

Full Length Research Paper

HIV counseling and testing among men in the University of Ghana: Implications for gender-based HIV and AIDS prevention interventions

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HIV counseling and testing (CT) is one of the key strategies in the prevention and control of HIV and AIDS in Ghana. Although condoms remain a significant tool in the prevention of sexual transmission of HIV, they are often not used consistently or correctly due to some patriarchal beliefs resulting from the typical male roles that call for men and boys to be tough, aggressive, sexually dominant, and risk taking. What is more, the utilization of CT services among men is generally low. We therefore conducted a quantitative study of 600 men (median age = 22 years) to determine HIV counseling and testing among men in the University of Ghana. Overall, CT use among men was 19%. Of those who used CT, 84% did so voluntarily. The major barriers to CT use among men were due to 'non regular use of a condom', 'don't want to know', and 'fear of receiving an HIV positive test result'. Results however revealed that age of respondents had a significant influence on HIV counseling and testing among men ($p < 0.05$).

Key words: Human immunodeficiency virus and acquired immunodeficiency syndrome, Human immunodeficiency virus counseling and testing, voluntary human immunodeficiency virus counseling and testing, University of Ghana, men.

INTRODUCTION

Almost 30 million people are estimated to be living with HIV and AIDS in Sub-Saharan Africa (Fiaveh, 2011a; GAC, 2010; NACP, 2010). The HIV and AIDS scenario in Ghana presents an increasing trend in the spread of the disease. This is evident in the Ghana Demographic Health Survey report which states that the national prevalence rate increased from 1.7 in 2008 to 1.9% in 2009 (GAC, 2010; NACP, 2010). The potential of reducing the burden of HIV and AIDS in Ghana is undermined by the low (21% of women and 14% of men) patronage of HIV counseling and testing (GDHS, 2010; GSS, 2008). Even among those who use HIV counseling and testing (CT), only a smaller number (17% of women and 12% of men) returned for their result and many who

test HIV-positive do not disclose test result to their partners. In the 12 months preceding this study, only 7% of women and 4% of men received the result of the last HIV test taken (GDHS, 2010). This study, therefore, investigated HIV counseling and testing among men in the University of Ghana. Specifically, the study sought to find out knowledge of HIV and AIDS, perceived risk of HIV infection, prevalence of HIV counseling, and factors influencing HIV counseling and testing among men in the University of Ghana.

The HIV rates among members of the University of Ghana community are unknown. However, since the majority of members of this segment of the population are youthful, they belong to that section of the Ghanaian population which is the vulnerability group (NACP, 2009; WHO, 2008). Majority (nearly 90%) of infections in Ghana is within the age group of 15 to 49 years (NACP, 2009a). Similarly, according to WHO report on the Global trend of the HIV and AIDS epidemic, more than 90% of HIV

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infections is among adults aged 15 to 49 years, which coincides with the age group of the majority of the student population (UG, 2009b). Since this is the most economically productive segment of the population that is being trained to steer the country towards its growth and development, illness and death in this age group constitute an immense economic burden. The result is a huge loss of productive years and investment in education and training (Oti-Boateng, 2006). The University of Ghana is concerned with the threat posed by HIV and AIDS to most of its clients (that is students) who are between the ages of 20 and 30 years, within which most HIV infections occur (UG, 2009b). The myth surrounding HIV counseling and testing among men makes it not only difficult for women as the most vulnerable group for HIV infection, but even for the government of Ghana to shoulder the burden surrounding the intervention and treatment of HIV and AIDS related diseases.

Women are more likely to go for an HIV test compared with men. This means gender issues are basic to confronting the HIV and AIDS epidemic in Ghana. Different views have been expressed on the need for HIV counseling and testing (CT). On one hand, some argue that knowledge of HIV status influences people to practice safer sex behaviours (Fiaveh, 2011b; MacPhail et al., 2009; Mola et al., 2006; Ntata et al., 2008; Pickering et al., 1993; Zamberia, 2009; Van der Straten et al., 1995). On the other, some think that a positive HIV test result is a death sentence and that many people would rather not know their HIV status (Fiaveh, 2011a; Lekas et al., 2005). To these pundits, people are thus afraid of the use of CT because of a greater level of HIV risk denial (Fiaveh, 2011a; Kellerman et al., 2002). A study in the San Francisco Bay, for instance, revealed that most participants in the survey reported that news of their positive test result and the manner with which the news was given¹ affected their future use of CT (Hult et al., 2009). This means that several factors could serve as obstacles to taking an HIV test, among which factors are confidentiality and fear of receiving an HIV-positive test result (Awad et al., 2004; Fiaveh, 2011a; Nanín et al., 2009).

It is, therefore, crucial to find an effective solution to the spread of HIV and AIDS in Ghana, particularly from a gender perspective. Consequently, this study investigated HIV counseling and testing among men. This is important in the light of the fact that HIV counseling and testing (CT) is one of the key strategies in the prevention and control of HIV and AIDS in Ghana (GAC, 2010).

RESEARCH METHODS

University of Ghana was the site from which the study participants

¹According to some respondents, the news was given as: "I'm sorry, but you tested positive".

were selected. It had a student population of 42,692, representing 58.78% male, 41.22% female and staff strength of about 5004, representing 76.96% male and 23.04% female (UG, 2009a). Reasons for choosing this site were due to increased sexual promiscuity among students on campus (Manuh et al., 2007), low prevalence rate of counseling and testing among students in the University of Ghana (Tagoe and Aggor, 2009; Oti-Boateng, 2006). This is crucial in sustaining prevention efforts targeted particularly at the age groups 15 to 24 and 25 to 49, considering that they hold good prospects for contributing to further decline in HIV prevalence in Ghana² (NACP, 2009; UG, 2009b³).

Design and procedure

The study design was a behavioural-based survey involving men in the University of Ghana. The design provided baseline information on HIV counseling and testing among men in the university. A quantitative approach was adopted because it enabled the researchers identify variables that predicted use of CT among men and measured relationships between some of these variables. Though a different approach could have been useful for the phenomenon under study, most often people tend to adhere to the methodology that is in consonance with their socialized worldview (Glesne and Peshkin, 1992: 9). The study protocol was reviewed by the Noguchi Memorial Institute for Medical Research ((NMIMR-IRB CPN 028/09-10) Appendix 1). A sample of 2% of the male population (for students and staff) of the University of Ghana was taken (Table 1). The sample size calculated was 579 (but approximated to 600). The number of students and staff recruited for interview was done on proportions (thus in ratio of their respective populations), that is 13:2. The total number of students and staff sampled was thus 520 and 80 respectively.

The sampling procedure for this study was stratified simple random sampling technique. The adoption of this technique was largely because it helps to carry out in-depth investigations of specific characteristics (such as residence, social status and beliefs) of particular aspects of a population, while making a general study of different aspects of that population as a whole (Kumekpor, 2002: 149). In order to have large cells for meaningful statistical analysis and discussions, this survey recruited only students in halls of residence. The variables examined as factors influencing HIV counseling and testing were broadly categorized as socio-demographic and behavioural. The socio-demographic variables included age, marital status, education, religion and social status (that is whether a student or a staff). The behavioural variables were also measured on the basis of Knowledge of HIV and AIDS, perceived risk of HIV infection, and prevalence and factors influencing HIV counseling and testing. Close ended questions were used in this study. This was informed by a typical male role of toughness and risk taking (WHO, 2007), especially considering possible exaggeration and overstatement by men about their sexual behaviour. The main dependent variable was HIV counseling and testing among men.

Statistical analyses were done using Statistical Package for the Social Scientist software (SPSS version 16). Appropriate measures of centrality were computed (for example, median age). For comparison of variables, a bivariate analysis (chi square test) was computed and univariate analysis summarized in tables with

²This view was well espoused by Sipa-Adjah Yankey (former Minister of Health, 2009).

³Another reason was due to the response of the university in recognizing the possible threat of HIV and AIDS to its human resource development through, the draft of a Policy Document on HIV/AIDS (by the University of Ghana). Refer to, University of Ghana (UG)(2009b). The University of Ghana Draft HIV/AIDS Policy Document. UG, Legon.

Table 1. Male population (Students and Staff, 2009).

Variable	N
Staff	3851
Students	25095
Total	28946
Staff category	
Senior staff	877
Senior members	819
Junior staff	2155
Total	3851
Hall of residence*	
Graduate Hostel and Legon Annex C	300
Mensah Sarbah	771
Akuafo	976
Legon	1123
Commonwealth	1574
Total	4744

*Excludes Volta hall which is an all female hall.

significance level stated as 'p value'.

RESULTS

Characteristics of survey respondents

Table 2 shows information on the demographic characteristics of respondents. Overall, 600 men were interviewed in this study with two-third of this number being students. About 80% of the respondents had either completed Senior High, Vocational or Technical school education. This was because a large number of the sample comprised of undergraduate students who were in their first and second years. 6% constituted postgraduate students and this reflected the population of male students resident in halls (UG, 2009a). The median age of respondents was 22 years (range 17 to 74) and 75% (N = 600) were between ages 19 to 24 years (62%). This age group coincided with the national and sub-Saharan African HIV and AIDS vulnerability group (Fiaveh, 2011a; NACP, 2009b; Bankole et al., 2009). 90% of respondents were Christians and 9 of 10 men were never married.

Knowledge of HIV and AIDS, and perceived risk of HIV infection

Table 3 shows the knowledge of men about HIV and AIDS and their perceived risk of contracting HIV infection.

Almost all the men in the University of Ghana had heard about HIV and AIDS. Majority of men perceived unprotected sex with an HIV positive partner as the major means of HIV transmission (91%). Others mentioned sharing of sharp objects with an infected person and blood transfusion (74 and 55%, respectively). Only a few men thought they could be infected with HIV through eating and sharing of cooking utensils with an infected person (5.9%). Also, results from this survey show that almost all men believed that HIV and AIDS can be prevented. Majority of these men suggested abstinence (69%), and less than 50% mentioned the use of a condom and having one sexual partner (40 and 35%, respectively) as a means of preventing HIV and AIDS. Two of five men did not believe that they were at any risk of contracting HIV and AIDS. Some men also thought they were at high risk of contracting HIV and AIDS (6%).

The main reasons advanced by those who thought they were not at risk of contracting HIV and AIDS were: 'cannot be infected' (30%), 'trust of a partner' (18%), 'never had sex' (16%), and 'have one sexual partner' (15%).

Prevalence and factors influencing HIV counseling and testing

Table 4 presents data on prevalence of HIV counseling and testing, and factors influencing use of CT among men. Less than 20% of men had ever used CT in the last 12 months preceding this survey. For those who used CT, 83% had their test voluntarily. The reasons they offered regarding their taking an HIV test included the desire to know their HIV status, fear of being infected with HIV, and non regular use of a condom. As regards those who were required to use CT (17%), their reasons were mainly on the grounds of medical examination and coercion by parents. Some men also asserted that they had not used CT because of non regular use of a condom (20%), fear of receiving an HIV positive test result (14%), and their unwillingness to know their HIV status (15%).

Bivariate analysis of characteristics associated with HIV counseling and testing

Tables 5 and 6 present data on the influence of sociodemographic and behavioural variables on CT use of men. Findings revealed that level of education, religion, marital status, and social status had no significant statistical association with men's ever use of CT ($p > 0.05$, each). Data gathered on behavioural factors (ever had sex, ever used a condom, knowledge of HIV and AIDS, and perceived risk of being infected with HIV) also revealed no significant statistical association with men's use of CT ($p > 0.05$, each). Results from the bivariate analysis, however, revealed that age of

Table 2. Background characteristics of respondents (N = 600).

Background characteristics	Frequency	Percent
Age bracket		
19 years or younger	80	13.3
20 to 24 years	369	61.5
25 to 29 years	87	14.5
30 to 34 years	19	3.2
35 to 39 years	16	2.7
40 to 44 years	10	1.7
45 to 49 years	7	1.2
50 years or older	12	2.0
Highest level of education		
Middle/JHS*	10	1.7
SHS/Voc/Tech**	505	84.2
Post SHS/Nursing/Poly***	19	3.2
University	66	11.0
Religious denomination		
Christian	539	89.8
Islam	36	6.0
Traditional	2	0.3
Others****	2	0.3
No religion	21	3.5
Marital status		
Never married	542	90.3
Married/living together	54	9.0
Separated/Divorced	2	0.3
Widowed	2	0.3

*Middle School/Junior High School. **Senior High School/Vocational School/Technical school. ***Post Senior High School/Nursing Training College/Polytechnic education. ****Buddhist, Hindu, and Atheist.

Table 3. Knowledge of HIV and AIDS and perceived chances of HIV infection.

Ever heard of HIV and AIDS	Frequency	Percent
Yes	595	99.2
No	5	0.8
^How HIV and AIDS is transmitted		
Unprotected sex with HIV+ person	542	91.1
Infected blood transfusion	327	55.0
Fluid/blood contact with infected person	4	11.8
Mother-to-child	3	8.8
Sharing of sharps objects with infected person	25	73.5
Through eating and sharing cook	2	5.9
HIV/AIDS can be prevented		
Yes	593	98.8
No	1	0.2
Do not know	6	1
^How to prevent HIV/AIDS		
Nothing	1	0.2
Abstain from sex	409	68.7
Use condom	236	39.7

Table 3. Contd.

Have only one sex partner	210	35.3
Perceived risk of HIV infection		
No risk at all	254	43.4
low	183	31.3
Moderate	73	12.5
High	36	6.2
Do not know	39	6.7
Missing	15	2.5
Main reasons for perceived HIV risk		
Has one partner	82	14.9
Have multiple partners	8	1.5
Non regular use of a condom	16	2.9
Abstinence	24	4.4
Always use a condom	21	3.8
Trust partner	96	17.5
Never had sex	89	16.2
Cannot be infected	162	29.5
Do not know	11	2.0
Other*	21	3.8
Missing	50	8.3

^aN ≠ 600 and percentages do not sum to 100 due to multiple responses. * Through barbering shops, sharing of sharp objects, injection, blood donation, etc.

Table 4. Prevalence and factors influencing use of CT among men (N = 600).

HIV counseling and testing in last 12 months	Frequency	Percent
Yes	115	19.3
No	481	80.7
Missing	4	0.7
Voluntarily or required CT		
Voluntary	96	83.5
Required	19	16.5
Reasons for use of CT		
Non regular use of a condom	22	19.1
Fear of being infected with HIV	28	24.3
Know your status (want to)	37	32.2
Parents forced	5	4.3
Medical exams required by an org.	23	20
Reasons for nonuse of CT		
Non regular use of a condom	95	19.8
Fear of receiving HIV positive test result	70	14.6
Fear of being infected with HIV	32	6.7
Do not want to know	71	14.8
Sure of myself	62	12.9
No reason	61	12.7
Do not want to be stigmatized	54	11.2
Never had sex	11	2.3
Do not know	12	2.5

Table 4. Contd.

Other*	13	2.7
Missing	4	0.7

*Always use condom, lack of access to test facility.

Table 5. Sociodemographic factors associated with HIV counseling and testing among men in UG, Ghana (n = 600).

Variable	HIV counseling and testing in the last 12 months			χ^2 (df)	p (value)
	{No. (%)}				
Ages of respondents	Yes	No	Total		
< 20 years	6(5.2)	72(15.0)	78(13.1)	11.197(4)	0.024 [^]
20 to 29 years	95(82.6)	353(73.4)	448(75.2)		
30 to 39 years	5(4.3)	29(6.0)	34(5.7)		
40 to 49 years	6(5.2)	11(2.3)	17(2.9)		
> 49 years	3(2.6)	16(3.3)	19(3.2)		
Highest level of education completed					
Middle/JHS*	5(4.3)	5(1.0)	10(1.7)	6.604 (3)	0.086 ^{^^}
SHS/Voc/tech**	92(80)	410(85.2)	502(84.2)		
Post SHS/Nursing/Poly***	4(3.5)	15(3.1)	19(3.2)		
University	14(12.2)	51(10.6)	65(10.9)		
Religious denomination					
Christian	104(90.4)	431(89.6)	535(89.8)	4.405 (4)	0.354 ^{^^}
Islam	4(3.5)	32(6.7)	36(6.0)		
Traditional	0	2(0.4)	2(0.3)		
No religion	6(5.2)	15(3.1)	21(3.5)		
Other****	1(0.9)	1(0.2)	2(0.3)		
Marital status					
Never married	100 (87.0)	438(91.1)	538 (90.3)	3.387(3)	0.336 ^{^^}
Married/living together	14(12.2)	40(8.3)	54(9.1)		
Separated	1.9	1(0.2)	2(0.3)		
Widowed	0	2(0.4)	2(0.3)		
Social status					
Student	100(87.0)	417(86.7)	517(86.7)	0.006 (1)	0.941 ^{^^}
Staff	15(13.0)	64(13.3)	79(13.3)		

*Middle School/Junior High School. **Senior High School/Vocational School/Technical School. ***Post Senior High School/Nursing Training College/Polytechnic education. ****Buddhist, Hindu, and Atheist. [^]p<0.05 is significant ^{^^}p>0.05 is not significant.

Table 6. Behavioral factors associated with HIV counseling and testing among men in the UG*, Ghana (n = 600).

Variable	HIV counseling and testing in the last 12 months			χ^2 (df)	p (value)
	{No. (%)}				
Ever had sex	Yes	No	Total		
Yes	76(66.1)	282(58.6)	358(60.1)	2.153(1)	0.142 ^{^^}
No	39(33.9)	199(41.4)	238(39.9)		
Ever used a condom					
Yes	63(85.1)	213(78.6)	276(80.0)	1.553(1)	0.213 ^{^^}
No	11(14.9)	58(21.4)	69(20.0)		

Table 6. Contd.

Knowledge of HIV and AIDS					
Yes	114(99.1)	479(99.6)	593(99.5)	0.382(1)	0.537^^
No	1(0.9)	2(0.4)	3(0.5)		
Perceived risk of HIV infection					
	Yes	No	Total		
No risk at all	51 (47.7)	203(42.5)	254(43.4)		
Low	34 (31.8)	149(31.2)	183(31.3)	2.30(5)	0.680^^
Moderate	11(10.3)	62(13.0)	73(12.5)		
High	4(3.7)	32(6.7)	36(6.2)		
Do not know	7(6.5)	32(6.7)	39(6.7)		

*University of Ghana. ^p<0.05 is significant. ^^p>0.05 is not significant.

respondents had a significant influence on men's use of CT ($p<0.05$). This means that the majority of men were likely to take an HIV test as younger persons (20 to 29 years).

DISCUSSION

This study showed that CT use among men is low (<20%). Although we affirm findings from various national surveys that Ghanaians (92 to 98% of men) have knowledge of HIV and AIDS transmission (NACP, 2009b), this did not translate into high CT practice among men ($p>0.05$). Therefore, we cannot assume that the more knowledgeable one is about HIV and AIDS, the more likely it is that one would avail oneself to CT. However, our study revealed that men's age has an influence on their willingness to take an HIV test. Thus, the younger the age, the more likely it is that men would use CT, although this conclusion could stem from the fact that the majority of respondents were young people (students). Again, contrary to the findings of other studies (Venkatesh et al., 2009), we assert from this study that marital status has no significant influence on men's use of CT ($p>0.05$). Findings of this study revealed that the major barriers to CT use among men were due to 'non regular use of a condom', 'fear of receiving an HIV positive test result', 'do not want to know', and 'sure of myself'⁴. In spite of men's risky sexual behaviours and/or their unwillingness to know their HIV status, their perceived risk of HIV infection, for them, was 'no risk at all'. This means men's denial about their risk of contracting HIV and AIDS is very high. Nonetheless, we acknowledge the possibility of other factors ('don't want to know') influencing the fear factor among men regarding accessing HIV counseling and testing.

Our study also showed that some men could not imagine themselves ever being infected with HIV mainly because they had one sexual partner. It is this perception that makes some men believe that once their partner

tested negative for an HIV test it meant they were also HIV negative. Though we acknowledge that one sexual partner is useful in reinforcing the element of trust in any relationship (particularly on the 'be faithful' model of HIV and AIDS prevention), we however argue that one sexual partner does not mean one could not be infected with HIV. Hence, the only surety is to know one's serostatus through an HIV test. More so, studies have shown that there are some possibilities of discordances, where one partner is infected and the other partner, not (Aarnio et al., 2009; WHO, 2008). From this study, the strongest motivation for HIV testing among men was the desire to know one's HIV status (Know Your Status campaign). This means that the role of a 'know your status' campaign (KYS) in reinforcing men's willingness to CT use cannot be underestimated. In this regard, Universities in Ghana should take KYS seriously and expand this through the use of a home based approach (particularly through various halls and hostels on campus). Whereas elsewhere (for example, in Zimbabwe) the motivation for voluntary counseling and testing (VCT) was driven by knowledge and education rather than sexual risk (Sherr et al., 2007), in Ghana (particularly in the University of Ghana) men's unwillingness to seek VCT, in spite of educational knowledge, was due to factors such as risky sexual behavior, the fear of knowing one's HIV status, and one's perceived certainty of not being infected.

Our findings concur with those of Bwambale et al. (2008) who reported that among men in Bukonzo, Uganda, motivation for voluntary counseling and testing was not driven by knowledge on CT. As demonstrated in this study, knowledge on HIV and AIDS is necessary but not sufficient to influence use of CT. Therefore, other interventions including behavioural change communication (BCC) strategies are needed to change societal beliefs about HIV counseling and testing. To this end, as long as men perceive their risk (risk of HIV infection) as 'no risk at all' or 'low risk', prevalence of voluntary use of CT would remain low or negligible among men. What is more, having multiple sexual partners and perception on what constitutes risky behavior in the face of HIV and AIDS may be cultural

⁴ Meaning the respondent is confident of not having the HIV infection

constrained, wherefore men may not perceive a particular sexual behavior as risky. Above all, findings from this study are consistent with other research in sub-Saharan Africa which shows perceived risky sexual behaviour as an important barrier to CT utilization (Wolff et al., 2005).

Conclusion

Findings in this study derive from a quantitative sample of 600 men in the University of Ghana and caution should be taken when generalising beyond this population. As observed earlier, it is possible that, the influence of age on CT use among men may be influenced by students' being the majority in this sample. In this regard, our subsequent study could explore further this relationship (between demographic/behavioural factors and use of CT) by using a multivariate analysis (logistic regression). However, this study demonstrates that as long as men perceive their (risk of contracting HIV) infection as 'no risk at all' or 'low risk', prevalence of voluntary HIV counseling and testing among them would remain low. There is the need for HIV counseling and testing programmes to address CT myths and misconceptions among men, particularly regarding the fear of receiving an HIV positive test result. Among the more promising interventions could be expanding the 'KYS' campaign, and incorporating a hall-based (Hall of residence) approach (home-based approach (Bwambale et al., 2008; Were et al., 2006)) to VCT. Thus, taking CT to the door steps of students and staff on campus could prove very useful in encouraging voluntary counseling and testing.

We however note from our findings that it is possible that for those men who had ever had sex, the non-use of VCT could be as a result of the fear that they could possibly have contracted HIV from a previous unprotected sex and are, therefore, unwilling to face an HIV test from which they could equally possibly receive an HIV positive test result. As a recommendation, HIV counseling should consist in educating men about the fact that HIV infection is still possible even when an individual has one sexual partner. Men should be encouraged to use CT regularly. Universities should also acknowledge, as part of policy direction, the need to strengthen guidance and counseling as a tool for educating men on risky sexual behaviours, such as having multiple sexual partners.

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APPENDIX 1

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH INSTITUTIONAL REVIEW BOARD

(UNIVERSITY OF GHANA)

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P.O. Box LG581
 Legon
 Ghana

My Ref. No: DF.22

16th November, 2009

Your Ref. No:

ETHICAL CLEARANCE

FEDERALWIDE ASSURANCE FWA 00001824

IRB 0001276

NMIMR-IRB CPN 028/09-10

IORG 0000908

On 16th November, 2009, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB), conducted expedited review and approved your approved your protocol titled:

TITLE OF PROTOCOL : **Male Perspective on Condom Use: Context of STI/HIV Prevention in the University of Ghana Community**

PRINCIPAL INVESTIGATOR : **Daniel Yaw Fiaveh**

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 15th November, 2010. You are to submit annual reports for continuing review.

Signature of Chairman: 
 Rev. Dr. Samuel Ayete-Nyampong
 (NMIMR – IRB, Chairman)

cc: Professor Alexander K. Nyarko
 Director, Noguchi Memorial Institute
 for Medical Research, University of Ghana, Legon