INTERNET AND CELL PHONE AS TOOLS TO SUPPORT ANTIRETROVIRAL THERAPY ADHERENCE AMONG HIV INFECTED PATIENTS AGED ABOVE 18 YEARS ATTENDING KENYATTA NATIONAL HOSPITAL

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Internet and cell phone as tools to support antiretroviral therapy adherence

among HIV infected patients aged above 18 years attending Kenyatta

national hospital

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DECLARATION

This thesis is my original work and has not been presented for a degree or any other award in any other University.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

ACASI	Audio Computer Assisted Self Interview
AIDS	Acquired Immune Deficiency Syndrome
ARV	Antiretroviral
ART	Anti-retroviral Therapy
CAK	Communication Authority of Kenya
CD4	Cluster of Differentiation 4
CCC	Comprehensive Care Clinic
CI	Confidence Interval
DOT	Directly observed Therapy
ERC	Ethical Review Committee
ERMIS AFRICA	Environmental Research Mapping Information Systems in Africa
GDP	Gross Domestic Product
GOK	Government of Kenya
HAART	Highly Active Anti-retroviral Therapy
HIV	Human Immunodeficiency Virus
IRIN	Integrated Regional Information Networks
ITROMID	Institute of Tropical Medicine & Infectious Diseases
JKUAT	Jomo Kenyatta University of Agriculture & Technology
KAIS	Kenya AIDS Indicator Survey
KBR	Kenya Business Review
KDHS	Kenya Demographic Health Survey
KEMRI	Kenya Medical Research Institute
KNH	Kenyatta National Hospital
MOH	Ministry of Health
NACC	National AIDS Control Council
NASCOP	National AIDS & STI Control Program

NNRTI	Non-Nucleoside Reverse Transcriptase Inhibitor
NRTI	Nucleoside Analogue Reverse Transcriptase Inhibitor
OR	Odds Ratio
PI	Protease Inhibitor
PMTCT	Prevention of Mother to Child Transmission
SMS	Short Message Service
SPSS	Statistical Package for the Social Sciences
SSC	Scientific Steering Committee
UNAIDS	United Nations Agency for International Development
UNDP	United Nations Development Programme
UNF	United Nation Foundation
UNGASS	United Nations General Assembly Special Session
UNICEF	United Nations International Children's Emergency Fund
VCT	Voluntary Counselling and Testing
VL	Viral Load
WHO	World Health Organization

DEFINITION OF TERMS

Educated- As used in testing association of different parameters with variables refer to one who has attained secondary education and above.

Non-educated- As used in testing association of different parameters with variables refer to those who dropped at pre-primary level and those who did not attend school at all.

Employed- As used in testing association of different parameters with variables refer to one who is on a fixed monthly salary including the civil servants and those employed by private sectors.

Non-employed- As used in testing association of different parameters with variables refer to those not on any fixed monthly salary but those on self employment including those on business and those with no employment at all.

Single- As used in testing association of different parameters with variables refer to one living alone without a spouse either because he/she is not married, have separated/divorced or because he/she is widowed.

Married- As used in testing association of different parameters with variables refer to one who is married and is still living together with the spouse.

Adherence- is defined as a patient's ability to follow a treatment plan, take medications at prescribed times and frequencies, and follow restrictions regarding food and other medications.

Support ARV adherence- as used in this study means to improve ARV adherence through follow up by making calls or texting

ABSTRACT

World Health Organisation has been advocating for increased provision of Antiretroviral Therapy (ART) to lower Human Immunodeficiency Virus (HIV) prevalence. Embracing the advocacy Kenya increased its ART coverage tremendously with adults receiving it increasing from 70.4 % in the year 2009 to 85% in the year 2013. This intervention has however been facing challenge of adherence failure among the HIV infected patients necessitating need for an intervention to support adherence to medication for successful control and prevention of HIV-related mortality. Previous randomized trial in Kenya on tools for improved adherence reported increased self-reported adherence by 12%. Observational survey on accessibility, usage and perceptions of HIV infected patients towards internet and cell phones is still missing. A descriptive cross-sectional study was conducted at Kenyatta Nation Hospital with main objective to assess the accessibility, usage and perceptions of HIV infected patients towards internet and cell phones as tools for supporting adherence to medication. The data was collected using semi-structured questionnaires administered to HIV infected patients on treatment. Data was analysed using Statistical Package for the Social Sciences Version 16.0 for chi-squared test to establish Odds Ratios and 95% Confidence Interval for factors associated with cell phone and internet access and perceptions towards their use as a tools to support ARV adherence. This study was presented to Scientific Steering Committee and Ethical Review Committee at Kenya Medical Research Institute for Scientific and ethical approval respectively. Participants provided their consent by signing an informed consent form prior to their participation in the study. The main findings were 33% of participants with access to internet and 99% with access to cell phone. Majority of those with cell phone access used it for communication (49%) and money transactions (43%) while majority of those with internet access used it for communication via social networks (40%). Nearly all (99%) of the HIV infected clients interviewed supported the idea of cell phone use in improving adherence to their medication. Majority (98%) of the

respondents reported that internet was not a feasible tool in supporting ARV adherence due to its high cost of maintenance and use. The study concluded that there was higher accessibility of the participants to cell phone than internet and the high usage of cell phones for communication through calling and texting, while high usage of internet for communication through social media networks. Cell phone was identified as a feasible tool for supporting adherence to ARV therapy due to its affordability and easy access. The study therefore recommends adoption of cell phone into health care sector to boost medication adherence.

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Adherence is defined as a patient's ability to follow a treatment plan, take medications at prescribed times and frequencies, and follow restrictions regarding food and other medications. Both patients and health care providers face significant challenges with respect to adherence to ART (Orell *et al.*, 2003). Once initiated, HAART (Highly Active Antiretroviral Therapy) is a life-long treatment that consists of multiple medications to be taken two to three times a day with varying dietary instructions. These medications also have side effects, some of which may be temporary while others may be more permanent requiring a change of treatment. Inadequate adherence to treatment is associated with detectable viral loads, declining CD4 counts, disease progression, episodes of opportunistic infections and poorer health outcomes (Gross *et al.*, 2001).

The goal of HAART is to suppress viral load in the blood to undetectable levels (levels that are no longer detectable in routine viral load assays). Adherence to treatment is critical to obtain full benefits of HAART: maximal and durable suppression of viral replication, reduced destruction of CD4 cells, prevention of viral resistance, promotion of immune reconstitution and slowed disease progression (Gross *et al.*, 2001).

Paterson and colleagues found that adherence greater than 95% is needed to achieve virologic success, especially for Protease Inhibitor (PI) containing regimens. As adherence decreased, viral loads increased sharply in a dose response effect. The study showed that 22% patients with adherence of greater than 95%, 61% of patients with adherence between 80–94.9% and 80% of patients with adherence levels of less than 80% demonstrated virological failure ; detectable viral loads (Paterson *et al*., 2000).

Ninety five percent adherence involves taking at least 57 out of 60 tablets. Missing four pills or doses would result in 93% adherence and missing five pills would result in 91% adherence. Unfortunately, non-adherence is common among individuals treated with HAART. Several studies have shown varying levels of adherence: more than 10% of patients report missing one or more medication doses on any given day, and more than 33% report missing doses in the past two to four weeks (Chesney, 2000a). Chesney estimated that the average non-adherence to ARV therapy ranged from 50 to 70 percent among patients in the US (Carter, 2005).

Non-adherence can vary from missing one dose of a medication to missing a single dose of all three or four medications to missing multiple doses or all doses a day or week. Not observing instructions regarding dietary or fluid intake or not taking medications at prescribed time intervals also constitutes non-adherence. As it has been mentioned earlier, very high levels of adherence (near perfect adherence) are required to achieve the full benefits of HAART. Non-adherence can lead to inadequate suppression of viral replication, continued destruction of CD4 cells, progressive decline in immune function and disease progression. Non-adherence is also an important reason for the emergence of viral resistance to one or more antiretroviral medications hence there is need for a quick remedy for this (Chesney, 2000a).

1.1 Statement of the problem

The impact of HIV mortality has been greatest on people in their 20's and 30's which severely distort the shape of the population pyramid in affected societies. Projections indicated that mortality rates would increase by a higher margin by 2025(UN Geneva 2009). United Nations Agency for International Development (UNAIDS) indicated that unless the Acquired Immune Deficiency Syndrome (AIDS) response strategies are put in

place immediately populations in 38 African countries would decrease by 14% by 2025 (UNAIDS, 2004).

Among these AIDS response measures is ART which WHO argues that its provision has great impact on HIV management and prevention. This impact may include ability to prolong life, alleviate fears about HIV, change attitudes to the disease and reduce HIV transmission. Therefore there is need to intensify ART programmes in Kenya for successful control and prevention of HIV related mortality that is affecting our country's economy by a great margin (WHO/UNAIDS/UNICEF, 2007).

One way of intensifying ART programmes is by ensuring consistence follow up of the HIV infected patients to ensure that adherence to their treatment regimens is maintained high for successful immunological response of the body to the drug. However, adherence to such treatment regimens has been an increasing problem.

Earlier studies in Kenya by Lester *et al*., 2010 had proved cell phone communication as a possible intervention to improve adherence to ART programs. However the access to, current usage and perceptions of HIV infected patients regarding internet and cell phones as a means to support ARV adherence has not been assessed.

Therefore this study aimed at determining the access to, use and perceptions regarding cell phones and internet as a means to support ARV adherence among HIV infected patients attending Kenyatta National Hospital (KNH) Comprehensive Care Clinic (CCC).

1.2   Justification for the study

The average HIV prevalence among the general population aged 15-49 was estimated as 7.4% by the Kenya AIDS Indicators Survey (KAIS, 2007) and 6.3% by the Kenya Demographic and Health Survey (KDHS, 2008-09). The same surveys confirmed that women still have a higher prevalence compared to men: women 8.4 percent against 5.4 percent for men (KAIS, 2007) and women 8 percent compared to 4.3 percent for men (KDHS, 2008-09). Hence the need to counter the high prevalence for reduced HIV related mortality rates.

The WHO argued that the provision of ART could reduce AIDS-related deaths and alleviate fears about HIV as quoted in WHO Geneva 2003. Kenya embracing WHO argument increased its ARV coverage tremendously with percentage of adults receiving ART having increased from 55.3 % in the year 2008 to 70.4% in the year 2009 (NACC, 2008). This necessitated intensification of more ART programmes in Kenya for successful control and prevention of HIV-related mortality affecting our country's economy by a great margin.

The ARV scale up and intensification however faces a challenge of maintaining recommended drug adherence at near-perfect levels (>95%), for durable responses and prevention of drug-resistance. Adherence failure may be due to pill burden, dosing schedule, food restrictions, and side effects (Naar *et al*., 2006) However, forgetting is the most commonly cited reason for missing doses (Chesney *et al*., 2000b) A range of strategies to improve adherence to ART have been shown to be helpful for people living with HIV/AIDS, including directly observed therapy, reminder devices and counseling but many of these strategies are expensive, time consuming, and potentially intrusive (Purdy *et al*., 2008).

With over 64% mobile phone penetration rate and sharp concentrations of 70% in urban centers of high HIV prevalence (Lester, 2008 and CAK, 2011) cell phones have become a common gadgets of communication among most Kenyans, including those who are economically disadvantaged (Lenhart *et al*., 2010). This low-cost, convenient technology has provided benefit in a variety of health care settings and has been shown to be an effective tool for behaviour change (Wei *et al*., 2011). Evidence suggests that text messaging interventions may increase medication adherence among children and adolescents living with other chronic diseases such as asthma and diabetes (Miloh *et al*., 2009). Several studies have used both daily and weekly unidirectional, standardized SMS medication reminders for HIV-positive individuals in low-resource settings, but no published data have evaluated use of cell phone calls among people living with HIV/AIDS in Kenya.

In particular, mobile phones are well suited as a vehicle for ecological momentary interventions; that is, mobile technology can provide treatment to patients in real time and in their natural environments (Heron *et al*., 2010). The purpose of this cross sectional study was therefore to assess the access to, use and perceptions regarding cell phones calls and internet as a means to support ARV adherence among HIV infected patients.

The data generated in this study has provided information that should improve efficiency of serving HIV infected Patients more efficiently and with greater support on their adherence to the medication by maintaining constant follow up. Findings are of benefit to NASCOP, NACC, Communication Council of Kenya and other organizations in charge of HIV/AIDS Management and Communication services in country. The study has also given insight into the possibility of using mobile phone to support ARV adherence among the HIV infected patients.

1.3   Research Questions

i. What is the accessibility of HIV infected patients to internet and cell phones?

ii. For what purpose are the HIV infected patients currently using their cell phones and internet?

iii. What are the perceptions of HIV infected patients regarding use of cell phone and internet as a means to support antiretroviral medication adherence?

1.4   Objectives

1.4.1 General Objective

To determine access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence among HIV infected patients aged above 18 years in Kenyatta National Hospital (KNH).

1.4.2 Specific Objectives

i. To determine the accessibility of HIV infected patients in KNH to internet and cell phones.

ii. To determine the purpose for which the HIV infected patients in KNH are currently using cell phones and internet.

iii. To determine the perceptions of HIV infected patients in KNH regarding use of cell phone and internet as a means to support antiretroviral medication adherence.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

Adherence to antiretroviral therapy (ART) is well recognized to be an essential component of individual and programmatic treatment success. Higher levels of adherence are associated with improved virological and clinical outcome (Paterson *et al.*, 2000; Orell *et al.*, 2003). Near perfect pill taking (values exceeding 95%) are desirable in order to maximize the benefits of ART (Paterson *et al.*, 2000; Gross *et al.*, 2001). This means taking the correct dose of drugs at the right times and observing any dietary restrictions to counter the development of viral resistance that results to earlier treatment failure (Paterson *et al.,* 2000; Carter, 2005).

Missing even only one tablet in a week translates to only 92.8 % adherence (MOH, 2004). A person who takes ARVs erratically will receive only marginal benefit, but will suffer similar side effect and will potentially limit their future treatment options. It is important that all patients can demonstrate an understanding of this before starting treatment. A patient who stops taking ARV entirely will rapidly lose any benefit they may have received in terms of increased immunity as the virus flourishes and CD4+ cells are destroyed. Patients must therefore be made aware that ARV treatment is a lifelong treatment (MOH, 2004).

Educating a patient effectively and assessing their understanding can be time consuming and labour intensive, but it is never time wasted. Simply giving a prescription at the first visit without sufficient adherence counseling is clinically negligent, but unfortunately this is a common practice (MOH, 2004). Antiretroviral therapy providers that do not seriously address the complex issue of adherence will fail in their objective of helping their patient. At the public level this may cause the development of multi drug resistant

strains within the population they serve and which would have direct public health implications. Adherence is therefore central to the success of ART (MOH, 2005).

Non-adherence to ART might involve a person missing one dose of a given drug, missing a dose of all the three drugs, missing multiple doses, not observing the time intervals, not observing the dietary restrictions, not taking the correct dose of any drug (KITSO Manual, 2000; Cater, 2005). Non-adherence can lead to poor clinical, immunological and virological outcomes. At an individual level the consequences of non –adherence include: incomplete viral suppression, continued destruction of the immune system and decrease of CD4+ cell count, progression of disease, emergence of resistant viral strains and limited future therapeutic option and higher cost for individual treatment which translates to higher program cost (MOH, 2005).

Proper follow up of patients after the initiation of and during ART is important for the success of adherence. Strategies such as mobile phone/internet communications should provide basic information about HIV and its manifestations, the benefits and side effects of ARV medications, how the medications should be taken and the importance of not missing any doses and a reminder for taking the drugs. Adherence assessment should be done via call and have one visit the hospital when need be to save on time and transport costs.

2. 2 Highly Active –Antiretroviral Therapy (HAART)

Currently most effort is focused on reducing immediate risk by bringing about behavior change. But behavior change has been frustratingly difficult to achieve and sustain because the risks related to HIV and AIDS exposure are not always easy to control. In the past, it has been argued that in resource poor settings, either prevention or treatment must be prioritized. Prevention programmes have been funded at the expense of treatment programmes simply because prevention programmes are generally cheaper

(UNAIDS/WHO, 2004). It is now clear that prevention, care, support and treatment of people affected by HIV and AIDS are mutually reinforcing elements of an effective response (Farmer *et al.,* 2001*;* Piot and Coll-Seck, 2001, UNAIDS/WHO, 2004).

Incorporating AIDS treatment into the established preventive measures only serves to fortify them. It must be acknowledged that ART though important, is only part of comprehensive treatment programme for HIV disease that includes Voluntary Counseling & Testing (VCT), prevention and treatment of opportunistic infections and proper diet.

They are essential for the success of therapy because they prevent re-infection and reduce the transmission between discordant partners. This is because, even with ART, low levels of viral replication continue at concentration of viral load that is below the limits of detection (undetectable viral load). While the cure for HIV infection does seem far at the present moment, the enormous potential of these drugs to delay disease progression is undoubted.

Treatment and prognosis of HIV and AIDS improved dramatically between 1992 and 1995 with the development of protease inhibitors in 1992 and the subsequent introduction of HAART. It is now agreed that optimal therapy for HIV and AIDS involves the combination of three or more anti-retroviral drugs (Grierson *et al.*, 2000). Anti-retro-viral drugs are broadly classified into the following groups:

i) Nucleoside analogue reverse transcriptase inhibitors (NRTI).

ii) Non-nucleoside reverse transcriptase inhibitors (NNRTI).

iii) Protease Inhibitors (PIs) (Castro, 2005; WHO, 2005)

There is renewed sense of optimism that HIV could be transformed from a rapidly fatal disease to a manageable chronic illness. However, even among those on ARV treatment, drug side effects, co-morbidity, complexity of regimens, life-long pill taking and the quality of life that results from ART use may significantly limit the outcome of ART. Although currently available, ARV drugs are far from ideal, on-going pharmacological research may in future produce drugs that are less costly, easier to administer and fewer adverse effects and or resistance. Access to ARV drugs can motivate individuals to be tested for HIV and help to break the barriers of isolation and despair (Piot and Coll-Seck, 2001).

Over the last few years the issue of making AIDS drugs more readily available to people in poor countries has received more attention from treatment advocates, policy makers, heads of states and the media. Faced with growing pressure for expanded access and the threat of competition from generic manufacturers several pharmaceutical companies have lowered the price of their brands of Anti-retroviral drugs.

2.3 Goals of Antiretroviral Therapy

From patients' point of view, the primary goal of therapy is improvement of quality of life consequent to the reduction in morbidity, a result of treatment induced immune recovery. The goals of therapy can therefore be summarized as follows: improvement of the patient's quality of life, reduction of HIV related morbidity and mortality, restoration and or preservation of immunologic function and maximal and durable suppression of the viral replication (MOH, 2005).

Patients' follow up and education for long term adherence to treatment associated with treatment success should cover (i) why lifelong continuous treatment is necessary and the expected benefits of treatment (ii) adherence and its relation to treatment outcome (iii) drug resistance (iv) need to avoid non prescribed drugs including herbal medication

10

whose interaction with ARV drugs are unidentified or undesirable (MOH, 2005). Health providers should be able to: follow up and monitor patients to ensure long-term adherence to treatment; use drugs rationally allowing for future treatment options; manage complications of treatment and be able to change or discontinue treatment (MOH, 2005).

2 .4 HIV and AIDS Treatment and Adherence in the World

One who is infected with HIV is likely to become sick with AIDS within 1-10 years, but if treated with ARV medication their life can be prolonged (UNAIDS/WHO, 2006, 2007). As of December 2006, an estimated 7.1 million people living with HIV in low and middle-income countries urgently needed ARV medication. Of these only 2.015 million –barely one in four-were accessing the drugs (UNAIDS/WHO, 2006). Though shockingly small, this figure represents a great advance since 2003, when only 400,000 were receiving treatment (UNAIDS/WHO, 2006, 2007).

Since the turn of the century the international HIV and AIDS community have scaled up their commitment to universal access to HIV treatment. Compared to a decade ago, when less than half a million people living in low- and middle-income countries were receiving treatment, HIV treatment access has improved dramatically; By December 2012, an estimated 9.7 million people, living in low- and middle-income countries with HIV, in need of treatment were receiving it (UNAIDS, 2012). This represented 65 percent of the 2011 target of getting 15 million people on treatment by 2015 (WHO, 2013).

The first case of AIDS was recorded in Brazil in 1982, and whilst many countries have struggled to curb the spread of HIV and to care for those with AIDS, Brazil's response has been seen as a success story. Working alongside civil society groups, the Brazilian government has made aggressive efforts to minimise the impact of the HIV epidemic.

Since 1996, Brazil treatment effort has helped the country to prevent more than 60, 000 new cases of AIDS and about 100,000 HIV related death over seven years representing about 50 % mortality (WHO, 2005). In 1997, an estimated 35,900 people were receiving treatment in Brazil. This increased to 55,600 in 1998; 105,000 in 2001; 140,000 in June 2004 and 183,000 in December 2005(WHO, 2006).

In 2002, half of all people in the world on antiretroviral treatment (ART) were in Brazil. At the end of 2006, around 180,000 were getting drugs, out of an estimated 210,000 in need. Brazil is a particular success story and has the most advanced national HAART treatment programme in the developing world according to a 3 by 5 initiative statement. It has nationwide access to antiretroviral drugs (UNAIDS/WHO, 2006, 2007).A study on antiretroviral therapy adherence in Brazil revealed that adherence prevalence was 75% (95% confidence interval 73.08-76.95). The factors that influenced non adherence were: missed appointments, more complex regimes, a large number of pills (pills burden) and level of education (Nemes *et al.*, 2004).

The country's commitment to treatment access has continued ever since, achieving universal access status in 2011 with more than 80 percent of people in need of treatment on treatment (WHO, 2013). By 2011, HIV prevalence in the population aged 15 to 49 was 0.3 percent. By the end of the year it was estimated that 490,000 Brazilians were living with HIV (UNAIDS, 2012a) and around 15,000 deaths from AIDS-related illnesses were recorded in 2011(UNAIDS, 2012b)

2.5 HIV and AIDS treatment and Adherence in Africa

At the end of 2011 only 9.7 million people in low and middle-income countries were receiving ARV medication. This was just 65% of the 2011 target of getting 15 million people on treatment by 2015. For the first time, in 2011, over half of all sub-Saharan Africans in need of ART were receiving it (56 percent) (UNAIDS, 2012c). In 2012, this

increased to 68 percent (UNAIDS, 2013). It is widely acknowledged that increasing access to ART will dramatically decrease the impact of HIV in this region (Thirumurthy *et al*, 2012).

Botswana has been hard hit by HIV and AIDS. There were estimated 270,000 people living with HIV in Botswana at the end of 2005 (UNAIDS/WHO, 2006a). This gave Botswana a prevalence rate of 24.1% the second highest in the world. At the end of 2006 around 84,000 people were receiving ARV treatment, which was more than 95% of those in need. Botswana exceeded not only its 3 by 5 target of 30,000 by the end of 2005,but also the government's own target of 55,000 (UNAIDS/WHO, 2006,2007). A study in Botswana showed ART adherence rate of 77% (95% confidence interval 73.1-80.89), which is comparable to that of developed countries (Kgatlwane *et al*., 2005).

By 2011, there were an estimated 300,000 adults living with HIV – or one quarter of the population aged 15 and over. Considering Botswana's population is only 2.1 million, the epidemic has reached disturbing proportions. The country has an estimated adult HIV prevalence among 15-49 year olds of 23 percent, the second highest in the world after Swaziland (UNAIDS, 2012b).

It is clear, however, that the national response to the epidemic is now bringing about positive results. Variations in Botswana's life expectancy is a good indicator of this; after dropping from 64 years in 1990 to 49 years in 2002, life expectancy rose to 53 years in 2012 (WOLRD BANK, 2013). This rise can be attributed, in part, to the delivery of free HIV treatment (antiretroviral drugs) in 2001. The decision to provide antiretroviral treatment free through the public health service transformed treatment access from being only available to low numbers of people that could afford to buy their treatment, to being accessed by more than 95 percent of people in need (UNAIDS, 2012a).

Botswana has demonstrated that scaling up access to treatment is in the national interest. Now, however, they must commit to lowering new infections. Whilst new annual HIV infections have declined by 71 percent between 2001 and 2011, key issues are undermining present HIV prevention efforts; as a result, the number of new HIV infections reported per year has barely declined in recent years (UNAIDS, 2012 a) Currently, new annual infections are estimated at 9,000 cases (UNAIDS, 2012b).

At the end of 2005, there were one million people living with HIV in Uganda, according to UNAIDS data. The country's adult HIV prevalence fell from around 15% in the early 1990s to around 6.7% at the end of 2005 (UNAIDS/WHO, 2005). Uganda ran one of the first pilot ARV programmes in Africa. It begun in 1998 and aimed to see how an ARV programme could be set up and run in resource poor country. The 399 patients involved were responsible for paying for their treatment and bought their drugs at negotiated reduced prices. At the end of the two-year pilot, patients reported good adherence to treatment and virological and immunological response to ART were similar to those found in western countries (Byakika *et al*., 2005; UNAIDS/WHO, 2005). Uganda exceeded a government target of 60,000 treatments by the end of 2005. The number had risen to 96,000 by the end of 2006, which was around 41% of those in need (UNAIDS/WHO, 2006b).

By 2012, 7.2 percent of Uganda's population were living with HIV (UNAIDS, 2012a). This amounted to an estimated 1.4 million people, which includes 190,000 children (UNAIDS, 2012b). An estimated 62,000 people died from AIDS in 2011 and 1.1 million children orphaned by Uganda's devastating epidemic (UNAIDS, 2012a).

HIV prevalence has been rising since its lowest rate of 6.4 percent in 2006. New infections are diagnosed in 150,000 people a year, of who 20,600 are children (UNAIDS, 2012a). Despite this, the 2012 life expectancy of 55 years is nine years

higher than the expectancy in 2000, likely to be a result of greater access to treatment for people living with HIV (HDR, 2013).

Malawi has an adult HIV prevalence rate of 14.1%, which translates to 940,000 people infected. As of June 2004, only 3,760 people were reported to be receiving the drugs (UNAIDS/WHO, 2004). The government later set a target of 50,000 people on treatment by the end of 2005, which was less than the 3 by 5 goal of 65,000. Having missed both of these targets (only reaching 33,000) by the end of 2005, Malawi set another goal of

80,000 by June 2006. (UNAIDS/WHO, 2006b). As of 2011 an estimated 910,000 people were still living with HIV (UNAIDS, 2012/ UNDP, 2011) making AIDS the leading cause of death amongst adults in Malawi and a major factor in the country's low life expectancy of just 54.8 years (UNDP 2013).

The Malawian government has mounted an impressive response to the HIV/AIDS epidemic in recent years. This has been reflected by a steady decline in HIV prevalence; from 14 percent in 2003 to 10 percent in 2011, and new annual HIV infections; from 100,000 new infections in 2003 to 46,000 in 2011 (UNAIDS, 2012b). The government and international donors have both made commendable efforts to increase access to treatment and to improve prevention initiatives. But factors such as the scale of the epidemic and the shortage of human and financial resources available have hindered greater progress.

South Africa has had the biggest and most high profile HIV epidemic in the world. Data from the UNAIDS/WHO, 2006 report indicated that 5.5 million people were living with HIV at the end of 2005, giving an adult prevalence rate of 18.8%. This means that South Africa had a high HIV prevalence than any other country in the world. (UNAIDS/WHO, 2006a, 2007).In December 2004, the WHO estimated that 42,000-67,000 South Africans were receiving treatment. This figure rose to 178,000-235,000 by the end of 2005, 21%

of the 983,000 people in need. This means that, despite being Africa's richest country, South Africa fell along way short of its 3 by 5 target. At the end of 2006 the number receiving treatment had grown to 325,000 or 33% of those in need, which is slightly above the average for Sub-Saharan Africa (UNAIDS/WHO, 2006a, 2007).

In 2012, an estimated 6.1 million people were living with HIV, with 240,000 South Africans dying from AIDS-related illnesses (UNAIDS, 2013). Their antiretroviral treatment rollout programme has been the largest in the world. Life expectancy has also increased by 5 years since the height of the epidemic (Mayosi *et al.,* 2012). Moreover, these efforts have been largely financed from its own domestic resources. The country now invests more than $1 billion annually to run its HIV and AIDS programmes (Maurice, 2014). However, HIV prevalence remains high (17.9 percent) among the general population, although it varies markedly between regions (UNAIDS, 2013). For example, HIV prevalence is almost 40 percent Kwazulu Natal compared with 18 percent in Northern Cape and Western Cape (UNGASS, 2012).

2.6 HIV/AIDS status and Treatment in Kenya

Kenya has the fourth-largest HIV epidemic in the world. In 2012, an estimated 1.6 million people were living with HIV, and roughly 57,000 people died from AIDS-related illnesses (UNAIDS, 2013). Moreover, there are now 1.1 million orphans to the epidemic (USAID, 2013).

The first case of HIV in Kenya was detected in 1984, and by the mid 1990s it was one of the major causes of mortality in the country putting huge demands on the healthcare system as well as the economy. HIV prevalence peaked at 10.5 percent in 1996. By 2012, this had fallen to 6.1 percent due mainly to the rapid scaling up of antiretroviral treatment (UNGASS, 2014).

In 2003, only 6,000 people living with HIV were accessing ART, by 2013 this had increased to 656,000. Since 2008, the expansion of antiretroviral treatment (ART) services throughout the healthcare system has increased the number of adults on treatment from 64 percent to 80 percent (universal coverage) as of 2013(UNGASS, 2014).

As in many other countries, the proportion of children receiving ART is significantly lower. However, the scaling up of paediatric ART has increased coverage from 16 percent to 43 percent in the period 2008-13. These coverage figures are based on the 2009 WHO guidelines. The adoption of 2013 WHO guidelines is likely to reduce ART coverage as more people become eligible for it (UNGASS, 2014).

In Kenya, up to 60 percent of people with tuberculosis (TB) are co-infected with HIV. Antiretroviral treatment for co-infected individuals has been found to improve patient survival if administered immediately after TB treatment (Abdool et al., 2010). WHO recommends antiretroviral therapy for all HIV and TB co-infected patients, whatever the stage of HIV progression. However, in Kenya, facilities where dual treatment is available are limited and many of those who require antiretroviral drugs (ARVs) as well as TB treatment are not receiving it (IRIN, 2010).

Adequate nutrition for people living with HIV is essential. Yet, as poverty levels are high in Kenya and food shortages frequent, people living with HIV are often unable to eat a healthy, balanced diet (IRIN, 2009). Evidence shows that malnourished people are less likely to benefit from antiretroviral treatment and are at a higher risk of quicker progression to AIDS. In addition, taking treatment without food can be very painful. Obtaining antiretroviral medication for people leading nomadic lifestyles can also be difficult. One report explains how a Maasai family were unable to obtain antiretroviral

drugs for their two HIV-infected children, as they had to keep moving with their livestock (PlusNews, 2008).

Many HIV-positive pregnant women do not receive all the medications and treatment services they need to stay healthy and to prevent passing the virus to their children, due to: lack of access to health information, high rates of home births, distance to treatment facilities or lack of access to follow-up care. Without the complete package of health care services, many women are still passing the HIV virus to their children. Therefore there is need to overcome these obstacles using the growing technologies like mobile phones and internet to protect these children and end paediatric AIDS.

2.7 Internet penetration in the world and its use in HIV/AIDS prevention

Over the past few decades the use of the Internet has virtually revolutionized how individuals seek health care related information and connect with those around them. It is estimated that at least 130 million U.S. households currently have Internet access and that these numbers will continue to grow as new programs are implemented to expand access to disenfranchised populations (Bull *et al.,* 2007).

The use of the Internet has affected all areas of life including that of health related behaviors. For example, in 1999, it was estimated that nearly 30 million people sought out health related information using the Internet. 30% of all searches conducted on the National Medical Library's MEDLINE system were consumers of health care related information. These health seeking behaviors have been found to benefit patients suffering from illnesses such as cancer, cardiovascular disease, diabetes, and rheumatoid arthritis by increasing patient levels of knowledge about their conditions and treatment options (Kalichman *et al.*, 2002a).

Along with these positive shifts, increased use of the Internet has also witnessed a growing number of individuals seeking sexual partners through the Internet. While seeking sexual partners by using the Internet is not a public health risk, a growing body of literature has provided evidence that Internet initiated sexual encounters often include high risk sexual behaviors that increase risks for contraction and transmission of HIV and other sexually transmitted diseases. This growing body of evidence has serious implications for the development and implementation of HIV prevention outreach efforts by way of internet (Kalichman *et al.,* 2002a).

2.8 Cell phone penetration and its use in HIV programs in the World

Adherence to antiretroviral treatment (ART) is critical not only to promote the health of the infected individual but also to prevent the spread of HIV, as transmission is less likely when HIV viral load (VL) is suppressed (Cohen *et al*., 2011). The high rates of non-adherence in People Living with HIV especially the adolescents and young adults (Belzer, 2008) present a critical challenge to health care providers and to efforts highlighted in the National HIV/AIDS Strategy for the United States (WHO, 2010).

Cell phones are a convenient and culturally relevant mechanism for intervention delivery, as younger adults and socioeconomically disadvantaged populations have been identified as having high rates of cell phone use (Fjeldsoe *et al*., 2009). Text message reminders (via mobile phones) and cell phone adherence interventions have shown some success in HIV-infected adults (Lewis *et al*., 2010). A pilot intervention using personalized, interactive, daily text messages in twenty-five 14-to-29 year olds with adherence under 90 % demonstrated significant improvements in self-reported adherence at the conclusion of their 24 week intervention but lacked the power to demonstrate improved Viral Load (Dowshen *et al*., 2012). A multi-site network trial for African adults found that weekly telephone support calls by trained nurses improved

adherence; although adherence prior to the study was extremely high in both the control and adherence groups (Reynolds *et al.*, 2008).

Most cross-sectional studies of ART adherence have focused on social-cognitive predictors such as low self-efficacy for taking medications, depression, coping style, and social support (Comulada *et al.*, 2003, Macdonell *et al.*, 2010, Murphy *et al.*, 2003). Yet, when researchers ask young adults why they miss medications, the three most common barriers endorsed by the young adults living with HIV are forgetting, not having medication with them, or changes in their daily routine. A recent multi-site study reported that for 73 % of 498 non-adherent youth forgetting was the primary reason for non-adherence (MacDonell *et al.*, 2013). Thus, youth friendly interventions aimed at addressing these commonly cited barriers to adherence are needed.

There is limited literature on adherence interventions targeting HIV-infected people and literature on adherence with other chronic health conditions indicates only minimal improvements with educational and behavioral interventions (Belzer, 2008). Gaur et al. (2010) conducted a pilot study of twenty youth non-adherent to ARVs who were provided a 12 week intervention of tapered directly observed therapy (DOT). While his study found reduced VL at the end of the intervention period, adherence waned 12 weeks post intervention. Greater baseline depressive symptoms, global beliefs about medicine, and viewing HIV as a potential threat predicted better DOT adherence (Gaur *et al.*, 2010, Garvie *et al.*, 2011).

People living with HIV especially the young adults are a highly stressed and marginalized population. One concern has been that consistent cell-phone support would be difficult in a population where cell phone access is variable (e.g., cell phone numbers are disconnected, prepaid phone cards expire). Another concern is that the HIV infected people will not answer the phone for fear of disclosure or because they wish to avoid

discussing HIV-related issues (Marvin *et al*., 2014). In order to test feasibility, a small pilot study was undertaken with eight youth non-adherent to ART medications who received a tapered schedule of daily cell phone reminder calls for 12 weeks. This study demonstrated intervention acceptance, and improved adherence during the 12 week intervention but waning adherence in the subsequent 12 weeks, suggesting reminders alone were inadequate (Puccio *et al*., 2006). Thus, while intervention delivery format was feasible, young adults may benefit from ongoing supportive communication with a provider (Mallinson *et al*., 2007, Murphy *et al*., 2004).

Studies have shown that social support is a strong predictor of good adherence to ARV medication (Gardenier *et al*.,2010, Murphy et al., 2004, Singh et al., 1999) and retention to HIV care is predicted by clients' perceptions of providers as engaging, validating and partnering with clients in their treatment (Mallinson *et al*., 2007). While the total construct of social support has predicted adherence in these studies, tangible or instrumental support (such as practical assistance) and informational support, along with problem focused coping were specifically found to be predictive of adherence in a study of adults with HIV (Singh *et al*., 1999). More research with mixed population of both young and old is required to validate these earlier findings.

2.9 Mhealth technology in Kenya

MHealth is the use of mobile technology to support health outcomes. The varied definitions and opportunities of mHealth are evolving rapidly, but they all provide a tool to support the goals- improving health outcomes in developing countries.

Mobile technology is a tool with many uses, which can complement or perhaps transform current methods. The explosive growth of mobile phones in the developing world provides new opportunities for the design, management and measurement of health programs. The expanding adoption of mobile phones can facilitate scale up of

mHealth in health programs. Wide adoption also implies that mobile phones are culturally-appropriate technology (Fjeldsoe *et al*., 2009).

Programs in mHealth can leverage the tens of billions of dollars invested in mobile phone markets in developing countries. In this regard, mobile phone companies and consumers have done much of the difficult work for mHealth, providing the necessary infrastructure, adoption, and informal training on popular devices. More advanced mobile devices and programming also offer technological transfer to build local capacity.

This innovative use of mobile phones can give the HIV patients access to information, health advice, visit and medication reminders, and direct communication with community health workers. This increase in access to health information will: allow rapid transfer of laboratory results to peripheral clinics, support care provider training, and improve HIV prevention, early diagnosis, and adherence support (Gardenier *et al*., 2010, Murphy *et al*., 2004, Singh *et al*., 1999).

The Short Message Service (SMS) offer a low-cost, efficient, and relatively unobtrusive method for strengthening information exchange between individuals. Rapid SMS service also assists community health workers in communication with pregnant women to support them through every stage of pregnancy, labor, delivery and postnatal follow-up. Innovative use of mobile phone technology will improve the delivery and uptake of critical medicines and services required to prevent mother-to-child transmission (PMTCT) of HIV.

Kenya mobile penetration increased from 0.2% in 2002 to 78% in 2011 showing a very tremendous growth of mobile technology which should be used to avert the also increasing HIV prevalence by supporting adherence (CAK, 2011).

Mobile Subscription & Penetration trends in Kenya
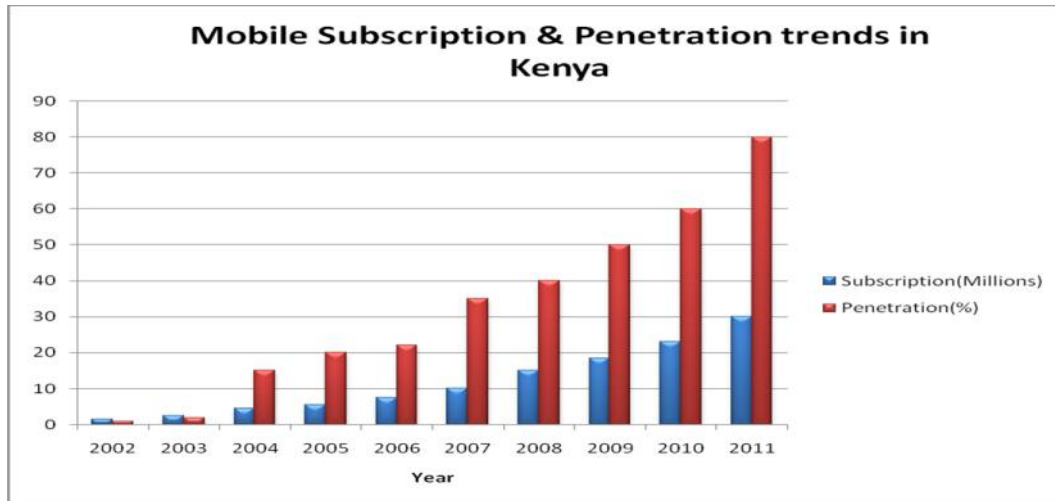
(Source Blycroft estimates 2011)

As at February 2015, Kenya was leading Africa internet access and connectivity with 26.1 million internet users and a penetration rate of 52.3% (KBR, 2015). The country had also 32.2 million cell phone subscribers in total with a 79.2 % penetration rate as at December 2014 (Safaricom Report, 2014).

The number of cell phone users is increasing rapidly mainly because of free market forces (ie, capitalism) and the demand for rapid wireless communications for personal use and to aid multisector economic development (e.g. trade, tourism, and infrastructure). Therefore mobile technology has the potential to be used in health systems worldwide. A wide range of medical services could be improved by providing patient-focused support and management through the health-care system (UNF, 2009).

2.10 Mhealth application research in Kenya

Two clinical trials were conducted recently in Kenya with HIV infected adults to test whether text messaging improved self-reported adherence (Lester *et al*., 2010, Elrches *et al*., 2011).

Lester et al. shown that using cell phone SMS reminders on the HIV infected patients improved absolute adherence rates by 12% and achieved viral load suppression by 9%. It was a randomized trial with an aim to assess whether cell phone communication between health-care workers and patients starting antiretroviral therapy in Kenya improved drug adherence and suppression of plasma HIV-1 RNA load. It was done in three clinics in Kenya where patients received a cell phone short message service (SMS) intervention or standard care (Lester *et al.*, 2010).

Intervention group consisted of HIV infected patients receiving weekly SMS messages from a clinic nurse and were required to respond within 48 hrs. Patients in the control group received standard follow-up without text messages. Primary outcomes were self-reported ART adherence (>95% of prescribed doses in the past 30 days at both 6 and 12 month follow-up visits) and plasma HIV-1 viral RNA load suppression (<400 copies per mL) at 12 months (Lester *et al.*, 2010)

At total of 538 patients participated and allocated to either to the SMS intervention (n=273) or to standard care (n=265). Adherence to ART was reported in 168 of 273 (62%) patients receiving the SMS intervention compared with 132 of 265 (50%) in the control group. Suppressed viral loads were reported in 156 of 273 patients (57%) in the SMS group and 128 of 265 (48%) in the control group. One extra patient would achieve adherence for every nine patients using the SMS service; while one extra person would achieve viral suppression for every 12 treated in the SMS group (Lester *et al.*, 2010).

The findings showed that mobile health innovations could improve HIV treatment outcomes since the HIV infected patients who received the SMS support were more likely to report adherence to ART and were more likely to have their viral load suppressed below detection levels than patients who received the standard care alone (Lester *et al.*, 2010).

The authors concluded that the applicability of this study to other countries and other diseases remained to be assessed; Factors that influenced adherence were common within Africa and other global settings; and that the patient-centered communication effect was universal and could be improved by mobile telecommunication (Lester *et al.*, 2010).

Elrches et al. (2011) carried out a randomized controlled trial to test the efficacy of short message service (SMS) reminders on adherence to ART among patients attending a rural clinic in Kenya. Four hundred and thirty-one adult patients who had initiated ART within 3 months were enrolled and randomly assigned to control group or one of the four intervention groups (Elrches *et al.*, 2011).

Participants in the intervention groups received SMS reminders that were either short or long and sent at a daily or weekly frequency. Adherence was measured using the medication event monitoring system. The primary outcome was whether adherence exceeded 90% during each 12-week period of analysis and the 48-week study period. The secondary outcome was whether there were treatment interruptions lasting at least 48 h (Elrches *et al.*, 2011).

In intention-to-treat analysis, 53% of participants receiving weekly SMS reminders achieved adherence of at least 90% during the 48 weeks of the study, compared with 40% of participants in the control group (P=0.03). Participants in groups receiving weekly reminders were also significantly less likely to experience treatment interruptions exceeding 48 h during the 48-week follow-up period than participants in the control group (81 vs. 90%, P = 0.03). The study results suggested that SMS reminders may be an important tool to achieve optimal treatment response in resource-limited settings (Elrches *et al.*, 2011)

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CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

The study was conducted at Kenyatta National Hospital Comprehensive care clinic where many HIV infected patients attended to receive the ARV medications and any other care they needed. The hospital is the oldest hospital in Kenya, founded in 1901 with a bed capacity of 40 as the Native Civil hospital, renamed the King George VI Hospital in 1952. It was later renamed Kenyatta National Hospital – after Jomo Kenyatta – following independence from the British. It is currently the largest referral and teaching hospital in the country with a capacity of 1,800 beds and over 6,000 staff members. It covers an area of 45.7 hectares harbouring University of Nairobi, Medical School, and several government agencies.

The Comprehensive Care Clinic was following up to 10,000 HIV infected patients by the time of this data collection with daily attendance of around 200 patients. The attendance of the patients was once in three months eliminating the risk of interviewing one patient twice. It also increased the probability of having almost all the patients attending the clinic having a chance of being recruited. The patients attended were of different social status hence eliminating bias and making the study area a good representative of other clinics.

3.2   **Study Design**

A descriptive cross-sectional study was conducted over a period of three months.

3.3 Study population

The study population was the HIV infected patients already on HAART at KNH comprehensive care clinic. This is the population that was thought to have a considerable accessibility to internet and cell phones as a means of communication.

3.4 Sample Size Determination

There being no previous study in resource poor countries on access, usage and perceptions of HIV infected patients regarding use of internet and cell phone in promotion of ARV adherence and HIV transmission reduction a prevalence value of 50% was used to determine the sample size.

$n = Z^2 pq/e^2$ (Fisher Equation)

Where z= standard variate (1.96) which correspond to 95% confidence interval

p= assumed proportion of patients who had positive perceptions towards usage of cell phone to improve ARV adherence

q=1-p

e= acceptable error margin (precision of measurement)

p=0.50

q=0.50

e=0.05

$$n= (1.96^2 \text{ x } 0.50 \text{ x } 0.50) / (0.05)^2$$

= 385

3.5 Sampling Method

The HIV infected patients meeting the inclusion criteria were recruited in the study as they came to the clinic for refills or any other purpose by convenience probability sampling method. Approximately 20 patients were interviewed per day until the required sample size of 385 patients was reached. This recruitment of the HIV patients was done on their exit after they were through with the doctor to avoid interfering with the normal running of the clinic.

3.6 Study Variables

3.6.1 Dependent variables

They included access to, current use and perceptions regarding cell phones and internet as a means to support antiretroviral medication adherence.

3.6.2 Independent variables

They included sex, age, marital status, level of education and occupation.

3.7 Inclusion Criteria

The inclusion criteria comprised of HIV infected patients already on HAART attending clinic in the months of May to July 2011, those aged above18 years and who were ready to consent by thumb printing or by signing.

3.8 Exclusion Criteria

The exclusion criteria comprised of those patients who were HIV infected but not on HAART, those who did not attend the clinic during the study period, those aged below 18 years and those who were not willing to consent either by writing or by thumb printing.

3.9 Data Collection

Semi-structured questionnaires written either in English were used for data collection among sampled participants. Interpretation of questions into simpler language was done wherever necessary. Questionnaires were administered after risks and benefits of the study were well explained to each of the participant.

Research assistants were trained on data collection by the Principal Investigator (PI) to support in administration of the questionnaires. The PI verified the questionnaires to appraise responses to the questions by checking one questionnaire for every five filled. If they were not well responded to, the research assistants and the PI were to re-administer the questionnaires to more patients until the required sample size was attained. Pre-testing of the questionnaires was done on 10 HIV infected patients from Mbagathi District Hospital prior to data collection to ascertain homogeneity and clarity of the questions.

3.10 Data Management and Storage

The PI closely supervised the process of data collection. Supervision involved periodic review of questionnaires for completeness and consistency. The data collected from questionnaires was entered into an SPSS version 16.0 database and analyzed with the same program. Data was kept in the PI's personal computer protected with the aid of a

password. Backs ups were made by keeping the information on CDs, flash disks and Google Doc internet folder.

3.11 Data Analysis

Data from the questionnaire was analyzed using version 16.0 of SPSS. Analysis involved descriptive statistics such as frequencies and proportions for both qualitative and quantitative variables. Tests of association on access, current use and perceptions of HIV infected patients (dependent variables) and the social demographic characteristics (independent variables) were done through chi-squared test to establish Odds Ratios to establish association between them. Level of significance was fixed at 0.05 (p=0.05) with a 95% Confidence interval. Data was presented in tables, pie and bar charts.

Perception of the respondents towards internet use as a tool to support ARV adherence were determined by analysing participants response to the following questions: (1) whether internet was affordable among the HIV patients, (2) the possibility of using internet to support adherence, and (3) whether there was any hindrance towards the use of internet by the HIV patients. "Good perception" was defined as saying "Yes" to questions one and two and saying "No" to question three while "Bad perception" was defined as saying "No" to questions one and two and saying "Yes" to question three.

Perceptions towards cell phone use to support ARV adherence was also determined considering the participants response to the following questions : (1) whether they supported the idea, (2) the affordability of cell phone among the HIV patients, (3) any fear of their confidentiality being infringed in the communication, (4) whether they had any problem with the language used in the communication, (5) whether they anticipated any hindrance to that communication and (6) whether they anticipated to benefit from that intervention. " Good perception" was defined as saying 'Yes' to questions one, two and six and saying 'No' to questions three, four and five, while 'Bad perception' was

defined as saying 'No' to questions one, two and six and saying 'Yes' to questions three, four and five. In summary Good perceptions was defined by 3-YES answers and 3-NO answers while bad perceptions was defined by 3-NO answers and 3-YES answers. The results were analysed to give overall 'Good' and 'Bad' perceptions as a percentage of the total participants.

3.12 Ethical Consideration

Scientific and ethical approvals were obtained from KEMRI's Scientific Steering Committee (SSC No. 1935) and KEMRI National Ethics Review Committee (ERC) (Appendix I). A courtesy call was made to KNH for permission to carry out the research there.

Informed consent was obtained from the participants before administration of the questionnaires. Participants were given an informed consent form (Appendix II and III) to read. An explanation into the study including purpose of the study, contents of the questionnaire was explained by both the PI and the research assistants. This was to make the participants familiarize themselves with the study before appending their signatures to respond to the questionnaire (Appendix IV and V). Voluntary participation in the study and right of withdrawal at any point without any negative consequences was clearly explained to them.

The interviews were conducted in a closed room next to the doctor for easier approach to the patients on their exit. Interviews were one-to-one interaction and no information was given to any other unauthorized person. No names were recorded; only serial numbers were entered into the questionnaire. The filled questionnaires were taken by the PI and kept under lock and key.

3.13 Dissemination of Study Results

The findings of this study were presented in mhealth Conference at AMREF Headquarters in 2011 and are yet to be presented to the National AIDS and STI control program (NASCOP). A copy of the report will be given to Comprehensive Care Centre KNH, Jomo Kenyatta University of Agriculture and Technology, Institute of Tropical Medicine and Infectious Diseases and the Kenya Medical Research Institute (KEMRI). Other AIDS Support Organizations in the country will also get a copy of these findings. Findings have been submitted and published in Bio-Medical Central Journal of Public Health (Appendix VI).

3.14 Limitations of the Study

The study focused only on assessing access to, current use and perceptions regarding cell phones and internet as a means to support antiretroviral medication adherence. It did not determine the perceptions of the care givers themselves on the same idea. Also, the results of the study might only be applicable to the HIV Patients in the urban centres with more access to internet and cell phones and may not be practical in the rural areas with low network coverage and high illiteracy levels.

CHAPTER FOUR:

RESULTS

4.1 Response of the HIV infected patients

A total of 400 HIV infected patients were interviewed but only 385 of them filled their questionnaires adequately. By gender this population consisted of 148 (38%) males and 237 (62%) females aged 19-72 with mean age of 40.3 years. Most of them were married, employed and had attained tertiary education **(Table 4.1).**

Table 4.1 Social demographic characteristics of the respondents

VARIABLE	FREQUENCY	PERCENT
Age category (n=385)		
19-29	43	11.2
30-39	142	36.9
40-49	128	33.2
50-59	57	14.8
60-69	13	3.4
>69years	2	0.5
Gender (n=385)		
Male	149	38.7
Female	236	61.3
Marital status(n=385)		
Married	205	53.2
Single	73	19.0
Widowed	65	16.9

Separated	42	10.9
Main occupation (n=385)		
Student	22	5.7
Employed	167	43.4
Business	115	29.9
Unemployed	81	21.0
Education status (n=385)		
Primary	51	13.2
Secondary	143	37.1
Tertiary	191	49.6

4.2 Access to internet

Only a small proportion (33%) had access to internet **(Table 4.2).**

Table 4.2: Accessibility to internet

Characters Internet access (n=385)	Both	Male	Female
Yes	157(32.5)	77(48.7)	80(51.3)
No	343(67.4)	117(34.1)	226(65.9)

4.2.1 Point of internet access

Greater proportion of those using internet accessed it from a cyber cafe with the least proportion accessing it from their laptops **(Figure 4.1).**
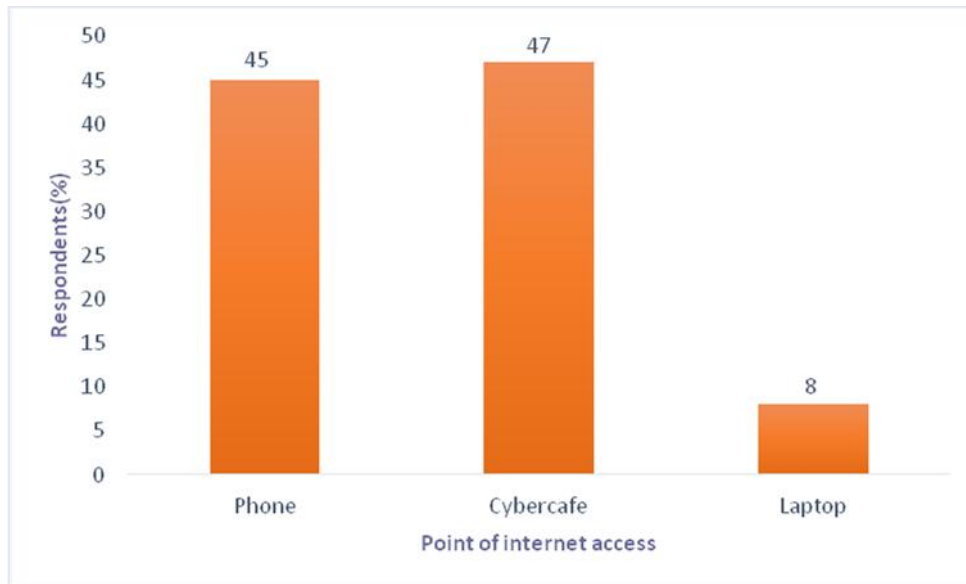
Figure 4.1: Point of internet access

4.2.2 Relationship between Internet access and socio demographic characteristics

Internet access was significant to the men who were singles aged between 19-29 years with tertiary education **(Table 4.3).**

Table 4.3:Internet access in relation to variables

Variable	Access (%)	No Access (%)	p-value
Gender			
Male	40.3	59.7	**P=0.01**
Female	27.7	72.3	
Marital status			**P<0.0001**
Married	31.2	68.8	
Single	64.4	35.6	
Windowed	12.5	87.5	
Separated	14.3	85.7	
Age category			**P<0.0001**
19-28	62.8	37.2	
29-38	40.1	59.9	
39-48	27.3	72.7	
49-58	8.9	91.1	
59-68	7.7	92.3	
Above 68 yrs	0	100	
Occupation			**P<0.0001**
Student	95.5	4.5	
Employed	55.7	44.3	
Business	7.0	93.0	
Unemployed	3.8	96.2	
Education level			**P<0.0001**
Primary	0	100	
Secondary	4.2	95.8	
Tertiary	62.3	37.7	

4.2.3 Current use of internet

Internet was commonly used for emailing **(Figure 4.2).**
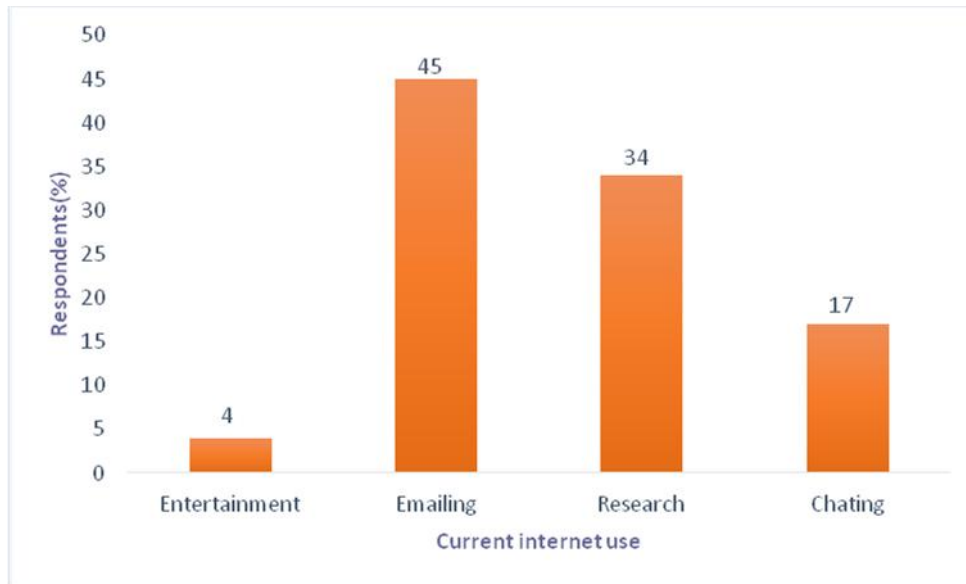
Figure 4.2: General internet use

4.2.4 Relationship between Internet use and socio demographic characteristics

Majority of those who used the internet used it for emailing. The demographic characteristics of this population are as shown on **Table 4.4.**

Table 4.4: Relationship between internet use and socio demographic characteristics

Variable (internet usage, n=157)	Face book /Skype (%)	Emailing (%)	Research (%)
Gender (n=157)			
Male	37.7	49.6	-
Female	62.3	50.4	100.0
Education level (n=157)			
Primary	-	-	-
Secondary	5.7	5.0	-
Tertiary	94.3	95.0	100.0
Occupation level (n=157)			
Student	32.1	17.4	-
Employed	52.8	74.4	100.0
Business	11.3	5.8	-
Unemployed	3.8	2.5	-
Age category (n=157)			
19—28	37.7	21.5	-
29-39	49.1	44.6	100.0
40-49	9.4	27.3	-
50-59	3.8	6.6	-
60-69	-	-	-
Above 69 yrs	-	-	-
Marital status (n=157)			
Married	30.2	50.4	100.0
Single	56.6	37.2	-
Widowed	1.9	6.6	-
Separated	11.3	5.8	-

4.3 Current use of cell phone

4.3.1 General cell phone use

Cell phones were commonly used for communication (48%) and business transactions (43%) with very small proportion using it for entertainment (games/Music) **(Figure 4.3).**
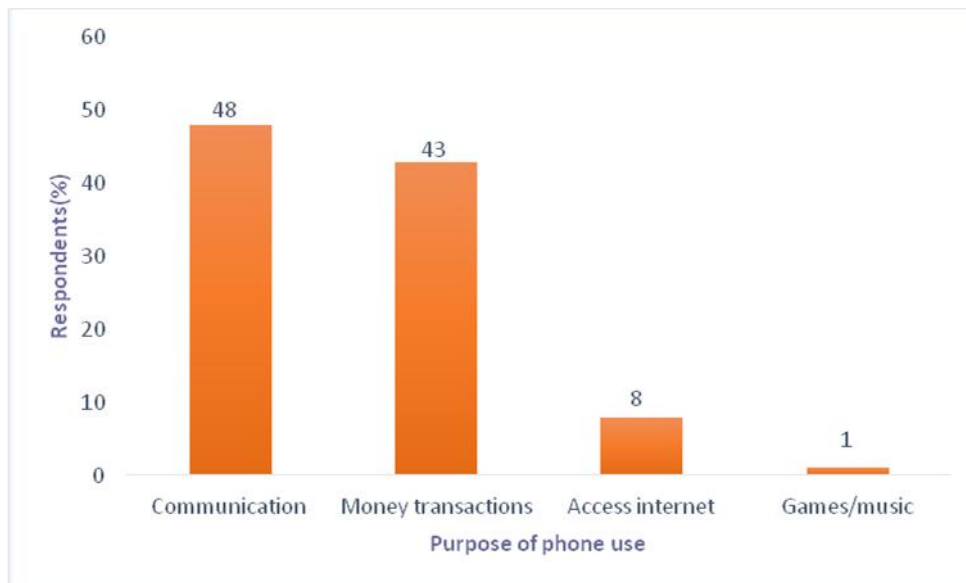
Figure 4.3: General phone use

4.3.2 Use of alarm function in the phone

Alarm function on the cell phone was used by 245 (64%) of the respondents with most of them 226 (76%) using it for waking up and only 23 (13%) using it as reminder for their drugs **(Figure 4.4).**
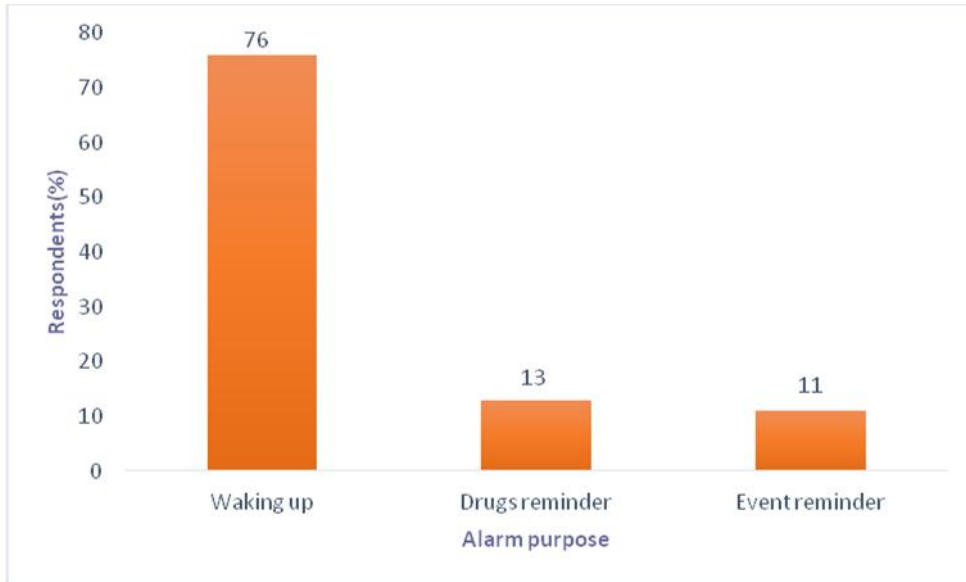
Figure 4.4: Use of alarm function on the cell phone

4.3.3 Text messaging via the cell phone

Greater proportion (85%) of the respondents could send or receive SMS via their cell phones **(Figure 4.5).**
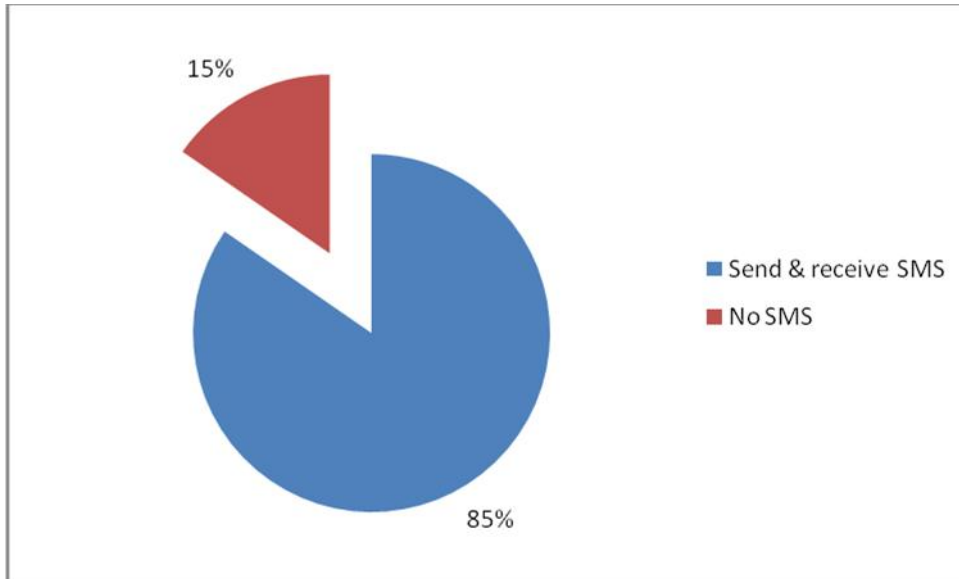
Figure 4.5: Text messaging via cell phone

4.3.4 Network used

The commonly used network was Safaricom by 381 (75%) followed by airtel with 84 (17%) of the total entries while the least used network was Orange with 1% (7) of the total entries **(Figure 4.6).**
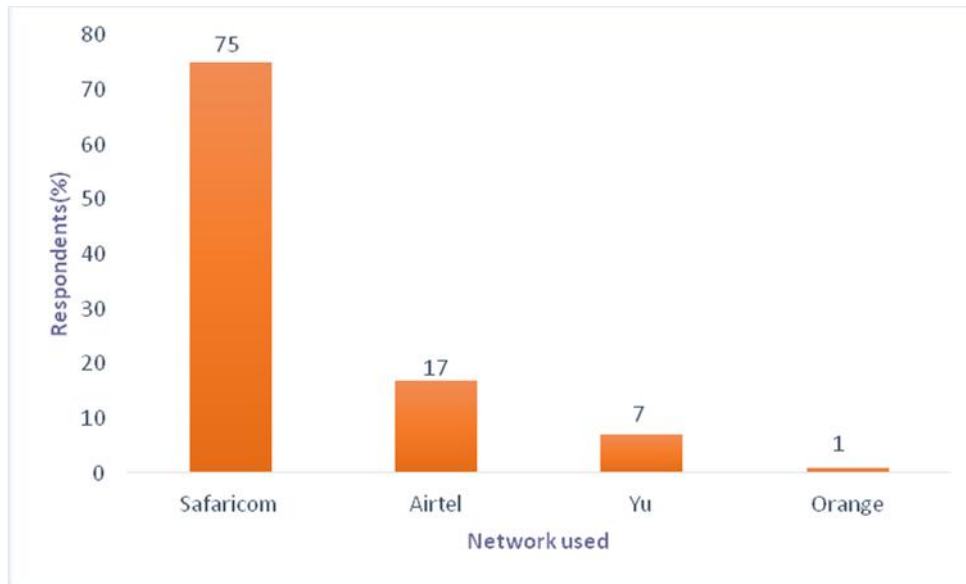
Figure 4.6: Network used by respondents

4.3.5 Use of cell phone as reminder for medication

Only 11% of the respondents were using their cell phones to remind them to take their medication **(Figure 4.7).**
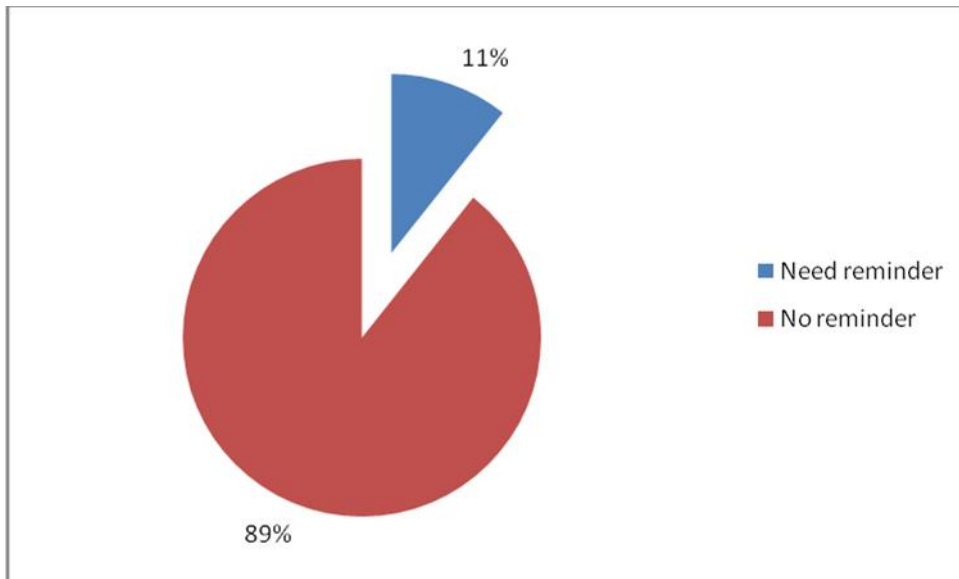
Figure 4.7: Cell phone use as drug reminder

4.3.6 Relationship between cell phone use and socio demographic characteristics

Most of those using their cell phones used it for communication (calling and texting). The socio-demographic characteristics of such population are as shown on **Table 4.5.**

Table 4.5: Relationship between cell phone use and socio demographic characteristics

Variable (phone use, n=383)	Games (%)	Communication (%)	Access internet (%)	Money transaction (%)
Gender (n=383)				
Male	58.3	38.1	43.9	38.3
Female	41.7	61.9	56.1	61.7
Education level (n=383)				
Primary	8.3	13.0	-	11.4
Secondary	16.7	37.3	7.0	38.6
Tertiary	75.0	49.7	93.0	50.0
Marital status (n=383)				
Married	8.3	52.9	43.9	55.7
Single	75.5	18.5	50.9	17.7
Widowed	-	17.2	1.8	15.0
Separated	16.7	11.4	3.5	11.7
Occupation (n=383)				
Student	50.0	5.8	28.1	4.8
Employed	33.0	43.1	64.9	44.3
Business	8.3	30.2	5.3	31.1
Unemployed	8.3	20.9	1.8	19.8
Age (n=383)				
19—28	58.3	11.4	29.8	9.6
29-39	33.3	34.9	47.4	36.8
40-49	8.3	33.3	19.3	34.4
50-59	-	15.6	3.5	15.6
60-69	-	4.2	0.0	3.0
Above 69 yrs	-	0.5	0.1	0.6

4.3.7 Text messaging

There was no significant association between the gender and marital status of the respondent with use of one's cell phone for text messaging. However text messaging was found to associate significantly with the age category, occupation and the education level of the respondent where those educated, aged above 30years and unemployed are likely to send text messages as opposed those uneducated, aged below 30years with employment **(Table 4.6).**

Table 4.6: Relationship between text messaging and socio demographic characteristics

Variable		Text	Don't text	OR	95% CI		p-value
Age				13.402	1.820	98.659	p<0.05
	< 30yrs	61	1	11.074	1.565	78.334	
	30yrs	264	58	0.826	0.777	0.879	
Gender				0.888	0.504	1.564	Ns
	Male	123	24	0.930	0.663	1.305	
	Female	202	35	1.048	0.834	1.316	
Education				0.057	0.029	0.112	p<0.05
	Educated	303	26	2.116	1.585	2.824	
	Non Educated	22	33	0.121	0.076	0.192	
Marital status				1.453	0.833	2.536	Ns
	Single	146	32	0.828	0.636	1.078	
	Married	179	27	1.204	0.896	1.616	
Occupation				0.117	0.049	0.279	p<0.05
	Employed	160	6	4.841	2.250	10.418	
	Un-employed	165	53	0.565	0.493	0.648	

4.3.1 Use of cell phone alarm

The cell phone alarm use was found to be significantly associated with; age category, gender, occupation education level and the marital status of the respondent; married females aged above 30 years of age, educated with no employment are likely to use the alarm as compared to the single males aged below 30years, uneducated with employment **(Table 4.7).**

Table 4.7: Relationship between cell phone use and socio demographic characteristics

Variable		Use	Don't use	OR	95% CI		p-value
Age				4.018	1.916	8.427	**0.001**
	< 30yrs	53	9	3.365	1.713	6.612	
	30yrs	192	131	0.838	0.774	0.906	
Gender				0.564	0.369	0.863	**0.001**
	Male	82	66	0.710	0.554	0.911	
	Female	163	74	1.259	1.051	1.507	
Education				0.243	0.133	0.444	**0.001**
	Educated	226	104	1.242	1.119	1.378	
	Non Educated	19	36	0.302	0.180	0.505	
Marital status				0.704	0.462	1.071	**0.010**
	Single	121	57	1.213	0.957	1.537	
	Married	124	83	0.854	0.710	1.027	
Occupation				0.526	0.342	0.810	**0.001**
	Employed	120	47	1.459	1.118	1.903	
	Un-employed	125	93	0.768	0.648	0.910	

4.3.9 Use of cell phone as a reminder to take medication

Use of cell phone as to remind on medication was found to associate significantly with the age and the marital status of the respondent; singles aged above 30 years of age are likely to use the cell phone reminder as compared to the married aged below 30years of age **(Table 4.8).**

Table 4.8: Relationship between cell phone use as reminder with socio demographic characteristics

Variable		Use	Don't use	OR	95% CI		p-value
Age				2.483	1.187	5.191	**0.001**
	< 30yrs	12	49	2.049	1.192	3.522	
	30yrs	29	294	0.825	0.675	1.010	
Gender				0.551	0.267	1.137	0.158
	Male	11	137	0.672	0.399	1.132	
	Female	30	206	1.218	0.993	1.495	
Education				0.814	0.305	2.174	0.463
	Educated	36	293	1.028	0.910	1.161	
	Non Educated	5	50	0.837	0.354	1.978	
Marital status				0.390	0.204	0.745	**0.003**
	Single	26	152	1.431	1.102	1.858	
	Married	15	191	0.657	0.434	0.994	
Occupation				1.229	0.633	2.384	0.658
	Employed	16	151	0.886	0.594	1.323	
	Un-employed	25	192	1.089	0.838	1.416	

4.4 Perceptions of the respondents towards the use of internet and cell phone as tools to support ARV adherence

4.4.1 Perceptions towards the use of internet as a tool for supporting ARV adherence

Results showed that greater proportion of HIV patients with cell phones did not support the idea of using internet to support adherence as compared to those supporting the idea. This was accumulated rating according to their responses towards 3 questions on internet affordability, possibility of use and an anticipation of an hindrance to its use as shown on **table 4.9.**

Table 4.9: Perceptions towards internet as tool to support ARV adherence

Internet use(n=157)	RESPONSE		GOOD	BAD	TOTAL
Characteristics	YES	NO	PERCEPTION	PERCEPTION	
Affordability(n=157)	110	47	(YES)110	(NO)47	157
Possibility of use in adherence (n=157)	6	151	(YES)6	(NO)151	157
Any hindrance to its use (n=157)	67	90	(NO)90	(YES)67	157
TOTAL			**206**	**265**	**471**
%Total			**44%**	**56%**	**P=0.20**

4.4.2 Perceptions towards cell phone use as a tool for supporting ARV adherence

A significantly greater proportion of patients with cell phones had good perceptions towards cell phone as a tool to support ARV adherence **(Table 4.10).**

Table 4.10: Perceptions towards cell phone use as tool to support ARV adherence

Cell phone use(n=383) Characteristics	RESPONSE		GOOD PERCEPTION	BAD PERCEPTION	TOTAL
	YES	NO			
Support the idea (n=383)	380	3	(YES)380	(NO)3	383
Phone affordability (n=383)	211	172	(YES)211	(NO)172	383
Confidentiality infringement (n=383)	31	352	(NO)352	(YES)31	383
Language problem (n=383)	146	237	(NO)237	(YES)146	383
Anticipation of an hindrance (n=383)	128	255	(NO)255	(YES)128	383
Anticipation of a benefit(n=383)	377	6	(YES)377	(NO)6	383
TOTAL			1812	486	2298
%Total			79%	21%	P=0.03

4.4.3 Communication mode

Majority (70%) of the respondents preferred calling the hospital as opposed to sending text message **(Figure 4.8).**
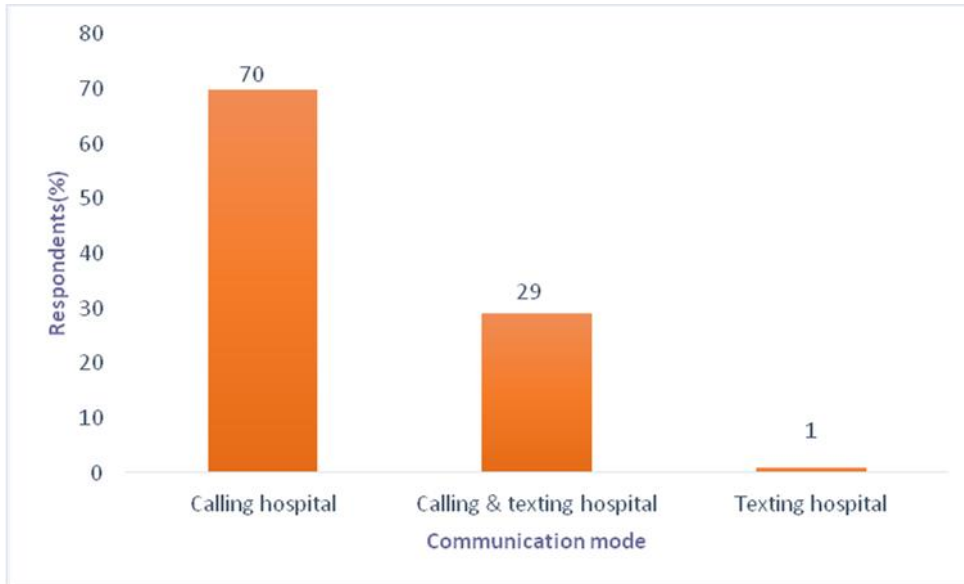
Figure 4.8: Preferred communication mode

4.4.4 Anticipated hindrances to cell phone use to support ARV adherence

Network problem was the common anticipated hindrance to the use of cell phone in ARV adherence support **(Figure 4.9).**
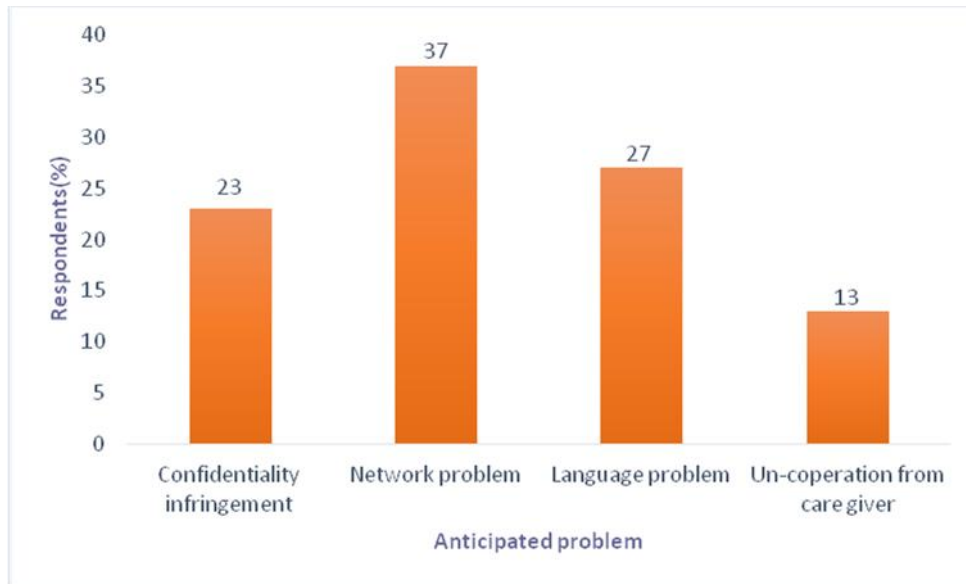
Figure 4.9: Anticipated hindrances

4.4.5 Anticipated benefits from the use of cell phone to support ARV adherence

Greater proportion of the respondents anticipated to benefit from medical advice with the least proportion anticipating receiving reminders for their drugs **(Figure 4.10).**
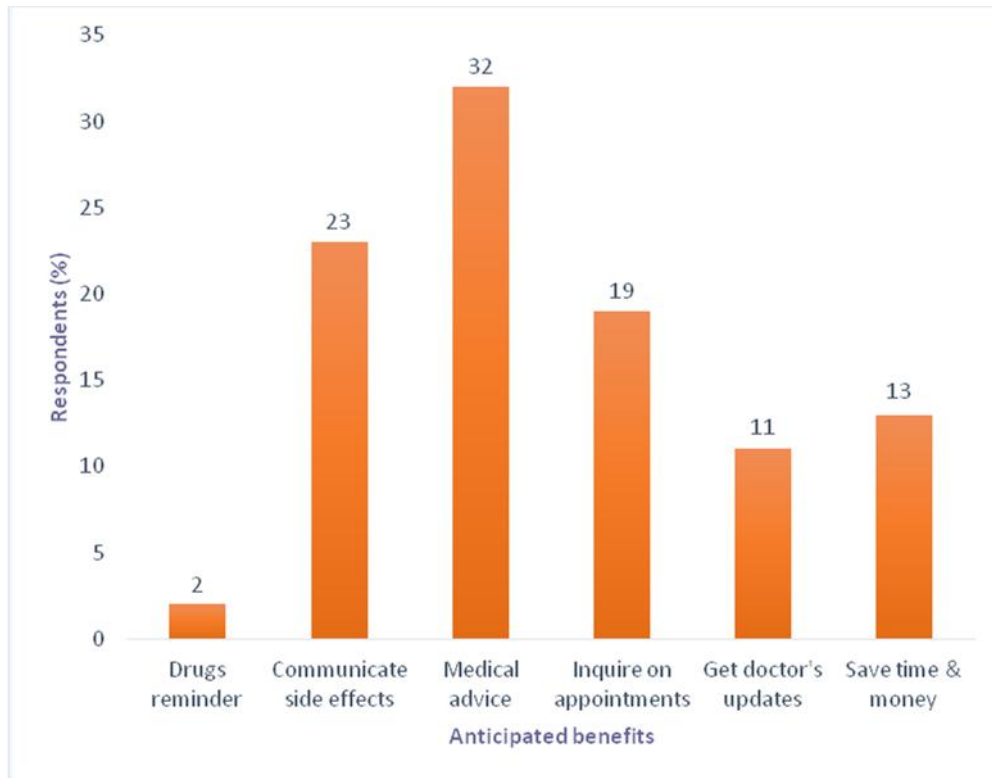
Figure 4.2: Anticipated benefits

4.4.6 Relationship between the idea support with socio-demographic characteristics

There was no significant association between the gender, education and occupation of the respondent with perceptions towards the possibility of cell phone use in supporting ARV adherence but there was a significant association with age and marital status of the respondent. All singles below 30years of age are likely to support idea of using cell phone to support adherence as compared to married aged above 30 years of age **(Table 4.11)**.

Table 4.11: Relationship between cell phone use in ARV adherence with socio demographic characteristics

Variable		Support idea	Not support	OR	95% CI		p-value
Age	< 30yrs	62	0				
	30yrs	318	4	0.837	0.801	0.875	p<0.05
Gender				0.617	0.086	4.428	Ns
	Male	145	2	0.763	0.284	2.050	
	Female	235	2	1.237	0.463	3.306	
Education				0.497	0.051	4.865	Ns
	Educated	326	3	1.144	0.649	2.017	
	Non Educated	54	1	0.568	0.102	3.159	
Marital status	Single	178	0				
	Married	202	4	0.532	0.484	0.584	p<0.05
Occupation				0.430	0.044	4.169	ns
	Employed	166	1	1.747	0.319	9.557	
	Un-employed	214	3	0.751	0.424	1.331	

4.4.7 Relationship between the perceptions towards cell phone affordability with socio demographic characteristics

There was no significant association between the gender, marital status and the age of the respondents with their perceptions towards affordability of the cell phones among the HIV infected patients but a significant association was established with occupation and the education level of the respondent. The educated and employed are likely to afford cell phone as compared to the uneducated and unemployed **(Table 4.12).**

Table 4.12: Association of cell phone affordability with socio demographic characteristics

Variable		Afford	Not afford	OR	95% CI		p-value
Age				0.995	0.621	1.596	0.985
	< 30yrs	44	39	0.996	0.672	1.477	
	30yrs	221	195	1.001	0.925	1.083	
Gender				1.336	0.929	1.921	0.117
	Male	111	82	1.195	0.955	1.497	
	Female	154	152	0.895	0.719	1.028	
Education				0.366	0.217	0.618	**0.001**
	Educated	241	184	1.157	1.071	1.249	
	Non Educated	24	50	0.424	0.269	0.667	
Marital status				1.343	0.943	1.913	0.102
	Single	112	116	0.853	0.704	1.032	
	Married	153	118	1.145	0.972	1.348	
Occupation				0.464	0.321	0.669	**0.001**
	Employed	131	73	1.585	1.264	1.986	
	Un-employed	134	161	0.735	0.634	0.851	

4.4.8 Relationship between language problem with socio demographic characteristics

There was no significant association between the gender and marital status of the respondent with having language problem but a significant association was found with education level, occupation and the age of the respondent. The unemployed and non educated aged above 30 years are likely to have language problem as compared to the employed and educated aged below 30 years of age **(Table 4.13).**

Table 4. 13: Relationship between language problem and socio demographic characteristics

Variable		Bad Perception	Good Perception	OR	95% CI		p-value
Age				**0.406**	**0.215**	**0.767**	**0.001**
	< 30yrs	14	48	**0.462**	**0.264**	**0.808**	
	30yrs	135	188	**1.137**	**1.047**	**1.235**	
Gender				0.859	0.562	1.312	0.160
	Male	54	94	0.910	0.698	1.185	
	Female	95	142	1.060	0.903	1.243	
Education				**30.184**	**10.618**	**85.800**	**0.001**
	Educated	98	232	**0.669**	**0.595**	**0.752**	
	Non Educated	51	4	**20.195**	**7.453**	**54.720**	
Marital status				1.087	0.720	1.640	0.266
	Single	67	111	0.956	0.765	1.195	
	Married	82	125	1.039	0.861	1.255	
Occupation				**6.193**	**3.809**	**10.068**	**0.001**
	Employed	28	139	**0.319**	**0.225**	**0.453**	
	Un-employed	121	97	**1.976**	**1.665**	**2.345**	

4.4.9 Relationship between the confidentiality infringement and socio demographic characteristics

There was no significant association between the gender, marital status, education level and occupation of the respondents with perceptions towards confidentiality infringement but it was found to associate significantly with the age of the respondent. Those aged below 30 years of age are likely to be more careful about the infringement of their confidentiality as opposed to those aged above 30years of age **(Table 4.14).**

Table 4.14: Relationship between confidentiality infringement and socio demographic characteristics

Variable		Infringed	Not infringed	OR	95% CI		*p*-value
Age				**2.510**	**1.039**	**6.062**	**0.02**
	< 30yrs	8	54	**2.046**	**1.093**	**3.829**	
	30yrs	18	305	**0.815**	**0.628**	**1.057**	
Gender				0.570	0.233	1.390	0.129
	Male	7	141	0.685	0.359	1.308	
	Female	19	218	1.203	0.939	1.542	
Education				0.986	0.833	1.168	0.937
	Educated	22	308	1.006	0.861	1.176	
	Non Educated	4	51	0.963	0.379	2.448	
Marital status				0.617	0.286	1.322	0.216
	Single	16	213	1.266	0.905	1.772	
	Married	12	259	0.781	0.505	1.207	
Occupation				0.579	0.269	1.244	0.158
	Employed	15	189	1.338	0.931	1.922	
	Un-employed	13	283	0.774	0.517	1.161	

CHAPTER FIVE:

DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1   Discussion

5.1.1   Cell phone access, current use and perceptions towards its use as tool to support adherence

This study reported almost 99% access to cell phone with majority using it for communication and in money transactions. This concurred with studies by Lester *et al.,* (2010) who reported mobile phones to be intensely used in personal lives and business transactions in Kenya. Similar findings were reported by Fjeldsoe who reported high rate of access and phone use among younger adults and socioeconomically disadvantaged populations (Fjeldsoe *et al*., 2009).

A bigger proportion of the respondents were using the alarm function in their phones with the majority using it for waking up (77%) and the least proportion using it as reminder to their drugs (15%). This was in disagreement with the Peruvian study that reported 77% (24/31) cell phone accessibility and 23% (7/31) alarm usage as a reminder for their medications (Walter *et al*., 2007).

Sending and receiving text messages via the cell phone was not a problem to many (84%) of the study participants. The commonly used network provider among those interviewed was Safaricom, the oldest network in Kenya (76%). This concurred with CAK-2010 report that quoted 80% subscription to Safaricom (CAK, 2010).

This study results showed that a significantly greater proportion of patients with cell phones had good perceptions towards cell phone to support ARV adherence as compared to those with a bad perception (79% versus 21%, p = 0.03). This is in support of a pilot study by Puccio *et al* where use of cell phone call reminders to assist adolescents adhere to HIV medications was practical and acceptable to the study participants (Puccio *et al*., 2012).

 Greater proportion of the participants reported that they had no problem using their current cell phones in the communication and were not ready to share their phones for confidentiality purpose (99%). Peruvian study results is in line with this where 74% of the participants supported the use of cell phone as tool to support adherence to medication and majority claimed to have no problem using their current phones for the communication (Walter *et al*., 2007) and Fjeldsoe who reported cell phones as convenient and culturally relevant mechanism for intervention delivery (Fjeldsoe *et al*., 2009).

Majority of the respondents preferred calling the health provider as opposed to sending the text message (72%) as most of them felt that calling would give an instant answer as opposed to sending the text. Warren reported the same in the statement that 'Communication of almost any type using SMS messages would lack nuance and individual "tailoring" so that synchronous, real-time voice communication between patient and healthcare provider would be preferred' (Warren, 2006) . However it differed with the report from Walter where equal proportions of the study population preferred calling and sending text (Walter *et al*., 2007), and Elrches report that cell phone text messaging was feasible communication to support adherence (Elrches *et al*., 2011).

The respondents felt that text messaging was inadequate to deliver and receive full information to and from the service provider. This concurs with Puccio *et al* study where reminders were reported inadequate (Puccio *et al*., 2006) and Mallinson *et al*. and Murphy *et al*. studies where ongoing supportive communication with a provider was proposed as a better intervention (Murphy *et al*., 2004, Mallinson *et al*., 2007).

Most of those interviewed (46%) perceived that this cell phone intervention could help them get advice from the healthcare provider anywhere and anytime on issues that could hinder adherence to the medication**.** They reported that the normal consultancy they had with the healthcare provider in the hospital set up was very much limited in that they were only allowed to answer what the health care provider needed to know which could not improve much on their adherence. This is in support with earlier studies that have shown social support as a strong predictor of good adherence to ARV medication (Gardenier *et al*., 2010, Murphy *et al*., 2004, Singh *et al*., 1999) and retention to HIV care being predicted by clients' perceptions of providers level of engagement, validation and partnering with clients in their treatment (Mallinson *et al*., 2007).

In this study, language was not a major challenge in communication since only 35% of the participants reported to have a language problem with majority of them proposing Kiswahili as the best language to be used. This could be attributed to the growth in literacy level in the country after the introduction of free primary education systems and the fact that most of the people interviewed were from the urban set up with increased literacy levels as compared to the rural areas. However introduction of voice based technology other than the SMS based applications would be of great help to illiteracy in communities as reported in Warren study (Warren, 2006).

Most of those interviewed (47%) reported that receiving reminders to take their drugs was not the solution for improved adherence as there were other issues within their life that could hinder them from taking their drugs rather than just forgetting. This differed from the report of Walter who reported that most of those interviewed 23/31 (74%) reported their willingness to use cell phones to receive reminder messages for their HIV medication (Walter *et al.*, 2007).It also differed from the report by Lester that use of text message reminders was a feasible method of improving self reported adherence (Lester *et al.*, 2010) and report by Macdonel who reported forgetting as a barrier to adherence among 73% of 498 non non-adherent HIV infected youths interviewed (MacDonell *et al.*, 2013).

Confidentiality infringement was not a big issue among the respondents since most of them claimed to have enough trust with the healthcare provider (94%). Some reported that in case they received healthcare provider's call while in the midst of many people they would excuse themselves or call the healthcare provider later when the environment is convenient for the conversation. This was in line with Walter study that reported greater confidentiality on the one using cell phones as compared to face-to-face interactions (Walter *et al.*, 2007). Simoes et al also reported that in audio computer-assisted self-interview (ACASI), there was more protection of patients' privacy as compared with the administration of questionnaires by the interviewer (Simoes *et al.*, 2006a, Simoes *et al.*, 2006b).

The cell phone intervention was reported by 47% of the participants to be of great benefit as it would enable the HIV patients to receive health care provider's advice on any issue hindering their adherence to medication. Furthermore they would be able to inquire on their appointments date so that they would visit the hospital when it is very necessary hence saving on time and fare. This was supported by Walter study where the study population perceived that HIV information was important to their health (Walter *et*

al., 2007) and in a report by Atun on varied health-related uses of SMS applications where he suggested that it " deliver [s] both efficiency savings and improvements in the health of individuals and public health" (Atun *et al*., 2006).

However, there was a smaller proportion (33%) who reported a bad perception with an argument of network problem, language problem and unco-operation from the care giver. Earlier studies have concluded that network problem can be overcome by the stakeholders finding their way into a state-owned network to manage through the changing regulatory environment (Navas *et al*., 2002, Hamilton, 2003, and Forestier *et al*., 2002). It also concurs with Marvin et al. report that 'cell-phone support would be difficult in a population where cell phone access is variable especially if cell phone numbers are disconnected (Marvin *et al*., 2014).

5.1.2   Internet access, current use and perceptions towards its use as a tool to support adherence

A smaller proportion 33 %(157) of the respondents had access to internet with majority of them using it to access emails from cybercafés. This is in support of a study by Kalichman *et al.* (2002a) where only 51% of the participants reported having used internet in their life time.

The current study showed that greater proportion of HIV patients with cell phones had a bad perception towards use of internet to support adherence as majority feared misinformation and others claimed that it was more expensive than mobile phone communication. This is in line with a study by Kalichman (2006) where individuals who sought information on the Internet to cope with chronic illness were more vulnerable to misinformation and unfounded claims which was predicted by lower incomes, less education, and avoidant coping styles.

Access to internet and acceptability of it as a tool for supporting adherence was found to be most likely among the single men aged between 19-29 years who have attained tertiary education. Studies have reported that internet users were significantly more likely to be better educated and of higher incomes (Kalichman, 2002a).

5.1.3 Association of perceptions with socio demographic characteristics

The HIV infected patients who are employed and educated are more likely to afford cell phones as compared to the unemployed and the illiterate in the society (p 0.001). This implied that an additional income would increase one's ability to acquire a cell phone as reflected in Warren study findings where the relationship between GDP/capita and mobile phone subscriptions per capita suggested that small changes in "wealth" would result in large changes in mobile phone penetration in poorer countries at GDP/capita less than about $3–4,000 (Warren, 2006)

The language problem is more likely to be an issue among the uneducated, unemployed and the aged as compared to the educated, employed and the young generation (p 0.001). This is in support of Feldman report that 'Pervasive illiteracy may be the rate-limiting step on use of SMS text messaging' (Feldmann, 2003).

Those in need of cell phone reminder were more likely to be 30 years or below and single as compared to those above 30 years of age and the married, divorced or the widowed (p 0.001,0.003). This is in line with Walter study results where majority of those interviewed felt that alarm reminders for medication were needed only by the ART-naïve patients (Walter *et al*., 2007). It also concurs with findings of a recent multi-site study that reported 73 % of 498 non-adherent youth with forgetting as the primary reason for non-adherence (MacDonell *et al*., 2013).

5.2 Conclusion

The study concluded that: i) Access and use of cell phone was higher than internet ii) Cell phones were mostly used for communication through text messaging and calling with minimal usage on carrying out money transactions. Internet was majorly for sending emails; iii) The concept of using mobile phones in their health management appeared to be highly favorable for Participants They generally preferred face to face communication with the health care providers versus receiving medication reminders as only a minority currently used their phone alarms for this purpose. They also preferred phone discussions to text messaging communications with health care providers. However although reminders were not preferred or used by the majority, a portion did report using their phone alarms for reminders, so we could not fully conclude that there is no need for reminders, only that they are not a primary reason for use. Internet was not supported by many as tool to support adherence due to its low accessibility and required expertise into its practice. It was therefore concluded not feasible tool to support adherence.

5.3 Recommendations

Recommendations for action

The study recommends the Ministry of Health, Communication Authority of Kenya and other stakeholders to adopt the use of cell phone in health care sector to improve on ARV adherence. This can be achieved through:

i. Devising a strategy that allows patient's access to the doctor anytime and anywhere they need his/her assistance to support adherence to the ARV medication.

ii. Seeking to ensure network problems do not hinder some communities from benefiting from this intervention immediately the strategy is put in place.

iii. Advising health caregivers to improve on their public relation to cultivate a friendly environment during the patient's consultation. This will make the patients feel free to share all what they may be going through that could be hindering their adherence to the medication.

Recommendation for research

The study also recommends more research seeking to determine the impact of cell phone communication intervention to long-term adherence and health outcomes.

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APPENDICES

Appendix 1: Ethical Approval

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840 - 00200 NAIROBI, Kenya
Tel: (254) (020) 2722541, 2713349, 0722-205901, 0733-400003; Fax: (254) (020) 2720030
E-mail: director@kemri.org info@kemri.org Website:www.kemri.org

KEMRI/RES/7/3/1   March 25, 2011

TO: FLORENCE KINYUA
         PRINCIPAL INVESTIGATOR

THRO':   DR. FREDERICK OKOTH,
         THE DIRECTOR, CVR,
         NAIROBI

RE: **SSC PROTOCOL NO. 1935 (*RE-SUBMISSION*): ASSESS, USE AND
         PERCEPTIONS REGARDING INTERNET AND CELL PHONES AS A MEANS TO
         PROMOTE HIV HEALTH INTERVENTIONS AMONG HIV PATIENTS IN
         KENYATTA NATIONAL HOSPITAL COMPREHENSIVE CARE CLINIC.**

Make reference to your letter dated March 24, 2010 received on March 25, 2010. Thank you for your
response to the issues raised by the Committee. This is to inform you that the issues raised during the
187th meeting of the KEMRI/ERC meeting held on 15th March 2011, have been adequately addressed.

Due consideration has been given to ethical issues and the study is hereby granted approval for
implementation effective this **25th day of March 2011**, for a period of twelve (12) months.

Please note that authorization to conduct this study will automatically expire on **24th March 2012.**
If you plan to continue with data collection or analysis beyond this date, please submit an
application for continuing approval to the ERC Secretariat by **25th December 2011.**

You are required to submit any amendments to this protocol and other information pertinent to
human participation in this study to the ERC prior to initiation. You may embark on the study.

Yours sincerely,

Caroline Kithinji,
FOR: SECRETARY,
KEMRI/NATIONAL ETHICS REVIEW COMMITTEE

In Search of Better Health

Appendix 2: Participant Consent Form (English)

Title of the study: The access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence**.**

PART A

Introduction

Internet tools, cell phones, and other information and communication technologies are being used by HIV-positive people on their own initiative. However missing of ARV doses by HIV patients has been a problem leading to poor treatment and control of HIV/AIDS. Therefore there is need to determine the access, current use and perceptions of HIV patients regarding this technology as a means to support ARV medication adherence to avoid missing these drugs.

You are therefore invited to participate in this study whose main objective of is to determine access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence and HIV transmission risk reduction.

We kindly request you to read this form and ask any questions you may have before agreeing to participate in the study.

This study is being conducted by Florence Muthoni Kinyua from the Institute of Tropical Medicine and Infectious Diseases, Jomo Kenyatta University of Agriculture and Technology.

Purpose of the study

The main objective of the study is to determine access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence and HIV transmission risk reduction among HIV patients in Kenyatta National Hospital.

Study procedures

If you agree to participate, you will be issued with a questionnaire to fill after a detailed guideline on how to fill in which you will answer questions on various issues such as your access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence and HIV transmission risk reduction. You will also be asked about your nutritional status, your level of education, your knowledge on the use of ARVs, your ownership of a cell phone and its usage.

Risks of study participation

There are no risks anticipated to cause pain or discomfort to you.

The confidentiality and privacy will be assured by not using any name on the questionnaires and conducting the interview with the assistance of trained counselors who are governed by some code of ethics.

Research benefits

The information gathered from this study will be an eye opener on the new ways of improving adherence to ARV to be embraced in our developing country and world at large.

Study costs

If you accept to take part in this study, there will be no payment to you and for the study procedures.

Confidentiality

The information collected from you will be strictly private and confidential and will be kept under lock and key. Your names will not be used in any report of this study, or in any reports, publications or presentations. In case the officials from Institute of Tropical Medicine and Infectious Diseases (ITROMID, KEMRI), or Jomo Kenyatta University of Agriculture and Technology will review your records for the study, they will protect your privacy.

Participation information

Participation is voluntary and there are no risks at all. It is your decision to participate or not to participate in this study. If at anytime you wish to withdraw from participating in the study, you can do so, and this will not affect any future participation or relations with anyone or any institution.

Contacts and questions

The researcher conducting this study is **Florence Muthoni Kinyua**. You may ask any questions you have now, or if you have any questions later, you are encouraged to contact her through mobile telephone number: **0725 237 625**, or email **muthoniflorence@yahoo.com**.

If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher (s), you are encouraged to contact the following:

The Director,

Institute of Tropical Medicine and Infectious Diseases (ITROMID)

Jomo Kenyatta University of Agriculture and Technology (JKUAT)

P.O. Box 62000- 00200, Nairobi

Telephone no: 067- 52711

Email: itromid@nairobi.mimcom.net

OR

The Chairman

KEMRI National Ethical Review Committee,

S.L.P. 54840 00200, Nairobi

Tel. No. 2722541, 2713349, 0722 205901

Email: info@kemri.org

Part B: Participant consent form

Please read the information sheet (PART A) or have the information read to you carefully before completing and signing this consent form. If there are any questions you have which are not clear to you regarding this study, please feel free to ask the investigator prior to signing the consent form.

Participant Statement

I, (Mr., Mrs, Miss,) …………………………………………………………………..
hereby give consent to Florence Kinyua to include me in the proposed study entitled "**the access to, current use and perceptions regarding internet and cell phones as a means to support antiretroviral medication adherence among HIV patients in Kenyatta National Hospital."**

I have read the information concerning this study, and I fully understand the aim of the study and what will be required of me if I accept to take part in the study. The risks and benefits have been explained to me. Any questions I have concerning the study have been adequately answered and I am satisfied.

I therefore consent voluntarily to participate in this study.

Name of Participant of respondent...

Relation to the index worker (subject)..

Signature.. **Or** Thump print

Date...

Name of the person taking consent……………………………………………………

Signature …..

Date ………………………

Name of the investigator ………………………………………………………

Signature …..

Date ………………………...

Appendix 3: Participant Consent (Kiswahili)

KIAMBATISHO

Anwani ya utafiti:

Upatikanaji, matumizi na maoni kuhusu mtandao na simu za rununu kama njia ya kusaidia kupunguza makali ya ukimwi kushikamana na kupunguza maambukizi ya ukimwi kwa kuwaoji wagonjwa wa ukimwi katika hospitali kuu ya Kenyatta.

SEHEMU A

Utangulizi:

Mtandao na simu za mkononi zinatumiwa na watu wanaoishi na ukimwi kwa juhudi zao wenyewe. Hata hivyo kukosa ya dozi za ARV kwa wagonjwa wa ukimwi ni tatizo katika matibabu na uzuiaji wa ukimwi.Kwa hivyo ni muhimu kuhanzisha miradi ya kukomesha tabia ya wagonjwa kukosa kuchukua madawa yao vifaavyo.

Basi, kuna haja ya kujua upatikanaji, matumizi ya sasa ya mtandao na simu za mikononi kupitia maoni ya wagonjwa wa ukimwi pamoja na maoni yao kuhusu utumishi wa mitandao na simu za mikononi kama njia ya kukumbusha wagonjwa wa ukimwi kuchukua dawa zao wakati ufaao.

Basi umealikwa kushiriki kwenye utafiti huu ambao lengo lake ni kupata maoni ya wagonjwa wanaougua ukimwi kuhusu utumishi wa simu simu za rununu kama njia ya kuwakumbusha kuchukua dawa zao.

Twakusihi usome fomu hii kwa makini kisha uulize maswali yoyote uliyo nayo kabla ya kukubali kushiriki katika utafiti huu.

Utafiti huu unatekelezwa na Florence Muthoni Kinyua kutoka idara ya utafiti wa Madawa na magonjwa ya kuambukiza katika chuo kikuu cha kilimo na Teknolojia cha Jomo Kenyatta.

Madhumuni ya utafiti:

Lengo kuu la utafiti ni kuchunguza juu ya upatikanaji, matumizi ya sasa na maoni kuhusu mtandao na simu za rununu kama njia ya kusaidia kupunguza makali ya ukimwi kushikamana na maambukizi ya ugonjwa wa ukimwi kwa kuwaoji wagonjwa wa ukimwi katika Hospitali kuu ya Keyatta.

Hatua ya Utafiti:

Ukikubali kushiriki kwenye utafiti huu, utapewa cheti cha utafiti na kuelezwa jinsi ya kujaza hicho cheti chenye maswali kuhusu upatikanaji, utumishi na maoni yako juu ya mtandao na simu za rununu kumarisha matibabu kamili ya ukimwi.

Utaulizwa pia kuhusu hali yako ya lishe, kiwango chako cha elimu, maarifa yako juu ya matumizi ya ARVs, umiliki wako wa simu ya mkononi na matumizi yake.

Hatari ya kushiriki kwa utafiti:

Hakuna hatari inayotarajiwa kusababisha maumivu au kutomakinika kwako. Wachunguzi watakueleza kuhusu utaratibu utakaofuatwa.

Manufaa ya uchunguzi:

Habari zitakazotokana na utafiti huu zitatumiwa kuimarisha utekelezaji wa miradi itakayoboresha hali ya matumizi ya dawa za kupunguza makali ya ukimwi kwa matibabu kamilifu ya ugonjwa wa ukimwi.

Gharama ya utafiti:

Ukikubali kushiriki katika utafiti huu, hautapokea malipo yoyote kwa utafiti wowote ule.

Kubanwa kwa utafiti:

Habari zitakazotokana nawe zitachukuliwa kwa siri kubwa na kuhifadhiwa kwa kufuli na ufunguo. majina yako hayatatumika kwenye ripoti yoyote ya utafiti huu, ama kwenye makala yoyote, machapisho au maonyesho. Ikiwa maofisa kutoka Idara ya utafiti wa Madawa na magonjwa ya kuambukiza au wale kutoka Chuo Kikuu cha Kilimo na Teknolojia cha Jomo Kenyatta watatumia majibu yako, watahifadhi siri yako.

Taarifa ya kushiriki:

Kushiriki katika utyafiti huu ni kwa hiari yako na hakuna madhara yoyote. Ni uamuzi wako kushiriki au kutoshiriki katika utafiti huu. Kama utahisi kujitoa kwenye utafiti huu wakati wowote ule, kufanya hivyo, na hii haitaathiri kushiriki kwako baadaye au uhusiano wako na mtu yeyote au idara yoyote.

Mawasiliano na maswali:

Mtafiti anayetekeleza utafiti huu ni Florence Muthoni Kinyua. Unaweza kuuliza maswali yoyote uliyonayo sasa, au kama una maswali yoyote ya baadaye, unahimizwa kuwasiliana naye kupitia nambari ya simu ya rununu: **0725 237 625**, au barua pepe **muthoniflorence@yahoo.com**
Kama una maswali au hoja kuhusu utafiti huu na ungependa kuongea na mtu mwingine isipokuwa mtafiti , unahimizwa kuwasiliana na wafuatao:

Mkurugenzi,
Idara ya Utafiti ya Madawa na magonjwa ya kuambukiza

Chuo Kikuu cha Kilimo na Teknolojia cha Jomo Kenyatta ,

S.L.P 62000-00200,

 Nairobi
Nanbari ya simu: 067-52,711

Barua pepe: itromid@nairobi.mimcom.net

AU

Mwenyekiti

 Taifa ya kimaadili Kamati ya Uchunguzi,

S.L.P. 54840 00200, Nairobi

Nambari ya simu: No 2722541, 2713349, 0722 205901

Barua pepe : info@kemri.org

Sehemu B: Fomu ya Mshiriki ya idhini

Tafadhali soma maelezo kwenye sehemu A ama hakikisha kwamba umesomewa na kuelewa kabla ya kutia sahihi fomu hii. Tafadhali uwe huru kuuliza maswali yoyote kwa mtafiti yasiyoeleweka kuhusiana na utafiti huu, kabla ya kutia sahihi kwenye fomu.

Maelezo ya mshiriki:

Mimi, (Mheshimiwa/Bw/Bi/Binti/) ... ... natoa idhini kwa Florence Kinyua anijumusihe kwa utafiti ujulikanao kama" **Upatikanaji, matumizi na maoni kuhusu mtandao na simu za rununu kama njia ya kusaidia kupunguza makali ya ukimwi kushikamana na kupunguza maambukizi ya ukimwi kwa kuwaoji wagonjwa wa ukimwi katika hospitali kuu ya Kenyatta.''**

Nimesoma habari zote kuhusu utafiti huu, na nimeelewa lengo la utafiti huu na yanayohitajika kwangu kama nitakubali kushiriki katika utafiti huu. Hatari na manufaa ya utafiti huu yameelezwa kinagaubaga kwangu. Maswali yote niliyokuwa nayo yamejibiwa vilivyo na nimeridhika.

Kwa hivyo, ninatoa idhini kwa hiari nishiriki katika utafiti huu.

Jina ya Mshiriki /mhojiwa---

Uhusiano na mfanyikazi--

Sahihi--
 Au
Alama ya kidole gumba(kushoto)

Tarehe------------------------------
Jina la anayetoa idhini ---

Sahihi---
Tarehe------------------------------
Jina la mtafiti --

Sahihi--

Tarehe --

Appendix 4: Structured Questionnaire (English)

(**A**) **Socio-Demographic Information**

1a). Sex/ Gender of participant   (1) Male [   ]   (2) Female [   ]

b) Residential place:

2). Age in years:

3) Current marital status?

    1)   Married   [   ]
    2)   Single   [   ]
    3)   Widowed [   ]
    4)   Separated [   ]

4). What is your main occupation?

    1)   Student   [   ]
    2)   Employed   [   ]
    3)   Business   [   ]
    4)   Unemployed [   ]

5). What is your level of education?

    1) None/primary incomplete   [   ]
    2) Primary complete/secondary incomplete [   ]
    3) Secondary complete/tertiary   [   ]

Access and current use of internet

6). Do you ever use the internet? 1. Yes, [   ] 2. No [   ]

7). If yes, where do you access the internet from?

      1)   My phone   [ ]

      2)   Phone of a friend   [   ]

      3)   From a cyber café   [   ]

      4)   Other (specify):------------------------------------

8). If you access internet from a cyber café how far are you from it?

      1)   Less than five minutes walk   [   ]

      2)   5-15 minutes walk   [   ]

      3)   15-30 minutes walk   [   ]

      4)   30-60 minutes walk   [   ]

      5)   More than an hour walk   [   ]

      6)   I don't know   [   ]

9) How are the charges at the cyber café?

      1)   High   [   ]

      2)   Fair   [   ]

      3)   Low   [   ]

      4)   Don't know   [   ]

10) Do you experience any internet problems?   1. Yes, [   ] 2. No [   ]

11) If YES how often do you experience it?

1) Less often   [   ]

2) Often   [   ]

3) More often   [   ]

12) For what purpose do you use the internet for?

1) Entertainment   [   ]

2) Communication   [   ]

3) Other (specify):

i)---

ii) --

iii) ---

13) Do you ever use any of these?

SITE	YES	NO
E-mail		
Chat		
E-group		
Online support groups		
Forums		
Blogs		

14) Do you know of any site of people living with HIV?

1. Yes [   ]   2. No [   ]

If yes, which one?

i) ---

ii) --

iii) --

15) Do you think internet is readily available for use?

1. Yes [   ]   2. No [   ]

16) Give a reason for your answer above:

1. Cheap   [ ]

2. Growth in technology [ ]

3. Other specify:

i) --

ii) ---

iii) ---

(C) Access and current use of cell phones

17) Do you have a cell phone? 1. Yes [   ]   2. No [   ]

18) Do you ever use a cell phone? 1. Yes [   ]   2. No [   ]

19) How often do you use the cell phone?

20) For what purpose do you use the cell phone?

1) Entertainment   [   ]

2) Communication   [   ]

3) Other (specify)

i) ---

21) Do you experience any network problems?   1. Yes [   ]   2. No [ ]

22) If YES, how often do you experience it?

23) Do you ever do text messaging?   1. Yes [   ]   2. No [   ]

24) If YES what do you do?

1. Send   [   ]

2. Receive   [   ]

3. Send and receive [   ]

4. None of the above   [   ]

25a) Which network are you currently using?

           i) Safaricom [   ]
           ii) Airtel   [   ]
           iii)   Yu   [   ]
           iv)   Zain   [   ]

v) Vodafone [   ]

vi)   Other specify---

25b) Which one do you use most often?

25c) How are the rates for the named network above?

1) High   [ ]

2) Fair   [   ]

3) Low   [   ]

4) I don't know [   ]

26) Do you ever use the alarm function of your cell phone?

 1. Yes [   ]   2. No [   ]

27) Are you currently using it?   1. Yes [   ]   2. No [   ]

28) If yes, for what purpose?

1. Waking up   [ ]

2. Reminder to take drugs [ ]

3. Other specify:

i) ---

(G) Perceptions towards ART and cell phone use

29a). For how long have you been on ARVs?

29b) What is your opinion regarding ARV therapy

(1) Approve   [   ]

(2) Disagree   [   ]

(3) Undecided   [   ]

(4) I don't know   [   ]

Give a reason for your answer above:

i) --

30) Do you support cell phone communication between doctor and the patient?

1. Yes [   ]   2. No [   ]

31) If yes, state the type of information you would like to get from the doctor

1. Reminder to take drugs   [ ]

2. Communicate side effects   [ ]

3. Other specify:

i)---

32a) Have you been having a problem with taking your drugs?

1. Yes [   ]   2. No [   ]

Give a reason for your answer above?

32b) If yes, would you like to be reminded to take them via the cell phone?

 1. Yes [   ]   2. No [   ]

33) Which cell phone would you prefer to use for this work?

1. Own cell phone   [ ]

2. New cell phone   [ ]

3. None of the above   [ ]

4. Don't know   [ ]

34) Is it easy for you to call the hospital or you need to be called?

1) Will call the hospital/ send message to hospital [   ]

2) I need to be called / be sent the message by hospital   [   ]

3) Both send and receive message to / from the hospital   [   ]

4) None of the above   [   ]

35) Who would you like to be involved in that communication?

1) Spouse   [   ]

2) Immediate member of family   [   ]

3) Nurse   [   ]

4) Doctor   [   ]

5) Friend   [   ]

6) Other (specify):

i) --

36) Do you think that communication with the doctor via the cell phone would affect your confidentiality?

1. Yes [   ]   2. No [   ]

37a) Between communication with the doctor via cell phone and the face to face conversation, which one do you prefer?

i) Cell phone communication [   ]

ii) Face to face communication   [   ]

iii) None of the above   [   ]

iv) Don't know   [   ]

37b) Give a reason for your answer above:

----

38) Is language a problem during the communication via the cell phone?

1. Yes [   ]   2. No [   ]   3. Don't know [   ]

39) If yes which language would you prefer?

1) English   [   ]

2) Kiswahili   [   ]

3) Local language   [   ]

4) Other (specify):

i)--

40) Do you think cell phones are readily available among the patients for communication with the doctor?

1. Yes [   ]   2. No [   ]

Give a reason for your answer above:

i) ---

ii) ---

41) Do you think there is any problem that may come up in the process of communication affecting the process?

1. Yes [   ]   2. No [   ]

If yes, which one?

1. Affect confidentiality [ ]

2. Network problems   [ ]

3. Language problem   [ ]

4. Other specify:

i)--

42) Do you think you will benefit from that communication with your doctor?

1. Yes [   ]   2. No [   ]

If yes, which one?

1. Reminder to take drugs   [ ]

2. Communicate side effects [ ]

3. Get updates from doctor   [   ]

3. Other specify:

i)--

Thank you for taking your time to participate in this interview

Appendix 5: Structured Questionnaire (Kiswahili)

KIAMBATISHO II: muundo maswali

Muundo wa maswali ya mahojiano kwa wagonjwa wa ukimwi walio kwenye matibabu

(A) Maswala ya Kijamii

1a). Jinsia ya mshiriki   (1) Mwanaume   [   ]   (2) Mwanamke   [   ]

1b) Mahali ya makazi:

2). Umri kwa miaka:

3) Hali ya ndoa?

       1)   Niko katika ndoa   [   ]

       2)   Sijaolewa   [   ]

       3)   Mjane   [   ]

       4)   Tumetengana   [   ]

4) Kazi yako ni gani.?

       1)   Mwanafunzi   [   ]

       2)   Nimeajiriwa   [   ]

       3)   Mfanyi biashara   [   ]

       4)   Bila kazi   [ ]

5) Kiwango chako cha elimu:

1) Hakuna / msingi nusu [   ]

2) Msingi kamili / sekondari nusu [   ]

3) Sekondari kamili / elimu ingine ya juu [   ]

(B) Upatikanaji na matumizi ya sasa ya mtandao

6). Je, umewahi kutumia mtandao? 1. Ndiyo   [   ]   2. Hapana   [   ]

7). Kama ndiyo, unapata mtandao huo kutoka wapi?

1) Simu yangu [ ]

2) Simu ya rafiki [   ]

3) Kutoka dukani la mitandao [   ]

4) Kazini   [   ]

8). Kama ni kutoka kwa duka la mtandao ni umbali gani kutoka mahali unakoishi?

1) Chini ya dakika tano kutembea   [   ]

2) dakika 5-15 kutembea   [   ]

3) dakika 15-30 kutembea   [   ]

4) dakika30-60 kutembea   [   ]

5) Zaidi ya saa moja kutembea [   ]

6) Sijui   [   ]

9). Je malipo ya mtandao kutoka kwa hiyo duka ni ya kiwango gani ?

1) Juu   [   ]

2) Wastani [   ]

3) Chini [   ]

4)   Sijui [   ]

10) Je, kuna itirafu yoyote ya mtandao?   1. Ndiyo, [   ]   2. Hapana [
]

11) Kama kunazo itirafu, zinauzoefu gani ?

1)   Mara moja kwa wiki   [   ]

2)   Mara mbili kwa wikii   [   ]

3)   Zaidi ya mara mbili kwa wiki   [   ]

12) Ni kwa sababu gani wewe unatumia mtandao?

1)   Maburudiko [   ]

2)   Mawasiliano [   ]

3)   Ingine taja:

i)----------------------

ii)---------------------

iii)--------------------

13) Je, ni gani kati ya hizi umewahi kutumia?

Mtandao	Ndiyo	Hapana
E-mail		
Chat		
E-group		
Online support groups		

14) Je, unajua mtandao wowote kwa watu wanaoishi na virusi vya ukimwi?

    1.. Ndiyo [   ]   2. Hapana [   ]

Kama ndiyo, taja huo mtandao

----

15) Je, mtandao ni rahisi kupatikana?

    1. Ndiyo   [ ]   2. Hapana [   ]

16) Toa sababu ya jibu lako hapo juu:

        i)   Ni ya bei nafuu   [   ]

        ii)   Nchi imekua katika mtandao   [   ]

        iii) Ingine taja:

        --

C) Upatikanaji na matumizi ya simu za mkononi

17) Je, una simu ya mkononi?   1.. Ndiyo [   ]   2. Hapana [   ]

18) Je, umewahi kutumia simu ya mkononi?   1. Ndiyo [   ]   2. Hapana [   ]

19) Ni mara ngapi, wewe hutumia simu ya mkononi?

20) Wewe hutumia simu ya mkononi kwa madhumuni gani?

1) maburundiko   [   ]

2) Mawasiliano   [   ]

3) Ingine taja:-------------------------------------

21) Je, kuna itirafu yoyote ya mawasiliano kupitia simu za mkononi?

 1. Ndiyo   [   ]   2. Hapana   [   ]

22) Kama ndiyo, hizo itirafu huja mara ngapi?

23) Je, umewahi kunukulu ujumbe kwa simu yako ya mkono?

1.. Ndiyo [   ]   2. Hapana [   ]

24) Kama NDIO unafanya nini?

1) Kutuma [   ]

2) Kupokea [   ]

3) Kutuma na kupokea [   ]

4) Hakuna   [   ]

25a) Ni mtandao gani unatumia kwa sasa?

1) Safaricom   [   ]

2) Airtel   [   ]

3) Yu   [   ]

4) Zain   [   ]

5) Vodafone [   ]

6) Ingine taja:-------------------------------------

25b) Ni mtandao gani unatumia sana?

25c) Je, mtandao uliyotaja hapo juu unaripishaje?

     1)   Juu [   ]

     2)   Wastani   [   ]

     3)   Chini   [   ]

     4)   Sijui   [   ]

26) Je, umewahi kutumia saa katika simu yako?

1. Ndiyo [   ]   2. Hapana [   ]

27) Je, sasa unaitumia?   1.. Ndiyo [   ]   2. Hapana [   ]

28) Kama ndiyo, kwa madhumuni gani?

     1)   Kuamka asubuhi   [   ]

     2)   Kunywa dawa   [   ]

     3)   Ingine taja:--

D) Maoni kuhusu ART na utumishi wa simu katika hiyo huduma

 29a) Umetumia dawa za ARV kwa muda gani?

29b). Nini maoni yako kuhusu tiba ya ARV

1) Ninaiunga mkono [   ]

(2) Sikubaliani nayo [   ]

(3) Sina uamuzi kwa sasa [   ]

(4) Sijui [   ]

Toa sababu ya jibu lako hapo juu

i)---

30). Je,unaunga mkono wazo la kuweza kujadiliana na daktari wako kupitia simu?

1. Ndiyo   [   ]   2. Hapana   [   ]

31). Kama ndiyo, taja mambo ungetaka kumwambia daktari kupitia simu yako

     1)   Kukumbushwa kunywa dawa   [   ]

     2)   Mawaidha kuhusu madhara ya dawa   [   ]

     3)   Ingine taja:---

32a) Je, umekuwa na shinda yoyote kunywa dawa?

1. Ndiyo [   ]   2. Hakuna [   ]

Toa sababu ya jibu lako hapo juu?

32b) Kama ndiyo, ungependa kukumbushwa kunywa dawa kupitia simu yako ya mkononi?

1. Ndiyo [   ]   2. Hakuna [   ]

33) Ni simu gani ungetaka kutumia kwa kazi hiyo?

     1)   Simu yangu mwenyewe [   ]

     2)   Simu mpya [   ]

     3)   Hakuna [   ]

     4)   Sijui [   ]

34) Je, kati ya kupiga simu na kutuma ujumbe ungependekeza gani?

   1)   Kupiga hospitali / kutuma ujumbe kwa hospitali [   ]

   2)   Kupigiwa / kutumiwa ujumbe na hospitali [   ]

   3)   Kutuma ujumbe kwa / kupokea ujumbe kutoka hospitali [   ]

   4)   Hakuna [   ]

   35) Ni kina nani ungependa wausike katika mawasiliano hayo?

   1)   Bwana/Bi arusi [   ]

   2)   Jamii yangu   [   ]

   3)   Muuguzi   [   ]

   4)   Daktari   [   ]

   5)   Rafiki   [   ]

   6)   Mwingine taja:--

36) Je, unafikiri kwamba mawasiliano na daktari kupitia simu ya mkononi itaathiri usiri wako?

1. Ndiyo [   ]   2. Hakuna [   ]

37a) Kati ya mawasiliano na daktari kupitia simu ya mkononi na mazungumzo ya uso kwa uso unapendelea gani?

   1)   Mawasiliano ya simu [   ]

   2)   Mawasiliano ya uso kwa uso [   ]

   3)   Hakuna   [   ]

   4)   Sijui   [   ]

37b) Toa sababu kwa jibu lako hapo juu:

--   ------------------------------

38) Je, lugha ni tatizo wakati wa mawasiliano kupitia simu ya mkononi?

1. Ndiyo [ ]   2. Hakuna [ ]   3. Sijui [   ]

39) Kama ndiyo, ni lugha gani ungependa itumiwe?

1) Kiingereza [ ]

2) Kiswahili [   ]

3) lugha za Mitaa [ ]

4) Taja nyingine --

40) Je, unafikiri wagonjwa wote watapata simu za kuwasiliana na daktari?

1. Ndiyo [   ]   2. Hakuna [   ]

Toa sababu ya jibu lako hapo juu:

i) -- ------------

ii) --- ------------

41) Je, unafikiri kuna jambo lolote linaweza kuathiri mawasiliano hayo na daktari kupitia simu za mkononi?

1. Ndiyo [   ]   2. Hakuna [   ]

Kama ndiyo, taja?

1. Kuathiriwa kwa usiri [   ]

2. Matatizo ya mtandao [   ]

3. Matatizo ya lugha   [   ]

4. I ngine taja:

i)---

42) Je, unafikiri utafaidika kupitia mawasiliano yako na daktari wako kupitia simu?
1. Ndiyo [   ]   2. Hakuna [   ]

Kama ndiyo, taja?

1. Kukumbushwa kunywa madawa [   ]

2. Kuwasiliana madhara ya dawa   [   ]

3. Kupata habari mpya kutoka kwa daktari   [   ]

4. Ingine taja: ------------------------------

Asante kwa kuchukua muda wako kushiriki katika mahojiano haya

Appendix 6: Sample of Published Manuscript

Perceptions of HIV infected patients on the use of cell phone as a tool to support their antiretroviral adherence; a cross-sectional study in a large referral hospital in Kenya.

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Abstract

Background: Clinical trials [4, 3] have been carried out to assess the feasibility of using cell phone text messaging to follow up the Human Immunodeficiency Virus (HIV) infected patients on antiretroviral (ARVs) for improved adherence to their medication. However there is need to assess the perceptions of the HIV infected patients towards the use of these cell phones to aid in the clinical management of their HIV infection. The

objective of this study was therefore to determine the perceptions of HIV infected patients on the use of cell phone text messaging as a tool to support adherence to their ARV medication.

Methods: A cross sectional survey was conducted among patients receiving Highly Active Anti-retroviral Therapy (HAART) at the Kenyatta National Hospital Comprehensive Care Clinic (KNH CCC) between May and July, 2011. Pre-tested questionnaires were used to collect the socio-demographic and perceptions data. The recruitment of the participants was done using the random probability sampling method and statistical analysis of data performed using Statistical Package for Social Sciences (SPSS) version 16.0.

Results: A total of 500 HIV infected patients (Male-107, Female-307) aged 19-72 years were interviewed. Majority of these (99%) had access to cell phone and all (99%) of the HIV infected patients interviewed supported the idea of cell phone use in management of their HIV Infection. A greater proportion (46%) claimed that they needed it for medical advice and guidance on factors that hinder their adherence to medication and only 3% of them needed it as a reminder to take their drugs. Majority (72%) preferred calling the healthcare provider with their own phones for convenience and confidential purposes with only 0.4% preferring to be called or texted by the health care provider. Most of them (94%) especially the older patients had no problem with their confidentiality being infringed in the process of the conversation as per the bivariate analysis results.

Conclusion: Cell phone communications are acceptable, and direct communications with health care providers are preferred to reminders.

Key Words: HIV, ARV Adherence, Cell phone

Background

The World Health Organisation (WHO) advocates that the provision of antiretroviral therapy (ART) could reduce Acquired Immuno Deficiency Syndrome (AIDS)-related deaths and alleviate fears about HIV as quoted in WHO Geneva 2003[1]. In embracing this advocacy, Kenya has increased its ART coverage tremendously with percentage of adults receiving ART having increased from 55.3 % in the year 2008 to 70.4% in the year 2009 [2]. This intensifying the need for more ART programmes in Kenya for successful control and prevention of HIV-related mortality which is affecting our country's economy by a great margin. In response to this the Kenyan government released free ARV drugs with an aim of lowering the HIV-related mortality rates. However several studies [4,3] have shown that adherence has remained a problem even after the release of the free medication.

Technology innovations in Kenya have been increasing tremendously with Communication Council of Kenya report of 2010(CCK 2010) reporting mobile phone penetration of 39% rate with sharp concentrations of 70% found within the urban centers where HIV prevalence was expected to be high according to a report by Lester [4]. This prompted more efforts into mhealth research to seek the possibility of mobile phones solving the challenge of decreasing adherence to ARV medication.

A randomized trial in Kenya by Lester *et al* assessed the feasibility of cell phone text messaging communication as a tool for improved ARV adherence and reported a 12% increase of self-reported adherence among the patients receiving text message reminders as compared to the group receiving the normal standard of care [3]. Results were positive and prompted the need to assess the perceptions of the HIV infected patients on a normal life setting other than the experimental set up. Therefore the main objective of

this study was to determine the perceptions of HIV infected patients towards cell phone text messaging as a tool for supporting adherence to ARV medication.

Methods

Settings

The study was conducted at KNH CCC where around 20,000 patients were receiving their medication from that clinic by then with daily attendance of around 200 patients.

Participants

The study participants were the HIV infected patients aged 19-72 years, already on HAART at KNH CCC in the months of May to July 2011 who were considered having above 90% accessibility to cell phone as a means of communication. Risks and benefits of the study were well explained to each of the participant before they consented by writing. Those who consented to participate in the study were issued with the pre-tested questionnaires to seek information on their basic demographic data, cell phone access and current use and perceptions towards cell phone use as a tool to support adherence. This study was approved by the Kenya Medical Research Institute Scientific Steering Committee and Ethical Review Board (Ref SSC-1935).

Sampling

 The random sampling method, picking randomly 3 files from a butch of 10 files using randomly generated numbers, was used to pick up the files of the patients attending the CCC with the interviews for recruitment of the participants done on their exit after they were through with the healthcare provider to avoid interfering with the normal running of the clinic.

Data collection

Pre-tested questionnaires written either in English or Kiswahili were used for data collection among the sampled participant (See attached copy).Those that could read and write filled the questionnaires by themselves but those that could not had them filled in an interview format using the language preferred by each participant.

Statistical analysis

Data was entered using Microsoft Access (Microsoft Corporation, Redmond, Washington) and statistical analysis performed using SPSS version 16.0. We present odds ratios (OR), and 95% Confidence Interval (CI) for factors associated with cell phone access and perceptions towards its use as a tool to support ARV adherence.

Perceptions towards cell phone to support ARV adherence was determined considering the participants response to the following issues: (1) whether they supported the idea, (2) the affordability of cell phone among the HIV patients, (3) any fear of their confidentiality being infringed in the communication, (4) whether they had any problem with the language used in the communication, (5) whether they anticipated any hindrance to that communication and (6) whether they anticipated to benefit from that intervention.

The perceptions were then determined from the participants response to the above issues using the following criteria: "Positive perception" was defined as saying 'Yes' to issues one, two and six and saying 'No' to issues three, four and five, while 'Negative perception' was defined as saying 'No' to issues one, two and six and saying 'Yes' to issues three, four and five. The results were analysed to give overall percentage of those with positive and negative perceptions.

Results

Respondents' cell phone accessibility and perceptions towards cell phone use as a tool for supporting ARV adherence

This study reported almost 99% access to cell phone with majority (77%) of those interviewed using the alarm function on their phones for waking as compared to only 15% that used it as a reminder to take their medications.

This study also showed that generally 78% of patients with cell phones had good perceptions towards cell phone to support ARV adherence according to their perceptions towards the selected questions; nearly 99% of the population supported the idea of using cell phone to support ARV medication. Phone affordability was not a problem to 55% of the population although the rest complained that they were either having no phone of their own or were sharing it with their spouses.

Confidentiality infringement was not an issue to 92% of the population although rest of the population mostly the young generation complained of their confidentiality being infringed in the process of communication with the health care provider. Language problem (unable to communicate well with English) was an issue among 62% of the population with majority proposing Kiswahili as the preferred language of communication.

 Bigger proportion (66%) of the population did not anticipate any upcoming challenge to hinder the conversation process although rest of the population anticipated network problems and language barrier as some of the challenges that would interfere with such an intervention in future. Bigger proportion (99%) of the population anticipated to benefit from this doctor-patient communication strategy with majority claiming to have a chance to get the required medical advice from the doctor. Majority of these had no

problem using their personal cell phones for this communication and they were not ready to share their cell phones to avoid infringement of their confidentiality.

Majority of the respondents (72%) preferred calling the hospital with their own phones for convenience and confidential purposes whereas only 26% could call or text the hospital and only 0.2% would wait to receive a call from the hospital (Table 2). About 47% of the respondents reported that receiving reminders to take their drugs was not the solution for improved adherence and majority of them preferred direct communication with the health care provider to seek for medical advice (Figure2).

Association of different socio-demographic status to the respondents' opinion

HIV infected patients under 30 years of age were more likely to be careful to protect their confidentiality as compared to those above 30 years of age ($p=0.023$) (Table 4). The HIV infected patients who were employed and educated were more likely to afford cell phones as compared to the unemployed and the illiterate in the society (p 0.001) (Table 5).

The language problem is more likely to be an issue among the uneducated, unemployed and the aged as compared to the educated, employed and the young generation (p 0.001) (Table 6). While those in need of cell phone reminder were more likely to be 30 years or below and single as compared to those above 30 years of age and the married, divorced or the widowed (p 0.001,0.003) (Table 7).

Discussions

The study finding that majority of those using their cell phone alarms used them for waking up rather than reminder for taking drugs concurred with a the Peruvian study that reported 77% (24/31) cell phone accessibility 23% (7/31) alarm usage as a reminder

for their medications [5]. This may imply that most of the lost adherence to medication would not be attributed to forgetfulness but maybe other atrributed reasons.

Majority (99%) of those interviewed had no problem using their current phones to call or send text messages to the doctor concurring with the Peruvian study results where 74% of the participants supported the use of cell phone as tool to support adherence to medication and majority claimed to have no problem using their current phones for the communication [5].

The patients preference to calling the health care provider other than sending text concurred with Warren statement that 'Communication of almost any type using SMS messages would lack nuance and individual "tailoring" so that synchronous, real-time voice communication between patient and healthcare provider would be preferred' [10] , Walter report where equal proportions of the study population preferred calling and sending text [5], and Lester's conclusion that cell phone text messaging was feasible communication to support adherence [4].

The anticipation of benefits from the doctor-patient communication than the normal hospital consultancy was supported in Walter study where most of the respondents reported that they would like to receive general HIV information via cell phones, including advances in HIV treatment and recent research [5].The few percentage of people with language problem could be attributed to the growth in literacy level in the country after the introduction of free primary education systems and the fact that most of the people interviewed were from the urban set up with increased literacy levels as compared to the rural areas.

The finding that majority of the participants would not need the cell phone for reminder to take drugs differed from the report of Walter who reported that most of those interviewed 23/31 (74%) reported their willingness to use cell phones to receive reminder messages for their HIV medication [5]. It also differed from the report by Lester that use of text message reminders was a feasible method of improving self reported adherence [3].

Confidentiality infringement was not a big issue among the respondents concurring with the Walter study that reported greater confidentiality on the one using cell phones as compared to face-to-face interactions [5]. Simoes et al also reported that in audio computer-assisted self-interview (ACASI), there was more protection of patients' privacy as compared with the administration of questionnaires by the interviewer [6,7].

The anticipation of benefits from this doctor-patient conversation by a greater proportion was supported by Walter study where the study population perceived that HIV information was important to their health [5]. This also concurred with Atun report on varied health-related uses of SMS applications where he suggested that it " deliver [s] both efficiency savings and improvements in the health of individuals and public health"[9].

The illiteracy reported from the study is also getting erased by the enforcement of compulsory free primary and secondary education in the new constitution. This may also not affect the verbal communication as reported by Warren that the introduction of voice based technology other than the SMS based applications would be of great help to illiteracy in communities [10].

The finding that confidentiality infringement was more of a problem among the young implied that the young population has other factors in the society that would make them fear disclosing their status to the second party. More research is needed to ascertain the predisposing factors to this finding.

Cell phone affordability was not a problem among the educated and employed with a considerable salary implying that an additional income will increase one's ability to acquire a cell phone as reflected in Warren study findings where the relationship between GDP/capita and mobile phone subscriptions per capita suggested that small changes in "wealth" would result in large changes in mobile phone penetration in poorer countries at GDP/capita less than about $3–4,000 [10].

The language problem was an issue among the illiterate and unemployed concurring with Feldman report that 'Pervasive illiteracy may be the rate-limiting step on use of SMS text messaging' [8].

Need of cell phone reminder was high among the young and widowed concurring with Walter study results where majority of those interviewed felt that alarm reminders for medication were needed only by the ART-naïve patients [5].

CONCLUSION

Participants generally found the concept of using mobile phones in their health management to be highly favorable. They generally preferred direct communication with the health care providers versus receiving medication reminders as only a minority currently used their phone alarms for this purpose. They also appeared to favor phone discussions to text messaging communications with health care providers. However although reminders were not preferred or used by the majority, a portion did report using

their phone alarms for reminders, so we could not fully conclude that there is no need for reminders, only that they are not a primary reason for use.

Competing Interests

The authors declare that they have no competing interests.

Authors' contributions

All authors contributed to the paper. FK and ES conceived the study; FK conducted the study; MK and GK provided the research team with a key link between JKUAT and KEMRI administration and technical assistance; JM assisted in preparation of the data collection tools and PM assisted in recruitment of the study participants. All authors reviewed drafts of the manuscript.

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Figures:

Figure 1: Expected information from the doctor-patient communication

Figure 2: The preferred language of communication

Figure 3: Language problem

Figure 4: Anticipated benefits from the doctor-patient communication

Figure 5: Confidentiality infringement

Tables:

Table 1: Access and current use of cell phones among the sampled HIV infected patients

Characters	All (%)	Male (%)	Female (%)
Phone ownership(n=500)			
Yes	497(99.4)	193(100)	304 (99.4)
No	3(0.6)	0(0.0)	3(0.6)
Send SMS (n=498)			
Yes	420(84.3)	163(84.9)	257(84.0)
No	78(15.7)	29(15.1)	49(16.0)
Alarm use(n=495)			
Yes	299(59.8)	98(50.8)	201(65.5)
No	201(40.2)	95(49.2)	106(34.5)
Alarm purpose(n=295)			
Waking up	277(76.7)	91(73.4)	186(78.5)
Reminder to take drugs	53(14.7)	18(14.5)	35(14.8)
Reminder for important events	31(8.6)	15(12.1)	16(6.8)

Table 2: Participants response to perceptions defining questions

Characters	All (%)	Male (%)	Female (%)
Support the idea(n=499)			
Yes	495(99.2)	190(99.0)	305 (99.3)
No	4(0.8)	2(1.0)	2(0.7)
Information type(n=495)			
Drugs reminder	28(3.0)	10(2.7)	18(3.2)
Communicate side effects	266(28.4)	106(28.9)	160(28.1)
Medical advice	434(46.4)	171(46.6)	263(46.2)
Inquire appointments	183(19.6)	70(19.1)	113(19.9)
Gets healthcare provider's updates	25(2.7)	10(2.7)	15(2.6)
Whose phone (n=499)			
Own phone	496(99.4)	192(99.5)	304(99.3)
New phone	2(0.4)	0(0.0)	2(0.7)
None	1(0.2)	1(0.5)	0(0.0)
Communication mode (n=498)			
Calling the hospital	359(72.1)	130(67.7)	229(74.8)
Sending SMS to hospital	9(1.8)	4(2.1)	5 (1.6)
Calling & texting the hospital	129(25.9)	58(30.2)	71(23.2)
Being called or texted by the hospital	1(0.2)	0(0.0)	1(0.3)
Phone affordability (n=499)			
Yes	261(52.3)	111(57.5)	150(49.0)
No	229(45.9)	82(42.5)	147(48.0)
Don't know	9(1.8)	0(0.0)	9(1.8)
Anticipation of a			
problem(n=500)			
Yes	167(33.4)	66(34.2)	101(32.9)
No	333(66.6)	127(65.8)	206(67.1)
Anticipated problems			
Affect confidentiality	31(19.5)	10(16.7)	21(21.2)
Network problems	53(33.3)	26(43.3)	27(27.3)
Language problem	52(32.7)	20(33.3)	32(32.3)

Un-cooperative healthcare provider	23(14.5)	4(6.7)	19(19.2)

Table 3: Established perceptions towards cell phone as a tool for supporting ARV adherence

Characteristic	GOOD (%)	BAD (%)
Support the idea	99.2(NO)	0.8(YES)
Phone affordability	55.0 (YES)	45.0(NO)
Confidentiality infringement	92.0(NO)	8.0 (YES)
Language problem	62.0(NO)	38.0(YES)
Anticipation of an hindrance	66.5(NO)	33.5(YES)
Anticipation of a benefit	98.4(YES)	1.6(NO)
TOTAL	473.1	126.9
Overall perception (%)	**78.9**	**21.1**

Table 4: Association of the confidentiality infringement with the social demographic characteristics

Variable		Infringement	No infringement	OR	95% CI		*p-value*
Age				2.548	1.110	5.848	**0.023**
	30yrs	9	74	2.050	1.151	3.652	
	>30yrs	19	398	0.805	0.622	1.041	
Gender				0.513	0.214	1.230	0.129
	Male	7	186	0.634	0.331	1.217	
	Female	21	286	1.238	0.987	1.551	
Education				0.957	0.322	2.843	0.937
	Educated	24	402	1.006	0.861	1.176	

Variable		Afford	Not afford	OR	95% CI		p-value
	Non Educated	4	70	0.963	0.379	2.448	
Marital status				0.617	0.286	1.322	0.216
	Married	12	259	0.781	0.505	1.207	
	Un-married	16	213	1.266	0.905	1.772	
Occupation				0.579	0.269	1.244	0.158
	Employed	15	189	1.338	0.931	1.922	
	Un-employed	13	283	0.774	0.517	1.161	

Table 5: Association of cell phone affordability with the social demographic characteristics of the respondents

Variable		Afford	Not afford	OR	95% CI		p-value
Age				0.995	0.621	1.596	0.985
	30yrs	44	39	0.996	0.672	1.477	
	>30yrs	221	195	1.001	0.925	1.083	
Gender				1.336	0.929	1.921	0.120
	Male	111	82	1.195	0.955	1.497	
	Female	154	152	0.895	0.719	1.028	
Education				0.366	0.217	0.618	**0.001**
	Educated	241	184	1.157	1.071	1.249	
	Non educated	24	50	0.424	0.269	0.667	

Variable		Yes	No	OR	95% CI		p-value
Marital status				1.343	0.943	1.913	0.102
	Married	153	118	1.145	0.972	1.348	
	Un-married	112	116	0.853	0.704	1.032	
Occupation				0.464	0.321	0.669	**0.001**
	Employed	131	73	1.585	1.264	1.986	
	Un-employed	134	161	0.735	0.634	0.851	

Table 6: Association of language problem with the social demographic status of the respondents

Variable		Yes	No	OR	95% CI		*p*-value
Age				0.380	0.213	0.678	**0.001**
	30yrs	16	67	0.436	0.261	0.728	
	>30yrs	161	256	1.148	1.067	1.234	
Gender				0.761	0.520	1.114	0.160
	Male	61	132	0.843	0.662	1.074	
	Female	116	191	1.108	0.963	1.275	
Education				23.412	10.895	50.311	**0.001**
	Educated	111	315	0.643	0.573	0.721	
	Non Educated	66	8	15.055	7.398	30.637	

Variable	Yes	No	OR	95% CI		p-value
Marital status			0.812	0.562	1.172	0.266
Married	90	181	0.907	0.762	1.080	
Un-married	87	142	1.118	0.921	1.357	
Occupation			6.371	4.025	10.085	**0.001**
Employed	28	176	0.290	0.204	0.414	
Un-employed	149	147	1.850	1.616	2.118	

Table 7: Association of perceptions towards cell phone reminder with the social demographic characteristics

Variable	Yes	No	OR	95% CI		*p*-value
Age			3.243	1.670	6.299	**0.001**
30yrs	16	66	2.446	1.556	3.844	
>30yrs	29	388	0.754	0.605	0.940	
Gender			0.618	0.316	1.210	0.158
Male	13	180	0.729	0.454	1.168	
Female	32	274	1.178	0.964	1.440	
						0.463
Education			0.697	0.266	1.830	
Educated	40	385	1.048	0.939	1.171	
Non Educated	5	69	0.731	0.311	1.718	
Marital status			0.390	0.204	0.745	**0.003**
Married	15	255	0.593	0.390	0.904	
Un-married	30	199	1.521	1.207	1.917	

Occupation			1.154	0.614	2.168	0.658
Employed	17	187	0.917	0.621	1.356	
Un-employed	28	267	1.058	0.832	1.345	

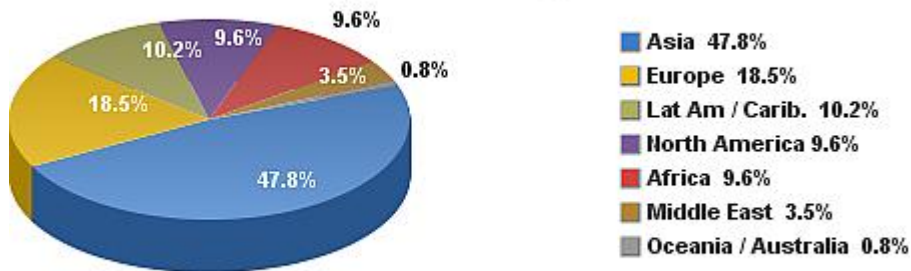Table 8 A:ssociation of perceptions towards alarm use with social demographic characteristics

Variable		Yes	No	OR	95% CI		*p*-value
Age				4.421	2.372	8.239	**0.001**
	30yrs	70	13	3.620	2.059	6.364	
	>30yrs	299	188	0.819	0.762	0.880	
Gender				0.544	0.377	0.786	**0.001**
	Male	13	180	0.693	0.557	0.863	
	Female	32	274	1.275	1.094	1.485	
Education				0.195	0.113	0.338	**0.001**
	Educated	40	385	1.276	1.167	1.395	
	Non Educated	5	69	0.249	0.154	0.403	
Marital status				0.622	0.422	0.894	**0.010**
	Married	15	255	0.809	0.690	0.948	
	Un-married	30	199	1.301	1.058	1.600	
Occupation				0.512	0.352	0.744	**0.001**
	Employed	17	187	1.505	1.187	1.907	

Un-employed	28	267	0.770	0.668	0.887	

Appendix 7: Internet penetration in the world

Internet Users in the World
Distribution by World Regions - 2015 Q2

9.6%

9.6%

10.2%

18.5%

3.5%

0.8%

47.8%

- ■ Asia 47.8%
- ■ Europe 18.5%
- ■ Lat Am / Carib. 10.2%
- ■ North America 9.6%
- ■ Africa 9.6%
- ■ Middle East 3.5%
- ■ Oceania / Australia 0.8%

Source: Internet World Stats - www.internetworldstats.com/stats.htm
Basis: 3,270,490,584 Internet users on June 30, 2015
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