

# The Impact of a High-risk Sexual Behavior Prevention Program via Mobile Application on Sexual Knowledge and Attitude of Female Students

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## ABSTRACT

**Background & aim:** The prevalence of high-risk sexual behaviors among different social groups has been considered as a serious health-related threat in recent years. Given the importance of raising awareness and health among the youth and preventing high-risk behaviors, the present study was conducted to investigate the effect of a high-risk sexual behavior prevention program via mobile application on sexual knowledge and attitude in undergraduate female students.

**Methods:** This quasi-experimental study was conducted among two groups of female students with a pretest-posttest design. A total number of 200 undergraduate eligible female students of Mashhad University of Medical Sciences, Mashhad, Iran were recruited in 2016. The subjects were randomly assigned to an intervention group receiving education through a mobile application (N=100) and a control group (N=100). To collect data a self-structured demographic questionnaire as well as sexual knowledge and attitude questionnaires were used. In the intervention group, the participants received a prevention program through a mobile application. Knowledge and attitude towards high-risk sexual behaviors were assessed and compared before and two weeks after the intervention. To analyze the data, paired t-test, independent t-test, Mann-Whitney U test, Wilcoxon signed-rank test, and Chi-square test were run in SPSS, version 16.

**Results:** The mean scores of sexual knowledge and attitude after education increased compared to the pre-intervention stage ( $p < 0.05$ ) in the intervention group. However, there was no significant difference in the control group in this respect ( $P > 0.05$ ).

**Conclusion:** The study results reflected the favorable effect of education via mobile application. The implementation of high-risk sexual behavior prevention programs using mobile applications could enhance sexual knowledge and attitude in students and promote community health.

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## Introduction

The prevalence of high-risk sexual behaviors among different social groups has been considered a serious health-related threat in

recent years, which has been regarded by health agencies and policy-makers as one of the most important problems following rapid social

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changes in communities (1, 2). High-risk sexual behaviors are known as potentially damaging behaviors committed by individuals voluntarily or without any information about their possible adverse consequences (1, 3).

Some high-risk sexual behaviors such as having multiple sex partners, unusual sexual practices (oral and anal), alcohol, narcotic, or psychoactive substance abuse before sex, homosexuality, and unprotected sex can be accompanied by augmented risks of HIV/AIDS transmission and other sexually transmitted diseases (STDs) (4). Statistics show the ever-increasing growth of such diseases in a way that only two common STDs had been introduced until 1960, while such diseases have reached 25 cases at the present time (5, 6). In addition to the escalated prevalence of STDs, a significant rise has been observed in HIV/AIDS infections caused by high-risk sexual behaviors. According to the official statistics released by Iranian Ministry of Health, Treatment, and Medical Education, approximately 26,126 individuals were inflicted with HIV/AIDS by early 2013 in this country and about 70% of these cases had been infected through injection drug abuse and 10% had been affected via sexual intercourse (7-9).

According to the report by the HIV/AIDS Prevention Center in March 2014, high-risk sexual behaviors accounted for 36.8% of new HIV/AIDS cases (7). Along with a report on increased high-risk sexual behaviors in Iran, the Institute for Reduction of High-risk Behaviors against AIDS in Iran considered changes in the epidemiologic profile of the transmission of the disease towards a sexually transmitted one and growth in prevalence rates in the female population to above 10% as a warning for the epidemic outbreak and further spread of HIV/AIDS in the future (7, 9). Cited in relevant studies, high-risk sexual behaviors need to be lowered through moderating complications, which is known as safe sex, through access to correct education in the domains of sexual and reproductive health (10). Investigations have also revealed that effective sex education programs can lead to sexual abstinence or delayed sexual activities, reduced unprotected sex, lowered number of sexual partners, and increased use of contraceptive methods (11).

In this line, the World Health Organization

(WHO) in 2004 announced that sex education programs, as a preventive method, were a necessity both for individuals who had not started their sexual activity and for those who were involved in it (12, 13). In this respect, sex education refers to teaching all issues and topics related to sexuality, gender, puberty (physiological and mental development), sexual morals and ethics, and controlling and moderating sexual instinct (14).

Therefore, a reflection on the concept and meaning of sex education demonstrates that although different experts have put forth various meanings and impressions about this concept, it can be concluded that sex education is one of the important functions of an educational system to transfer and teach a set of attitudes, emotions, information, knowledge, skills and abilities related to sexual issues. Undoubtedly, contents and methods used to transfer such recognition, emotions, and skills can be dependent on the perspective and macro-approach of an educational system as well as cultural and social values in each community (15).

Since sexual issues in Iran are taboos, there is not enough premarital education in this domain for individuals; thus, gaps are commonly filled through invalid and non-expert sources. To validate these information, designing appropriate and high-quality educational programs along with employment of novel and innovative teaching methods for the youth is necessary (16, 17). In-person education is currently the most common educational method (16, 18, 19); however, given the increasing population, this method cannot meet all individuals' needs. Therefore, a strategy is required to provide education for all people at low costs. In this respect, distance education is an appropriate response to this need, as one of the undeniable advantages of this method (20, 21). Online education is a new method with its own relative benefits (20, 22, 23). Considering the development of information technology (IT) and the influence of distance means of communication on communities, teaching methods and tools have also evolved so that the use of newer tools to transfer knowledge has been proposed along with developments in technology (23, 24). Nowadays, advances in IT and its effective role in healthcare systems have

provided the possibility of eliminating the barriers of time and place to fulfill high-quality services (25).

In recent years, a significant growth has been observed in the use of mobiles and tablets. These portable devices cause rapid access to information and easy communication between individuals (26). From the perspective of technology, mobiles are a platform for various users in the domain of community health (27). Smartphones with their computerized capability allow users install and run applications and use the Internet to connect to other networks. This technology can even help users benefit from such devices more than personal computers to perform some activities. In addition, these devices have their own advantages and conveniences in terms of size and portability. It seems that growth in use, increased computational capacities, and lowered costs of smartphones have enabled all individuals to download self-care applications and run them on their smartphones (27, 28).

Although these technologies could meet numerous educational goals in the domain of healthcare, there is a lack of studies and information on the effectiveness of sex education through mobile applications in Iran. Considering the advantages of these technologies and the need for taking steps towards preventing and reducing high-risk sexual behaviors among the youth, we aimed to investigate the effect of a high-risk sexual behavior prevention program through a mobile application on sexual knowledge and attitude of female students in Mashhad University of Medical Sciences, Iran.

## Materials and Methods

The quasi-experimental study with two groups and a pretest-posttest design was conducted among 200 female eligible single undergraduates at Mashhad University of Medical Sciences, Mashhad, Iran in 2016. The inclusion criteria were being an undergraduate student at Mashhad University of Medical Sciences, single, and aged 18 to 25 years, not having any history of participation in sex education programs, and possessing a smart phone with the capability to use mobile applications. The exclusion criteria included students' unwillingness to cooperate with the

study and failure to attend the post-test session.

To determine the sample size, a pilot study was used. Then, the sample size was determined using the comparison of two means formula with 90% confidence interval and 80% test power. Considering sample attrition, the sample size was estimated at 100 individuals per group at the onset of the study. By the end of the study, 164 individuals remained in the study (80 individuals in the control group and 84 in the intervention group).

For sampling, the researcher randomly selected the School of Health and the School of Paramedics from the study population, and then using the drawing method, randomly assigned the School of Health to the control group and the School of Paramedics to the intervention group. The reason for this was the separation of the intervention and control groups and preventing the release of educational content to the control group. Among the available disciplines at the School of Paramedics and the School of Health, one discipline at each school was randomly selected for sampling. Then, the researcher selected the samples using the random number table from rosters and explained the research subject and method to the participants them via e-mails. The researcher also asked if they would like to cooperate or not. This process continued until adequate sample size was obtained. After the study subjects were determined based on the drawing method, students of Optometry from the School of Paramedics were selected as the group receiving education via the mobile application and the students of Environmental Health Engineering were assigned to the control group.

During a 90-minute session, the researcher explained the study objectives and procedure, obtained informed consent from the students, and provides a demographic characteristics information form and questionnaires to assess sexual knowledge and attitude to be completed by the participants. After the briefing session, the samples in the intervention group received the given mobile application. The contents of the educational program included (1) definition of high-risk sexual behaviors, (2) definition of STDs and HIV/AIDS along with their symptoms and prevention methods, (3) the role of

unprotected sex, unusual sexual practices and multiple sex partners in disease infection, health status in individuals, and related complications, and (4) sexual protection during intercourse.

The educational content was prepared by the researcher in 14 sessions; session 1 was focused on an introduction to high-risk sexual behaviors and STDs; sessions 2 to 9 were related to introducing one STD; session 10 was about familiarity with unusual sexual practices and their complications; and session 11 was concerned with re-teaching the seven signs determined by the Ministry of Health, Treatment, and Medical Education in most cases of STDs. Session 12 was about safe sex and methods of sexual protection, session 13 was concentrated on condom use training, and session 14 was about learning the skills of "saying no".

Two weeks after the intervention, both groups received a posttest regarding their sexual knowledge and attitude towards high-risk sexual behaviors in the same manner as the pretest stage. The research instruments included a researcher-made demographic characteristics form and sexual knowledge and attitude questionnaires.

The demographic characteristics form included 49 items on the variables whose effects were considered in this research, namely age, place of residence, status of living with parents, parental education and occupation, degree of religious adherence, number of trusted individuals in family, number of intimate friends, amount of talking with family members and school counselors about issues such as consequences of having girlfriends or boyfriends, sexual relationship, virginity, HIV/AIDS and STDs, contraceptive methods, and sources of sexual information, amount of thinking about sexual intercourse, intensity of sexual stimulation via different methods, masturbation, having a romantic relationship and its limits, use of condoms, smoking cigarettes, hookahs plus use of alcoholic beverages, and the rate of use of smart phones and mobile applications and satisfaction with them.

Content validity of all the questionnaires was established by 10 faculty members of the School of Nursing and Midwifery at Mashhad University of Medical Sciences, and their reliability was

determined via Cronbach's alpha coefficient (demographic characteristics information form:  $\alpha=0.74$ , Sexual Knowledge Questionnaire:  $\alpha=0.76$ , Sexual Attitude Questionnaire:  $\alpha=0.7$ ).

The Sexual Knowledge Questionnaire was used to evaluate the knowledge of high-risk sexual behaviors and their consequences, STDs and their symptoms, and sexual abstinence through 31 items rated using a 3-point Likert scale. The total score of the questionnaire is 31 with scores of 0-10 showing poor level of knowledge, 11-20 indicating moderate level of knowledge, and 21-31 representing good level of knowledge.

The Sexual Attitude Questionnaire included 31 items rated using a 6-point Likert-type scale (i.e., totally agree, agree, relatively agree, disagree, relatively disagree, to totally disagree). Scoring positive items involved 6 for totally agree and 0 for totally disagree, while scoring negative items included 0 for totally agree and 6 for totally disagree. This instrument has a score range of 186-31. Scores 31-82 show poor attitude and scores from 83-134 and 135-186 indicate moderate and good attitudes, respectively.

To analyze the data, paired t-test, independent t-test, Mann-Whitney U test, Wilcoxon signed-rank test, and Chi-square test were run in SPSS, version 16. P-value less than 0.05 was considered significant.

## Results

A total number of 200 students were enrolled; the mean age of the mobile application and control groups was  $20.07\pm 1.701$  and  $20.51\pm 1.58$  years, respectively. Also, the mean grade point average in the intervention and control groups were  $16.68\pm 1.41$  and  $16.69\pm 1.55$ , respectively. Most of the mothers had primary school education and the majority of fathers had high school diploma. Also, the bulk of the mothers were housewives and the majority of fathers were self-employed. The two groups were homogenous in terms of demographic variable, and the effect of all these variables on research findings has been illustrated in Table 1.

The results of this study showed that the mean score of students' sexual knowledge in the mobile application group significantly increased after the intervention ( $p<0.05$ ); however, the mean score of students' sexual knowledge in

the control group suggested no significant difference between the pretest and posttest stages ( $p>0.05$ ; Table 2).

Moreover, the mean scores of students' sexual attitude in the mobile application was

significantly increased after the intervention ( $p<0.05$ ), whereas in the control group, no significant difference was observed between the pretest-posttest scores ( $p>0.05$ ; Table 3).

**Table 1.** Homogeneity of both study groups in terms of underlying and intervening variables

Variables	Test type	P-value
Level of education	Chi-square test	$p=0.284$
Father's occupation	Chi-square test	$p=0.819$
Mother's occupation	Fisher's exact test	$p=0.950$
Student's place of residence	Chi-square test	$p=0.085$
Status of living with parents	Fisher's exact test	$p=0.062$
Students' adherence to religious practices	Wilcoxon signed-rank test	$p=0.707$
Students' intimacy with family members	Fisher's exact test	$p=0.757$
Students' trust in family members	Chi-square test	$p=0.326$
Trusted individuals in family to talk about private issues	Fisher's exact test	$p=0.623$
The number of close friends	Cramer type moderate deviation	$p=0.228$
Having a reliable teacher during school years	Chi-square test	$p=0.514$
Obtaining sexual information via the Internet	Chi-square test	$p=0.896$
Obtaining sexual information via library sources	Chi-square test	$p=0.092$
Reasons for not talking to family members about sex	Chi-square test	$p=0.893$
Students' trusted individuals to talk about genital problems	Chi-square test	$p=0.495$
Acceptance of premarital sex	Fisher's exact test	$p=0.777$
Type of romantic relationships	Fisher's exact test	$p=0.136$
Having sex	Chi-square test	$p=0.231$
Number of sex practices per week	Fisher's exact test	$p=0.252$
Students' use of cigarette and hookah	Fisher's exact test	$p=0.145$
Need to use smartphones	Chi-square test	$p=0.731$
Nightly conversations with smartphones	Chi-square test	$p=0.158$
Use of educational mobile applications	Chi-square test	$p=0.663$
Students' satisfaction with educational mobile applications	Chi-square test	$p=0.643$

**Table 2.** Students' sexual knowledge scores at pretest and posttest stages

Variable	Intervention group	Control group	Independent t-test
	$X\pm SD$	$X\pm SD$	
Pre-intervention stage	$15.86\pm 4.06$	$14.4\pm 4.05$	$p=0.053$
Post-intervention stage	$29.8\pm 0.43$	$14.41\pm 4.21$	$p=0.004$
Paired t-test	$p<0.001$	$p=0.909$	
Pretest-posttest difference	$13.94\pm 4.13$	$0.01\pm 1.10$	$p<0.001$

**Table 3.** Students' attitudes at the pretest and posttest stages

Variable	Intervention group	Control group	Mann-Whitney U test
	$X\pm SD$	$X\pm SD$	
Pre-intervention stage	$137.24\pm 12.53$	$133.5\pm 10.7$	$p<0.001$
Post-intervention stage	$147.89\pm 14.62$	$133.01\pm 9.79$	$p=0.001$
Wilcoxon signed-rank test	$p<0.001$	$p=0.329$	
Pretest-posttest difference	$10.65\pm 2.9$	$-0.49\pm 1.09$	$p<0.001$

Since the levels of knowledge in individuals at the beginning of the study in both groups were significantly different, analysis of covariance (ANCOVA) was used to compare the levels of

knowledge in individuals in the study groups at the end of the study. Considering the results of ANCOVA, it was found that after removing the effect of the pretest scores, the levels of



knowledge in the two groups were significantly different at the posttest stage ( $p < 0.01$ ).

## Discussion

In this study, the effect of education on a high-risk sexual behavior prevention using mobile application was assessed. According to the results, the levels of sexual knowledge and attitude in students in both control and intervention groups was moderate, while some previous studies had shown low levels. In this regard, the study by Simbar et al. indicated that students' knowledge of sexual issues was low and high rates of problems such as premarital sex, unwanted pregnancy, intentional abortion, and STDs were reported (29). In the investigation by Darabi on individuals aged over 15 years in the city of Kermanshah in Iran, the level of knowledge in individuals was reported relatively low (30). The study by Simbar et al. further showed that half of the students had moderate levels of information about sexual and reproductive health, while the other half did not have even basic information about it. These results were verified by other studies in this domain (31). Such investigations similarly suggest that comprehensive sex education programs are effective in preventing sexual dysfunctions, promoting healthy sexual behaviors, observing health, establishing mental and family-related health, and maintaining proper sexual identity (13). Moreover, the study by Amirzadeh et al. in 2005 on 300 female students at Urmia University of Medical Sciences revealed that receiving knowledge and obtaining high-risk sexual behavior prevention skills at schools and universities could diminish high-risk sexual behaviors and help effectively maintain health in the youth (32).

Mueller et al. (2007) also concluded in their study that sex education at schools could significantly reduce high-risk sexual behaviors and increase knowledge and understanding of all kinds of sex-related problems and diseases in students (15). The meta-analysis by Kirbi et al. (2006) using 83 research studies on the impact of sexual education programs in different countries demonstrated the success of most of these programs (15). In fact, the researchers reported that two-thirds of the programs had significantly improved sexual

misconduct and reduced high-risk sexual behaviors (15). Therefore, teaching prevention methods at schools and universities seems essential because studies have shown that sex education does not increase sexual behaviors, rather, it can effectively help in monitoring health status in young people (33).

In the same vein, the results of the present study proved that education could enhance the level of sexual knowledge and improve students' sexual attitude, such that knowledge and attitude scores in students were promoted from moderate scores at the pre-intervention stage to good scores after the intervention. In the current era, "learning anywhere any time" and "lifelong learning" are the accepted principles that refuse the traditional outlook in modern education (34). In this regard, Bull et al. conducted a study entitled as "social media-delivered sexual health intervention" to determine the effect of sending sexual health messages through Facebook as a social network to lower STDs. They pointed out that social websites and networks could be effective for health education interventions (35).

In a systematic review, Alizadeh et al. examining the effects of mobile use in managing heart failure patients found that the use of smartphones could be helpful in monitoring patients with heart failure and providing health services to such individuals (36). Besides, Saeedi et al. in a study evaluated the effect of a user-oriented Android-based software for educating caregivers of children with cerebral palsy and reported that the given application could facilitate the learning process and help the caregivers to access the information they need about daily care of these children at any time and any place (37). The only study using mobile applications for sexual health education was the one by Brayboy et al., which was to produce a comprehensive application including comprehensive information on sexual health and its utility and gravity among adolescent girls. Accordingly, the researchers concluded that the use of smart phones had the potential to provide accurate and comprehensive sexual information to adolescents (38). Given the results of Brayboy et al. and the findings of the present study, it seems that smart phones are an acceptable tool at the present era. The customization of smart

phones and the possibility of storing a large volume of information without any fear of their disclosure have even made portability and accessibility easier. It should be noted that educational pamphlets cannot be easily carried; obviously, positive attitudes of individuals towards smart phones and their high attractiveness can help in better understanding of contents via smart phones.

One of the limitations of this study was the possibility of exchange of contents between participants in the intervention and control groups whose management required shortening the duration of the educational course as much as possible. One possible limitation was the inclusion of more high-risk individuals in the study, which was controlled through random sample selection.

According to the results of this study, we suggest conducting further studies to identify the features of smart phones and widely used social networks in the domain of health education.

## Conclusion

According to the results of this study, the use of mobile applications in the domain of preventing high-risk sexual behaviors could enhance sexual knowledge and attitude in students.

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## Conflicts of interest

The authors declare no conflicts of interest.

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