Prevalence and predictors of HIV infection among adults aged 50 years and above in Shinyanga, Iringa and Ruvuma regions of Tanzania

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Abstract
Background
The UNAIDS Report on the global AIDS report shows that 35.3 million people living with HIV globally, out of that an estimated 3.6 million are people aged 50 years or above. However, in Tanzania, the prevalence and predictors of HIV/AIDS among people aged 50 and above has not been appropriately investigated.
Methods
This was a cross sectional study conducted in Shinyanga, Iringa and Ruvuma regions in Tanzania aiming at determining prevalence and risk factors for HIV infection among elderly people aged 50 years and above. Random sampling was employed to select 2,214 participants. HIV testing to consenting participants was conducted and a questionnaire was used to collect data on socio-demographic information, medical conditions and sexual behavioral factors.
Results
The overall prevalence of HIV infection among study participants was 4.4% (95% CI=3.6%-5.4%). The prevalence was higher among females compared to males. Majority of study participants were aware of HIV, transmission and preventive measures. Few respondents knew that a person could be infected through anal sex. More than half of the participants prefer HIV status to remain confidential. A significantly larger proportion (24.2%) of males reported to ever use a condom during their last sexual intercourse compared to females (9.5%). Compared to older age groups, respondents aged 50-59 years were significantly more likely to report condom use during last sexual intercourse. Being in the fourth wealth quintile, ever use of condom, condom use during last sexual encounter, having 2 or more partners in the last one year were associated with an increased risk of HIV infection.
Conclusion
The high prevalence of HIV among study participants highlights the prerequisite for increased attention to address underlying risk factors for HIV infection among adults.

Key words: *HIV prevalence, adults, social cultural context, Tanzania*

Background
Global statistics reveal that 36.3 million people globally are living with Human Immunodeficiency Virus (HIV), and out of them an estimated 3.6 million are people aged 50 and above years. The majority these estimates 2.9 million are found in low-and middle-income countries where the proportion of adults living with HIV aged 50 years or older is above 10%. The estimates also show that in developed countries almost one-third of people living with HIV are 50 and above years (UNAIDS 2013b). The percentage of adults living with HIV aged 50 years and older has increased in all regions, at fluctuating rates since 2007 (UNAIDS, 2013).

In Tanzania the annual occurrence of HIV among adults aged 15 to 64 is 0.29 percentage that is 0.40 percent among females while 0.17 percent among males. This matches with approximately 81,000 novel cases of HIV infection yearly among adult aged 15 to 64 in Tanzania. For the HIV prevalence among adults aged 15 to 64 is 5.0 percent (6.5 percent among females whereas 3.5 percent among males), consistent with approximately 1.4 million people living with HIV aged 15 to 64 in Tanzania (THIS, 2017). However, despite global attention on HIV epidemic, moderately few HIV surveys have been conducted among individuals aged 50 and above, however those available disclose high HIV occurrence (UNAIDS, 2013). On top of that studies on infection rates among older people in Sub-Saharan Africa are few and neglected.

It is reported that people who are 50 to 54 years old consist of the main percentage of people living with diagnosed HIV in USA in 2016. The highest prevalence was among people who are 50–54 years, then those aged 45–49 (661.6), followed by those aged 55–59. Since 2012 to 2016, the main percentage upsurge in rates (56%) was among people aged 65 years and above (CDC, 2017). Tanzania HIV Impact Survey (2017) revealed that, HIV prevalence peaks at 12 percentages amongst females aged 45 to 49, as compared to the highest of 8.4 percent among males aged 40 to 44, while for the 15 to 24 years old is 1.4 percent.

The burden of diseases among people aged 50 and older is always ignored worldwide. This shows an imperative sightless spot in the international response to the endemic of HIV infection and Acquired Immunodeficiency Syndrome (AIDS) (Negin & Cumming, 2010). This owes to the fact that, the greatest estimates of HIV prevalence in sub-Saharan Africa come from two main sources: antenatal clinic surveillance and nationally representative household sero-surveys such as the Demographic and Health Surveys (DHS), and normally, there is insufficient sources that provide information on HIV prevalence among adults above 49 years old (Bendavid et al., 2012; Autenrieth et al., 2018).

Notwithstanding the increased consideration on HIV prevalence, there is still little empirical evidence on the degree of HIV prevalence among older people in sub-Saharan Africa (Negin et al., 2016; Bendavid et al., 2012). Among few studies conducted, majority of them are done in South Africa, excluding the rest of the continent under-studied (Negin et al., 2016). Studies in developing countries emphasize on the social and economic impact of HIV infection and mostly its effect on older people regarding their role as caretakers of children orphaned, thus have ignored the magnitude of HIV infection among older population and its impact on their lives (Kyobutungi et al., 2009). The number of people living with HIV infection in developing and middle-income countries aged 50 or above continues to grow, representing 12% of all adults living with HIV in 2013. In developed countries, the population of people aged 50 and above represents approximately 30% of the adult population living with HIV.

In a recent survey indicates that HIV prevalence among men and women between 50 and 60 years old was over 8%, higher than among men in the age group between 20 and 24 years old and women 15 to 19 years old (Bendavid et al., 2012). A good example is an analysis of data from Malawi which showed that while HIV prevalence among men and women declined at older old ages while the level of HIV infection after the typical 15–49 focus of HIV data collection remains considerable (Freeman et al., 2012).

While the general decline with age were observed, levels of sexual activity and HIV remained substantial: 26.7% and 73.8% among women while men aged 65 above reported having sex in the last year; men's

average number of sexual partners remained above 1; and HIV prevalence is significantly higher for men aged 50-64 (8.9%) than men aged 15-49 (4.1% (Freeman, *et al.*, 2012).Another study conducted in Zimbabwe revealed that more than half of the adults aged 50 years and above in the study had sero-converted after their 50th birthday (Mahy *et al.*, 2014). Complemented by an analysis from five survey across Zimbabwe signified that, HIV prevalence among men aged 15-44 decreased progressively from 18.4% in 1998-2000 to 11.0 %. in 2009-2011, HIV prevalence among men aged 45-54 also declined from 27.0% in 1998-2000 to 21.3% in 2006-2008, but then augmented meaningfully to 23.4% in 2009-2011 more than twofold the level among younger adults at this time. HIV prevalence in women aged 15-44 decreased expressively from 20.8% in 2003-2005 to 17.3% in 2009-2011 then increased from 17.7% to 21.3% in older women over the previous period (Negin *et al.*, 2016).

It is ventured that majority of cases at old age are not severe infections, but slightly chronic, venerable HIV infection. Factors associated with late testing of HIV infection among older people include: routine HIV screening being infrequent in this age group; poor awareness of HIV risk factors (including safe sex practices); disappointment of health care providers to consider HIV infection among older population; and misperception about HIV-specific or opportunistic infection, with symptoms of other diseases regularly associated with older age e.g. Alzheimer's and dementia (Mark and Mo, 2003).

The motivation behind conducting this study in Tanzania stems from the varying pattern of the HIV pandemic and its effects on adults. This changeover of HIV trend into adult population can be explained by three key factors: the success of antiretroviral therapy in lengthening the lives of people living with HIV/AIDS, lessening HIV incidence among younger adults shifting the disease burden to older ages, and that people aged 50 and over likewise engage in risk taking behaviour such as unprotected sex and intravenous drug use which eventually leads to new HIV contamination (UNAIDS, 2013).

In addition, recent evidence highlights that HIV prevention services have now been tailored to also target people aged 50 and older. Surveillance for HIV and population-based surveys has always targeted youth and adults up to 49 years. In Tanzania for example, National HIV and Malaria Indicator Surveys conducted have been testing and providing results for population of age group 15- 49 years only, leaving out adults aged 50 years and above (TACAIDS *et al.*, 2013).

A study conducted in Tanzania reported HIV prevalence of 11.3% and 3.7% consistently among individuals aged 50 years and beyond (Nyigo *et al.*, 2014). Despite this reality, studies to determine HIV occurrence among adults aged 50 years and over in Tanzania are lacking. Operative control of the epidemic necessitates effective checking of HIV infections of different population groups in the community. Regrettably, there is a lack of information on the factors accompanying rising HIV infection in adults aged more than 50 years. Seeing this trend in HIV epidemic, we conducted this study to determine the prevalence and predictors of HIV infection among adults aged 50 years and beyond in Iringa, Ruvuma and Shinyanga regions in Tanzania. This is one of the few cross-sectional community-based studies looking for the magnitude and risk factors for HIV among adults 50 years and over.

Materials and methods
Study design and settings
A cross sectional study was conducted in Shinyanga, Iringa and Ruvuma regions from November-December 2013. Recent data show that these regions have some of the highest HIV prevalence in Tanzania. According to the Tanzania HIV/AIDS and Malaria Indicator Survey of 2011-2012, the estimated HIV prevalence among adults aged 15-49 years is 9.1%, 7.4% and 7.0% in Iringa, Shinyanga and Ruvuma respectively (TACAIDS *et al*, 2013). The National Bureau of Statistics 2006 projection by 2013 estimates Shinyanga to have a total population of 4.3 million people where 11 percent reside in urban and 89 in rural areas. Population of adults aged 50 and above is estimated at 305,261. Iringa has a total population is estimated at 1.8 million people where 23% reside in urban areas and 77% in rural areas having about 180,614 adults over

50 years of age. Ruvuma is estimated to have a total population of 2.5 million people with 18% residing in rural areas and 82% in urban. The population of adults over 50 years of age is estimated at 143,936.

Study participants and sample size
The study participants were male and female adults aged 50 and above years from the three regions. Eligibility criteria included residence in the study site for a period of six months and above. Sample size estimation for this study was done by using the formula for estimating a single proportion (Lwanga *et al.*, 1991).We presumed a 5.4% prevalence of HIV among 50 and above years adults infected with HIV in Tanzania (Negin *et al.,* 2010) with 2% margin of error at 95% confidence level. A design effect of 1.5 was considered in this study. We estimated a minimum sample size of 730 for each region. Therefore, for the three regions the total sample size calculated was N= 2,211 adults aged 50 years and above.

Sampling technique
Study participants were selected by using multistage cluster sampling method. Because it was complex and costly to obtain a list of all adults aged 50 years at the regional level, multistage cluster sampling was used because it is comparatively inexpensive and expedient. Therefore, for each region, sampling was conducted in four stages:
Stage 1: For each region, two districts were randomly selected from among the total number of districts in Shinyanga, Iringa and Ruvuma regions by using the lottery method.
Stage 2: From each district, 4 wards were selected by using simple random sampling.
Stage 3: From each ward, 3 villages were randomly selected by using simple random sampling.
Stage 4: From each village, 30 households were selected by using systematic random sampling method. All adults aged 50 years and above in the households who consented to participate in this study were included.

Data collection procedures
Questionnaires were pretested in one of the villages not included in the sample in Iringa region. There were only minor changes to the study tools involving typographic errors. For each study region seven research assistants were identified by DACCs. All of the research assistants were health care workers trained on Provider Initiated HIV Testing and Counseling (PITC). These were mostly nurses and clinical officers. For each region, research assistants were pulled at one centre and oriented/familiarized on the study protocol and tools.
For all three regions, research assistants (with backgrounds in nursing, medicine and social sciences) collected data for a quantitative part of the study from November to December 2013 under supervision of PI and Co-PIs. A group of seven research assistants moved from one village to another and conducted interviews and HIV testing. Research assistants were divided in groups of two where one research assistant conducted an interview and filled questionnaires while the other one conducted HIV testing.
Before researchers and research assistants travelled to the sites, they requested Village Executive officers of the sampled villages to collaborate with Home Based Care Volunteers and social welfare officers in informing people aged 50 years about the study. Study participants were visited in their households for interview and HIV testing. Before undergoing HIV tests, participants were interviewed using a structured questionnaire, which contained socio-demographic information, medical conditions experienced and HIV risk factors. The HIV tests were confidential, and results were shared with participants and only with a third party upon request of the participant himself/herself. Study participants were comprehensively counseled using trained health care workers who were used as research assistants before and after undergoing a HIV test. The recruited research assistants were conversant with the native language. HIV testing was conducted in accordance to the current national HIV testing algorithm, where determine allele was the first test and Uni-Gold was the second test in a serial manner. Uni-Gold was only used to confirm positive samples that reacted on determine allele. Each test result was recorded on the respective questionnaire of the tested individual. Used needles and test strips were put into sharp boxes and disposed at health facilities' incinerators.

Data analysis

Data from completed questionnaires were entered using SPSS software program. Frequencies and percentages were generated for categorical variables and differences between proportions compared using Chi-Square test or Fisher's exact tests where appropriate. HIV prevalence and its corresponding 95% confidence intervals are presented. Principal components analysis (PCA) was used to construct a proxy for socio-economic status based on asset ownership ranging from a television to a bicycle and household characteristics such as source of drinking water and type of sanitation facilities. Each individual was assigned a score for each asset. Individuals were then divided into quintiles from lowest to highest representing the poorest to least poor respectively. Univariate and multivariate logistic regression models were used to test for the association between the independent variables and HIV infection. All factors with $P<0.20$ in the univariable analyses were included in the multivariable models. Crude and adjusted odds ratios with their corresponding 95% confidence intervals are presented. Two-sided P values of less than 0.05 were considered statistically significant. Because of differences in the rate of HIV infection between women and men, all analyses were stratified by sex. To adjust for the complex design, robust standard errors were estimated. Data analysis was performed using STATA version 11 (Stata Corp).

Ethical considerations

The National Institute for Medical Research (NIMR) granted ethical clearance approval for conducting this study. Permission to conduct the study was sought from the Regional Administrative Authorities in the respective regions. District executive directors of the selected districts were requested to grant permission to conduct the study in the selected wards. The research team provided prior information and paid courtesy visits to village and ward leaders. All study participants were informed on the procedures of this research, benefits and risks and were requested to consent. A written informed consent was obtained from all study participants. Only consenting participants were included in this study. HIV testing and counseling (HTC) services in this study were conducted with the best interests of participants in mind and responded to the needs and risks of the participants. The core principles of HTC (as per national guidelines) which includes the following were adhered to; confidentiality, accurate and sufficient pre and post-test counseling, informed consent, adherence to standard operating procedures and quality control measures for testing to ensure the provision of correct test results; and referral and networking for prevention, care and treatment, as well as other support services within the community. Study participants were also informed on potential benefits expected for study participants/population which included; becoming aware of their HIV status as an avenue for referral and networking for care, treatment and support services.

Results

Characteristics of study participants

A total of 2214 adults aged 50 years and above participated in the study. Of these, 29 (1.3%) declined blood testing leaving 2185 tested for HIV infection. Age group, marital status, education levels and wealth quintile composition differed significantly by sex. Nearly half of the women were divorced, separated from their spouses or widowed while 73% of the men were married. About 72% of the men attained at least primary education compared to 50% of the women. Majority of the participants were peasants (Table 1).

Table 1: Socio demographic characteristics of study participants

Factor	Total	Men	Women	P value
		N (%)	N (%)	
Age (years)				
50-59	718	336 (30.6)	382 (35.3)	0.01
60-69	741	378 (34.4)	363 (33.5)	
70-79	514	289 (26.3)	225 (20.8)	
80+	210	97 (8.8)	113 (10.4)	
Region				
Shinyanga	738	400 (36.1)	338 (30.8)	0.01
Iringa	731	340 (30.7)	391 (35.7)	

Ruvuma	736	369 (33.3)	367 (33.5)	
Marital status				
Single	69	37 (3.4)	32 (2.9)	<0.0001
Married/cohabiting	1323	804 (73.2)	519 (47.6)	
Divorced/separated/widowed	797	258 (23.5)	539 (49.5)	
Education				
None	799	287 (28.0)	512 (53.7)	<0.0001
Primary	1146	707 (68.9)	439 (46.0)	
Secondary+	34	31 (3.0)	3 (0.3)	
Occupation				
Employed	38	23 (2.3)	15 (1.6)	0.16
Petty business	76	34 (3.3)	42 (4.4)	
Peasant	1820	950 (93.1)	870 (91.7)	
Housewife/unemployed	36	14 (1.4)	22 (2.3)	
Wealth quintile				
Lowest	512	234 (22.4)	278 (26.5)	<0.0001
Second	426	170 (16.3)	256 (24.4)	
Middle	320	161 (15.4)	159 (15.2)	
Fourth	439	233 (22.3)	206 (19.7)	
Highest	395	246 (23.6)	149 (14.2)	

Note: Numbers do not add up to total due to missing data

HIV prevalence

Out of 2185 individuals tested in all regions, 97 (4.4%; 95% CI=3.6-5.4) were HIV positive. The prevalence of HIV infection among males was 3.4% (95% CI=2.3-4.4) and 5.6% (95% CI=4.2-6.9) for females. The prevalence of HIV infection among adults aged 50 years and above in the three regions is shown in Table 2. Findings show that prevalence of HIV infection varies by region. Among males, prevalence of HIV infection was 5.0% in Iringa compared to 1.4% in Ruvuma and 3.8% in Shinyanga. Similarly, the prevalence of HIV infection among females was 9.1%, 1.9% and 5.4% in Iringa, Ruvuma and Shinyanga regions respectively.

Table 2: Prevalence of HIV infection by sex among individuals aged 50 years and above in Iringa, Ruvuma and Shinyanga

Region	Number tested*			Number infected (%; 95% CI)		
	Male	**Female**	**Total**	**Male**	**Female**	**Total**
Iringa	338	383	727	17 (5.0; 2.7-7.4)	35 (9.1; 6.3-12.0)	52 (7.3; 5.5-9.3)
Ruvuma	364	360	725	5 (1.4; 0.5 - 3.0)	7 (1.9; 0.5-3.4)	12 (1.7; 0.9-2.8)
Shinyanga	398	333	733	15 (3.8; 1.9-5.6)	18 (5.4; 3.0-7.8)	33 (4.5; 3.2-6.2)
Total	1100	1076	2185	37 (3.4; 2.3-4.4)	60 (5.6; 4.2-6.9)	97 (4.4; 3.6-5.4)

* Missing data on sex for 9 individuals

Awareness of HIV/AIDS, transmission and prevention methods

Respondents were asked whether they have heard of AIDS. About 98.5% of respondents had ever heard of AIDS (98.8% for men, 98.3% for women). Those who reported having heard of AIDS were asked a number of questions about modes of HIV transmission and prevention. While the results (for both males and females) indicate that a majority was aware of different modes of transmission, fewer respondents were

aware that a person could be infected through homosexual contact with a HIV infected person. Furthermore, knowledge of HIV prevention methods is extensive. Eighty-nine percent of women and 92% of men know that the chance of becoming infected with the AIDS virus is reduced by limiting sexual intercourse to one uninfected partner who has no other partners. Similarly, 86% of women and 90% of men knew that the chance of contracting HIV/AIDS is reduced by using condoms.

Condom use by sex and age

Results indicated that a significantly larger proportion (24.2%) of males reported ever use of condom compared to females (9.5%). Furthermore, the proportion of participants reporting ever use of condom decreased significantly with increasing age. Respondents were also asked whether they used a condom during their last sexual intercourse. It was noted that males were significantly more likely to report condom use during their last sexual intercourse compared to females. Similarly, compared to older age groups, respondents aged 50-59 years were significantly more likely to report condom use during their last sexual intercourse (Table 3).

Table 3: Proportion of participants who reported condom use during last sexual intercourse

Variable	Total	Ever use of condom	p-value	Condom use during last sexual act	p-value
Sex					
Male	1073	260 (24.2)	**<0.0001**	130/834 (15.6)	**<0.0001**
Female	1034	98 (9.5)		46/723 (6.4)	
Age group (years)					
50-59	708	205 (30.0)	**<0.0001**	98/609 (16.1)	**<0.0001**
60-69	713	108 (15.2)		53/505 (10.5)	
70-79	482	35 (7.3)		18/312 (5.8)	
80+	193	6 (3.1)		3/124 (2.4)	

TB symptoms during past one month

Study participants were asked to report TB symptoms experienced during the past one month. Findings show that the proportion of women reporting these conditions was higher than among men (Table 4).

Table 4: Percent with TB symptoms experienced in the past one month

Condition	Women	Men
Cough for more than 2 weeks	5.3	3.7
Coughing blood	1.3	1.2
Fever for more than 2 weeks	3.5	3.1
Excessive night sweat	4.4	3.5
Significant weight loss	2.6	2.4
Number of respondents	**1072**	**1080**

Socio-demographic and sexual risk factors associated with HIV infection

Tables 5 and 6 show results from univariate and multivariate analysis of factors associated with HIV infection among men and women respectively. Findings from univariate analysis indicate that for both men and women, increasing age was associated with decreased odds of HIV infection. Similarly, being in the fourth of highest wealth quintile, ever use of condom, use of condom during last sex, having 2 or more partners in the last 1 year were associated with an increased risk of HIV infection. For women, petty traders were significantly more likely to test HIV positive compared to peasants.

After adjusting for other variables, being 70 years or older was associated with a reduced risk of HIV infection among men. Other significant risk factors for HIV infection included ever use of condom, use of

condom during last sexual intercourse and being in the second or fourth wealth quintile. For women, only wealth index remained as a significant determinant for HIV infection after adjusting for the other factors. Women in the second, middle and fourth quintile were significantly more likely to be HIV infected compared to women in the first quintile (Tables 5 and 6).

Table 5: Factors associated with HIV infection among men aged 50 years and above (n=1056)

Factor	HIV infection n (%)	COR (95% CI)	AOR (95% CI)
Age (years)			
50-59	20 (6.0)	1.0	1.0
60-69	13 (3.5)	0.56 (0.28 – 1.15)	0.62 (0.30 - 1.29)
70+	4 (1.0)	0.16 (0.06 – 0.49)	**0.21 (0.06 – 0.73)**
Marital status			
Married/cohabiting	23 (2.9)	1	
Single	2 (5.6)	1.98 (0.45 – 8.75)	-
Divorced/separated/widowed	11 (4.3)	1.50 (0.72 – 3.13)	
Education			
No formal	6 (2.1)	1	
Primary	26 (3.7)	1.80 (0.73 – 4.42)	-
Secondary+	2 (6.5)	3.22 (0.62 – 16.70)	
Occupation			
Peasant	31 (3.3)	1	-
Employed	1 (4.4)	1.34 (0.17 – 10.2)	
Petty business	2 (5.9)	1.84 (0.42 – 8.01)	
Housewife/unemployed	0 (0)	-	
Wealth quintile			
Lowest	1 (0.4)	1.0	1.0
Second	8 (4.7)	11.5 (1.43 – 93.16)	**11.08 (1.43– 86.02)**
Middle	5 (3.1)	7.44 (0.86 – 64.33)	6.07 (0.72 – 51.50)
Fourth	10 (4.3)	10.50 (1.33 – 82.77)	**7.67 (1.04 – 56.74)**
Highest	10 (4.1)	9.87 (1.25 – 77.82)	5.41 (0.73– 40.37)
Sexual partners in the last 12 months			
None	7 (1.8)	1.0	1.0
1	16 (3.0)	1.7 (0.71 – 4.28)	0.79 (0.29 – 2.19)
2+	13 (8.0)	4.91 (1.92 – 12.55)	2.01 (0.71 – 5.68)
Ever use of condom			
No	22 (2.7)	1.0	1.0
Yes	15 (5.8)	2.19 (1.12 -4.28)	1.15 (0.52 – 2.54)
Condom use during last sexual intercourse			
No	20 (2.9)	1.0	1.0
Yes	12 (9.2)	3.46 (1.65 – 7.26)	**2.50 (1.03 – 6.06)**
Ever use of illicit drugs			
No	30 (3.4)	1.0	
Yes	1(5.6)	1.69 (0.22 – 13.14)	-

COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI= Confidence Interval

Table 6: Factors associated with HIV infection among women aged 50 years and above (n=1005)

Factor	HIV infection n (%)	COR (95% CI)	AOR (95% CI)
Age (years)			
50-59	28 (7.5)	1.0	1.0
60-69	19 (5.4)	0.70 (0.38 – 1.27)	0.72 (0.35 – 1.46)
70+	11 (3.3)	0.42 (0.20 – 0.85)	0.54 (0.22 – 1.35)
Marital status			
Married/cohabiting	21 (4.1)	1	
Single	2 (6.5)	1.60 (0.36 – 7.16)	-
Divorced/separated/widowed	35 (6.6)	1.64 (0.94 – 2.85)	
Education			
None	29 (5.8)	1	
Primary	23 (5.3)	0.92 (0.52 – 1.62)	-
Occupation			
Peasant	45 (5.3)	1.0	1.0
Petty business	6 (14.3)	3.00 (1.20 – 7.48)	1.65 (0.63 – 4.33)
Housewife/unemployed	2 (9.1)	1.80 (0.41 – 7.94)	1.58 (0.28 – 8.89)
Wealth quintile			
Lowest	7 (2.6)	1.0	1.0
Second	14 (5.7)	2.29 (0.91 – 5.77)	**3.37 (1.15 – 9.92)**
Middle	10 (6.3)	2.59 (0.96 – 6.94)	**3.24(1.02– 10.37)**
Fourth	17 (8.4)	3.52 (1.43 - 8.67)	**4.55(1.41– 14.70)**
Highest	9 (6.1)	2.50 (0.91 – 6.85)	2.66 (0.70 – 10.12)
Sexual partners in the last 12 months			
None	30 (4.9)	1.0	1.0
1	18 (4.8)	0.99 (0.54 – 1.81)	0.72 (0.34 – 1.52)
2+	10 (12.1	2.68 (1.26 – 5.71)	1.64 (0.62 – 4.33)
Ever use of condom			
No	47 (5.1)	1.0	1.0
Yes	11 (11.5)	2.41 (1.20 – 4.81)	1.44 (0.48 – 4.27)
Use of condom during last sexual intercourse			
No	35 (5.2)	1.0	1.0
Yes	7 (15.9)	3.42 (1.42 – 8.23)	1.26 (0.35 – 4.58)

COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI= Confidence Interval

Discussion
The general prevalence of HIV infection among adults aged 50 years and over is minor (4.4%) compared to 5.2% among 15-49 year olds in Tanzania (TACAIDS, National HIV & AIDS Response Report, 2013). Findings show that prevalence of HIV differs by region. Our findings are similar with those reported in a review done by Negin and Cumming (2010) where they found that prevalence of HIV infection among people aged ≥ 50 years in sub-Saharan Africa was 4.0%, compared with 5.0% among those people aged 15– 49 years. The prevalence of HIV reported in this study is lower compared to that reported in Ethiopia by Kassu *et al.*(2004). Moreover, the prevalence observed in our study is three times lower than that reported in a study done among hospitalized adults in Dar es Salaam (Mtei and Pallangyo, 2001). This could be

explained by the fact that our study involved a healthier population which was not admitted to hospital. However, HIV prevalence reported in our study is slightly higher compared to that reported by Negin and Cumming (2010). Recent reports from UNAIDS reveal that relatively few HIV surveys have been conducted in Sub Saharan Africa among individuals aged 50 years and older (UNAIDS, 2013).

Our findings show that prevalence of HIV infection was higher among females compared to males for all three regions. This corroborates with other studies conducted in other African countries which reveal higher prevalence among females compared to males. For instance, in a 2012 national HIV survey in South Africa, reported prevalence of HIV which was 12% among women and 6.9% among men aged 55–59 years. In contrast to our findings, a 2006–2007 national population-based survey in Swaziland, found that 13% of men and 7% of women aged 60–64 years were living with HIV (UNAIDS, 2013). Additionally, in a recent study in Malawi it was reported that the HIV prevalence was also higher among women (7.0%) compared to men older than 50 years old (Negin and Cumming, 2010). In Tanzania among both women and men, it was reported that HIV prevalence increases with age from 1% among women aged 15-19, to 10% among women aged 45-49 years. While for men the prevalence increases from 1% among those aged 15-19 to a plateau of 7% among those aged 30-49 (THIS, 2011-2012).

The variations in prevalence of HIV by sex in different countries might be explained by specific exposure factors and scenery of studies conducted. While ours was a population-based study in selected regions, the two previous studies reported above were national population based surveys.

In our study findings from univariate analysis indicate that for both men and women, increasing age was associated with decreased odds of HIV infection. Nevertheless, multivariate analysis indicates the findings were significant for men and not for women. A reasonable explanation may be that younger adults are more sexually active compared with older adults. It was also observed in our study findings that condom use was more prevalent among people aged 50-59 years compared to those aged 80 years and over. Preceding studies have shown that those who become infected with HIV later in life progress more rapidly towards AIDS and death than those people who are infected at a younger age.

In countries with a high HIV prevalence, the large number of AIDS-related deaths tends to facade the nation's potential burden of non-communicable diseases among older people since large proportion of this population do not live long enough for non-AIDS-related illnesses to manifest (UNAIDS, 2014).While our findings show significant variation in HIV infection among age groups, previous evidence point to the fact that there is occurrence of new cases of HIV infection among older adults (Freeman *et al.*, 2012).

Our study findings also revealed that for women, petty traders were significantly more likely to test HIV positive compared to peasants. Conversely, this association was not significant in the multivariate analysis that we conducted. Evidence from previous studies shows that that both men and women aged 65 and over generally had fewer sexual partners than those aged 15-49. Moreover, individuals aged 50 and older were less likely to have had sex in the past 12 months (Freeman *et al.*, 2012). Consistent with our findings, a previous study found that level of education and marital statuses were not associated with HIV infection (Mtei and Pallangyo, 2001).

In our study wealth was found to be an important determinant of HIV infection for both men and women. For men, being in the second and fourth wealth quintile was associated with an increased likelihood of HIV infection whereas for women, those in the second, middle and fourth quintile were more likely to be infected compared to women in the first quintile. In their study of hospitalized patients, Mtei and Pallangyo (2001) found no association between HIV-1 sero-status and socio-economic status. Generally, our findings are consistent with data from Tanzania among people aged 15-49, which revealed that the likelihood of HIV infection increased with wealth (TACAIDS, 2013).

With regards to sexual behavior, our study has shown that having 2 or more sexual partners, ever use of condoms and use of condom during last sex in the past 1 year were associated with an increased risk of HIV

infection among men. Our findings are similar to those reported for younger adults in our setting and elsewhere (TACAIDS, 2013; Mbaga *et al.,* 2006).

Conclusions

It is without doubt that HIV/ AIDS is a serious problem among adults aged 50 years and over. The HIV prevalence observed in the current study is high among the elderly despite the regional and sex specific variations. In fact, some of the risk factors exposing this group to HIV are similar to those exposing 15-49 years old people in Tanzania. While awareness of the modes of transmission and prevention is high, this has not translated into reported changes in risk sexual behaviours among this population. Older adults continue to be sexually active in a context of increasing vulnerability due to social, structural and contextual environments. Older adults are exposed to risks of HIV infection in an environment that offers limited access to services, resources, information and education to facilitate prevention of HIV/AIDS.

It is important to note that while the observed prevalence of HIV is a call for alarm in the country. There is a general feeling that the perceived magnitude of the epidemic among adults 50 years and over is no cause for serious concern. It is paradoxical that study participants generally felt at less risk of HIV in their informal conversations (due to their advanced age and assumed sexual inactivity) in a context where some appear to be reluctant or socially constrained to protect themselves using available HIV prevention methods such as condoms.

At this juncture, it is fair to say that the current study provides the most recent picture of the epidemic from a large sample population-based data on older adults in settings with high HIV prevalence. These findings add to the body of knowledge on the magnitude and factors associated with HIV among older adults that has been lacking in many parts of sub Saharan Africa, and Tanzania in particular. Additional research is warranted to explore intergenerational sexual relationships and how they influence HIV transmission dynamics among older adults. Fears about status disclosure and other negative attitudes towards individuals living with HIV call for additional behavior change interventions targeting this population group.

Declarations

Ethics and consent to participate

The Ethical Committee of the National Institute for Medical Research (NIMR) granted ethical clearance approval for conducting this study.

Consent for publication

Not applicable

Competing interest

The authors declare no competing interest.

Authors' contributions

MJE participated in the conception and design, acquisition of data, analysis and interpretation of data, drafting and revising of the manuscript. LEM participated in data analysis and interpretation, writing and approved the final manuscript. MN & SL participated in the conceptualization of the study, collected and analyzed data, participated in the drafting the manuscript. IHM participated in reviewing the manuscript. CM participated in the design, acquisition of data, analysis interpretation. All authors approved the final manuscript.

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