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Chapter 6

Influence of mHealth SMS utilization on adolescents' attitude towards risky sexual behavior in Homa-Bay County, Kenya

By

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Abstract

Risky Sexual Behaviors (RSB) refers to behaviors leading to unintended pregnancies and Sexually Transmitted Infections (STIs). Adolescents' Risky Sexual Behavior (RSB) is a global public health concern. In Kenya, 21% of adolescents are reported to have had their sexual debut before 15 years; while in Homa-Bay County, 60% of adolescent are reported to have had their sexual debut before 15 years which is thrice the national prevalence. Globally, mHealth technology has been successful in improving health knowledge and awareness, behavior change, and other health outcomes. The aim of this paper was to assess influence of mHealth SMS utilization on adolescents' attitude towards risky sexual behavior in Homa-Bay County, Kenya. The study design was experimental. A community-based single-blind Randomized Control Trial (RCT) was used. Pre-test post-test study were conducted to establish the influence of mHealth SMS utilization on risky sexual behavior. The Intervention was interactive Adolescent Sexual and Reproductive Health (ASRH) SMS to the treatment group while the control group received non-interactive Malaria prevention SMS. The overall level of positive attitude towards RSB at pre-test was 79(22.1%) and 73(24.1%) at post-test. There was an association between mHealth SMS and adolescents' attitude towards RSB (O.R.=1.916; C.I.=0.78-3.82; P=0.003; $\chi^2=27.92$). mHealth SMS had a positive influence on sexual activity P=0.075, safe sex P=0.033 and sexual partners P=0.009 but not on alcohol/drugs P=0.214. The study concluded mHealth SMS intervention has a positive influence adolescents' RSB.

Key words: mHealth, SMS, Adolescents, Attitude, Risky sexual behavior.

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1.1: Introduction

According to Centre for Disease Control (CDC) report of 2018, Adolescents' Risky Sexual Behavior (RSB) is a global public health concern because it is second among the top ten risk factors in the global burden of all diseases. Risky Sexual Behaviors (RSB) refers to behaviors leading to unintended pregnancies and Human Immune-Deficiency Virus (HIV)/Acquired Immune Deficiency Syndrome (AIDS) and Sexually Transmitted Diseases (STD's) transmission (Wang, Hu, Yu & Yang 2019). These behaviors include early sexual debut, multiple sexual partners, engaging in sexual activity without protection and under influence of drugs/alcohol (Fleming, Eisenberg, Catalano, Kosterman, Cambron, David, Hobbs, Berman, & Watrous, 2019; Isaksson, Stickley, Kuposov & Ruchkin, 2018). Globally, more than a half of adolescents engage in risky sexual behavior. The level of risk varies substantially by region and sex (Kreager, Staff, Gauthier, Lefkowitz & Feinberg, 2016).; Isaksson et al., 2018).

In developed world approximately 45% of adolescents practice inconsistent/non-condom use during sexual activity. Less than 19% have more than one sexual partner with high early sexual debut among males compared to females (Szucs, Lowry & Fasula et al., 2019). About 155 million (25%) of adolescents 15-19 years consume alcohol; 4.7% use Cannabis and 10% use tobacco. Drug abuse has been highly associated with indulgence in risky sexual behavior (Ross, Granja, Duperrouzel, Pacheco-Colon, Lopez-Quintero, Hawes and Gonzalez, 2019). Similar observations have been documented by United Nations Inter-Agency Group for child mortality Estimation (UN-IGME) and United Nations Children Education Fund (UNICEF) reports (UNICEF, 2020; UN-IGME, 2020).

In Middle- and Low-Income Countries (MLIC), the prevalence of risky sexual behavior is high with less than 60% of adolescents with multiple sexual partners use condom during sexual activity (UNAIDS, 2016). Sub- Saharan Africa has an overall of approximately 36% of low risky sexual behavior. The region has highest early sexual debut (46.3%) especially amongst the girls compared to males. There is low (41.2%) condom use while

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prevalence of multiple sexual partners is 44.5% (Liang, Simelane, Fortuny, Chalasani, Weny & Salazar 2019; Witwer, Jones & Lindberg, 2018). Kenya has low prevalence of consistent condom use of 36%, early sexual debut of 21% and more than 60% of males while 32% of females engage in multiple sexual partners respectively.

In Homabay County more than 60% of adolescents engage in risky sexual behavior; approximately 60% of adolescent males have their sexual debut before 15 years which is thrice the national prevalence of 21%. Additionally, 60% of males aged 15-24 would have had sex before 15 years. National AIDS & STI Control Programme (NASCOP, 2020). Consequently, risky sexual behavior has been associated with adolescents' unplanned pregnancies, risks of abortion, miscarriage, haemorrhage, early childbearing and early marriages. It has greatly contributed to high adolescent morbidity (HIV/AIDS/STI's) and maternal mortality rate and negative social problems like stigma poor academic performance and school dropout (Ganchimeg et al., 2014). Globally, more than 30% of adolescents are infected with HIV/AIDS world-wide (Piot, Abdool, Hecht, Legido-Quigley, Buse, Stover, Resch, Ryckman, Mogedal and Dybul et al., 2015).

1.2: Background and literature review

Globally, mHealth technology has been successful in improving health knowledge and awareness, behavior change, and other health outcomes by ensuring accurate, timely, private, confidential and anonymous delivery of SRH information (Direito, Jiang, Whittaker & Maddison, 2015). In a randomized control trial in America on mHealth intervention for pregnancy prevention for lesbian, gay, bisexual and other sexual minority among adolescents 14-18 years showed positive results. The study used mHealth SMS technology where between 5-10 text messages were sent daily for 7 weeks improved condom use and increased pregnancy preventive behaviors in the short term. (Ybarra, Goodenow, Rosario, Saewyc, & Prescott, 2021). Similar findings have been reported by other studies on mHealth SMS as an important technology in gathering and distribution of adolescents' sexual reproductive health information and it enhances positive sexual behavior change among adolescents (Rokicki & Fink, 2017; Orr & King, 2015).

Negative attitude towards risky sexual behavior has been associated with adolescents in engaging in risky sexual behavior such

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as having multiple sexual partners. More than 30% of young people aged 15-19 years of age stated to have had sex with more than two sexual partners while 15% have more than four sexual partners (CDC, 2018). Due to the negative attitude towards risky sexual behavior, about 22% reported to have investigated their HIV status. Survey reports show that adolescents with negative attitude towards risky sexual behavior and those who drink alcohol/ drug abuse were twice more likely to engage in risky sexual behaviors compared to those who don't. Alcohol consumption increases a person's vulnerability by clouding their judgement and restraint increasing their chances of over-indulging in sexual activities which make a person vulnerable to HIV/AIDS/STIs. A study finding reported that adolescents who consume alcohol were less likely to use condoms during sexual activities. The odds of engaging in risky sexual behavior were 4 times higher among the drunken adolescents (Scalese, Denoth, Siciliano, Bastiani, Cotichini, Cutilli, & Molinaro, 2017).

1.3: Problem statement

Homa-Bay County has the highest burden of adolescents' risky sexual behaviors. The County is ranked second position in the prevalence of adolescent pregnancy at 38% more than twice the national prevalence of 18%. The County ranks first position in child marriage, HIV/IDS prevalence and new HIV infection and HIV/AIDS related mortality. Regardless of HIV/AIDS trend being on downward trajectory, of HIV hyper-endemicity in Homa-Bay County has been sustained from the year 2013-2018 as indicated in the yearly rates of 27%, 25%, 26%, 26%, 23%; 19.6% respectively NACC, 2020).

1.4: Theoretical and conceptual frameworks

Conceptual framework was based on social learning theory in combination with construct from health belief model and the ecological model. The learning model posits that adolescents' risky sexual behavior change is dependent on their environment factors such as health facility factors such as access to health facility, cost and availability of supplies. Attitude towards risky sexual behavior was the modifiable variables of the study where the researcher targeted change in adolescents' attitude towards their risky sexual behavior after mHealth SMS intervention. Similarly, health belief model postulates that behavior change can be achieved if well

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executed health education is conducted targeting individual perceptions (attitude) towards the behavior (Rosenstock, 1974). Use of mHealth SMS was used as one of the components of HBM as a trigger or cue to action to adopting desired sexual behavior. The last construct in the social learning theory is behavioral factors such as practice of condom use, one sexual partner, not engaging in sexual activity under drug/alcohol influence. This eventually resulted in overall change in either high or low risky sexual behavior. These theories helped to understand the logical relationship of non-modifiable variables (socio-demographic and health facility characteristics), modifiable variable (attitude) and experimental independent variable (mHealth SMS) how they are interrelated to influence risky sexual behavior

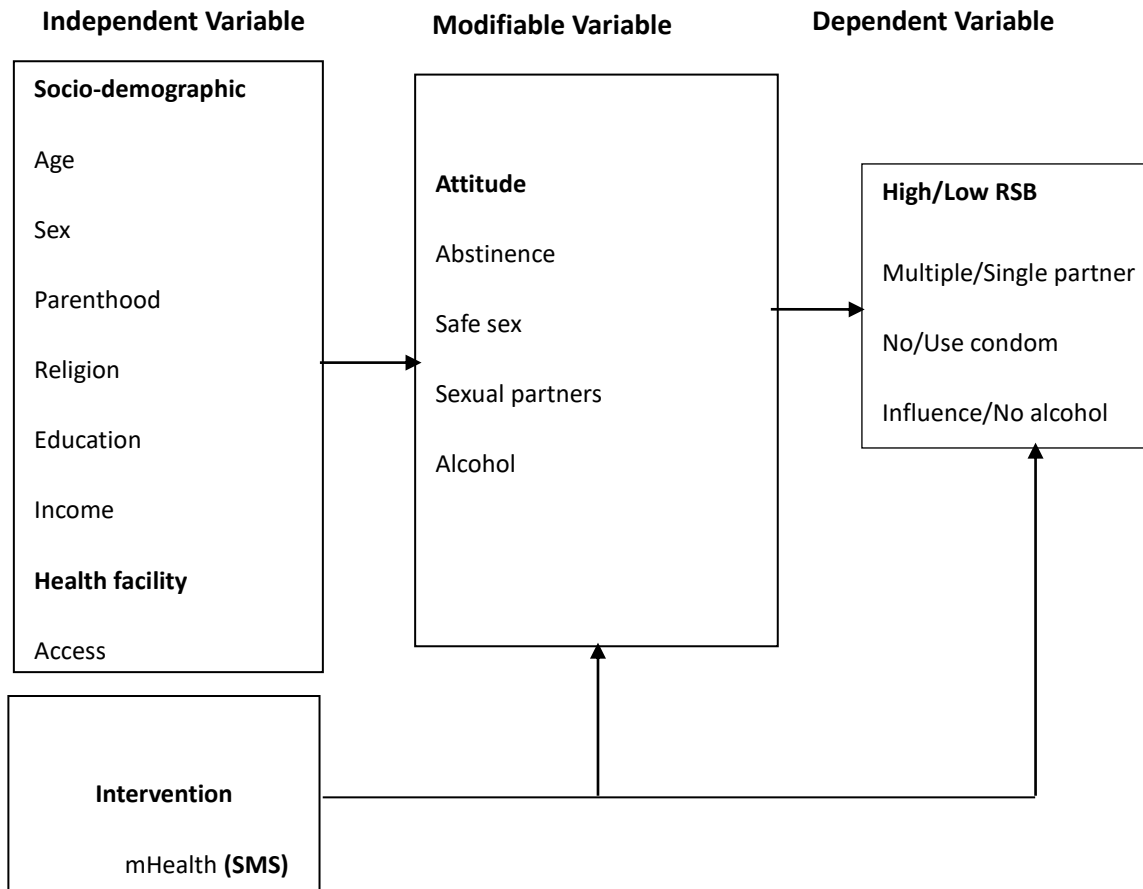


Figure 1: Conceptual framework, Source: Modified from PRECEDE- PRECEDE framework (Green & Kreuter 2015)

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1.5: Research Objective

1. To determine the influence of mHealth SMS utilization on adolescents' attitude towards risky sexual behavior in Homa-Bay County, Kenya.

1.5: Methodology

The study design was experimental. A community-based single-blind Randomized Control Trial (RCT) was used. Pre-test post-test study were conducted to establish the influence of mHealth SMS utilization on risky sexual behavior. The Intervention was interactive Adolescent Sexual and Reproductive Health (ASRH) SMS to the treatment group while the control group received non-interactive Malaria prevention SMS. The quantitative approach employed experimental technique where using the prospective method, two sub-sets of data was collected at baseline and at 6 months' follow-up, whereby pre-test and post-test studies were conducted (Shelton et al., 2019). This was necessary for inferential statistics and testing of the hypothesis in order to establish the influence of the intervention in order to draw conclusions, (King et al 2019). The assignment of the participants and the intervention was blinded to the principal investigator and research assistants. Un-blinding was done two weeks after the intervention. The research adopted both qualitative and quantitative studies. Quantitative data was collected from the main participants of the study while qualitative data was collected from the Key informants.

The target population was adolescents aged 15-19 years within Homa-Bay County to whom the researcher generalized the study findings. The study population was eligible adolescents aged 15-19 years who consented to participate in the study. The study used multi-stage sampling technique. Homa-Bay County was purposely selected due to high prevalence risky sexual behavior (60% early sexual debut) and poor indicators of ASRH, for instance, 38% adolescent pregnancy (KDHS, 2014). Also, Homa-Bay Sub-County was purposely chosen due to its high population density of the adolescents 15-19 years approximately 31,200 in comparison to other sub-counties (KNBS, 2017). Homa-Bay sub-county was clustered by geographical regions that already existed in the form of four wards: Homa-Bay East, Homa-Bay Central, Homa-Bay Arujo and Homa-Bay West. Cluster random sampling was used to select a half (50%)

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of the wards: Homa-Bay West and Homa-Bay Central. These two wards had in total eight locations hence, a half (50%) of locations from each of the two wards were randomly selected. In Homa-Bay West the randomly selected locations were three out of five namely: Kotieno, North Kanyabala and Kalanya/Kanyango. In Homa-Bay Central, the two randomly selected locations out of three were: Asego and Kobuola Kogwang as shown in Table 1. From each location, half (50%) of the villages were randomly selected through proportionate random to determine the representation. The villages were randomized into either control and intervention arms as demonstrated in randomization. Adjacent villages were dropped from the study to form a buffer to minimize contamination of the participants in the control group. (Park, 2020). Systematic random sampling technique was used to identify the actual participant to be included in the study. A sampling frame of 1480 of households with eligible adolescents 15-19 years old was generated. A sampling interval of 3 was computed ($1480/612$) and Kth was 4 by computational random number generation (Wayne et al., 2016).

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Table 1: Sample size distribution of participants

Wards	Location	Enrolment (Sampling frame)	Sample Size	Percentage Proportion
West	1.North Kanyabala	552	234	37.3
	2.Kotieno	241	102	16.2
	3.Kalanya/Kanyango	312	133	21.2
Central	4.Asego	269	114	18.2
	5.Kobuola Kogwang	106	45	7.2
Total		1480	628	100.00

Source: Field Survey, 2022

1.5.1: Sample Size Determination

The Chan formula of 1998 was used to determine the sample size. The formula enabled the study to determine the sample size of two-sided groups, the control group, and the treatment group (Chan, 1998; Ellis, 2010). Study findings indicates an adolescents' low risky sexual behavior level of 36%; hence, of the effect size of 36 % was used (UNICEF, 2015). Previous studies have reported evidence of improvement of score points of 15 (Rokicki, 2016). Therefore, this study was powered to detect an improvement of 15% points score, where absolute improvement of 51% of the subjects will have a successful outcome; with a power of 90% and an α 0.05.

Chan formulae, 1998:

$$m (\text{Size per group}) = c * \pi_1 (1-\pi_1) + \pi_2(1-\pi_2) / (\pi_1-\pi_2)^2$$

Where $c=10.5$ for 90% power; π_1 and π_2 were the proportionate estimate.

Thus, $\pi_1=0.36$; $\pi_2=0.51$

$$m=10.5*0.36(1-0.36) + 0.51(1-0.51) / (0.36-0.51)^2 = 224 \quad n=448$$

Based on previous studies, loss of follow up in similar trials having been reported at a level of 20-40% by Lau et al., (2014) and Bailey et. al, (2013). The loss of follow up for this study was calculated at 40% to be more secure.

$$40\% (448) = 179.2 \text{ hence, } 448+180 = 628 \quad \text{Therefore } n=628$$

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Proportionate simple random allocation of the participants at a ratio of 1: 1 (314) to either control or treatment group was conducted. (Ellis, 2010; Burns et al., 2016).

1.5.3: Description of the intervention

The study used Short Message Service (SMS) as an intervention. The text messages were in two languages: English and Dholuo-native language. The intervention process began with identification of participants. The baseline data was used to create a database for all the participants. Data included participants' name, preferred language, phone number, cluster name. Participants were randomly allocated to either intervention group or control group at a ratio of 1:1 by use of a computer MS-excel package. The messages were then mounted on a computer server which created a system called 'mHealth' which sent automated SMS to the participants. The allocation and intervention were blinded from the beginning of the intervention until two weeks after the intervention on was completed.

1.5.4: The intervention Group

The intervention group was sent three text messages on Adolescents Sexual and Reproductive Health (ASRH) every week for a period 6 months or 24 weeks. In total 72 messages were sent to each participant. The three intervention text messages (Alert Quiz, Alert Clarification, Alert Tip). The first SMS was sent on every Monday as an 'Alert Quiz'. Once the participants responded, they received the automated feedback indicating whether they were correct or not correct with a short 'Alert Clarification' as their second SMS. The third non-interactive 'Alert Tip' messages were sent on Friday. The system was monitored to ensure delivery on the SMS. In some cases, where the SMS was not delivered due to an absentee subscriber, the SMS text message was automatically routed to participants' alternative phone number. Follow-up text message reminders to respond to the SMS was automatically sent to the participants who had received the SMS text and not responded to it. This was done on a day after the message had been delivered without respond. The study assured response to the SMS by informing participants that the messages were free and no cost was to be incurred. They were assured of privacy, confidentiality and anonymity of their responses through automated prompt messages

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1.5.5: The Control Group

The participants in the control group were sent one non-interactive Malaria prevention text due to its' high prevalence in the County. Every Wednesday at 4.00pm 'Alert Fact' on Malaria prevention was sent for a period of six months or 24 weeks. A total of 24 'Alert Fact' text messages were sent. The total cost of sending text messages was KES. 120,000 (1200 USD).

1.5.6: Data Analysis

In order to assess the participants' attitude towards risky sexual behavior, the study had 10 Likert scale items. Each item was scored using a 5-point Likert scale. The 5-point descriptive anchors were; Strongly Disagree (SD) = 1, Disagree (D)=2, Neutral (N)=3, Agree (A)=4 and Strongly Agree (SA)=5. The study established one composite score where the 5-point descriptive anchors were categorized into one outcome variable of either yes or no. Reverse scores were done so that negatively stated descriptive anchors were given the right score. The total possible minimum score was 0 while the total possible maximum score was 10. The study used median as a cut-off point. Median was considered as the most appropriate score compared to mean score considering the categorical nature of the data and its capacity to separate data into two possible outcomes (Liddell et al., 2018). All participants who scored SD=1, D=2 and N=3 were categorized as 0=no while those who scored A=4 and SA=5 were categorized 1=yes. All the participants who scored the median of 5 and below were categorized and dummy coded to have 0= negative attitude while those above the median 5 were categorized dummy coded to have 1= positive attitude. Logistic regression analyses were computed to test for significant.

1.6: Findings

1.6.2: Consolidated Standards Summary Report

Eligibility of participants 15-19 years as per inclusion criteria was 1597. Those who were excluded from the study were 117. The 1480 who consented to participate formed a sampling frame. Through systematic sampling a sample size of 628 as the target enrolment was established. The enrolment at baseline was 612(97.5%). Participants were randomly assigned to either control or treatment arm at a ratio of 1:1. A follow up of six months was conducted and final analysis

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was conducted on 544 (88.8%) due to attrition and contamination of the controls. The 544 (88.8%) of the participants in the end line analysis of the study was considered good enough for sample size, (Singh, 2015; Wayne *et al.*, 2016).

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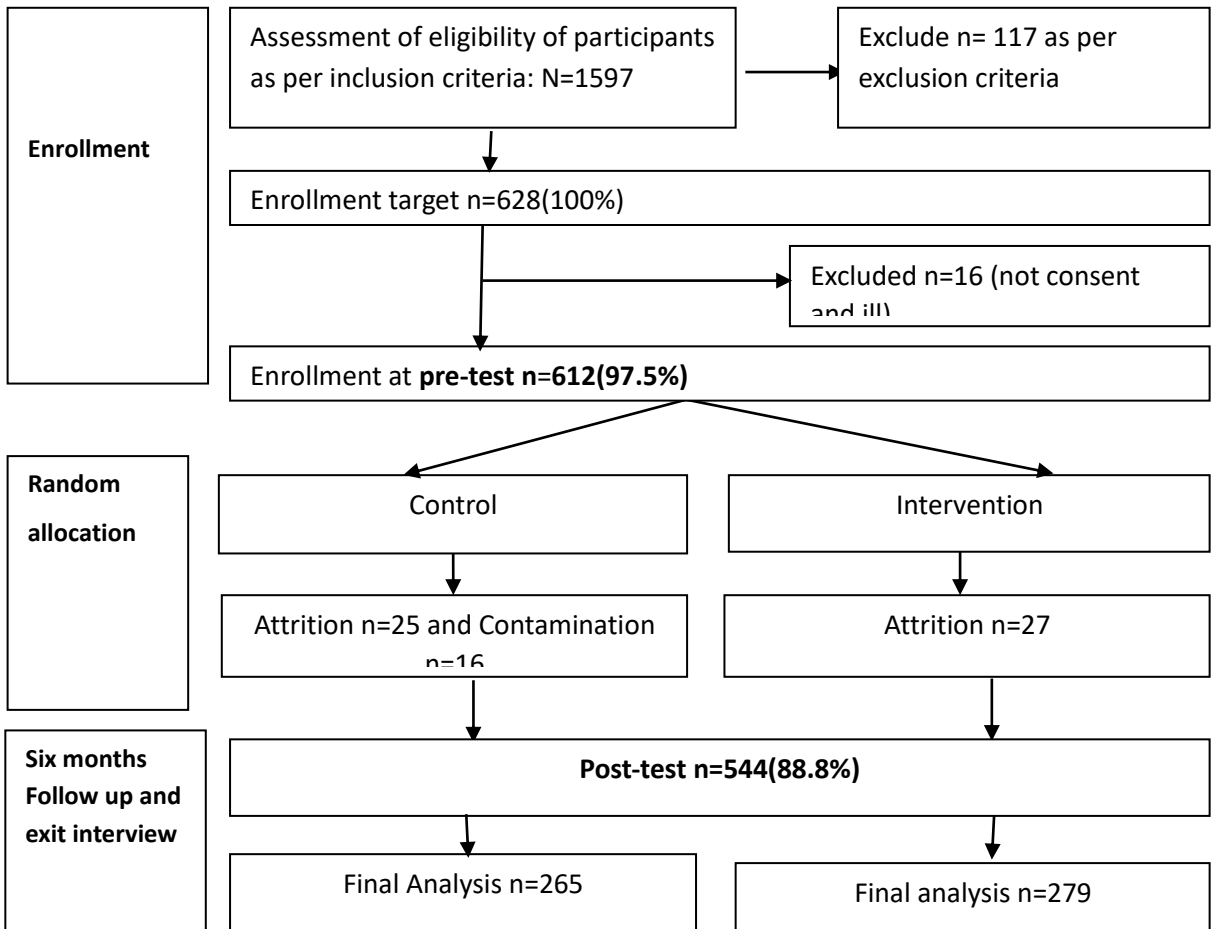


Figure 2: Consolidated standards summary report

1.6.3: Comparative Analysis of Socio-demographic Characteristics of Trial Arms

Comparative analysis between the socio-demographic characteristics of the participants in the control group and the treatment group at baseline study was done to establish whether the two groups were statistically different. The findings indicated that there was no statistical difference ($P>0.05$) between the socio-demographic characteristics of the participants in the control group and those in the treatment group Table 2.

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Characteristics

1.6.4: Socio-Demographic Characteristics of the Participants

Table 3 findings indicated that majority 374(61.1%) of the participants were males. The participants had a mean age of 17.12 with a standard deviation of ± 1.44 . Majority 433(70.8%) of the participants had completed their primary level of education and 578(94.4%) did not have children at the time of the interview. Most 276(45.2%) of the participants were Protestants and more than a half 408(66.7%) preferred English language. Most 589(96.2%) of the participants were not in any form of employment. However, those who were employed 20(86.9%) were in informal sector where slightly more than a half 12(52.2%) earned less than KES 200 (<2 USD) daily wages. Most 532(86.9%) of the participants were schooling. More than a half 382(62.4%) lived less than one kilometer from their nearest health facility while 321(54.5%) paid more than KES 100 (>1 USD) as transport cost. In addition, more than a half 328(53.6%) reported unavailability of supplies in health facilities. Phone characteristics findings showed that majority 343(56.1%) had owned their phones for more than one year prior to the study while 524(85.6%) had only one phone number.

Variable	Category	Control arm n = 306	Treatment arm n = 306	Chi square	P-value
		Freq (%)	Freq (%)		
Sex	Males	176 (57.5)	198 (64.7)	$\chi^2 (1)$ =3.33	0.068
	Females	130 (42.5)	108 (35.3)		
Age in years	15-17	192 (62.7)	164 (53.5)	$\chi^2 (4)$ =7.39	0.116
	18-19	114 (37.2)	142 (46.4)		
Education level completed	None	38 (12.4)	37 (12.1)	$\chi^2 (1)$ =0.01	0.926
	Primary complete	217 (70.9)	216 (70.6)		
	Secondary complete	51 (16.7)	53 (17.3)		
Adolescent parenthood	Have children	15 (4.9)	18 (5.9)	$\chi^2 (1)$ =0.28	0.591
	No children	291 (95.1)	287 (93.8)		

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Religion	Catholic	111 (36.3)	118 (38.6)	$\chi^2 (1)$ =5.89	0.075
	Protestant	123 (40.2)	153 (50.0)		
	Traditional	55 (17.9)	23 (7.5)		
	None	17 (5.6)	12 (3.9)		
Preferred Language	English	213 (69.6)	195 (63.7)	$\chi^2 (1)$ =2.34	0.123
	Dholuo	93 (30.4)	111 (36.3)		
Employment	Employed	9 (2.9)	14 (4.6)	$\chi^2 (1)$ =0.69	0.405
	Not employed	297 (97.1)	292 (95.4)		
Type of work	Informal	7 (77.8)	13 (92.9)	$\chi^2 (1)$ =1.09	0.295
	Formal	2 (22.2)	1 (7.1)		
Daily wages	<KES 200 (<2 USD)	4 (44.4)	8 (57.1)	$\chi^2 (1)$ =0.35	0.552
	>KES 200 (>USD)	5 (55.6)	6 (42.9)		
Currently in school	Yes	274 (89.5)	258 (84.3)	$\chi^2 (1)$ =3.68	0.750
	No	32 (10.5)	48 (15.7)		
Distance	< 1km	189 (61.8)	193 (63.1)	$\chi^2 (1)$ =0.11	0.738
	>1 km	117 (38.2)	113 (36.9)		
Cost	<KES 100 (1 USD)	170 (55.6)	121 (39.5)	$\chi^2 (1)$ =5.73	0.902
	>KES 100 (1 USD)	136 (44.4)	185 (60.5)		
Availability of supplies	Available	139(45.4)	145(47.3)	$\chi^2 (1)$ =0.650	0.177
	Not available	167(54.6)	161(52.6)		

Table 2: Comparative Analysis of Socio-Demographic

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Variable	Overall Baseline n=612 Freq. (%)	Control Group		Treatment Group	
		Baseline n=306 Freq. (%)	End line n=265 Freq. (%)	Baseline n=306 Freq. (%)	End line n=279 Freq. (%)
Sex: Male	374(61.1)	176(57.5)	142(53.5)	198(64.7)	178(63.8)
Female	238(38.9)	130(42.5)	123(46.4)	108(35.3)	101(36.3)
Age: 15-17 years	356(58.2)	192(62.7)	167(63.1)	164(53.6)	150(53.8)
18-19 years	256(41.8)	114(37.3)	98(36.9)	142(46.4)	128(45.9)
Education: None	75(12.3)	38(12.4)	27(10.1)	37(12.1)	31(11.1)
Primary	433(70.8)	217(70.9)	206(77.7)	216(70.6)	223(79.6)
Secondary	104(16.9)	51(16.7)	32(12.1)	53(17.3)	25(8.9)
Parenthood: Children	34(5.6)	15(4.9)	15(5.7)	19(6.2)	19(6.8)
No children	578(94.4)	291(95.1)	250(94.3)	287(93.8)	260(93.2)
Religion: Catholic	229(37.4)	111(36.3)	92(34.7)	118(38.6)	123(44.1)
Protestant	276(45.2)	123(40.2)	149(56.2)	153(50.0)	129(46.2)
Tradition	78(12.7)	55(17.9)	24(9.1)	23(7.5)	27(9.7)
None	29(4.7)	17(5.6)		12(3.9)	
Language: English	408(66.7)	213(69.6)	181(68.3)	195(63.7)	173(62.0)
Dholuo	204(33.3)	93(30.4)	84(31.6)	111(36.3)	106(37.9)
Employment: Employed	23(3.8)	9(2.9)	6(2.3)	14(4.6)	14(5.0)
Not employed	589(96.2)	297(97.1)	259(97.7)	292(95.4)	265(94.9)
Employ type: Informal	20(86.9)	7(77.8)	5(83.3)	13(92.9)	13(92.9)
Formal	3(13.1)	2(22.2)	1(16.7)	1(7.1)	1(7.1)
Daily wages <KES 200 (<2 USD)	12(52.2)	4(44.4)	4(66.7)	8(57.1)	9(60.0)
>KES 200 (>USD)	11(47.8)	5(55.6)	2(33.3)	6(42.9)	6(40.0)
Current school In school	532(86.9)	274(89.5)	241(90.9)	258(84.3)	235(84.2)
Not in school	80(13.1)	32(10.5)	24(9.1)	48(15.7)	44(15.8)
Distance facility: < 1km	382(62.4)	189(61.8)	137(51.7)	193(63.1)	116(41.6)
>1 km	230(37.6)	117(38.2)	128(48.3)	113(36.9)	163(58.4)
Transport facility <KES 100 (1 USD)	219(47.5)	170(55.6)	138(52.1)	121(39.5)	135(48.4)
>KES 100 (1 USD)	321(54.5)	136(44.4)	127(47.9)	185(60.5)	144(51.6)
Supplies: Available	284(46.4)	139(45.4)	155(58.5)	145(47.3)	147(52.6)
Not	328(53.6)	167(54.6)	110(41.5)	161(52.6)	132(47.3)

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available					
Phone ownership					
<one year	269(43.9)	131(42.8)	123(46.4)	138(45.1)	26(45.2)
>one year	343(56.1)	175(57.2)	142(53.6)	168(54.9)	53(54.8)
Phone number: one	524(85.6)	272(88.9)	209(79.2)	252(82.4)	36(84.6)
More than one	88(14.4)	34(11.1)	55(20.7)	54(17.6)	3(15.8)

Table 3: Socio-Demographic Characteristic of Participants

Source: Field survey, 2023

1.7: Association Between mHealth SMS and Adolescents' Attitude Towards Risky Sexual Behavior

1.7.1: Overall Level of Attitude Towards Risky Sexual Behavior

Figure 3 illustrates the level of positive attitude towards high risky sexual behavior by the participant. The overall level of positive attitude towards risky sexual behavior was 79(22.1%) and 73(24.1%) at baseline and end line respectively. The finding was based on the four operational variables. The scores for each variable respectively at pre-test and post-test were: abstinence 65(18.2%) and 64(21.2%); safe sex 81(22.8%) and 91(29.9%); sexual partners 96(27.1%) and 88(29.2%) while alcohol had 91(25.7%) and 81(26.6%).

These statistical 22.1% findings of attitude towards RSB were supported by some of the key informants when asked to comment on whether adolescents' attitude towards risky sexual behavior in the County. *K.I.9:*

Most of our adolescents do not care about the consequences of indulging in risky sexual behavior. During our youth workshops, sometimes some of them brag about having many sexual partners. Especially our boys, they think in it 'a badge of honor' to have sex with many girlfriends.

Findings showed that only 25.7% used protection during sexual activity. These findings were supported by qualitative information. *K.I.7:*

They (adolescents) have poor attitude on protecting themselves from the Virus. In our monthly

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sensitization program, we sometimes debate on health issues like STD's. Surprisingly, some youth still believe HIV does not exist, so they end up not using any form of protection during sexual activity.

Similar information on the statistical 22.8% of findings of poor attitude towards safe sex was documented. *K.I.8:*

It is unfortunate that despite some of the adolescents who have contracted HIV/AIDS, during our counselling session, they still admit not to use protection when having sex with their peers. They don't think there is anything wrong with their irresponsible actions even to their own health.

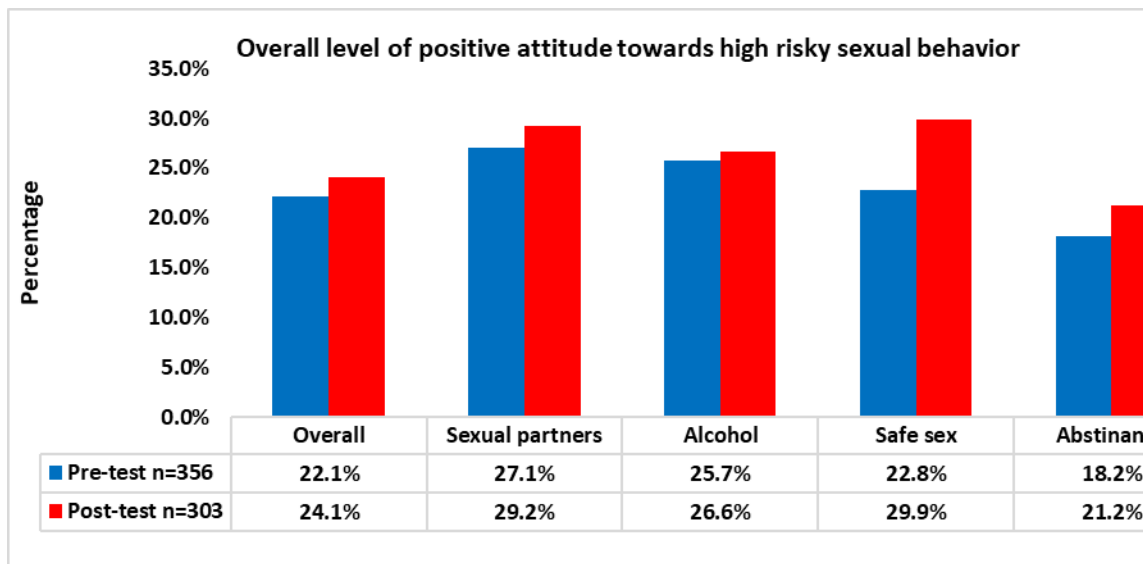


Figure 3: Overall level of attitude towards risky sexual behaviour 1.7.2: Pre-test Comparative Analysis of Attitude Level towards Risky Sexual Behavior of Trial Arms

Table 4 shows that the study recorded no statistically significant difference $P > 0.05$ in the level of attitude towards risky sexual behavior between the control group and the treatment group at pre-test study.

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Table 4: Pre-test Comparative Analysis of Attitude Level Towards High Risky Sexual Behaviour of Trial Arms

Item	Category	Control n=167	Treatment n=189	χ^2	p-value
		Freq (%)	Freq (%)		
Overall attitude level	Positive	38(22.6)	41(21.7)	6.528	0.083
	Negative	129(77.4)	148(78.3)		
Abstinence					
I can live without sex and still be okay	Yes	72(43.2)	77(40.7)	0.168	0.081
	No	95(56.8)	112(59.3)		
It is not possible to abstain	Yes	95(56.9)	103(54.8)	0.309	0.182
	No	72(43.1)	86 (45.2)		
Safe sex					
My policy is that no condom no sex	Yes	54(32.4)	61(32.3)	1.178	0.097
	No	113(67.6)	128(67.7)		
Asking a partner to use condom shows lack of trust	Yes	80(47.9)	70(44.6)	2.367	0.062
	No	87(52.1)	87(55.4)		
Condoms reduce sexual pleasure	Yes	77(45.9)	95(50.3)	0.805	0.166
	No	90(54.1)	94(49.7)		
Sexual Partner					
I Can be faithful to one sexual partner use	Yes	69(41.3)	73(38.9)	0.549	0.217
	No	98(58.7)	116(61.1)		
My policy is no to multiple sexual partners	Yes	54(32.4)	63(33.6)	0.973	0.105
	No	113(67.6)	126(66.4)		
It's okay to have multiple sexual partners	Yes	56(33.6)	71(37.6)	1.775	0.273
	No	111(66.4)	118(62.4)		
Alcohol					
It is fun to have sex when drunk	Yes	81(48.6)	92(49.1)	0.992	0.977
	No	86(51.4)	97(50.9)		
I cannot have sex unless I am drunk	Yes	101(60.9)	130(68.8)	1.992	0.723
	No	66(39.1)	59(31.2)		

Source: Field survey, 2023

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1.7.3: Comparison of Level of Attitude Towards Risky Sexual Behavior in Trial Arms

Figure 4 shows the level of positive attitude towards risky sexual behavior the treatment group had improved from 42(22.3%) and 40(25.7%) while the control group improved from 36(21.6%) and 34(22.9%) at pre-test and post –test studies respectively.

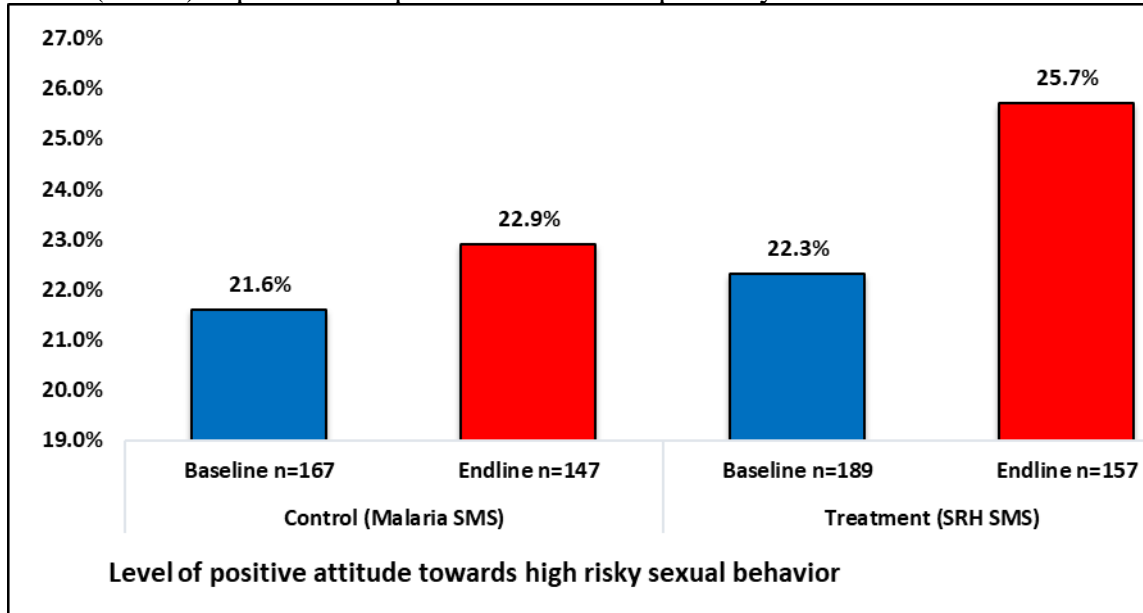


Figure 4: Level of Attitude Towards Risky Sexual Behaviour in Trial Arms

1.7.4: Influence of mHealth SMS on the Level of Attitude Towards Risky Sexual Behavior

Findings in Table 5 indicates that there was a strong significant association ($p < 0.05$) between mHealth intervention and the level of attitude towards risky sexual behavior at $p = 0.003$, $\chi^2 = 27.92$. The participants in the treatment group were 1.9 times more likely to have positive attitude towards risky sexual behavior compared to those in the control group after mHealth intervention. (O.R.=1.916; C.I.=0.78-3.82; $P = 0.003$; $\chi^2 = 27.92$). mHealth had positive influence on adolescents' attitude towards abstinence ($p = 0.072$; O.R.=0.984), safe sex ($p = 0.033$; O.R.=1.038) and sexual partners ($p = 0.009$; O.R.=1.733) but not on alcohol/drug influence ($p = 0.214$; O.R.=0.693).

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Table 5: Influence of mHealth SMS on Attitude on Level Attitude Towards Risky Sexual Behaviour

Attitude		OR	P-value	χ^2	C.I. (95%)	
Overall	Control (ref)					
	Treatment	1.916	0.003	27.92	0.78	3.82
Abstinence	Control (ref)					
	Treatment	0.984	0.072	67.23	0.23	1.89
Safe sex	Control (ref)					
	Treatment	1.038	0.033	21.66	0.74	4.32
Sexual partners	Control (ref)					
	Treatment	1.733	0.009	17.84	0.63	2.51
Alcohol	Control (ref)					
	Treatment	0.693	0.214	8.34	0.54	1.47

Source: Field survey, 2023

1.7.5: Pre-test Analysis of Attitude Level Towards Risky Sexual Behavior

The study assessed the attitude of the participants towards risky sexual behavior for both the control and the treatment group. The scores were based on ten items using a 5-point Likert scale as shown in Table 6.

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Table 6: Pre-test Analysis of Attitude Level towards Risky Sexual Behavior

Likert scale items	SD	D	N	A	SA
	Freq (%)	Freq (%)	Freq (%)	Freq (%)	Freq (%)
Control Group					
I can live without sex and still be okay	20(13.6)	24(16.2)	9(6.1)	77(52.4)	22(14.9)
It is not possible to abstain	26(17.9)	24(16.3)	18(12.1)	38(26.5)	38(25.8)
My policy is that no condom no sex	67(45.5)	48(32.6)	14(9.5)	13(8.8)	16(10.9)
Asking a partner to use condom shows lack of trust	25(17.3)	26(17.9)	9(6.5)	40(27.5)	47(32.1)
Condoms reduce sexual pleasure	32(21.8)	28(18.9)	6(4.2)	47(32.4)	32 (22.2)
I Can be faithful to one sexual partner use	46(32.3)	50(34.0)	12(8.2)	32(21.7)	17(11.6)
My policy is no to multiple sexual partners	14(9.8)	17(11.8)	12(8.2)	52(35.3)	47(32.4)
It's okay to have multiple sexual partners	11(7.5)	19(13.1)	24(16.3)	40(27.5)	50(34.3)
It is fun to have sex when drunk	21(14.4)	19(13.1)	19(13.1)	48(33.0)	38(26.1)
I cannot have sex unless I am drunk	47(32.4)	27(18.6)	15(10.1)	27(18.6)	29(19.6)
Treatment Group					
I can live without sex and still be okay	33(21.2)	18(11.5)	12(7.7)	70(44.9)	16(10.3)
It is not possible to abstain	33(21.6)	23(14.7)	21(13.7)	42(26.7)	37(23.9)
My policy is that no condom no sex	53(33.9)	51(32.7)	17(10.9)	12(7.7)	12(7.7)
Asking a partner to use condom shows lack of trust	24(15.7)	31(19.6)	14(8.8)	39(25.2)	46(29.4)
Condoms reduce sexual pleasure	31(19.6)	34(21.6)	9(5.9)	51(33.3)	31(19.9)
I Can be faithful to one sexual partner use	42(26.9)	47(30.1)	9(5.8)	29(18.6)	17(10.9)
My policy is no to multiple sexual partners	20(12.7)	20(13.1)	17(10.8)	53(33.9)	50(32.0)
It's okay to have multiple sexual partners	15(9.8)	24(15.7)	24(15.7)	40(25.8)	53(33.7)

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It is fun to have sex when drunk	28(17.9)	18(11.4)	21(13.4)	50(32.1)	7840(25.5)
I cannot have sex unless I am drunk	50(32.0)	23(15.0)	18(11.8)	32(20.3)	34(21.6)

1.7.6: Association between Attitude Level and Risky Sexual Behavior

Table 7 indicates an association $p < 0.05$ between attitude level and risky sexual behavior. Participants with positive attitude were 1.8 times less likely to engage in risky sexual behavior compared to those with negative attitude. (O.R.=1.813; C.I.=0.22-3.11; $P=0.047$; $\chi^2=11.18$).

Table 7: Overall Association between Attitude and Sexual Behaviour at Baseline

Item	Category	O.R.	P-value	χ^2	C.I. 95%	
Overall	Negative (ref)					
	Positive	1.813	0.047	11.184	0.22	3.11
Abstinence	Negative (ref)					
	Positive	0.772	0.109	1.755	0.75	1.17
Safe sex	Negative (ref)					
	Positive	1.117	0.048	0.942	0.36	3.82
Sexual partners	Negative (ref)					
	Positive	1.045	0.037	7.944	0.88	4.41
Alcohol	Negative (ref)					
	Positive	0.319	0.635	3.412	0.31	1.83

1.8: Discussion

Others studies have established an association between mHealth SMS and positive change in adolescents' attitude towards risky sexual behaviour (Rokicki, 2016). In agreement are findings in this study which indicates that there was a significant association ($p < 0.05$) between mHealth intervention and attitude towards risky sexual behaviour. Participants in the treatment group were 1.9 times more likely to have a positive attitude towards risky sexual behaviour compared to the participants in the control group. mHealth SMS had a positive influence on adolescents' attitude towards abstinence, safe sex, sexual partners but not on alcohol/drug influence. This means

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that mHealth SMS has potential to improve adolescents' attitude towards risky sexual behaviour with regard to sexual activity, safe sex, sexual partners but not on alcohol/drug influence. It also means that without mHealth SMS utilization, the adolescents' attitude towards risky sexual behaviour remains negative as shown by the control group and other studies where more than 50% of adolescents have negative attitudes towards sexual behaviour (Dutt, 2017).

1.9: Conclusion

mHealth SMS had a positive influence on only two aspects of attitude towards RSB: sexual activity, safe sex and sexual partners. The study findings showed mHealth SMS had no influence on attitude towards practicing sexual activity under influence of alcohol/drugs.

1.10: Recommendation

1. Health educators should include attitude (affective skills) in training programs on RSB perception to motivate adolescents to take initiatives in adopting the desired behaviors
2. A follow up study on evaluation of cost benefit analysis of mHealth intervention in improvement of adolescents' risky sexual behavior.

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