

**MAGNITUDE OF HIV INFECTION AND ASSOCIATED FACTORS  
AMONG THE FISHING COMMUNITY IN GEITA REGION,  
TANZANIA**

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**MSc (Epidemiology and Laboratory Management) Dissertation  
Muhimbili University of Health and Allied Sciences  
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**Muhimbili University of Health and Allied Sciences**

**Department of Epidemiology and Biostatistics**



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**By**

**Onna Duuma Panga**

**A Dissertation Submitted in (Partial) Fulfillment of the Requirements for the Degree  
of Master of Science (Epidemiology and Laboratory Management) of**

**Muhimbili University of Health and Allied Sciences  
October, 2019**

## CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **“Magnitude of HIV Infection and Associated Factors among the Fishing Communities in Geita, Tanzania”**, in (partial) fulfillment of the requirements for the degree of Master of Science (Epidemiology and Laboratory Management) of Muhimbili University of Health and Allied Sciences

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**DECLARATION AND COPYRIGHT**

I, **Onna Duuma Panga**, declare that this **dissertation** is my work and it has not been presented and will not be presented to any other University for similar or any other degree award.

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## ABSTRACT

**Background:** Fishing communities have been identified as among the vulnerable groups who are at high risk of acquiring HIV infections. This vulnerability is mainly due to their mobility, time away from home and access to cash income. Several strategies have been used to mitigate the spread of HIV in high-risk group however there is a paucity of information on magnitude of HIV infection and associated factors among the fishing community in Geita.

**Objective:** This study aimed to determine the magnitude of HIV infection and associated factors among the fishing communities in Geita Region.

**Methodology:** A cross-sectional study was conducted at fish landing site along the shores of Lake Victoria basin in Geita region from January to February 2019. The study participants were interviewed using a structured questionnaire. Blood samples were screened for HIV using HIV1/2 SD bioline and HIV Unigold rapid test kits. HIV positive sample was tested using LAg Avidity test and viral load test to distinguish between recent and long-term HIV infection. Bivariate and Multivariate Logistic regression was used to determine factors associated with HIV infection.

**Results:** A total of 1048 consented individuals were included in the study. Majority of the participants were aged between 25-39 years and their age mean was 34 years ( $SD\pm 11.5$ ). The overall prevalence of HIV was 9.06%. Of the 95 who tested positive for HIV, 7 (7.4%) had HIV recent infection. The factors that were independently associated with HIV infection were being never attended schools, (AOR=3.41, 95%CI=1.15-10.10), separated/divorced (AOR=1.69,95%CI=1.01-2.81), transactional sex (AOR=2.24, 95%CI=1.30-3.86), history of sexual transmitted infections (STI) in the last six months (AOR=1.67, 95%CI=1.05-2.66), and never tested HIV in the last 12 months (AOR=2.09, 95%CI=1.32-3.29) compared to the reference group. More than half (55.2%) of the participants had low access to education information materials and had to access the condom (54.4%) from shop or pharmacy.

**Conclusion and Recommendations:** The HIV infection in the fishing community was high along the shore of Lake Victoria in Geita Region. Public health intervention such periodic screening of STI, treatment and provision of health education on the use of HIV services like condom use, HIV testing should be done in Geita Region.

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**ABBREVIATIONS**

AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
CD4	Cluster of differentiation
CDC	Center for Disease Control
DMO	District Medical Officer
FRR	False-recent rate
HIV	Human immune virus
LA <sub>g</sub>	Limiting antigen
MOCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
MUHAS	Muhimbili University of Health and Allied Sciences
NACP	National AIDS Control Program
PEPFAR	President's Emergency Plan for AIDS Relief
PLHIV	People Living with HIV
RITA	Recent infection testing algorithms
RMO	Regional Medical Officer
SOP	Standard Operation Procedures
TFELTP	Tanzania Field Epidemiology and Laboratory Training Program
THIS	Tanzania HIV impact survey
UNAIDS	Joint United Nations Program on HIV/AIDS
VL	Viral load
WHO	World Health Organization
EIA	Enzyme immunoassay

rDR	Recombinant immunodominant region
MDRI	Mean duration of recent infection
BMU	Beach Management Unit
OD	Odd ratio
NHLQACT	National Health Laboratory Quality Assurance and Training Center

## DEFINITIONS OF TERMS

**Algorithm:** A specific set of sequential instructions for carrying out a procedure, also known as a protocol.

**Mean duration of recent infection** is the average length of time that people with newly acquired infection in the population. The mean duration time for Limiting Antigen -avidity test is 130 (95% CI; 118-142) days with the range of up to six months.

**The landing site:** Is a point at the shore of the lake where the fishing boats dock to offload fish for sale and small-scale processing of fish.

**Beach Management Units (BMU):** Are community-based organizations that bring together everyone involved in fisheries at the beach.

**HIV recent infection:** a condition that can develop as early as two to four weeks after someone contracts HIV. Therefore, is generally considered the phase up to 6 months after infection, during which detectable anti-HIV-1 antibodies develop.

## CHAPTER ONE

### 1.0 INTRODUCTION

#### 1.1 Background

Human immunodeficiency virus (HIV) continues to be a major public health problem affecting all groups of people globally. HIV/AIDS may lead to progressive deterioration of the immune system allowing life-threatening opportunistic infections (1). HIV is mainly transmitted through unsafe sex with an infected person however, transmission can also occur through transfusion with infected blood and mother to child transmission. Mother to child transmission may occur through breastfeeding, placenta or during delivery (2). In 2017, approximately 36.9 million people were living with HIV worldwide and nine hundred and forty thousand (940 000) people died due to AIDS-related complication (3). Globally, of those people living with HIV 1.8 million are newly infected with Sub-Saharan Africa accounting for 66% of this infection. Eastern and southern Africa remains high HIV burden regions accounting for 45% of the world's HIV infections (3). Due to improved case management (care and treatment), HIV/AIDS-related death has significantly declined; however, HIV infection continues to increase posing a challenge to HIV prevention programs. In 2017, Tanzania had approximately 1.5 million people living with HIV and new infection contributing 65 000 (4.3%) of these infections (3). The prevalence of HIV in Tanzania has declined from 5.1% in 2012 to 5% in 2017 while in Geita region the prevalence of HIV has increased from 4.7% to 5% in the same year among the age group 15 to 64 years (4,5).

In order to respond to the HIV epidemic, UNAIDS set 90-90-90 HIV Global targets in December 2013 aiming to ensure that by 2020, 90% of all people living with HIV know their status, 90% of those diagnosed as HIV-infected receive sustained antiretroviral therapy, and 90% of people receiving ART will have viral suppression (6). To address this in October 2016 the Tanzanian government adopted the universal test and treat approach to reduce the rate of HIV new transmission in the population (7). The approach requires people living with HIV (PLHIV) to start treatment regardless of their CD4 count or WHO clinical staging. To attain the first 90 and prevent HIV new infection, there is a need to

have intensified HIV case findings among the key vulnerable groups like the fishing community (7,8).

Like other key population, the fishing community is also identified as high-risk groups in acquiring HIV infection (9,10). These high-risk sub-groups tend to have consistently increased the rates of new and existing infections than the general population (10,11). Epidemiological evidence from East Africa and other sub-Saharan African countries demonstrate a considerably higher burden of HIV infection among fishing communities than corresponding general populations (9,12–14).

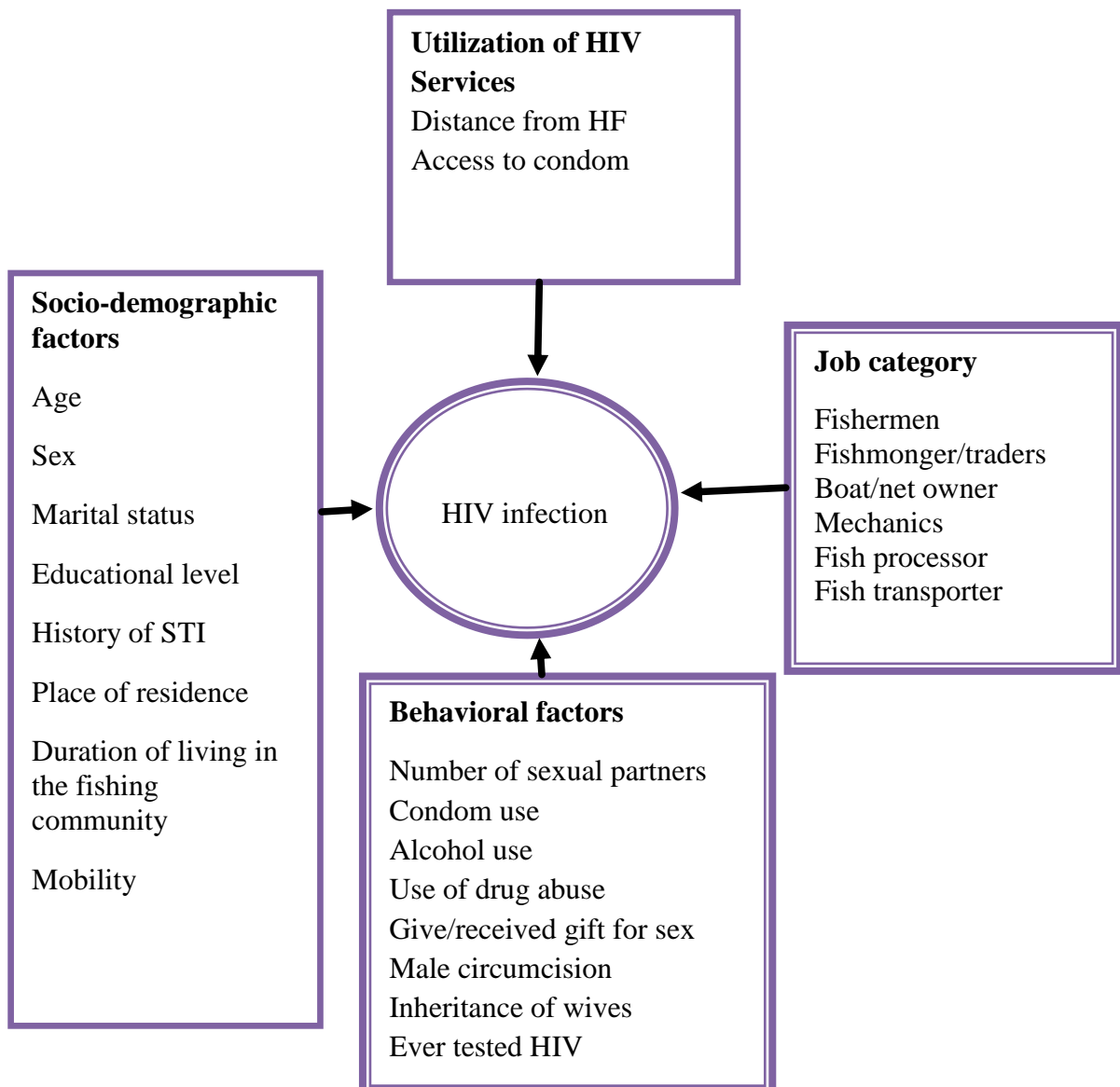


## **1.2 Statement of the problem**

HIV infection remains a major public health issue worldwide. The fishing communities are among the identified high-risk group in acquiring HIV infection. Fishing communities have social, economic and lifestyle behaviours, which are likely to predispose them to a higher risk of HIV infection than the general population. The previous studies done in Uganda and Kenya along Lake Victoria basin reported a high prevalence of HIV infection among the fishing community (19.7% to 28.8%) which is higher compared to the general population (13–17). The high rate of HIV new infection (3 to 6 cases per 100 people) were documented in different studies carried out among the fishing communities in Uganda and Kenya along the Lake Victoria basin (9,18,19). A survey done by the Tanzania National AIDS Program in 2016 reported an increase of prevalence of HIV infection in Geita region from 4.7% to 5% among aged group 15-64 years (5). However, this study did not look at magnitude of HIV infection among a high-risk group like the fishing community. There is limited information on magnitude of HIV infection and associated factors among the fishing community in Geita. Therefore, there is need to carry this study to estimate the magnitude of HIV infection and associated factors among the fishing community in Geita Region.

### 1.3 Conceptual framework

The conceptual framework in Figure 1 shows different factors associated with HIV infection. Research has shown that the fishing community is highly vulnerable to HIV/AIDS. This vulnerability is attributed to several drivers including mobility or migration, time away from home, inconsistency condom use, alcohol consumption, access to health services and commercial sex at landing sites.



**Figure 1: The interaction between HIV infection and associated factors**

#### **1.4 Rationale**

Fishing communities are quite dynamic; such dynamism is likely to diversify risk factors associated with HIV acquisition. Knowing the magnitude of HIV infection and its associated factors provide a more accurate picture of who in the population is at increased risk of HIV infection. Moreover, knowing the proportion of HIV recent infection will help to track the trends of HIV epidemic in key and vulnerable populations. Therefore, the finding of this study will inform the Ministry of Health, Community Development, Gender, Elderly, and Children, HIV stakeholders and community at large to understand the impact of HIV infection in these populations. Finally, information obtained from this study will help to guide the appropriate intervention, determine and guide the designing of necessary specific interventions to reduce the risk and vulnerability of HIV transmission among the fishing communities.

#### **1.5 Research questions**

1. What is the magnitude of HIV infection among the fishing community in Geita Region, Tanzania?
2. Do social demographic or behavioural factors influence HIV acquisition among the fishing community in Geita Region, Tanzania?
3. Are the health services accessible and utilized by the fishing community in Geita region?

## **1.6 Objectives**

### **1.6.1 Broad Objective**

To determine the magnitude of HIV infection and associated factors among the fishing community in Geita region Tanzania.

### **1.6.2 Specific Objectives**

1. To determine the prevalence of HIV infection among the fishing community in Geita Region, Tanzania
2. To determine the proportion of HIV recent infection among the positive clients in the fishing community in Geita Region, Tanzania
3. To identify the factors associated with the prevalence of HIV infection among the fishing community in Geita Region
4. To determine accessibility and utilization of health services among the fishing community in Geita Region.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

#### 2.1 Magnitude of HIV infection

The fishing community is considered the most at-risk population due to their high vulnerability of HIV infection (11). This vulnerability is mainly attributed to the socio-demographic profile, economic, low access to HIV health services, and their behavioural lifestyle of the fishing community (9). Several studies conducted in the world have shown high HIV infection among vulnerable groups like the fishing community. Several studies have reported great Regional variation of HIV prevalence among the fishing community in Asian countries (11). The prevalence was 4.6 to 14 times than the prevalence in the general population (11). In Malaysia, a prevalence of 12.4% among fishermen was documented (20). Studies conducted in Thailand and Cambodia among the fishermen along coastal areas of Sihanouk Ville, the Gulf of Thailand and Andaman sea have shown a higher prevalence of HIV infection (15.5% vs 16.1%) among the fishing communities (21,22). However, low prevalence of HIV infection (0.3% vs 1.8%) was documented in Brazil and Honduras (Latin America) among the fishing folk communities (11).

High vulnerability of HIV among the fishing community compared to the vulnerable group have been reported in several African countries including Tanzania, Democratic Republic of Congo, Kenya, Malawi and Uganda (9,11,12,16,23,24). In DRC the study conducted along Lake Tanganyika recoded 20% prevalence of HIV infection among the fisherfolk community (11). In East African Countries including Tanzania (6.2%), Kenya (22.7%,26%) and Uganda (19.7%, 22%, 24%, 26.6%,28.8%) the prevalence of HIV among the fishing community living around Lake Victoria was relatively higher compared to general population (11,12,13,16,17,23,24). Several studies done in Uganda have shown that the HIV incidence among the fishing communities at Lake Victoria varied in between 3.5 to 6.04 per 100-person-year at risk (9,10,18, 19). This overall incidence rate among fishing communities was found to be four (4) times higher than the estimated national incidence among adults in the general population in Uganda and Kenya (25). Similarly, the nationally representative survey done in Uganda and Kenya has shown a high proportion of HIV recent infection (17% vs 6.02%) among the general population (26,27,28). In

Tanzania, a recent survey conducted among the general population has shown a slight decline in HIV prevalence from 5.1% in 2012 to 5% in 2017 and the HIV incidence was 0.29 (4,5). In the Geita region, the prevalence of HIV has increased from 4.7% to 5% among the age group of 15 to 64 years (4,5). These rates are from the general population and may mask the epidemic trends in high-risk groups such as sex workers and fishing communities (11,13).

## **2.2 Socio-demographic factors related to HIV infection**

Socio-demographic characteristics including age, educational level, marital status, job category, history of STI, duration lived in the fishing community and history of travelling are among the factors associated with the acquisition of HIV infection in a population including the fishing community (29). Several studies done in Asian, Latin American and African Countries have reported fishing communities are among the key vulnerable groups with HIV acquisition (11). This vulnerability includes the time fishermen and fish traders are away from their home (mobility), demographic profile, the ready availability of commercial sex in the fishing port and subordinate economic and social position of women in fishing communities make them even more vulnerable to acquire HIV infection (11,29,30).

In low and middle-income countries including Malawi, Kenya, and Uganda, research has demonstrated that there is a high level of mobility among fishermen and fish traders looking for the availability of a fish. This lifestyle made most of the fishermen engaged in unsafe sexual practices outside their family (12,14,16). So far, it has been shown that the economically active age groups have the highest HIV incidence in the population whereas females in the reproductive age group are more likely to have HIV than males in the corresponding age group (27,28). In Uganda research conducted among fishing communities have revealed that age younger than 25 years has the highest risk of HIV infection compared to age more than 25 years (9,10) while Kamali et, al. found that the high rates of HIV infection in fishing communities have been attributed to several factors such as mobility, young age, duration of living in the community, nature of occupation, history of STI/genital sore/discharge, marital status, level of education, uncircumcised men (18,19). The likelihood of high prevalence rates in this specific population may pose a huge challenge to the rest of the population as fishermen are likely to have sex with local women

when they bring their catch to the mainland, acting as a bridge for spreading the virus to the general population (31,32). Such a lifestyle of people involved in the fish trade could be one of the reasons for the high prevalence rates in the region.

### **2.3 Behavioural factors associated with HIV infection**

Globally behavioural factors are known to be associated with the transmission of HIV infection in a population like fishing communities and their drivers differ from one place to another (9,10,22). The high risk of HIV infection among fishermen/fishing communities in Southeast Asia is generally thought to be related to their sexual behaviour and low frequency of condom use (21,22). The study done in Malaysia suggested that the main route of HIV acquisition among fishermen is via intravenous drug use and infrequent use of condom among sexually active groups (20). In North Pacific Ocean the study demonstrated that foreign and local fishing vessels are in port from days to weeks, during which time local women board the vessels for transactional sex (the exchange of sexual services for goods or opportunities) (33). Some of these women drink alcohol with the foreign/Local fishermen and engage in sex with the local women which led to raising the HIV epidemic (33).

Similarly, study done in Malawi at Lake Malawi has noted different types of transactional sex among female fish traders exchanging sex for access to fish from fishing boats, sex for capital and sex for accommodation while in Kenya, study reported that women get benefits from being involved in sex for fish business regardless of their HIV status (12,31). Research has reported high rates of HIV infection or acquisition among regular drinkers of alcohol probably as a result of sexual disinhibition. Others behavioral factors like having sexual partners within 3 months, having multiple sexual partners, use of marijuana and being away from home frequently have shown high rates of HIV infection (9,10). Similarly, a study done in Uganda has found that high HIV rates among fishing communities have been attributed to multiple sexual partners, inconsistency use of condom and frequent use of alcohol (18,19). There is also a very high rate of sexual mixing within the fishing communities where fishermen have sexual intercourse with different partners who are either married to other men or engage in commercial sex (31).

#### **2.4 Accessibility and utilization of health services among the fishing community**

The different study done worldwide has revealed the access to health care services such as a condom, distance from the facility and HIV testing services are an important determinant for early detection and prevention of new HIV infection. The study done in Southern Malawi at Lake Malawi reported that most of the fishing landing sites are often in remote areas and access to health care services may be difficult. Long and unpredictable distance away from home villages can create challenges for HIV prevention and treatments program (30). A study conducted in Uganda among fishing communities has found that inadequate HIV intervention such as HIV testing, access to condom and long distance from home villages has contributed to high rates of HIV infection (18,19).

#### **2.4 Control and Prevention strategy in HIV transmission**

Since the HIV epidemic, the number of interventions has been undergone globally in controlling HIV transmission in a population. The Combining behavioural, biomedical and structural HIV prevention interventions tailored to national epidemics is the most effective approach to reducing new infections. These include health promotion, behaviour change counselling, quality-assured HIV testing and counselling, male and female condom programming, safe voluntary medical male circumcision, prevention of mother to children transmission program, and early initiation of antiretroviral therapy (34). In Tanzania over the past 35 years since the first case report, Tanzania has implemented a series of strategic plans and has scaled up prevention interventions, care and treatment services. Since 2004, the Government of Tanzania (GOT), in collaboration with partner organizations, has initiated care and treatment programs under the National AIDS Control Program (NACP). Currently, 5891 care and treatment centre has been established to monitor HIV client's patients in 2018.

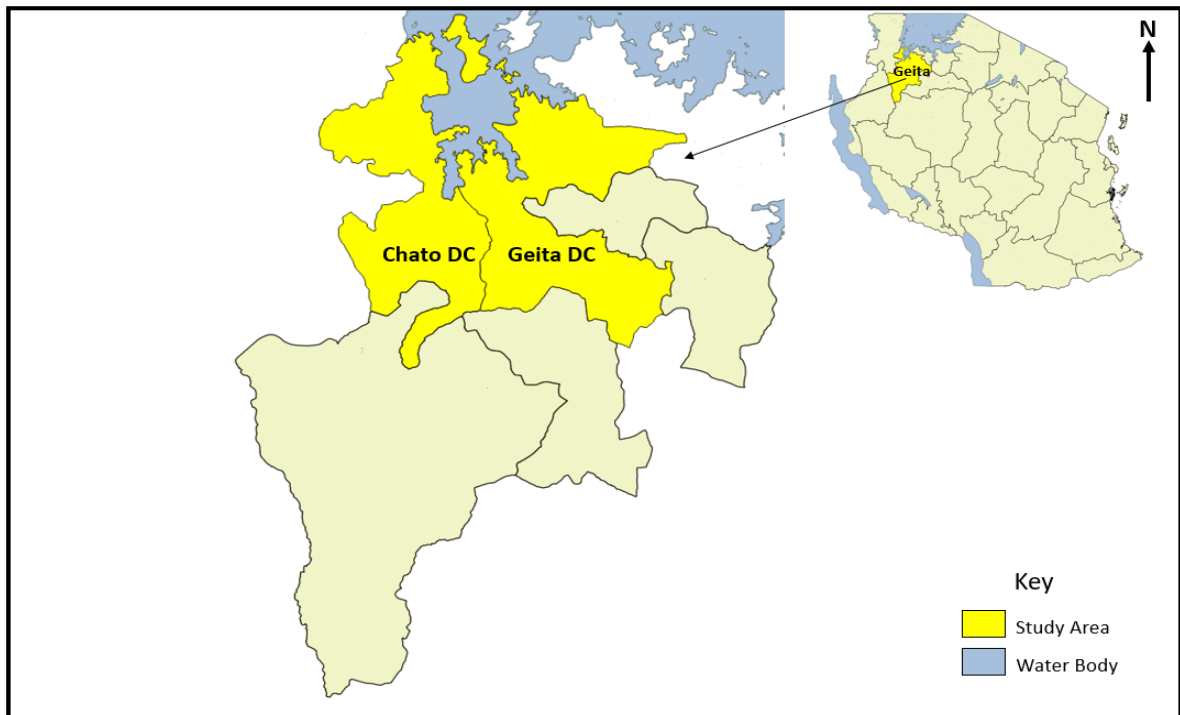


## CHAPTER THREE

### 3.0 METHODOLOGY

#### 3.1 Study area

Geita is one of the 26 Tanzania Mainland Region with an estimated total population of 2.4 million (Population projection NBS, 2018). The region is 1,100 to 1,300 meters above sea level and shares borders with Kagera region to the West and North while to the South and South Eastern parts border Shinyanga region and Mwanza region to the North. Also, it was surrounded by the Lake Victoria shores especially in the north and east parts. The total surface area occupied by Geita region is 21, 879 sq .kms. Out of this area, 1,150 sq. kms (5.3%) is covered by water, dominated by Lake Victoria. Administratively the region has 5 Districts (Geita, Chato, Bukombe, Nyang'whale and Mbogwe) and one town Councils (Geita). In terms of total surface area by District, Geita DC 27%, Bukombe DC 34%, Nyangh'wale DC 7% , Chato DC 13% and Mbogwe DC 19%. The Districts that involved in fishing activities are Geita and Chato (figure 2). The region has a total of 72 landing sites where fishing activities takes place. Of the total landing sites, 38 from Chato Districts 34 from Geita Districts. The landing site is a point at the shore of the lake where the fishing boats dock to offload fish for sale and small-scale processing of fish. All the fish landing sites are registered in beach management units (BMU). The BMUs are community-based organizations that bring together everyone involved in fisheries at the beach.



**Figure 2: Map of Geita Region showing the study districts**

### **3.2 Study design and duration**

This was a cross-sectional study to determine the magnitude of HIV infection and associated factors among the fishing communities that was conducted from January to February 2019 along the shores of Lake Victoria basin in Geita region.

### **3.3 Study population**

The study population was the fishing communities residing along the shores of Lake Victoria in Geita region. The study population included both the fishermen and those who interface with the fishermen within a given geographical coverage along the shores of the lake i.e. those residing or working within the landing site (beaches) and earning their livelihoods from such activities. The fishing communities were, therefore, include members of BMU namely boat owners, boat managers, boat crew, fish traders, fish processors, boat builders, and repairers. The fishing communities have similar social characteristics anchored by the economic thread of fish and are mobile persons who live away from their families hence prone to multiple sexual partners. The fishermen are also known to be involved in the hazardous business that leads to frequent drowning and may

not appreciate very much the risk of death due to HIV as being more than that due to drowning. The fishing business also attracts a host of other business and people including food vendors, commercial sex workers etc.

### 3.4 Sample size estimation

The study sample was estimated using the Kish Leslie formula (Kish, 1965)

$$n = DEFF \times Z^2 p [1-p] / \varepsilon^2$$

Whereby:

DEFF= Design effect

n = the minimum estimated sample size fishing community

Z = Z score for 95% Confidence Interval (1.96)

P = 4.9% proportion of HIV infection study by Seeley et al 2012 (9).

$\varepsilon$  = tolerable errors (1.9%)

Therefore:

$$n = 2 \times (1.96)^2 \times 4.9 \times (100-4.9)/1.9^2 = 992 \text{ participants}$$

Adjusting for non-response rate

$$n = \frac{N}{1 - 0.1}$$

Where,

n = adjusted sample size

N= Initial sample size= 992/1-0.1

=1102 participants

The samples of 1102 participants were included in the study.

### 3.5 Sampling methods

A probability proportional to size cluster sampling method was used to provide the best estimate for the HIV infection and associated factors for the fishing community. For the fishing community, the fish landing site was considered as a cluster. Members of a fish-landing site have a lot of similarities in their behaviours that may predispose them to HIV infection. Due to the different types of fishing predominant in each landing site, there are important differences in character and behaviours of persons in different landing sites. Members of the fish-landing sites were registered in a BMU and this register is usually

updated regularly. The members include only those who were 18 years and above. Before the onset of the study the district fisheries officers, in liaison with the BMU leaders and the local leaders were made to obtain the updated list of the fishing population who are above 18 years.

### **3.5.1 Sampling procedures**

The sampling procedure was two-stage cluster sampling. The two districts involved in the fishing activities were purposively selected. These include Geita and Chato District councils and the total list of landing sites was obtained from the District fisheries officers, local leaders and the Beach Management leaders with their respective population members who are above 17 years and arrange them in order and the cumulative population was determined. Eleven (11) out of 72 landing sites were obtained through random selection whereby we used Open Epi to generate random numbers. The probability proportion to size was applied to attain the sample size for each landing sites. Thereafter participants were selected using systematic random sampling. Sampling interval was calculated by dividing total population by sample size. Formula:  $K^{th} = \text{Population size (7861)} / \text{Sample size (1102)} = 7$ , therefore after every 7<sup>th</sup> interval, participant in each landing sites was selected from the sampling frame until the required sample size was attained.

## **3.6 Inclusion and exclusion criteria**

### **3.6.1 Inclusion criteria**

1. All individuals aged 18 years and above whom are working at the landing beach site
2. Participants consented and agree to participate in the study

### **3.6.2 Exclusion criteria**

1. People who meet the criteria but are dumb or deaf or with mental retardation.

## **3.7 Study variables**

### **3.7.1 Dependent variables**

HIV infection among the fishing community in Geita region

### **3.7.2 Independent variables**

The independent variables included were Socio-demographic characteristics such as age, sex, marital status, place of residence, educational level, duration of living, history of travel in the last three months and history of sexually transmitted infection. Behavioral factors such as the number of sexual partners, use of condom at last sexual intercourse, consistency condom use, alcohol use, use of drug abuse, give/received fish for sex and job category like a boat or net owner, net or boat repair, fishmonger/traders, fishermen, and fish processor. Health system factors such as availability of condom, HIV testing services and distance from the health facility, provision of electronic information materials, the facility that providing HIV services and access to condom.

### **3.8 Recruitment and training of research assistant**

Four research assistants with a medical background including two laboratories technologist and two nurses were recruited from Chato District hospital and Geita hospital. The research assistants were trained on the following before starting data collection: rationale, purpose and scientific objectives of the research; tracking of participants, completion of different forms, data collection, confidentiality, linkage to care for that positive HIV, separation of plasma sample and storage.

### **3.9 Data collection**

#### **3.9.1 Administering of Questionnaire**

Data was collected using a Kiswahili version structured questionnaire (appendix 1). The questionnaire was tested in the field for ease of use and analysis along with proper data collection of desired information. The choice of Kiswahili is because of the diversity of the various ethnic groups in and fishing community and Kiswahili is the commonest language for a transaction of business in this community. Data collection took place in a three private room including counseling, HIV testing and ART initiation. In all settings, data was collected in a way that maximizes privacy. Personal identifying information (PII) (name and date of birth) was collected on the questionnaire forms and special register. The information's that were collected by the counselor nurses and laboratory technologist was inspected for completeness every day before leaving the site.

### **3.10 Laboratory investigation/ Procedures process**

#### **3.10.1 Blood sample collection**

Venous blood was collected from eligible participants by a well-trained phlebotomist or nurses. Eight mls of whole blood were collected into two separate EDTA vacutainer tubes (4mls each). One was used for HIV rapid test and CD4 count measurement and the other one for testing LAg avidity test and HIV viral load. SOP outlining the process for blood collection under normal circumstances was available. Plasma was prepared at the satellite laboratories and stored at 2<sup>0</sup>C to -8<sup>0</sup>C within two weeks for the viral load and LAg Avidity testing at National Health Laboratory Quality Assurance Training Center in Dar es Salaam.

#### **3.10.2 HIV testing**

HIV testing was performed by a research assistant after completion of pre-test counseling. HIV screening was performed using the national HIV rapid testing algorithm using the SD Bioline and Uni-Gold test (35). Individuals with a non-reactive result on the screening test were reported as HIV-negative while individuals with a reactive rapid test result were further tested by the Uni-Gold test. The participant results were returned on the same day and those HIV positive clients were counseled and linked to care and treatment centre.

#### **3.10.3 Specimen storage and transportation**

The Blood samples were centrifuged **to harvest** plasma **which was** stored in a freezer at a temperature of 2<sup>0</sup>C to -8<sup>0</sup>C at the Geita Regional Referral Laboratory. Plasma samples were later shipped to the National Health Laboratory Quality Assurance and Training Centre for LAg-avidity and viral load testing in Dar es Salaam.

#### **3.10.4 CD4 count testing**

CD4 T-cell measurement was performed on the same day to all participants who test HIV-positive by trained laboratory technologist at district laboratory using BD presto machine. The internal quality control was done according to manufacturer instruction before running patients' sample to ensure the validity and reliability of results.

#### **3.10.5 Recent HIV testing**

##### **3.10.5.1 Principle of LAg-Avidity EIA**

The Sedia™ HIV-1 LAg-Avidity EIA is based on the functional avidity or binding strength of antibodies. Antibody avidity increases with time since infection and is a robust

parameter to distinguish recent from long-term infection. The assay incorporates a recombinant protein (rIDR-M) containing the major variants of gp41 immunodominant regions among the HIV-1 group M viruses to minimize subtype bias. LAg-Avidity EIA is a single-well avidity assay and provides a measure of antibody avidity as normalized optical density (ODn). The assay is optimized by coating plates with limiting amounts of rIDR-M which facilitates binding of only high avidity antibodies. Due to a low density of antigen on coated wells, weak antibodies dissociate easily because of monovalent binding of antibodies, thus distinguishing between recent and long-term HIV-1 infection (36). The studies have shown that the LAg Avidity assay is more accurate compared BED-CEIA assay (37). The LAg avidity assay has demonstrated sensitivity and specificity of 100% and 98.2% (38). A significant limitation of current HIV incidence laboratory assays is that they overestimate HIV-1 incidence by misclassifying a proportion of individuals with long-term infection as recent infection, which can lead to errors in incidence estimations (39,40). The proportion of individuals with long-term infection that misclassify as recent infection on the incidence assay is termed in this study as the assay's proportion false recent (PFR). Because the PFR has been shown to vary significantly by population, HIV subtype, HIV epidemic phases, individual immune status, and antiretroviral (ARV) use (41-45). Low viral loads among HIV-infected persons as a result of ARV treatment and among those who naturally maintain an undetectable viral load in the absence of treatment (also known as "elite controllers") will misclassify as false recent on incidence assays that rely on HIV antibodies to determine recent infection. Experts in the field of HIV incidence assay development recommended that a PFR for a HIV incidence assay not exceed 2% to produce reliable incidence estimates. Therefore, this assay should be accompanied with multiple laboratory methods such as CD4 counts, viral load and ART metabolites test (41). In this study we included CD4 count and viral load test to minimize the false recent infection.

### **3.10.5.2 LAg-avidity procedure**

The Sedia™ HIV-1 LAg-Avidity EIA is a single well-limiting antigen IgG capture enzyme immunoassay. Briefly, 500 µl of sample diluents was transferred to each titer tubes by use of a multichannel pipette. Five 5µl of controls, calibrator or plasma samples were added into the separate titer tubes containing 500 µl of sample diluents solution. Then 100 µl of controls and plasma sample was added to the avidity plate and then washed after one hour

of incubation at 37°C. Two hundred (200) µl of dissociation buffer was added to each well of avidity plate. One hundred (100) µl of conjugate working solution Goat Anti-Human IgG-Horseradish peroxidase (HRP) (AAT Bioquest, USA) was added into the avidity plate followed by 100 µl of tetramethylbenzidine solution (TMB) (AAT Bioquest, USA). Then 100 µl of stopping solution was added. The plate was read at a wavelength of 450 nm using a reference filter wavelength of 620-650 nm. The colour is generated with the intensity proportional to the amount of HRP. Therefore, the optical density (OD) of each well was measured. The OD value is divided by the OD value of an internal kit calibrator to generate the normalized OD or "ODn". For confirmatory testing, the "OD of the sample" is the median value of the three replicate-tested specimen OD values as shown in the equation below,

$$\text{ODn} = \frac{(\text{OD of sample, Control, or Calibrator})}{(\text{median OD of Calibrator})}$$

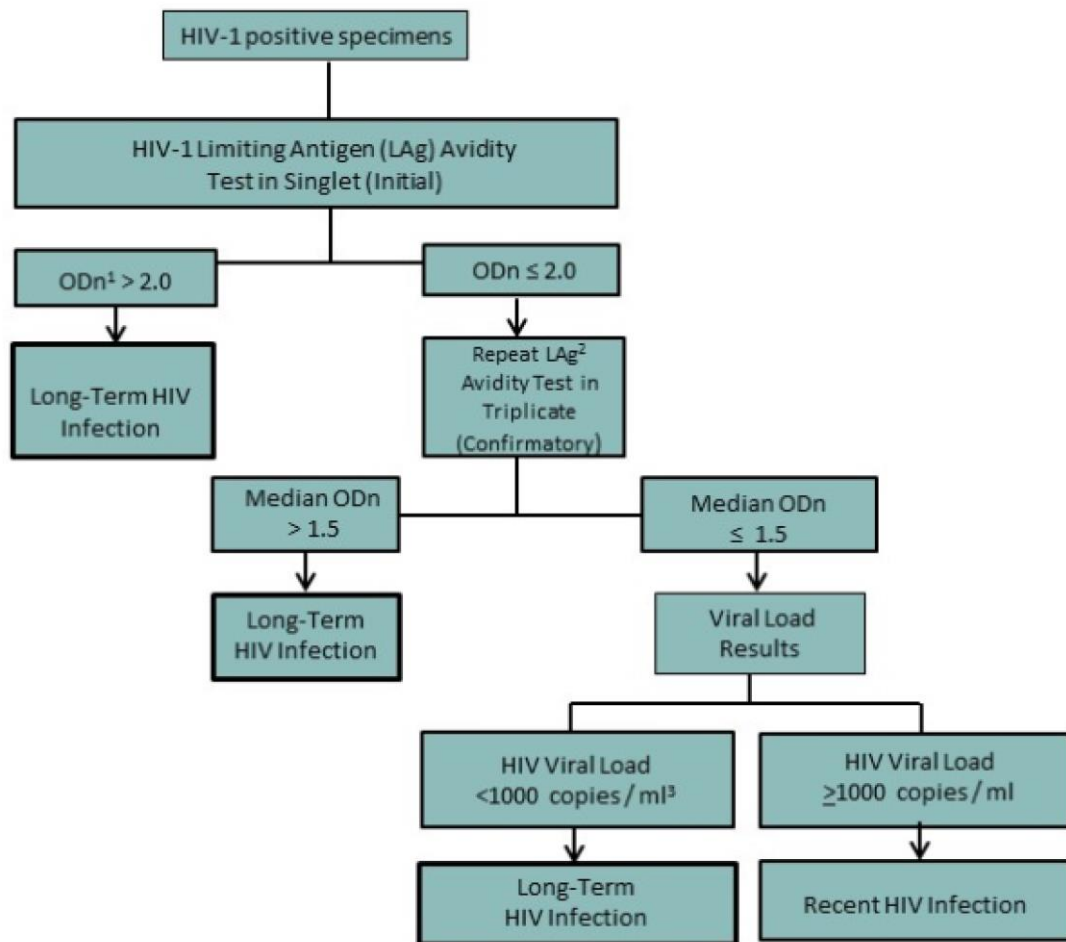
Therefore, the value of the ODn dictates whether a result needs to be confirmed and/or if the HIV infection is a recent or long-term (36).

### **3.10.5.3 LAg-avidity interpretation**

The LAg testing assay was performed twice: the initial screening test, followed by a confirmatory test in triplicate for specimens suggesting recent infection. In initial screening testing, the specimen was tested once times while in a confirmatory test the specimen was tested three times and the results were compared across the three normalized optical density to ensure the reliability of the test results. During the initial test, the specimen with ODn value >2 was termed long-term infection while the specimen with ≤2.0 was performed a confirmatory test in triplicate. After the confirmatory test, the specimen with an ODn value >1.5 was classified as long-term infection while specimen with and ODn value ≤1.5 was classified HIV recent infection. Specimens with a final ODn value <0.4 was retested by the HIV diagnostic testing algorithm to confirm HIV-1 seropositivity. The specimen identified as recent infection was performed viral load testing in order to minimize the false-recent rate due to individual immune variability (elite controller) or persons under suppressive ART. Finally, the specimens with ODn values ≤1.5 and VL ≥1000 copies/ were classified as recent infections and specimens with suppressed VL,



classified as  $<1000$  copies/mL was removed from the number of recent infections specimens and included in the number of long-term infections specimens (36,46, 47) figure 3. The internal quality control was performed before running patients sample as per manufacture instruction.



**Figure 3: HIV-1 Recent Infection Testing Algorithm (LAg/VL algorithm)**

### 3.11 HIV viral load testing

HIV viral load test was performed for all participants who test HIV positive by trained laboratory technologist using the Abbott Real-time PCR. The testing was done at a National Health Laboratory Quality Assurance Training Center (NHLQATC) in Dar es Salaam. This parameter was used as an additional test to minimize the false recent rate. Internal quality control was performed according to the manufacturer's instructions.

### **3.12 Quality assurance for HIV testing**

Quality of rapid HIV testing in the testing sites included the use of nationally approved and licensed test kits and testing algorithm; lot-to-lot qualification of all RT kits used; training of staff administering the RTs; job aids; SOPs. The equipment was calibrated before the running patient's sample. The quality control was performed according to the manufacturer's instruction.

### **3.13 Validity and reliability**

**Validity-** refers to the extent to which the concept is accurately measured. Research assistants were training on both the contents of the data collection instruments and the use of the interview tools before the start of study implementation and routine supervision during implementation was conducted to assess the data completeness, outliers, integrity and consistency question. The pre-testing of tools was done in Dar es Salaam region before commencing of the study. The questionnaires were administered to the fishing community in the landing beach sites and the result was assessed to ensure the validity of a study.

**Reliability-** this refers to the consistency of measuring. The onsite quality assurance of the reagents or kits used, training of the testers on how to follow algorithms and maintenance and calibration of equipment was performed. For central laboratory testing, quality control was performed to ensure test accuracy. During transportation cold chain was maintained to ensure viability and samples integrate. An adequate volume of sample was collected and separated for testing viral load and LAg avidity assay.

### **3.14 Data processing and analysis**

Questionnaire verification was conducted during and after data collection to assess out of range value, measurement error, transcription error, outliers and invalid value. The data were entered and cleaned using statistical software Stata MP Version 16.0.

Descriptive analysis was carried out using frequency and proportion for categorical variables and means and standard deviations for continuous variables. A chi-square test was used to determine the significance of association between exposure variables (socio-demographic, behavioural) and the outcome (HIV infection). Covariate were selected for inclusion in multivariate models based on bivariate statistical significance at an alpha of

<0.25 and biological plausibility (clinical and intuitive relationship to outcome variables). A p-value of <0.05 was used as a cut-off for significance level and 95% confidence interval was used to assess the strength of association.

### **3.15 Ethical consideration**

Ethical clearance was obtained from the Senate Research and Publications Committee of Muhimbili University of Health and Allied Sciences (MUHAS). The permission to conduct this study was obtained from the Geita regional secretariat. The risks, benefits and purpose of the study were explained to the study participants and a written informed consent obtained. The participant's wish to decline HIV testing was respected, although attempts were made to ascertain the reasons for refusal. Pre and post-test counselling were done by trained nurse counsellors. The information obtained from this study was kept strictly confidential. The brief report was prepared and shared with the Regional or District Medical Officer and the respective health facility manager of the saving catchment area to ensure proper linkage and treatment care.

## CHAPTER FOUR

### 4.0 RESULTS

#### 4.1 Social demographic characteristics of study participants

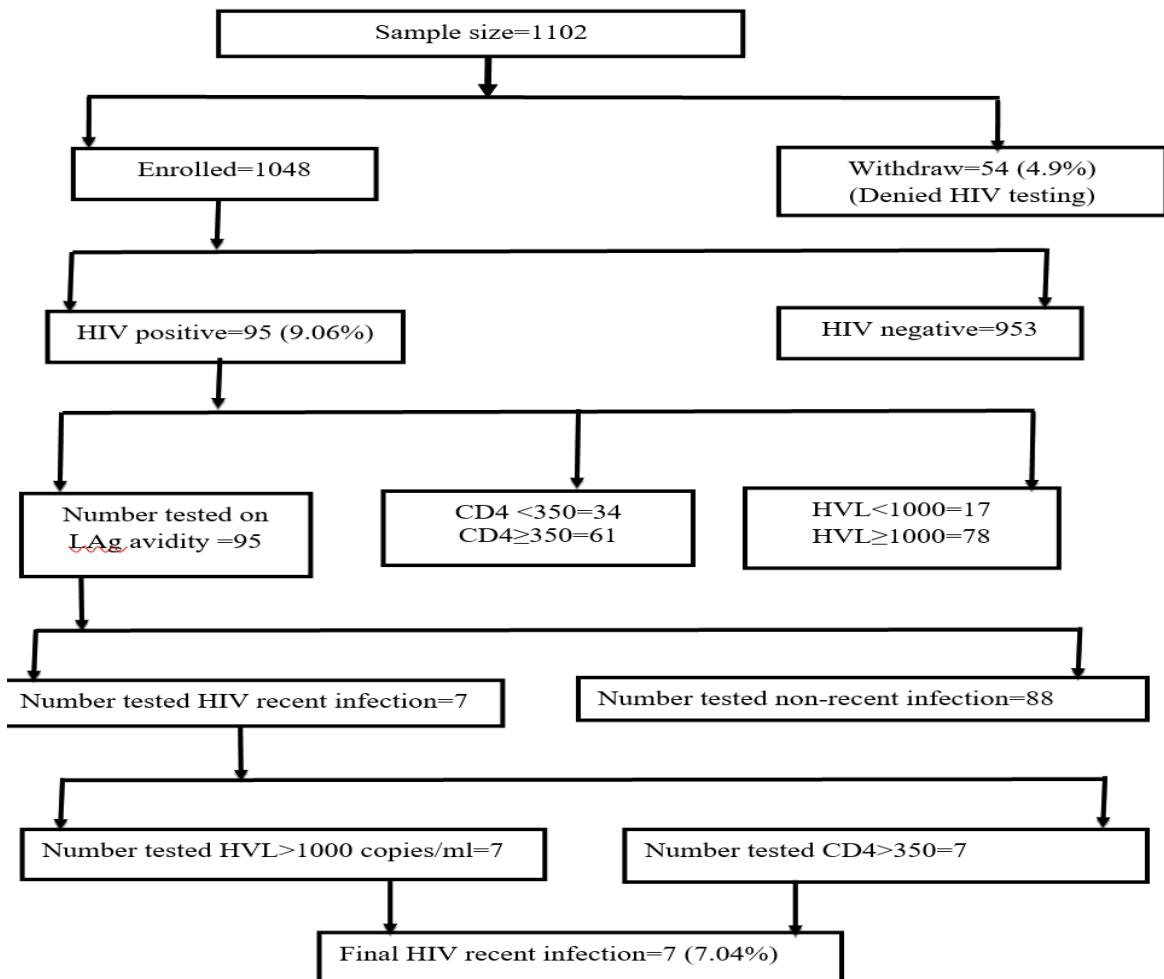
A total of 1102 consented and agreed to participate in the study. Of the 1102 participants interviewed, 54 (4.9%) denied HIV rapid testing. The mean age of study participants was 34 years  $\pm$ 11.5 SD with 30.3% (317) being aged between 30-39 years. Majority of the study participants had completed primary education, married, fishermen and male 740 (70.6%), 613 (58.5%), 375 (35.8%) and 583 (55.6%) respectively. Five hundred sixty-four (58.3%) were from Chato District Council (Table 4.1).

**Table 4.1: Social demographic characteristics of study participants (N=1048)**

<b>Variable</b>	<b>Number</b>	<b>Percentage</b>
<b>Age group (Mean 34 SD (<math>\pm</math>11.5))</b>		
18-24	249	23.8
25-29	172	16.4
30-39	317	30.3
40-49	201	19.2
$\geq$ 50	109	10.4
<b>Sex</b>		
Male	583	55.6
Female	465	44.4
<b>Educational level</b>		
Informal	221	21.1
Primary	740	70.6
Secondary/tertiary	87	8.3
<b>Marital status</b>		
Single	185	17.6
Married	613	58.5
Divorced/separated/widowed	250	23.9
<b>Job category</b>		
Fishermen	375	35.8
Boat maker/repair	55	5.3
Boat owner	154	14.7
Fish trader	300	28.6
Fish processor	110	10.5
Fish transporter	54	5.2
<b>Place of residence</b>		
Chato District	564	53.8
Geita District	484	46.1

### 4.3 Magnitude of HIV infection among the fishing community in Geita Region

The overall prevalence of HIV infection was 9.06%, 95% CI, 7.47-10.96 (figure 4). The HIV prevalence was significantly higher among separated/divorced/widowed (17.7%) and those who never attended schools (15.2%) compared to those married and attended schools respectively (table 4.2). Out of the 95, HIV positive samples subjected to LAg-avidity assay 7 (7.04%) had HIV recent infection while 88 (92.29%) had a long-standing infection (figure 4). Majority of the participant with HIV recent infection were female 6 (85.7%) and had attained primary education 6 (87.7%). A high proportion of HIV recent was detected among separated/divorced participants 4 (57.2%) and fish traders 4 (57.2%) as summarized in table 4.3.



**Figure 4: Number of participants interviewed, recruited, withdrawn and laboratory tests performed**

**4.2 Distribution of HIV infection by socio-demographic and job category among the fishing community in Geita and Chato Districts (N=1048).**

<b>Variable</b>	<b>Total</b>	<b>Positive number</b>	<b>Percentage</b>	<b>95%CI</b>	<b>P-value</b>
<b>Age</b>					
18-24	249	21	8.4	5.2-12.6	0.86
25-29	172	16	9.3	5.4-14.7	
30-39	317	33	10.4	7.3-14.4	
40-49	201	17	8.5	5.0-13.2	
≥50	109	8	7.3	3.2-14.0	
<b>Sex</b>					
Male	583	53	9.1	6.9-11.7	0.97
Female	465	42	9.0	6.6-12.0	
<b>Marital status</b>					
Single	185	17	9.2	5.4-14.3	<0.0001
Married	613	40	6.5	4.7-8.8	
Separated/Divorced/Widowed	250	38	15.2	11.0-20.3	
<b>Educational levels</b>					
Informal	221	39	17.6	12.8-23.3	<0.0001
Primary	740	52	7.0	5.3-9.1	
Secondary and tertiary	87	4	4.6	1.3-11.4	
<b>Job category</b>					
Fishermen	375	40	10.7	7.7-14.2	0.82
Mechanics/boat maker	55	4	7.3	2.0-17.6	
Boat owner	154	14	9.1	5.1-14.8	
Fish trader	300	24	8.0	5.2-11.7	
Fish processor	110	8	7.3	3.2-13.8	
Fish transporter	54	5	9.3	3.1-2.3	

**Table 4.3: Distribution of HIV recent infection by socio-demographic factors (n=7)**

<b>Variable</b>	<b>Number</b>	<b>Percentage</b>
<b>Age group</b>		
18-24	2	28.6
25-29	2	28.6
30-39	2	28.6
40-49	1	14.2
≥50	0	0
<b>Sex</b>		
Male	1	14.3
Female	6	85.7
<b>Educational level</b>		
Primary and below	6	87.7
Secondary and above	1	14.3
<b>Marital status</b>		
Single	2	28.6
Married	1	14.2
Divorced/separated/widowed	4	57.2
<b>Job category</b>		
Fishermen	2	28.6
Boat maker/repair	0	0
Boat owner	0	0
Fish trader	4	57.2
Fish processor	0	0
Fish transporter	1	14.2

#### **4.4 Socio-demographic factors associated with HIV infection among the fishing community**

On bivariate analysis, the socio-demographic characteristic that was significantly associated with HIV infection were education, marital status, and history of STI in the last 6 months and had travelled in the last three months (mobility). The odd of contracting HIV was four times higher (OR=4.44, 95% CI=1.54-12.85) among the people who never attended school compared to those attended secondary or higher education. Those who were separated or widowed was two times higher odds of developing HIV infection (OR=2.57, 95%CI= 1.60-4.11) compared to those who were married. The odd of being HIV positive was 1.89 times higher among those who self-reported had a history of STI in the last six months (OR=1.89, 95%CI=1.21-2.93) compared to those who had no history of STI. Moreover, people who had ever travelled in the last three months were at increased odds of developing HIV infection by 1.92 (OR=1.92, 95%CI=1.23-2.99) compared to those who did not (table 4.4).



**Table 4.4: Socio-demographic factors associated with HIV infection among the fishing community (N=1048).**

Variable	HIV infection		Crude OR(95%CI)	P-value
	Positive n (%)	Negative n (%)		
<b>Age group</b>				
18-24	21 (8.4)	228 (91.6)	1.16 (0.50-2.71)	0.727
25-29	16 (9.3)	156 (90.7)	1.29 (0.53-3.14)	0.567
30-39	33 (10.4)	284 (89.6)	1.47 (0.66-3.28)	0.351
40-49	17 (8.5)	184 (91.5)	1.17 (0.49-2.80)	0.730
≥50	8 (7.3)	101 (92.7)	Ref	
<b>Sex</b>				
Male	53 (9.1)	530 (90.9)	1.01 (0.66-1.54)	0.974
Female	42 (9.0)	423 (91.0)	Ref	
<b>Educational level</b>				
Informal	39 (17.6)	182 (82.4)	4.44 (1.54-12.85)	0.006
Primary	52 (7.0)	688 (93.0)	1.57 (0.55-4.45)	0.39
Secondary/tertiary	4 (4.6)	83 (95.4)	Ref	
<b>Marital status</b>				
Single	17 (9.2)	168 (90.8)	1.45 (0.80-2.62)	0.22
Separated/ Divorced	38 (15.2)	212 (84.8)	2.57 (1.60-4.11)	<0.0001
Married/cohabiting	40 (6.5)	573 (93.5)	Ref	
<b>Job category</b>				
Fishermen	40 (10.7)	335 (89.3)	1.52 (0.52-4.43)	0.441
Fish transporter	5 (9.3)	49 (90.7)	1.30 (0.33-5.13)	0.707
Boat owner	14 (9.1)	140 (90.9)	1.28 (0.40-4.05)	0.681
Fish trader	24 (8.0)	276 (92.0)	1.11 (0.37-3.33)	0.854
Fish processor	8 (7.3)	102 (92.7)	1.00 (0.28-3.48)	1.000
Boat maker/repair	4 (7.3)	51 (92.7)	Ref	
<b>Had history of STI in the last 6 months</b>				
Yes	36 (13.4)	233 (86.6)	1.89 (1.21-2.93)	0.005
No	59 (7.6)	720 (92.4)	Ref	
<b>Duration lived in the fishing community</b>				
More than 6 months	65 (9.7)	607 (90.3)	1.24 (0.79-1.94)	0.360
1-6 Months	30 (8.0)	346 (92.0)	Ref	
<b>Travelled in the last 3 months</b>				
Yes	35 (13.6)	222 (86.4)	1.92 (1.23-2.99)	0.004
No	60 (7.6)	731 (92.4)	Ref	

#### **4.5 Behavioural factors associated with HIV infection among the fishing communities**

On bivariate analysis model, the behavioural characteristics that were found to predispose fishing community to HIV infection were an inheritance of wives, alcohol use, give/received fish for sex and never used HIV testing services in the last 12 months. The odd of getting HIV infection was two times (OR=2.36, 95%CI=1.27-4.39) higher among those who inherited wives compared to those do not. The odd of contracting HIV infection was 1.61 times higher (OR=1.61, 95%CI=1.05-2.46) among alcohol drinkers compared to non-alcohol drinkers. The odds of being HIV positive was two times higher among those never tested HIV in the last 12 months (OR=2.05, 95%CI=1.33-3.15) compared to those tested HIV. A number of wives (polygamy), number of sexual partners, any substance use, not used the condom at last sex, the inconsistency of condom use, and uncircumcised male were not significantly associated with HIV infection (Table 4.5).

**Table 4.5: Behavioral factors associated with HIV infection among the fishing communities (N=1048).**

Variable	HIV infection		Crude OR (95%CI)	P-value
	Positive, n (%)	Negative, n (%)		
<b>Wives inheritance</b>				
Yes	14 (17.7)	65 (82.3)	2.36 (1.27-4.39)	0.007
No	81 (8.4)	888 (91.6)	Ref	
<b>Number of wives</b>				
More than one wife	8 (7.9)	93 (92.1)	1.30 (0.58-2.89)	0.535
One wife	32 (6.3)	480 (93.7)	Ref	
<b>Number of sexual partners in the last 6 months</b>				
More than one	35 (9.7)	324 (90.3)	1.13 (0.73-1.75)	0.58
One	60 (8.7)	629 (91.3)	Ref	
<b>Substance use</b>				
Yes	4 (11.1)	32 (88.9)	1.27 (0.44-3.66)	0.664
No	91 (9.0)	921 (91.0)	Ref	
<b>No condom used at last sex</b>				
Yes	35 (16.2)	181 (83.8)	1.02 (0.62-1.67)	0.949
No	39 (16.0)	205 (84.0)	Ref	
<b>Consistence of condom use</b>				
Never	35 (16.2)	181 (83.8)	1.07 (0.62-2.86)	0.81
Rarely	13 (17.6)	61 (82.4)	1.18 (0.56-2.45)	0.66
Always	26 (15.3)	144 (84.7)	Ref	
<b>Alcohol use</b>				
Yes	44 (11.7)	333 (88.3)	1.61 (1.05-2.46)	0.029
No	51 (7.6)	620 (92.4)	Ref	
<b>Give/received fish for sex</b>				
Yes	26 (18.4)	115 (81.6)	2.75 (1.68-4.49)	<0.001
No	69 (7.6)	838 (92.4)	Ref	
<b>Uncircumcised male</b>				
Yes	7 (10.0)	63 (90.3)	1.15 (0.50-2.56)	0.750
No	8 (9.0)	467 (91.0)	Ref	
<b>Never tested HIV in the last 12 months</b>				
Yes	40 (13.8)	250 (86.2)	2.05 (1.33-3.15)	0.001
No	55 (7.3)	703 (92.7)	Ref	

#### 4.6 Stratification analysis for the factors that were effect modifiers

Number of sexual partners and marital status was found to be effect modifier. Those who drink and having more than one sexual partner had an increased odd of being HIV positive and thus the interaction of two variables modified the association shown by the difference of odd ratio from 1.61 to 2.62. Marital status was an effect modifier with the acquisition of HIV infection, the chi-square for differing odds ratio by stratum (interaction) had significant p-values. This implies that those who were not married and taking alcohol were more likely to be HIV positive and the interaction of these variable modified the association from 1.61 to 5.17 (table 4.6).

**Table 4.6: Stratification analysis for the factors that were effect modifiers**

<b>Exposure</b>	<b>Crude OR (95%CI)</b>	<b>Covariate</b>	<b>Covariate strata</b>	<b>Stratum specific, OR (95%CI)</b>	<b>Chi square for interaction p value</b>
<b>Drinking alcohol</b>	1.61 (1.05-2.46)	Number of Sexual partners in the last 6 months	One	0.66 (0.31-1.38)	<b>0.003</b>
			More than one	2.62 (1.53-4.47)	
		Marital status	Single	5.17 (1.84-14.51)	<b>0.024</b>
			Separated/ divorced	1.12 (0.55-2.24)	
			Married	1.00 (0.50-1.98)	

#### **4.7 Multivariate logistic regression**

On multivariate analysis using binary logistic regression, the factors that were independently associated with HIV infection among the fishing community were educational level, marital status, and history of STI, gave/received fish for sex and never tested HIV in the last 12 months. Those who never attended school was three times higher odds of developing HIV infection (AOR=3.95, 95%CI=1.30-12.02)) compared to those never attended secondary or tertiary education. The odd of developing HIV infection was two times higher among those give/received fish for sex (AOR=2.75 95%CI=1.51-5.02) compared to those did not. Those who self-reported to have STI in the last six months were at increased odds of HIV infection by 1.78 (AOR=1.78, 95%CI=1.10-2.85) compared to those do not. The odd of developing HIV infection was 1.69 times higher among the separated/widowed or divorced (AOR=1.97, 95%CI=1.16-3.35) compared to married couples. Those who never tested HIV in the last 12 months was 2.09 times higher (AOR=2.09, 95%CI=1.32-3.32) compared to those never tested HIV in the last 12 months (table 4.7).

**Table 4.7: Bivariate and Multivariate logistic regression for the socio-demographic and behavioral factors independently associated with HIV infection among the fishing community (N=1048)**

<b>Variable</b>	<b>Total HIV positive, n (%)</b>	<b>Crude OR (95%CI)</b>	<b>Adjusted OR (95%CI)</b>	<b>P-value</b>
Age group				
18-24	21 (8.4)	1.16 (0.50-2.71)	2.07 (0.73-5.89)	0.17
25-29	16 (9.3)	1.29 (0.53-3.14)	2.34 (0.88-6.28)	0.09
30-39	33 (10.4)	1.47 (0.66-3.28)	2.13 (0.89-5.14)	0.09
40-49	17 (8.5)	1.17 (0.49-2.80)	1.39 (0.55-3.52)	0.48
≥50	8 (7.3)	Ref		
Sex				
Male	53 (9.1)	1.01 (0.66-1.54)	1.01 (0.63-1.59)	0.97
Female	42 (9.0)	Ref	ref	
Education level				
Informal	39 (17.6)	4.44 (1.54-12.85)	3.95 (1.30-12.02)	0.015
Primary	52 (7.0)	1.57 (0.55-4.45)	1.31 (0.44-3.87)	0.62
Secondary/tertiary	4 (4.6)	Ref	ref	
Marital status				
Single	17 (9.2)	1.45 (0.80-2.62)	1.22 (0.56-2.67)	0.61
Divorced/separated/widowed	38 (15.2)	2.57 (1.60-4.11)	1.97 (1.16-3.35)	0.012
Married	40 (6.5)	Ref	ref	
Had history STI the last 6 months				
Yes	36 (13.4)	1.89 (1.21-2.93)	1.78 (1.10-2.85)	0.018
No	59 (7.6)	Ref	ref	
Alcohol use				
Yes	44 (11.7)	1.61 (1.05-2.46)	1.17 (0.72-1.89)	0.52
No	51 (7.6)	Ref	ref	
Gave/received fish for sex				
Yes	26 (18.4)	2.75 (1.68-4.49)	2.75 (1.51-5.02)	0.001
No	69 (7.6)	Ref	ref	
Wives inheritance				
Yes	14 (17.7)	2.36 (1.27-4.39)	1.91 (0.97-3.76)	0.06
No	81 (8.4)	Ref	ref	
Number of sexual partners in the last 6 months				
More than one	35 (9.7)	1.13 (0.73-1.75)	1.57 (0.92-2.67)	0.09
One	60 (8.7)	Ref	ref	
Substance use				
Yes	4 (11.1)	1.27 (0.44-3.66)	2.72 (0.83-8.88)	0.10
No	91 (9.0)	Ref	ref	
Travelled in the last 3 months				
Yes	35 (13.6)	1.92 (1.23-2.99)	1.16 (0.98-2.63)	0.06
No	60 (7.6)	Ref	ref	
Never tested HIV in the last 12 months				
Yes	40 (13.8)	2.05 (1.33-3.15)	2.09 (1.32-3.32)	0.002
No	55 (7.3)	Ref	ref	

#### **4.8 Utilization and accessibility of HIV services among the fishing community in Geita Region**

A high proportion of study participants (92.4%) reported to have access and utilize HIV health services from health facilities including HIV testing services. More than half of study participants (55.2%) had no access to education information communication materials. Majority of the study participants (54.4%) buy the condoms from shop or pharmacy (table 4.8).

**Table 4.8: Utilization and accessibility of HIV services among the fishing community in Geita Region (N=1048).**

<b>Variable</b>	<b>Number</b>	<b>Proportion</b>
<b>Health facility providing HIV services</b>		
Yes	968	92.4
No	80	7.6
<b>Distance from health facility</b>		
Less than 5 km	482	49.8
Five km and above	486	50.2
<b>Provided EIC materials</b>		
Yes	470	44.8
No	578	55.2
<b>Government/Non-Government organization distributed condom</b>		
Yes	470	44.8
No	578	55.2
<b>Where do you get condom</b>		
Government	71	25.9
Shop/pharmacy	149	54.4
Non-Government organization	24	8.8
Others	30	10.9

## CHAPTER FIVE

### 5.0 DISCUSSION

This present study sought to determine the magnitude of HIV infection, its associated factors and utilization of HIV health services in the fishing community along the shore of Lake Victoria in Geita region Tanzania. The study utilized the elaborate network of fishing folk through the beach management units to enhance the overall response rate. The network of beach management units facilitated identification of the sampled study participants and enrolment into the study. Most studies done in Tanzania have focused on national and regional HIV seroprevalence, however, this study concentrated on highly vulnerable group regarded as fishing folks. Other than looking at HIV infection in general, this study has also provided information on HIV recent information among those who tested positive for HIV infection. This information is useful in guiding focused intervention towards the achievement of UNAID target of 90-90-90. The data from this cross-sectional study cannot provide evidence of the HIV situation in Tanzania, but we can gain a general understanding of HIV situation along the shore of Lake Victoria basin in Geita Region.

Previous studies done in Tanzania have shown great regional variation in HIV prevalence. The recently concluded Tanzania HIV Indicator Survey (THIS) ranked Njombe and Iringa regions among the regions with the highest HIV infection (5). HIV prevalence in the current study area (Geita region) among the general population was comparable to the national prevalence (5.0% vs 5.1%) (5). However, the result from this study showed that the HIV prevalence in the fishing community in Geita is much higher (9.06% vs 5.0 %) than HIV prevalence in the general population (Geita region) as reported by recently concluded Tanzania HIV Indicator Survey (5). This disparity could be explained by the fact that the THIS was a national survey while the current study focused on fishing community/folks which are regarded as a high venerable group. One would expect a higher prevalence in this study than general population-based studies. Lower prevalence (6.29%) in a similar population i.e. fishing folks has been reported in North-Western Tanzania (23). Several studies have also reported a high prevalence of HIV infection among the fisherfolk communities compared to our study (12-17,21-22,24). These large differences in prevalence between our study and the previous study may be explained by on-going



intervention initiatives such as focused HIV community testing and treat policy/approach that was introduced to reduce the rate of HIV transmission (7).

Several studies carried out in Asia have shown that fishermen communities have a high prevalence of HIV infection compared to the general population (11). In Cambodia, HIV prevalence (16.1%) among fishermen was found to be more than three times higher as compared to the general population (22). Higher prevalence (15.5%) of HIV was also noted among the fishermen in Thailand and Malaysian in the year 2000 and 2015 respectively (20,21). The fishermen communities are regarded as mobile population and studies have shown that their risk of contracting HIV is high (8,24). Their unique characteristics may increase their risk of contracting HIV infection due to the fact this population spend most of the time away from their homes. The situation may force them to indulge in risky behaviour such as having multiple sexual partners. As a result of the ready market for fish, the fisherman usually gets access to daily cash income in an overall context of poverty hence increase their vulnerability to HIV infection.

The study found that 7.04% of those who tested positive for HIV was a recent infection. This implies that there is an active HIV transmission going on in the fishing community. The measurement of HIV incidence can elucidate transmission dynamics of new HIV infections and allow tracking of epidemiological trends. The similar findings have been documented among the fishing communities and representative general population survey in Uganda and Kenya (9,10,18,19,28). However, the large difference was observed in the study done in Uganda among the representative general population that reported 17.0% proportion of HIV recent infection (27). These differences were thought to be the BED-CEA assays laboratory technology used which is more prone to false -recent rate misclassification compared to LAg-Avidity assay that is more accurate (26,36,348,49).

Several risk behaviours have been associated with HIV infection in this study. Specific drivers for contracting HIV found in this study included the exchange of fish for sex (transactional sex). Those who receive or give fish for sex were shown to have a greater risk for HIV infection compares to those who don't give/receive fish for sex. This study found that the HIV epidemic in the beaches along Lake Victoria in Geita and Chato Districts seems to be driven largely by the high demand for fish. Fish-centred sex like our finding was documented by several studies across the globe (11,31).

This study has revealed that those who drink alcohols and having more than one sexual partner had a two-fold increase in odd of contracting HIV infection compared to those who drink alcohol and had one sexual partner. This finding is consistence with previous studies among the fishing community in Uganda that reported the high risk of HIV infection among alcohol drinkers and strong correlation between alcohol consumption and risk behaviours such multiple sexual partners, sex with non-regular partners and transactional sex (9,10,13,50). It is known that having sex under the influence of alcohol may lead to have multiple numbers of sexual partners and none or incorrectly use of protection hence increase the probability of getting an infection. Other factors such as having a history of sexually transmitted infection have been associated with increased odds of HIV. These findings are consistent with a study done in Uganda along Lake Victoria (9). It is well known that STIs, such as syphilis, herpes and chancroid, create genital ulcers or inflammation, which cause breaks in the lining of the genital tract. Those breaks can then become entry points for HIV. STIs such as chlamydia, gonorrhoea and trichomoniasis can also create inflammation, which increases the concentration of cells in genital secretions that the virus can attach to. Other drivers/factors that were identified by this study to increase the odds of contracting HIV infection included the low level of education, not married and had never used HIV testing services in the last twelve (12) months.

About (92.0 %) of the study participants reported that there was health facility that provides health services and half of the study participants reported that the services were accessible within five kilometres which is the acceptable distance according to the Tanzania health policy. The majority (55.0%) of study participants reported that they cannot access education information communication (EIC) materials regarding HIV. Condom accessibility was also low, however, the majority of those who reported having the access/got them from either private facility or pharmacy store. Low utilization of HIV health services can be due to the education status of study participants since 221 (21.9%) had no formal education while 740 (70.6%) had primary education. This figure is consistent with the study done in Kenya among the fishermen that reported 74.4% were illiterate (50). The nature of work of fishermen may affect health-seeking behaviours of these individuals because they spend most of their time in the water. This suggests that the rate of HIV transmission rate could continue affecting this population as the majority are not accessing condom leading to unprotected sex.

In conclusion, the study revealed high HIV prevalence with the substantial number of HIV new infection among the infected population of fisher folks compared to the prevalence of the general population in Geita Region. The significant predictors for HIV acquisition were low education, not married, history of STI in the last six months, give/received fish for sex and never used HIV testing services in the last 12 months.

### **5.1 Study Limitation**

Most of the information obtained from the study was based on self-report hence subject to information and recall bias. The study sample was not stratified according to their job category as we understand that most of the population in the fishing community were fishermen. The cross-sectional nature of the study allows us to infer but not to establish a causal relationship. Despite these limitations, these studies contribute immensely to the understanding of HIV infection, associated factors and utilization of HIV services among the fishing community in Geita.

## CHAPTER SIX

### 6.1 Conclusion

This study found a higher prevalence of HIV infection and a high proportion of recent infection among the fishing communities. The predictors that independently associated with HIV were being never attended school, separated/divorced/widowed, had a history of STI in the last 6 months, give/received fish for sex and never tested HIV in the last 12 months. A high proportion of the study participants had low access to education information materials and majority access the condom from shop or pharmacy. With such high risks of HIV infection in the fishing communities, sexual intermixing and interaction between the persons in these communities and the general population may lead to an upsurge of HIV infection in general population.

### 6.2 Recommendation

The high prevalence of HIV infection as well as high HIV recent infection among the fishing communities in our study warrants an immediate response to prevent wider community transmission. Public health intervention such as periodic screening of STI and treatment among the fishing communities to prevent further spread into the community should be implemented. In order to reduce HIV epidemic, HIV self-testing should be done in this highly risk group of fishing communities. Regular mobile health services for prevention and treatment of STI in the fishing communities can help on awareness creation about HIV infection drivers such as transactional sex, number of multiple partners. Also, creating awareness on HIV drivers such frequency of HIV testing among the fishing community should be conducted to diagnose unknown people living with HIV in the community. As the prevalence of HIV in this population is high, we advocate for follow up studies to assess the trends of HIV infection in this population. Further study that could assess the impact of HIV infection in nearby fishing community villages in Geita and Chato District is needed.

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**APPENDICES**

**Appendix 1: Structured questionnaire (English version)**

To the fishing community in Geita region, Tanzania

**SECTION 1: IDENTIFIER INFORMATION**

1.1: Questionnaire number .....
1.2: Date of interview..... /..... /.....
1.3: Patient ID number.....
1.4: District.....
1.5: Ward.....
1.6: Village.....
1.7: BMU.....

<b>SECTION 2: DEMOGRAPHICS</b>	
<b>2.1</b>	<b>Gender:</b> <input type="checkbox"/> Male <input type="checkbox"/> Female
<b>2.2</b>	<b>Age in years</b> __ __
<b>2.3</b>	<b>What is the highest level of education attained?</b> <input type="checkbox"/> Non-Informal education <input type="checkbox"/> Primary- not completed <input type="checkbox"/> Primary-completed <input type="checkbox"/> Secondary-not completed <input type="checkbox"/> Secondary-completed <input type="checkbox"/> College/ Tertiary
<b>2.4</b>	<b>Marital status?</b> <input type="checkbox"/> Single <input type="checkbox"/> Married/Cohabiting <input type="checkbox"/> Divorced <input type="checkbox"/> Separated <input type="checkbox"/> Widowed /Widower
<b>2.5</b>	<b>What is your job category/ occupation?</b> <input type="checkbox"/> Fishermen <input type="checkbox"/> Fish transporter <input type="checkbox"/> Boat/net owner <input type="checkbox"/> fish traders <input type="checkbox"/> Fish processor <input type="checkbox"/> Boat or net Maker/repair/
<b>2.6</b>	<b>For how long have been working in the fishing activities?</b> <input type="checkbox"/> One months <input type="checkbox"/> Three months <input type="checkbox"/> Six months <input type="checkbox"/> Others (specify).....

<b>SECTION 3: BEHAVIORAL FACTORS</b>				
<b>3.1</b>	<input type="checkbox"/> <b>MALES</b> Are you currently married or living together as if married?	<input type="checkbox"/> <b>FEMALE</b> Are you currently married or living together as if married?	Yes, currently married Yes, living with a man/woman No, not in union	<i>If yes, skip to 3.4</i>
<b>3.2</b>	Have you ever been married or lived together with a woman as if married?	Have you ever been married or lived together with a man as if married?	Yes, formerly married Yes, lived with a man/woman No	<i>If no skip to 3.9</i>
<b>3.3</b>	What is your marital status now; are you widowed, divorced or separated?	What is your marital status now; are you widowed, divorced or separated?	Widowed Divorced Separated	<i>Skip to 3.9</i>
<b>3.4</b>	Is your wife living with you or she is elsewhere?	Is your husband living with you or she is elsewhere?	Living together Staying elsewhere	
<b>3.5</b>	Do you have more than one wife/woman you live with as if married?	Does your husband have other wives, or does he live with other women as if married?	Yes No	
<b>3.6</b>	Altogether, how many wives do you have, or other partners do you live with as if married?	Including yourself, in total, how many wives or other partners does your husband live with now as if married?	Number of wives/live in partners _____  Don't know	
<b>3.7</b>	Is wife inheritance	Is wife inheritance	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/>	

	practiced in your community?	practiced in your community?	Don't Know	
<b>3.8</b>	Are any of your wives inherited?	Including yourself, are any of your husband's wives inherited	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.9</b>	Do you have any sexual partners (if married, other than your married partner(s))?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	<i>If No, skip to 3.15</i>	
<b>3.10</b>	Do you have any sexual partners if not married	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	<i>If No, skip to 3.15</i>	
<b>3.11</b>	What is the relationship between you and these partners?	<input type="checkbox"/> Business partner <input type="checkbox"/> Workmate <input type="checkbox"/> Friend <input type="checkbox"/> Others <input type="checkbox"/> Others(specify) _____		
<b>3.12</b>	How often do you engage in sexual intercourse with these partners?	<input type="checkbox"/> Weekly <input type="checkbox"/> Monthly <input type="checkbox"/> Once every Three monthly <input type="checkbox"/> Occasionally		
<b>3.13</b>	Do you use a condom when engaging in sexual intercourse with these partners?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<i>If No skip to 3.15</i>	
<b>3.14</b>	How often do you use condoms when engaging in sexual intercourse with these partners?	<input type="checkbox"/> Always <input type="checkbox"/> Rarely <input type="checkbox"/> Never		
<b>3.15</b>	Do you use a condom	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't		

	with your regular partner	Know	
<b>3.16</b>	How often do you use a condom with a regular partner	<input type="checkbox"/> Always <input type="checkbox"/> Rarely <input type="checkbox"/> Never	
<b>3.17</b>	Where do you get the condoms from?	<input type="checkbox"/> Government Health Facility <input type="checkbox"/> Buy from a shop <input type="checkbox"/> Private health facility <input type="checkbox"/> Non GOK health facility <input type="checkbox"/> Others (specify)	
<b>3.18</b>	Do you always get the condoms when you need them?	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Never	
<b>3.19</b>	Have you ever had history of syphilis/ gonorrhea or unusual or smelly discharge in your private parts in the last 6 months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.20</b>	Is circumcision practiced in your community?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.21</b>	Are you circumcised? – <b>Note: -Apply this question to male respondents only</b>	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	



<b>3.22</b>	In the last three months, did you travel and sleep away from home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	<i>If no, skip to 3.25</i>
<b>3.23</b>	Have you had sex when away from home in the last three months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.24</b>	Did you use a condom?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
<b>3.25</b>	Have you ever been given/received a fish for sex	<input type="checkbox"/> Yes <input type="checkbox"/> No	<i>If no, skip to 3.26</i>
<b>3.26</b>	Do you drink alcohol?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<i>If no, skip to 3.29</i>
<b>3.27</b>	How often do you engage in sex after drinking alcohol?	<input type="checkbox"/> Always, <input type="checkbox"/> Sometimes, <input type="checkbox"/> Never	
<b>3.28</b>	Did you use condom after taking alcohol	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.29</b>	How often do you engage in sex if never drink alcohol?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.30</b>	Did you use condom?	<input type="checkbox"/> Always, <input type="checkbox"/> rarely <input type="checkbox"/> Never	
<b>3.31</b>	Do you take any drugs?	<input type="checkbox"/> Yes <input type="checkbox"/> No	<i>If no, skip to 3.33</i>
<b>3.32</b>	Have you ever engaged in sex if taken this drug?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>3.33</b>	When was the last time you had sexual intercourse with your	LAST PARTNER Days ago, ____ Weeks ago, ____ Months ago, ____	

	last partner	Years ago, _____	
<b>3.34</b>	What was the relationship to this person	<input type="checkbox"/> Husband/Wife <input type="checkbox"/> Live-in Partner <input type="checkbox"/> Boyfriend/Girlfriend Not living with respondent <input type="checkbox"/> Casual acquaintance <input type="checkbox"/> Commercial sex worker <input type="checkbox"/> Other (specify)	
<b>3.35</b>	In total, how many different people have you had sexual intercourse in the last six months?	<input type="checkbox"/> One <input type="checkbox"/> two <input type="checkbox"/> more than two	

#### SECTION 4: AVAILABILITY AND UTILIZATION OF SERVICES

<b>4.1</b>	Are there facilities that provide HIV related services around your area of residence?	Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>4.2</b>	Who provide these services	<input type="checkbox"/> Health facility (GOK) <input type="checkbox"/> Health facility (Private) <input type="checkbox"/> Health facility (church based) <input type="checkbox"/> Mobile clinics	
<b>4.3</b>	How accessible are these facilities from your area of residence?	<input type="checkbox"/> Very accessible <input type="checkbox"/> Somehow accessible	

		<input type="checkbox"/> Hardly accessible	
<b>4.4</b>	What is the approximate distance to the nearest health facility	_____km	
<b>4.5</b>	How long does it take you to get to the facility?	_____hours	
<b>4.6</b>	Have you used any of these services in the last 12 months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>4.7</b>	What was the quality of service offered?	<input type="checkbox"/> GOOD <input type="checkbox"/> FAIR <input type="checkbox"/> EXCELLENT <input type="checkbox"/> POOR <input type="checkbox"/> VERY POOR	
<b>4.8</b>	How affordable were the services	<input type="checkbox"/> Free <input type="checkbox"/> Affordable <input type="checkbox"/> Not affordable Don't Know	
<b>4.9</b>	Were you given any reading materials for more information at the facility?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
<b>4.10</b>	What are the main channels of communication from which you receive AIDS information?	<input type="checkbox"/> Radio <input type="checkbox"/> Television <input type="checkbox"/> Film <input type="checkbox"/> Drama <input type="checkbox"/> Newspapers/magazines <input type="checkbox"/> brochures <input type="checkbox"/> Posters <input type="checkbox"/> Billboards <input type="checkbox"/> Community notices <input type="checkbox"/> Family <input type="checkbox"/> friends <input type="checkbox"/> Peers <input type="checkbox"/> Health workers <input type="checkbox"/> Teachers <input type="checkbox"/> Political leaders <input type="checkbox"/> Traditional leaders <input type="checkbox"/> religious leaders <input type="checkbox"/> Internet <input type="checkbox"/> Others	
<b>4.11</b>	Is there any non-government or government organization provided condom in the last six months	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	

4.12	Do you get condom services at any health care facility when you need it?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
4.13	Have you ever been tested for HIV in the last six months?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
4.14	Where was the last test done?	<input type="checkbox"/> Government Health Facility <input type="checkbox"/> Private Health facility <input type="checkbox"/> VCT Centre <input type="checkbox"/> Blood Donation Centre <input type="checkbox"/> Mobile clinic <input type="checkbox"/> Others <input type="checkbox"/> Others (specify)_____	
4.15	When was the last time you were tested for HIV?	____/____/____	
4.16	Did you get the result of that test?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
4.17	Is it possible to disclose to us the results of your HIV status?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't Know	
4.18	What was the result?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Don't remember	

**Appendix 2: Kiambatisho 1: Dodoso la muundo (Swahili version)**

Dodoso kwa jamii ya uvuvi katika mkoa wa Geita

**SEHEMU YA KWANZA (1): TAARIFA YA UTAMBUZI WA MSHIRIKI WA UTAFITI**

- 1.1: Namba ya dodoso .....
- 1.2: Tarehe ya mohojiano..... /..... /.....
- 1.3: Namba ya Mshiriki.....
- 1.4: Wialaya.....
- 1.6: Kata.....
- 1.7: Kijiji.....
- 1.8: Mwalo.....

<b>SEHEMU YA PILI (2): TAARIFA YA DEMOGRAFIA</b>	
<b>2.1</b>	Jinsia: <input type="checkbox"/> Me <input type="checkbox"/> Ke
<b>2.2</b>	Umri katika Miaka halisi    __ __
<b>2.3</b>	Kiwango cha elimu cha Mshiriki wa utafiti? <input type="checkbox"/> Hakuna <input type="checkbox"/> Elimu isiyo rasmi <input type="checkbox"/> Msingi-hajamaliza <input type="checkbox"/> Msingi-amemaliza <input type="checkbox"/> Sekondari -hajamaliza <input type="checkbox"/> Sekondari -amemaliza <input type="checkbox"/> Elimu ya Chuo/Juu
<b>2.4</b>	<b>Ndoa ya Mshiriki wa utafiti?</b> <input type="checkbox"/> Hajaoa/sijaolewa <input type="checkbox"/> Talaka <input type="checkbox"/> ametengana <input type="checkbox"/> Mjane <input type="checkbox"/> ameoa/ameolewa <input type="checkbox"/> Nyinginezo (taja.....)
<b>2.6</b>	<b>Kazi/majukumu ya mshiriki wa utafit</b> <input type="checkbox"/> Mjeshi (anavua samaki) <input type="checkbox"/> Msafirishaji <input type="checkbox"/> Mmiliki wa mashua/ Mmiliki wa neti Mnunuzi was samaki/biashara <input type="checkbox"/> <input type="checkbox"/> mchakataji wa samaki <input type="checkbox"/> natengeneza mashua
<b>2.6</b>	Kwa muda gani umekuwa ukifanya kazi katika shughuli za uvuvi? <input type="checkbox"/> Mwezi moja <input type="checkbox"/> miezi mitatu <input type="checkbox"/> miezi sita <input type="checkbox"/> Nyinginezo taja.....

<b>SEHEMU YA TATU (3): SABABU ZA KITABIA NA KIJAMII</b>				
<b>3.1</b>	<input type="checkbox"/> <b>MWANAUME</b> Je! kwa Sasa umeoa au unaishi pamoja kana kwamba umeoa?	<input type="checkbox"/> <b>MWANAMKE</b> Je! kwa Sasa umeolewa au unaishi pamoja kana kwamba umeolewa	<input type="checkbox"/> Ndiyo, kwa sasa nimeoa/nimeolewa <input type="checkbox"/> Ndiyo, kwa sasa naishi na mwanaume/ mwanamke <input type="checkbox"/> Hapana, hatupo pamoja	<i>Kama ndiyo, ruka mpaka 3.4</i>
<b>3.2</b>	Je! Umewahi kuoa au kuishi pamoja na mwanamke kana kwamba umeoa?	Je! Umewahi kuolewa au kulishi pamoja na Mwanaume kana kwamba umeolewa	<input type="checkbox"/> Ndiyo, Zamani niliolewa/nimeoa <input type="checkbox"/> ndiyo, Nimeishi na mwanaume/mwanamke <input type="checkbox"/> Hapana	<i>Kama hapana, ruka mpaka 3.9</i>
<b>3.3</b>	Je! Hali yako ya ndoa ikoje kwa sasa; wewe ni mjane, talaka au umetengana	Je! Hali yako ya ndoa ikoje kwa sasa; were ni mjane, talaka au umetengana	<input type="checkbox"/> Mjane <input type="checkbox"/> talaka <input type="checkbox"/> Umetengana	<i>ruka mpaka 3.9</i>
<b>3.4</b>	Je! Mke wako unaishi nawe au yeye ni mahali pengine?	Je! mume wako unaishi nawe au yeye ni mahali pengine?	<input type="checkbox"/> Tunaishi pamoja <input type="checkbox"/> Anakaa mbali/mahali pengine	
<b>4.5</b>	Je, una zaidi ya mke mmoja / mwanamke mmoja unayeishi naye kama aliyeolewa?	Je, mume wako ana wake wengine, au anaishi na wanawake wengine kama wameolewa?	<input type="checkbox"/> Ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Taja idadi.....	
<b>3.6</b>	Kwa jumla, una wanawake wangapi, au wapenzi wengine	Ikiwa ni pamoja na wewe, kwa jumla, ni wanawake wangapi	<input type="checkbox"/> Idadi ya wake / wapenzi unaoishi nao.....	

	unaoishi nao kana kwamba umewaoa?	au wapenzi wengine mwanaume wako wanaishi nae kwa sasa kama wameolewa ?	<input type="checkbox"/> Don't know	
3.7	Je, kuna tabia ya urithi wa wake katika jamii ya wavuvi?	Je, kuna tabia ya urithi wa wake katika jamii ya wavuvi?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
3.8	Je, mke wako yeyote alishawahi kurithiwa?	Ikiwa ni pamoja na wewe mwenyewe, Je, Mume wako alishwahi kurithiwa mke yeyote mwingine?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
3.9	Je, una wapenzi wengine Zaidi ya mke wako wa ndoa ?	Je, una wapenzi wengine Zaidi ya mume wako wa ndoa?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui <b><i>Kama hapana ruka mpaka 3.15</i></b>	
3.10	Je, kwa muda wa miezi sita iliyopita ulishawahi kuwa na mpenzi/wapenzi? <b>(kama hajaoa)</b>	Je, kwa muda wa miezi sita iliyopita ulishawahi kuwa na mpenzi/wapenzi? <b>(kama hajaolewa)</b>	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui <b><i>Kama hapana ruka mpaka 3.15</i></b>	
3.11	Je, unauhusiano gani na hawa wapenzi?	Je, unauhusiano gani na hawa wapenzi?	<input type="checkbox"/> Mahusiano ya kibiashara <input type="checkbox"/> Mpenzi wa kazi <input type="checkbox"/> rafiki <input type="checkbox"/> Wengine taja _____	
3.12	Huwa unafanya mapenzi/tendo la ndoa	Huwa unafanya mapenzi/tendo la	<input type="checkbox"/> Wiki <input type="checkbox"/> Mwezi <input type="checkbox"/> Mara moja kwa kila baada ya miezi mitatu <input type="checkbox"/> Mara	



	mara ngapi na hawa wapenzi?	ndoa mara ngapi na hawa wapenzi?	kwa mara <input type="checkbox"/> Mara chache <input type="checkbox"/> Taja nyinginezo.....
<b>3.13</b>	Je, unatumia kondomu wakati unavyofanya ngono na wapenzi hawa?	Je, huwa unatumia kondomu wakati unavyofanya ngono na wapenzi hawa?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> Sijui  <b><i>Kama hapana ruka mpaka 3.15</i></b>
<b>3.14</b>	Ni mara ngapi unatumia kondom wakati unavyofanya ngono na wapenzi hawa	Ni mara ngapi unatumia kondom wakati unavyofanya ngono na wapenzi hawa	<input type="checkbox"/> Mara kwa mara <input type="checkbox"/> mara chache <input type="checkbox"/> Situmii
<b>3.15</b>	Je, huwa unatumia kondomu na mpenzi wako wa kawaida	Je, huwa unatumia kondomu na mpenzi wako wa kawaida	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui
<b>3.16</b>	Je, unatumia kondomu na mpenzi wako wa kawaida	Je, unatumia kondomu na mpenzi wako wa kawaida	
<b>3.17</b>	Unapata wapi kondom?	Unapata wapi kondom?	<input type="checkbox"/> Vituo vya serikali vya Afya <input type="checkbox"/> Nunua dukani <input type="checkbox"/> Vituo binafsi <input type="checkbox"/> Shirika lisilo la kiserikali <input type="checkbox"/> Taja nyinginezo.....
<b>3.18</b>	Je, daima unapata kondomu wakati unahitaji?	Je, daima unapata kondomu wakati unahitaji?	<input type="checkbox"/> mara kwa mara <input type="checkbox"/> mara chache <input type="checkbox"/> hazipatikani
<b>3.19</b>	Je! Kwa miezi sita iliyopita ulishawahi kuhisi dalili ya kuwa na	Je! Kwa miezi sita iliyopita ulishawahi kuhisi dalili ya	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui

	kisonono/kaswende, vidonda au kutokwa na harufi yeyote kwenye sehemu yako ya siri ?	kutokwa na harufi yeyote kwenye sehemu yako ya za siri?	
3.20	Je, shughuli za kutahiri wanaume huwa inafanyika katika jamii yako?	-	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.21	Je, wewe umetahiriwa?.Hili swali kwa ajili ya wanaume tu	-	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.22	Katika miezi mitatu iliyopita, ulikuwa umesafiri na kulala mbali na nyumbani kwako?	Katika miezi mitatu iliyopita, ulikuwa umesafiri na kulala mbali na nyumbani kwako?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui  <b><i>Kama hapana ruka mpaka, 3.25</i></b>
3.23	Je! Umewahi kushiriki tendo la ndoa ukiwa safarini au mbali na nyumbani kwako kwa miezi sita iliyopita?	Je! Umewahi kushiriki tendo la ndoa ukiwa safarini au mbali na nyumbani kwako kwa miezi sita iliyopita?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.24	Je! Umetumia kondomu?	Je! Umetumia kondomu?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.25	Je! Umewahi kutoa zawadi kama vile samaki kwa ajili ya ngono?	Je! Umewahi kupokea zawadi kama vile samakai kwa ajili ya ngono?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui  <b><i>Kama hapana ruka mpaka 3.26</i></b>

3.26	Je! unakunywa pombe?	Je! unakunywa pombe?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui <b>Kama hapana ruka mpaka 3.29</b>
3.27	Ni mara ngapi unafanya ngono baada ya kunywa pombe?	Ni mara ngapi unafanya ngono baada ya kunywa pombe?	<input type="checkbox"/> Mara kwa mara <input type="checkbox"/> Mara chache <input type="checkbox"/> Sikumbuki
3.28	Je, umetumia kondomu?	Je, umetumia kondomu?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.29	Je, ni mara ngapi huwa unafanya ngono usipokunywa pombe?	Je, ni mara ngapi huwa unafanya ngono usipokunywa pombe?	<input type="checkbox"/> Mara kwa mara <input type="checkbox"/> Mara chache <input type="checkbox"/> sikumbuki <b>Kama hapana ruka mpaka 3.31</b>
3.30	Je, unatumia kondomu?	Je, unatumia kondomu?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.31	Katika maisha yako ulishawahi kutumia dawa yeyote ya kulevya?	Katika maisha yako ulishawahi kutumia dawa yeyote ya kulevya?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui <b>Kama hapana ruka mpaka 3.33</b>
3.32	Je, umefanya ngono baada ya kutumia dawa yoyote ya kulevya?	Je, umefanya ngono baada ya kutumia dawa yoyote ya kulevya?	<input type="checkbox"/> ndiyo <input type="checkbox"/> Hapana <input type="checkbox"/> Sijui
3.33	Mara ya mwisho ulifanya mapenzi lini?	<b>Mpenzi wa Mwisho</b> Siku zilizopita, _____ Wiki iliyopita, _____ Miezi iliyopita, _____ Miaka iliyopita, _____	
3.34	Je, unauhusiano gani na huyu mtu (mpenzi wa	<input type="checkbox"/> Mume/mke <input type="checkbox"/> wanaishi kama	

	pili wa mwisho)	wapenzi <input type="checkbox"/> Rafiki wa kiume/kike hawaishi pamoja <input type="checkbox"/> Biashara ya ngono <input type="checkbox"/> Nyingine taja.....	
<b>3.35</b>	Kwa wastani una wapenzi wangapi uliofanya nao mapenzi kwa miezi sita iliyopita?	Kwa wastani una wapenzi wangapi uliofanya nao mapenzi kwa miezi sita iliyopita?	<input type="checkbox"/> Moja <input type="checkbox"/> wawili <input type="checkbox"/> Zaidi ya wawili <input type="checkbox"/> Wengine taja.....

<b>SEHEMU YA NNE (4): UPATIKANAJI NA MATUMIZI YA HUDUMA ZA AFYA</b>			
<b>4.1</b>	Je! Kuna vituo vinavyotoa huduma za VVU na magonjwa mengine ya ngono katika eneo hili?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
<b>4.2</b>	Nani hutoa huduma hizi?	<input type="checkbox"/> Kituo cha afya (serikali) <input type="checkbox"/> Kituo cha afya (binafsi) <input type="checkbox"/> Kituo cha Afya (Kanisa) <input type="checkbox"/> Shirika lisilo la serikali <input type="checkbox"/> Mengineyo taja.....	
<b>4.3</b>	Je, upatikanaji wa kituo cha kutolea huduma ukoje katika eneo lako?	<input type="checkbox"/> inapatikana sana <input type="checkbox"/> Kwa namna fulani kupatikana <input type="checkbox"/> haipatikani kabisa	
<b>4.4</b>	Ni umbali gani kwa wastani kutoka hapa mpaka kwenye kituo cha afya kilichopo karibu zaidi?	_____ km	

4.5	Je, umetumia huduma yeyote kwa miezi sita iliyopita?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
4.6	Je, unaonaje ubora wa huduma zinazotolewa?	<input type="checkbox"/> Nzuri sana <input type="checkbox"/> Nzuri <input type="checkbox"/> kawaida <input type="checkbox"/> mbaya <input type="checkbox"/> Mbaya sana	
4.7	Je, unaonaje gharama za huduma?	<input type="checkbox"/> bure <input type="checkbox"/> nafuu <input type="checkbox"/> siyo nafuu sijui <input type="checkbox"/>	
4.8	Umepeva vifaa vya kusoma kwa habari zaidi kwenye kituo cha Afya?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
4.9	Ni aina gani ya taarifa yaliyopo ndani ya hizo vipeperushi uliyopewa?	<input type="checkbox"/> taarifa ya kinga <input type="checkbox"/> taarifa ya kuendeleza <input type="checkbox"/> taarifa ya tiba <input type="checkbox"/> Mengine taja.....	
4.10	Je! Kuna shirika lisilo la serikali au serikali ilikuja kutoa kondomu katika miezi sita iliyopita?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> Sikumbuki	
4.11	Je, ulishawahi kupima virusi vya Ukimwi kwa miezi sita iliyopita?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sikumbuki	
4.12	Kwa mara ya mwisho ulipima wapi?	<input type="checkbox"/> Kituo cha Afya cha Serikali <input type="checkbox"/> Kituo cha afya cha kibinafsi <input type="checkbox"/> Kituo cha ushauri nasaha na upumaji <input type="checkbox"/> Kituo cha kuchamgia damu <input type="checkbox"/> Wengine (taja)_____	
4.13	Kwa mara ya mwisho ulipimwa virusi vya ukimwi lini?	_____/_____/_____ _____	<b>(dd/m m/yy)</b>
4.14	Je, ulipata matokeo ya kipimo?	<input type="checkbox"/> ndiyo <input type="checkbox"/> hapana <input type="checkbox"/> sijui	
4.15	Matokeo ilikuwaje?	<input type="checkbox"/> Chanya <input type="checkbox"/> hasi <input type="checkbox"/> sikumbuki	

### **Appendix 3: Informed Consent (English version)**

#### **Consent to participate in this study**

Greetings, my name are Onna Duuma Panga. I am pursuing the **Masters of Science in Epidemiology and Laboratory Management at Muhimbili University of Health and Allied Sciences, Dar es Salaam**. At the moment, we are carrying out a study to determine the HIV recent infection and associated factors among the fishing community in Geita region, Tanzania.

#### **Purpose of the study**

The purpose of this study is to determine the HIV recent infection and the associated risk factors among the fishing communities. If you agree to join this study, you will be required to answer a series of questions that have been prepared for the study in an interview in order to obtain the intended information. As part of this study, we are requesting people to give a small amount of blood (about 9ml) to test for the above-mentioned conditions. This information will help the Geita region, stakeholders and the Ministry of Health, Community Development, Gender, Elderly and Children to plan the intervention for the specific group like the fishing community.

#### **Procedure**

If you agree to take part, you will be asked to provide about 9ml of venous blood. Your blood specimen will be tested for HIV, viral load and CD4 count by the counsellors at the site; the remaining portion will be transported to National Laboratory Training Centre and Quality assurance (NLTCQA) for viral load testing and Avidity testing.

#### **Confidentiality**

I assure you that all the information collected from you will be kept confidential. Only people working in this research study will have an access to the information. We will ensure that any information included in our report does not identify you as respondent as we will not put your name or other identifying information on the records of the information you provide. I will put a study number, but not your name on the blood sample.

**Risks of taking part in the study**

The risk to you if you take part in testing is minimal. All instruments that will be used to collect blood are clean and safe. They have not been used before and will be safely destroyed after a single use. You may experience pain when blood is being drawn. If you have any pain, bleeding, or swelling from taking blood, please contact our study staff or your health worker. We do not anticipate that any harm will occur to you.

**Rights to withdraw and alternatives**

Your participation in this study is completely voluntary. If you choose not to participate in this study no harm will come to you. Refusal to participate or withdraw from the study will not involve loss of any benefit to which you are otherwise entitled.

**Benefits from the study**

Trained counsellors and Laboratory technologist will be available at the site for the same day for Voluntary Counseling and testing. If you wish to know your HIV status, information can be obtained from the counsellors. You will also get educational information on how to prevent HIV transmission. Once results on viral load and CD4 count screening are available you can freely get the information regarding those tests. If you will be found to have HIV you will be referred to the nearby health facility for linkage to care and treatment. The information from your tests will be used by the different program in the region for targeting specific intervention.

**Compensation**

There will be no compensation of time spent during the interview.

**Who to contact**

If there is any question about this study please don't hesitate to communicate to the **Director of Research and Publication Dr. Bruno Sunguya**, the Muhimbili University of Health and Allied Science (MUHAS), P. O. Box 65001, Dar es Salaam, Tel. no 2150302-6. OR

Dr A. Joachim, The study Supervisor (Mobile: 0717874791)

Dr Ahmed Abade, The study Supervisor (Mobile: 00683498787)

Panga, Onna Duuma –Principal Investigator (Mobile 0684804700).

**Participant agree**  **Participant disagree**

Signature of Participant/Thumb print \_\_\_\_\_

Signature of the interviewer\_\_\_\_\_ Date consent signed \_\_\_\_\_



#### **Appendix 4: Fomu Ya Ruhusa (Swahili Version)**

##### **HATI YA KUKUBALI KUHOJIWA NA KUTOLEWA DAMU**

Namba ya utambulisho

Habari, Jina langu naitwa Onna Duuma Panga. Ninasoma katika chuo Kikuu Cha Tiba na sayansi shirikishi Muhimbili. Tumekuja kufanya utafiti juu ya hali ya maambukizi mapya ya virusi vya ukimwi na mambo yanayohusishwa kati ya jamii ya wavuvi katika Mkoa wa Geita

Matokeo ya utafiti huu yataisaidia serikali ya Mkoa wa Geita katika kupanga mikakati ya kuboresha huduma za kuzuia na kupambana na maambukizi mapya ya virusi vya ukimwi katika jamii ya wavuvi. Wale ambao vipimo vitaonyesha kuwa wana matatizo watatumwa katika vituo vya karibu kwa matibabu au msaada wa kitaalamu.

Mazungumzo yetu yatachukuwa kama dakika kumi na tano mpaka ishirini hivi kukamilika, zitatumika namba na sio jina wala hakutakuwa na kitu kingine chochote cha kutambua ushiriki wako. Taarifa utakazozitoa zitakuwa ni siri na zitatumika kwa ajili ya utafiti tu na si kwa kitu kingine chochote.

Kama sehemu ya utafiti huu, utaombwa kutoa kiasi kidogo cha damu kwa ajili ya kupima maambukizi ya VVU, kwa wale watakao gundulika na maambukizi vya VVU watapimwa uwingi wa virusi vya ukimwi na kiasi cha Kinga Mwilini. Damu itachukuliwa na mtalaamu wa maabara na vifaa vitavyotumika viko salama, havijatumika kwa mtu mwingine na baada ya kutumika viataturupwa kwa kufuata taratibu. Tutatumia namba na siyo majina, hivyo hakuna mtu ataweza kujua majibu yako. Utasikia maumivu kidogo wakati wa kuchukua damu.

Hatutarajii kutokea madhara ya aina yoyote kwako yatakayosababishwa na utafiti huu, hata hivyo kama yatakuwepo, hakutakuwa na fidia ya namna yoyote

Kushiriki kwako katika utafiti huu ni hiari, unaweza kuamua kukataa au kutoshiriki katika utafiti huu na hakuna adhabu itakayofanyika kwa kutoendelea kushiriki katika mazungumzo. Hata hivyo ni mategemeo yangu kuwa utashiriki kikamilifu katika utafiti huu kwani maoni yako ni muhimu sana.

Kama kuna swali kuhusianan na utafiti huu itakubidi kuwasiliana na  
**Mkurugenzi wa Utafiti na Uchapishaji Dr Bruno Sunguya** - Chuo Kikuu cha Afya na  
Sayansi ya Tiba Muhimbili, S.L.P. 65001 DSM. Simu namba 2150302-6. Kama una maswali  
zaidi unaweza kuwasiliana na

Dr. A.Abade– Msimamizi wa Utafiti (Mobile: 0683498787)

Dr.A.Joachim- Msimamizi wa Utafiti (Mobile: 0717874791)

Panga, Onna Duuma–Mtafiti Mkuu (Mobile 0684804700)

“Nimesoma na nimeelewa ombi lako, kwa hiari yangu, bila ya nguvu wala ahadi zozote  
nakubali kushiriki katika utafiti huu”.

“Samahani, sipo tayari kushiriki  Nipo tayari Kushiriki

Sahihi ya mshiriki/Alama ya dole gumba..... Tarehe.....

Sahihi ya muulizaji..... Tarehe .....