Journal of Infection and Public Health (2015) 8, 254—259

http://www.elsevier.com/locate/jiph

An evaluation of human immunodeficiency virus oral screening test awareness and preferences in the West region of Cameroon

Celine N. Nkenfou[a,b,*], **Japhette T. Kembou**[c], **Appolinaire Djikeng**[d], **Irenee Domkam**[a], **Timoleon Tchuinkam**[c]

[a] *''Chantal Biya'' International Reference Centre for Research on HIV/AIDS Prevention and Management (CIRCB), Yaounde, Cameroon*
[b] *Higher Teachers' Training College, University of Yaounde I, Cameroon*
[c] *Faculty of Sciences, University of Dschang, Cameroon*
[d] *Biosciences Eastern and Central Africa — International Livestock Research Institute (Beca-ILRI) Hub, Nairobi, Kenya*

Received 8 September 2014; received in revised form 10 October 2014; accepted 13 October 2014

KEYWORDS
Awareness;
Control programs;
HIV;
Oral test;
Preference

Summary HIV serological diagnosis has evolved during the last decade to give rise to rapid testing using biological materials, such as blood or oral mucosal transudate (OMT). However, blood collection is not always welcomed, justifying the evaluation of OMT-based devices. In a cross sectional study carried out in May 2011 aimed at evaluating the level of awareness about OMT based HIV tests, questionnaires were administered to participants who consented to take part in the study. Eighty-five percent ($n = 1520$) of participants reported a lack of awareness of HIV oral screening before the study, and surprisingly, no association was found between the awareness of participants and their educational level ($p = 0.768$). There was also no association ($p = 0.743$) found between having had previous screening tests and awareness of oral testing. The percentage of participants who accepted the oral test before being informed about it was 31.3% ($n = 1520$). After sensitization, 76.3% ($n = 1520$) preferred oral screening for future tests ($p = 0$). These results reveal that if the OMT based test is affordable, its implementation as a screening tool in the general population could greatly increase participation in screening campaigns and is welcomed

* Corresponding author at: ''Chantal Biya'' International Reference Centre for Research on HIV/AIDS Prevention and Management (CIRCB), University of Yaounde I, P.O. Box: 3077, Yaounde, Cameroon. Tel.: +237 75 57 35 19; fax: +237 22 31 54 56.
E-mail address: nkenfou@yahoo.com (C.N. Nkenfou).

http://dx.doi.org/10.1016/j.jiph.2014.10.004

by those who want to self-test in a non-invasive way. This will create a better estimation of the national HIV prevalence. Its use could then have a significant public health impact on HIV prevention and clinical management.

Introduction

The overall HIV prevalence in Cameroon was reported to be 4.3% in 2011. Among the various risk groups, HIV prevalence was as follow: sex workers, 37%; military men, 6%; and pregnant women, 7.8% (EDS, 2011) [1].

During the past decade, HIV serological diagnosis has evolved considerably from a 1st to a 4th generation of tests. Most of the kits used in serology are based on HIV antibody detection in blood samples. However, blood collection is not always accepted by many populations for several reasons. A study carried out by Gregson et al. [2] revealed that an irrational fear of Satanism was a common reason for refusing to provide Dried Blood Spot (DBS) samples in an epidemiologic survey in Zimbabwe. Alemnji et al. [3] showed that in some specific groups of populations, such as newborns, children and obese individuals, blood sample collection has been found to be particularly difficult. Thus, there is a considerable need to use body fluids other than blood, especially if non-invasive approaches are possible. This would be more adaptable for field use, especially for high risk and hard-to-reach populations or in resource-constrained settings, such as the rural area of the West region of Cameroon, as highlighted by Constantine and Zink [4] as well as Keenan et al. [5].

Since 2000, oral screening testing has become available for point-of-care (POC) HIV antibody testing in many countries of the world, leading to a significant increase in HIV screening participation at testing sites, as reported by Facente et al. [6].

In Cameroon, studies have been carried out by Ndembi et al. [7] and Nkenfou et al. [8] to evaluate oral fluid test devices for their potential use as rapid POC testing. Moreover, in the West region of Cameroon, populations are still highly attached to their culture and traditions and are usually skeptical with regard to blood collection. The implementation of HIV oral fluid testing as a component of HIV control initiatives and programs in Cameroon offers many advantages, such as improved national coverage, which will increase the possibility of obtaining real estimations of the global prevalence. This, in turn, will permit more adequate and targeted HIV/AIDS prevention, treatment and control programs. This study aimed at evaluating the level of awareness of the existence of an HIV oral fluid test. Specifically, we wanted to know the pre-test levels of awareness and post-test acceptability for rapid oral fluid HIV tests in a region reportedly plagued by ''traditional rituals and cultural believes''. We hypothesized that when populations are aware of the oral test, they will prefer it to the blood-based test.

Materials and methods

Study design and sample population

A survey study for cross-sectional analysis was carried out in Dschang, Cameroon in May 2011 to evaluate the level of awareness of rapid oral fluid testing during a free screening campaign with participants attending voluntary counseling and testing services. This study was carried out during the annual university games that mobilize students from all of the 6 state Universities of Cameroon. Questionnaires were then administered to participants before and after being screened with the OMT-based test (OraQuick HIV 1/2 Rapid Antibody Test Orasure Technologies Bethlehem, PA 18015, USA).

Ethical considerations

Our study received the approval of the NEC (National Ethical Committee, authorization n° 215/CNE/SE/2012) of Cameroon. Participants gave their written consent and were assured of confidentiality by the attribution of encoded identification numbers.

Data collection

Questionnaires were administered to our participants before and after being screened sequentially using gold standard HIV tests with blood samples

(determine HIV-1/2 Ag/Ab combo rapid test and HIV (1 + 2) Antibody (colloidal gold) KHB Shanghai Kehua Bio-engineering Co. Ltd., China) and OMT-based tests (ORAQUICK® Rapid HIV-1/2 Antibody). The questionnaires were designed to collect data including: age, sex, educational level, knowledge level of HIV/AIDS, sexual activities, number of HIV tests that they had received previously, and awareness of and preference for HIV oral testing. After receiving an identification number, counselors assisted the participants in filling out the questionnaires.

Data and statistical analysis

Analysis of the data from the questionnaires was carried out using Microsoft Excel 2010 and statistical software (stata, release 13) [9]. The level of awareness of the study population regarding rapid oral fluid testing and the preference of this test after sensitization were captured as a binary variable equal to 1 if the individual knew or preferred the oral test and 0 if not. The following parameters were taken into account during analysis: gender, age group, educational level, risk behaviors (number of sexual partners, frequency of condom usage, and awareness of sexual partner's HIV sero-status). A comparison of the awareness of the HIV oral test between different groups was carried out using the chi square test.

Results

During this study, 1625 people were contacted and 1520 consented to participate. The mean age (in years) of the participants was 24 ± 6.5, ranging from 13 to 49 years. Over half (62%, $n = 1520$ participants) were male, 30% ($n = 1520$) attended higher school, and 68.5% ($n = 1520$) and 1.5% ($n = 1520$) were from secondary and primary schools. Over half (61.1%) of the participants were not aware of the HIV sero-status of their sexual partner. The overall characteristics of the study population are presented in Table 1. The risk behaviors observed in this population ($n = 1520$) are as follows: 61.1% of the participants were not aware of the HIV sero-status of their partner, 30.9% had more than one sexual partner, and 22% and 32.2% frequently and occasionally used condom during sexual activities, respectively. The overall HIV antibody positivity in the study population was 1% and was confirmed by the national HIV testing algorithm of Cameroon.

As presented in Table 1, when participants were asked if they knew about the existence of HIV oral screening tests before the current contact, data analysis revealed that 85% ($n = 1520$) of participants reported that they had never heard about HIV oral screening before and only 14.9% ($n = 1520$) were aware of the existence of the oral-based test.

No association was found between the awareness of participants and their educational level ($p = 0.768$). Additionally, no association was found between been awareness of the oral test and the age of the participants ($p = 0.425$).

Table 1 Description of the study population.

Characteristic	Number (percentage)
Gender	
Male	940 (62.0
Female	575 (38.0)
Missing data	5
Age group	
<20	267 (17.6)
20—29	1036 (68.2)
>29	217 (14.3)
Education level	
Primary	23 (1.5)
Secondary	998 (68.5)
Higher	436 (30.0)
Missing data	63
Awareness on serological status of the sexual partner	
Yes	552 (38.9)
No	867 (61.1)
Missing data	101
Knowing any HIV positive relatives	
Yes	618 (40.7)
No	900 (59.3)
Missing data	2
Having more than one sexual partner	
Yes	463 (30.9)
No	1033 (69.2)
Missing data	24
Frequency of condom use	
Never	312 (22.0)
Occasionally	455 (32.2)
Always	647 (45.8)
Missing data	106
Awareness on oral test before	
Yes	226 (14.9)
No	1289 (85.0)
Missing data	5
Test preference before sensitization	
Blood	830 (55.3)
Oral	469 (31.3
None	201 (13.4)
Missing data	20
Test preference after sensitization	
Blood	343 (23.7)
Oral	1102 (76.3)
Missing data	75

More than 900 participants ($n = 916$, 60.3%) admitted they had previously had an HIV screening test, but 786 (85.8%, $n = 916$) of them were unaware of the existence of an HIV oral screening test. Among those who admitted that this was their first screening test, 84.5% ($n = 602$) also admitted they were unaware of the existence of an HIV oral-based test. Thus, no association ($p = 0.743$) was found between participants who had been tested previously and their awareness of an existing HIV oral test.

The analyses showed that no factors were associated with oral test awareness before sensitization, including education level, age group or even number of prior HIV tests.

Before the administration of the oral screening test, the participants were asked to choose between a blood screening test and an oral test. We found that 55.3% ($n = 1520$) preferred blood-based screening devices compared to only 31.3% ($n = 1520$) who chose the oral fluid testing method. Some 201 participants (13.8%) had no preference and 20 participants did not answer the question (see Table 1).

After sensitization and administration of the oral screening test, participants were asked again if they would like to be screened with oral screening test or blood screening tests in the future. Two-thirds (76.3%, $n = 1520$) stated a preference for a future oral screening test compared to only 23.7% ($n = 1520$) of participants who preferred the blood test. A small proportion (5.1%) of the 1520 participants had no preference. There was a statistically significant difference for the preference of the oral-based test before compared to after sensitization ($p = 0$).

After sensitization, no association was found in the preference of oral test according to gender or educational level ($p = 0.644$ and $p = 0.077$, respectively). An association was found between the oral preference after sensitization and the number of prior HIV tests ($p = 0.005$), and the age group ($p = 0.028$). In fact, as the population gets older they tend to prefer the oral test when aware of its existence. An association was also found between the preference for an oral HIV test and risk behavior ($p = 0.039$), see Table 2.

Table 2 Factor associated to oral test preference (after sensitization).

	Oral test preference after sensitization by individual characteristic (%)	*p*
Gender		
Male	75.8	0.644
Female	75.7	
Education level		
Primary	75.0	0.077
Secondary	74.3	
Higher	79.9	
First time to be tested		
Yes	72.4	**0.005**
No	78.7	
Age group		
<20	70.4	**0.028**
20—24	77.1	
25—29	78.1	
>29	83.5	
Risky behavior		
Yes	79.7	**0.039**
No	74.7	
Knowing any PLWHIV[a]		
Yes	74.6	0.213
No	77.4	

Bold values signify *p* less than 0.05.
[a] People living with HIV.

Discussion

Many rapid test assays have been developed to enable HIV detection in as little as 20 min at the POC, among which the oral screening testing assay is probably the least invasive. This testing method has been evaluated in many clinical settings around the world since its approval by the UNAIDS/WHO in 2005—2006 [10]. Our study revealed that since the approval of this oral test, many Cameroonians are still not aware of its existence (85.3% of our sample population). Surprisingly, we found no relation between the awareness of the population about an existing HIV oral fluid testing method and their level of education or between awareness and having had previous HIV screening tests. One explanation could be the fact that the oral testing method is not yet fully integrated into health and medical HIV care programs. On the other hand, after sensitization, there was a correlation between the oral test preferences of the participants and their age: the older the participants, the higher their preference for oral testing. This could imply that as they aged, they are more aware of the risks related to blood testing or that they still hold a skeptical view of traditional rituals and cultural believes concerning blood. The association between the age of the participants and their preference for an oral screening test may be biased due to the age distribution of our study population, which included many more youths than adults (a prominent characteristic of the Cameroonian population). Although the study took place during

the university games, study participants had a wide variety of backgrounds not only university students but also secondary students, farmers, and workers, and the participants were 13—49 years old. The bias may only be that those who were not interested in the university games could not be assessed for their preferences or awareness. It is important to note that this survey study may be hampered by biases, as ethically we could not force participation.

Before its administration, only 31.3% of participants expressed a desire to get tested using an oral device. This trend was reversed after ''lectures'' on the advantages and disadvantages of oral testing, and thus, 76.3% of the sample population admitted that they would prefer oral screening test devices for future testing. These findings reveal how successful the acceptance of this screening device could be in the populations, which might lead to increased participation in screening, potentially leading to a better estimation of both the national and global prevalence.

The OMT kit offers many advantages, including: being non-invasive, not needing a well-trained phlebotomist, being less painful and uncomfortable, not having a risk of blood exposure for staff and personnel as well as the participants, having easy storage conditions and having no need for complex materials or a power supply for storage.

In countries where populations are already aware of the existence of oral fluid testing, Delaney et al. [11] observed that the preference and acceptability of this assay has increased as well as the number of people who are testing and receiving their results.

Some field evaluation studies of the ORAQUICK® HIV-1/2 Ab Rapid Test carried out by Nkenfou et al. [8] highlighted the fact that this test presents comparable specificity and sensitivity with blood-based tests as well as many of the advantages listed above. This means that it is highly suitable to be implemented in medical outreach in Cameroon, especially in populations with strong cultural believes and taboos about blood-related practices. This also suggests that, if included in the Cameroonian National Program for HIV testing, it could greatly impact HIV control initiatives and programs. There is a compelling reason to educate populations about the option of oral HIV testing and to make sure their tests are fully incorporated in HIV screening campaigns.

However, this screening method does have some limitations. Ndembi et al. [7] demonstrated that some oral fluid based kits fail to detect certain HIV subtypes (notably HIV-1 group O and HIV-1 group N). This can be a real disadvantage, especially in Cameroon, which is known to harbor many different HIV-1 subtypes, as highlighted in the HIV Sequence Compendium [12]. To overcome this disadvantage, we suggest that the manufacturer expand the strain-specific antigens on the test strip.

One limiting factor to the implementation of the oraquick test could be its cost, which is very expensive (4.00—12.00 US$ or 1600—4800 CFA francs) compared to the reference standard tests (1.5—2 US$ or 600—800 CFA francs). Additionally, the occurrence of false negative results may be another shortcoming of the oraquick test. False negative results can occur with ORAQUICK® when used to screen asymptomatic patients with unknown HIV status, particularly those with early HIV infection and in a population characterized by a relatively low HIV/AIDS prevalence [11,13,14]. However, as recognized by the UNAIDS/WHO [10] since 1998, HIV serodiagnosis, particularly in resource limited settings, should not be hindered by factors such as the need for trained personnel, the high cost of equipment and reagents, and the lack of a power supply and laboratory infrastructures. The performance of oraquick, as demonstrated by Alemnji et al. [3] and Nkenfou et al. [8] in populations with different viral diversities, such as Cameroon, makes it a reliable tool for HIV testing.

Conclusion

When sensitized about the existence of an oral based test, the population preferred it for their future HIV screening. The use of an OMT-based test for HIV testing could have a significant public health impact on HIV prevention and clinical management in light of the finding that 76.3% of participants preferred the OMT-based test for future screening. This demonstrates that if provided at the same cost as other HIV blood based tests, the implementation of OMT devices for HIV testing will be successful in both Cameroon and other populations. The manufacturer should modify their test device to reduce the cost per patient. Decision makers should take the lead to include oral testing in the national algorithm.

Funding

No funding sources.

Competing interests

The authors declare to have no competing interests.

Ethical approval

This study received the approval of the National Ethical Committee of Cameroon (CNE).

''All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000 and 2008. Informed consent was obtained from all patients for being included in the study.''

Acknowledgements

This work was supported by the ''Chantal Biya'' International Reference Centre student internship program through its Laboratory of Systems Biology. We are grateful to all participants for their interest in this project.

Editorial assistance in the preparation of this manuscript was provided by Sir Richard Roberts, Nobel Prize laureate of New England Biolabs Inc.

References

[1] EDS, 2011: rapport enquête séroépidémiologique et comportemental chez les Travailleurs de Sexe, HIV seroprevalence and behavioral epidemiology risk survey.

[2] Gregson S, Zhuwau T, Ndlovu J, Nyamakupa CA. Methods to reduce social desirability bias in sex surveys in low-development settings: experience in Zimbabwe. Sex Transm Dis 2002;29:568—75.

[3] Alemnji GA, Ngulefac AG, Ndumbe MP, Asonganyi T. Field evaluation of Calypte's AWARETM blood serum plasma (BSP) and oral mucosal transudate (OMT) rapid tests for detecting antibodies to HIV-1 and 2 in plasma and oral fluid. Open AIDS J 2009;19:14—8.

[4] Constantine NT, Zink H. HIV testing technologies after two decades of evolution. Indian J Med Res 2005;121:519—38.

[5] Keenan PA, Keenan JM, Branson BM. Rapid HIV testing. Wait time reduced from days to minutes. Postgrad Med 2005;117:47—52.

[6] Facente SN, Dowling T, Vittinghoff E, Sykes DL, Colfax GN. False positive rate of rapid oral fluid HIV tests increases as kits near expiration date. PLoS ONE 2009;4(12):e8217, http://dx.doi.org/10.1371/journal.pone.0008217.

[7] Ndembi N, Ngansop C, Moudourou S, Tagny CT, Abimiku A, Mbanya DS, et al. Can oral fluid testing be used to replace blood-based HIV rapid testing to scale up access to diagnosis and treatment in Cameroon? J Acquir Immune Defic Syndr 2011;56(4):e115—7, http://dx.doi.org/10.1097/QAI.0b013e31820a9d1d.

[8] Nkenfou NC, Kembou JE, Temgoua E, Djikeng A, Mekue ML, Ndzie NE, et al. Evaluation of OraQuick® HIV-1/2 as oral rapid test. Afr J Infect Dis 2013;7:27—30.

[9] StataCorp. Stata statistical software: release 13. College Station, TX: StataCorp LP; 2013.

[10] UNAIDS/WHO Recommendations. The importance of simple/rapid assays in HIV testing. Wkly Epidemiol Rec 1998;73:321—8.

[11] Delaney KP, Branson BM, Uniyal A, Kerndt PR, Keenan PA, Jafa K, et al. Performance of an oral fluid rapid HIV-1/2 test: experience from four CDC studies. AIDS 2006;20:1655—60.

[12] HIV Sequence Compendium LANL (2010) www.hiv.lanl.gov/content/Sequence/HIV/COMPENDIUM/2010/plvprot.pdf

[13] Bhore AV, Sastry J, Patke D, Gupte N, Bulakh PM, Lele S, et al. Sensitivity and specificity of rapid HIV testing of pregnant women in India. Int J STD AIDS 2003;14:37—41.

[14] Stekler J, Wood RW, Swenson PD, Golden M. Negative rapid HIV antibody testing during early HIV infection. Ann Intern Med 2007;147:147—8.