

Socio-demographic associations of HIV among antenatal care attendees in selected rural primary care facilities in South Africa's Eastern Cape province

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Abstract

Background

To effectively reduce vertical HIV transmission requires a reduction of HIV prevalence and incidence among pregnant women and a full understanding of its epidemiology. There is, however, literature paucity of HIV studies focusing on women attending antenatal care in rural areas in South Africa.

Methods

A Cross-sectional study of women attending antenatal care in four Primary Care facilities was conducted using an interviewer-administered questionnaire which collected information on socio-demographic characteristics and medical history. Binomial logistic regression analyses were used to determine factors associated with HIV and to estimate the prevalence ratio (PR). The 95% confidence interval (95%CI) is used for precision of estimates; $p \leq 0.05$ for statistical significance.

Results

A total of 343 participants were recruited. The antenatal HIV prevalence was 38.2% (95%CI: 33.2–43.9). Participants older than 40 years were 4.6 times significantly more likely to be HIV positive compared to teenagers (p -value = 0.019). Furthermore, multiparous, unemployed and employed participants, were significantly associated with 40%, 60% and 70% higher antenatal HIV prevalences respectively when compared to primigravidas or tertiary students (p -value < 0.0001).

Conclusion

Despite a 100% antenatal HIV testing rate, the antenatal HIV prevalence remains high and is increasing in this population, coupled with no spousal attendance in antenatal care and poor condom compliance. It is therefore important to remain vigilant and monitor mother-to-child transmission that could be associated with this increased prevalence.

Background

It is widely accepted that South Africa is facing a quadruple burden of diseases [1], where the main causes of illnesses and deaths are due to four groups, namely; communicable diseases including HIV/AIDS and TB; Other infectious disease, maternal mortality, child mortality, and malnutrition; non-Communicable diseases (NCDs) and; violence and injuries [1–3]. Vertical transmission of HIV from mother to child can take place during pregnancy, delivery and lactation [4]. The World Health Organization (WHO) European regions especially the Eastern and Central sub-regions reported an increase of HIV infection in infants and children during the perinatal period and lactation from 347 to 494 per 1000 live births between the years 2004 and 2011 [5, 6]. It is not clear what the rates are currently.

A 2009 to 2011 Kenyan study on the effectiveness of the Prevention of Mother-to-Child Transmission (PMTCT) programme showed improved immunity and viral load suppression of HIV positive pregnant women who were initiated on antiretrovirals (ARVs) [7]. In addition, 90% of their children were HIV negative [7]. UNAIDS previously estimated 330000 pregnant women to be HIV positive in South Africa in 2009, and 95% of them received ARVs through the PMTCT programme [8].

South Africa's PMTCT programme has gone through several phases from 2001, when the South African government was ordered by the country's apex court (constitutional court) to introduce effective PMTCT guidelines [9, 10]. There have been several versions of the guidelines since then, starting with the 2003 version which placed emphasis on the provision of nevirapine, the extension of treatment to all HIV-infected pregnant women and their children and the expansion of other services like Voluntary Counselling and Testing (VCT) [9, 10]. In addition, the Highly Active Antiretroviral Therapy (HAART) policy for individuals with clinical stage 4 HIV and/or a CD4 cell count of less than 200 cells/mm³ was introduced [9, 10].

Despite guidelines being updated in 2008, a significant shift was in 2010 [11] where lifelong HAART could be initiated in HIV positive pregnant women with a CD4 cell count of less than or equal to 350 cells/mm³ and/or in clinical stage 3 or higher [11]. All other pregnant women were to be placed on dual antiretroviral therapy from fourteen weeks of pregnancy [11]. Whereas only doctors could initiate HIV positive patients on HAART before 2010, the 2010 guidelines also introduced Nurse Initiated Management of Antiretroviral Therapy (NIMART) [11]. Nyasulu et al. [12] noted in 2013 that the rolling out of NIMART had reduced the number of patients requiring initiation on ART in the main referral facilities; referral sites could focus more on complicated cases [12].

The 2015 guidelines [13] recommended for all HIV positive pregnant women to receive HAART from their first antenatal care visit regardless of gestational age, clinical HIV stage or CD4 cell count; and all unbooked women who tested positive during labour would be given prophylactic treatment and initiated on lifelong ART before being discharged [13]. In 2016, the guidelines were updated further, to allow all HIV positive individuals to be enrolled on HAART regardless of CD4 count or HIV stage [14].

To effectively reduce the HIV incidence in newborns, requires an increased HIV testing uptake among pregnant women, a reduction of HIV prevalence amongst pregnant women, a suppressed viral load and a full understanding of the HIV epidemiology among pregnant women. With all the policy changes, assumptions are that the epidemiology of HIV would have also been affected, e.g. reduction in incidence, improved testing, reduced stigma, etc. There is, however, a literature gap of recent HIV studies focusing on women attending antenatal care in rural areas in South Africa.

The research aimed to determine the HIV antenatal prevalence, socio-demographic associations and the extent of the male partner involvement with pregnancy and antenatal care. Study findings will provide valuable information to health providers and will assist in prioritising, planning and strengthening of the PMTCT programme. Health care users from similar settings in low- and middle-income countries (LMIC) will also gain information through community awareness and will be able to help minimise risks of HIV infection from mother-to-child.

Methods

Study setting

The Eastern Cape Province is one of nine of South Africa's Provinces. This is the Province with the second biggest surface area, the third most populous and the most rural with eight health districts [15]. Two of these (OR Tambo and Chris Hani) were purposefully selected for this study. The province was chosen for this study due to its rurality and size.

Study design, Population and Sampling

This quantitative cross-sectional study included all pregnant women with a gestational age of at-least 24-weeks, who used antenatal care services at the OR Tambo and Chris Hani Districts in the Eastern Cape Province, South Africa between March and November 2016. This gestational age was chosen to ensure that all women had been offered at least one HIV test and had results available in their antenatal care records. Study Participants were recruited from four community health centres. Participants under the age of 18 were included after providing written consent from both themselves and their parents or guardians. All other pregnant participants issued a voluntary informed, written consent to participate. Participants with missing date of birth and HIV status were excluded in the final analysis.

A two stage-cluster sampling was used to recruit participants from four weighted facilities. Two Eastern Cape Health Districts were considered as the first cluster level, (OR Tambo and Chris Hani district). The second cluster level of sampling was the convenient selection of two large community health centres (CHCs) in each of the two Districts. Thirdly, a convenience sampling technique was used to access pregnant women who met the inclusion criteria in each of the selected facilities.

A sample size of 352 was initially planned, based on using a one-sided 95% confidence interval and a 5% significance level ($z = 1.96$), an estimated antenatal HIV prevalence of 29.5% [16], a desired precision (d) of 5% and an addition of 10% to give allowance for non-responses.

Measurements

An interviewer administered questionnaire that was adapted from three instruments that have previously been used to measure HIV prevalence, PMTCT effectiveness and HIV stigma in developing countries [17–19]. It obtained information on socio-demographic characteristics and the medical history including HIV status (main outcome). The HIV status, the gestational age and antenatal care history were confirmed from the antenatal care card. Social desirability bias and language bias were mitigated through the use of a private interviewing space, training of researchers on professional conduct during interviews (e.g. phrasing of questions, avoidance of gestures, etc.) and the translation of the questionnaire into the local language (isiXhosa) respectively. The instrument was piloted among 12 pregnant women in the four study sites.

Statistical Analysis

Stata version 14.1 (STATA Corp, Colleague Station, Texas, USA) was used to analyse data. Missing data are treated as if they had never been offered to the participants. Numerical variables were explored using the Shapiro Wilk test. Numerical data were not normally distributed and thus reported on using non-parametric statistics (median and Interquartile Range (IQR)). The Wilcoxon Sum rank test (Mann-Whitney U test) was used to test for the equality of two medians, e.g. age in years by HIV status. Categorical variables are presented using, frequency tables, percentages and graphs.

Binomial logistics regression was used to determine the associations of an HIV positive status and to estimate the Prevalence Ratio (PR). The univariable models and the multivariable model selected through the forward selection process of model building are presented. The model with the lowest Bayesian Information Criterion (BIC) was selected as the better model. The 95% Confidence Interval (95%CI) was used to estimate the precision of estimates. The level of significance was set at 5% ($p\text{-value} \leq 0.05$) for statistical significance.

The Walter Sisulu University Human Ethics and Biosafety Committee granted ethical clearance with ethics approval number (052/2016). The Eastern Cape Provincial Health Research Committee granted research access approval (EC_2016RP27_272).

Results

Socio-demographic and medical characteristics of participants are presented in Table 1. A total of 343/352 participants (97.4%; 95%CI: 95.2–98.8) were included in the final analysis, of whom 38.2% ($n = 131$) were HIV infected. There was no significant difference in the HIV status of participants in the four health facilities. HIV positive participants (median age = 30) were significantly older than HIV negative participants (median = 25; $p\text{-value} < 0.0001$). The youngest participants were 15 years old, with 35 teenagers (10.2%) and the oldest were 43 years. High school learners and tertiary students comprised 33 (9.6%) and 32 (9.3%) of participants respectively. All participants knew their HIV status and the main reasons for having an HIV test included the fact that it was mandatory in antenatal care (44.0%); for health reasons or tests as a routine (47.2%); for sake of unborn baby (5.3%) and 3.5% reported to have tested due to being medically unwell.

The median gestational age at antenatal care booking for the 339 (98.8%) respondents who had complete information was 15.6 weeks (IQR 11.3–20.3) and there was no significant difference between HIV positive and HIV negative individuals. Whilst one patient had been on HAART for 13-years, at-least 80.3% ($n = 102$) of the participants had their HIV status diagnosed in the index pregnancy, with a median duration of diagnosis and initiation on HAART of 77 days (IQR 42–141).

Primigravidas accounted for 124 (36.1%) of all participants and there were statistical differences between HIV positive and negative participants. Even though both HIV positive (64.1%) and HIV negative (75.9%) participants were mostly never married, the latter were statistically more likely to have never been married ($p\text{-value} = 0.019$). A similar observation was made with participants who were tertiary students, wherein they were more likely to be HIV negative (13.7%) than being HIV positive (2.3%; $p\text{-value} < 0.0001$). Unemployed participants accounted for 199 (58.0%) of all participants. Spouses were distributed between those employed locally (44.6%), employed in another town (32.1%), unemployed (12.0%), high school learners (9.6%) and self-employed (1.8%).

Table 1
Socio-demographic Characteristics (N = 343)

	HIV infected		HIV uninfected		p-value
Demographics and Medical characteristics	N = 131		N = 212		
HIV status; n (%)	131	(38.2)	212	(61.8)	< 0.0001
Age, years; median (IQR*)	30	(10)	25	(9)	< 0.0001
Duration of HIV diagnosis (N = 127), days; median (IQR)	77	(99)	-		-
#Gestational age at booking, weeks (N = 339); median (IQR)	15.1	(11) &	16	(8) \$	0.419
Age, years; n (%)					
15–19	8	(6.1)	27	(12.7)	0.049
20–29	53	(40.5)	131	(61.8)	< 0.0001
30–39	60	(45.8)	52	(24.6)	< 0.0001
40–43	10	(7.6)	2	(0.9)	0.001
Facility; n (%)					
Ngangelizwe CHC	61	(46.6)	107	(50.5)	0.482
Mhlakulo CHC	44	(33.6)	72	(34.0)	0.943
Ngcobo CHC	14	(10.7)	15	(7.1)	0.243
All Saints Gateway clinic	12	(9.2)	18	(8.5)	0.831
First Pregnancy; n (%)					
No	100	(76.3)	119	(56.1)	< 0.0001
Yes	31	(23.7)	93	(43.9)	< 0.0001
Marital Status; n (%)					
Married	35	(26.7)	43	(20.3)	0.167
Never Married	84	(64.1)	161	(75.9)	0.019
Cohabiting	9	(6.9)	6	(2.8)	0.075
Divorced	1	(0.8)	2	(0.9)	0.862
Widowed	2	(1.5)	0	(0)	0.071
Occupation; n (%)					
High School Learner	8	(6.1)	25	(11.9)	0.083
Tertiary Student	3	(2.3)	29	(13.7)	< 0.0001
Employed	33	(25.2)	36	(17.1)	0.065
Unemployed	83	(63.4)	116	(54.7)	0.115
Self-employed	4	(3.1)	6	(2.84)	0.905
Spousal occupation; n (%)					
Locally Employed	64	(48.9)	89	(42.0)	0.213
Employed in another town	42	(32.1)	68	(32.1)	0.998
A high school learner	2	(1.5)	31	(14.6)	< 0.0001
Unemployed	22	(16.8)	19	(9.0)	0.030
Self-employed	1	(0.8)	5	(2.4)	0.274

	HIV infected	HIV uninfected	p-value
*IQR = Interquartile Range = 75th percentile – 25th percentile.			
#This is the estimated gestational age at first antenatal care reading based on clinical records.			
&n = 209; \$n = 130			

Participants reported their health status to be good (63.6% or n = 218), very good or moderate (17.2% or n = 59), or bad (2.0% or n = 7) respectively (Fig. 1). Whilst 209 (60.9%) participants reported to condomise sometimes, 73 (21.3%) reported to never and 61 (17.9%) reported to always condomise (Fig. 2). Only 72/73 respondents (98.6%) stated reasons for never using a condom. One respondent (1.4%) never used a condom because the index pregnancy was her sexual debut. Others cited reasons such as being married (3/72 or 4.2%); trusting partner (13/72 or 18.1%); partner refusal (33/72 or 45.8%); sexual preference (21/72 or 29.2%) and swelling or rash associated with using a condom for a respondent (1.4%).

Only 73 (21.3%) participants' partners were reported to accompany them to antenatal care. Most participants' partners (92.4%) were, however, reported to show an interest on the pregnancy. Partners did not attend antenatal care due to no longer being together (n = 1); they stayed far apart (37.4%); other commitments (41.9%); had never discussed it (8.9%); partner refused to come (5.9%) and 5.6% believed that males were not welcome in antenatal care.

In univariable analysis, the antenatal HIV prevalence was significantly higher in participants between the ages of 30–39 and 40–43 compared to teenagers (Table 2). In addition, multiparous, unemployed and employed participants, were significantly associated with 40%, 60% and 70% higher antenatal HIV prevalences respectively when compared to primigravidas or tertiary students. Other factors associated with a significantly higher antenatal prevalence included the perceived health status and spousal occupation.

Multivariable analysis had three variables in the best fitting binomial logistic regression model (Table 2). Gravidity was not a statistically significant association of antenatal HIV prevalence (p-value = 0.116). Those older than 30 or unemployed, in employment or a high school leaver were significantly more likely to be HIV positive when compared to younger participants or tertiary students respectively.

Table 2
Antenatal HIV Associated Factors

Characteristics	n	Univariable analysis			Multivariable analysis		
		PR (95% Confidence interval)	p-value	PR (95% Confidence interval)	p-value		
Age, years							
15–19	8/35	ref	1	ref	1		
20–29	53/184	1.1 (0.9–1.3)	0.437	1.1 (1.0–1.2)	0.317		
30–39	60/112	1.7 (1.3–2.2)	< 0.0001	1.5 (1.2–1.9)	0.002		
40–43	10/12	4.6 (1.3–16.6)	0.019	4.0 (1.1–14.3)	0.034		
First pregnancy							
Yes	31/124	ref	1	ref			
No	100/219	1.4 (1.2–1.6)	< 0.0001	1.1 (1.0–1.3)	0.116		
Occupation							
Tertiary student	3/32	ref	1	ref	1		
High School Learner	8/33	1.2 (1.0–1.5)	0.115	1.2 (1.0–1.5)	0.023		
Employed	33/69	1.7 (1.4–2.2)	< 0.0001	1.3 (1.0–1.7)	0.027		
Unemployed	83/198	1.6 (1.3–1.8)	< 0.0001	1.3 (1.2–1.6)	< 0.0001		
Self-employed	4/10	1.5 (0.9–2.5)	0.119	1.0 (0.9–1.0)	0.303		
Perceived Health status							
Good	77/218	ref	1	-	-		
Very Good	31/59	1.4 (1.0–1.8)	0.034	-	-		
Moderate	18/59	0.7 (0.5–0.9)	0.018	-	-		
Bad	5/7	1.7 (0.5–5.5)	0.408	-	-		
Spousal occupation							
High School learner	2/33	ref	1	-	-		
Locally employed	64/153	1.6 (1.4–1.9)	< 0.0001	-	-		
Employed in another town	42/110	1.5 (1.3–1.8)	< 0.0001	-	-		
Unemployed	22/41	2.0 (1.4–2.8)	< 0.0001	-	-		
Self-employed	1/6	1.1 (0.8–1.6)	0.524	-	-		
PR = Prevalence Ratio							

Discussion

This study will hopefully add evidence to the already existing body of knowledge on South Africa's HIV epidemiology, especially among pregnant women. It is a unique study that does not only provide an update of the antenatal HIV prevalence but also seeks to use epidemiological data to inform health promotion practices in a rural South African environment. Lessons from this high HIV burden country

will hopefully also be applicable to other LMIC and their planners. The major difference between this study and the South African antenatal surveys is that this study includes all pregnant women and not exclusively primigravidas [16, 20].

This study has also been able to show that the HIV epidemic is maturing, characterised by an almost 40% antenatal HIV prevalence; a 100% proportion of women who know their HIV status; a higher HIV prevalence in older women, those who are unemployed, those who have had a previous pregnancy and those whose partners are locally employed. This study is also unique in that it has assessed the support provided by the male partner during antenatal care visits in public health facilities.

Of the 10.2% of teenagers interviewed in the study, 94.3% were high school students. This teenage pregnancy rate is lower than that described by Mchunu et al. [21] in a similar South African population wherein 19.2% of women reported to have fallen pregnant during their teenage years [21]. In that study, 74.1% of teenage pregnancies were attributed to lack of knowledge, and 55% claimed that they did not fully understand the risks involved with sexual intercourse [21]. Teenage pregnancy is known to be highly associated with a poor socio-economic status, risky sexual behaviours, violent behaviours and substance use [22]. Regardless of the percentage of teenagers who were pregnant, it cannot be ideal for school children who are themselves dependent on adults to be pregnant as this often has an impact on their long-term progress [21, 22].

This is a poverty-stricken community with more than half of the women interviewed being unemployed (57.7%), never married (71.4%) and multiparous (63.9%). Almost 45% of the women's partners were employed locally, suggesting that there were economic opportunities locally that favour males. These compare to other antenatal care survey results such as that in another South African province (Limpopo), where 808 pregnant women were recruited, 51% from rural areas and 28% from peri-urban areas [23]. In that study both rural and peri-urban pregnant women had a high rate of being unemployed and being unmarried [23].

Encouraging is the fact that 50% of women had their first antenatal care visit at 16 weeks. This is good as it allows adequate time for identification of congenital abnormalities, maternal or foetal risks and the suppression of the viral load if HIV positive, thus reducing the probability of Mother-to-Child-Transmission [5, 6, 24–27]. This compares to antenatal care survey results of a Cameroonian study [28], of 293 pregnant participants, where 34% had started antenatal care in the first trimester [28]. The explanations most commonly offered for a late antenatal presentation were financial difficulties and living a long way from the health facility [28].

The fact that all participants knew their HIV status and were open to disclose is positive and moves us closer to the goals of the 90-90-90 strategy [14, 29]. This compares favourably with other similar studies where the HIV testing rate in antenatal care was up to 99.0% [29]. Disclosure of HIV test results to sexual partners in a group of Ugandan women was relatively high and the findings suggest that having a sexual partner who had also tested for HIV probably made it easier for women to disclose their HIV status [30]. The study also suggested the following as key factors in promoting disclosure: the need for promotion of sexual partner HIV testing; furthering of knowledge about HIV in women; and encouraging women to attend antenatal care [30]. The high testing rate is also a sign that health professionals were complying with HIV policies to encourage testing of all pregnant women so that they can be initiated on HAART without delays [13].

The data shows that antenatal HIV prevalence is increasing and higher than that presented in previous studies for same area [20]. The crude antenatal HIV prevalence of 38.2% is higher than the 31.9% (95%CI: 27.4–36.8) and the 33.3% (95%CI: 30.4–36.4) antenatal prevalences previously reported for Chris Hani and OR Tambo Districts respectively [20]. The differences could be attributed to the inclusion of multigravida women in this study [16, 20]. The high prevalence could be a result of an increasing incidence most probably related to poor condom compliance and the concurrent reduction of HIV related mortality due to an improved antiretroviral programme [31]. There was no statistical difference in HIV prevalence between health facilities.

The 2015 South African National Antenatal Sentinel HIV and Syphilis survey reported a declining HIV prevalence for the Eastern Cape Province [20]. This contrasts with findings from this study. The prevalence in the Eastern Cape province has stabilised since 2005, having increased by only 0.7% from 1990–2015 [20]. Over the 5-year period (2011–2015), the point prevalence estimate reached a peak in 2013 and 2014 at 31.4 (95%CI: 29.4–33.5%); and declined by 1.2% in 2015 to 30.2% [20].

In women, the HIV risk has always been known to be decreasing with increasing age [1–3, 6, 16, 20, 31]. According to Stats SA [31], approximately 20% of South African women in their reproductive years (15–49 years) are HIV positive; however, HIV prevalence among those aged 15–24 has declined over time from 7.3% in 2002 to 4.6% in 2017 [31].

Several studies [1–3, 6, 16, 20, 31] have previously described a higher HIV incidence among teenage women since they had sex with both their peers and much older men [1–3, 6, 16, 20, 31]. Another South African study [32] previously reported a 'recent partnership' in 32% of young women aged 15–24 years to involve a partner five or more years older than them [32]. Another 42% reported at least one age-disparate partner either in any of their three most recent partnerships or in their first-ever partnership [32]. HIV prevalence was 29% among these women [32].

Pregnancy in early adolescence has been found to be associated with an increased incidence of HIV infection among South African women [33]. The higher risk is associated with sexual risk behaviour such as multiple partners and a greater age difference with partners [33]. This study, however, found a different phenomenon: the prevalence is higher amongst older women which suggests changes in the epidemiological characteristics possibly since the HIV infected women were infected many years previously but only knew their HIV positive status in the index pregnancy or it could well be a mark of an increasing incidence among older women. The aim of PMTCT programs is to improve the wellbeing of expectant mothers and to reduce the incidence of HIV among newborns [9, 10]. It is therefore of interest to quantify the HIV MTCT trends among newborns in the same study population, especially since multigravidas were associated with a higher prevalence than primigravidas.

It is of little surprise that unemployed women had a significantly higher risk of being HIV positive than self-employed women. HIV is a disease of poverty [34], which further explains the increasing HIV prevalence in this community where more than 50% of the participants were unemployed [34]. Poverty may drive some women into risky sexual behaviours such as transactional sex and an inability to negotiate safer sexual practices with their partner [34]. Participants who reported to always use condoms during intercourse were possibly not being honest. After all, they were pregnant at the time of interview, making it unlikely that they always used condoms.

One participant reported her sexual debut to have consensual, without a condom and is the one that resulted in the index pregnancy which was unplanned. This kind of behaviour suggests an opportunity for the South African Department of Health to have more health promoters who can assist such women. The results further suggest that health promoters could help dispel myths about condoms. They should also advocate for latex free condoms for people who are allergic to latex condoms [35]. Plastic or polyurethane condoms are an effective barrier against HIV as well as bacterial sexually transmitted diseases while at the same time allowing better transfer of heat [35]. They are thinner than latex condoms and increase sensitivity [35]. However, plastic condoms are more expensive than latex condoms and less flexible so more lubrication may be needed [35].

Women need to be empowered to be the ones who decide on the choice of condom use [36]. As evidenced in this study, 45.8% of women reported not using a condom because of the partner's preference. Women should therefore not blindly trust their partners but should instead take control of their sexual decisions and be empowered through interventions that encourage them to negotiate safe sex. They need to understand and acknowledge their own bodies, wishes and desires, in addition to being stimulated to participate in social movements to combat gender inequalities [36]. All these roles can be fulfilled by qualified health promoters [36].

Most women did not have an expectation for their partners to accompany them during their antenatal care visits. Spousal support during antenatal care can help improve acceptance and utilisation of preventive strategies in general and to an increased uptake of interventions to prevent vertical and sexual transmission of HIV [37]. Partner/couple counselling in the antenatal setting may have further benefits to individual VCT [37]. In a Kenyan study, male antenatal care attendance was found to be associated with improved infant HIV-free survival [38]. Promotion of HIV testing in men and engagement in antenatal care services may improve outcomes in infants [38].

The non-involvement of partners in antenatal care services could discourage women in their ability to disclose their HIV-positive status due to fear of rejection, stigma and discrimination. It could also serve as a barrier to women beginning treatment and adhering to it and may disrupt HIV prevention services which could in turn result in poor HIV outcomes.

Even though attempts were made to reduce limitations the study encountered a few. Firstly, findings from this study are not representative of the Eastern Cape Province as participants were recruited from only four health facilities. Findings from this study do, however, give a reasonable idea of the changing epidemiology of HIV in a rural environment amongst women attending antenatal care.

Secondly, the limited privacy during the interviews that occurred as a result of infrastructure challenges could have resulted in a social desirability bias, especially in questions pertaining to sexual behaviour and the use of condoms. Where this bias was noted results are reported truthfully. Lastly, only a few participants' CD4 cell counts and viral loads were included in the clinical records, as such these measures are not reported altogether in this article. It is however unlikely that these limitations could have distorted the findings on the epidemiology of HIV in this population especially since medical information was triangulated from clinical records.

Conclusion

It is in no doubt that a successful PMTCT program is bolstered by an early antenatal care attendance and high HIV testing rates. This was evident in this study with a median antenatal booking attendance of 15.6 weeks of gestation and an HIV testing rate of 100%. Whilst an efficient antiretroviral programme means that HIV infected individuals will live longer and will initially result in an increasing HIV prevalence it is important to reduce HIV incidence of both newborns and adults. The antenatal HIV prevalence of 38.2% is therefore high by any standards. It is therefore important to remain vigilant and monitor mother-to-child transmission that could be associated with this increased prevalence. Of further concern is the higher prevalence among the older participants who will soon also be at a higher risk of comorbid non-communicable

diseases. Health systems must therefore be designed to address this burden using a comprehensive public health approach of disease prevention.

This population showed a very low uptake of spousal attendance in antenatal care. In addition to dealing with a high teenage pregnancy rate and myths around condom usage, health promotion practitioners have a huge role to play in assisting health systems to address the new HIV challenge of this century. This cadre of professionals can have an impact on HIV prevention as they will plan, and conduct awareness campaigns related to HIV/AIDS issues, reproductive health and family planning.

Abbreviations

ARVs

Antiretrovirals; CHC:Community Health Centres;

HAART

Highly Active Antiretroviral Therapy; LMIC:Low- and middle-income countries

MTCT

Mother-to-Child Transmission; NCDs:Non-communicable diseases;

PMTCT

Prevention of Mother-to-Child Transmission; PR:Prevalence Ratio;

TB

Tuberculosis; UNAIDS:The Joint United Nations Programme on HIV and AIDS;

VCT

Voluntary Counselling and Testing; WHO:World Health Organization

Declarations

Availability of data and material

The datasets used and/or analysed during the current study are available on request from the corresponding author on request.

Ethics approval and consent to participate

The Walter Sisulu University Human Ethics and Biosafety Committee granted ethical clearance and approval for the study to be conducted with ethics approval number (052/2016). The Eastern Cape Provincial Health Research Committee granted permission for the study to be conducted (EC_2016RP27_272). District managers of Chris Hani and OR Tambo Districts as well as the operational managers of the facilities concerned also granted permission for the study to be conducted. In addition to the fact that each participant gave informed written consent; confidentiality was maintained abiding by the four ethical principles of autonomy, beneficence, non-maleficence, and justice. Participants under the age of 18 were included after providing written consent from both themselves and their parents or guardians.

Consent for publication

No personal identifiers or participants' images are contained in this study. The consent did however mention that findings would be disseminated to scientific audience, lay audience and policy makers.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

SAM and KS conceptualised, designed, executed and did the main drafting of the manuscript and its revisions. SAM analysed the data and signed off on the final version. WC sought funding and reviewed manuscript. TA and SN provided critical review and approved the manuscript.

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References

1. South African National Department of health. Annual Report 2013-14: Pretoria 2014. Cited from; https://www.gov.za/sites/default/files/Department_of_Health_Annual_Report_2014.pdf. Accessed on; 02 September 2018.
2. Bradshaw D, Groenewald P, Laubscher R, Nannan N, Nojilana B, Norman R, et al. Initial burden of disease estimates for South Africa, 2000. *SAMJ*. 2008;93(9):682–8.
3. Statistics South Africa. Mortality and causes of death in South Africa in 2014: Findings from death notification. Pretoria Statistics South Africa. 2015. Cited from; <http://www.statssa.gov.za/publications/P03093/P030932014.pdf>. Accessed on; 02 September 2018.
4. Burns DN, Nourjah P, Minkoff H, Korelitz J, Biggar RJ, Landesman S, et al. Changes in CD4 + and CD8 + cell levels during pregnancy and post partum in women seropositive and seronegative for human immunodeficiency virus-1. *Am J Obstet Gynecol*. 1996;174(5):1461–8. doi:10.1016/s0002-9378(96)70589-6. Epub 1996/05/01.
5. Nesheim S, Harris LF, Lampe M. Elimination of perinatal HIV infection in the USA and other high-income countries: achievements and challenges. *Curr Opin HIV AIDS*. 2013;8(5):447–56. doi:10.1097/COH.0b013e3283636ccb. Epub 2013/08/09.
6. McGowan JP, Shah SS. Prevention of perinatal HIV transmission during pregnancy. *J Antimicrob Chemother*. 2000;46(5):657–68. doi:10.1093/jac/46.5.657. Epub 2000/11/04.
7. Ngemu E, Khayeka-Wandabwa C, Kweka E, Choge J, Edward Anino E, Oyoo-Okoth E. Retraction: effectiveness of option B highly active antiretroviral therapy (HAART) prevention of mother-to-child transmission (PMTCT) in pregnant HIV women. *BMC Res Notes*. 2014;7:868. doi:10.1186/1756-0500-7-868. Epub 2014/12/05.
8. Granich R, Gupta S, Hersh B, Williams B, Montaner J, Young B, et al. Trends in AIDS Deaths, New Infections and ART Coverage in the Top 30 Countries with the Highest AIDS Mortality Burden; 1990–2013. *PLoS One*. 2015;10(7):e0131353. doi:10.1371/journal.pone.0131353. Epub 2015/07/07.
9. Abdullah MF, Young T, Bitalo L, Coetzee N, Myers JE. Public health lessons from a pilot programme to reduce mother-to-child transmission of HIV-1 in Khayelitsha. *S Afr Med J*. 2001;91(7):579–83. Epub 2001/09/08. PubMed PMID: 11544974.
10. Barron P, Pillay Y, Doherty T, Sherman G, Jackson D, Bhardwaj S, et al. Eliminating mother-to-child HIV transmission in South Africa. *Bull World Health Organ*. 2013;91(1):70–4. doi:10.2471/blt.12.106807. Epub 2013/02/12.
11. South African National Department of Health. Clinical Guidelines for the Management of HIV & AIDS in Adults and Adolescents. (2010). Cited from; http://www.who.int/hiv/pub/guidelines/south_africa_art.pdf. Accessed on; 02 September 2018.
12. Nyasulu JC, Muchiri E, Mazwi SL, Ratshefolo M. NIMART rollout to primary healthcare facilities increases access to antiretrovirals in Johannesburg: an interrupted time series analysis. *S Afr Med J*. 2012;103(4):232–6. doi:10.7196/samj.6380. Epub 2013/04/04.
13. South African National Department of Health. National Consolidated Guidelines for the Prevention of Mother to Child Transmission (PMTCT) and Management of HIV in Children, Adolescents and Adults (2015), South Africa. Cited from; <http://www.sahivsoc.org/Files/ART%20Guidelines%2015052015.pdf>. Accessed on; 02 September 2018.
14. Meintjies G, Moorhouse M, Carmona S, Davies N, Dlamini S, van Vuuren C, et al Adult Antiretroviral Guidelines 2017 by the Southern African HIV Clinicians Society (2017). Cited from; http://www.sahivsoc.org/Files/Adult%20ART%20GUIDELINE_June%202017.pdf. Accessed on; 02 September 2019.
15. Statistics South Africa. People of South Africa: population census, 2016. In: SA S, editor. Pretoria, South Africa. (2017). Cited from; <http://www.statssa.gov.za/>; Accessed on; 02 September 2019.
16. South African National Department of Health. The 2012 National Antenatal Sentinel HIV & Syphilis Survey, South Africa. (2014). Cited from; http://www.hst.org.za/publications/NonHST%20Publications/ASHIVHerp_Report2014_22May2014.pdf. Accessed on; 02 September 2019.
17. Kinuthia J, Kiarie JN, Farquhar C, Richardson BA, Nduati R, Mbori-Ngacha D, et al. Uptake of prevention of mother to child transmission interventions in Kenya: health systems are more influential than stigma. *J Int AIDS Soc*. 2011;14:61-. doi:10.1186/1758-2652-14-61.

18. Nyblade L, MacQuarrie K. Can we measure HIV/AIDS-related stigma and discrimination? Current knowledge about quantifying stigma in developing countries. Policy project; 2006. Cited from; <http://www.icrw.org/publications/canwe-measure-hiv-aids-related-stigma-and-discrimination>. Accessed on; 02 September 2018.
19. World Health Organization. A short guide on methods measuring the impact of national PMTCT programmes: towards the elimination of new HIV infections among children by 2015 and keeping their mothers alive. Geneva, Switzerland: WHO. 2012. Cited from; https://apps.who.int/iris/bitstream/handle/10665/75478/9789241504362_eng.pdf;jsessionid=264E4330349654F81F868977EBF523E8?sequence=1. Accessed on; 02 September 2018.
20. South African National Department of Health. The 2015 National Antenatal Sentinel HIV & Syphilis Survey, South Africa. In: Health, editor. Pretoria 2017. Cited from; <http://www.health.gov.za/index.php/shortcodes/2015-03-29-10-42-47/2015-04-30-08-18-10/2015-04-30-08-21-56?download=2584:2015-national-antenatal-hiv-prevalence-survey-final-23oct17>. Accessed on; 02 September 2018.
21. Mchunu G, Peltzer K, Tutshana B, Seutlwadi L. Adolescent pregnancy and associated factors in South African youth. *Afr Health Sci*. 2012;12(4):426–34. doi:10.4314/ahs.v12i4.5. Epub 2013/03/22.
22. Jonas K, Crutzen R, van den Borne B, Sewpaul R, Reddy P. Teenage pregnancy rates and associations with other health risk behaviours: a three-wave cross-sectional study among South African school-going adolescents. *Reprod Health*. 2016;13(1):50. doi:10.1186/s12978-016-0170-8. Epub 2016/05/05.
23. Ebonwu J, Mumbauer A, Uys M, Wainberg ML, Medina-Marino A. Determinants of late antenatal care presentation in rural and peri-urban communities in South Africa: A cross-sectional study. *PLoS One*. 2018;13(3):e0191903. doi:10.1371/journal.pone.0191903. Epub 2018/03/09.
24. Boyer PJ, Dillon M, Navaie M, Deveikis A, Keller M, O'Rourke S, et al. Factors predictive of maternal-fetal transmission of HIV-1. Preliminary analysis of zidovudine given during pregnancy and/or delivery. *Jama*. 1994;271(24):1925–30. Epub 1994/06/22. PubMed PMID: 7911164.
25. Kuhn L, Sinkala M, Thea DM, Kankasa C, Aldrovandi GM. HIV prevention is not enough: child survival in the context of prevention of mother to child HIV transmission. *J Int AIDS Soc*. 2009;12:36. doi:10.1186/1758-2652-12-36. Epub 2009/12/18.
26. Peltzer K, Mosala T, Shisana O, Nqueko A, Mngqundaniso N. Barriers to prevention of HIV transmission from mother to child (PMTCT) in a resource poor setting in the Eastern Cape, South Africa. *Afr J Reprod Health*. 2007;11(1):57–66. Epub 2007/11/07. PubMed PMID: 17982948.
27. Phaswana-Mafuya N, Peltzer K, Ladzani R, Mlambo G, Davids A, Phaweni K, et al. Pre- and post-intervention assessment of a PMTCT-programme-strengthening initiative in a rural area of the Eastern Cape, South Africa. *Afr J AIDS Res*. 2011;10(1):83–93. doi:10.2989/16085906.2011.575551. Epub 2011/04/01.
28. Tolefac PN, Halle-Ekane GE, Agbor VN, Sama CB, Ngwasiri C, Tebeu PM. Why do pregnant women present late for their first antenatal care consultation in Cameroon? *Matern Health Neonatol Perinatol*. 2017;3:29. doi:10.1186/s40748-017-0067-8. Epub 2017/12/20.
29. 10.1097/QAI.0000000000000669
Tenthani L, Haas AD, Egger M, Van Oosterhout JJ, Jahn A, Chimbwandira F, et al Brief Report: HIV Testing Among Pregnant Women Who Attend Antenatal Care in Malawi. *Journal of acquired immune deficiency syndromes (1999)*. 2015;69(5):610-4. doi: 10.1097/QAI.0000000000000669.
30. Batte A, Katahoire AR, Chimoyi A, Ajambo S, Tibingana B, Banura C. Disclosure of HIV test results by women to their partners following antenatal HIV testing: a population-based cross-sectional survey among slum dwellers in Kampala Uganda. *BMC Public Health*. 2015;15:63. doi:10.1186/s12889-015-1420-3. Epub 2015/02/01.
31. Statistics South Africa. Statistical Release P0302: Mid-Year Population Estimates 2017. Pretoria. (2017). Cited from; <http://www.statssa.gov.za/publications/P0302/P03022017.pdf>. Accessed on; 02 September 2018.
32. Maughan-Brown B, George G, Beckett S, Evans M, Lewis L, Cawood C, et al. HIV Risk Among Adolescent Girls and Young Women in Age-Disparate Partnerships: Evidence From KwaZulu-Natal, South Africa. *J Acquir Immune Defic Syndr*. 2018;78(2):155–62. doi:10.1097/qai.0000000000001656. Epub 2018/05/17.
33. Christofides NJ, Jewkes RK, Dunkle KL, Nduna M, Shai NJ, Sterk C. Early adolescent pregnancy increases risk of incident HIV infection in the Eastern Cape, South Africa: a longitudinal study. *J Int AIDS Soc*. 2014;17:18585. doi:10.7448/ias.17.1.18585. Epub 2014/03/22.
34. Singh K, Buckner B, Tate J, Ndubani P, Kamwanga J. Age, poverty and alcohol use as HIV risk factors for women in Mongu, Zambia. *Afr Health Sci*. 2011;11(2):204–10. Epub 2011/08/23. PubMed PMID: 21857851; PubMed Central PMCID: PMC3158508.
35. Marfatia YS, Pandya I, Mehta K. Condoms. Past, present, and future. *Indian J Sex Transm Dis AIDS*. 2015;36(2):133–9. doi:10.4103/0253-7184.167135. Epub 2015/12/23.
36. 10.5935/1414-8145.20160015

Márcio Tadeu Ribeiro F, Vinícius Rodrigues Fernandes dF, Carina D'Onofrio Prince P, Monyque Evelyn dSS, Thelma S, Dalmo Valério Machado dL. Condom use among participants of the Carnival-gender perspective. *Escola Anna Nery - Revista de Enfermagem*. 2016;20(1):106 – 13. doi: 10.5935/1414-8145.20160015.

37. Farquhar C, Kiarie JN, Richardson BA, Kabura MN, John FN, Nduati RW, et al. Antenatal couple counseling increases uptake of interventions to prevent HIV-1 transmission. *J Acquir Immune Defic Syndr*. 2004;37(5):1620–6. doi:10.1097/00126334-200412150-00016. Epub 2004/12/04.

38. Aluisio AR, Bosire R, Bourke B, Gatuguta A, Kiarie JN, Nduati R, et al. Male Partner Participation in Antenatal Clinic Services is Associated With Improved HIV-Free Survival Among Infants in Nairobi, Kenya: A Prospective Cohort Study. *J Acquir Immune Defic Syndr*. 2016;73(2):169–76. doi:10.1097/qai.0000000000001038. Epub 2016/04/29.

Figures

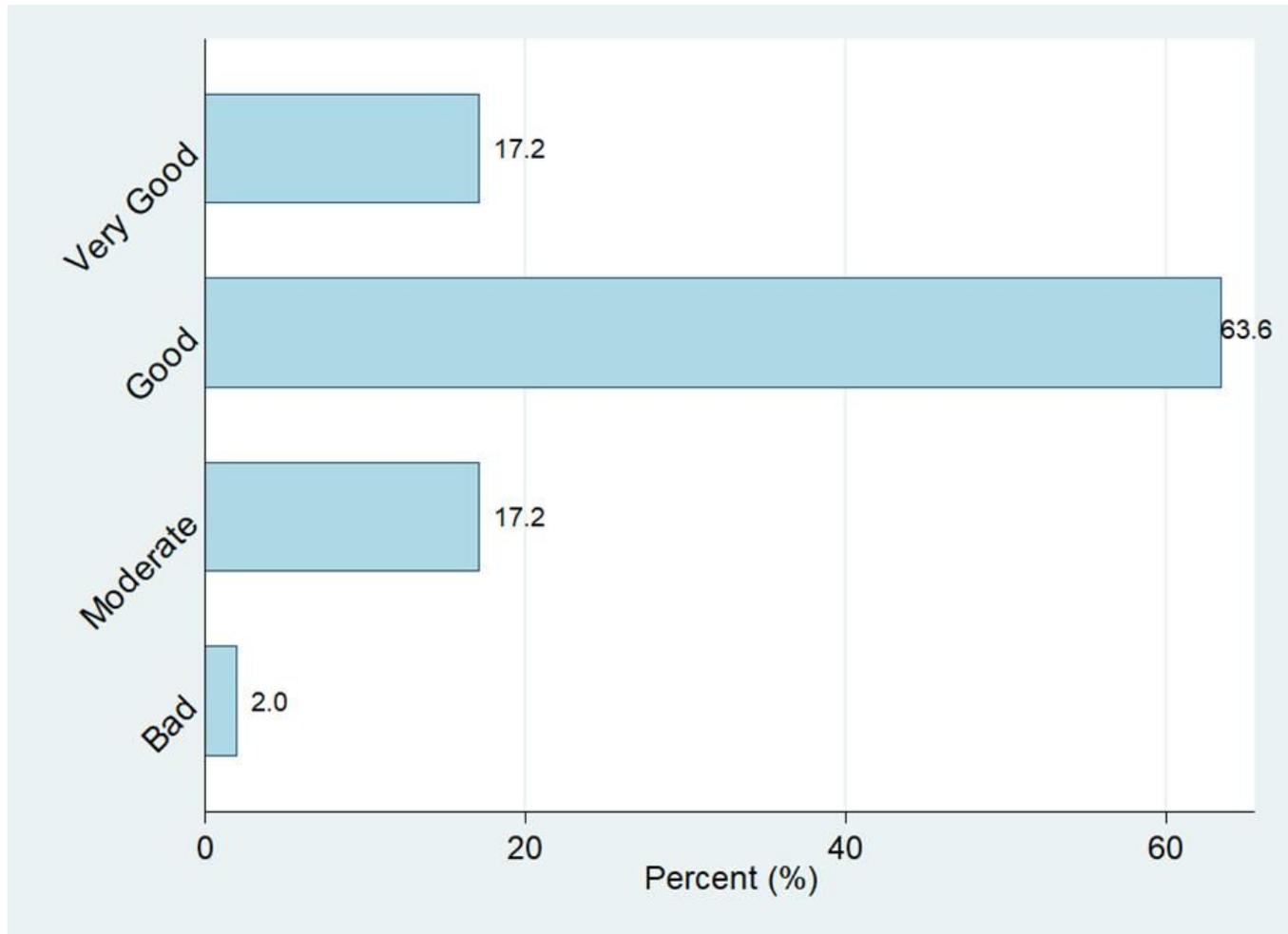


Figure 1

Perceived Health Status

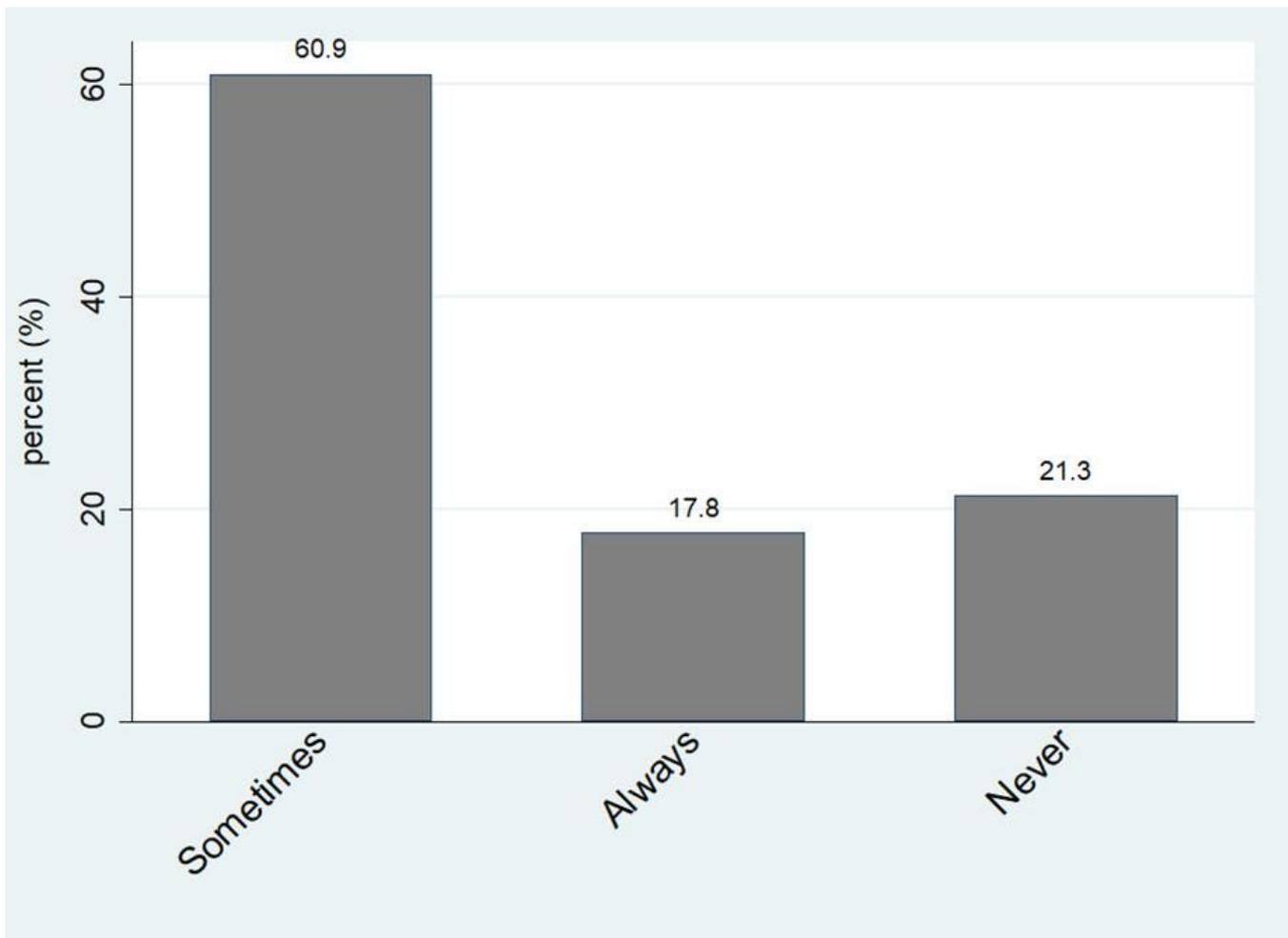


Figure 2

Reported Condom Use

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