

## Original Research Article

## The Potential Risk of HIV Infection and Transmission of Other Blood-Borne Pathogens through the Sharing of Needles and Pins among People Infested with Jiggers in Kenya

Thomas Matenjwa Kamau<sup>1</sup>, Sheryl K. House<sup>2</sup>

<sup>1</sup>Assistant Professor of Health Sciences, Department of Social and Public Health, Ohio University-Zanesville 1425 Newark Road, Zanesville OH 43701.

<sup>2</sup>Assistant Professor of Nursing, Ohio University-Zanesville, 1425 Newark Road, Zanesville OH 43701.

Corresponding Author: Thomas Matenjwa Kamau

Received: 24/09/2014

Revised: 28/10/2014

Accepted: 31/10/2014

### ABSTRACT

Tungiasis is an inflammatory skin disease caused by jigger infestation and poses a significant threat to an individual's health. The purpose of this study was to (1) investigate the extent of the use and sharing of unclean sharp instruments to remove jiggers, (2) examine the demographic characteristics and factors associated with jigger infestation and the practice of using sharp instruments for removal, and (3) determine the knowledge of HIV transmission among people infested with jiggers in the Kandara district in Kenya. The study utilized a convenience sample consisting of 306 participants. Data on demographic characteristics, knowledge of tungiasis etiology, preventative and treatment practices for tungiasis, and knowledge about modes of HIV transmission were collected in face-to-face interviews. Of all respondents interviewed, 89.9% indicated that they have used sharp instruments to extract jiggers. Seventy-five percent of participants using sharp instruments also indicated that they have shared unclean instruments. The majority of participants (52%) saw tungiasis as a nuisance rather than as a disease. The practice of sharing sharp instruments to remove jiggers may increase the risk of HIV infections and other blood-borne pathogens. As such, there is a need for evidence-based prevention and treatment to increase the risk awareness associated with the practice.

**Keywords:** HIV infections, Tungiasis, jigger infestation, Public health

### INTRODUCTION

Tungiasis is an inflammatory skin disease caused by the female ectoparasite, *Tunga penetrans*, also known as the jigger flea, found in sub-Saharan Africa, the Caribbean, Central and South America, and India.<sup>[1]</sup> The disease develops when the female jigger flea burrows into the epidermis of its host, causing severe pain,

itching, and a lesion at the site of penetration. Researchers posit that tungiasis remains a neglected disease because of poverty, social neglect, and inappropriate health self-care by affected populations.<sup>[2]</sup> Consequently, individuals infested with jiggers and the resulting tungiasis must manage the disease on their own. Recent research conducted among individuals

infested with jiggers in Muranga County, Kenya indicated that over 90% of individuals infested with jiggers utilize some type of sharp instrument, such as needles or pins, to extract the jiggers. The individual practice of extracting jiggers burrowed into the epidermis not only causes damage to the skin but may also lead to digital amputations.<sup>[3]</sup> It is not evident whether individuals who engage in this practice share contaminated sharp instruments, which may pose a potential risk in the transmission of blood-borne pathogens.

The utilization of potentially infectious sharp instruments in the jigger infested population raises alarm due to the risk of the human immunodeficiency virus (HIV) and other blood-borne pathogen transmissions. Even though no known research has collected data on the use or sharing of unsterile instruments, researchers have indicated that the use of blunt and inappropriate instruments may foster the spread of HIV and other blood-borne pathogens.<sup>[4]</sup> This view is supported by research establishing that the risk of HIV infection occurs after percutaneous exposure to blood, depending on the volume and viral load concentration in the source patient's blood.<sup>[5,6]</sup> Due to the risk of HIV transmission, the Joint Commission of the United Nations (UNAIDS) recommends that drug users have access to clean injecting equipment and that contaminated equipment be removed from circulation.<sup>[6]</sup> Similarly, the Centers for Disease Control and Prevention (CDC) warns against the sharing of unsterile needles in tattooing and piercing so as to prevent the transmission of HIV and other blood-borne pathogens because it is possible for the blood of an infected person to remain on a needle that is then used to pierce or tattoo another person.<sup>[7]</sup>

Although Kenya has made remarkable advances in reducing HIV infections in the last decade, it continues to

have a severe, generalized HIV epidemic. Public health agencies have instituted a variety of interventions to prevent HIV transmission through heterosexual and homosexual relations; vertical transmissions from mother to child; and the sharing of needles and syringes in healthcare settings, among drug users, or in circumcision ceremonies.<sup>[8]</sup> Kenya's national AIDS Control Council estimates that 104,137 individuals were newly infected with HIV in 2010, and approximately 1.3 million individuals were living with HIV by the end of 2010.<sup>[9]</sup> Due to the significant incidence and prevalence of HIV in Kenya, it is necessary to maintain up-to-date preventative HIV measures and investigate other potential modes of HIV transmission. Theoretically, a risk of HIV transmission may exist when jigger-infested individuals share HIV-contaminated sharp instruments for jigger removal. The purpose of this study is to (1) investigate the extent of the use and sharing of unclean sharp instruments to remove jiggers, (2) examine the demographic characteristics and factors associated with jigger infestation and the practice of using sharp instruments to extract jiggers and (3) determine the knowledge about modes of HIV transmission among people infested with jiggers in the Kandara district in Kenya.

## MATERIALS AND METHODS

A cross-sectional descriptive design was utilized to collect and analyze data from a convenience sample consisting of 306 individuals - mean age for under 17 years was  $7 \pm 2.4$  years while mean age for 18 years and above was  $71 \pm 8.16$  years of participants - infested with jiggers, all of whom lived in Kandara district, Kenya. A descriptive study design is appropriate for the assessment of phenomena by summarizing data according to demographic, social, or health

characteristics. The design is appropriate for this study because the objective is to determine who is affected by jiggers - through a classification of the sample by demographic characteristics - and to explore other factors, such as beliefs, health practices, and general knowledge of modes of HIV transmission, all of which may determine levels of risk of tungiasis and other blood-borne diseases.

### **Recruitment**

Prior to the recruitment of the study participants, approval to conduct the study was sought and obtained from the Institutional Review Board (IRB) of Ohio University. In accordance with the international guidelines for research conducted outside the United States, [10] another IRB approval was sought and obtained from the Great Lake University of Kisumu, Kenya. Permission to recruit participants was obtained from official public health officers at the county and district levels. At the national level, written permission was obtained from the Division of Community Health of the Kenya Ministry of Health. In addition, permission to access the jiggers-infested population was obtained from the Department of Environmental Health of Muranga County and from the Kandara District Public Health Office.

Three research assistants were trained by the principal investigator on how to collect data for the study. In addition, each assistant completed Web-based training on protecting human research participants, which was provided by the National Institute of Health (NIH). [10] They were also trained on how to recruit participants, obtain informed consent, and conduct face-to-face interviews.

Additionally, three divisional community health extension workers were employed to assist in mapping households infested with jiggers and linking the researchers to volunteer community health

workers who knew households affected by jigger infestation. The volunteer community health workers are respected by the community and acted as liaisons between the researchers and potential participants.

### ***Inclusion and exclusion criteria***

To be included in the study, individuals had to (1) be residents of the Kandara district for more than a year, (2) be six years of age or older, (3) be infested with jiggers, (4) be able to communicate in Kikuyu, Kiswahili, or English, and (6) be willing to give informed consent (those aged 18 and older) or (7) be willing to give assent (those younger than 18 years) after their parents or guardians consented to their participation. Individuals excluded from the study included (a) prisoners, (b) non-residents of the Kandara district, and (c) those who declined to consent to the study. With the assistance of the community health extension workers and volunteer community health workers, a final sample of 306 jigger-infested children and adults of the Kandara district of Kenya was established. The participants were scheduled for face-to-face interviews at their homes, which offered convenience and privacy.

A semi-structured interview was conducted with key informants, including the coordinator of community health at the national level and the Kandara district public health officer, who are public health experts. They assessed the potential interview questions to ensure every question carried the intended meaning and would be fully comprehensible to participants in the study. Based on the experts' feedback, a structured questionnaire was developed and piloted on ten individuals who had similar characteristics to those of the study participants. The questionnaire was then revised, and a final version was created on the basis of the pilot results.

The questionnaire collected data on demographic characteristics, such as age,

gender, occupation, education, and residency, to establish the associated demographics of jigger infestation. The participants were questioned about jigger infestation, the use and sharing of sharp instruments, and the perception of tungiasis as a disease or as a nuisance. They were also questioned about their knowledge and perceptions of modes of HIV transmission. The interviews were audio recorded for backup purposes.

To ensure anonymity, no personally identifiable information associated with the participants was recorded on the survey forms. Each study participant was assigned a code. The data collection records were stored in a locked filing cabinet.

Diagnosis of tungiasis is based on clinical findings and is easy in endemic zones where the disease is well known by natives. [11] As part of the study, participants were physically examined for lesions that are usually indicative of current or previous jigger infestation. Photographs were taken with the consent of adult participants and assent from minor participants. The study questionnaires were administered in Kikuyu (the indigenous language) and Kiswahili (Kenya's national language) during face-to-face interviews. The participants were given soaps and a basin in return for their participation. In addition, the healthcare extension workers provided treatment to participants who had not initiated or sought treatment on their own.

## RESULTS

Three hundred six (n=306) individuals participated in the study. Of those interviewed, 179 (58.5%) were minors between six and 17 years old, and 127 (41.5%) were adults 18 years and older. A majority of the participants (58.8%) were female while 41.2% were male. Among the participants, minors were 2.8 times more likely than adults and 1.5 times more likely

than the elderly to be infested with jiggers. Additionally, the elderly were 1.76 times more likely than adults to be infested with jiggers. Fifty-four percent of the participants were either children aged six to ten years or adults 70 years and older. Forty-two percent of the children were six to ten years old and comprised the highest percentage among all age groups. Within this subgroup, the majority (53.5%) were female. Noteworthy, 95.1% of the participants had either no formal education or had only attained some elementary (primary) level of education. Table 1 shows the demographic characteristics of the sample.

Table 1: Demographic Characteristics of the Sample.

Respondents	N	(%)
Gender		
Male	126	(41.2)
Female	180	(58.8)
Total	306	(100)
Age		
Minors (6-17)	179	(58.5)
Adults (18-50)	46	(15)
Elderly (51 and older)	81	(26.5)
Total	306	(100)
Education		
None	30	(9.8)
Primary School	261	(85.3)
Secondary School	15	(4.9)
College	0	(0)
Total	306	(100)
Occupation		
Employed	0	(0)
Temporary workers	54	(17.6)
Unemployed	83	(27.1)
Pupils/students	169	(55.2)
Total	306	(100)

Asked whether tungiasis is a disease or a nuisance, 52% of the participants responded that it was a nuisance while 48% believed it was a disease. Importantly, the majority of the adults were unemployed (58.3%), and 40.2% were temporarily employed. Almost all the minors (93.3%) were enrolled in primary school, and only 6.7% did not attend school.

Asked about their current practice to relieve the pain caused by jigger infestation, 89.9% of the participants indicated that they used sharp instruments to extract jiggers, and

67.6% reported sharing sharp instruments. Among the participants who reported using sharp instruments to remove jiggers, approximately 75% indicated that they shared unclean instruments to remove

jiggers. Among those who reported sharing sharp instruments to remove jiggers, 70.1% were adults aged 18 and older compared to 65.9% of minors aged six to 17 years (see Table 2).

Table 2: Use of needles/sharps to remove jiggers by demographic characteristics.

Respondents		N (%) Use needles or sharps		N (%) share needles or sharps		Yes	% (%)	No	% (%)
		Yes	%	No	%				
<b>Gender</b>									
	Male	115	(37.6)	11	(3.6)	81	(26.5)	45	(14.7)
	Female	160	(52.3)	20	(6.5)	126	(41.2)	54	(17.6)
	Total	275	(89.9)	31	(10.1)	207	(67.6)	99	(32.4)
<b>Age</b>									
	Minors	166	(54.2)	13	(4.2)	118	(38.6)	61	(19.9)
	Adults	39	(12.7)	7	(2.3)	33	(10.8)	13	(4.2)
	Elderly	70	(22.9)	11	(3.6)	56	(18.3)	25	(8.2)
	Total	275	(89.9)	31	(10.1)	207	(67.6)	99	(32.4)
<b>Education</b>									
	None	29	(9.5)	1	(0.3)	18	(5.9)	12	(3.9)
	Primary School	232	(75.8)	29	(9.5)	177	(57.8)	84	(27.5)
	Secondary School	14	(4.6)	1	(0.3)	12	(3.9)	3	(1.0)
	Total	275	(89.9)	31	(10.1)	207	(67.6)	99	(32.4)
<b>Occupation</b>									
	Temporary workers	46	(15.03)	8	(2.6)	34	(11.1)	20	(6.5)
	Unemployed	71	(23.2)	12	(3.9)	63	(20.6)	20	(6.5)
	Pupils	158	(51.6)	11	(3.6)	110	(35.9)	59	(19.3)
	Total	275	(89.9)	31	(10.1)	207	(67.6)	99	(32.4)

Of participants 18 years and older, 50.4% reported that they did not believe that HIV could be transmitted through the sharing of sharp instruments to remove jiggers. The majority (52.9%) believed that the only prevention against HIV transmission was by practicing abstinence and/or partner faithfulness. Approximately 81% of participants believed that one's HIV status could not be determined by simply looking at an individual, and 87.9% believed HIV could not be transmitted by touching a person living with HIV. Nearly 50% believed that one's HIV status could only be determined through testing.

## DISCUSSION

The study's findings suggest that the practice of using and sharing needles to remove jiggers' raises concerns over the potential risk of HIV infection and the

transmission of other blood-borne pathogens among people infested with jiggers. While it may be accurate to believe that sufficient knowledge of the risk of HIV transmission through needles and syringes or sharps does exist, there is a need for serious questions regarding the extent of dissemination of such knowledge in the grassroots where it really matters. This would be crucial for the 67.5% of respondents in this study who reportedly used and shared needles/sharps with people of unknown HIV status. We contend that the dangers of the potential risk of HIV transmission need to be expressed in language that is understandable by at-risk populations, including people infested with jiggers, such as those in rural Kenya.

Given the prevalence of HIV transmission in Kenya, the practice of using and sharing needles need to be taken with the seriousness it deserves if we have to

drastically reduce the incidence of HIV infection.<sup>[12]</sup> This argument is based on research showing the existence of risk of HIV infection after percutaneous exposure, such as scarification, circumcision, tattooing, and acupuncture, if the source patient's blood contains HIV.<sup>[6-8,13,14]</sup> Both UNAIDS and the CDC recommend single-use instruments in tattooing and circumcision as well as access to clean needles and syringes among drug users to prevent the risk of the transmission of HIV, hepatitis B virus (HBV), hepatitis C virus (HCV), and other infections.<sup>[7,8]</sup> Moreover, the CDC advises individuals who come in contact with blood of an unknown HIV sero status to seek post-exposure prophylaxis (PEP) treatment. These precautionary measures can assist in eliminating the possibility of contaminated blood left on sharp objects being passed on to susceptible individuals.<sup>[8]</sup> As such, since these practices are known to pose the risk of blood-borne pathogen transmission, it is arguable that similar risks exist among the 67.6% of participants who indicated that they shared unsterile sharp instruments to remove jiggers.

Had participants known that the sharing of sharp instruments increases the risk of contracting HIV and other life-threatening blood-borne pathogens, they may have taken precaution in preventing and treating the jigger infestations. A lack of knowledge was evident as the majority of the adult participants believed that jigger infestation is a nuisance rather than a disease and that HIV can only be transmitted through sexual contact. Other studies conducted among individuals affected by tungiasis in rural parts of Cameroon found that tungiasis victims and public health officials typically did not understand that tungiasis was a disease requiring medical intervention.<sup>[14]</sup> This attitude raises concerns about whether these participants have a true

understanding of tungiasis and the potential ramifications if left untreated. It is our view that it is crucial to educate jiggers-infested population about tungiasis and the risk of HIV transmission and other blood-borne pathogens that could result from the use and sharing of sharp instruments in the removal of jiggers. Although HIV educational resources on modes of transmission may be readily available, one needs to be cognizant that over 95% of those interviewed had either no formal education or only some primary (elementary) education. The target population is therefore in urgent need of an HIV curricular and other easily understandable behavioral communication.

Nonetheless, changing behavior will require more than just raising awareness of the risks of sharing sharp instruments to remove jiggers. As noted, unemployment and low education levels contribute significantly to poverty, as evidenced by poor housing and a lack of financial support or health insurance, which also appears to be a serious barrier to access to healthcare services. Behavioral changes will require access to evidence-based prevention and treatment practices.

The findings of this study also suggest that minors and the elderly are more vulnerable to jigger infestation. The results showed that young children aged six to ten years and adults 70 years and older were most susceptible to jigger infestation. This is not surprising given the fact that the youngest and oldest individuals may be unable to fully exercise autonomy in their personal care.<sup>[13]</sup>

The findings from this study and previous studies suggest that tungiasis is not merely a microbiological issue requiring a microbiological solution but a problem with multiple contributing factors, such as demographic, environmental, and socioeconomic dynamics, that work collectively to make it a complicated issue.

<sup>[1,2,6,15]</sup> Tungiasis may be a culprit in sustaining entrenched levels of poverty among the poor and depriving them of opportunities to improve their economic situation. <sup>[16]</sup> Jigger infestation may also have been intensified by a lack of employment or temporary employment, which makes it difficult to work. As noted by other researchers, jiggers impede progress and development among the poverty-stricken because it is difficult to work when one has difficulty walking, persistent itching, and insomnia. <sup>[12,14,15]</sup> This is also true for children, whose academic performance may be hindered as a result of persistent itching and the inability to write due to jigger infestation of the fingers.

#### **Limitations**

This research does not establish a cause and effect relationship. We do not purport to suggest that the utilization of sharp instruments to remove jiggers causes the transmission of HIV. Also, the findings are not generalizable because of the sampling method – convenience and may only apply to Kandara district, Kenya. Further studies are needed to examine the relationship between the sharing of sharp instruments and HIV transmission and, more importantly, to design interventions aimed at eliminating or at least reducing the need to use and share sharp instruments to remove jiggers among the jigger-infested population.

#### **CONCLUSION**

Tungiasis is clearly a serious health problem with serious health ramifications, such as the transmission of HIV and other blood-borne pathogens. Prevention and treatment alternatives to the use of sharp instruments are urgently needed to reduce the risk of transmission of blood-borne pathogens and to alleviate the suffering resulting from the disease. Public health agencies and healthcare providers need to

raise awareness of the dangers of sharing sharp instruments to remove jiggers and design and implement evidence-based interventions to decrease jigger infestation and tungiasis, thus indirectly reducing the transmission of HIV and other blood-borne pathogens. Finally, because tungiasis is intricately linked to poverty, a long-term solution should also include poverty alleviation strategies among the affected population.

#### **ACKNOWLEDGEMENTS**

This research was funded internally by the Ohio University Research Committee (OURC), and we are grateful to Ohio University for the support. We are also grateful to Dr. James Mwitari and Ruth Ngechu of the Division of Community Health, Muranga County Environmental Health Office, and the Kandara District Health Office –of the Ministry of Health, Kenya – for their invaluable support in mapping and accessing households and individuals infested with jiggers in Kenya. More importantly, we appreciate the research participants, without whose participation this research would not have been possible.

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How to cite this article: Kamau TM, House SK. The potential risk of HIV infection and transmission of other blood-borne pathogens through the sharing of needles and pins among people infested with jiggers in Kenya. Int J Health Sci Res. 2014;4(12):278-285.

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