ikhwezi center.
- Able to provide informed consent for research

Exclusion criteria for the PACART study

- Intention to relocate out of Cape Town permanently during the study period
- Any medical, psychiatric or social condition which in the opinion of the investigators would affect the ability to consent and/or participate in the study including o refusal to take ART/antiretrovirals (ARVs)

  o denial of HIV status
- Loss of pregnancy/neonate at the time of eligibility determination

  Current co-morbidity requiring additional health care attention, including opportunistic infections such as tuberculosis (TB) disease or any chronic condition or other condition that is not controlled or stable

Data Collection methods

Interviews were conducted by trained interviewers at study visits held separate to routine care. Study visits were conducted at enrolment (within 70 days post-delivery) and 3, 6, 12, 18 and 24 months postpartum. Questionnaires were administered on maternal and infant demographics, medical history, feeding practices, mental illness, alcohol consumption, social support, and patient-provider relationship scale.

Variable Definitions

The dependent variable for the study is breastfeeding duration.

Breastfeeding practices were assessed using the infant feeding intentions/practices questionnaire where women were asked questions like "have you ever given breast milk to your baby?", "what are the reasons for stopping to breastfeed/not breastfeed your child?" ,"For how long did you breastfeed your child?" etc. (see Appendix A).

The independent variable was the risk of postnatal depression which was measured using the Edinburgh Postnatal Depression scale (EPDS). The EPDS is one of the most used screening tools to assess symptoms of perinatal depression and anxiety in high- and low-income countries (Shrestha, Pradhan, Tran , Gualano, & Fisher, 2016). It is also the most frequently validated instrument to screen for perinatal depression and has been further validated in 37 other languages (Smith-Nielson, Matthey, Lange, & Vaever, 2018). In the context of South Africa, the EPDS was validated against DSM-IV criteria for depression in postnatal women it identified 100% of major depression cases and 70.6% of minor depression cases, with a sensitivity of 80% and specificity of 76.6%. In Cape Town, the EPDS anxiety subscale (questions 3, 4, and 5) was validated against Mini-International Neuropsychiatric Interview criteria, correctly classifying 61% of pregnant women, with a sensitivity of 67%, and specificity of 59% (Abrahams, Schneider, Field & Honiman, 2019). The tool uses ten Likert-scale items to assess emotional experiences in the preceding 7 days with a maximum total score of 30 (Shrestha, Pradhan, Tran, Gualano, & Fisher, 2016). Participants with a score of ≥13 were categorized as having an increased risk of postnatal depression and those with a score of <13 were characterized as being at decreased risk of postnatal depression, the thresholds of characterization can also differ based on setting (Levis , Negeri , Sun , Benedetti, & Thombs , 2020).

Table: 1 The table below contains a description of all the variables that will be used in the study.

Variable	Description	Type
Age	In years	Discrete
Highest level of education	1=Primary School 2=High School 3=Post-Secondary	Categorical
Occupation	= Student/Working 2= Not studying or working	Binary
Economic status	1= Full-time employment 2= Part-time employment 3=Social grants/other	Categorical
Relationship status	1=Married/ living together 2=Not married, not living together	Binary
Previous Pregnancy	1=No 2= Yes	Binary
Dwelling type	1= Formal housing 2= Informal housing	Binary

Running water in household	1 = No 2= Yes	Binary
Parity	1= Primiparous 2=More than one	Binary
ART duration at enrolment in weeks	Between 0 - 50	Numerical
Lifelong ART use prior to ART initiation in last pregnancy	1= No 2= Yes	Binary
ART use in the last 7 days	1 = No 2 = Yes	Binary
Prior use of medication for prevention of vertical transmission to infant	1 = No 2 = Yes	Binary
One or more children diagnosed with HIV	1= No 2=Yes	Binary
Contraception use	1= No 2=Yes	Binary

Breastfeeding	1= No 2= Yes	Binary
Perceived availability of support	0 -28	Discrete
EPDS score	Less than 13 = low risk 13 and above = high risk	Binary
Infant on Prophylaxis (NVP or AZT)?	1= Yes 2= No	Binary
Infant weight at birth	3000 – 7000 kg	Discrete
Mother lives with baby	1= No 2=Yes	Binary
Mode of delivery	1= Normal vaginal Delivery 2= Caesarean section	Binary

Data analysis

All mothers will be included in the analysis. Data will be exported to Stata version 15 , where all analyses will be carried out (Stata Corporation, College Station, Texas).

Descriptive statistics will be performed and reported on each of the chosen variables in the form of means, standard deviations and interquartile range for numerical variables. Categorical variables will be reported in the form of frequencies and percentages.

The proportion of women who reported to be breastfeeding at the start of the study will be calculated and reported as percentage.

In order to determine any meaningful differences and relationships between the exposure and outcome variables, bivariate analysis using Wilcoxon rank-sum, mann whitney-U, t-tests chi-square and fishers exact statistical tests will be used and p-values reported. Furthermore, a log-binomial regression analysis will be used to determine factors associated with breastfeeding and to adjust for confounders. The following factors will be considered in our analysis as potential risk factors or confounders: age, highest level of education, ooccupation, economic status, relationship status, dwelling type, running water in household, parity, median ART duration at enrolment, lifelong ART use prior ART initiation in last pregnancy, ART use in last 7 days, prior use of medication for prevention of vertical transmission to infant, number of children diagnosed with HIV, Contraception use, breastfeeding, perceived availability of support, infant on Prophylaxis (NVP or AZT), infant weight, infant living with mother, nonspecific psychological distress and mode of delivery (see table 1). These factors were chosen based on existing literature that have found associations with breastfeeding.

The duration of breastfeeding will be based on the month that breastfeeding was stopped. Survival analysis using cox proportional hazard models (PH) will be used to determine

duration. The Kaplan-Meier survival curves will be used to derive the median durations and the Log-rank and Breslow tests will be used to assess the quality of the survival curves. The previously stated covariates will be used to fit this model. (table 1)

Data Management

Data received from the PACART study coordinator will be de-identified. Data for this study will be stored in a password protected universal serial bus (USB) which will only be accessible to the researcher.

Ethical considerations

The PACART study has been reviewed by the Human Subjects Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town (021 650 2717)

Informed consent for participants enrolled in PACART was conducted in the home language of the participants by trained interviewers. The consent process entailed informing the participants of the purpose of the study, the nature of randomization, study procedures throughout the postnatal period and the potential risks and benefits of participation in the study. Furthermore, the fact that participation was voluntary and that they could exit the study at any point in time was emphasized.

The study included participants experiencing psychological distress during the assessments and this was addressed by having trained interviewers who could recognise these signs and provide participants with referral resources and procedures if necessary. There was minimal biomedical risk related to participation since the ART medications used by the participants as well as the timing and frequency of medical monitoring were identical between the two groups.

For the purpose of this study ethics approval will be sought from Human Subjects Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town. Since we will be making use of secondary data from the PACART study, we will have no contact with participants. The data was also anonymised as participants were given identification numbers in the study documents to maintain confidentiality, therefore the researcher will have no means of identifying the participants.

References

Abrahams, Z., Schneider, M.M., Field, S., & Honikman, S. (2019). Validation of a brief mental health screening tool for pregnant women in a low-socio-economic setting. *BMC psychology* 7(77). Retrieved from https://bmcpsychology.biomedcentral.com/articles/10.1186/s40359-019-0355-3

Sharp, P. M. (2011). Origins of HIV and the AIDS Pandemic. *Cold Spring Harbour,* 1(1), 1-22. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3234451/pdf/cshperspectmed-HIV-a006841.pdf

Pandey, A., & Galvani, A. P. (2019). The global burden of HIV and prospects for control. *The Lancet, 6*, 809-811. Retrieved from https://www.thelancet.com/action/showPdf?pii=S2352-3018%2819%2930230-9

Satoh, S., & Boyer, E. (2019). HIV in South Africa. *The Lancet, 394*. Retrieved from https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(19)31634-4/fulltext

Mabaso, M., Makola, L., Mlangeni, L. L., Jooste, S., & Simbayi, L. (2019). HIV prevalence in South Africa through gender and racial lenses: results from the 2012 population-based national household survey. *International Journal for Equity in Health, 18*(167), 1-11. Retrieved from https://equityhealthj.biomedcentral.com/track/pdf/10.1186/s12939-019-1055-6.pdf

Karim, S. S., & Baxter, C. (2019). HIV incidence rates in adolescent girls and young wom–n in. *The Lancet, 7*, e1470 - e1471. Retrieved from

https://www.thelancet.com/action/showPdf?pii=S2214-109X%2819%2930404-

George, G., Cawood, C., Puren , A., Khanyile, D., Gerristen, A., Govender, K., . . . Glenshaw. (2020). Evaluating DREAMS HIV prevention interventions targeting adolescent girls and young women in high HIV prevalence districts in South Africa: protocol for a cro’ssectional study. *BMC Women's Health,* 7(20), 1-11. Retrieved from https://bmcwomenshealth.biomedcentral.com/track/pdf/10.1186/s12905-019-0875-2.pdf

Davey, D. J., & Linda-Gail, B. (2020). *South Africa isn't doing enough to provide HIV prevention treatment for mothers: why it needs to.* Retrieved from https://theconversation.com/south-africa-isnt-doing-enough-to-provide-hivprevention-treatment-for-mothers-why-it-needs-to-171409#:~:text=Over%20one%2Dthird%20of%20pregnant,transmission%20of%20HIV%20since%202015.

Turk, R., Sakar, T., & Erkaya, R. (2017). The effect of prega–ncy on happiness. *Procedia - Social and Behavioral Sciences*(237), 1247-1253. Retrieved from https://www.researchgate.net/publication/314719417_The_Effect_of_Pregnancy_on_Happiness

Malhotra, R., Mudgal, R., Dharmarha, S., Mehta, S., & Bhola, S. (2015). How happy are pregnant women?: A socio-demographic analysis. *Clinical Epidemiology and Global Health, 3*(3), 117-124. Retrieved from https://www.sciencedirect.com/science/article/pii/S2213398414000475

Lagadec, N., Sreinecker, M., Kapassi, A., Magnier, A. M., Chastang, J., & Robert, S. (2018).

Factors influencing the quality of life of pregnant women: a systematic review. *BMC Pregnancy and Childbirth, 45*5(18), 1-14. Retrieved from https://bmcpregnancychildbirth.biomedcentral.com/track/pdf/10.1186/s12884-018-2087-4.pdf

Hodgson, I., Plummer, L. M., Kanopka, S. N., Colvin , C. J., Jonas, E., & Albertini, J. (2014). A Systematic Review of Individual and Contextual Factors Affecting ART Initiation, Adherence, and Retention for HIV-Infected Pregnant and Postpartum Women. *Plos One, 9*(1), 1-14. Retrieved 2014, from https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0111421&type=printable

Ngocho, J. S., Watt, H. M., Minja, L., Knettel, B., Mmbaga, B. A., Williams, P. P., & Sorsdahl, K. (2019). Depression and anxiety among pregnant women living with HIV in Kilimanjaro region, Tanzania. *Plos One, 1*4(10), 1-15. Retrieved from https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0224515&type=printable

Mdiba, S. (2021). When Pregnancy Coincides with Positive Diagnosis of HIV:. *International Journal of Environmental Research and Public Health*(18), 1-14. Retrieved 2021, from file:///C:/Users/Kanyo/Downloads/ijerph-18-13006-v2%20(1).pdf

Thomas, E., Kuo, C., Cohen, S., Hoare, J., Koen, N., Barnett, W., . . . Stein, D. J. (2017). Mental health predictors of breastfeeding initiation and continuation among HIV infected and uninfected women in a South African birth cohort study. *Pubmed, 102*, 100-111. doi:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5802398/pdf/nihms897266.pdf

West, N. S., Schwartz, S. R., Yende, N., Schwartz, S. J., & Parmley, L. (2019). Infant feeding by South African mothers living with HIV: implications for future training of health care workers and the need for consistent counselling. *International Breastfeeding Journal, 14*(11), 1-7. Retrieved from https://internationalbreastfeedingjournal.biomedcentral.com/track/pdf/10.1186/s13006-019-0205-1.pdf

WHO. (1989). Physiological development of the infant and its implications for complementary feeding. *67*. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2491195/pdf/bullwho00065-0057.pdf

Kapetanovic, S., Dass-Brailsford, P., Nora, D., & Talisman, N. (2014). Mental Health of HIV-Seropositive Women During Pregnancy and Postpartum Period: A Comprehensive Literature Review. *AIDS Behaviour, 16*(6), 1152-1173. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4120872/pdf/nihms607127.pdf

CDC. (2022). *Breastfeeding Benefits Both Baby and Mom*. Retrieved from https://www.cdc.gov/nccdphp/dnpao/features/breastfeedingbenefits/index.html#:~:text=Breastfeeding%20can%20help%20protect%20babies,ear%20infections%20and%20stomach%20bugs.

Tuthill, E. L., Pellowski, J. A., Young, S. L., & Butler, L. M. (2016). Perinatal depression among HIV-infected women in Kwa-zulu-Natal South Africa-prenatal depression predicts lower rates of exclusive breastfeeding. *AIDS and Behaviour, 21*, 1691-1698. Retrieved from https://link.springer.com/article/10.1007/s10461-016-1557-9

Chakona, G. (2020). Social circumstances and cultural beliefs influence maternal nutrition, breastfeeding and child feeding practices in South Africa. *Nutrition Journal, 19*(7), https://nutritionj.biomedcentral.com/articles/10.1186/s12937-020-00566-4.

Vitalis, D., Vilar-Compte, M., Nyhan, K., & Perez-Escamilla. (2021). Breastfeeding inequities in South Africa: Can enforcement of the WHO Code help address them? – A systematic scoping review. *International Journal of Equity in Health, 20*(114).

Remmert, J. E., Mosery , N., Goodman, G., Bangsberg , D., & Smit, J. (2020). Breastfeeding Practices among women living with HIV in KwaZulu -Natal, South Africa: An Observations Study. *Gale Academic Onelife, 24*(2).

Vitalis, D., Witten , C., & Perez-Escamilla, R. (2022). *PLOS ONE, 17*(3), 1-12.

Mallampati, D., Maclean, R., Shapiro, R., Debis, F., Barbara, E., Freedberg, K., & Leroy, V. (2018). Optimal breastfeeding durations for HIV- exposed infants: The impact of maternal ART use, infant mortality and infact replacement feeding risk. *Journal of International AIDS society, 21*(4).

Doherty, T., Sanders, D., Jackson, D., Swanevelder, S., Lombard, C., Zembe, W., . . . Colvin, M. (2012). Early cesation of breastfeeding amongst women in South African: an area needing urgent attention to improve child health. *BMC*, 1-10.

Fawzy, A., Arpadi, S., Sinkala, M., Mwiwa, M., Thea, D., Adrovandi, G., & Kuhn, L. (2011). Early weaning increases Diarrhea morbidity and mortality among unin–ected children born to HIV - infected mothers in Zambia. *The Journal of infecctious Diseases, 203*(9), 1222-1230.

Chaponda, A., Goon, D., & Hoque, M. (2017). Infant feeding practices among HIV-positive mothers at Thembisa Hospital, South Africa. *African Journal of Primary Health Care and Family medicine, 9*(1), 1-6.

Ngbapai, J., Izudi, J., & Okoboi, S. (202). Cesation of breatfeeding and associated factors in the era of eliination of mother to child transmission of HIV at Ndejje health center, Uganda: a retrospective cohort study. *International Breastfeeding Journal, 15*(78), 1-11.

Doherty , T., Horwood, C., Haskins, L., Magasana, V., Goga, A., Feucht, U., . . . Dhansay, M. (2019). Breastfeeding advice for reality: Women's Perspectives on Primary care support in South Africa. *Maternal and Child nutrition, 16*, 1-10.

Kinshella, M.-L., Hiwa, T., Vilder, M., Nyondo-Mipando, A., Dube, Q., Godlfarb, D., & Kawaza, K. (2021). Barriers and facilitators for early and exclusive breastfeeding in heatlh facilities in Sub-Saharan Africa: A systematic review. *Global health Research and Policy, 21*(6).

Thomas, E., Kuo, C., Cohen, S., Haoare, J., Koen, N., Barnett, W., . . . Barnett, W. (2017). Mental health predictors of breeastfeeding initiation and continuation among HIV infected and uninfected women in South Africa. *PMC, 21*(6).

Jiang, Q., Zhang, E., Cohen , N., Ohtori, M., Zhu, S., Guo, Y., . . . Rozelle, S. (2022). Postnatal mental health, breastfeeding beliefs and breastfeeding practices in rural china. *International Breatfeeding Journa;, 17*(60), 1-9.

Hoffman, J., Cossie, Q., Ametaj, A., Kim, H., James, R., Stroud, R., . . . Gelaye, B. (2022). Construct Validity and factor structure of the Kessler-10 in South Africa. *BMC, 10*(177), 1-10.

Part B : Journal Manuscript

Mental Health Effects on Breastfeeding practices among women living with HIV who started antiretroviral therapy in pregnancy in Cape Town, South Africa

Targeted Journal: Women's health issues (See appendix C)

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Abstract

Background

Mental illness as a determinant of non-adherence to breastfeeding remains an understudied phenomenon in South Africa. Our aim was to investigate the relationship between risk of postnatal depression and adherence to breastfeeding practices in Cape Town, South Africa.

Methods

We conducted a secondary analysis on data from 411 WLHIV initiating ART in pregnancy from the 2016 – 2018 Postpartum Adherence Clubs for Antiretroviral Therapy trial (PACART). All 411 were eligible for our analysis. We examined the prevalence and factors associated with breastfeeding, including risk of postnatal depression, using a bivariate analysis and log-binomial regression. We also examined factors associated with breastfeeding

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duration and compared this duration in women at high and low risk of postnatal depression, using the cox proportion hazard model, Kaplan-Meier curves, and the log rank test. Risk of depression was assessed using the Edinburgh Postnatal Depression scale (EPDS) and questionnaires were administered to assess breastfeeding practices.

Results

A large proportion of mothers were breastfeeding within 72 hours postpartum (n=399; 97.4%), and this was similar among those with an increased risk of postnatal depression (n=99; 96.1%) and those with a decreased risk of postnatal depression (n=300; 97.4%). No significant factors were found that were associated with breastfeeding. Breastfeeding duration was similar in women with high risk of postnatal depression (91 days; interquartile range [IQR] 30 – 180) and those with low risk of postnatal depression (90 days; IQR 1 - 180), and this was not statistically significant (p-value = 0.69). Furthermore, we found no factors associated with breastfeeding duration.

Conclusion

We found no relationship between risk of postnatal depression and breastfeeding. Though breastfeeding initiation was at an optimal level, the duration was short. More efforts need to be made to address breastfeeding non-adherence.

Keywords: Mental illness, Breastfeeding non-adherence, ART in pregnancy

Background

Currently, South Africa is characterized as having the largest national Human Immunodeficiency Virus (HIV) epidemic globally with approximately 8 million people living with the disease (Johnson, et al., 2022). The epidemic disproportionately affects women, who account for over 60% of new infections (Karim & Baxter, 2019; & Palenee-Philips, et al., 2022). Women who are at the beginning of their reproductive years' experience the highest incidence, and high proportions of women conceive while living with the disease (Woldesenbet, et al., 2011).

Living with HIV and experiencing pregnancy can affect quality of life for women. Women need to quickly transition to constantly meeting the physical needs of their infants post-delivery (Malhotra, et al., 2015), and those who only learn of their status during pregnancy must also quickly adapt to a lifetime commitment to antiretroviral therapy (ART) (Watt, et al., 2018). Studies have shown that during pregnancy, women living with HIV can experience psychological distress, limited social support, loneliness, fear of vertical transmission of HIV to the baby, stigma, and the need to disclose their status to their significant others (Malhotra, et al., 2015, & Mdiba, 2021). Consequently, the risks of anxiety and depressive disorders are high and can be exacerbated in the postpartum period when women are recovering from delivery and faced with the daily needs of their infants (Ngocho, et al., 2019). Currently, women in South Africa have three times the prevalence of depression and anxiety disorders compared to women in High-income countries (HICs) and this is a common issue among pregnant women living with HIV (WLHIV) (Kapetanovic, et al., 2014 & Thomas, et al., 2017 & Brown & Sprague, 2021).

Antenatal depression and anxiety are associated with multiple HIV-related maternal outcomes which can influence the infant's development. According to Ngocho, et al (2019) mothers experiencing depression are less likely to adhere to ART, leading to faster disease progression which can lead to mortality. Furthermore, they are also less likely to adhere to the breastfeeding practices as per the World Health Organization (WHO) guidelines. However, most of these findings have been documented in HICs while low-and-middle income countries (LMICs) have understudied this phenomenon (Jiang, et al., 2022).

Current WHO infant feeding guidelines recommend that WLHIV on ART exclusively breastfeed for the first 6 months before introducing complementary feeding and that they breastfeed for a duration of 24 months or longer irrespective of CD4 cell count or disease severity (Zunza, et al., 2018). However, since the adoption of these guidelines, evidence in South Africa has reported a variety of EBF rates among WLHIV which range from 26 – 99%, and the duration of breastfeeding ranged from 1 – 3 months for any breastfeeding (Chakona, 2020 & Vitalis, VilarCompte, Nyhan, & Perez-Escamilla, 2021). These results indicate a clear problem of nonadherence to the WHO guidelines, particularly when it comes to duration, since low proportions of women breastfeed through 24 months. Although South Africa has a high coverage of ART for pregnant and breastfeeding WLHIV and a young child feeding policy which provides a suitable context for supporting safe and effective breastfeeding, non-adherence continues to be challenging.

Investigating the barriers to breastfeeding and creating targeted interventions will be beneficial in addressing the issue of non-adherence. Current literature examining barriers in LMICs

including South Africa have largely reported and focussed on barriers such as nulliparity, caesarean section, infant male gender, low birth weight, HIV infection, high viral load, low socioeconomic status, large family size and caregiver factors particularly around attitude and knowledge (Thomas, et al., 2017 & Kinshella, et al., 2021). However, scant attention has been made to examine mental illness as a barrier to any form of breastfeeding up to 24 months among WLHIV in LMIC. A systematic review conducted by Butler, Young and Tuthill (2021) comprising of 68 794 participants across 20 countries found that perinatal depressive symptoms are negatively associated with EBF and breastfeeding duration as per WHOs recommendations. These studies focused mostly on EBF and when it comes to duration, they reported it up till 6 months at most for any breastfeeding, and majority of these studies were conducted in HICs (Butler , Young, & Tuthill, 2021).

The impact of mental health on breastfeeding remains understudied in LMIC despite long existing evidence of a high prevalence of depression among WLHIV in LMICs (Brown & Sprague, 2021). With substantial evidence of the benefits of breastfeeding in promoting maternal and infant health among WLHIV, and mental health being identified as one of the barriers of effective breastfeeding in HIC, the investigation of this barrier in the context of LMIC is of great interest in public health. Therefore we conducted a retrospective cohort study to assess prevalence and predictors of breastfeeding initiation post-delivery, including the association between risk of postnatal depression and breastfeeding initiation post-delivery, among WLHIV who initiated ART in Cape Town, South Africa. In addition, we assessed duration of breastfeeding and the association between risk of postnatal depression and breastfeeding duration.

Methods

Study Setting

The study population was from a peri-urban township in Cape Town. This area is predominantly of low socioeconomic status with 55% of the adult population unemployed and 65% living on less than R400 a month (Myer, et al., 2015). The vast majority of this population uses a Community Health Centre (CHC) and Midwife Obstetric Unit (MOU) which serves the population of 350 000. Approximately 4800 women seek antenatal care at the MOU annually where they are provided with basic antenatal and obstetric services and when there are more complex issues, they have a hospital referral system (Myer, et al., 2015).

Design and data source

The data used originated from the Postpartum Adherence Clubs for Antiretroviral Therapy (PACART) trial, which compared maternal viral suppression up to 24 months in postpartum women living with HIV who were randomized to receive either clinic-based care or care in adherence clubs for ART delivery during the postnatal period (Odayar, Malaba, Allerton, Lesosky, & Myer, 2019).

The inclusion criteria of the parent trial consisted of all women attending the antenatal clinic at the MOU who had a documented HIV-positive status, were 18 years or older and were within 70 days post-delivery (Myer , et al., 2022). They had to have started ART in pregnancy and be virally suppressed with the most recent viral load <400 copies/mL within the preceding 3 months and willing to consent and adhere to all study procedures. Women were excluded if they had intentions of relocating during the study period, had any existing psychiatric or social condition that would affect their ability to consent and participate in the study, experienced

pregnancy loss at the time their eligibility was assessed or had any co-morbidity that would require additional health care attention (Myer , et al., 2022).

The study took place from January 2016 to January 2020. Eligible women underwent multiple assessments during six study visits spanning twenty-four months after giving birth. The initial visit occurred within seventy days postpartum, followed by visits at three, six, twelve, eighteen, and twenty-four months postpartum. (Myer , et al., 2022). The measurements were carried out by a team of research nurses and interviewers who worked independently from the routine ART service at a dedicated research space at the MOU (Myer , et al., 2022). The measurements included the following questionnaires: demographics, medical history, the EPDS scale, family planning use/pregnancy intentions, maternal adherence, infant demographics and medical history, these measurements were collected at each study visit attended (Myer , et al., 2022).

Eligible Participants

All women enrolled in the PACART trial who started ART at the MOU in their most recent pregnancy were potentially eligible for this analysis.

Variable definitions

Postnatal depression

The independent variable was the risk of postnatal depression which was measured using the Edinburgh Postnatal Depression scale (EPDS). The EPDS is one of the most used screening tools to assess symptoms of perinatal depression and anxiety in high- and low-income countries (Shrestha, Pradhan, Tran , Gualano, & Fisher, 2016). It is also the most frequently validated instrument to screen for perinatal depression and has been further validated in 37 other languages (Smith-Nielson, Matthey, Lange, & Vaever, 2018). In the South African context, the EPDS was tested against DSM-IV criteria for postnatal depression. It accurately identified all major depression cases and 70.6% of minor depression cases, demonstrating an 80% sensitivity and 76.6% specificity. In Cape Town, the EPDS anxiety subscale (comprising questions 3, 4, and 5) was validated against Mini-International Neuropsychiatric Interview criteria. It correctly categorized 61% of pregnant women, showing a sensitivity of 67% and a specificity of 59% (Abrahams, Schneider, Field & Honiman, 2019). The tool uses a ten Likert-scale items to assess emotional experiences in the preceding 7 days with a maximum total score of 30 (Shrestha, Pradhan, Tran, Gualano, & Fisher, 2016). Participants with a score of ≥13 were categorized as having an increased risk of postnatal depression and those with a score of <13 were characterized as being at decreased risk of postnatal depression (Levis , Negeri , Sun , Benedetti, & Thombs , 2020) .

Breastfeeding

We included in the analysis women with a known breastfeeding status at enrolment. At enrolment, women were asked whether they had given breastmilk to their babies which was categorised as yes or no. Women whose breastfeeding status was unknown or missing were excluded.

At each subsequent study visit, women were asked whether they were still currently breastfeeding their baby. Those who said that they were no longer breastfeeding were asked when they had stopped. The duration of breastfeeding was then calculated as the duration from the date at which they started breastfeeding to the date at which they stopped (See appendix A).

Potential confounders

Based on previous literature, a number of factors were identified as potential confounders in the relationship between postnatal depression and breastfeeding practices. These included age, highest level of education, occupation, source of income, marital status, dwelling type; pregnancy and delivery indicators such as parity, delivery mode, previous pregnancy; family planning intentions, perceived social support, alcohol consumption, maternal and infant medical history (Thomas, et al., 2017 & Kinshella, et al., 2021; Weber, Apanga, Darrow, Riddle, & Tung, 2021; etegan, et al., 2012 & Appiah, Ahinkorah, & Budu, 2021).

The Multidimensional Scale of Perceived Social Support (MSPSS) was developed in 1988 by Zimet, Dalhem, Zimet and Farley the tool is used to measure perceived social support using 12 items that cover family, intimate relationships, and friends (Maria, Eva, Lindberg, & Arestedt, 2013). The items are rated on a Likert-type of scale with 7 items which range from 1 = very strongly disagree to 7 = very strongly agree) (Maria, Eva, Lindberg , & Arestedt, 2013). The score

is calculated by summing all the scores from all the items. The scores range from 4 – 28, where the higher the score the higher the perceived social support. The MPSPSS scale is widely used across a variety of studies and has demonstrated good psychometric properties (Maria, Eva, Lindberg, & Arestedt, 2013).

Statistical analysis

Characteristics at enrolment were described overall and by EPDS status, including the prevalence of breastfeeding. Continuous variables were summarized as means and standard deviations; categorical variables were summarized as proportions. A bivariate analysis was performed using the pearson's chi-square, fisher's exact and wilcoxon rank sum tests to compare characteristics in women who had a low EPDS score (<13) and those who had a high EPDS score (≥=13). A log-binomial regression was conducted to determine the relationship between EPDS score at enrolment and breastfeeding initiation.

Cumulative probabilities of breastfeeding duration among mothers with low risk of postnatal depression and those who were at greater risk of postnatal depression were compared using the Kaplan-Meier estimation method and log-rank test. Women were censored when they stopped breastfeeding or, for those still breastfeeding at the end of the study, at the date of the final study visit. Cox proportional hazards models were used to determine the association between postnatal depression and breastfeeding duration.

Ethical considerations

The PACART study was approved by the Human Subjects Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town (REF 194/2015); the study was also approved by the local government and the facility manager.

This analysis was approved by the Human Subjects Research Ethics Committee of the Faculty of Health Sciences at the University of Cape Town (REF 688/2022).

Results

Sample characteristics at enrolment

Of the 412 women included in the PACART study, one withdrew and the remaining 411 women were included in this analysis. At enrolment, 97.4% of women reported that they initiated breastfeeding within 72 hours and these women had a median age of 28 years (IQR 28-31). The majority of women (95.9%) had completed high school with only a few who completed primary (1.5%) and post-secondary school (2.7%) as the highest level of education. Half of the women reported to be employed full time (50.4%) and 16.3% relied on social grants and other forms of income. Almost 60% of women were not married or living with their partners (59.9%) and 53% lived in a household that had running water. Most women (n=261; 63.5%) had had a normal vaginal delivery for the index pregnancy, compared to a caesarean section (n=150; 36.5%) and the median weight at birth for all infants was 3120g (IQR 2800g – 3420g). Many women lived with their infants at the time of enrolment (n=410; 97.1%). Three hundred and eight women (74.9%) were multiparous and only five (1.2%) women reported to have a child that had been diagnosed with HIV. Most women had never taken lifelong ART prior the index pregnancy (n=351, 85.4%) and 84 (20.4%) had previously used medication to prevent vertical transmission of HIV. All women had been started on ART in the index pregnancy and at enrolment their median duration on ART was 23 weeks (IQR 18-28). Furthermore, 97.8% of the women reported to have taken their ART in the seven days preceding enrolment and the median score for perceived social support was 4 (IQR = 3.2 -4.8). (Table 1)

Bivariate Analysis

The proportion of women who initiated breastfeeding post-delivery was similar among those with a high risk of postnatal depression (n=99; 96.1%) and those with a low risk of postnatal depression (n=300; 97.4%). Among those with a high risk of postnatal depression, 3 women (2.9%) self-reported that they had not used ART in the preceding 7 days, compared to 1 woman (0.050%) with a low risk of postnatal depression (p-value = 0.021). A higher proportion of women who were at low risk of depression had running water (n=174; 56.4%) compared to women at high risk of depression (n=44; 42.7%; p=0.015). Women who were at low risk of depression had a median score of 4 (IQR=3.2 - 4.8) on the perceived availability of social support scale while women who were at high risk had a median score of 3.5 (IQR 2.9 – 4.6; p=<0.001). Lastly, 61.0% (n=188) of women at low risk of depression had a normal vaginal delivery compared to 70.9% (n=73) of women who were at high risk of postnatal depression (p=0.073).

Age, highest level of education, occupation, economic status, relationship status, dwelling type, parity, ART duration at enrolment, lifelong ART use, prior use of medication to prevent vertical transmission to infant, one or more children diagnosed with HIV, contraception use, breastfeeding, infant prophylaxis, infant weight, mode of delivery and whether the mother lives with their baby were not associated with EPDS score category (See table 1).

Table 1: Characteristics of all women included in analysis, stratified by EPDS status at enrolment

Characteristic	All women (n =411)	EPDS<13 n = 308 (74.9%)	EPDS≥13 n = 103 (25.1%)	P-Value
Median Age in years (IQR)	28 (24 - 31)	27 (24 - 31)	28 (25 - 32)	0.301
Highest level of education				0.252
Primary School	6 (1.5)	6 (1.9)	-	
High School	394 (95.8)	295 (95.8)	99 (96.1)	
Post-Secondary	11 (2.7)	7 (2.3)	4 (3.9)	
Occupation				
Student/working	132 (32.1)	99 (32.1)	33 (32.0)	0.984
Not studying or working	279 (67.9)	209 (67.9)	70 (68.0)	
Economic status				0.859
Full-time employment	207 (50.4)	154 (50.0)	53 (51.5)	
Part-time/Informal employment	137 (33.3)	102 (33.1)	35 (34.0)	
Social grants/other	67 (16.3)	52 (16.9)	15 (14.5)	

Relationship status				
Married/living together	165 (40.1)	125 (40.6)	40 (38.8)	0.754
Unmarried/not living together	246 (59.9)	183 (59.4)	63 (61.2)	

Dwelling Type				
Formal housing	192 (46.7)	150 (48.7)	42 (40.8)	0.163
Informal housing	219 (53.3)	158 (51.3)	61 (59.2)	
Running water in household-				
No	193 (47.0)	134(43.6)	59 (57.3)	0.015
Yes	218 (53.0)	174 (56.4)	44 (42.7)	
Parity				
Primiparous	103 (25.1)	82 (26.6)	21 (20.4)	0.206
More than one	308 (74.9)	226 (73.4)	82 (79.6)	
Median ART duration at enrolment in weeks (IQR)	23 (18 – 28)	23 (18 – 29)	23 (18 – 26)	0.559
Lifelong ART use prior to ART initiation in last pregnancy				
No	351 (85.4)	266 (73.4)	85 (82.5)	0.460
Yes	50 (12.1)	34 (11.3)	16 (15.5)	
Missing	10 (2.4)	8 (2.5)	2 (2.0)	

ART use in the last 7 days				
No	4 (1.0)	1 (0.4)	3 (2.9)	0.050
Yes	407 (99.0)	307 (99.6)	100 (97.1)	
Prior use of medication for prevention of vertical transmission to infant				
No	327 (79.6)	247 (79.5)	80 (77.7)	0.582
Yes	84 (20.4)	61 (19.8)	23 (22.3)	
One or more children diagnosed with HIV				
No	406 (98.8)	304 (98.7)	102 (99.0)	1.000
Yes	5 (1.2)	4 (1.3)	1 (1.0)	
Contraception use				
No	10 (2.3)	8 (2.6)	2 (2.0)	1.000
Yes	401 (97.7)	300 (97.4)	101 (98.0)	
Breastfeeding				
No	12 (2.9)	8 (2.6)	4 (3.9)	0.505
Yes	399 (97.4)	300 (97.4)	99 (96.1)	

Median Perceived social support (IQR)	4 (3.2 – 4.8)	4 (3.6 – 4.8)	3.5 (2.9 – 4.6)	<0.001
Infant on Prophylaxis (NVP or AZT)				
No	9 (2.2)	7 (2.3)	2 (1.9)	0.843
Yes	402 (97.8)	301 (97.7)	101 (98.1)	
Infant weight at birth Median (IQR)	3120 (2800 – 3420)	3110 (2785 -3430)	3125 (2820 – 3400)	0.835
Mother lives with baby, n (%)				
No	1 (0.24)	1 (0.3)	-	0.563
Yes	410 (97.1)	307 (99.7)	103 (100)	
Mode of Delivery				
Normal Vaginal Delivery	261 (63.5)	188 (61.0)	73 (70.9)	0.073
Caesarean section	150 (36.5)	120 (41.5)	30 (29.1)	

Abbreviations: ART, antiretroviral therapy; AZT, azidothymidine; EPDS, Edinburgh postnatal depression; HIV, Human immunodeficiency virus; NVP; nevirapine

The p-values are from chi2 tests for categorical variable: for variables with cell sizes of <5 Fisher's exact p-values are reported.

Among the women who were breastfeeding none reported to have initiated breastfeeding after 72 hours

Log-binomial regression

In the log-binomial model, there was no statistically significant association between having symptoms of postnatal depression and breastfeeding initiation post-delivery (RR = 0.97; CI = 0.24 – 3.91), similarly with age and duration of ART at enrolment (RR =1.02; CI = 0.89 -1.17 & RR = 1.00; CI = 0.99 – 1.03). Furthermore, none of the other factors were statistically significant associated with breastfeeding. These included relationship status (RR = 1.63; CI =0.45 – 5.91), perceived social support (RR= 1.51; CI = 0.17 – 3.38), occupation (RR = 1.30 ; CI = 0.334 – 5.03), parity (RR = 3.20; CI = 0.37 – 27.7), mode of delivery (RR = 0.65; CI = 0.17 -2.54) and having running water in the household (RR = 0.46; CI = 0.0.13 – 1.66) (Table 2).

Table 2: Adjusted and unadjusted risk ratios of breastfeeding initiation with their 95% confidence intervals by selected variables.

Variables	**Unadjusted RR [95%CI]**	**Adjusted RR {95%CI]**	**P-Value**
Age (years)	1.04 (0.93 – 1.16)	1.02 (0.90 – 1.17)	0.720
Occupation			
Student/working	1		
Not studying or working	1.41(0.38 – 5.24)	1.30 (0.34 – 5.00)	0.692

Relationship status			
Married living together	1		
Unmarried/not living together	0.94(0.30 -2.96)	1.65 (0.47 – 5.84)	0.435
Running water in household (No)			
Yes	0.63 (0.20 -1.99)	0.46 (0.13 – 1.62)	0.225
Parity (Primiparous)	1		
More than one	3.67(0.47 – 28.5)	3.20(0.38 -27.08)	0.285
ART duration at enrolment in weeks	1.00(0.98 – 1.02)	1.00(0.99 – 1.03)	0.630
EPDS (Yes)	1		
No	0.67 (0.20 – 2.22)	0.97 (0.24 – 3.80)	0.966
Perceived social support	1.49 (0.70 – 3.20)	1.51 (0.68 – 3.80)	0.966
Mode of delivery (NVD)	1		
caesarean	0.64 (0.25 -2.93)	0.64 (0.17 – 2.45)	0.528

Abbreviations: ART, Antiretroviral therapy; EPDS, Edinburgh Postnatal Depression Scale; NVD, Normal Vaginal Delivery; OR Odds Ratio.

Kaplan Meier Curves

Figure 1 displays the duration (in days) of mothers who were breastfeeding at follow up. The median duration of any breastfeeding was approximately 90 (21 – 180 days). By the third study visit at 180 days, only 20% of women were breastfeeding and at 365 days only 5% of women were breastfeeding.

Figure 2 displays the breastfeeding duration of mothers at follow up grouped by risk of postnatal depression as determined by the EPDS score measured at baseline. The median breastfeeding duration for women at low risk was 90 (21 – 180) days and the median duration for those at high risk was 91 (30 – 180) days. Whether the mother had a high risk of postnatal depression or not was not significantly associated with breastfeeding duration in our sample; (p-value = 0.69) (Figure 1).

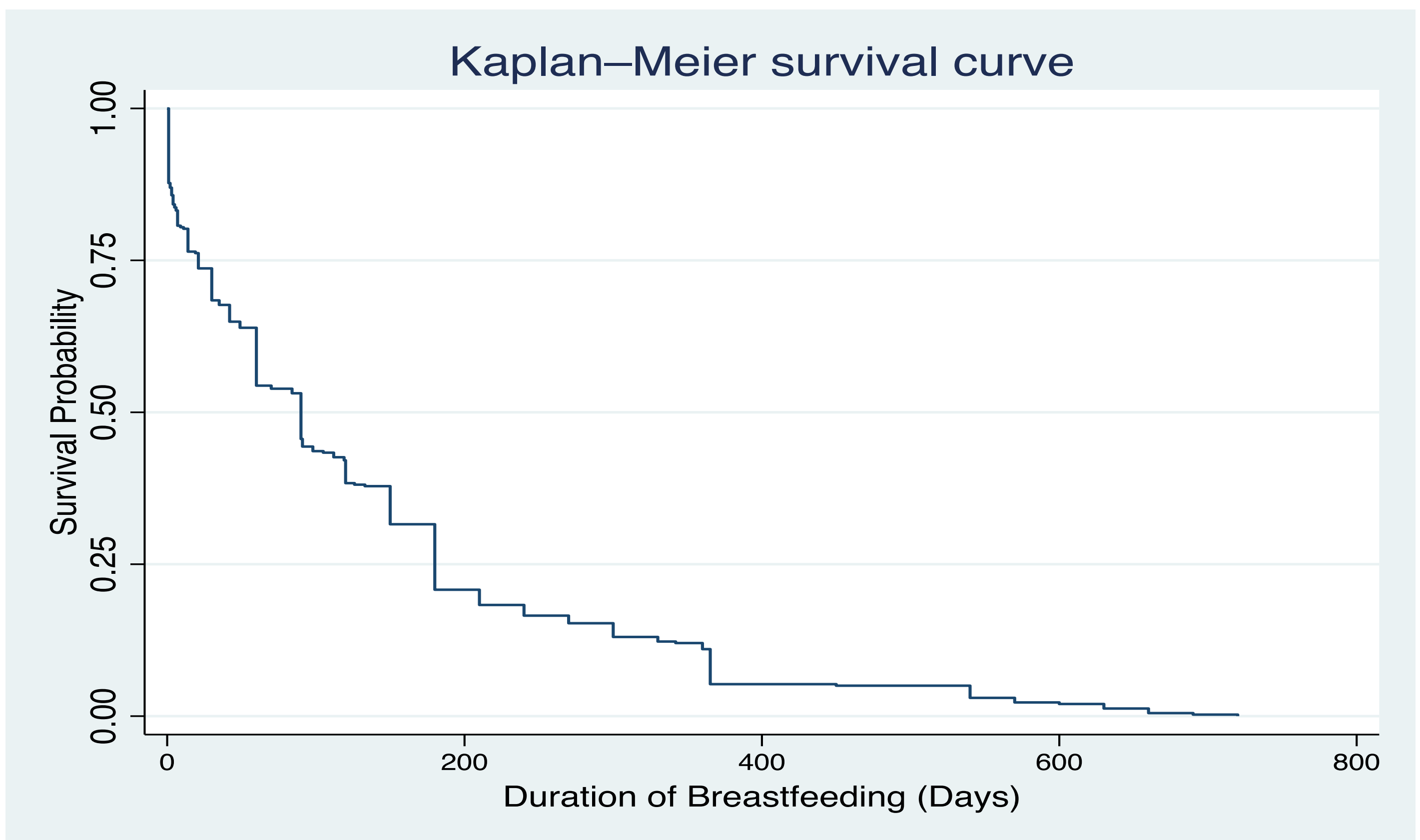


Figure 1: Duration of breastfeeding among WLHIV who were breastfeeding at follow up.

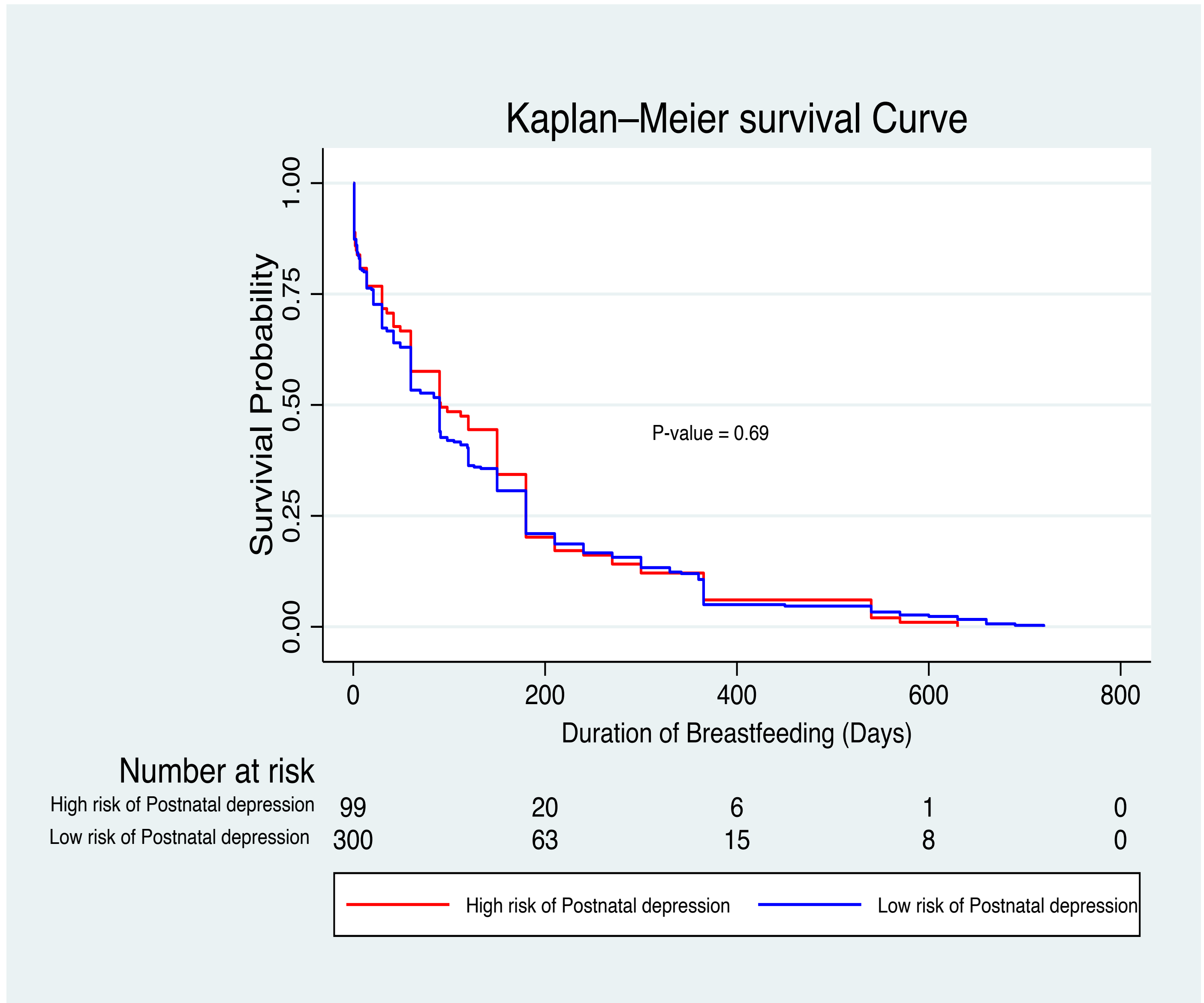


Figure 2: Duration of breastfeeding among mothers at follow up, stratified by Postnatal depression status.

Cox Proportional Hazard Model

Table 3 presents the results of a multivariable Cox proportional hazard model that investigated the relationship between postnatal depression status at enrollment and the duration of breastfeeding. This analysis considered various factors at enrollment, including age, occupation, relationship status, access to running water, parity, ART duration, perceived social support, and mode of delivery. After adjusting for all these factors, there was no statistically significant association between EPDS score and how long women breastfeed.

However, it's noteworthy that women who were not employed or studying showed a 30% higher risk of experiencing postnatal depression compared to those who were students or working when other factors were taken into account. This suggests that employment or student status is associated with a lower risk of postnatal depression. For the remaining variables examined, there was no statistically significant association on the duration of breastfeeding.

Table 3: Results of a multivariable proportional hazards model examining the association between postnatal depression status and breastfeeding duration adjusted for enrolment characteristics

Variables	**Adjusted hazard ratio**	**95% CI**	**P value**
Age (years)	1.00	0.98 – 1.02	0.527
Occupation			
Student/working	1		
Not studying or working	1.03	0.57 -0.89	0.003

Relationship status			
Married living together			
Unmarried/not living together	1.03	0.84 – 1.28	0.758
Running water in household			
No	1		
Yes	0.90	0.73 – 1.09	0.289
Parity			
Primiparous	**1**		
More than one	0.94	0.73 – 1.21	0.659
ART duration at enrollment in weeks	1.00	0.99 – 1.01	0.231
Postnatal depression (Yes)	**1**		
No	1.08	0.79 -1.29	0.941
Perceived social support	1.07	0.94 – 1.23	0.274
Mode of delivery			
NVD	1		
Caesarean	0.97	0.79 – 1.19.	0.769

Abbreviations: ART, Antiretroviral therapy; CI, Confidence intervals; NVD, Natural Vaginal Delivery

Discussion

The purpose of this analysis was to investigate whether there was a relationship between the risk of postnatal depression and breastfeeding practices among pregnant women initiating ART in pregnancy in Cape Town. We found that 97% of all women initiated breastfeeding postdelivery and this was similar among women with a low or high risk of postnatal depression. Though initiation was almost, universal the duration of breastfeeding was short at a median of 90 days and this was also similar among women with low and high risk of postnatal depression. We found no statistically significant relationship between the risk of postnatal depression and breastfeeding. However, our study confirmed non-adherence to the WHO breastfeeding guidelines regarding breastfeeding duration.

Mixed findings in South Africa have been presented on the prevalence of breastfeeding among WLHIV and women without HIV. According to Vitalis, Vilar-Compte, Kate and Rafael (2021), after South Africa endorsed the 2010 WHO breastfeeding recommendations, the rates of breastfeeding ranged between 26-99% across different studies. Contrary to our findings a prospective birth cohort investigating breastfeeding initiation and continuation in 899 women, reported a low breastfeeding prevalence of 45%. This discrepancy may be attributed to the small sample size they had of 192 women and since they analysed women who were on ART prior to pregnancy, they might not have received as much intensive counselling pertaining breastfeeding compared to mothers who initiated ART in pregnancy (Thomas, Kuo, Cohen, & Horare, 2017). A cross sectional study among 218 WLHIV and women not living with HIV, found a high prevalence of 99% (Niewoudt , Manderson, & Noris, 2018), which was consistent

with our study results. The consistency may have been due to the similar socio-demographic characteristics of the samples as the both the populations of these studies were of low socioeconomic status and had inadequate access to healthcare and thus breastfeeding may have been regarded as a cost-effective means to sustain the health of the infant.

Though breastfeeding prevalence differed across different studies the duration of breastfeeding was seldom optimal across majority of studies and this was consistent with our study findings. For instance, a community-based cluster randomized trial (Promise EBF) promoting EBF in three South African sites (Paarl, Umlazi and Rietvlei), indicated that 40% of WLHIV completely discontinued breastfeeding at 12 weeks postpartum (Doherty, et al., 2012). Furthermore, the national breastfeeding rates have reported an average breastfeeding duration of 2.9 months which is considered the lowest rates on the African continent (Vitalis, Vilar-Compte, Kate, & Rafael, 2021). These results continue to highlight the inadequacy of existing efforts to promote breastfeeding and the need for more efforts to be made in addressing this issue.

We did not find any factors associated with breastfeeding initiation which may have resulted from having a very small proportion of women who did not breastfeed compared to those who breastfed and thus affecting our precision estimates. However, there were other studies which found associations with the factors that we included in our analysis such as caesarean section, social support, access to water, nulliparity and a low-socio-economic status (Thomas, et al., 2017; Patel, et al., 2015; Kimani-Murage, et al., 2015 & Apanga, et al, 2021).

We also did not find any significant relationship between the risk of postnatal depression and breastfeeding duration. Similar findings were also reported by Woldeyohannes, Tekalegn and Sehiledengle (2021), in a systematic review and meta-analysis on data from women in sub-

Saharan Africa (SSA). These findings were also consistent with individual studies conducted in Malawi, South Africa and Ethiopia (Woldeyohannes, Tekalegn & Sehiledengle, 2021).

Postpartum depression remains a public health concern in LMICs and has been neglected in the area of research (Thomas, et al., 2017 ;Phukuta & Omole, 2020). LMICs continue to have considerably high proportions of women who have postpartum depression and many of these women remain undiagnosed (Phukuta & Omole, 2020). It is well-known that if depression is left undiagnosed and untreated among pregnant women, it is associated with a poor quality of life for the mother and child (West, Schwartz, Yende, Schwartz, & Parmley, 2019).

Breastfeeding is a crucial aspect of an infant's development particularly in the early months after childbirth. It provides nutritional benefits for infants and reduces the risk of malnutrition and diarrhoeal illnesses which are among the leading cause of infant mortality in low- and middle-income countries (West, Schwartz, Yende, Schwartz, & Parmley, 2019). Not only is it beneficial for the infant but it is also beneficial for the mother as it can reduce the mother's risk of ovarian and breast cancer, type 2 diabetes and high blood pressure (CDC, 2022). However, despite these benefits, evidence based breastfeeding recommendations for WLHIV as stipulated by the WHO and continuous programs centred around promoting breastfeeding practices within prevention of mother to child transmission of HIV programs, the duration of breastfeeding in South Africa remains significantly low (Tuthill, et.al., 2016).

Limitations

Our results may not be generalizable to other women from different sociodemographic and socioeconomic backgrounds since they are from a single low-socioeconomic population. The sample size of women who were not breastfeeding was small and may have affected precision estimates.

Our breastfeeding data regarding dates that women stopped breastfeeding were self-reported which may have not been accurate. Depression was assessed using the EPDS scale which is only a screening tool, so we were not able to determine women who actually had depression. Lastly, we were unable to look at prevalence and duration of exclusive breastfeeding as these data were not collected by the parent study.

Implications for practice and/or policy

While our study did not reveal any significant association between postnatal depression and breastfeeding practices, it is crucial that the this concern should not be ignored. It does probe for additional research which would investigate breastfeeding practices by comparing women who have been diagnosed with clinical depression, which was a limitation in our study as we made use of a screening tool. Our study however did highlight the continuous issue of non-adherence to breastfeeding practices as per WHO guidelines. Therefore, it is recommended that healthcare providers and policy makers prioritize breastfeeding promotion and education particularly among pregnant women initiation ART during pregnancy. Implementing comprehensive education programs can help mothers understand the importance of extended breastfeeding and address any knowledge gaps and barriers to breastfeeding. Community based support interventions can also be implemented with the aim of providing emotional support and education. These interventions can be targeted mostly in areas of low socio-economic status where access to healthcare services is limited. Having recognized from existing literature that postpartum depression remains a concern, routine screening for postpartum depression should be integrated in health systems in order to identify and treat depression, to improve the quality

of life for the mother. Lastly continued research is needed to better understand the barriers of prolonged breastfeeding.

Conclusion

Our study did not find any significant relationship between risk of postnatal depression and breastfeeding practices among women initiating ART in pregnancy. Though breastfeeding initiation was at an optimal level, the duration of breastfeeding was short, highlighting continued non-adherence to WHO breastfeeding guidelines. More efforts need to be made to address breastfeeding non-adherence as it is of great public health concern and continues to negatively impact the health of both the mother and infant.

Abbreviations

ART: Antiretroviral therapy EBF: Exclusive Breastfeeding EPDS: Edinburgh Postnatal Depression Scale HIC: High-Income Countries HIV: Human Immunodeficiency Virus LMIC: Low- and- middle- income countries WHO: World Health Organization WLHIV: Women living with HIV Multidimensional Scale for perceived social support: MSPSS

Competing interests

The authors declare that they have no competing interests.

Ethics approval

This analysis was approved by the Human Subjects Research Ethics Committee of the faculty of Health Sciences at the University of Cape Town (REF 688/2022). (See Appendix B)

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References

Abrahams, Z., Schneider, M.M., Field, S., & Honikman, S. (2019). Validation of a brief mental health screening tool for pregnant women in a low-socio-economic setting. *BMC psychology* 7(77). Retrieved from https://bmcpsychology.biomedcentral.com/articles/10.1186/s40359-019-0355-3

Apanga, P., Weber, A., Lyndsey , A., & Riddle, M. (2021). The interrelationship between water access, exclusive breastfeeding and diarrhoea in children: a cross-sectional assessment across 19 African countries. *Journal of global health, 11*, 1-9.

Appiah, F., Ahinkorah, B., & Budu, E. (2021). Maternal and child factors associated with timely initiation of breastfeeding in sub-Saharan Africa. *International breastfeeding Journal, 16*(55), 1-11.

Brown , S., & Sprague, C. (2021). Health care providers' perceptions of barriers to perinatal mental healthcare in South Africa. *BMC Public Health, 21*(1905), 1-13.

Butler , M., Young, S., & Tuthill, E. (2021). Perinatal depressive symptoms and breastfeeding behaviours: A systematic literature review and biosocial research agenda. *Journal of Affective disorders, 15*(283), 441 - 471.

CDC. (2022). *Breastfeeding Benefits Both Baby and Mom*. Retrieved from https://www.cdc.gov/nccdphp/dnpao/features/breastfeedingbenefits/index.html#:~:text =Breastfeeding%20can%20help%20protect%20babies,ear%2 0infections%20and%20stomach%20bugs.

Doherty, T., Sanders, D., Jackson, D., Swanevelder, S., Lombard, C., Zembe, W., . . . Colvin, M. (2012). Early cessation of breastfeeding amongst women in South African: an area needing urgent attention to improve child health. *BMC*, 1-10.

Johnson, L., Meyer-Rath, G., Dorrington, R., Puren, A., Seathlodi, T., Zuma, K., & Feizzadeh, A. (2022). The Effect of HIV Programs in South Africa on National HIV Incidence Trends, 2000–2019. *Journal of Acquired immune deficiency syndrome, 90*(2), 115 - 123.

Kimani-Murage, E. W., Wekesah , F., & Wanjohi, M. (2015). Factors affecting actualisation of the WHO breastfeeding recommendations in urban poor settings in Kenya. *Maternal and Child Nutrition, 11*(3), 214-332.

Kinshella, M.-L., Hiwa, T., Vilder, M., Nyondo-Mipando, A., Dube, Q., Godlfarb, D., & Kawaza, K. (2021). Barriers and facilitators for early and exclusive breastfeeding in health facilities in Sub-Saharan Africa: A systematic review. *Global health Research and Policy, 21*(6).

Levis , B., Negeri , Z., Sun , Y., Benedetti, A., & Thombs , B. (2020). Accuracy of the Edinburgh Postnatal Depression Scale (EPDS) for screening to detect major depression among pregnant and postpartum women: systematic review and meta-analysis of individual participant data. *371*, 1-11. Retrieved from https://www.bmj.com/content/bmj/371/bmj.m4022.full.pdf

Maria, E., Eva, B., Lindberg , M., & Arestedt, K. (2013). The Swedish version of the multidimensional scale of perceived social support (MSPSS) - a psychometric evaluation study in women with hirsutism and nursing students. *Health and Quality of life Outcomes, 11*(168), 1-9. Retrieved from https://hqlo.biomedcentral.com/articles/10.1186/1477-7525-11-168#:~:text=The%20possible%20score%20range%20is,28%20%5B9%2C%2017%5D.

Malhotra, R., Mudgal, R., Dharmarha, S., Mehta, S., & Bhola, S. (2015). How happy are pregnant women?: A socio-demographic analysis. *Clinical Epidemiology and Global Health, 3*(3), 117-124. Retrieved from https://www.sciencedirect.com/science/article/pii/S2213398414000475

Mdiba, S. (2021). When Pregnancy Coincides with Positive Diagnosis of HIV:. *International Journal of Environmental Research and Public Health*(18), 1-14. Retrieved 2021, from file:///C:/Users/Kanyo/Downloads/ijerph-18-13006-v2%20(1).pdf

Myer , L., Odayer, J., Malaba, T., Alleton, J., Kabanda, S., Hu, N.-C., . . . Jacobs, S. (2022). Improved virologic outcomes in postpartum women living with HIV referred to differentiated models of care. *AIDS, 36*(15), 2203 - 2211.

Myer, L., Philips, T., Manuelli, V., Mclntyre, J., Bekker, L.-G., & Abrams, E. (2015). Implementation and Operational Research Evolution of Antiretroviral Therapy Services for HIV-Infected Pregnant Women in Cape Town, South Africa. *69*(2), e57 -e65. Retrieved from https://journals.lww.com/jaids/Fulltext/2015/06010/Implementation_and_Operational_Research__Evolution.20.aspx

Ngocho, J. S., Watt, H. M., Minja, L., Knettel, B., Mmbaga, B. A., Williams, P. P., & Sorsdahl, K. (2019). Depression and anxiety among pregnant women living with HIV in Kilimanjaro region, Tanzania. *Plos One, 14*(10), 1-15. Retrieved from https://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0224515&type=printable

Niewoudt , S., Manderson, L., & Noris, S. A. (2018). Infant feeding practices in Soweto, South Africa: Implications for healthcare providers. *South African Medical Research, 109*(9), 1-7.

Odayar, J., Malaba, T., Allerton, J., Lesosky, M., & Myer, L. (2019). Delivery of antiretroviral therapy to HIV-infected women during the postpartum period: The Postpartum Adherence Clubs for Antiretroviral Therapy (PACART) trial. *contemporary clinal trials communications, 16*, 1-8.

Palenee-Philips, T., Rees, H. V., Heller, K. B., Ahmed, k., Batting, J., & Beesham, I. (2022). High HIV incidence among young women in South Africa: Data from a large prospective study. *Plos One, 17*(6), 1-12.

Patel, A., Bucher, S., Pucdekar, Y., & Fabian , E. (2015). Rates and determinants of early initiation of breastfeeding and exclusive breast feeding at 42 days postnatal in six low and middle-income countries: A prospective cohort study. *Reproductive Health, 12*(Suppl 21), 1-11.

Phukuta, N., & Omole, O. (2020). Prevalence and risk factors associated with postnatal depression in a South African primary care facility. *African Journal of Primary Health Care and Family Medicine, 12*(1), 1-6.

Setegan, T., Belachew, T., Gerbaba, M., Deribe, K., Deribew, K., & Biadgilin , S. (2012). Factors associated with exclusive breastfeeding practices among mothers in Global district, south east Ethiopia: a cross-sectional study. *International Breastfeeding Journal, 7*(17).

Shrestha, S., Pradhan, R., Tran , T., Gualano, R., & Fisher, J. (2016). Reliability and validity of the Edinburgh Postnatal Depression Scale (EPDS) for detecting perinatal common mental disorders (PCMDs) among women in low-and lower-middle-income countries: a systematic review. *BMC Pregnancy and Childbirth, 16*(72), 1-19.

Smith-Nielson, J., Matthey, S., Lange, T., & Vaever, M. (2018). Validation of the Edinburg Postnatal Depression Scale against both DSM-5 and ICD-10 diagnostic criteria for

depression. *BMC psychiatry, 18*(393), 1-12.

Thomas, E., Kuo, C., Cohen, S., & Horare, J. (2017). breastfeeding initiation and continuation among HIV infected and uninfected women in a South African birth cohort study. *Preventive Medicine, 102*. Retrieved from https://www.sciencedirect.com/science/article/pii/S0091743517302499

Vitalis, D., Vilar-Compte, M., Kate, N., & Rafael, P.-E. (2021). Breastfeeding inequities in South Africa: Can enforcement of the WHO Code help address them? – A systematic scoping review. *International Journal of Equity in Health, 20*(114), 1-17.

Watt, M. H., Knipler, E., Knettel, E., Sikkema, K., Ciya, N., Myer, L., & Joska, J. (2018). HIV disclosure among pregnant women initiating ART in Cape Town South Africa: Qualitative perspectives during pregnancy and postpartum periods. *AIDS and Behaviour, 22*(12), 3945-3956.

Weber, A. M., Apanga, P. A., Darrow, L., Riddle, M., & Tung, W.-C. (2021). The interrelationship between water access, exclusive breastfeeding and diarrhoea in children: a cross-sectional assessment across 19 African countries. *Journal of Global health, 11*, 1-9.

West, N. S., Schwartz, S. R., Yende, N., Schwartz, S. J., & Parmley, L. (2019). Infant feeding by South African mothers living with HIV: implications for future training of health care workers and the need for consistent counselling. *International Breastfeeding Journal, 14*(11), 1-7. Retrieved from https://internationalbreastfeedingjournal.biomedcentral.com/track/pdf/10.1186/s130

06-019-0205-1.pdf

Woldesenbet, S. A., Lombard, C., Manda, S., Kufa, T., Ayalew, K., Cheyip, M., & Puren, A. (2011). *The 2019 National Antenatal Sentinel HIV Survey, South Africa, National Department of Health.* Johannesburg: NICD.

Woldeyohannes, D., Tekalegn, Y., & Sehiledengle, B. (2021). Effect of postpartum depression on exclusive breast-feeding practices in sub-Saharan Africa countries: a systematic review and meta-analysis. *BMC Pregnancy and Childbirth, 21*(113), 1-10.

World Health Organisation . (2011). *GLOBAL HIV/AIDS RESPONSE Epidemic update and health sector progress towards Universal Access.*

Zunza, M., Esser, M., Slogrove, A., Bettinger, J., Machekano, R., & Cotton, M. (2018). Early breastfeeding cessation among HIV-infected and HIV uninfected women in Western Cape Province, South Africa. *Aids and Behaviour, 22*(1), 114 - 120.

Part C: Appendices

Appendix A: Breastfeeding questionnaire and EPDS questionnaire

PACART

INFANT PID: - - Date: / /

16.INFANT FEEDING INTENTIONS & PRACTICES 12 Months Version 1

Siza kubuza imibuzo malunga nendlela olutyisa ngalo usana lwakho
We are going to ask you some questions about how you are feeding your baby

1. Wakhe waluncancisa ibele usana lwakho? *Have you ever given breast milk to your baby?* ....

.... Ewe/*Yes* Hayi/*No*

IF NO, SKIP TO QUESTION 7

2. Uyaluncancisa ibele usana lwakho ngoku? *Are you currently breastfeeding your baby?* .... Ewe/*Yes* Hayi/*No*

IF YES, SKIP TO QUESTION 7

3. Check whether participant was breastfeeding at last visit .... Ewe/*Yes* Hayi/*No*

4. Ukugqibela kwethu ukuthetha nawe, ingaba ukhe wayeka ukuncancisa usana lwakho ibele? *Did you stop breastfeeding before your last visit or after your last visit?* .... *Before* *After*

IF Before, SKIP TO QUESTION 7

5. Lixesha elingakanani uncancisa usana lwakho ibele? *For how long did you breastfeed?*

Iimini *Days,* ***specify number:*** _______________ Iiveki *Weeks,* ***specify number:*** _________________

Iinyanga *Months,* ***specify number:*** __________ Yiminyaka *Years,* ***specify number:*** _____________

6. Zeziphi izizathu ezibangele ukuba uyeke ukuluncancisa ibele usana lwakho. Phendula yonke imibuzo.
   What were your reasons for stopping to breastfeeding? Answer all

   a. Umsebenzi *Work* .... Ewe/*Yes* Hayi/*No*

   b. Imfundo *Education* .... Ewe/*Yes* Hayi/*No*

   c. Ukugula,ngaphandle kweengxaki zokuncancisa *Illness, other than lactation problems* .... Ewe/*Yes* Hayi/*No*

   Ukuba uthi Ewe, cacisa *If YES, specify*: ____ ____________________

CRF COMPLETED BY:

PACART

INFANT PID: □□□□□-□-□□ Date: □□/□□□/□□□□

d. Iingxaki zokuncancisa *Lactation problems* .... □ Ewe/Yes □ Hayi/No

e. Usana alukhuli kakuhle *Child not growing well* .... □ Ewe/Yes □ Hayi/No

f. Usana lukhala kakhulu *Child crying a lot* .... □ Ewe/Yes □ Hayi/No

g. Ubisi lwebele alwanelanga *Not enough breast milk* .... □ Ewe/Yes □ Hayi/No

h. Andifuni ukusulela usana lwam ngeNtsholongwane kaGawulayo *Did not want to give my baby HIV infection* .... □ Ewe/Yes □ Hayi/No

i. Iingcebiso/ukunyanzeliswa ngabanye *Advice or pressure from others* .... □ Ewe/Yes □ Hayi/No

j. Olunye *Other* .... □ Ewe/Yes □ Hayi/No

Cacisa, *specify:* ____________________

Ngoku sizakubuza imibuzo malunga nokutyiswa komntwana wakho ukuqala phezolo ekuseni
We will now ask you some questions about your baby's feeding since yesterday morning

7. Ukuvuka kwakho izolo ekuseni kude ibe kukuvuka kwakho namhlanje ekuseni uye waluncancisa usana lwakho? *From the time you woke up yesterday morning till you woke up this morning did you breastfeed your baby?* .... □ Ewe/Yes □ Hayi/No

8. Ukusuka kwixesha ovuke ngalo kusasa izolo kude kuye ekuvukeni kwakho kusasa nje, ubukhe walunika usana wakho ubisi lwabantwana olungumgubo? *From the time you woke up yesterday morning till you woke up this morning did you give your baby any formula milk?* .... □ Ewe/Yes □ Hayi/No

9. Ukuvuka kwakho izolo ekuseni kude kube kukuvuka kwakho namhlanje ekuseni: Ulunikile usana lwakho ezinye zezi zinto? *From the time you woke up yesterday morning till you woke up this morning: Did you give any of the following items to your baby?*

a. Amanzi *Any water* .... □ Ewe/Yes □ Hayi/No

b. Amanzi aneswekile *Any water with sugar or glucose* .... □ Ewe/Yes □ Hayi/No

c. Ijusi yeziqhamo *Any fruit juice* .... □ Ewe/Yes □ Hayi/No

d. Ingcambu emanzini *Any herbs in water* .... □ Ewe/Yes □ Hayi/No

CRF COMPLETED BY: □□□

PACART

INFANT PID: □□□□□-□-□□ Date: □□/□□□/□□□□

e. Iti engenabisi *Any tea without milk* .... □ Ewe/Yes □ Hayi/No

f. Iti enobisi *Any tea with milk* .... □ Ewe/Yes □ Hayi/No

g. Amanzi erayisi *Rice water* .... □ Ewe/Yes □ Hayi/No

h. Ubisi lwenkomo oluxutyiweyo *Diluted cow's milk* .... □ Ewe/Yes □ Hayi/No

i. Ubisi lwenkomo olungaxutywanga *Non diluted cow's milk* .... □ Ewe/Yes □ Hayi/No

j. Olungolunye ubisi olungumgubo *Other powdered milk* .... □ Ewe/Yes □ Hayi/No

k. Ezinye izinto njenge yogati, itshizi, ikhrim *Any other dairy product like yoghurt, cheese or cream* .... □ Ewe/Yes □ Hayi/No

l. Ubisi lwebhokhwe *Goat's milk* .... □ Ewe/Yes □ Hayi/No

m. Ipapa yabantwana, ipapa, okanye isonka *Cereals, porridge or bread* .... □ Ewe/Yes □ Hayi/No

n. Iziqhamo/iiveji *Any fruits/vegetables* .... □ Ewe/Yes □ Hayi/No

o. Inyama, intlanzi *Any meat or fish* .... □ Ewe/Yes □ Hayi/No

p. Amaqanda *Eggs* .... □ Ewe/Yes □ Hayi/No

q. I-Gripe water *Gripe water* .... □ Ewe/Yes □ Hayi/No

r. Amayeza abhalwe ngugqirha *Any prescribed medicine* .... □ Ewe/Yes □ Hayi/No

s. Amayeza angabhalwanga ngugqirha *Any non-prescribed medicine* .... □ Ewe/Yes □ Hayi/No

t. Into ebutywalara njenge bhiya,umqombothi *Any alcohol like beer or brew* .... □ Ewe/Yes □ Hayi/No

u. Ezinye *Other* .... □ Ewe/Yes □ Hayi/No

If yes, specify(Ukuba uthi Ewe, cacisa): ____________________

CRF COMPLETED BY: □□□

INFANT PID: □□□□□-□-□□ Date: □□/□□□/□□□□

Ngoku sizakubuza imibuzo malunga nokushiya umntwana wakho kukhathalelo lwabanye abantu
We will now ask you some questions about leaving your child with others

10. Ukugqibela kwethu ukuthetha nawe, ingaba wakhe wahlukana nosana lwakho oko wabelekayo kwenzeka ukuba ancanciswe ibele ngomnye umntu? *After your last visit, have you been separated from your baby so that someone else has fed him/her?*.. □ Ewe/*Yes* □ Hayi/*No*

IF NO, END OF QUESTIONNAIRE

11. Luye lwatyiswa ntoni usana lwakho ngelixesha ungekhoyo? *What did they feed your baby the last time you were away?*

- □ Umxube wamanzi *Water based liquids*
- □ Ubisi lomgubo *Formula milk*
- □ Umxube wobisi/ukutya okuthambileyo *Milk based liquids/semi-solid feeds*
- □ Ubisi lwam lwebele ebendilukhamile *My own expressed breast milk*
- □ Ukutya ebendikuhlafunela usana *Food that chewed for the baby*
- □ Usana beluncanciswe ibele ngomnye umdlezana *Child was "wet nursed" (breastfed by another woman)*
- □ Ezinye, Cacisa *Other **specify**:*___________________
- □ Andazi *Don't know*

QC COMPLETED BY: □□□ **QC DATE:** □□/□□□/□□□□

CRF COMPLETED BY: □□□

MATERNAL PID: - Date: / /

9. EPDS Visit 1, Version 1

Sifuna ukwasi ukuba ubuziva njani kwiveki ephelileyo. Sicela ukhethe iimpendulo ezikufutshane nendlela ozive ngayo kwi veki edlulileyo, hayi nje indle oziva ngayo namhlanje. ***We would like to know how you have been feeling in the past week. Please choose the answer that comes closest to how you have felt in the past week, not just how you feel today. Please read all the options for each statement.***

		0	1	2	3
1	Ndibenako ukuhleka nokubona icala lezinto ezinga lunganga. *I have been able to laugh and see the funny side of things*	Njengokuba ndihlala ndisenza *As much as I always could*	Hayi Kangako *Not quite so much now.*	Ngokuqinisekileyo akukho kangako ngoku *Definitely not so much now.*	Hayi azange *Not at all.*
2	Izinto ndizijonge ndinolonwabo *I have looked forward with enjoyment to things*	Njengokuba bendihlala ndisenza *As much as I ever did.*	Kancinci kunokuba bendihlala ndisenza *A little less than I used to.*	Kancinci kakhulu kunokuba bendisenza *Much less than I used to.*	Kungqabile ukuba kubenjalo. *Hardly at all.*
3	Bendizigxeka xa izinto zingandihambeli kakuhle ngaphandle kwesizathu. *I have blamed myself unnecessarily when things went wrong*	Ewe, ixesha elininzi *Yes, most of the time.*	Ewe, ngamanye amaxesha *Yes, some of the time.*	Hayi kangako *Not very much.*	Hayi azange *No, never*
4	Bendinxunguphele ndinexhala ngaphandle kwesizathu *I have been anxious or worried for no good reason*	Hayi konke konke *No, not at all.*	Kungqabile ukuba kubenjalo *Hardly ever.*	Ewe, ngamanye amaxesha *Yes, sometimes.*	Ewe kakhulu *Yes, very much.*
5	Ndizive ndisoyika ndinexhala ngaphandle kwesizathu *I have felt scared or panicky for no very good reason*	Ewe kakhulu *Yes, quite a lot.*	Ewe, ngamanye amaxesha *Yes, sometimes.*	Hayi kangako *No, not much.*	Hayi konke konke *No, not at all*
6	Izinto bezindongamela *Things have been getting on top of me*	Ewe, ixesha elininzi bedingakwazi ukuphumelela tu *Yes, most of the times I haven't been managing at all.*	Ewe, ngamanye amaxesha bendingakwazi ukuphumelela njengesiqhelo *Yes, sometimes I haven't been managing as well as usual.*	Hayi, ixesha elininzi bendiphumelela kakuhle kakhulu *No, most of the time I have managed quite well.*	Hayi, benoliphumelela njengesiqhelo *No, I have been managing as well as ever.*
7	Bendingonwabanga ndifumane ubunzima xa kufuneka ndilele *I have been so unhappy that I have had difficulty sleeping*	Ewe, ixesha elininzi *Yes, most of the time.*	Ewe, ngamanye amaxesha *Yes, sometimes.*	Hayi kangako *Not very much.*	Hayi konke konke *No, not at all.*
8	Ndiziva ndilusizi okanye ndingxunguphele *I have felt sad or miserable*	Ewe, ixesha elininzi *Yes, most of the time.*	Ewe, ngamanye amaxesha *Yes, sometimes.*	Hayi kangako *Not very much.*	Hayi konke konke *No, not at all.*
9	Bendingonwabanga ndisoloko ndililа *I have been so unhappy that I have been crying*	Ewe, ixesha elininzi *Yes, most of the time.*	Ewe, ngamanye amaxesha *Yes, sometimes.*	Hayi kangako *Not very much.*	Hayi konke konke *No, not at all.*
10	Ingcinga yokuzenzakalisa ithe yandifikela *The thought of harming myself has occurred to me*	Ewe kakhulu *Yes, quite a lot*	Ngamanye amaxesha *Sometimes*	Kungqabile ukuba kubenjalo. *Hardly ever*	Zange *Never*

QC COMPLETED BY: **QC DATE:** / /

CRF COMPLETED BY:

Apendix B: Ethics clearance

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: https://health.uct.ac.za/home/human-research-ethics

25 November 2022

HREC REF: 688/2022

Dr J Odayar
Division of Epidemiology & Biostatistics
School of Public Health
Email: Jasantha.Odayar@uct.ac.za
Student: Nqtkan001@myuct.ac.za

Dear Dr Odayar

PROJECT TITLE: BREASTFEEDING PRACTICES AMONG WOMEN LIVING WITH HIV WHO STARTED ANTIRETROVIRAL THERAPY IN PREGNANCY IN CAPE TOWN, SOUTH AFRICA (MASTERS - MS KANYO NALEDI NQETO)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 November 2023.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Ms Kanyo Nqeto will also be involved in this study.

Please quote the HREC REF 688/2022 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Hrec ref-688 2022

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

17 April 2015

HREC REF: 194/2015

Prof L Myer
Epidemiology & Biostatistics
Public Health & Family Medicine
Falmouth Building

Dear Prof Myer

PROJECT TITLE: POSTPARTUM ADHERENCE CLUBS FOR ANTIRETROVIRAL THERAPY (PACART)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th April 2016.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Yours sincerely

pp T Burgess

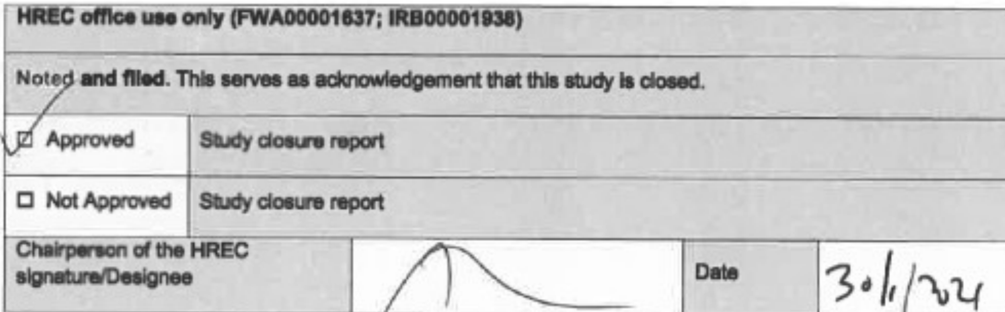
PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI),and Declaration of Helsinki guidelines.

UNIVERSITY OF CAPE TOWN
IYUNIVESITHI YASEKAPA • UNIVERSITEIT VAN KAAPSTAD

HUMAN RESEARCH ETHICS COMMITTEE
27 JAN 2021
HEALTH SCIENCES FACULTY

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS010: Study Closure Report



HREC office use only (FWA00001637; IRB00001938)			
Noted and filed. This serves as acknowledgement that this study is closed.			
☑ Approved	Study closure report		
☐ Not Approved	Study closure report		
Chairperson of the HREC signature/Designee	[signature]	Date	30/1/2021

Note: Please note that incomplete submissions will not be reviewed.
Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.

Please clarify your plan for research-related activities during COVID-19 lockdown

1. Principal Investigator to complete the following:

Date (when submitting this form)	21 Jan 2020
HREC REF Number	194/2015
Protocol Title	Postpartum Adherence Clubs for Antiretroviral Therapy
Protocol number (If applicable)	Protocol version 5, 01 March 2020
Principal Investigator	Professor Landon Myer
Department / Office Internal Mail Address	5th Floor Falmouth Building, Division of Epidemiology and Biostatistics, School of Public Health & Family Medicine

2. Please confirm (tick ✓)

This study is closed to enrollment	✓ Yes	☐ No
Participants have completed all research-related interventions	✓ Yes	☐ No
Participants have completed all research-related follow-up	✓ Yes	☐ No
Data analysis is complete	✓ Yes	☐ No
Your sponsored protocol is closed	✓ Yes	☐ No

Apendix C: Women's Health issues Journal guidelines

WOMEN'S HEALTH ISSUES

Official Publication of the Jacobs Institute of Women's Health

AUTHOR INFORMATION PACK

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- **Impact Factor p.1**
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ISSN: 1049-3867

DESCRIPTION

Women's Health Issues (WHI) is a peer-reviewed, bimonthly, multidisciplinary journal that publishes research and review manuscripts related to **women's health care** and **policy**. As the official journal of the Jacobs Institute of Women's Health, it is dedicated to improving the health and **health care** of all women throughout the lifespan and in diverse communities. The journal seeks to inform health services researchers, health care and public health professionals, social scientists, policymakers, and others concerned with women's health. It has a particular focus on women's issues in the context of the U.S. health care delivery system and policymaking processes, and it publishes both original research and commentaries.

Benefits to authors

We also provide many author benefits, such as free PDFs, a liberal copyright policy, special discounts on Elsevier publications and much more. Please click here for more information on our author services.

Please see our Guide for Authors for information on article submission. If you require any further information or help, please visit our Support Center

AUDIENCE

Health Professionals, Social Scientists, Policy Makers, and others concerned with the complex and diverse facets of health care delivery to women.

IMPACT FACTOR

2021: 3.053 © Clarivate Analytics Journal Citation Reports 2022

ABSTRACTING AND INDEXING

Sociological Abstracts

Cumulative Index to Nursing and Allied Health Literature

Embase

PubMed/Medline

Studies on Women Abstracts

Current Contents

Scopus

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GUIDE FOR AUTHORS

INTRODUCTION

Women's Health Issues is a peer-reviewed, bimonthly, multidisciplinary journal that publishes original research and commentaries on women's health care and policy.

The journal has a particular focus on women's issues in the context of the U.S. health care delivery system and policymaking processes, although it invites submissions addressing women's health care issues in global context if relevant to North American readers. As the official journal of the Jacobs Institute of Women's Health, it builds on a history of valuing methodologically rigorous investigation as a basis for improving the quality of health care for women and the health of women across the lifespan.

The journal seeks to inform health services researchers, social scientists, health care and public health professionals, and policymakers and to engage readers in the perspectives of multiple disciplines relevant to the study of women's health.

Please note that we do not accept for review clinical case reports or standard literature reviews. Systematic literature reviews and scoping reviews (see details below) and translational and implementation research studies are welcome.

At this time, we are not considering publication of manuscripts that report only descriptive statistics (e.g., only univariate analysis without accompanying qualitative findings or policy analysis). This is based on the fact that our small staff faces a large number of submissions and must prioritize them in some way, rather than any judgment about the value of such work, and we hope to be able to resume consideration of such manuscripts in the future.

The editorial board is also interested in empirical, methodological, and commentary pieces focused on the evaluation of sex and gender differences, with an emphasis on the reporting of stratified results over statistical adjustment.

All manuscripts are subject to peer-review under the direction of the editors. Published manuscripts are abstracted and indexed in leading services, including Cumulative Index to Nursing and Allied Health Literature, EMBASE/Excerpta Medica, Index Medicus, ISI's Current Contents/Social & Behavioral Sciences Research Alert and Social SciSearch, Sociological Abstracts, and Studies on Women Abstracts. Unsolicited manuscripts are invited

that address women's health issues relating to the mission of the journal. Further information is available at http://publichealth.gwu.edu/projects/jiwh. The Journal is available online at http://whijournal.com and on www.ScienceDirect.com.

BEFORE YOU BEGIN

Ethics in Publishing

For information on Ethics in publishing and Ethical guidelines for journal publication see https://www.elsevier.com/publishingethics and https://www.elsevier.com/journal-authors/ethics. Ethical Approval of Studies and Informed Consent: If applicable, all manuscripts reporting data from studies involving human participants should include a statement that the research protocol was approved by the relevant institutional review boards or ethics committees. State in the Methods section the manner in which informed consent was obtained from the study participants (i.e., oral or written). For those investigators who do not have formal ethics review committees, the principles outlined in the Declaration of Helsinki of 1975 and as revised in 2000, should be followed. This requirement is in compliance with "Protection of Human Subjects and Animals in Research" described by the International Committee of Medical Journal Editors (http://www.icmje.org/#protect).

Editorial policy for ethics reviews in manuscripts reporting quality improvement studies

The editors of *Women's Health Issues* encourage submission of manuscripts that assess the impact of various quality improvement initiatives in health care. These initiatives may be at the system, organization, clinic, or provider levels. Often the evaluation of these initiatives involves collection of data from patients, health care providers, staff, trainees, or others. Policies and practices with respect to ethics reviews for quality improvement projects vary, and institutional policies are not consistent.

Accordingly, the editorial board of *Women's Health Issues* has adopted the following policy for manuscripts based on quality improvement projects that are submitted to the journal for possible publication.

1. When the manuscript is based on quality improvement activities conducted at an academicinstitution or a health care organization with an Institutional Review Board, or when the author of the manuscript is employed at an academic institution or a health care organization with an IRB, the author of the manuscript is required to provide a statement to the effect that the study was or was not reviewed by the IRB. If the study was not reviewed by the IRB, the reason must be stated. If the study met the IRB's criteria for exemption or if the study was determined to not constitute research, then that should be explicitly stated.

2. When the manuscript is based on quality improvement activities conducted at an academicinstitution or a health care organization without an IRB or at an academic institution or a health care organization that does not regard quality improvement efforts as research involving human subjects, then the authors are required to provide a statement to that effect.

The editors reserve the right to contact the authors to clarify the situation or to confirm that ethical practices were used in the conduct of the study.

Whether to proceed to peer review is at the Editor's discretion. Inquiries about this policy may be directed to the Editor-in-Chief of *Women's Health Issues.*

Conflict of Interest

All authors must disclose any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. Examples of potential conflicts of interest include employment, consultancies, stock ownership, honoraria, paid expert testimony, patent applications/ registrations, and grants or other funding. See also https://www.elsevier.com/conflictsofinterest.

Submission Declaration

Submission of an article implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see https://www.elsevier.com/postingpolicy), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere including electronically in the same form, in English or in any other language, without the written consent of the copyright-holder. Further to this policy, each author must attest to the following statement in the cover letter: "I certify that this material has not been published previously and is not under consideration by another journal. I further certify that I have had substantive involvement in the preparation of this manuscript and am fully familiar with its content."

Submission declaration and verification

Submission of an article implies that the work described has not been published previously (except in the form of an abstract, a published lecture or academic thesis, see 'Multiple, redundant or concurrent publication' for more information), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyrightholder. To verify compliance, your article may be checked by Crossref Similarity Check and other originality or duplicate checking software.

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Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Content should make no assumptions about the beliefs or commitments of any reader; contain nothing which might imply that one individual is superior to another on the grounds of age, gender, race, ethnicity, culture, sexual orientation, disability or health condition; and use inclusive language throughout. Authors should ensure that writing is free from bias, stereotypes, slang, reference to dominant culture and/or cultural assumptions. We advise to seek gender neutrality by using plural nouns ("clinicians, patients/clients") as default/wherever possible to avoid using "he, she," or "he/she." We recommend avoiding the use of descriptors that refer to personal attributes such as age, gender, race, ethnicity, culture, sexual orientation, disability or health condition unless they are relevant and valid. When coding terminology is used, we recommend to avoid offensive or exclusionary terms such as "master", "slave", "blacklist" and "whitelist". We suggest using alternatives that are more appropriate and (self-) explanatory such as "primary", "secondary", "blocklist" and "allowlist". These guidelines are meant as a point of reference to help identify appropriate language but are by no means exhaustive or definitive.

Reporting sex- and gender-based analyses

Reporting guidance

For research involving or pertaining to humans, animals or eukaryotic cells, investigators should integrate sex and gender-based analyses (SGBA) into their research design according to funder/ sponsor requirements and best practices within a field. Authors should address the sex and/or gender dimensions of their research in their article. In cases where they cannot, they should discuss this as a limitation to their research's generalizability. Importantly, authors should explicitly state what definitions of sex and/or gender they are applying to enhance the precision, rigor and reproducibility of their research and to avoid ambiguity or conflation of terms and the constructs to which they refer (see Definitions section below). Authors can refer to the Sex and Gender Equity in Research (SAGER) guidelines and the SAGER guidelines checklist. These offer systematic approaches to the use and editorial review of sex and gender information in study design, data analysis, outcome reporting and research interpretation - however, please note there is no single, universally agreed-upon set of guidelines for defining sex and gender.

Definitions

Sex generally refers to a set of biological attributes that are associated with physical and physiological features (e.g., chromosomal genotype, hormonal levels, internal and external anatomy). A binary sex categorization (male/female) is usually designated at birth ("sex assigned at birth"), most often based solely on the visible external anatomy of a newborn. Gender generally refers to socially constructed roles, behaviors, and identities of women, men and gender-diverse people that occur in a historical and cultural context and may vary across societies and over time. Gender influences how people view themselves and each other, how they behave and interact and how power is distributed in society. Sex and gender are often incorrectly portrayed as binary (female/male or woman/man) and unchanging whereas these constructs actually exist along a spectrum and include additional sex categorizations and gender identities such as people who are intersex/have differences of sex development (DSD) or identify as non-binary. Moreover, the terms "sex" and "gender" can be ambiguous—thus it is important for authors to define the manner in which they are used. In addition to this definition guidance and the SAGER guidelines, the resources on this page offer further insight around sex and gender in research studies.

Changes to authorship

Authors are expected to consider carefully the list and order of authors **before** submitting their manuscript and provide the definitive list of authors at the time of the original submission. Any addition, deletion or rearrangement of author names in the authorship list should be made only **before** the manuscript has been accepted and only if approved by the journal Editor. To request such a change, the Editor must receive the following from the **corresponding author**: (a) the reason for the change in author list and (b) written confirmation (e-mail, letter) from all authors that they agree with the addition, removal or rearrangement. In the case of addition or removal of authors, this includes confirmation from the author being added or removed.

Only in exceptional circumstances will the Editor consider the addition, deletion or rearrangement of authors **after** the manuscript has been accepted. While the Editor considers the request, publication of the manuscript will be suspended. If the manuscript has already been published in an online issue, any requests approved by the Editor will result in a corrigendum.

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Data Access and Responsibility

For all reports (regardless of funding source) containing original data, at least one (1) named author (e.g., the principal investigator) who is independent of any funder or sponsor should indicate that she or he "had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis." This exact statement should be included in the *Acknowledgments* section on the Title Page of the manuscript. Modified statements or generic statements indicating that all authors had such access are not acceptable.

These requirements are consistent with "Potential Conflicts of Interest Related to Project Support" described by the International Committee of Medical Journal Editors (http://www.icmje.org/#conflicts).

Elsevier will send to PubMed Central the author's manuscript on behalf of authors reporting research supported by an NIH grant. The author manuscript reflects any author-agreed changes made in response to peer-review comments. Elsevier will authorize its public access posting on PubMed Central 12 months after final publication. Authors will receive further correspondence from PubMed Central after the manuscript is deposited.

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Language (Usage and Editing Services)

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Women's Health Issues uses the serial (Oxford) comma.

Submission

Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

Submit your article

Please submit your article via https://www.editorialmanager.com/whi.

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Please submit, with the manuscript, the names, addresses and e-mail addresses of three potential referees. Note that the editor retains the sole right to decide whether or not the suggested reviewers are used.

PREPARATION

Manuscript Length and Type

This journal accepts two kinds of submissions:

Full-length articles: These report the results of original research and contain the "Article structure" elements listed below. Full-length article manuscripts should contain 2,000 to 4,000 words, excluding front matter, references, and tables and figures. Systematic literature reviews and Policy Matters submissions fall into this category and have additional requirements described below.

Commentaries: Commentaries should make a compelling, novel, evidence-based argument for a research or policy agenda related to any aspect of women's health. Arguments should be supported by references. Commentary submissions will be evaluated based on the topic's timeliness and importance, strength of the argument, use of evidence, and overall writing quality, including clarity and flow. Commentary manuscripts do not require abstracts and do not need to follow the structure of full-length articles. The text should contain no more than 2,000 words.

Each submission from either of these categories must include a Cover Letter and a Title Page as well as a blinded Manuscript without Author Details. If a manuscript is revised and re-submitted, the revision must be accompanied by a Response to Reviewers and by an Author Biography file if this was not submitted with the original manuscript.

Systematic Literature Reviews We consider two types of reviews for publication: systematic literature reviews and scoping reviews. Reviews must address a clear research question of importance to women's health and of interest to WHI readers. Both types of reviews should provide detailed information about how the review was

conducted, particularly the inclusion criteria for identifying the studies reviewed. Systematic literature reviews must include data syntheses (rather than just summaries of published work) and evaluate the quality of included studies; see the Cochrane Collaborative for examples. Scoping reviews must be clear about how authors determined the types of studies to include, the quality of evidence they provide, and how those decisions affected conclusions about what is known and the gaps in knowledge. Please note that we do not accept for review clinical case reports or literature reviews that do not meet these standards for transparency and rigor.

Policy Matters We invite authors to submit scholarly, thoughtful, and timely policy analyses related to various issues affecting women's health. These could include, for example: Policy implications of proposed legislation, regulations, judicial decisions at the federal, state, and local levels as they may affect women's health; Policy implications of current and future developments in programs integral to women's health (e.g., Medicaid, Medicare, community health, Healthy Start, WIC, family planning, public health, and private sector insurance coverage); Scholarly policy analyses of health and social issues affecting women's health from a historical perspective, e.g., the effects of delinking Medicaid from welfare and subsequent reproductive health choices, or the effects of state and national health reform efforts on women's health; and, Scholarly policy analyses that contribute to our understanding of how effective policy actions can improve the scope and quality of women's health care services and the organization, financing, and delivery of these services.

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