

# Results

## Overview

In October 2019, 305 adolescents from 12 villages in Kibra were mobilized and screened for eligibility. Owing to lack of access to a mobile phone, 5 adolescents were excluded from the study. Study participants were then randomized to the intervention (154/300, 51.3%) and control (146/300, 48.7%) groups. From late December 2019, 77% (231/300) of the adolescents were successfully followed up—74.7% (109/300) from the intervention group and 76.6% (118/300) from the control group. As the app was not used at least once, 47 participants, together with another 4 participants with incomplete data in the intervention group, were excluded from the final analysis. Figure 2 shows the enrollment and follow-up stages of the study. The data were analyzed as per the per-protocol analysis.

## Background Characteristics of the Study Participants

The distribution of the study participants according to the selected background characteristics indicated a desired comparable result at baseline as shown in Table 1. The mean ages of the participants in the control group (17.29, SD 1.23 years) and the intervention group (17.27, SD 1.12 years) were statistically comparable ( $P=.94$ ). There were no significant differences in participant demographics. However, there was a statistically significant difference in the distribution of sex ( $P=.025$ ) by the study enrollment group.

**Table 1.** Characteristics of the study participants (N=300).

Variables	Total (n=180), n (%)	Intervention (n=62), n (%)	Control (n=118), n (%)	<i>P</i> value
<b>Sex</b>				.03
Male	67 (37.2)	30 (48.4)	37 (31.4)	
Female	113 (62.8)	32 (51.6)	81 (68.6)	
<b>Phone ownership</b>				.64
Adolescent	81 (45)	30 (48.4)	51 (43.2)	
Parent or guardian	90 (50)	30 (48.4)	60 (50.8)	
Other	9 (5)	2 (3.2)	7 (5.9)	
<b>Highest level of education</b>				.97
Primary	23 (12.8)	8 (12.9)	15 (12.7)	
Secondary and above	157 (87.2)	54 (87.1)	103 (87.3)	

## SRH Knowledge Score

Participants' responses were analyzed by attitude toward contraceptives, gender role stereotypes, abstinence, and perceived vulnerability to negative SRH outcomes. Knowledge scores were also analyzed as aggregated data. A paired sample *t* test analysis of the relationship between the knowledge score and the use of the mobile app was performed using R software.

Table 2 presents an analysis of the effect of the intervention on specific indicator scores. The difference in the mean scores between those enrolled in the intervention group compared with those in the control group showed statistical significance in the total knowledge scores. The overall mean change in total scores in the intervention group was 0.5 ( $P=.015$ ) compared with the control group 0.246 ( $P=.236$ ). The *P* value between the 2 groups on the total knowledge scores was .029, which was statistically significant, indicating that the mobile app had an impact on the adolescents' SRH knowledge scores. In the intervention group, the intervention had a statistically significant effect on contraceptive scores (0.355;

$P=.017$ ). The intervention also showed a trend toward statistical significance in abstinence knowledge scores ( $0.129$ ,  $P=.088$ ).

**Table 2.** Effects of intervention on overall and specific knowledge scores.

Outcome (knowledge score)	Intervention					Control					Between group, $P$ value
	Baseline, mean [SD] (95% CI)	End line, mean [SD] (95% CI)	Difference in scores, mean [SD] (95% CI)	Effect sizes	Within group, $P$ value	Baseline, mean [SD] (95% CI)	End line, mean [SD] (95% CI)	Difference in score, mean [SD] (95% CI)	Effect sizes	Within group, $P$ value	
Contraceptives	3.613 [1.107] (3-4)	3.968 [0.887] (4-5)	0.355 [1.147] (0.064 to 0.646)	0.309	.02	3.602 [1.039] (3-4)	3.678 [1.183] (3-5)	0.076 [1.235] (-0.148 to 0.301)	0.062	.5	.06
Vulnerability	2.000 [0.768] (1.25-3)	2.032 [0.768] (2-3)	0.0323 [0.829] (-0.178 to 0.243)	0.038	.76	1.856 [0.860] (1-2.75)	1.941 [0.798] (1-2.75)	0.085 [0.939] (-0.086 to 0.256)	0.090	.33	.32
Gender stereotype	3.097 [0.987] (3-4)	3.081 [1.060] (3-4)	-0.016 [0.757] (-0.208 to 0.176)	0.021	.87	2.890 [1.160] (2-4)	2.881 [1.126] (2-4)	-0.008 [1.121] (-0.213 to 0.196)	0.008	.94	.88
Abstinence	1.565 [0.532] (1-2)	1.694 [0.465] (1-2)	0.129 [0.586] (-0.020 to 0.278)	0.220	.09	1.576 [0.576] (1-2)	1.669 [0.539] (1-2)	0.129 [0.569] (-0.011 to 0.197)	0.163	.08	.01
Total knowledge score	10.270 [2.050] (9-12)	10.770 [2.012] (10-12)	0.5 [1.576] (0.099 to 0.900)	0.317	.02	9.924 [2.227] (8.25-12)	10.170 [2.412] (9-12)	0.246 [2.242] (-0.163 to 0.654)	0.109	.24	.03

## Use and Perceptions of the Mobile Phone App

The use and perceptions questionnaires were used to measure the perceived usefulness of the app. We also aimed to evaluate how the knowledge adolescents received from the app influenced their SRH decision-making. Tables 3 and 4 show the descriptive statistics of our evaluation. The tables show the responses from each adolescent who had used the mobile app at least once in 3 months. The questions addressed topics of interest, the perceived usefulness of information, and the mobile app features the users appreciated. The information in Table 3 is stratified by age—adolescents aged < 18 years and those  $\geq 18$  years. Table 4 is stratified by gender.

**Table 3.** Use and perception of the mobile app stratified by age groups (62 participants).

Variable	All, n (%)	Age <18 years, n (%)	Age ≥18 years, n (%)	P value
What information did you require when you last used the mobile app?				
STIs <sup>a</sup>	20 (26.7)	8 (40)	12 (60)	.37
Drugs	18 (24)	12 (66.7)	6 (33.3)	.16
Relationship	17 (22.7)	9 (52.9)	8 (47.1)	.81
Sex	12 (16)	4 (33.3)	8 (66.7)	.25
Contraceptives	6 (8)	3 (50)	3 (50)	>.99
Pregnancy	2 (2.7)	0 (0)	2 (100)	.16
What knowledge about SRH <sup>b</sup> issues have you gained?				
Abstinence	53 (42.4)	28 (52.8)	25 (47.2)	.68
STIs	30 (24)	14 (46.7)	16 (53.3)	.72
Condom use	22 (17.6)	12 (54.5)	10 (45.5)	.67
Contraceptives	12 (9.6)	6 (50)	6 (50)	>.99
Drugs	8 (6.4)	5 (62.5)	3 (37.5)	.48
What decision-making was informed by the information you accessed on the mobile app?				
Abstinence	51 (38.1)	28 (54.9)	23 (45.1)	.48
Condom use	36 (26.9)	18 (50)	18 (50)	>.99
STIs	29 (21.6)	11 (37.9)	18 (62.1)	.19
Contraceptives	9 (6.7)	6 (66.7)	3 (33.3)	.32
Drugs	9 (6.7)	6 (66.7)	3 (33.3)	.32
Were the questions you on SRH had answered adequately?				
Yes	56 (90.3)	30 (53.6)	26 (46.4)	>.99
No	6 (9.7)	3 (50)	3 (50)	
Did the information you receive inform better decision-making on SRH matters?				
Yes	62 (100)	33 (53.2)	29 (46.8)	.62
No	0 (0)	0 (0)	0 (0)	
What are the most important features of the mobile phone app?				
Ease of use	54 (28.3)	28 (51.9)	26 (48.1)	.79

Confidentiality	51 (26.7)	26 (51)	25 (49)	.89
Quality of information	45 (23.6)	24 (53.3)	21 (46.7)	.65
Immediate feedback	41 (21.5)	20 (48.8)	21 (51.2)	.88

<sup>a</sup>STI: sexually transmitted infection.

<sup>b</sup>SRH: sexual reproductive health.

Information about STIs was of great interest to the participants, with 26.7% (20/75) of the responses by users seeking information on this subject the last time they used the app. Adolescent girl participants had a higher interest in STIs, with 55% (11/20) accessing this information. Most participants (56/62, 90.8%) found the information provided in the app to have adequately answered their questions or met their SRH information needs. All the 62 adolescents who used the app felt that the information they received could improve their decision-making on issues relating to SRH. This outcome was similar when data were stratified by age and gender.

The participants reported gaining knowledge from the app on several SRH issues in their responses, including abstinence (53/125, 42.4%), STIs (30/125, 24%), and condom use (22/125, 17.6%). Although only 9.7% (12/125) of the participant's responses showed increased knowledge of contraceptives, 75% (9/12) of these were female, showing a trend toward significance ( $P=.08$ ).

On improved decision-making, 38.1% (51/134) of the adolescent participant's responses show they were able to abstain from sex. Of these responses, 54.9% (28/51) were aged between 15 and 17 years and 52.9% (27/51) were male. The knowledge obtained may have also prompted 26.9% (36/134) of the responses to show use a condom by the adolescent participants during a sexual encounter. Although sex is illegal for ages under 18 years in Kenya, 50% of those who reported deciding to use a condom were aged  $\leq 17$  years. Of the participants who used a condom, 52.8% (19/36) were male. Adolescent participants were also able to identify STIs, with 21.6% (29/134) responses reporting that app information guided their decision to seek treatment after identifying an STI; 51.7% (15/29) of these responses were from female participants.

Ease of use was the most important feature of the app for 28.3% (54/191) of the participants' responses, followed by confidentiality at 26.7% (51/191) and high-quality information at 23.6% (45/191), with 60% (27/45) of the latter being from responses by female participants.

**Table 4.** Use and perception of the mobile app stratified by gender (62 participants).

Variable	All, n (%)	Male, n (%)	Female, n (%)	P value
<b>What information did you require when you last used the mobile app?</b>				
STIs <sup>a</sup>	20 (27)	9 (45)	11 (55)	.65
Drugs	18 (24.3)	10 (55.6)	8 (44.4)	.64
Relationships	16 (21.6)	8 (47.1)	9 (52.9)	.81
Sex	12 (16.2)	5 (41.7)	7 (58.3)	.56
Contraceptives	6 (8.1)	1 (16.7)	5 (83.3)	.10
Pregnancy	2 (2.7)	1 (50)	1 (50)	.>99

<b>What knowledge about sexual reproductive health matters have you gained?</b>					
	Abstinence	53 (42.7)	26 (49.1)	27 (50.9)	.89
	STIs	30 (24.2)	13 (43.3)	17 (56.7)	.47
	Condom use	22 (17.7)	13 (50.1)	9 (40.9)	.39
	Contraceptives	12 (9.7)	3 (25)	9 (75)	.08
	Drugs	7 (5.6)	2 (25)	6 (75)	.16
<b>What better decision-making was informed by the information you accessed on the mobile app?</b>					
	Abstinence	51 (38.1)	27 (52.9)	24 (48.1)	.67
	Condom use	36 (26.9)	19 (52.8)	17 (47.2)	.74
	STIs	29 (21.6)	14 (48.3)	15 (51.7)	.85
	Contraceptives	9 (6.7)	4 (44.4)	5 (55.6)	.74
	Drugs	9 (6.7)	3 (33.3)	6 (66.7)	.32
<b>Were the questions you had on SRH answered adequately?</b>					
	Yes	56 (90.3)	26 (46.4)	30 (53.6)	.61
	No	6 (9.7)	4 (33.3)	2 (66.7)	
<b>Did the information you receive inform better decision-making on SRH<sup>b</sup> matters?</b>					
	Yes	62 (100)	30 (48.4)	32 (51.6)	.8
	No	0 (0)	0	0	
<b>What are the most important features of the mobile phone app?</b>					
	Easy to use	54 (28.3)	26 (48.1)	28 (51.9)	.79
	Confidentiality	51 (26.7)	24 (47.1)	27 (52.9)	.67
	Quality of information	45 (23.6)	18 (40)	27 (60)	.18
	Immediate feedback	41 (21.5)	19 (46.3)	22 (53.7)	.64

<sup>a</sup>STIs: sexually transmitted infections.

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