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# Messages and Perceived Self-Efficacy

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## Abstract

**Purpose:** The purpose of this study was to ascertain the effect of frequency of text messaging on perceived self-efficacy for treatment among people living with HIV/AIDS in Homa Bay County.

**Methodology:** The study used a quasi-experimental design. This involved a control and an intervention group to assess the effect of the text messaging. Data was collected using an interview schedule for participants and questionnaires for key informant interview. The study triangulated quantitative and qualitative data. Results shared in this paper are for the intervention group. Spearman's rho correlations and simple linear regression models were used to estimate the relationship between the independent variable (frequency of messages) and the dependent variable (self-efficacy), and ANOVA test was done to test the hypothesis and presented in tables and graphs. Qualitative data was analyzed thematically and narratives are provided under each section in verbatim.

**Findings:** The desired sample size for the intervention group was 317. Out which the study achieved 77.92 percent (n=247). Frequency of messages, did not yield a statistically significant relationship on perceived self-efficacy for appointment adherence ($p<0.52$; CI=95 per cent). However, receiving messages on a monthly basis had a significant but relatively week, inverse relationship with perceived self-efficacy (C= -0.181; $p<0.02$ ;< 0.05,). Qualitative findings established the messages were not boring

**Unique Contribution to Theory, Practice and Policy:** Frequency of messages may depend on other factors such as type and content of messages being sent. Individual characteristics such as the social environment, level of education and general interest of HIV information and ART adherence may also influence the frequency of messages. Mobile interventions should ensure that the right number of required messages is sent to patients for optimum utilization and achievement of the desired outcomes.

**Key words:** *Appointment adherence; HIV/AIDS; Self-efficacy; Text for adherence (T4A), Frequency of messages.*

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## 1.0 INTRODUCTION

Majority of countries globally including Kenya are committed towards achieving the 95-95-95 targets (UNAIDS, 2015) in an attempt to suppress and track progress towards the HIV epidemic by 2030, given that the population living with HIV globally has reached 38 million. HIV management in the developed world has experienced trends in the development and effective use of highly sensitive and specific HIV screening tests (WHO, 2002a), focus towards viral load testing and suppression (Pearson & Eagan, 2017), In addition, reducing the risk of mother-to-child transmission (MTCT) by including Early Infant Diagnosis. However, recent data suggest that such short-term successes may be at the expense of resistance and viral failure once treatment is introduced after delivery (Bertozzi et al., 2006; Eshleman et al., 2001). The World Health Organization (WHO) estimates show that different regions were at various levels of achieving the UNAIDS 90-90-90 program targets by 2020 as Kenya has reached 89-77-63 (UNAIDS, 2019). Kenya has the fifth-largest number of persons living with HIV in the world, of about1.5 Million people which translates to a prevalence rate of 4.9 per cent. HIV continues to be a leading cause of adult morbidity and mortality, nonetheless the last decade has had the greatest positive impact in terms of controlling the HIV epidemic in Kenya (National AIDS Control Council (NACC), 2018). HIV incidence among adults aged 15-49 has declined from 3.5 per 1000 in 2010 to 1.4 per 1000 in 2018 and new HIV infections among all ages declined from 77,200 in 2010 to 36,000 in 2018. This indicates 53 per cent decline in the number of new annual HIV infections at national level, in spite of population growth(National AIDS Control Council (NACC), 2018).

One of the challenges facing HIV/AIDS management is the degree of antiretroviral therapy (ART) adherence. The challenge to manage chronic illnesses such as HIV is the rate of defaulters in the course of managing life-long diseases. More so in developing countries like Kenya, limited human resource for defaulter tracing has become a major challenge. The result of this consequence has led to the suboptimal utilization of health services among patients hence has negatively impacted on an individual's health outcomes (UNAIDS, 2018a). As such, ART entails continuous follow-up and strict adherence to treatment. This calls for the need to leverage technology to inform People Living with HIV (PLHIV) on the treatment adherence since the field of mobile phone technology is marked with tremendous growth globally, especially with high level mobile phone penetration.

There is sufficient evidence that mHealth innovations have been able to influence treatment adherence and subsequently improve patient outcomes (Deglise, Suggs, & Odermatt, 2012) (Sharma & Agarwal, 2012); (Badawy et al., 2017). mHealth to the concept of mobile self-care that consumer technologies like smartphone and tablet apps that enable consumers to capture their own health data, without a clinician's assistance or interpretation[1]. mHealth thereby intends on improving health outcomes, health care services and health research by using mobile and wireless technologies. A study done by Cole-Lewis & Kershaw (2010), reported that eight out of nine sufficiently powered studies found statistically significant effects on behavior change for disease prevention and chronic disease self-management using text messaging intervention. Text-messaging interventions (TMIs) may be scalable at a relatively low cost, and simple models can

reach large groups of people at a low cost per person, more complex interventions may have a higher per capita cost TMIs also have the potential to incorporate qualities often associated with more effective health communication interventions, such as tailoring, interactivity, personalization, and/or high message repetition (Hall et al., 2015). Whereas mobile health solutions appear to be effective, there has been concern on the impact of the solutions on building self-efficacy among patients for the desired long-term health outcomes. Accordingly, Morrison et al. (2017), study demonstrated that there is need for further research in a larger sample over a more extended period to identify whether frequency or timing of notification delivery is associated with health-related change. Conversely, in many cases mHealth solutions are designed and pushed down to the patients for implementation without having strategies in place to enable the patients be part of the decision making on how the solutions work which the main aim of the study. There is need to assess the relative effectiveness of specific Text Message Intervention delivery characteristics, such as frequency of messaging to the improvements to managing chronic diseases (Hall et al., 2015). This study therefore focused on text messaging frequency as a mobile phone text messaging intervention, which was used to send appointment, wellness and informative messages to PLHIV in Homa Bay County.

**Objective**

To investigate the effect of frequency of mobile phone text messaging on perceived self-efficacy for treatment among PLHIV in Homa Bay County.

**Study Hypothesis**

$H_0$: Frequency of messages has no significant effect on the perceived self-efficacy for treatment among PLHIV in Homa Bay County

Hypothesis one: $Y= \beta_0 + \beta_1 X_1 + \varepsilon$

Where Y= Self efficacy index

$\beta 0$ = The intercept

$\beta_1$ = Regression coefficients shows the change in the value of Y from a unit change in X

$X_1$= Timing of messages; Frequency of messages

$\varepsilon$ = Random error

## 2.0 THEORETICAL FRAMEWORK

The study was pegged on the self-efficacy theory. This was critical in assessing the effectiveness of frequency as the communication strategy on influencing self-efficacy for treatment as a behavior. The theory places emphasis on four tenets namely mastery experience; vicarious experience; verbal persuasion; and somatic and emotional state. The expected outcome is improved appointment keeping rates by clients because of the reminders. In a systematic review titled “Does mHealth increase adherence to medication?” Anglada-Martinez et al., (2015) argues that the frequency of text messages may vary between adherence levels where text messages are more frequent when adherence is low (daily reminders), less frequent in patients with good

adherence (weekly reminders) (Anglada, Riu, Martin, Rovira, & Sotoca, 2015). The study reported 93% of the participants responded that they read all the SMS.

The text for adherence (T4A) messages are designed to condition participants by encouraging familiarity through a series of repetition, thus the more one relates or connects with the messages received the higher the influence on the belief that they can also accomplish the communicated behavior. T4A system is a mobile & web-based platform developed with the objective of improving the health outcomes of PLHIV by providing timely and reliable messages including appointment reminder messages, treatment adherence messages, and wellness messages. Reit et al. (2008) hypothesizes that Persuasive health messages are a central component of efforts to promote healthy behavior specifically how persuasive health messages are framed that can manipulate an individual through Somatic and emotional adaptations.

The study also used the Technology Readiness and Acceptance Model (TRAM) to assess the perception of efficacy as influenced by technology readiness index (TRI) and the technology acceptance theory (TAM). The two integrated theories looked at the adoption and acceptance of the technology and how the technology attributes may affect how an individual perceives new technology and subsequently how this affects the usage of the technology (Porter & Donthu, 2006). Therefore, this study looked at how the T4A system was adopted or accepted based on this integrated TRAM model. The platform also provides the care provider with an electronic appointment diary & defaulters tracing module aimed at managing patients' appointments at the facility level.

Most studies on mobile phone text messaging do not have options to choose the frequency of messaging. For example, in a study in South Africa on Mobile Phone Text Messages to Support Treatment Adherence in Adults with High Blood Pressure, personalized SMS text messages were sent to information-only message and interactive message group participants at weekly intervals at a time and in a language selected by the participant. Additional reminders were sent when medicines were ready for collection or for scheduled clinic appointments (Bobrow, et al., 2016).

According to Free et al. (2013), existing systematic reviews of M-health interventions focus on the application of specific devices (e.g., mobile phones), specific mobile technology functions (e.g., text messaging), or individual diseases or types of illness (e.g., diabetes care or chronic disease management) whose reviews require updating. However there is little literature that goes further to evaluate determinants of self-efficacy that promote health outcome on lifelong disease using the mHealth innovation. This study sought to evaluate the relationship between various elements on timing of messages (daily, weekly and monthly), towards self-efficacy index of PLWHA for treatment in western Kenya.

## 3.0 METHODOLOGY

### Target Population

The target population of this study was PLHIV and accessed HIV care and treatment services at the three facilities namely Gongo, Ogongo and Kiasa in Homa Bay County in Kenya. The three facilities were part of the initial implementation of the T4A project and had the privilege of having a flexible solution delivered in three languages (English, Swahili, and Luo). The facilities were

purposively selected for the comprehensive care and management of HIV which was in line with the objective of the study.

There are 1095 PLHIV who consented to receiving appointment messages using the T4A intervention across the three facilities and have been part of the T4A for more than 2 years. Specifically, the numbers of consented clients per facility were as follows; Ogongo 450, Gongo 244 and Kiasa 401 clients. This study also included a control group. The control group comprised of PLHIV from the same facilities (Gongo, Ogongo, and Kiasa) that have not consented to receive mobile text messages on T4A.

**Sampling frame**

Based on program data from the selected facilities and T4A database on the current people receiving HIV care and treatment, the sampling frame for the study included a total of 2,175 people receiving HIV care and treatment in the three facilities of which 45 per cent had consented to receiving messages while 55 per cent were not receiving messages.

**Sample and sampling techniques**

Using the formula for quasi experimental design sampling;

$$\mathbf{n} = \frac{\mathbf{2}(\acute{p})\,(\mathbf{1}-\acute{p})(\boldsymbol{Z\alpha}+\boldsymbol{Z\beta})^2}{\boldsymbol{d}^2}$$

*Where:*
n = Sample size in each arm
ṕ = Measure of variability (from 90% adherence to 94.5% adherence)
Zα = 1.96 (critical value at 95% confidence interval and 0.05 significance level)
Zβ = 0.84 (critical value at 80% desired power)
d= 4.5% (Effect size of the intervention /difference in proportion)

**Table 1:** *Sample size estimation*

| **Study site** | **Intervention group expected sample size** |
|---|---|
| Gongo dispensary | 38 |
| Kiasa Health Centre | 150 |
| Ogongo sub-County hospital | 129 |
| **Total** | **317** |

**Data Collection tools**

The study used two instruments of data collection, which were key informant interview guide and interview schedule for respondents. A file review was also done to collect appointment information that was intended to validate the information collected from the patients through the questionnaires.

**Research Design**

The study employed a quasi-experimental design to find out the overall effect of text messaging frequency, on perceived self-efficacy for appointment adherence for patients in the various facilities receiving care and treatment. Quasi-experimental design suited best due to lack of randomization of the participants at the implementation stage. According to (Maciejewski, 2020), most common quasi-experiment designs are retrospective study of a single treatment group that would be compared with a non-equivalent group that can either be self-registered into the group or a provider or health care worker and select or register them on behalf of the patients or participants. The intervention group comprised of PLHIV who had consented to receive mobile phone text messages through the text for adherence (T4A) system in the three facilities. The control group included PLHIV who were also receiving care and treatment but had not consented to receive text messages. Both groups received regular care and treatment from the sampled facilities. The control group was compared with the intervention group to assess the role of the mobile phone text messaging strategies on perceived self-efficacy for treatment among PLHIV. The independent variable was manipulated but participants were not randomly assigned to conditions or orders of conditions (Cook & Campbell, 1979). The rest of the factors remained constant.

The content of the messages (T4A) involved short texts delivered via mobile phones reminding patients on their appointment dates (appointment messages), prompt messages on how well or not okay the patients are doing and informative texts. The frequency of the messages depended on the type of messages the clients select to be receiving. Therefore a client may receive messages on a daily, weekly or monthly basis depending on individual desire.

**Data Collection Methods**

The research used Key informant interviews for health Care professionals and interview schedule for the respondents. The study employed qualitative and quantitative data.

**Data Analysis**

Descriptive and inferential analysis of quantitative data was conducted using SPSS version 25. The study used Spearman's Rho non-parametric test and linear regression models to examine the influence of frequency of messages on perceived self-efficacy and ANOVA to test the Hypothesis. Self-efficacy index was measured using the 4-likert scale and results were based on outcomes within the intervention group. Data was presented using tables and figures.

Qualitative research was transcribed and translated to English. Data was then analyzed using Nvivo version 11 for thematic analysis. Transcripts were coded inductively, clustered to reflect emerging themes. Qualitative data was presented in narratives as quotations in the report.

## 4.0 RESULTS RESPONSE RATE AND PROFILE OF THE RESPONDENTS

Generally, the study achieved 77.79 per cent of the desired sample (n=543/698). More than two quarters, (55 per cent) of the total sample size achieved were members of the control group while 45 per cent (n=296) were members of the intervention group. Within the intervention group, majority of the sample consisted of female population (66.40 per cent), while 33.60 per cent were male. In terms of marital status, bulk of the population were formally married (61.54 per cent) and

(19.03 per cent) were widowed. Two-thirds (14.57 per cent) were cohabiting while of the sampled, 3.24 per cent were either separated or divorced. Only 1.93 per cent were single.

In regard to level of education, it is apparent that majority of the respondents, 40.89 per cent had not completed primary school while two thirds (32.79 per cent) had completed primary school, 10.53 per cent had completed secondary school, whereas 9.31 per cent had not completed secondary school. Less than a sixth (3.64 per cent) had completed tertiary education. Only 2.83 per cent had not attained any level of education.

On average weekly income, over 81.77 per cent were earning less than a thousand shillings. This includes 47.77 per cent of respondents that were earning Ksh.101- Ksh. 500, 17.81 per cent were earning less than 100Ksh and 16.19 per cent were earning Ksh. 501- Ksh. 1,000. Only14.17 per cent were earning 1000ksh and above {5.67 per cent that were earning Ksh. 2,001 and above and 8.50 per cent were earning Ksh. 1,001- Ksh. 2,000}. Interestingly, 4.05 per cent did not have any income. The above results confirm findings that indicate rural settings like Homa Bay demonstrates low levels of income. The results are in line with the Kenya AIDS Indicator Survey (KAIS, 2012) which validated that in rural households, the majority population fell within the lowest (94.3 per cent), second (87.3 per cent), and middle (76.6 per cent) wealth quintile(National AIDS and STI Control Programme (NASCOP) Kenya, 2012). Table 2 shows the summary of socio-demographic characteristics.

**Table 2: Socio-demographic characteristics**

| **Socio-demographic Indicators** | | | |
|---|---|---|---|
| **Variable** | Indicator | N | Percentage |
| **Gender** | Female | 164 | 66.40% |
| | Male | 83 | 33.60% |
| | Total | 247 | 100.00% |
| **Marital Status** | Cohabiting | 36 | 14.57% |
| | Legally married | 152 | 61.54% |
| | Separated/divorced | 8 | 3.24% |
| | Single | 4 | 1.62% |
| | Widowed | 47 | 19.03% |
| | Total | 247 | 100.00% |
| **Education** | Completed primary school | 81 | 32.79% |
| | Completed secondary school | 26 | 10.53% |
| | Completed tertiary training | 9 | 3.64% |
| | None | 7 | 2.83% |
| | Not completed primary school | 101 | 40.89% |
| | Not completed secondary school | 23 | 9.31% |
| | Total | 247 | 100.00% |
| **Income** | Ksh 2001 & above | 14 | 5.67% |
| | Ksh. 1001- Ksh. 2000 | 21 | 8.50% |
| | Ksh. 501- Ksh. 1000 | 40 | 16.19% |
| | Ksh.101- Ksh. 500 | 118 | 47.77% |
| | Less than Ksh. 100 | 44 | 17.81% |
| | No income | 10 | 4.05% |
| | **Grand Total** | **247** | **100.00%** |

### 4.1Frequency of mobile text messaging

Respondents were asked to state how often they received messages. Frequency was classified into daily, weekly and monthly as shown in Table 3.

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**Table 3: Frequency of messaging**

| | Frequency of messages | (n) | % |
|---|---|---|---|
| | Daily | 20 | 8.10% |
| | I don't know | 34 | 13.77% |
| | Monthly | 164 | 66.40% |
| | Weekly | 29 | 11.74% |
| | **Total** | **247** | **100.00%** |

In terms of frequency of receiving messages, more than two quarters (66.40 %) of the respondents preferred to receiving messages on a monthly basis, while weekly (11.74%) was the second most ideal frequency of receiving messages. Only 8.10% favored to have messages delivered on a daily basis. Interestingly, 13.77 % did not remember how often they used to get messages as depicted in Figure 1.

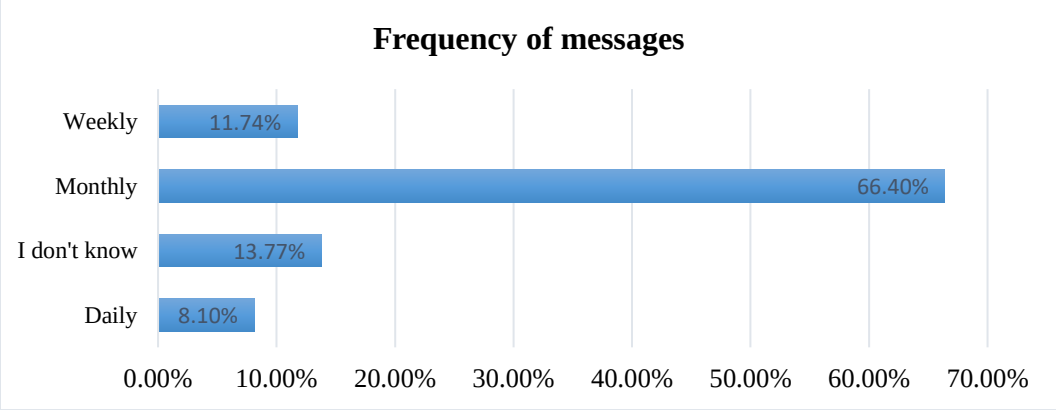


**Figure 1: Frequency of Messages**

Perhaps less frequent messages are ideal compared to bombarding patients with messages that may end up becoming boring and monotonous. This could explain why there was high preference (66.40%) to receive messages on a monthly basis.

### 4.2 Perceived self -efficacy

Self-efficacy as described by Bandura, (1986) is a major determinant of motivation to engage in healthy behavior (Reit et al., 2008). Self-efficacy indicator looks at the direct patterns of adherence by the participants receiving Text for Adherence messages. This permits adapting of the intervention to the individual over the course of the intervention (Riley et al. 2011). A 4-likert scale was used to measure the self-efficacy scores. The measures were categorized into high, moderate and low level of self-efficacy as shown in Table 4.

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**Table 4: Perceived self-efficacy among test group**

| Levels of self-efficacy | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | High | | Moderate | | Low | | | | | |
| **Statements** | Strongly agree n | % | Moderately True n | % | Hardly true n | % | Not at all true n | % | **Total by row n** | **%** |
| If I try hard enough, I can always keep all my appointments attended | 212 | 85.83% | 32 | 12.96% | 2 | 0.81% | 1 | 0.40% | **247** | **100.0%** |
| No one can influence me not to keep my appointments | 217 | 87.85% | 26 | 10.53% | 3 | 1.22% | 1 | 0.40% | **247** | **100.0%** |
| It is easy for me to stick to my aims and accomplish my goals including keeping all my appointments | 214 | 86.64% | 26 | 10.53% | 5 | 2.02% | 2 | 0.81% | **247** | **100.0%** |
| Thanks to my resourcefulness, I know how to handle unforeseen situations so that I keep my appointments | 208 | 84.21% | 36 | 14.58% | 2 | 0.81% | 1 | 0.40% | **247** | **100.0%** |
| I can solve most problems if I invest the necessary effort to attend my appointments | 212 | 85.83% | 32 | 12.96% | 2 | 0.81% | 1 | 0.40% | **247** | **100.0%** |
| I can remain calm when facing difficulties by relying on my coping abilities to keep all my appointments attended | 203 | 82.19% | 40 | 16.19% | 3 | 1.22% | 1 | 0.40% | **247** | **100.0%** |
| When I am confronted with a problem, I can usually find several solutions to keep my appointments | 210 | 85.02% | 32 | 12.96% | 4 | 1.62% | 1 | 0.40% | **247** | **100.0%** |
| If I am in trouble associated with keeping my appointments, I can usually think of a solution | 210 | 85.02% | 32 | 12.96% | 4 | 1.62% | 1 | 0.40% | **247** | **100.0%** |
| If I am in trouble associated with keeping my appointments, I can usually think of a solution | 215 | 87.04% | 30 | 12.16% | 1 | 0.40% | 1 | 0.40% | **247** | **100.0%** |

According to Table 4, individuals with high level of self-efficacy scored exactly true on all questions, while; individuals who scored moderately true were classified as having moderate level of self-efficacy. Findings from this study established that majority of the respondents scored high levels of self-efficacy that ranged between 82.19 per cent and 87.85 per cent. The proportion of

individuals who presented moderate levels of self-efficacy ranged between 10.53 per cent and 12.96 per cent. Respondents with low levels of self-efficacy ranged between 0.80 to 2.44 per cent.

SMS messages sent at user designated 'good' times are likely to have positive impact on receptivity and perceived self-efficacy levels. However, the frequency of messages may have been influenced by perceptions of the notification content and type of messages (appointment reminders, wellness and informative messages) that counters the effects of repetitiveness that may make the respondent lose interest in the period of the intervention. Individuals who chose more than one type of messages may have had more frequent messages compared to those who were only receiving one type of messages.

### 4.3 Effect of Frequency of Mobile text messaging on the perceived self-efficacy for treatment among PLHIV in Homa Bay County

Spearman's Rho, non-parametric test was used to measure the strength of association between frequency of messages and self-efficacy index as shown in Table 5.

**Table 5: Effect of frequency of messages on self-efficacy**

| Frequency | | Daily | Weekly | Monthly | Self-Efficacy Index |
|---|---|---|---|---|---|
| Daily | Correlation Coefficient | 1.000 | | | 0.145 |
| | Sig. (2-tailed) | | | | 0.542 |
| | N | 20 | 0 | 0 | 20 |
| Weekly | Correlation Coefficient | | 1.000 | | 0.135 |
| | Sig. (2-tailed) | | | | 0.485 |
| | N | 0 | 29 | 0 | 29 |
| Monthly | Correlation Coefficient | | | 1.000 | -.181* |
| | Sig. (2-tailed) | | | | 0.020 |
| | N | 0 | 0 | 164 | 164 |
| Self-efficacy index | Correlation Coefficient | 0.145 | 0.135 | -.181* | 1.000 |
| | Sig. (2-tailed) | 0.542 | 0.485 | 0.020 | |
| | N | 20 | 29 | 164 | 247 |

*** Correlation is significant at the 0.05 level (2-tailed)**

Data shows that there was no significant relationship between receiving messages on a daily basis (p=0.52; >0.05, CI=95 per cent) as well as on a weekly basis (p=0.485; >0.05, CI=95 per cent) on the self-efficacy index. However, there was an inverse relationship in correlation {negative but weak relationship} between receiving messages monthly to self-efficacy index(C=-0.181; p=0.02 ;< 0.05). Thus If individuals received messages on a monthly basis only they were likely to have

low levels of self-efficacy. Further, a linear regression model was also used to ascertain the overall statistical significance of frequency of messages on self-efficacy in Table 6.

**Table 6: Regression model on frequency of messaging and self-efficacy index**

**Regression Model-Coefficient[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| **1** | (Constant) | -5.343E-16 | 0.063 | | 0.000 | 1.000 |
| | Z-score (Frequency) | 0.026 | 0.064 | 0.026 | 0.402 | 0.688 |

**a. Dependent Variable: Z-score (self- efficacy index)**

The result (p=0.688; >0.05; CI=95 per cent) implies that there was no significant evidence to reject the null hypothesis, hence the conclusion that frequency of messages had no statistically significant effect on the self-efficacy. The sub-variables of frequency were assessed separately as shown in Table 7.

**Table 7: *Analysis of individual sub-variables of Timing and self-efficacy***

**ANOVAa**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **1** | Regression | 0.671 | 1 | 0.671 | 0.340 | .567b |
| | Residual | 35.517 | 18 | 1.973 | | |
| | Total | 36.188 | 19 | | | |

**a. Dependent Variable: Zscore(self-efficacy index)**

**b. Predictors: (Constant), Zscore(daily)**

**ANOVAa**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **1** | Regression | 0.231 | 1 | 0.231 | 0.156 | .696b |
| | Residual | 39.948 | 27 | 1.480 | | |
| | Total | 40.179 | 28 | | | |

**a. Dependent Variable: Zscore(self-efficacy index)**

**b. Predictors: (Constant), Zscore(weekly)**

**ANOVAa**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **1** | Regression | 2.556 | 1 | 2.556 | 2.903 | .090b |

| | | | |
|---|---|---|---|
| Residual | 142.631 | 162 | 0.880 |
| Total | 145.187 | 163 | |

**a. Dependent Variable: Zscore(self-efficacy index)**
**b. Predictors: (Constant), Zscore(monthly)**

Findings from Table 7 indicate that individually (Daily, weekly & monthly), none of them had an effect on the self-efficacy index (daily, p-value <0.567; weekly, p-value<0.696 and monthly, p-value<0.090; CI=95%.

### 4.4Qualitative Findings

Triangulation of quantitative and qualitative was done to strengthen the study. Qualitative findings demonstrate the importance of considering frequency of messages. Majority of the respondents said that the frequency of the messages mattered a lot because it was important to ensure that patients are not bored by many messages.

> *"Yes the frequency was important because it would have affected some patients who complained of getting many messages at the same time thus raising questions with their partners why they were receiving all those messages."*_ Program officer

However, some observed that this would depend on other factors such as the type of messages and the stability of the patients.

> *"I think the frequency of the messages largely depends on the model in which the patient is receiving care. Patients on differentiated care model are stable and may not need to receive the messages so frequently. However, if one is not coming to the facility and you keep on sending the messages then it means the messages are not working. Patients who are stable with suppressed viral load can even come after six months. So the condition of the patient and model of care matter a lot in determining the frequency."*_ DASCO

### Discussion

Frequency of messages is an important communication strategy that should be considered in mHealth interventions. Monthly messages were mainly the appointment messages which focused on reminding patients to attend their appointments and take medication. Whereas receiving fewer messages may not have any impact on the expected outcomes, bombarding patients or generally individuals with messages may end up becoming boring. Better outcomes in terms of self-efficacy may therefore be attributed to the type of messages they received on a monthly basis and not specifically the frequency of the messages.

Results from this study suggest that sending frequent, daily notifications may not deter users from engaging with message based intervention and could mean that they are exposed to more of the intervention content; thereby increased knowledge in terms of content being relayed on the platform. However, precise thresholds for the frequency at which notifications deter or encourage self-efficacy is not yet known nonetheless qualitative research highlights individuals' tendency to either adopt messages or "outgrow" them.

It is critical to note that the frequency of messages depends on other factors such as type and context (Fear-appeal or persuasive) messages a mHealth intervention may have. Other studies have also demonstrated this by arguing that the frequency of messages depends on factors related to both the sender and the recipient. According to (Head et al., 2013), the sender's ability, in terms of taking care of the related expenses determines the number and frequency of messages to be sent. On the other hand the recipient's needs such as adherence levels should be critically considered. Other extraneous variables like the timing, content of messages and social environment i.e. stigma, peers or level of education etc. affect how an individual perceives the type of messages and action taken thereafter. Text messages could be more frequent when adherence is low (daily reminders) and less frequent in patients with good adherence (weekly reminders)(Rana et al., 2015)(Anglada-Martinez et al., 2015).

In this study the frequency of messages depended on whether patients were receiving all types of the messages (appointments, wellness and informative) or just one or two types of the messages. Nonetheless, majority of patients preferred receiving messages monthly as compared to those receiving on daily/ weekly basis and appeared to have better outcomes. An inverse relationship was established between receiving messages monthly and self-efficacy thus the more frequent the messages the less the self-efficacy index of an individual. The finding correspond to Hall et al. (2015) study findings that established greater effects were associated with text messages on ART adherence that were sent less frequently than daily (such as weekly). Accordingly, Interventions that used an individualized or decreasing frequency of messages over the course of the intervention were more successful than interventions that used a fixed message frequency (Head et al., 2013).

## Conclusion

Whereas frequency of the messages is also an important communication strategy, it depends on other factors such as the context and type of messages an intervention has and those that a patient may have consented for. However, sending messages more frequently than required may not have any positive effect on the outcome of the intervention, finding the correct balance in the frequency of sending text messages is paramount depending on the nature of the intervention. Of importance is that messages should be user centered to achieve better health and self-efficacy in managing chronic illnesses and adherence in ART.

## Recommendations

Programs and partners involved in designing and implementing mHealth solutions need to consider and involve participants in determining communication strategies that can be effective. Frequency of messaging can be explored to ensure that interventions are highly acceptable and effective. Future interventions should ensure that they send messages at the right frequency. However, messages should only be sent out on a monthly basis as it appears to have statistically significant effect on outcomes such as self-efficacy as demonstrated in this study.

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