

The Effects of Short Health Messages Intervention in Improving Knowledge and Attitude on Sexual and Reproductive Health among Late Adolescents at Colleges in Malaysia

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Abstract

Sexual and reproductive health problems among adolescents are increasing in trend. Inadequate knowledge of sexual and reproductive health is the main cause of problems in sexual and reproductive health. Short messages service (SMS) intervention has been implemented widely in health education and the outcomes are positive. Hence, this study was conducted to evaluate the effects of mobile phone messaging in improving sexual and reproductive health among late adolescents (age 18 - 19 years old). A quasi-experimental study was conducted in two Professional Vocational Colleges in Malaysia. A total of 116 respondents in the intervention group and 130 respondents in the control group had completed the study. There was a series of 24 messages (SMS) sent to the respondents biweekly for 12 weeks. The adolescent girls (mean knowledge score 15.90, sd \pm 3.321) in the intervention group had a significantly ($P = 0.007$) higher mean score in knowledge of sexual and reproductive health than boys (mean knowledge score 13.87, sd \pm 4.003) at post intervention. The adolescent boys (mean knowledge scores 15.35, sd \pm 4.748) in the control group had a significantly ($P = 0.009$) higher mean score for knowledge on HIV/AIDS than girls (mean scores 13.08, sd \pm 4.325) at post intervention. In the intervention group, the number of respondents with good knowledge and good attitude on HIV/AIDS increased at 3 months post intervention. SMS intervention on knowledge of sexual and reproductive health for adolescents was accepted and effectively improved the knowledge scores and sustained even after 3 months post intervention. Therefore, the SMS intervention should be implemented as an intervention package to improve knowledge and reduce risk in developing sexual and health related problems among adolescents.

Keywords

Adolescent, Sexual and Reproductive Health, SMS Intervention, College

1. Introduction

Every human being who reaches adulthood will experience life as an adolescent. Based on the World Health Organization, an adolescent is defined as a person whose age is between 10 and 19 years old. It is divided into three parts which are early adolescent, middle adolescent and late adolescent [1]. This is a critical period for them because they will experience many facets of developmental changes in their life which involves biological, physical, emotional and sexual demand. These developmental changes can lead them to be exposed to sexual and reproductive health (SRH) problems if they are unprepared to manage the risks. Nowadays, many adolescents are involved in SRH problems around the world like teenage pregnancy, sexual transmitted diseases, HIV/AIDS infection and mental health issues. Some of the adolescents are having sexual activity at an early age. It was reported that the first time of sexual debut occurred in Malaysia as young as 15 years old in average [2]. Premarital sexual activity has increased the prevalence of unmarried pregnancy in the country [1].

Many studies showed that there is an increasing trend in SRH problems among adolescents. In the United States of America, there is a 3% increment in birth rates among 15 to 19 years old adolescents [3]. In fact, the number of adolescent boys and girls who are aged 10 to 24 years old diagnosed with HIV and AIDS is counted to be over 20,000 [4]. A global survey carried out by the CDC's YRBS in America in 2005 showed that among the adolescents who involved in this survey, 46.8% of them have had sexual intercourse [3].

In Malaysia, SRH problems among adolescents are reported to be an increasing trend by years. Birth delivery among adolescents aged 15 to 19 have increased from 15,849 cases in year 2004 to 17,600 cases in year 2008 [5]. From July to December 2010, there have been 5962 cases of unmarried pregnancy reported in a study among adolescents aged between 10 to 19 in Malaysia [5]. About 75% of them (n = 4441) have married and 25% (n = 1521) of them are not married. Besides, the media reported that, the average number of abandoned babies is 100 babies per year. HIV/AIDS is a problem among adolescents aged between 13 to 19 years old and they make up a 5.6% of total HIV/AIDS patients in Malaysia in year 2008 [5]. Several risk factors have been determined for these problems such as lack of information and understanding of knowledge regarding sexual and reproductive health [3]. Among the risk factors identified are peer pressure, socioeconomic and education level, parents-adolescents relationship, parental influence and the adolescents' view on excitement of sexual intercourse [3].

Currently, many interventions have been carried out to empower adolescents

on SRH risk prevention. These include health talks, campaigns, camps, seminars and others. Malaysia has developed policies and guidelines for healthcare workers in delivering healthcare services related to SRH among adolescents [1]. The interventions are implemented by both government and non-government agencies. One of the activities carried by the government is creating Café @Teens at National Population and Family Development Board service centres to engage with the adolescents in promoting health and preventing risk [6]. The Federation of Reproductive Health Associations, Malaysia (FRHAM) is actively involved in SRH promotions among adolescents in the community. They contribute to the government in developing policies and procedures related to SRH [7]. In San Francisco, An online program called SEXINFO has been developed for SRH intervention for adolescents in response to rising rates of gonorrhea cases [8]. In Australia, the delivery of information on SRH has been done through short text messages (SMS) and it showed positive feedback from adolescents on that method [9].

Currently, adolescents are one of the main users of mobile phones. A study done in United States of America shows that 33% of adolescents aged between 12 to 14 years old have their own mobile phones [8]. The study conducted in Los Angeles shows that the adolescents like to receive health information via text messages every week as they felt secure by using text messages [10]. It is reported that 75% of adolescents utilize the internet to search for information on health besides using it for other matters [10].

In Malaysia, the majority of adolescents get their informal information regarding SRH from mass media such as internet and television [2]. SMS intervention plays an important role in disease treatment and management, health promotion, disease prevention by forming good communication between patients and healthcare providers [11]. It has been shown to increase patients' commitment to treatments and follow ups [12] and also as a method for advertisement in business [13]. In fact, studies conducted using the SMS intervention among the young people on sex and reproductive safety have showed that the knowledge level is improving in the intervention group than in the control group [9] [14].

Even though many interventions have been implemented on SRH for adolescents, the knowledge level of adolescents on SRH remains unsatisfied. The current trend of SRH problems among adolescents requires a new intervention method to utilize the current technology and environment to overcome these problems. Hence, this study is conducted to assess the effect of mobile phone message (SMS) as intervention in improving the knowledge of adolescents on sexual and reproductive health.

2. Methods

2.1. Study Design

This study was designed as a quasi-experimental study which had an interven-

tion group and a control group. Intervention was implemented on the intervention group throughout the intervention period. An intervention package was used in this study and it was implemented based on the intervention implementation protocol. This intervention was implemented for 12 weeks through mobile phone text messages (SMS). On the other hand, the control group was given a health talk at pre intervention. This study was conducted in two centres which were called as intervention centre and control centre. The period of study was from January 2016 until January 2017.

The study period was divided into three phases. The first phase was on situational analysis through searching and understanding the local and international problems related to SRH among adolescents. Various sources were used as references including journals, articles, books and others. The second phase was the development of study instruments which consisted of a set of questionnaires and an intervention package. Based on the sources related to sexual and reproductive health among adolescents, a set of questionnaire and an intervention package were developed and validated by the expert group.

The third phase was data collection and implementation of the intervention package. Data collection was conducted at pre intervention and post intervention. After the completion of data collection at pre intervention, a series of intervention through SMS was delivered to the respondents of intervention group biweekly for 12 weeks. Data collection was again conducted at post intervention after completion of the intervention. Data entry, verification and analysis were performed to answer the study objectives.

2.2. Recruitment

This study involved 18 and 19 years old adolescents who were studying at colleges in 2 different states: Negeri Sembilan and Selangor. The states were chosen as they were comparable in term of respondents' socio demographic and academic performance background. Each college per state is selected to be represented as intervention group and control group. Respondents from both colleges had received basic SRH education during their study at the secondary schools as part of school education curriculum. The respondents from both colleges who fulfilled the selection criteria were aged between 18 and 19 years old, have mobile phones with functioning SMS and were studying at the college for at least 3 months throughout the intervention period and unmarried. Those who were not Malaysians and did not understand Malay Language were excluded from this study. Universal sampling technique was used for both groups to avoid bias in retrieving information. A total of 298 students were included in the study at pre intervention stage (**Figure 1**).

2.3. Sample Size

A previous study showed that the prevalence of adolescents with good knowledge of sexual and reproductive health in the intervention group at post intervention was 73.3% and the prevalence of adolescents with good knowledge of

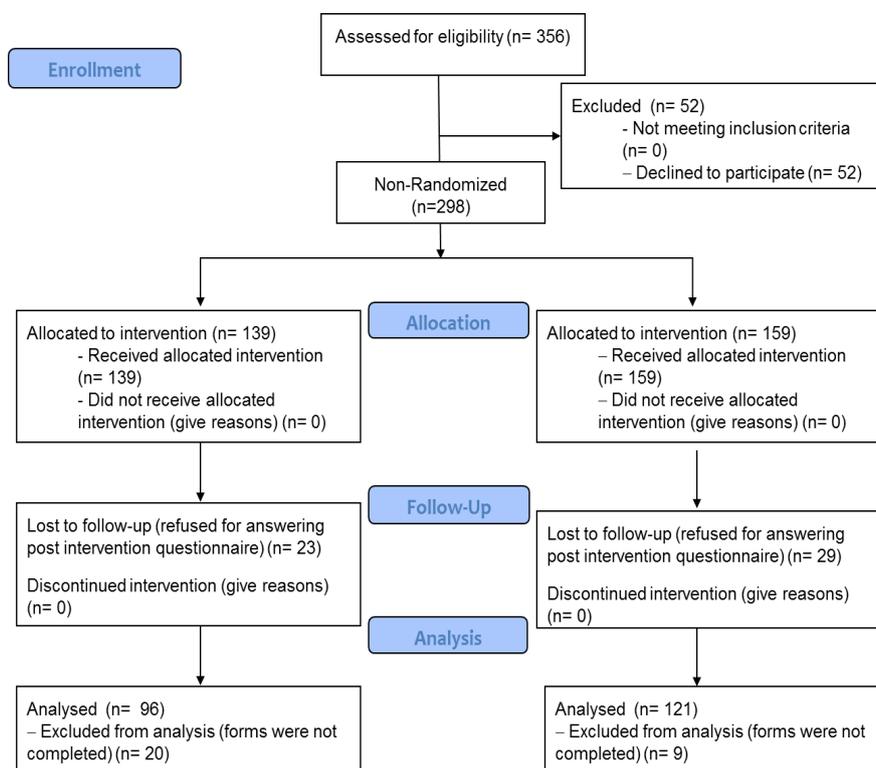


Figure 1. Flow of respondents' recruitment and retention.

SRH in the control group at post intervention was 53.4% [15]. Based on the study with a two-sided 5% significance level and a power of 80%, a sample size of 90 adolescents per group was calculated to be necessary. An addition of 20% ($n = 18$ respondents) per arm resulted in that the number of sample needed for one arm was 108, hence the total number of sample needed was 216. Sample size was calculated using software PS version 3.1.2.

2.4. Intervention and Questionnaire Validation

In present study, an intervention package was developed and used as the SMS intervention. It consisted of information regarding SRH for adolescents tailored to the situational analysis conducted for phase 1 study. The development process was conducted based on the intervention package development protocol which consisted of 4 stages [16]. It covered seven domains of SRH which had its own important messages to be known by the adolescents. The sources of information were mainly books, documents, articles, standard operating procedures and policy of the Ministry of Health. The development process involved six experts who are Public Health Specialists, Family Medicine Specialists and Secondary School Counsellors as the expert reviewers. Adolescents aged between 18 and 19 years old were involved in the development process. As a result, 24 SRH messages which were suitable for adolescents and can conveniently be delivered via SMS had been developed. This package which contained information delivered via SMS was known as *I-Remaja*.

A set of self-administered questionnaires were used in the study and comprised of four parts which were Part A, Part B, Part C and Part D. Part A had a set of questions regarding socio-demographic and socioeconomic background, sharing information delivered by SMS with other people, searching further information on SRH and feedback of respondents on SMS intervention. Part B consisted of questions on SRH and HIV/AIDS. Part C consisted of statements on attitude towards sexuality and reproduction and Part D was on attitude towards HIV/AIDS respectively. The questionnaire was developed and validated. The content of the questionnaire has been adopted from various studies [2] [5] [7] [17] [18] and revised to adapt according to local SRH problems. The developed questionnaire has been sent to a group of family health experts and teachers for content and construct validity. It was then tested in another college as a pretest for assessment on face validity and assessed for Cronbach Alpha. It showed a good internal consistency (overall Cronbach Alpha was 0.81, part B questionnaire was 0.70, part C was 0.48 and part D was 0.50. Kappa value for items related to opinion on SMS information on SRH was 0.63. The questionnaire was developed in Malay language. There are 21 items on SRH Knowledge (higher score showed better knowledge with cut off at 11 to indicate good (>11) and poor (≤ 11). There are 28 items on HIV/AIDS knowledge (higher score showed better knowledge with cut off at 14 to indicate good (>14) and poor (≤ 14). There are 9 items with 3 option answers to measure attitude on sexuality and reproduction (higher score showed better attitude with cut off at 18 to indicate negative attitude with permissive opinion (≤ 18) and positive attitude with conservative opinion (>18). There are 14 items with 2 option (yes/no) to measure attitude on sexuality and reproduction (higher score showed better attitude with cut off at 18 to indicate negative attitude with permissive opinion (≤ 28) and positive attitude with conservative opinion (>28).

2.5. Units

All respondents were given an information sheet and were requested to sign a consent form before the distribution of the questionnaire. They signed the consent form before participating in the study. The respondents had filled in and answered the questionnaire during the pre-intervention stage. All 24 SMS messages were sent in a biweekly series to each of the respondent in the intervention group using web application known as BulkSMS. All respondents' mobile numbers and messages in the intervention package were recorded in the application. The dates of delivery for each message were also recorded so that the messages will be automatically sent to each of the respondent throughout 12 weeks of intervention period. Respondents in the intervention group were given SMS containing SRH information from the *I-Remaja* package. Respondents in the control group were given a health talk consisting of information that is same as in the SMS intervention package at pre intervention. The talk was given once at pre-intervention.

2.6. Study Outcomes

The study has two outcomes which are the primary outcome and secondary outcome. The primary outcome is the knowledge level of sexual and reproductive health and the knowledge level of HIV/AIDS. The secondary outcome is the attitude towards sexuality and reproduction, attitude towards HIV/AIDS, seeking information on SRH and dissemination of the SRH knowledge and feedback on delivery of SRH through SMS in the intervention group.

2.7. Statistical Analysis

Data analysis in present study was conducted using Statistical Packages for Social Sciences (SPSS) software version 21.0. Data analysis consisted of descriptive analysis and bivariate analysis. The level of significance is set at 95% confidence level with P-value < 5% for two tailed.

2.8. Study Ethics

The study was approved by the Research Ethic Committee of Malaysia National University (FF-2015-407). The present study was given permission by Headquarters of *Majlis Amanah Rakyat* (MARA), Kuala Lumpur to conduct data collection and implementing the intervention.

3. Results

3.1. Response Rate

At the beginning of the study, there were 162 students in the intervention group and 194 students in the control group that were eligible as respondents. There were 139 respondents who participated in the intervention group and 159 respondents in the control group. There were 58 respondents who refused to be involved in this study and were absent in the pre-intervention stage which comprised of 23 respondents from intervention group and 35 respondents from the control group. Response rate was calculated at post intervention. The number of respondents in both intervention and control groups showed a decrease in number after completing the 12 weeks of intervention. In the intervention group, 23 respondents refused to answer the questionnaire during post intervention. There were three respondents in the intervention group who informed that they did not receive any SMS throughout the intervention period. Consequently, the number of respondents in post intervention was 116 with an attrition rate of 16.6%. There were 16 sets of incomplete questionnaires and one respondent attended another talk on SRH during the intervention period. Finally, the number of analyzed respondents in the control group was 96 respondents. In the control group, there were 29 respondents who refused to answer the questionnaire at post intervention. Consequently, the number of respondents during post intervention was 130 with an attrition rate of 18.2%. There were 9 sets of incomplete questionnaires. Finally, the number of analyzed respondents in the control group was 121 respondents. The number of respondents from pre intervention

and post intervention is shown in **Figure 2**.

There were 83.5% and 81.8% respondents in the intervention group and control group respectively (**Figure 2**). **Table 1** shows the prevalence of respondents in the study. Majority of the respondents participated were the girls. The intervention group has more girls (76.0%) than the control group (40.5%) Most of the respondents in both groups lived in urban area. About 94.8% (intervention group) and 100.0% (control group) respondents still have own parents alive. About 73.4% (intervention group) and 64.5% (control group) respondents had a mean total family income below RM5000. Only gender difference showed significant and others were not significant findings.

3.2. Prevalence of SRH Information Seeking

The prevalence of respondents who searched for information on SRH was higher in the intervention group than the control group. About 57.3% of the 96 respondents searched for further information on SRH topics related (**Table 1**) while 30.6% of the 121 respondents were from the control group.

3.3. Prevalence of Sharing Health Information

Out of 96 respondents in the intervention group, there were 74% of respondents who felt that the messages benefited them. There were 69.8% of the respondents who agreed that the SMS messages were suitable for adolescents and are easily understandable. There were 67.7% of the respondents who agreed that delivery of messages via SMS is suitable to be implemented in this country and that this method should be carried out at all levels of community. However, only 49.0% shared the messages received with others and majority were the girls (83.6%) (**Table 2**).

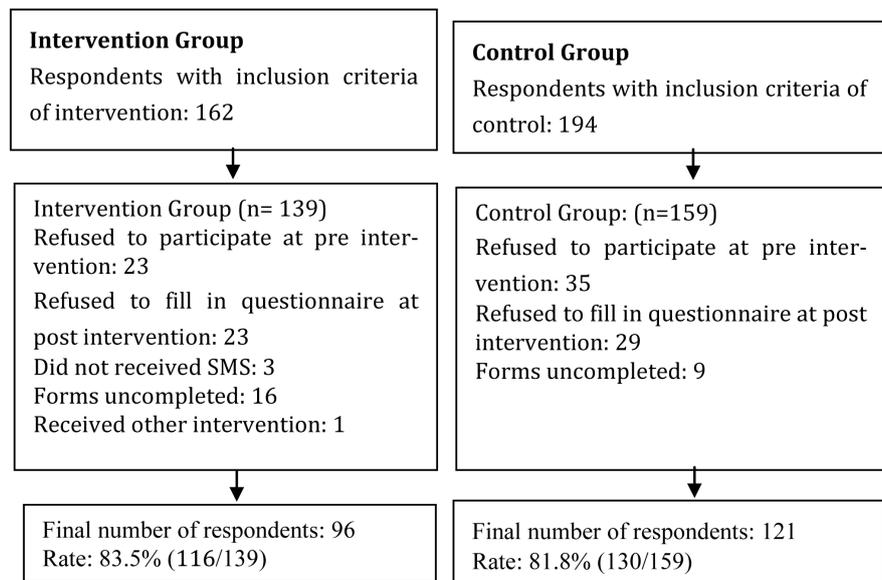


Figure 2. Flow of respondents.

Table 1. Sociodemographic of respondents and comparison between group.

Characteristics	Intervention group (n = 96)		Control group (n = 121)		P value
	n	%	n	%	
Age					
18 years old	72	75.0	77	63.6	0.073
19 years old	24	25.0	44	36.4	
Gender					
Boy	23	24.0	72	59.5	< 0.001
Girl	73	76.0	49	40.5	
Type of residence					
Rural	24	25.0	28	23.1	0.750
Urban	72	75.0	93	76.9	
Status of mother					
Alive	91	94.8	121	100.0	
Deceased	5	5.2	0	0.0	
Status of father					
Alive	90	93.8	116	95.9	
Deceased	6	6.2	5	4.1	
Parent marital status					
Married	90	93.8	118	97.5	
Divorced	6	6.2	3	2.5	
Mean Parental Household Income (RM) intervention (n = 76); control (n = 110)					
< RM5000	58	73.4	71	64.5	0.196
≥ RM 5000	21	26.6	39	35.5	
Searching for sexual and reproductive health information					
	intervention (n = 96)		control (n = 121)		
Yes	55	57.3	37	30.6	
No	41	42.7	74	69.4	

3.4. Prevalence of Knowledge Level by Groups

There was no significant difference based on knowledge level for the intervention group at pre-intervention and post intervention (**Table 3**). Nonetheless, the number of respondents who had good knowledge on HIV/AIDS showed an increment during post intervention from 41.7% to 57.0%.

In the control group, there was an increment in the number of respondents who had good knowledge on SRH during post intervention. The number of respondents with good knowledge on HIV/AIDS also showed an increment from 57.0% to 71.1%.

There was no significant difference in both groups on SRH knowledge level

Table 2. Prevalence on sharing health information and feedback on SMS intervention.

Items	n (%)
Sharing SRH information (n = 55)	
Boy	9 (16.4)
Girl	46 (83.6)
Feedback on SMS Intervention as a method of SRH information delivery (n = 96)	
I get benefits from the messages	71 (74.0)
The messages are interesting	47 (49.0)
The messages are suitable for adolescents	67 (69.8)
The messages are easily understood	67 (69.8)
I am more interested to search for further information on reproductive health	41 (42.7)
I am motivated to share the messages with other people	42 (43.8)
I have shared the messages with other people	47 (49.0)
I think the delivery of health message through SMS is suitable to be implemented on adolescents in this country.	65 (67.7)
I think the delivery of health message through SMS should be implemented on adolescents in this country	65 (67.7)

(Table 3). However, there was a significant difference in the intervention group and control group on knowledge level of HIV/AIDS between the intervention group and the control group. At post intervention, there was a significant difference ($P > 0.05$) for the prevalence of respondents in the intervention group as compared to control group based on SRH knowledge and HIV/AIDS.

3.5. Comparison on Mean SRH Knowledge Score by Gender at Pre and Post Intervention

In the intervention group, adolescent boys had higher mean SRH knowledge score on HIV/AIDS than adolescent girls during both pre intervention and post intervention. Adolescent girls had higher mean SRH knowledge score than adolescent boys during post intervention. In the control group, adolescent boys had higher mean SRH knowledge score and HIV/AIDS than adolescent girls during pre-intervention. The mean SRH knowledge score and HIV/AIDS were equally same during pre-intervention and post intervention (Table 4).

3.6. Prevalence of Respondents Based on Attitude Level at Pre Intervention and Post Intervention within and Inter Group

There was a decrement in the number of respondents with positive attitude on sexuality and reproduction in the intervention group at post intervention (Table 5). However, there was an increment in the number of respondents with positive attitude on HIV/AIDS in the intervention group in post intervention.

During pre-intervention, there was a significant difference in the number of respondents between the intervention and control group based on attitude towards HIV/AIDS. During post intervention, there was significant difference in

Table 3. Comparison on SRH knowledge level within group and inter groups.

Comparison on SRH knowledge level within group	Group	SRH knowledge level		P value
		Poor knowledge	Good knowledge	
Intervention group				
Knowledge on sexual and reproductive health	Pre-intervention	13 (13.5%)	83 (86.5%)	0.545
	Post-intervention	16 (16.7%)	80 (83.3%)	
Knowledge on HIV/AIDS	Pre-intervention	56 (58.3%)	40 (41.7%)	0.030
	Post-intervention	41 (42.7%)	55 (57.3%)	
Control group				
Knowledge on sexual and reproductive health	Pre-intervention	18 (14.9%)	103 (85.1%)	0.066
	Post-intervention	9 (7.4%)	112 (92.6%)	
Knowledge on HIV/AIDS	Pre-intervention	52 (43.0%)	69 (57.0%)	0.023
	Post-intervention	35 (28.9%)	86 (71.1%)	
Comparison on SRH knowledge level at difference phase	Group	SRH knowledge level		P value
		Poor knowledge	Good knowledge	
Pre intervention				
Knowledge on sexual and reproductive health	Intervention	13 (13.5%)	83 (86.5%)	0.078
	Control	18 (14.9%)	103 (85.1%)	
Knowledge on HIV/AIDS	Intervention	56 (58.3%)	40 (41.7%)	0.025
	Control	52 (43.0%)	69 (57.0%)	
Post intervention				
Knowledge on sexual and reproductive health	Intervention	16 (16.7%)	80 (83.3%)	0.034
	Control	9 (7.4%)	112 (92.6%)	
Knowledge on HIV/AIDS	Intervention	41 (42.7%)	55 (57.3%)	0.035
	Control	35 (28.9%)	86 (71.1%)	

the prevalence of respondents between the intervention group and control group when it came to attitude towards sexuality and reproduction. There was no significant difference in the prevalence of respondents between the intervention group and control group for attitude towards HIV/AIDS. The number of respondents with positive attitude showed an increase in trend during post intervention in both attitudes on SRH and HIV/AIDS.

4. Discussion

In an intervention study, the response rate is important to assess the sustainability of respondents in the study throughout the intervention period. Reason for respondents' dropout from the study may be due to respondents withdrawing from the study colleges and not compliance with the study protocol. However, in present study, the response rates in both intervention group and control group are high. The response rate for intervention group is 83.5% and the response rate

Table 4. Comparison on mean SRH knowledge score by gender.

Group		Mean SRH knowledge score				* P value
		boy	s.d.	girl	s.d.	
Intervention group						
Pre	Knowledge on sexual and reproductive health	14.17	2.534	14.33	3.342	0.839
	Knowledge on HIV/AIDS	14.57	3.342	12.86	4.791	0.117
Post	Knowledge on sexual and reproductive health	13.87	4.003	15.90	3.321	0.017
	Knowledge on HIV/AIDS	16.35	6.429	14.97	5.914	0.343
Control group						
Pre	Knowledge on sexual and reproductive health	15.49	3.224	14.76	2.997	0.210
	Knowledge on HIV/AIDS	15.35	4.748	13.08	4.325	0.009
Post	Knowledge on sexual and reproductive health	16.13	3.030	16.71	2.858	0.285
	Knowledge on HIV/AIDS	17.15	5.512	17.20	3.730	0.955

*Independent t-test; s.d. = standard deviation.

for control group is 81.8%. This shows that the attrition rate is less than 20%. The response rate of present study is in line with response rate of other intervention studies such as the SMS intervention study conducted in reducing the perinatal mortality in Zanzibar where the response rate for the intervention group and control group are 97% and 96% respectively [19].

This study was conducted among respondents who are 18 and 19 years old in both the intervention and the control group. There is no significant difference between both groups by age and residential area. The majority of the respondents stayed in the urban area. There is no significant difference between both groups based on total monthly parental income and the majority of the respondents have total parental income of less than RM 5000. Eventhough there is a significant difference based on gender of respondents between the intervention and the control group, it does not influence the implementation of intervention in the study. Previous studies show various results in the increment of knowledge on SRH based on gender whereby there are intervention studies that show the SRH knowledge is higher in girls than boys and vice versa.

4.1. Intervention Effect on Seeking SRH Information

SRH information was delivered to the respondents by SMS in the present study. This approach is used to make them aware and understand on SRH in a secure manner via own phone. The findings showed that it able to trigger them to seek for further information on SRH related to the intervention package. About 57.3% of respondents in the intervention group searched for further information on sexual and reproductive health throughout the intervention period. However, only 30.6% of respondents in the control group searched for further information

Table 5. Comparison of SRH attitude within groups and inter group.

Comparison of SRH attitude within groups		SRH attitude		P value
		Negative attitude	Positive attitude	
Intervention group				
Attitude on sexuality and reproduction	Pre-intervention	2 (2.1%)	94 (97.9%)	< 0.001
	Post-intervention	24 (25.0%)	72 (75.0%)	
Attitude on HIV/AIDS	Pre-intervention	45 (46.9%)	51 (53.1%)	0.143
	Post-intervention	35 (36.5%)	61 (63.5%)	
Control group				
Attitude on sexuality and reproduction	Pre-intervention	4 (3.3%)	117 (96.7%)	1.000
	Post-intervention	4 (3.3%)	117 (96.7%)	
Attitude on HIV/AIDS	Pre-intervention	32 (26.4%)	89 (73.6%)	0.768
	Post-intervention	30 (24.8%)	91 (75.2%)	
Comparison of SRH attitude inter groups		SRH attitude		P value
		Negative attitude	Positive attitude	
Pre intervention				
Attitude on sexuality and reproduction	Intervention	2 (2.1%)	94 (97.9%)	0.585
	Control	4 (3.3%)	117 (96.7%)	
Attitude on HIV/AIDS	Intervention	45 (46.9%)	51 (53.1%)	0.002
	Control	32 (26.4%)	89 (73.6%)	
Post intervention				
Attitude on sexuality and reproduction	Intervention	24 (25%)	72 (75.0%)	< 0.001
	Control	4 (3.3%)	117 (96.7%)	
Attitude on HIV/AIDS	Intervention	35 (36.5%)	61 (63.5%)	0.113
	Control	32 (26.4%)	89 (73.6%)	

on sexual and reproductive health during the same time. It is related to the learning style of people where they will look for further information to increase their knowledge in a particular subject when they have an interest and high motivation for it [20].

There were more adolescent girls searching for further information on sexual and reproductive health than adolescent boys after receiving SMS during intervention in this study. Several studies show that girls have higher motivation and interest than boys in searching for information to increase their knowledge. In fact, searching for information is very easy at this time because it can be obtained easily from the internet. In 2010, the number of internet users in Malaysia had reached 16.9 million [21]. Adolescents use internet in searching for information for study purposes, leisure and any desired particulars [21]. This study involves the late adolescents and it shows that there are a number of

adolescents who use the internet for study purposes and seeking more information. The findings support the earlier study involving university students who has found that 91% of them use the internet for searching information to increase their knowledge [22].

4.2. Intervention Effect in Dissemination of Information

This study showed that 57.3% of respondents in the intervention group have disseminated information received via SMS to other people and the majority of them are the girls (83.6%). This shows that adolescent girls are more interested in forwarding text messages than boys. This is in line with the fact that adolescent girls use more text messages than boys in the United States of America [23]. Adolescent girls aged between 12 to 17 years old use an average of 4050 text messages a month compared to boys who use 2539 messages [23]. A study carried out among the youth in Australia showed that about three quarter of respondents received SMS from other people especially their friends [15] [24]. Dissemination of knowledge is one of the elements in the knowledge management process. It is a process whereby people exchange their knowledge mutually so that new knowledge is created together [25]. This process is important because it expands knowledge of individuals in various aspects of life such as in their study and work [26]. There are several factors influencing the dissemination of knowledge among humans. Some of the factors are the ability to disseminate information, have own positive competition level, trust, gain technical support skill and positive attitude of sharing [27]. A person will disseminate the knowledge when he or she is confident that the knowledge is right and beneficial to other people [25]. Technology aspect plays an important role in the dissemination of knowledge to each other. A study carried out among students has shown that technology encourages the dissemination of knowledge [28]. Besides, dissemination of knowledge is in the character of a person who has an active learning style [29].

4.3. Feedback on SMS Intervention

The present study found that more than half of the respondents in the intervention group stated that they benefited from the messages delivered to them through SMS during the intervention period. They agreed that the SMS messages are suitable for adolescents and easily understood. They agreed that the delivery of SRH messages through SMS is suitable to be used as one of health promotion approach in reaching more adolescents. This study is in line with another study conducted among the youth in Australia that provide positive feedback on SMS intervention [24]. They found that SMS is an attractive and enjoyable approach that they learn something [24].

A study has been conducted on viewing the adolescent's perspective on the usage of text messaging in prevention of sexual health problems in Los Angeles. It has found that the adolescents were happy receiving text messages on sexual

health delivered to them weekly in a way that informative, easily understood and easily to share with their friends [30]. A study done in Selangor on the acceptance of sexual and reproductive health education for adolescents and youth in Malaysia has found that sexual health education can overcome social problems among adolescents at schools [31].

4.4. Knowledge on Sexual and Reproductive Health among Adolescents

The present study showed that the knowledge level on sexual and reproductive health among adolescents is still unsatisfying, despite having completed their secondary school study. Their knowledge on sexual and reproductive health, HIV/AIDS and sexually transmitted diseases have been taught at the secondary school level. It has been included in the Secondary School Integrated Curriculum for Form 5 Sciences subject and Biology subject in government school in Malaysia [32].

This study showed that the mean knowledge score on sexual and reproductive health and HIV/AIDS is higher among boys than girls. A study on knowledge of sexual and reproductive health among adolescents at a college in Malaysia showed that the mean score is higher among girls than boys [17] [18] [32]. In fact, a study done on knowledge of gynaecology among college students in United States of America also showed that the mean score was higher among girls than boys [33]. Besides, another study conducted on knowledge of sexual and reproductive health among adolescents at secondary schools in Kelantan showed that the knowledge score mean is higher among girls than boys [2]. However, another study conducted among secondary school students in Pulau Pinang on knowledge of sexually transmitted diseases showed that the mean score of adolescent boy is higher than girl [34]. Based on studies conducted on knowledge of sexual and reproductive health among adolescents, there are variations in the knowledge mean score based on gender according to component of SRH.

The present study shows that there is an increment in the prevalence of adolescents with good knowledge on HIV/AIDS in the intervention group during post intervention. Another study on the effectiveness of SMS intervention has been conducted in Australia involving the young people also noted similar findings [14] [15] [24]. SMS intervention study involving 14 to 24 years old female students was conducted in Ghana to assess the effect of the intervention on reproductive health showed that the knowledge score increased after the intervention [35]. A study conducted using SMS as intervention for reduction of perinatal mortality in Zanzibar showed that the perinatal mortality rate has been reduced in the intervention group [19]. Furthermore, an SMS intervention study involving homosexual males in Australia shows higher prevalence of respondents in the intervention group than control group in performing HIV screening at post intervention [36]. An SMS intervention study has also

been conducted for non-communicable diseases whereby there is an increment of awareness on symptoms of asthma, compliance on treatment and control of asthma among asthmatic patients aged between 13 to 17 years old in the United States of America [37]. SMS intervention has reduced the prevalence of defaulters among patients at ophthalmology clinic based on a study conducted in London [38].

Many studies show that SMS intervention result in positive effect in various areas of health and medicine. There are many advantages in using SMS as health intervention for the community [39]. It gives comfort to the users because the messages are directly delivered to the receivers at anytime and anywhere. Information sent via SMS is easily updated and the cost of SMS intervention is cheap. In fact, monitoring of the delivering and receiving information by the receivers can be easily managed. This is because the messages delivered through SMS are designed and developed to be short, simple and attractive but informative. Reading is closely related with the learning style of a person whereby a person needs to focus, process the information and sustain the information received [40] [41] [42]. There are varieties of learning styles such as active and verbal learning styles [29]. Motivation is an important factor to enhance people to read. It has been found a significant relationship between learning style and motivation [20]. Visual is found as a dominant learning style among 16 years old adolescents at secondary schools in Pontian [40]. On the other hand, a study showed that a majority of secondary school students in Johor have reflectors as their learning style [43]. There are two types of learning skills which are quick reading and critical reading [41]. In addition, reading culture in Malaysia is stated as at moderate level [44]. Based on a study conducted, “*Profil Membaca Rakyat Malaysia 2005 (PNM2007)*” Malaysians read about 8 to 12 books per year [45]. This number is low compared to Singaporeans who read 25 books per year and it shows that the reading rate among Malaysians is still low. Even though there are many higher education institutions in this country, they do not increase the reading behaviour [45]. A study conducted in Malaysia shows that the main factor that encourages students to read is their own self (52.17%) and 97.1% of respondents agree that reading is an important activity [46].

4.5. Intervention Effect on Attitude Level towards Sexuality and Reproduction

Based on Knowledge-Attitude-Behaviour Theory, attitude toward a subject is influenced by knowledge on that particular matter. This study showed that there is no increment in the prevalence of adolescents with positive attitude towards sexuality and reproduction in the intervention group. This is in line with no increment in the prevalence of adolescents with good knowledge of sexual and reproductive health in the intervention group. Furthermore, this study showed that there is an increment in the prevalence of adolescents with good attitude towards HIV/AIDS in the intervention group from 53.1% to 63.5%. This coin-

cides with the increment of prevalence of adolescents with good knowledge on HIV/AIDS in the intervention group. There are various results from previous studies on the attitudes of people in health. A study conducted showed that there is no change of attitude among policemen after they attend HIV/AIDS awareness course [47]. On the other hand, there is an increment in the score of positive attitude among youth based on a study conducted in the United States of America [48]. As mentioned earlier, attitude is based on the knowledge and gaining knowledge based on the learning style of people. The learning style and value of oneself determine their life [49]. There are various learning styles in human life and each of them has its own characteristics [29]. It is closely related with motivation and thus will encourage oneself to seek for knowledge and subsequently understand the knowledge [20].

This study has its strengths and limitations despite of putting efforts on overcoming the study bias. Its strength was the study design, its validated intervention and low attrition rate. This study is a quasi-experimental study whereby experimental study can measure the effect of an intervention on the respondents. The intervention implemented in this study is SMS which is simple, cheap, less manpower and effective intervention in health promotion, education and management. This study has a low attrition rate thus has adequate respondents for the implementation of intervention and outcome measurement. The limitations of this study are the Hawthorne effect, cross-contamination, monitoring of its delivery process in acceptance and reading of the messages sent via SMS.

5. Conclusion

This study has achieved its objectives and it has positive feedbacks from the adolescents on the method of intervention. SMS intervention showed an improvement of the knowledge on sexual and reproductive health as well as conventional method of health promotion (health talk). Both methods give positive effects on knowledge of sexual and reproductive health among adolescents and each of them has its own advantages and disadvantages in the implementations and outcomes. This study can contribute to the public health policy makers, health promoters and public health physicians as the basis in choosing the applicable and practical method for health promotion in this country especially for adolescents group. A further study should also be conducted involving a wider range of adolescents and involve other subjects besides the study on the cost-effectiveness of SMS intervention as health promotion method.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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