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Decline in the prevalence HIV among pregnant women attending antenatal clinics in Tanzania, 2001-2011

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Abstract

Background: The Tanzania National AIDS Control Programme has established HIV sentinel surveillance among antenatal clinic (ANC) attendees as one of the methods for collecting data on HIV prevalence. This article provides trends on HIV prevalence for 92 sentinel sites that have constantly been part of the surveillance system since 2001 and have participated in at least three consecutive rounds.

Method: The surveillance population included all pregnant women aged 15–49 years who were attending a selected sentinel ANC site for the first time for any pregnancy between 2001 and 2011. Serial testing for HIV infection was done anonymously by detecting for the presence of IgG antibodies to HIV on dried blood spot (DBS) specimens. HIV trends were calculated taking into account random effects from sites on the following variables: region, sites and socio-demographic characteristics defined as age, marital status, parity, education level and duration of stay at present residence.

Results: Overall, there was a significant decline in HIV prevalence from 9.6% in 2001 to 5.6% in 2011 ($p<0.01$). Specifically, the HIV prevalence among 15-24 years' pregnant women significantly declined from 7.8% in 2001/2002 to 4% in 2011 ($p<0.01$). The decline in HIV prevalence occurred irrespective of residence, marital status, education level or previous pregnancies.

Conclusion: There has been a significant decline in HIV infections among young pregnant women attending ANC clinics in Tanzania since 2001. This study also indicates that ANC surveillance among pregnant women over time can provide useful estimates of HIV situation between the population surveys.

Keywords: HIV/AIDS, prevalence, surveillance, pregnant women, antenatal care, Tanzania

Introduction

Since 1990, the Tanzanian National AIDS Control Programme (NACP) has established human immunodeficiency virus (HIV) sentinel surveillance system among antenatal clinic (ANC) attendees (Kwesigabo *et al.*, 2000). The aim is to monitor the trend in the prevalence of HIV infection over time as well as provide evidence-based data to for public health decision making, including resource allocation, monitoring and evaluating prevention and care programmes. Between 1990 and 1998, data were being collected bi-annually. However, since 1998 data are collected annually. At the beginning, HIV testing was being done on the whole blood samples collected largely from sentinel sites located in urban areas and tested in respective regional hospitals due to cold chain challenges in the transportation of the samples. The introduction of the dried blood spots (DBS) technique in 2000 (Cassol *et al.*, 1997) simplified handling and transportation of freshly collected samples, contributing to the scale up to more ANC surveillance sites, including those located in remote and hard to reach areas.

Tanzania adopted ANC HIV surveillance procedures based on UNAIDS/WHO guidelines (UNAIDS/WHO, 1996). Between 2001 and 2011, NACP has conducted five rounds of ANC HIV surveillance (MoHSW, 2014). The numbers of ANC sentinel sites and Regional coverage as well as geographical coverage have steadily increased from 24 (in six Regions) during 2000/2001 (largely urban), to 133 (urban, semi-urban and rural) in all 21 regions of mainland Tanzania by 2011. Data

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from three population-based surveillances among adults aged 15–49 years in Tanzania have revealed a decrease in the magnitude of HIV infection with variations by regions (THIS, 2005; THMIS, 2008, 2012). In both surveys HIV prevalence was higher in women than men. However, ANC based sentinel surveillance has been limited to women and continues to be an instrumental data source for estimating HIV prevalence trends over time. Consequently, HIV prevalence trends data at national, regional and sub-group levels are critical for providing the necessary information for proper monitoring, evaluation and programming as well as mobilization of political commitment. This article analysed trends in the HIV prevalence in 92 sentinel sites in Tanzania that have participated in at least three consecutive ANC HIV surveillance rounds from 2001 to 2011.

Materials and Methods

Surveillance target population

The surveillance population included all pregnant women aged 15–49 years who were attending a selected sentinel ANC site for the first time at any pregnancy between 2001 and 2011. Surveillance staff recorded social and demographic characteristics of the women that included age, marital status, parity, educational level, and duration of stay at present residence. The data collection periods for all ANC surveillances rounds were three months.

Specimen collection

In 2001, ANC surveillance HIV testing was done on whole blood samples and testing were done in respective regional hospitals. From 2003-04 to 2011 ANC surveillance, a drop (100 µl) of leftover whole blood from syphilis testing was used to prepare dried blood spot (DBS) specimens for HIV surveillance purposes. The procedure for DBS preparation and transport has been explained elsewhere (Manyahi *et al.*, 2015). The DBS cards were labelled matching to surveillance data collection form. At this point, the upper part of the surveillance data collection form that contained the woman's clinic card number was torn up and discarded in order to ensure de-linking of the client identifier from the respective HIV data.

Dried DBS cards were stacked between weighing paper and stored in zip-locked plastic bags with desiccant (drying) packets and a humidity indicator card together with their completed data collection forms. Desiccant packs were changed when humidity indicator cards changed colour from blue to pink. On weekly basis using courier service, ANC survey staff mailed completed data collection forms and DBS samples to their assigned zonal laboratory. Upon receipt of the samples at the zonal laboratory, the surveillance numbers for each sample were recorded in a logbook. The NACP regularly monitored the volume of DBS received by zonal centres from each ANC and contacted the clinics which had posted unlinked numbers for reconciliation. Then all DBS specimens collected were sent to the Department of Microbiology and Immunology at Muhimbili University of Health and Allied Sciences for testing. Testing for the presence of IgG antibodies to HIV and quality assurance were performed according to a previously described protocol (Manyahi *et al*., 2015).

Data analysis

Data analysis was carried out using Stata v.12 software (Stata Corporation, College Station, Texas, USA). Trends of HIV point prevalence were done; p-trends were calculated taking into account random effects from sites. The X^2 test and tests for linear trend were used as appropriate; p-value of less than 0.05 was considered statistically significant.

Ethical considerations

Because syphilis screening is already routinely conducted and HIV testing was performed on non-linked samples, informed consent was not warranted. Collected data was de-identified before

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analysis to protect client confidentiality. The surveillance protocols received ethical approval from the Medical Research Coordinating Committee of the National Institute for Medical Research.

Results

Results show a significant decline in HIV prevalence from 9.6% (95% CI= 8.9, 10.2) in 2001/ 2002 to 5.6% (95% C.I 5.4, 5.8) in 2011 (p<0.01) (Figure 1). Likewise, HIV prevalence among pregnant young women aged 15–24 years has decreased substantially in urban (from 8.8% to 4.0%), semi-urban (from 8.5% to 4.0%) and rural settings (from 3% to 2.2 %) (Figure 2).

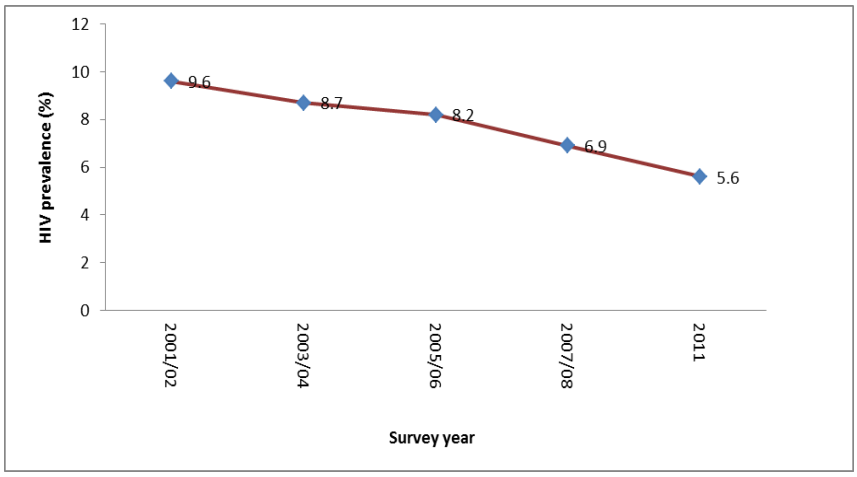

Figure 1: Trends of HIV prevalence among ANC attendees (2001-2011)

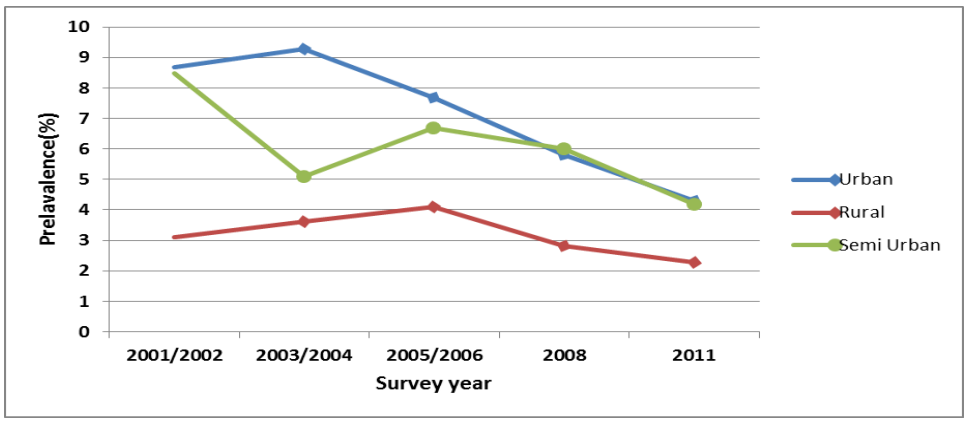

Figure 2 : HIV prevalence trends among ANC attendees aged 15-24 years by residence

Point estimates calculated from the 24 sites that had five data points, showed HIV prevalence declined significantly from 9.7% (95%CI= 8.9, 10.2) in 2001/2002, to 5.8 (95%CI=5.3, 6.3) in 2011 (p=0.0001) (Figure 3).

Decreasing HIV prevalence trends were significant in all age groups except >35 years and older from 2001 to 2011 (Table 1). Further decreases (p<0.001) were seen in both single and married pregnant women (from 12.6% to 6.8% and from 9.1% to 5.4%, respectively,), and urban (from 12.1% to 6.6 %) and rural (from 4.1% to 3.1%, p<0.001) pregnant women. The decline in HIV prevalence occurred irrespective of the number of previous pregnancies or education status, (p<0.001).

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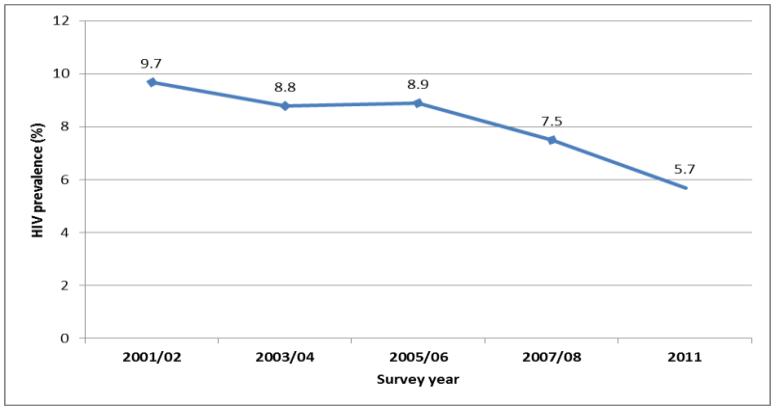

Figure 3: Trend of HIV prevalence among ANC attendees of all ages

Table 1: HIV prevalence trends by social-demographic characteristics 2001 – 2011

Variable	Response	Prevalence					P-value
		2001/02	2003/4	2005/06	2007/08	2011	
Age (years)	15 – 24	7.6	7.4	6.8	5.3	3.9	<0.001
	25 – 34	13	11	9.9	8.9	7.3	<0.001
	35+	7	6.7	8.1	7.2	7	0.984
Education	None	6.4	5.2	5.5	4.8	4.5	0.012
	Primary	10.2	9.3	8.6	7.5	6	<0.001
	Secondary+			9.3	7	4.9	<0.001
Marital status	Single	12.6	9.7	8.9	7	6.8	<0.001
	Married	9.1	8.6	8.1	6.9	5.4	<0.001
	Divorced	-	-	-	-	5.1	
	Others	-	-	-	13	8.7	
Residence	Urban	12.1	11.2	9.9	8.4	6.6	<0.001
	Semi-urban	3.7	4.7	7.8	7.5	5.8	0.010
	Rural	4.1	3.7	4.4	3.4	3.1	<0.001
Previous pregnancy	0	7.2	7	6.5	4.7	3.5	<0.001
	1 – 2	11	10.2	9.3	8.2	6.5	<0.001
	3 – 4	11.6	9.4	9.1	7.6	7.3	<0.001
	5+	6.5	5.4	5.4	5.4	4.2	<0.001

At regional level, the most consistent and significant HIV prevalence declines were observed among pregnant women in Dar es Salaam (from 12.8% to 6.08%), Dodoma (6.1% to 1.96), Mbeya (16.0% to 11.31%), Kigoma (from 5.1% to 1.31%), Tanga (from 9.2% to 4.76%), and Arusha (from 6.1% to 2.84%) p<0.001 (Table 2). Furthermore, substantial HIV prevalence declines were observed among ANC attendees in Kilimanjaro, Morogoro, Mara, Tabora and Iringa regions. Notably, Kagera and Mtwara regions which have participated in five ANC rounds showed insignificant changes in HIV prevalence trends (p=0.2).

When the results of ANC surveillance were compared with those of population-based surveys, an overestimation of HIV prevalence in ANC survey in early rounds (2002-2008) was observed. However, in the consequent years, the prevalence between ANC and population-based surveys were similar (Figure 4).

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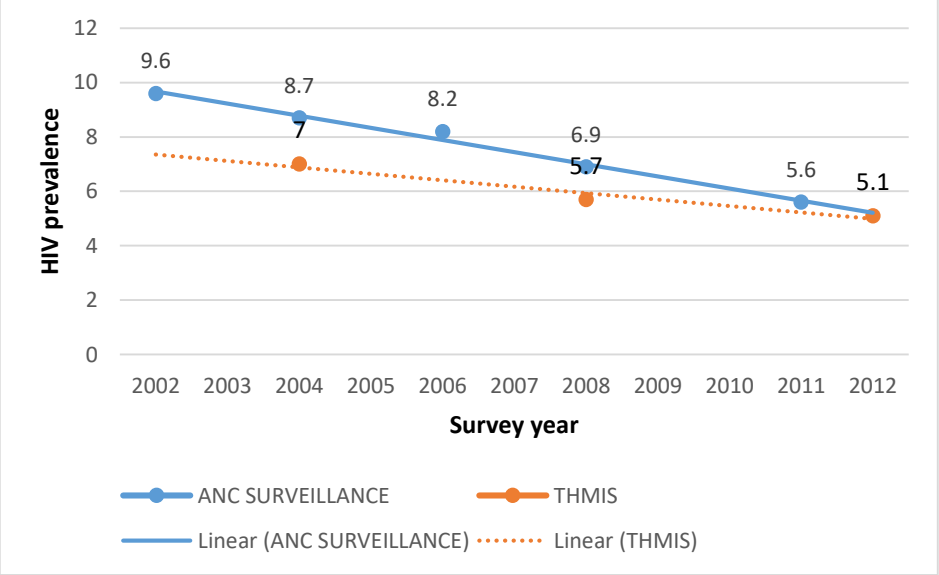

Figure 4: Comparison of HIV trends between data from ANC surveillance and population surveys

Table 2: Trends of HIV prevalence among ANC attendees by region 2001 – 2011

Region	Prevalence					P-value
	2001/02	2003/04	2005/06	2007/08	2011	
Dar es Salaam	12.8	10.8	10.9	7	6.1	<0.001
Dodoma	6.1	7.8	6.1	5.4	2	<0.001
Kagera	5.6	4.7	4.7	4.8	4.6	0.238
Kilimanjaro	6.3	5.7	5	4.57	3.2	0.001
Mbeya	16	15.7	15.9	12.6	11.3	<0.001
Mtwara	7.1	5.1	6.1	6.8	5.5	0.216
Morogoro	-	9	7.2	6.59	5.6	0.001
Kigoma	-	5.1	3.5	1.53	1.3	<0.001
Lindi	-	7.1	9.4	5.7	5.4	0.137
Tanga	-	9.2	6.5	5.89	4.8	<0.001
Arusha	-	-	6.1	5.6	2.8	<0.001
Mara	-	-	6.1	4.4	4.2	0.014
Iringa	-	-	18.2	16.5	14.8	0.044
Shinyanga	-	-	6.8	7.1	5.8	0.133
Tabora	-	-	7.2	6.5	4.7	0.004

Discussion

This study shows a significant decline in HIV prevalence among pregnant women attending ANC in Tanzania from 2001 to 2011. The finding is in agreement with those from population surveys in Tanzania (THIS 2005, THMIS 2008, 2012), which have shown steady decline in HIV prevalence from 7% in 2004, 5.7% in 2008 and 5.1% in 2011. In Tanzania HIV/AIDS and Malaria Indicator Surveys, HIV prevalence among women declined from 7.7% in 2004, to 6.6% in 2008 and 6.2% in 2011 (THIS 2005; THMIS 2008, 2012). Comparing results of ANC surveillance with those of THMIS, we find an overestimation of HIV prevalence in ANC survey in early rounds, however later ANC and THMIS showed similar prevalence. Most likely, the increase in the number of sites and geographical coverage with each round has increased representativeness of the ANC survey. In addition, there has been a change in the nature of the HIV epidemic from concentrated to a more generalized form (THMS 2012).

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The decline in HIV infection occurred irrespective of residential, marital status, education level and previous pregnancies. These findings are in agreement with results of population based surveys (THMS 2008, 2012) and other studies in Tanzania (Wambura *et al*., 2007; Hargreaves & Howe, 2010; Kumogola *et al.*, 2010). A significant reduction in HIV prevalence was also observed among young pregnant women aged 15–24 years, which signifies a reduction in new HIV infections (Zaba *et al.*, 2000; Ghys *et al*., 2010). The 2011/2012 population survey in Tanzania have documented an increase in the age of sexual debut, male circumcision, consistent condom utilization, coverage rates HIV testing and counselling services, as well as in availability and access to antiretroviral treatment (THMIS, 2012). Similarly, others studies in Tanzania have reported significant change in sexual risk behaviours (Lugalla *et al.*, 2004; Mmbaga *et al.*, 2007). We also register positive impact resulted from different intervention activities by both the Government and development partners; collectively, these measures could explain the observed decline in HIV prevalence.

Despite the general decline in HIV infection among the ANC attendees we found two exceptions. First, there were four regions (Kagera, Mtwara, Lindi, Shinyanga) with no significant decline trend in HIV prevalence. Kagera is a region where HIV/AIDS epidemic was first reported in Tanzania in 1983 (Kwesigabo *et al*., 2000) and the epidemic in that region matured, stabilized and declined earlier compared to other regions (Kwesigabo *et al*., 1998, 2000, 2005). The trend in the other three regions could be attributed to a number of factors such as socio-cultural, knowledge, attitudes and practices, which however were not investigated in these sentinel surveys. Secondly, we observed that over the years HIV prevalence among women aged above 35 years has stabilized at around 7%. This finding could partly be attributed to an aging cohort effect (cumulative HIV infection case load). People including women, are living longer with the disease as result of substantial availability of anti-retrovirus treatment in reducing HIV associated morbidity and mortality (Quinn, 2008).

One of limitations of our study was change in blood collection procedures and testing facilities. The first surveillance testing was done at regional level facilities using whole blood while the rest were done at Muhimbili University of Health and Allied Sciences, and DBS were used. Moreover, although ANC surveillance data remains a useful tool to monitor HIV epidemic it is still an estimate of the HIV prevalence in the general population.

In conclusion, there is a significant decline in HIV infections among young pregnant women attending ANC clinics in Tanzania since 2001. This study indicates ANC surveillance among pregnant women over time can provide useful estimates of HIV situation between the population surveys.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Authors contributed equally to this study. All authors read and approved the final manuscript.

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