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Effect of text-messaging on treatment adherence practices among young people living with HIV in Niger State, Nigeria

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Recent studies reveal that Youths living with HIV (YLHIV) enrolled in HIV treatment experience a higher rate of interruption in treatment, sub-optimal medication adherence, and greater HIV-related mortality compared with other age groups. Therefore, this study investigated the effect of text messaging on medication adherence and antiretroviral-therapy (ART) retention practices among YLHIV in Niger state, Nigeria. The study was a quasi-experimental design in two selected hospitals. One hospital was assigned to a once-weekly text message intervention (TMI) for six weeks, and the 2nd served as the control group (CG). Data were collected at baseline, immediate post-intervention, and at the sixth-week follow-up. Data were analyzed using descriptive and inferential statistics at a 0.05 level of significance. Findings showed that between baseline and immediate post-intervention, there was a significant increase ($p < 0.05$) in the mean score of knowledge, perception, medication-adherence, and ART retention practices (from 9.62±12.28 to 22.98±4.57; 32.21±30.01 to 79.04±4.13; 13.50±8.41 to 26.65±13.15; 6.62±3.53 to 15.15±2.42) but there was no significant ($p > 0.05$) difference in the CG (from 10.29±11.08 to 10.58±10.74, 34.81±25.15 to 35.81±24.80, 17.13±9.23 to 17.23±9.16, 9.00±5.59 to 9.00±5.59) respectively. Between baseline and 6th week follow-up, there was a significant difference ($p < 0.05$) with a large effect size for knowledge (1.6), perception (2.2), medication-adherence (2.2) and ART retention practices (3.1) but no significant difference ($p > 0.05$) in the CG for all measures with an effect size of 0. The text messages intervention effectively influenced knowledge and perception of YLHIV, thereby improving treatment adherence practices. In addition, findings from this study can be used to design projects or interventions for scaling up the use of mobile phone text messaging to promote the adoption of health innovations and influence mHealth policy dialogue and review.

Key words: HIV, mHealth, text message, treatment adherence, youths.

INTRODUCTION

Human Immunodeficiency Virus (HIV) infection burden globally has accelerated in the past 40 years, negatively impacting all socioeconomic and ethnic groups, and significantly influencing health outcomes, welfare, employment, and criminal justice (Awofala and Ogundele, 2018). According to recent epidemiological statistics, HIV remains a public health issue that continues to drain the economy, having taken more than 36.3 million people's lives in the four decades since its discovery (UNAIDS, 2021). As of the end of 2021, 37.7 million were estimated to be living with HIV, with Sub-Saharan Africa accounting for 25.4 million PLHIV with 67 and 39% of the global HIV burden and newly infected people living with HIV (UNAIDS, 2021). Young people aged 15 to 24 comprise approximately a third of all new HIV infections in sub-Saharan Africa. They account for about 7% of persons living with HIV in Nigeria and often have poorer treatment outcomes than adults (Jahun et al., 2021). Nigeria is home to 9% of all HIV-positive persons (UNAIDS, 2014). The nation, which has already suffered from political instability and widespread political corruption because of almost 33 years of military dictatorship, seems to be on track to 'cure' the virus within a few (NACA, 2012). However, despite advances in institutional changes and political commitment to combat the illness, the nation has experienced a rise in the number of residents put on life-saving antiretroviral treatment (AART) to improve their chances of survival (NACA, 2012). Medication adherence and antiretroviral therapy (ART) retentions are critical requirements for successful virologic suppression and improved treatment outcomes among youths. However, several factors influence youth regimen compliance, such as forgetfulness, low level of knowledge, distance to health facilities, fear of disclosure of HIV status, poor self-care skills, and poor parental care and support, among others (Erah and Arute, 2008; Verma et al., 2020). Youth is a transition period from childhood dependence to adulthood independence and awareness of our interdependence as community members (Alawale et al., 2022)**.** HIV treatment among the youths is characterized by loss of follow-up, poor adherence to ART, poor integration of Adolescent and youth-friendly services with intervention centers, adolescent perception of care, risk of treatment failure, and high mortality rates compared to young children and adults. A cross-sectional study conducted in four facilities as a baseline to an interventional program revealed that medication adherence among young people living with HIV is sub-optimal (Asaolu and Agbede, 2022).

Routine Antiretroviral Therapy (ART) is tedious to some young people, while others find it inconvenient when people find out, fundamentally becoming an impediment to their everyday lives. For this population segment, timeliness, consistency in treatment, and maintenance of active medication often involve more than a simple time track for medication and hospital check-ups. It requires good motivation and additional effort to rise above the various factors that affect adherence (Luseno et al., 2019). Young people now have increased access to the internet and mobile phones, which have stimulated interest in exploring the role of health (Poushter, 2016, WHO, 2016). Access and ownership of mobile telecommunication devices have increased drastically in the past two and half decades, especially in low and middle-income countries (Linnemayr et al., 2007). Mobile communication technologies in medical care (mHealth) have been suggested as a method to improve the delivery of health services, especially to this youth population (Van der Kop et al., 2018). There are different variations of mHealth interventions, and they include short messaging services (SMS) reminders, gaming applications (apps), and interactive mobile apps (Cele and Archary, 2019). Text messaging is a unique mHealth variant because it allows researchers to personalize message content, promote bidirectional communication, and pair message timing to ART dosage schedules (Finitsis et al., 2014). Results from the previous study reported that using mobile phone text messaging reminders was feasible and acceptable in a group of eight HIV-infected young people, but that viral suppression declined for most individuals after the 12-week intervention ended; moreover, no objective measure of adherence was used (Poushter, 2016,). Although there are few efficacy studies on the use of mobile phones to improve adherence, a rising body of research suggests that their use in chronic conditions is promising (Tanue et al., 2020). Therefore, this study investigated the effect of text messaging intervention on knowledge, perception, medication adherence practice, and ART retention among youths living with HIV in Niger State, Nigeria.

METHODS

Study design, population

The study utilized a quasi-experimental involving patients receiving HIV care in two selected general hospitals in Niger State. Multi-stage sampling technique was employed in the selection of participating health facilities. One of the three senatorial districts (Niger East) in Niger State was purposively selected for this study. The two hub facilities providing free comprehensive HIV care and treatment were purposively selected- Rafi LGA (Control) and Suleja LGA (Intervention). Fifty-two (52) young people living with HIV from the two selected health facilities that met inclusion criteria and

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consented to participate in the study were enrolled in the intervention arm. To be eligible, patients had to be at least 18 years old, enrolled on ART for at least 6 months, own or have access to a mobile phone, and be able to use simple text messaging. Exclusion criteria were previous assessment for ART eligibility, previous or current exposure to ART, and pregnancy. The study was conducted between December 2021 and March 2022. Ethical approval for the study was obtained from the Babcock University Health Research Ethical Committee (BUHREC) and the Niger State Ministry of Health Ethical Review Committee (NSMOH ERC). Signed consent forms were obtained from the respondents. Respondents on the intervention arm received one-way text messages containing key messages from the Intervention Module designed by the researcher. Prior notifications were given to the respondents for the text message group that the word “food” would be used instead of medication or drug when sending the messages to maintain confidentiality. So, the following messages were sent consecutively once weekly for six weeks.

1. Taking your food correctly, as advised, helps one to live a healthy life
2. Adherence is taking your food as advised at the correct time.
3. Adherence is not taking breaks and taking your food as advised at the right time.
4. Adopting a healthy lifestyle and trying to avoid risky behaviors. Take your food.
5. You are critical. Do not play with your health. Take your food.
6. You are so loved. Handle your health with great care. Take your food.

The control arm received the standard of care provided by the facilities but excluded text messaging during the twelve weeks of intervention and post-intervention. The study outcomes were knowledge, perception, medication adherence practice, and ART retention practice scores from each construct of the validated questionnaire administered at baseline, immediately post-intervention, and six-week follow-up period.

Sample size determination

Previous studies documented that approximately 60% of participants would maintain >= 95% adherence without any intervention, while 85% of participants would maintain >=95% adherence with the intervention (Tanue et al., 2020). Hence, the mean difference between the treatment and control arm (D^2) was set at 0.3. Furthermore, the significance level (*p*-value) and Power of the study was set at 5 and 80%, respectively. Hence, the Standard normal deviation (z score) $Z\alpha$ and Z_β were 1.960 and 0.84, respectively, at a Confidence Interval of 95%. The sample size was computed using the sample size for intervention trails described by Cohen (1992) and arrived at 47 participants for each study group. Ten percent was added to account for any attrition or loss to follow-up during the study. Fifty-two YPLHIV were assigned to each group, and there was a 100% completion rate. Therefore, a total of 104 participants were enrolled in the study and participated throughout the study.

Instrumentation

Three instruments were deployed for this study, and the first was a 67-item interviewer- administered questionnaire (Cronbach alpha was 0.96). The second was a visual analog scale that fed into the last item on the questionnaire. The third was a text message record log to document the timely dispatch and delivery of text messages to participants. The questionnaire contains four sections. Section A captured the socio-demographic characteristics of the participants, partner HIV status, and social climate. The age of the participants was assessed in an open-ended question; sex, ethnicity, and other demographic variables were coded. Section B captured information on knowledge relating to medication adherence and ART retention practices and was assessed on a 25-point scale dichotomous question of Yes/No, I don’t know. Section C captured information on the Perception of medication adherence and ART retention. The perception of the YLHIV on medication adherence and ART retention was assessed on an 82-point Likert scale which was categorized into four perception domains operationalized by variables of perceived seriousness of the consequences of poor adherence and retention (24-point scale); Perceived susceptibility to complications resulting from treatment failure (12-point scale); perception of benefit of taking recommended medication (30-point scale) and perception of self-efficacy to take recommended ART medications (16-point scale). The fourth section captured information on Medication adherence and ART retention practice. Medication Adherence was measured using the combination of 4-response options Likert-type response categories, and three yes or no questions. At the same time, while ART retention was also measured using the combination of 4-response options Likert-type response categories, and two yes or no questions. Aggregating the seven items and six items in the sub-scale created a 27-point scale and 16-point scale of measurement for Medication adherence practice and ART retention practices, respectively. The average time to complete the questionnaire was estimated to be 25 min. The instrument was validated through a rigorous review by the Project Supervisor, a Professor of Public Health, and other faculty members at the School of Public and Allied Health. The contents of the questionnaire were strengthened with items extracted from peer-reviewed literature. The internal consistency of the questionnaire was assured through retesting with equivalent groups (n=10) away from the intervention area. Content and item analysis was conducted with a Cronbach alpha score of 0.97.

Data management and analysis

Data Analysis was accomplished by using the computer software STATA package version 15.0. Data collected from participants using the instruments were reviewed for completeness, edited, and coded using a coding guide designed before data collection and entered into the computer by research assistants. Computations involving frequency distributions, summaries of descriptive statistics and paired t- tests, were used to process the data collected and to test the validity of the leading hypothesis concerning knowledge, perception, medication adherence practice, and ART retention practice among clients who participated in the study. All statistical tests are set at p=0.05 level of significance cut-off. The decision rule applied was that if computed $p \leq 0.05$, the null hypothesis will be rejected in favour of the alternative view; otherwise, do not reject. To standardize the magnitude of the impact accountable to the intervention conditions, since the p-value cannot estimate this change but only expresses that the change is present and is significant at a predetermined cut-off; hence the inclusion of Cohen"s d, also known as the effect size (ES) for the difference in means of two independent groups and the corresponding 95% confidence interval (95%CI). This became an effective tool to accurately estimate and compare the magnitude of the changes produced by the intervention across all variables of interest (Cohen, 1988; Nakagawa and Cuthill, 2007).

RESULTS

One hundred and four participants were engaged in the study, with fifty-two participants in each group. The two

Table 1. Socio-demographic characteristics of the participants in the study for each arm of the intervention at baseline.

Variable	Control group (n=52)		Text messages (n=52)		Total
	Frequency N (%)		Frequency N (%)		Frequency N (%)
Sex					
Males	7	(13.5)	16	(30.8)	23 (22.1)
Females	45	(86.5)	36	(69.2)	81 (77.9)
Age in years					
18-19	6	(11.5)	10	(19.2)	16 (15.4)
20-24	46	(88.5)	42	(80.8)	88 (84.6)
Age in years					
Mean ±SD	22.05 (±1.69)		21.27 (±1.84)		21.66 (±1.81)
Ethnicity:					
Hausa	32	(61.5)	22	(42.3)	54 (51.9)
Fulani	13	(25.0)	7	(13.5)	20 (19.2)
Yoruba	7	(13.5)	5	(9.6)	12 (11.5)
Igbo	0	(0.0)	3	(5.8)	3 (2.9)
Gwari	0	(0.0)	8	(15.4)	8 (7.7)
Gbayi	0	(0.0)	7	(13.5)	7 (6.7)
E**ducation**					
Islamic	26	(50.0)	10	(19.2)	36 (34.6)
Primary	0	(0.0)	22	(42.3)	22 (21.2)
Secondary	26	(50.0)	14	(26.9)	40 (38.5)
Tertiary	0	(0.0)	6	(11.5)	6 (5.8)
Religion:					
Islam	52	(100.0)	43	(82.7)	95 (91.4)
Christianity	0	(0.0)	9	(17.3)	9 (8.7)

Source: Authors 2022

groups had a proportion of females, than male, where control group had 86.5%, and the text message group had 69.2% females. However, the overall mean age of participants was 21.661±.8 years. Participants in the control group had the highest mean age at 22.05±1.69 than those with text messages at 21.27±1.84 years. Overall, slightly above half (54.8%) of the participants were of Hausa ethnicity. In comparison, each group had the same as those in the control group, which comprised 61.5%, and the Hausa in the text messages group, 42.3%. Generally, the highest level of education among all participants was Secondary, with 38.5%. In contrast, for those in the control group, half of the participants (50.0%) had Islamic education as their highest level, and the other half had secondary education. However, some (42.3%) of those in the text messages group had primary education as their highest level, followed by some (26.9%) who had Secondary school education. Islam is the dominant religion, (91.4%); however, in the control group, none of the participants were Christians, while most (82.7%) of those in the text messaging group were Muslims as well (Table 1). Findings from the text message intervention group showed that between baseline and immediate post-intervention, there was a significant increase ($p<0.05$) in the mean score of knowledge (from 9.62±12.28; 38% to 22.98±4.57; 92%), perception (from 32.21±30.01; 39% to 79.04±4.13; 96%), medication adherence (from 13.50±8.41; 50% to 26.65±1.41; 99%) and ART retention practices (from 6.62±3.53; 41% to 15.15±2.42; 95%) (Table 2). However, for the control group, there was no significant ($p>0.05$) difference in the mean score of knowledge (from 10.29±11.08; 41% to 10.58±10.74; 42%), perception (from 34.81±25.15; 42% to 35.81±24.80; 44%), medication adherence (from 17.13±9.23; 63% to 17.23±9.16; 64%) and ART retention practices (from9.00±5.59; 56% to 9.00±5.59; 56%) (Table 3). Furthermore, between baseline and 6 weeks of follow-up, there was a significant increase ($p<0.05$) in the mean score of knowledge (from 9.62±12.28, 38% to 23.85±3.07, 95%), perception

Table 2. Impact evaluation of variables at baseline and immediate post-intervention for text messages.

Variable	Max. points	Baseline N=52	Immediate post-intervention (N=52)	6 weeks follow-up (N=52)	P-value
		$\bar{X}$ (±SD)	$\bar{X}$ (±SD)	$\bar{X}$ (±SD)	
Knowledge	25	9.62 (12.28)	22.98(4.57)	23.85 (3.07)	<0.0001
Perception*	82	32.21(30.01)	79.04(4.13)	79.90(3.25)	<0.0001
Severity	24	10.46 (8.16)	23.77(0.94)	23.85 (0.78)	<0.0001
Susceptibility	12	4.62 (5.89)	11.38(1.46)	11.62 (1.19)	<0.0001
Benefits	30	11.54 (14.74)	28.85(2.91)	29.13 (2.37)	<0.0001
Self-efficacy	16	5.59 (2.24)	15.04(2.48)	15.31 (1.73)	<0.0001
Medication adherence	27	13.50 (8.41)	26.65(1.41)	26.65 (1.41)	<0.0001
ART retention	16	6.62 (3.53)	15.15(2.42)	15.38 (2.00)	<0.0001

*Perception is a composite aggregate of the components; severity, susceptibility, benefits and self-efficacy.
Source: Authors

Table 3. Impact evaluation of variables at baseline and immediate post-intervention for control group.

Variables	Max. points	Baseline (N=52)	Immediate post-intervention (N=52)	P-value	6 weeks follow-up (N=52)	P-value
		$\bar{X}$ (±SD)	$\bar{X}$ (±SD)		$\bar{X}$ (±SD)	
Knowledge	25	10.29 (11.08)	10.58(10.74)	0.893	10.58(10.74)	0.893
Perception*	82	34.81 (25.15)	35.81(24.80)	0.839	34.88 (24.68)	0.989
Severity	24	10.69 (8.03)	10.69(7.59)	1.000	10.77 (7.58)	0.958
Susceptibility	12	4.85 (5.62)	4.85(5.62)	1.000	4.85(5.56)	1.000
Benefits	30	12.5 (13.41)	12.50(13.41)	1.000	12.50(13.41)	1.000
Self-Efficacy	16	6.77 (3.02)	6.77(3.02)	1.000	6.77(3.02)	1.000
Medication Adherence	27	17.13 (9.23)	17.23(9.16)	1.000	17.23(9.16)	1.000
ART Retention	16	9.00 (5.59)	9.00(5.59)	1.000	9.00(5.59)	1.000

*Perception is a composite aggregate of the components; severity, susceptibility, benefits and self-efficacy.
Source: Authors

(32.21±30.01; 39% to 79.90±3.25; 97%), medication adherence (13.50±8.41; 50% to 26.65±1.41; 99%) and ART retention practices (6.62±3.53; 41% to 15.38±2.00; 96%) (Table 2). However, for the control group, there was no significant ($p>0.05$) difference in the mean score of knowledge (from 10.29±11.08; 41% to 10.58±10.74; 42%), perception (from 34.81±25.15; 42% to 35.81±24.80; 44%), medication adherence (from 17.13±9.23; 63% to 17.23±9.16; 64%) and ART retention practices (from 9.00±5.59; 56% to 9.00±5.59; 56%) (Tables 2 and 3).

DISCUSSION

Overall, the intervention group had improved knowledge and medication adherence immediately after the intervention compared to the control group. This can be attributable to text messaging.

This is further supported by several studies that showed that using mobile phones and other reminder gadgets could greatly improve adherence (Kibu et al., 2022; Mbuagbaw et al., 2013). For example, a study conducted in a rural area of Kenya found that an SMS-based mHealth intervention was associated with a 90% improvement in adherence over 48 weeks (Mbuagbaw et al., 2013). There was also improvement in ART retention post-intervention after the series of text messages, similar to a study by Kalichman et al., 2018 where the intervention group significantly improved in ART retention post-intervention. At the end line, there was a significant difference between the control and the intervention group, as expected due to the intervention over a certain period in the effort to change their behavior and knowledge worked as there was a significant change in the knowledge, perception, medication adherence, and ART retention. This result revealed a statistically significant difference in the level of medication adherence at baseline and immediately after the 6 weeks of text messages among youths living with HIV, similar to a study by Alice et *al.* (2019), who reported that medication among participants improved compared to those that received standard care.

CONCLUSION AND RECOMMENDATION

This study provides evidence on the extent to which the text message intervention could have a great effect on the knowledge, perception, medication adherence, and ART retention practice among youth living with HIV, also giving evidence of the effect over a more extended period than after intervention as a 6-week follow data was taken and reported significance over the period. Findings from this study can be used to design projects or interventions for scaling up the use of mobile phone text messaging to promote the adoption of health innovations concerning HIV treatment and retention. Finding from this research have important implication for youth health outcomes and services, it demonstrates the effectiveness of text messaging on HIV medication adherence, which is currently inadequately explored and could be used to influence m-Health policy dialogue and policy review.

It is therefore recommended that:

1. Integrating and expanding m-Health strategy by policymakers and stakeholders into the existing national HIV guidelines and policy.
2. Scaling up this study and innovation to build more evidence with wide geographic spread towards increasing HIV treatment, retention, and suppression, thus contributing to the achievement of the UNAIDS 2nd and 3rd 95.
3. Setting up automated reminder text messaging tools and databases as a viable and innovative channel for health information is predicated on the growing availability and use of mobile phones among youths.
4. Building the capacity of major stakeholders in the Ministry of Health, NACA, drug pickup centers, and health workers to use this innovation, which can potentially improve the care and health outcomes of youths living with HIV.

LIMITATIONS OF THE STUDY

Due to the short intervention period of less than a year, the result will give a weak prediction of variables like medication adherence and ART retention, as any event could change the course of adherence or retention. In addition, the primary measure by self-report of medication adherence and ART retention is associated with recall biases resulting in overestimates of the actual value whereby the self-reported might not reflect proper behaviors over–more extended periods because patients may become more adherent in the few days preceding their appointment.

ABBREVIATIONS

YLHIV, Youths Living with HIV; **HIV:** Human Immunodeficiency Virus; **AIDS:** Acquired Immunodeficiency Syndrome; **ART:** Antiretroviral Therapy; **TMI:** Text Messaging Intervention;

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Alawale O, Ayinde A, Ayinde O, Asaolu O, Itodo S, Olayinka G (2022). Pattern in Human Immunodeficiency Virus Perception, Sexual Risk Behaviors and Condom use among Young People In Orire Local Governments Area Oyo State, Nigeria. Middle European Scientific Bulletin 22:16-33.

Alice C, Leahy-Warren P, Savage E, Hegarty J, Cornally N, Day M, Sahm L (2019). Interventions to Promote Early Discharge and Avoid Inappropriate Hospital (Re) Admission: A Systematic Review. International Journal of Environmental Research and Public Health 16 (14):2457.

Asaolu OS, Agbede C (2022). Factors Influencing Medication Adherence Among Young People Living with HIV In Niger State, Nigeria. Open Journal of Medical Research 3(1):12-19. https://doi.org/10.52417/ojmr.v3i1.321

Awofala A, Ogundele O (2018). HIV epidemiology in Nigeria. Saudi Journal of Biological Science 25(4):697-703. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5937013/pdf/main.pdf

Cele MA, Archary M (2019). Acceptability of short text messages to support treatment adherence among adolescents living with HIV in a rural and urban clinic in KwaZulu-Natal. Southern African Journal of

HIV Medicine 20(1):1-6.
Cohen J (1988). Statistical Power Analysis for the Behavioral Sciences. Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers. (2nd ed.).
Cohen J (1992). Power primer. Psychological Bulletin 112(1):155-160.
Erah P, Arute J (2008). Adherence of HIV/AIDS patients to antiretroviral therapy in a tertiary health facility in Benin City. African Journal of Pharmacy and Pharmacology 2(7):145-152.
Finitsis DJ, Pellowski JA, Johnson BT (2014). Text message intervention designs to promote adherence to antiretroviral therapy (ART): a meta-analysis of randomized controlled trials. PloS One 9(2):e88166.
Jahun I, Said I, El-Imam I, Ehoche A, Dalhatu I, Yakubu A, Greby S, Bronson M, Brown K, Bamidele M, Boyd AT (2021). Optimizing community linkage to care and antiretroviral therapy Initiation: Lessons from the Nigeria HIV/AIDS Indicator and Impact Survey (NAIIS) and their adaptation in Nigeria ART Surge. PLoS One 16(9):e0257476. https://doi.org/10.1371/journal.pone.0257476
Joint United Nations Programme on HIV/AIDS (2014). aids JUNPo: 90–90-90: an ambitious treatment target to help end the AIDS epidemic. Geneva: UNAIDS.
Joint United Nations Programme on HIV/AIDS (2021). Global HIV Statistics Fact Sheet. Ending the AIDS Epidemic. (June). 2021:1-3.
Kalichman SC, Cherry C, Kalichman MO, Eaton LA, Kohler J, Montero C, Schinazi RF (2018). Mobile Health Intervention to Reduce HIV Transmission: A Randomised Trial of Behaviorally Enhanced HIV Treatment as Prevention (B-TasP). Journal of Acquired Immune deficiency Syndromes 78(1):34-42.
Kibu OD, Siysi VV, Albert Legrand SE, Asangbeng TE, Nsagha DS (2022). Treatment Adherence among HIV and TB Patients Using Single and Double Way Mobile Phone Text Messages: A Randomized Controlled Trial. Journal of Tropical Medicine 2022.
Linnemayr S, Huang H, Luoto J, Kambugu A, Thirumurthy H, Haberer J (2017). Text messaging for improving antiretroviral therapy adherence: No effects after 1 year in a randomized controlled trial among adolescents and young adults. American Journal of Public Health 107(12):1944-1950.
Luseno W, Iritani B, Maman S, Mbai I, Ongili B, Otieno F, Hallfors D (2019). “If the mother does not know, there is no way she can tell the adolescent to go for drugs”: Challenges in promoting health and preventing transmission among pregnant and parenting Kenyan adolescents living with HIV. Children and Youth Services Review 103(8):100-106.
Mbuagbaw L, Van Der Kop ML, Lester RT, Thirumurthy H, Pop-Eleches C, Ye C, Thabane L (2013). Mobile phone text messages for improving adherence to antiretroviral therapy (ART): an individual patient data meta-analysis of randomised trials. BMJ Open 3(12):e003950.
Nakagawa S, Cuthill I (2007). Effect Size, Confidence Interval and Statistical Significance: A Practical Guide for Biologists. Biological Reviews of the Cambridge Philosophical Society 82:591-605.
Nigeria National Agency for the Control of AIDS (2012). Global AIDS Response: Country Progress Report. GARPR, Abuja. Federal Ministry of Health, 2008. HIV/STI Integrated Biological and Behavioural Surveillance Survey 2007 Federal Ministry of Health, Abuja, Nigeria. Available from: http://www.wisdomofwhores.com/references/blog_refs/NigeriaIBBSSReport2008HV.pdf Accessed 12 April, 2022.
Poushter J (2016). Smartphone ownership and internet usage continues to climb in emerging economies. Global Attitudes and Trends. 2016. Available from: http://www.pewglobal.org/2016/02/22/smartphone-ownership-and-internet-usage-continues-to-climb-in-emerging-economies/ website. Accessed 18 April, 2022.
Tanue EA, Nsagha DS, Theophile NN, Assob JCN (2020). Improving retention in care and promoting adherence to HIV treatment: protocol for a multisite randomized controlled trial of mobile phone text messaging. JMIR Research Protocols 9(8):e15680.
Verma D, Bachani D, Acharya A, Seth A, Hemal A (2020). Factors affecting adherence to treatment in children living with HIV. Indian Journal of Sex Transmission Disease AIDS 41(2):181-187.
Van der Kop ML, Muhula S, Nagide PI, Thabane L, Gelmon L, Awiti PO, Abunah B, Kyomuhangi LB et al (2018). Effects of an interactive text-messaging service on patient retention during the first year of HIV care in (WelTel Kenya): an open-label, randomised parallel-group study. Lancet Public Health 3:143-152. http://dx.doi.org/10.1016/S2468-2667(17)30239-6
World Health Organization (2016). Global diffusion of eHealth: Making universal health coverage achievable. In Report of the third global survey on eHealth. 2016. Available from: http://who.int/goe/publications/global_diffusion/en/. Accessed 18 April, 2022.