## **Adherence to antiretroviral therapy and associated psychosocial factors among mothers attending antenatal clinics in selected public referral hospitals in Nairobi County, Kenya.**

**ABSTRACT**

**Background:** Adherence to antiretroviral therapy may be affected by various psychosocial factors but there is scant literature to support this in resource constrained settings. The study aimed at assessing the level of adherence to antiretroviral therapy and the associated psychosocial factors among mothers attending antenatal clinics at Mbagathi and Kenyatta National Hospitals.

**Methods:** This was a descriptive cross-sectional study conducted between the **months of April and July 2023** among 70 HIV infected mothers attending the antenatal clinics. Assessment on level of adherence to antiretroviral therapy was done using the well-established 8-scale Morisky Medication adherence tool. The associated psychosocial support was assessed using the documented Multidimensional Scale for Perceived Social Support tool. Data analysis was done using IBM Statistical Package for Social Sciences version 23. Statistical associations with P<0.05 were considered statistically significant.

**Results:** The mean age of the study population was 32.3 (SD 5.78), had attained at least a secondary school education level (47.1%), married (75.7%) and **participants’ average duration on antiretroviral therapy (ART) was 6 months**. Adherence to antiretroviral therapy was at 78.8% among the mothers, with low, moderate and high adherence at 47.1%, 21.4% and 31.4% respectively. The levels of social support were low (47.1%), moderate (45.7%) and high social support (7.1%). There was a statistically significant association between level of education and adherence (**aOR= 0.276, 95%CI: 0.075 – 1.019,** **P=0.05**) but **no statistically significant association between adherence and the level of psychosocial support.**

**Conclusion:** **The level of adherence to antiretroviral therapy among the mothers was suboptimal but this was not associated with the level of psychosocial support accorded** but with low academic achievements. **Adherence mechanisms should therefore be intensified among mothers with low education level. Further studies to underscore other potential barriers to adherence such as side effects of antiretroviral therapy and socio-economic variables are recommended.**

**Key words:** Antiretroviral therapy**,** Adherence, Antenatal Clinic mothers, Psychosocial support.

**Abbreviations**

**ART:** Antiretroviral Therapy

**ARVs:** Antiretrovirals

**ANC:** Antenatal Clinic

**KNH:** Kenyatta National Hospital

**KMTC:** Kenya Medical Training College

**U.o.N:** University of Nairobi

**NACOSTI:** National Commission for Science and Technology

1. **Introduction**

Antiretroviral therapy (ART) in pregnancy focuses on treatment of maternal HIV and lowering of perinatal transmission rate (Nthala et al., 2019). It lowers perinatal transmission by reducing maternal antepartum viral load and prophylactic management of the newborn, both of which require optimal adherence to the treatment (Nthala et al., 2019). Optimal adherence is defined as taking 95% of the prescribed antiretrovirals (ARVs) on time (Igwebe et al., 2010). Suboptimal adherence includes discontinuations, treatment interruptions, late or missed doses, partial or subtherapeutic dosing (HIV.gov Guideline 2022).

Studies have indicated that adherence to antiretroviral therapy is associated with improved treatment outcome (Fedlu et al., 2020). In expectant mothers, it also ensures reduced viral load prior to delivery and during breastfeeding, both of which reduce chances of vertical transmission (Wondimu et al., 2020). Reduced adherence is associated with development of resistance to the antiretroviral therapy and poor clinical outcomes (Mukosha et al., 2020).

**The global adherence rates of ART have been shown to vary between 35 to 93.5% but in sub–Saharan Africa, the rate is at 73.5% (Adenyi et al., 2018; Abebe et al., 2022). In some countries in East Africa, the adherence to ARV among antenatal clinic (ANC) mothers is as high as 76.8% (Mukose et al., 2021). In Kenya, the general adherence rates for ART among patients ranges between 65 and 87% (Odeny et al., 2018)**. There are no documented studies on adherence rates of ART among Kenyan mothers attending ANCs. There are various psychosocial obstacles that hinder attainment of optimal adherence among the seropositive ANC mothers. Barriers to ART adherence include lack of support from the spouse, stigma, and discrimination (Kalungwe et al., 2022).

Social support is defined as a system of material or spiritual support from all societal aspects including spouse, parents, friends and relatives (Li et al., 2021). Social and family support gives motivation, provides encouragement and reminders on taking the ARVs timely and diligently (Okonji et al., 2020). Additionally, good psychosocial support improves ARV adherence by 1.4 times (Habibi et al., 2021). Studies have documented that the prevalence of perceived social support is at 22.1%, 47.2% and 30.7% for high, middle and low social support, respectively (Berhe et al., 2022).

Several psychosocial factors have been reported to influence adherence to ART. Globally; emotional distress and low self-efficacy were regarded as barriers to therapy (Adenyi et al., 2018). African studies reported stigma, depression and poor attitude by healthcare workers as obstacles to adherence (Opara et al., 2022). Studies in Kenya have reported depression as the key deterrent to retention in care and adherence to ART among mother attending antenatal clinics (Kogo et al., 2018).

Adherence may also be affected by the socio-demographic characteristic of the ANC mother(s). Some of the documented deterrents of adherence to therapy include increased maternal age, extremes of parity, and low education level (Igwebe et al., 2010). Other studies have documented young maternal age and separation as hinderance to ART among the seropositive mothers (Mukosha et al., 2020).

There is scant literature on the associated factors of adherence to ART among mothers attending ANCs in resource limited settings. The present study determined the level of adherence to ARV treatment among the seropositive ANC mothers as well as the associated psychosocial support.

**2. Methodology**

**2.1 Study Area and Site**

The study was conducted in Nairobi County, Kenya. It was a hospital-based study at selected public referral hospitals in Nairobi County. The selected hospitals were Kenyatta National Hospital (KNH) and Mbagathi County Hospital. Kenyatta National Hospital is the largest teaching and referral hospital in Kenya. It is situated in the capital city, Nairobi and serves as the teaching hospital for the University of Nairobi and Kenya Medical Training College (KMTC) health science students. Mbagathi County Hospital is a level 5 hospital in Nairobi, Kenya and is approximately 1.7 km away from KNH. The close proximity and busy nature of the hospitals suggest that patients overflow from either institution. The study was carried out at the ANCs of the said hospitals. There were 70 HIV infected mothers attending the ANCs of the selected hospitals with KNH 36 while Mbagathi County Hospital had 34. The two institutions are major public referral hospitals in Kenya. Antenatal clinics are specialized clinics that provides distinct services and care to pregnant mothers.

**2.2 Study Population**

Antenatal clinic mothers with HIV infection who were on ARVs were targeted. This included all adult mothers (>18 years) in the reproductive age bracket. All pregnant mothers were included regardless of the trimester provided they had been on ART for at least a month. It takes about a month for the patient to stabilize and adapt to the treatment hence the choice of a month’s duration of ART. Additionally, some of the adherence questions enquire about the adherence behavior in the last two weeks hence the choice of one month. Pregnant mothers aged less than 18 years were excluded. This is because mothers under the age of 18 years are minors and, in most cases, school going children. Pregnancy at this age is unwanted and stigmatized. The mothers therefore receive very low level of psychosocial support if any. If considered in the study, they would record an exceedingly low level of psychosocial support hence the exclusion. Expectant mothers with confirmed diagnosis of HIV/AIDS but who were not on ART and those on ART for less than a month were also excluded.

**2.3 Sample Magnitude and Selection Method**

The major study outcome was adherence to ART as measured by the 8 – scale Morisky tool. The total target population in the 2 hospitals was less than 100, therefore, participants were sampled based on universal sampling technique. Eligible participants were invited to participate as they came for their clinic appointments. A sample of 36 Participants from KNH and 34 participants were recruited from Mbagathi County Hospital based on the total respective target population in the 2 hospitals.

Recruitment of participants occurred between 0800 hours to 1300 hours every day excluding the weekends. This continued until the desired sample size was achieved. The sampling frame was from all the described HIV positive ANC mothers from the two selected hospitals.

**2.4 Study Methods**

Approval to undertake the study was sought and obtained from Kenyatta National Hospital /University of Nairobi Ethics and Review Committee (KNH/U.o.N – ERC) vide reference P856/11/2022 as well as National Commission for Science and Technology (NACOSTI) (through NACOSTI/P/23/24868). Permission to conduct the study was further sought and granted by Nairobi City County (Ref NCCG/DHS/REC/365). The study was also approved by Kenyatta National Hospital (Ref RH/535/2023) as well as Mbagathi County Hospital (Ref NCCG/DHS/REC/365).

Structured interviewer administered questionnaire which was tested and standardized before the main study was used as the formal tool for data collection. The questionnaire was organized in sections capturing demographic data including age, trimester of pregnancy, religion, level of education, marital status, employment status, history of alcohol consumption and history of smoking. The second part of the questionnaire focused on assessing the level of adherence to ART using the Morisky tool and the third part was on determining psychosocial support level accorded to the mothers using the Multidimensional Scale for **Perceived** Social Support. The aforementioned tools have been validated, are widely accepted and used globally.

The Morisky tool is comprised of 8 items. The first 7 questions were graded 0 or 1 depending on a ‘No’ or ‘Yes’ response given. The last question was scaled between 0 – 4. The total score was summated. A score of 8, 6 – 7, <6 was regarded as high, medium and low adherence respectively. The Multidimensional Scale for Perceived Social Support comprised of 12 questions for assessing the level of perceived psychosocial support from friends, family and a significant other. The responses were rated between 1 – 7. Upon completion, summation of the score was done. The mean score was calculated by dividing the total score by the 12 items. Scores of 1 – 2.9, 3 – 5, 5.1 – 7, were regarded as low, moderate and high psychosocial support respectively.

Interested participants who fulfilled the inclusion criteria were issued with consent forms and taken through the consent process.Any question or clarification thereof was addressed. Upon getting satisfied and giving the consent to participate, the participant was enrolled into the study. This was done in seclusion in a separate room.

**2.5 Data Management and Statistical Analysis**

The questionnaires were coded to ensure privacy.The filled questionnaires were verified again by the principal investigator to ensure correct data entry and proper coding. Data was then entered into IBM Statistical Package for Social Sciences (SPSS) Chicago Illinois version 23 and cleaned. The verification and cleaning helped in removing erroneous entries. Analysis was done using IBM SPSS version 23. Summary statistics were done with continuous variables such as age summarized using mean and standard deviation while categorical variables such as employment status and level of education presented by calculating proportions. Prevalence of perceived social support was computed and presented as percentages. Inferential data analysis was then done with association between adherence and social support determined by use of chi squared test or Fischer’s exact test of association. The outcome variable (ART adherence) was dichotomized into low and high and binary logistic regression analysis was used to determine the independent predictors of ART adherence. Odds ratios (ORs) and P-values were used to determine the strength of association between the variables investigated. The confidence level of 95% was set throughout the data analysis. Result was presented in figures and tables where appropriate.

**3.0 Results**

A total of seventy participants were recruited into the study, with 36 from KNH and 34 from Mbagathi County Hospital. Table 1 shows the sociodemographic and clinical characteristics of the respondents.

**Sociodemographic characteristics of the study population**

The mean age of the study population was 32.3 (SD= 5.78) with a range of 18 – 50 years with majority being 18 – 35 at 67.1%. The participants were mainly Christians (94.3%). Most participants had attained at least a secondary school education level at 47.1%, were employed (64.3%) and married (75.7%). None of the participants had a history of smoking but 10% had a history of alcohol consumption (**Table 1**).

**Adherence to antiretroviral therapy among pregnant mothers**

**Figure 1** shows adherence to ART among the seropositive ANC mothers. The prevalence of ART adherence was 78.8% with a mean ART adherence score of 6.3 (SD= 1.65). The ART adherence was divided into 3: low adherence at 47.1%, moderate adherence (21.4%) and high adherence (31.4%) (**Figure 1**).

**Prevalence of psychosocial support among seropositive mothers**

**Table 1** shows the prevalence of social support among the seropositive ANC mothers. The social support level was stratified into 3 using the Multidimensional Scale for Perceived Social Support. The levels of social support were low (47.1%), moderate (45.7%) and high social support at 7.1% (**Table 1**).

**Association between sociodemographic and adherence to ART**

Association between socio-demographic variables and adherence to ART are as shown in **Table 2.**

There were no statistically significant findings between the clinical characteristics of the patients and adherence to ART. However, lower age (18 – 35) was associated with lower odds of adherence (OR 0.8, 95%CI 0.275 – 2.300, P 0.672). Christians had lower odds of adherence to ART (OR 0.667, 95%CI 0.562 – 0.791, P 0.301) compared to their muslim counterparts though this was not statistically significant. Participants with tertiary level of education were almost four times more likely to be adherent to the ART therapy than those with primary level of education. In comparison to the unemployed, getting employed reduced the odds of ART adherence by almost half (OR 0.545, 95%CI 0.193 – 1.540, P 0.250). Negative history of alcohol consumption tripled the odds of ART adherence (**Table 2**).

**Association between adherence to ART and psychosocial factors**

**Table 2** shows the association between adherence to ART and psychosocial support. There was no statistically significant association between ART adherence and the level of psychosocial support accorded to the mothers (**Table 2**)

**Independent predictors of adherence to ART among the seropositive pregnant mothers**

Independent predictors of adherence to ART among the seropositive ANC mothers is as shown in **Table 3**

Mothers in third trimester were 2.5 times more likely to adhere to ART than their counterparts in first trimester (aOR=2.557, 95% CI = 0.720 – 9.084, P=0.147). Low education level was associated with statistically significant decrease in adherence to ART with participants having secondary or lower education level having 0.2 8 times odds of ART adherence (aOR=0.276, 95%CI= 0.075 – 1.019, P= 0.05). Married mothers had 0.6 times odds of ART adherence (aOR= 0.645, 95%CI= 0.149 – 2.789, P= 0.558). Negative history of alcohol consumption reduced ART adherence by almost half (aOR= 0.560, 95%CI= 0.042 – 7.559, P= 0.662) (**Table 3**)

**Table 1: Socio-demographic characteristics and social support accorded to the participants (N= 70)**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | Frequency (N=70) | Percentage (%) |
| Age Mean (SD) | **18-35** | 47 | **67.1** |
| 36-50 | 23 | 32.9 |
| 32.33(5.775) |
| Trimester | 1st | 12 | 17.1 |
| 2nd | 27 | 38.6 |
| **3rd** | 31 | **44.3** |
| Religion | **Christian** | 66 | **94.3** |
| Muslim | 4 | 5.7 |
| Level of education | primary | 9 | 12.9 |
| **secondary** | 33 | **47.1** |
| Tertiary | 28 | 40.0 |
| Marital status | **Married** | 53 | **75.7** |
| Not married | 17 | 24.3 |
| Employment status | **Employed** | 45 | **64.3** |
| Not employed | 25 | 35.7 |
| History of alcoholconsumption | **No** | 63 | **90.0** |
| Yes | 7 | 10.0 |
| History of smoking | No | 70 | 100.0 |
|  |  |  |  |
|  Social support | **Low** | 33 | **47.1** |
| Moderate | 32 | 45.7 |
| High | 5 | 7.2 |
|  |  |  |  |

**Table 2: Association between socio-demographic and psychosocial factors with adherence**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sociodemographic | Category | ART adherence (N=70) | OR (95%CI) | P-value |
| Low(n=48) | High (n=22) |
| Age | 18-35 years | 33(68.75%) | 14(63.64%) | 0.795(0.275,2.30) | **0.672** |
| 36-50 years | 15(31.25%) | 8(36.36%) | **Ref** |  |
| Trimester | 1st  | 9(18.75%) | 3(13.64%) | **Ref** |  |
| 2nd | 21(43.75%) | 6(27.27%) | 1.167(0.238,5.726) | **0.849** |
| 3rd  | 18(37.50%) | 13(59.09%) | 0.462(0.104,2.045) | **0.309** |
| Religion | Christian | 44(91.67%) | 22(100.00%) | 0.667(0.562, 0.791) | **0.301** |
| Muslim | 4(8.33%) | 0(0.00%) | **Ref** |  |
| Education level | Primary | 5(10.41%) | 4(18.18%) | **Ref** |  |
| Secondary | 20(41.67%) | 13(59.09%) | 1.231(0.228,5.454) | **0.785** |
| Tertiary | 23(47.92%) | 5(22.73%) | 3.680(0.719,18.824) | **0.118** |
| Marital status | Married | 36(75.00%) | 17(77.27%) | 1.133 (0.344, 3.733) | **0.837** |
| Not married | 12(25.00%) | 5(22.73%) | **Ref** |  |
| Employment status | Employed | 33(68.75%) | 12(54.55%) | 0.545(0.193, 1.540) | **0.250** |
| Not employed | 15(31.25%) | 10(45.45%) | **Ref** |  |
| History of alcohol consumption | Yes | 6(12.50%) | 1(4.55%) | **Ref** |
| No | 42(87.50%) | 21(95.45%) | 0.333(0.038,2.951) | **0.420** |
| Psychosocial support | High | 23(47.92%) | 10(45.45%) | **Ref** |
| Low | 25(52.08%) | 12(54.55%) | 1.104(0.401,3.038) | **0.848** |

**Table 3: Independent predictors of adherence to ART among seropositive pregnant mothers**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Category | Bivariate analysis | Multivariate analysis |
| Crude OR (95%CI) | P-value | Beta | df | Adjusted OR (95%CI) | P-value |
| Constant |   |   |   | 22.715 | 1 |   | 0.999 |
| Age | 18-35 years | 0.795(0.275,2.30) | 0.672 | 0.192 | 1 | 1.211(0.355, 4.137) | 0.760 |
| 36-50 years | Ref |   |   |
| Trimester | 1st  | Ref |   | 2 |   | 0.341 |
| 2nd | 1.167(0.238,5.726) | 0.849 | 0.574 | 1 | 1.776(0.338, 9.323) | 0.497 |
| 3rd  | 0.462(0.104,2.045) | 0.309 | 0.939 | 1 | 2.557(0.720,9.084) | 0.147 |
| Religion | Chirstian | 0.667(0.562,0.791) | 0.301 | -21.173 | 1 | 0.000(0.00, ∞) | 0.999 |
| Muslim | Ref |   | 1 |   |
| Education level | Secondary and below | 3.128(0.994,9.846) | **0.046** | -1.286 | 1 | 0.276(0.075, 1.019) | 0.05 |
| Tertiary | Ref |
| Marital status | Married | 1.133(0.344,3.733) | 0.837 | -0.438 | 1 | 0.645(0.149, 2.789) | 0.558 |
| Not married | Ref |  |  |  |  |  |
| Employment status | Employed | 3.00(0.339,26.561) | 0.42 | 0.616 | 1 | 1.851(0.578, 5.930) | 0.300 |
| Not employed | Ref |   |   |   |   |
| History of alcohol consumption  | No | 0.545(0.193,1.540) | 0.25 | -0.580 | 1 | 0.560(0.042, 7.559) | 0.662 |
| Yes | Ref |   |   | 1 |   |
| Social support | low | 1.104(0.401, 3.038) | 0.848 | -0.197 | 1 | 0.822(0.240, 2.813) | 0.754 |
| High | ref |

**Adherence to ART among the study patients**

Figure 1 shows the adherence to ART among the ANC mothers studied.

**Figure 1 ART adherence**

**4.0: Discussion**

The aim of the study was to underscore the burden of stigma and inadequate family - social support and its influence on ART adherence among HIV infected ANC mothers attending clinics at KNH and Mbagathi County Hospital.

General adherence rate of 78.8% was recorded among the seropositive mothers. The adherence rate is in close range with 73.5% rate reported in Ethiopia and 76.8% in central Uganda (Abebe et al., 2022; Mukose et al., 2021). However, relatively lower and higher figures have been reported elsewhere. Adherence rate as low as 31.9% has been reported in Malawi and rates as high as 95.97% documented in Uganda (Tsegaye et al., 2020). The conflicting findings in the latter studies could be caused by the differences in the study design which were systemic review and meta-analysis against the cross-sectional design employed by the present study.

The social support level was categorized into 3 using the Multidimensional Scale of Perceived Social Support. The overall social support was rated at 45.7% which mirrored a study done in Kenya which recorded rate of 43.9% (Yator et al., 2021). However, the study contrasted a previous study done at public hospitals in Gamo zone, southern Ethiopia which reported 30.7%, 47.2% and 22.1% for low, moderate and high family-social support respectively (Okonji et al., 2020). The difference in the latter study is possibly attributable to the larger sample size of 423 against 70 in the present study.

Factors associated with adherence to ART vary from sociodemographic to psychosocial contexts. The present study has demonstrated that employment reduced odds of ART adherence. This is in tandem with a study done in Eastern cape, South Africa where employment and work-related demands were illustrated as obstacles against adherence to ART (Adenyi et al., 2018). Low level of education reduced adherence to ART as evident in participants with secondary and lower level of education (OR= 0.276, 95%CI 0.075– 1.019, P= 0.05). This is in concurrence with a study in Uganda, Greece and Nigeria that revealed that low or lack of formal education acted as hindering factor to retention in care and adherence to therapy (Masereka et al., 2019; Pontiki et al., 2022; Igwebe et al., 2010).

The study did not establish a statistically significant association between psychosocial support and adherence. The lack of association was also shown by a study in Kwazulu-Natal, South Africa (**George and McGrath, 2018**). However, this contradicts with the findings from a systemic review and meta-analysis, a study in South Africa and in southern Brazil which reported statistically significant association (Berhe et al., 2021; Psaros et al., 2020; Oliveira RDS et al., 2020). Adequate awareness and previous counselling services may have influenced social support, hence obscuring the association.

**Strengths and limitations of the study**

The major limitation of the study was the reliance on self-report of adherence and associated psychosocial factors. This was not ascertained by objective diagnostic review and therefore patients may have over or under reported the factors under study. However, to limit the subjective reporting of adherence and psychosocial factors by the patients, the care giving nurses ensured that patients were comfortable and could confide with their care providers throughout the data collection process. Using universal sampling technique ensured that all the seropositive mothers at the clinics enrolled in the research thereby increasing the power of the study.

**Conclusion**

The level of ART adherence among the seropositive ANC mothers is suboptimal (78.8%). **There was no statistically significant association between ART adherence and the level of psychosocial support accorded** to the seropositive mothers. However, a high level of education was associated with better adherence to ART. Therefore, **ART adherence mechanisms should be intensified among mothers who have not attained tertiary education level**. **Further studies to underscore other potential barriers to ART adherence including side effects of ARV medicine and socio-economic factors are recommended.**

**Acknowledgements**

The authors wish to thank the patients at Mbagathi and KNH for their participation and contribution to the study.

**Disclaimer (Artificial Intelligence)**

**Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of this Manuscript.**

**Competing interests**

The authors declare no competing interests.

**Authors’ contributions**

The idea was conceived by A.M who wrote the protocol with the help of DN and BA. Data was collected and analyzed by AM. DN and BA participated in interpretation of the data. All authors reviewed and approved the manuscript for publication.

**Consent**

A written voluntary informed consent has been obtained prior to the formulation and conduction of this study.

**Ethical approval**

Institutional Ethical Committee approval has been obtained prior to the formulation and conduction of the study as illustrated in the methodology section (Check 2.4: Study methods).

**References**

Abebe W, Gebremariam M, Molla M, Teferra S, Wissow L and Ruff A. Prevalence of depression among HIV positive pregnant women and its association with adherence to antiretroviral therapy in Addis Ababa, Ethiopia. 2022 PLos ONE 17 (1): e0262638. Published online 2022 Jan 20.

Adenyi OV, Ajayi AI, Ter Goon D, Owolabi EO, Eboh A and Lambert J. Factors affecting adherence to antiretroviral therapy among pregnant women in the Eastern Cape, South Africa. BMC Infect Dis 2018 Apr 13; 18 (1): 175.

Berhe H, Godana W, Boti SN, Birgoda GT, Gebresellasie L, Hussen S, Gebeyehu S. Perceived social support and associated factors among adults living with HIV/AIDS attending ART clinic at public hospitals in Gamo zone, southern Ethiopia 2021. HIV/AIDS (Auckl). 2022 March 14; 14: 103 – 117.

Fedlu A, Alie B, Mohammed SA, Adem F, Hassen A. Adherence to antiretroviral treatment for prevention of mother to child transmission of HIV in Eastern Ethiopia: A cross-sectional study. HIV/AIDS (Auckl) 2020 Nov 10; 12: 725 – 733.

George S, McGrath N. Social support, disclosure and stigma and the association with non-adherence in the six months after antiretroviral therapy initiation among a cohort of HIV positive adults in rural KwaZulu-Natal, South Africa. AIDS Care. 2019 Jul; 31 (7): 875 – 884. Published online 2018 Nov 25.

Habibi M, Rahardjo SS and Murti B. Association between HIV status disclosure, social support and adherence to antiretroviral therapy in adult patients with HIV/AIDS. Journal of Epidemiology and Public Health (2021), 06 (01): 112 – 124.

HIV gov. Guidelines for the use of antiretroviral agents in padeatric HIV infection. 2022 April 11.

Hope C Opara, Peace N Iheanacho, Blessing Nebo, Justin A Ingwu, Chinenye J Anetekhai and Agnes N Anarado. Factors affecting adherence to antiretroviral therapy among women attending HIV clinic of a tertiary health institution in Southeastern, Nigeria. Afr Health Sci. 2022 Mar; 22 (1): 456 – 464.

Igwebe AO, Ugboaja JO, Nwajiaku LA. Prevalence and determinants of non-adherence to antiretroviral therapy among HIV positive pregnant women in Nnewi, Nigeria. International Journal of Medicine and Medical Sciences. 2010 Aug. Vol 2 (8), pp 238 – 245.

Kalungwe M, Mbalinda SN, Karongo T, Simwanza NR, Mumba Mtambo CM, Nyashanu M. Exploring barriers to antiretroviral therapy adherence among pregnant women: a scoping literature review. International Journal of Gynecology and Obstetrics. 2022 Nov; 159 (2): 343 – 350.

Kogo J, Kumar M and Otieno J. The association between depression and non-adherence to antiretroviral therapy among pregnant women living with HIV. A cross-sectional study at the antenatal clinic of Kibera south health centre, Nairobi. U.o.N November 2018.

Li Y, Zhang XW, Liao B, Liang J, He WJ, Liu J, Yang Y, Zhang YH, Ma T and Wang JY. Social support status and associated factors among people living with HIV/AIDS in Kunming city, China. BMC public health. 2021 Jul 17; 21 (1): 1413.

Masereka EM, Ngabirano TD, Osingada CP, Wiltshire CS, Castelnuovu B and Kiragga AN. Increasing retention of HIV positive pregnant and breastfeeding mothers on option B plus by upgrading and providing full-time HIV services at a lower health facility in rural Uganda. BMC Public Health. 19, 950 (2019).

Mukose AD, Bastiaens H, Makumbi F, Buregyeya E, Naigino R, Musingizi J, Van Geertruyden JP, Wanyenze RK. What influences uptake and early adherence to option B+ (lifelong antiretroviral therapy among HIV positive pregnant and breastfeeding women) in central Uganda? A mixed method study. PLos one. 2021 May 5, 16(5): e0251181.

Mukosha M, Chiyesu G, Vwalika B. Adherence to antiretroviral therapy among HIV infected pregnant women in public health sectors. A pilot of Chilenje level one hospital Lusaka, Zambia. Pan African Medical Journal. 2020. Volume 35, Article 49, 19 Feb 2020.

Nthala V, Makasa M, Hazeemba A, Sitali D. Adherence to ART among pregnant women living with HIV/AIDS in Lusaka Urban. Journal of Public Health International. 2019 Jan 1, volume No: 1 issue No: 3 ISSN: 2641 – 4538.

Odeny TA, Onono M, Owour K, Helova A, Wanga I, Bukusi E, Turan M, Abuogi L. Maximizing adherence and retention for women living with HIV and their infants in Kenya (MOTIVATE study): study protocol for a randomized control trial. Trial 19, 77 (2018).

Okonji EF, Mukumbang FC, Orth Z, Vickerman – Delport SA, Van Way B. Psychosocial support interventions for improved adherence and retention in ART care for young people living with HIV (10 – 24 years): a scoping review. BMC public health. 2020 Dec; 20 (1): 1 – 1.

Oliveira RDS, Primeira MR, Santos WMD, Paula CC, Padoin SMM. Association between social support and adherence to antiretroviral treatment in people living with HIV. Rev Gaucha Enferm. 2020; 41: e20190290. Portuguese, English.

Pontiki G, Sarantaki A, Nikolaidis P, Lykeridou A. Factors affecting antiretroviral therapy adherence among HIV positive pregnant women in Greece: An exploratory study. Healthcare. 2022 Apr; 10 (4): 654. Published online 2022 Mar 31.

Psaros C, Smit JA, Mosery N, Bennett K, Coleman JN, Bangsberg DR, Safren SA. PMTCT adherence in pregnant South African women: The role of depression, social support, stigma and structural barriers to care. Ann Behav Med. 2020 Sept 1; 54 (9): 626 – 636.

Tsegaye R, Etafa W, Wakuma B, Mosisa G, Mulisa D, Tolossa T. The magnitude of adherence to option B plus program and associated factors among women in Eastern African countries. A systematic review and mete-analysis. BMC Public Health. 2020 Nov 27; 20 (1): 1812.

Wondimu F, Yetwale F, Admassu E, Binu W, Bulto G, Lake G, Girmaye E, Temesgen K and Marama T. Adherence to option B+ care for the prevention of mother to child transmission among pregnant women in Ethiopia. HIV/AIDS (Auckl) 2020; 12: 769 – 778.

Yator O, Mathai M, Albert T and Kumar M. Burden of HIV related stigma and post-partum depression: a cross-sectional study of patients attending prevention of mother to child transmission clinic at Kenyatta National Hospital in Nairobi. Front psychiatry. 2021 Feb 25; 11: 532557.