

Effect Of Assistive Technology On Knowledge And Practices Of Hearing- Impaired Adolescents Regarding Reproductive Health

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Abstract

Background: Adolescents with disabilities have the same reproductive health needs as the abled adolescents. Reproductive health education is essential for adolescents with hearing impairment. Since they communicate using specialized language (i.e., sign language), specialized reproductive health computer application in sign language is a necessity.

Aim: To assess the effect of assistive technology on knowledge and practices of hearing-impaired adolescents regarding reproductive health.

Design: A quasi-experimental research design was utilized to fulfill the aim of this study.

Setting: the study was conducted in Resala Charity Association at El-Maadi district, Cairo Governorate.

Sample: A purposive sample of 35 hearing-impaired girl adolescents were included in the study.

Tools for Data Collection: Three tools were used: 1- Hearing-impaired adolescent's structured interviewing questionnaire. 2- Hearing-impaired adolescent's reported practices related to reproductive health. 3- Reproductive Health Computer Application.

Results: The current study revealed that 37.1% of adolescents aged between 18 and less than 20 years old, 62.9 % of them were enrolled in secondary schools. There was a highly statistically significant difference found between adolescents' total knowledge scores and total practices scores regarding reproductive health in pre, post, and follow up posttests ($p < 0.001$). Adolescents' total knowledge scores and total practices scores were increased in the post and follow up posttests compared to pretest scores.

Conclusion: Reproductive Health Computer Application has a significant positive effect on improving hearing-impaired adolescents' level of knowledge and practices related to reproductive health.

Recommendations: Designing training programs to hearing-impaired adolescents on reproductive health through using assistive technology and that covers all organizations in different settings in Egypt, also a replication of this study on a larger sample and in different settings for the generalization of the results.

Keywords: Knowledge and Practices related to Reproductive health, Assistive technology, Hearing-impaired adolescents.

Introduction

Adolescence refers to the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19. It's a significant period in the life of a female. This period of adolescence for a girl is a period of physical and psychological preparation for safe motherhood (Allen, 2019). Adolescents with disabilities have the same health needs as every other member of the population, including immunization, screening, sexual and reproductive health, and all other aspects of regular healthcare (Bright, 2018).

Reproductive health covers all aspects of adolescent health. It is an umbrella concept, maintaining reproductive health is the most important thing, especially in adolescents, because adolescence is the best time to build a good practice to guard cleanliness, which can be an asset in the long run. The important condition to maintain good reproductive health during adolescents is promoting a healthy lifestyle, which is mostly associated with a good diet, physical exercise, good sleeping patterns, personal hygiene, no bad habits or addiction, health education, a safe environment, and physical fitness (Negbal, 2019).

Female adolescents with hearing impairment face main difficulties in getting reproductive health information including even basic information on their physical growth and changes (Bowman & Gyngell, 2019). Studies have reported hearing impaired adolescents face several

challenges in accessing reproductive health services due to difficulties in communication, lack of knowledge among healthcare workers, and speech difficulties (Suariyani, 2020). The communication barriers which are the main cause of the ineffectiveness of reproductive education in deaf adolescents can be overcome by developing reproductive health media, the use of relevant visual media for deaf adolescents can increase their understanding of the media presented, facilitate learning, strengthen knowledge and explain ideas (Winarsih et al, 2020).

Assistive Technology (AT) is a term used to identify the set of resources and services that provide or expand the functional abilities of disabled people. The goal is to provide greater independence, a better quality of life, and social inclusion through the expansion of communication, mobility, environmental control, skills, work, and integration with the family and society (Cavalcante, Oliveira & Pagliuca, 2018).

The community health nurse can advocate for hearing-impaired adolescents by improving their needs, by designing health education through assistive technology to protect them from hazards such as reproductive tract infection, obesity, and the dangers of the spread of sexually transmitted diseases, promoting their healthy lifestyle, or even by participating in teaching classes focusing on the targeted areas of puberty nutrition, reproductive health, and physical activity (Mahmoud & Ibrahim, 2020).

Aim of the study

The present study aims at evaluating the effect of assistive technology on knowledge and practices of hearing-impaired adolescents regarding reproductive health.

Research hypotheses

To fulfill the aim of this study, the following research hypotheses were formulated:

H.1: Hearing-impaired adolescents who receive reproductive health program through assistive technology had higher knowledge scores than before the intervention.

H.2: Hearing-impaired adolescents who receive reproductive health program through assistive technology had higher practices scores than before the intervention.

Research Design:

A quasi-experimental design (Pre / Post Test) was utilized to fulfill the aim of the study.

Setting:

The current study was carried out at Resala Charity Association in Cairo Governorate's El-Maadi district, which is affiliated with the Ministry of Social Solidarity.

Sample:

A purposive sample was utilized in this study. The sample size was 35 hearing-impaired girl adolescents.

Inclusion criteria:

- 1- Computer literate.
- 2- Free from other types of disabilities.

Tools of Data Collection:

Tool I: Hearing-impaired adolescent's structured interviewing questionnaire: Was divided into two parts:

Part 1: Hearing-impaired adolescents' demographics and general characteristics From Q1 to Q9, such as age, school stage, residence, and parents' education and occupation, etc.

Part 2: Hearing-impaired adolescents' knowledge related to reproductive health (Pre /Post/Follow up Test), **it is classified into 4 sections to assess:**

Section 1: Hearing-impaired adolescents' knowledge related to puberty: From Q 1 to Q 7, such as the definition of puberty, the normal age of puberty for girls, and puberty's changes, etc.

Section 2: Hearing-impaired adolescents' knowledge related to menstruation: From Q 8 to Q 14, such as the definition of menstruation, source of menstrual blood, age of menarche, etc.

Section 3: Hearing-impaired adolescent nutrition knowledge: From Q 15 to Q 31, such as food benefits, balanced diet, main nutrient elements, nutrient functions, etc.

Section 4: Hearing-impaired adolescents' knowledge related to exercise: From Q 32 to Q 41, such as the importance of exercise (7 questions) and types of exercise, etc.

Scoring system

The complete correct answer was given two scores (41 questions equaled 82 scores), the incomplete correct answer was given one score, the incorrect/unknown answer, and the missing data was given zero. The knowledge scores were calculated by adding the scores for the correct answers. The total number of points was 82, with a score of $\geq 50\%$ (≥ 41) indicating satisfactory knowledge and a score of $< 50\%$ (< 41) indicating unsatisfactory knowledge.

Tool II: Hearing-impaired adolescents' reported practices related to reproductive health (Pre /Post/Follow up Test), Was divided into 3 sections to assess:

Section 1: Hearing-impaired adolescents' reported practices related to menstrual hygiene: From Q 1 to Q 13, such as type of towel used during menstruation and frequency of changing it, frequency of bathing during the menstrual cycle, cleaning the perineal area, and methods of cleaning, etc.

Section 2: Hearing-impaired adolescents' reported practices related to nutrition: From Q 14 to Q 27, such as a number of daily meals and snacks, taking breakfast, etc.

Section 3: Hearing-impaired adolescents' reported practices related to exercise: From Q 28 to Q 35, such as doing exercise, kind of exercise, etc.

Scoring system

Each appropriate practice was given two scores (35 questions equal 70 scores), each inappropriate practice was given one score, and missing data were given zero. The reported practice scores were calculated by adding the scores for the appropriate practice. The total number of points was 70 points considered as score $\geq 50\%$ (≥ 35) referred to the appropriate practice and the score $< 50\%$ (< 35), referred to the inappropriate practice.

Tool III: Reproductive Health Computer Application: "Guide Hearing-impaired adolescents about reproductive health in sign language." The reproductive health text content was translated from Arabic text to sign language by Khalifa Computer Group (KCG) and then cited on the computer desktop in the form of an application. The application has a master list for browsing among the introduction and four main topics. These include puberty changes, menstruation, nutrition, and exercise. The first main topic about puberty changes was browsed by 4 subtopics, the second main topic about menstruation was browsed by 5 subtopics, the third main topic about nutrition was browsed by 8 subtopics, and the fourth main topic about exercise was browsed by 3 subtopics. The browsing and navigation between the main and subtopics are done through the menu.

Content Validity

Three experts from the community health nursing department at Cairo University were asked to check the I and II tools for their content validity. Modifications of the content were made according to the panel's judgment on the clarity of sentences and appropriateness of the content. The reliability of the knowledge tool was tested by using Cronbach's Alpha equal (0.867). Also, the reliability of the reported practices tool was tested by using Cronbach's Alpha equal (0.800). The

expert sign language interpreter was asked to evaluate the III tool for its content validity after translating it into sign language.

Procedure

Official permission was obtained from the Research Ethics Committee and related committees at the Faculty of Nursing, Cairo University, to conduct the study. Official permission was obtained from the director of Resala Charity Association. The purpose and nature of the study were explained to the adolescents. The researcher emphasized that adolescents in the study were entirely volunteers, anonymity and confidentiality were assured through data code, and written informed consent was obtained from the adolescents' parents. The study was carried out in 4 phases: the assessment, planning, implementation, and evaluation phase.

Assessment phase, included assessment of hearing-impaired adolescents' knowledge and practices regarding reproductive health by using the hearing-impaired adolescents' structured interviewing questionnaire and the hearing-impaired adolescents' reported practices questionnaire.

Planning and designing phase, based on the assessment results and comprehensive review of relevant literature, the researcher designed an assistive technology (Reproductive Health Computer Application) about reproductive health in the form of sign language.

Implementation phase, sessions were implemented through effective communication and with the help of the association's sign language interpreters. The designed reproductive health computer application was carried out in four sessions, each of which was given in the form of a teaching class. At the beginning of each session, an orientation to the session objective took place. The total number of adolescents was divided into small groups (4 groups), which ranged from 8-10 adolescents. The program was introduced to each group in the same manner by the researcher and the association's sign interpreter. Each group received four sessions. The duration of each session was 30 minutes.

The program sessions:

Introductory session, this session aimed to clarify the aim of the program. Adolescents were also instructed on the phases of the study and the program sessions (time, duration, location, rules, and contents). Teaching aids include assistive technology (reproductive health computer application), a model of the female reproductive system, and electronic colored educational photos. Teaching methods used were lectures, discussions, demonstrations, and re-demonstrations.

The first session included a knowledge part and an introduction about the meaning of puberty, female reproductive organs, and puberty's physical, psychological, and social changes.

The second session included a knowledge and practice part, where the knowledge part about meaning, physiology, symptoms of the menstrual cycle, and the characteristics of vaginal secretions was introduced. The practical part was about personal hygiene and self-care during menstruation.

The third session included knowledge and practice part, the knowledge part about the concept of healthy nutrition, food pyramid and the six food groups, types of nutrients, important tips for healthy eating. The practical part about the selection of proper foods, drinks and herbs that must be taken during menstruation, and foods that should be avoided during menstruation.

The fourth session included the knowledge and practice part, which included the knowledge part about the importance, types, and time of exercise. The practical part is about warm-up exercise techniques.

Evaluation phase, the researcher reassesses the same hearing-impaired adolescents by using the same tools post and three months after implementation of the reproductive health program in order to assess the degree of knowledge and changes in their practices after the program.

Ethical and legal considerations

Written approval was obtained from the Committee of Research Ethics at the Faculty of Nursing, Cairo University, and the director of Resala Charity Association in the El-Maadi district. The researcher informed the adolescents that all data gathered during the study would be confidential and that they had the right to withdraw from the study at any time without giving any reason and without any pressure from the director of the association.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) program, version 27, The data was analyzed using descriptive statistics such as percentage, mean, and standard deviation, chi-square test, independent t-test, Mann Whitney test, and Friedman's test. coefficient (Spearman's rho) was used to determine the direction and strength of the relationship between the selected variables. The level of significance was set at $p\text{-value} < 0.05$, where $p\text{-value}$ is the degree of significance. The p value > 0.05 indicates an insignificant result. The $p\text{-value} < 0.05$ indicates a significant result. ANOVA test was done to find the effect of some independent variables on the respondent's knowledge and practices in pretest, posttest, and follow up tests.

Results

Table (1): Percentage distribution of adolescents according to their age, School stage, place of residence, number of family members, family income per month, and their parent's education and occupation (N=35).

Demographic variables	No.		%	
Age				
12 - <14 years	5		14.3	
14 - <16 years	7		20.0	
16 - <18 years	10		28.6	
18 - < 20 years	13		37.1	
Mean \pm SD	16.60 \pm 2.45			
School stage				
Preparatory school	13		37.1	
Secondary school	22		62.9	
Residence				
Urban	35		100	
Number of family members				
3-5	20		57.1	
6-8	12		34.3	
\geq 8	3		8.6	
Mean \pm SD	5.5 \pm 2.01			
Family's income per month				
Sufficient	11		31.4	
Insufficient	24		68.6	
Parent's educational level	Father		Mother	
	No.	%	No.	%
Can't read and write	10	28.6	14	40.0
Read and write	9	25.7	9	25.7
Basic education	4	11.4	3	8.6
Secondary education	4	11.4	4	11.4
University education	8	22.9	5	14.3
Father's occupation	No.		%	
Manual worker	23		65.7	
Employee	10		28.6	
Retired	2		5.7	
Mother's occupation				
House wife	29		82.9	

Employee	6	17.1
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(Table 1) asserts that 37.1% of adolescents aged between 18 and less than 20 years old, with a mean age of 16.60 ± 2.45 years, 62.9 % of them were enrolled in secondary schools; all adolescents (100%) live in urban areas. Concerning the number of family members, 57.1% of adolescents had three to five members, and 68.6% of adolescents reported that they had insufficient family income per month. The table also shows that 28.6% and 40% of fathers and mothers can't read and write, respectively. Regarding their parents' occupations, 65.7% of fathers were manual workers and 82.9% of mothers were housewives.

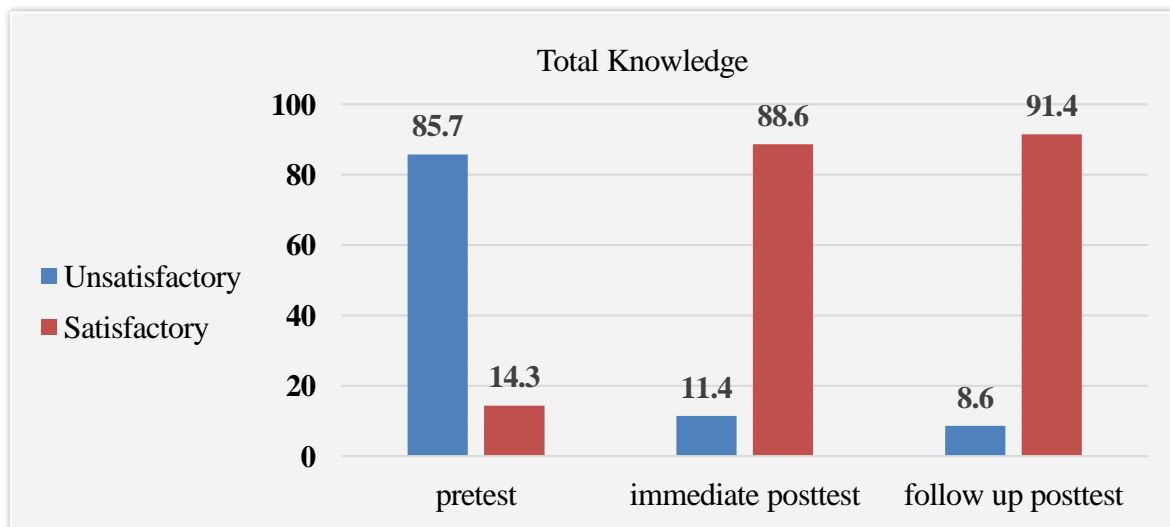


Figure (1): Percentage distribution of adolescent's total knowledge levels pre, post and follow up (N=35).

(Figure 1) indicates that, 88.6% and 91.4% of adolescents had satisfactory knowledge in the immediate and follow up posttests, respectively, compared to 14.3% in the pretest. While unsatisfactory knowledge represented 85.7%, 11.4%, and 8.6% in the pre, immediate, and follow up posttests, respectively. This figure supported the first research hypothesis.

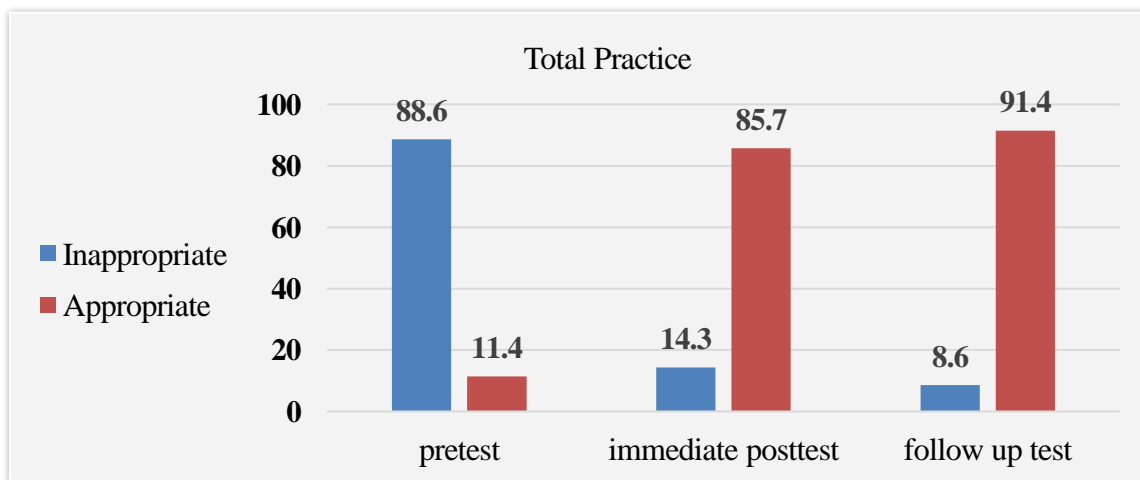


Figure (2): Percentage distribution of hearing- impaired adolescent's total practice levels pre, post and follow up (N=35).

(Figure 2) indicates that, 85.7% and 91.4% of adolescents had appropriate practices in immediate and follow up posttests, respectively, compared to 11.4% in the pretest. While inappropriate practices represented 88.6%, 14.3%, and 8.6% in pre, immediate, and follow up posttests, respectively, this figure supported the second research hypothesis.

Table (2): Comparing adolescent's mean score of reproductive health knowledge dimensions between pre, immediate and follow up posttests (N=35).

Knowledge about reproductive health	Pre test		Immediate Post test		Follow up Post test		Repeated measures ANOVA	
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	F	P
Puberty	5.3	0.61	10.9	0.56	11.3	0.54	23.97	0.0001*
Menstruation	6.0	0.73	12.0	0.53	12.3	0.51	28.96	0.0001*
Nutrition	19.5	0.80	30.9	0.50	31.2	0.38	21.98	0.0001*
Exercise	10.0	0.80	17.9	0.54	17.6	0.58	17.51	0.0001*
Total knowledge	40.8	17.5	71.7	6.7	72.4	5.7	88.2	0.0001*

*significant at p-value <0.05

(Table 2) highlights that, a highly statistically significant difference was found between adolescents' total knowledge scores regarding all aspects of reproductive health (puberty, menstruation, nutrition, and exercise) in pre, immediate, and follow up posttests ($f=88.2$, $p=0.0001$).

Table (3): Comparing adolescent's mean score of reproductive health practice dimensions between pre, immediate and follow up posttests (N=35).

Practices about reproductive health	Pre test		Immediate Post test		Follow up Post test		Repeated measures ANOVA	
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	F	P
Menstruation	11.0	0.82	22.8	0.56	23.4	0.53	30.99	0.0001*
Nutrition	12.8	0.97	23.1	0.75	23.5	0.71	13.46	0.0001*
Exercise	3.1	0.55	13.1	0.69	13.8	0.59	38.75	0.0001*
Total Practice	26.9	8.3	59.0	5.9	60.7	6.4	260.5	0.0001*

*significant at p-value<0.05

(Table 3) shows that a highly statistically significant difference was found between adolescents' total practice scores regarding all aspects of reproductive health (menstruation, nutrition, and exercise) in the pre, immediate, and follow up posttests ($f=260.5$, $p=0.0001$).

Table (4): Correlations between adolescent's total knowledge scores and total practice scores in pre, immediate and follow up posttests (N= 35).

Total knowledge score	Total practice score					
	Pretest		Immediate posttest		Follow up posttest	
	r	p	r	p	r	p
Pretest	0.53	0.001**				
Immediate posttest			0.2	0.24		
Follow up posttest					0.05	0.75

** Correlation is highly significant at p-value <0.01

*Correlation is significant at p-value <0.05

(Table 4) indicates a highly statistically significant positive correlation between adolescent's total knowledge scores and total practice scores in pretest ($r= 0.53$, $p=0.001$).

Discussion

Hearing-impaired adolescent reproductive health is both a challenge and an opportunity for health care providers, many adolescents are less informed, less experienced, they are not getting even basic information from schools or from their parents. Adolescent reproductive health problems are still a great threat to them, this limits the adolescents' opportunity to build their future (Simeon et al; 2020). Reproductive health education through the use of assistive technology is an effective way to

improving the reproductive knowledge and practices for adolescent girls and enable them to protect their health as they grow and assume family responsibilities (World Intellectual Property Organization (WIPO), 2021).

The current study showed that two thirds of adolescents aged between 16 to less than 20 years and the mean age of them was (16.60 ± 2.45) years, the majority of the adolescents were enrolled in secondary schools. Regarding to family income, more than two thirds of adolescents reported that they had insufficient monthly income. About the parent's educational level and employment status, more than one quarter of fathers were can't read and write and less than two thirds of them were manual workers, while two fifths of mothers were can't read and write, and the majority of them were housewives (Table 1).

The same results were found by Mahmoud & Ibrahim, (2020) who evaluated knowledge and practices of reproductive health among 63 deaf adolescents at Al Zagazig city, Egypt, and found that, 77.8% of total adolescents were aged between 14-20 years, 62% of them enrolled in enrolled in secondary schools. Considering, fathers' education of the adolescents 49.2% were can't read and write compared to 34.9% of mothers, more than half of the families' students' income 50.8% was sufficient and not saving.

The present study revealed that, the majority of adolescents had satisfactory knowledge 88.6% & 91.4% in immediate and follow up posttests respectively compared to fewest percentage of them in the pretest (Figure 1). A highly statistically significant difference was found between adolescents' total knowledge scores regarding all aspects of reproductive health (puberty, menstruation, nutrition, and exercise) in pre, immediate, and follow up posttests ($f=88.2$, $p=0.0001$) (Table 2). These findings supported the first research hypothesis.

These results were in agreement with the study done by Abd El-Haleim, Mohamady & Abd El-Gawad, (2021) who evaluated the effect of health education program on 50 deaf and mute adolescent girls regarding reproductive health in Helwan city, Egypt, and found that, all deaf and mute adolescent girls had poor knowledge regarding reproductive health in pretest, while the majority of them had good knowledge 100% & 96% in immediate and follow up posttests respectively, it also reveals a highly statistically significant difference was found between adolescents' total knowledge scores regarding reproductive health in pre, immediate and follow up posttests ($P<0.001$).

Also, the results were supported by Abd El-Megaly, Attia & Soliman, (2019) who assessed the effect of health education program among 60 females blinded adolescents regarding reproductive health in Cairo city, Egypt, and found that, the level of adolescents' knowledge regarding reproductive health increased after applying for the audio teaching program, also highly

statistically differences was found between adolescents' total knowledge in pre and posttests ($P < 0.001$).

The present study revealed that, the majority of adolescents had appropriate practices 85.7% & 91.4% in immediate and follow up posttests respectively compared to fewest percentage of them in the pretest (Figure 2). A highly statistically significant difference was found between adolescent's total practice scores regarding all reproductive health aspects (menstrual care, nutrition and exercise) in pre, immediate and follow up posttests ($f = 260.5$, $p = 0.0001$) (Table 3). These findings supported the second research hypothesis.

These results were in agreement with the study done by Mahmoud & Sabbour, (2021) about the effect of educational program regarding reproductive health among 91 blind and deaf adolescents in Sharkia governorate, Egypt, and found that, the majority of deaf and mute adolescent girls had poor practice regarding reproductive health in pretest, while the majority of them had good practice 98% & 90% in immediate and follow up posttests respectively, it also reveals a highly statistical significant difference was found between adolescent's total practice scores regarding reproductive health in pre, immediate and follow up posttests.

The present study revealed that, a highly statistically significant positive correlation between adolescent's total knowledge scores and total practice scores in pretest ($r = 0.53$, $p = 0.001$) (Table 4). This result was in agreement with a study done by Abd El-Megaly, Attia & Soliman, (2019) who evaluated the effect of health educational program among 60 females blinded adolescents regarding reproductive health in Cairo city, Egypt, and found that, a statistically positive correlation between total knowledge and total practice pre and post implementation the program ($r = 0.721$, $p = 0.001$).

From the researcher point of view, when knowledge improves, practice tends to be more healthy. If adolescents have adequate knowledge about their body changes, menstrual hygiene management, proper nutrition, and adequate exercise they have an opportunity to easily practice it which positively affects their reproductive health.

Conclusion

Hearing-impaired adolescents who received reproductive health program through the assistive technology "reproductive health computer application" had higher knowledge and practice scores after the program was done. When adolescents knowledge has improved their practices become more healthy, which emphasizes that the reproductive health computer application has a significant positive effect on improving adolescents' knowledge and practices regarding reproductive health as well as helping to achieve the two research hypotheses of the current study. The study provides

the evidence that is necessary to create and use assistive technologies for hearing-impaired adolescents to provide an independent understanding of reproductive health.

Recommendations

Based on the results of the current study, the following recommendations are suggested:

1. Designing training programs to hearing-impaired adolescents on reproductive health through using assistive technology and that covers all organizations in different settings in Egypt.
2. Perform periodic reproductive health training programs for adolescents at deaf and hearing impaired schools to promote their reproductive health knowledge and practices.
3. Non-governmental organizations (NGOs) should strengthen information especially their reproductive health with a special focus on creating an interactive multimedia educational
4. E-curriculum for hearing-impaired students that supports information and communication technology in general teaching and learning.
5. Replication of this study on a larger sample and in different settings for adolescents at deaf and hearing-impaired schools for generalization of results.

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