

Use of e-modules to increase awareness and utilization of preconception care services in adolescents: a study Implementation of the technology acceptance model theory

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Abstract

Education about PHS with online methods through e-modules is known to be more flexible than face-to-face methods. However, the use of e-modules in raising awareness and utilization of PHS in adolescents has not been proven. This study aims to explore the role of e-modules in increasing awareness and utilization of PHS in adolescents. An exploratory qualitative study was conducted in Sidemen Karangasem District, Bali, Indonesia. Exploration of the use of e-modules in adolescents using the concept of acceptance model theory. The informants in this study were selected by a purposive method consisting of adolescents, parents of adolescents, heads of community health centers, obstetrics and gynecology specialists, and information technology experts. The criteria for included informants are willing to be interviewed and coordinated when collecting data. Data were collected by in-depth interview method at the residence of each informant. The interview was conducted for \pm 30 minutes/informant. The interview data were analyzed by thematic methods. Based on the results of interviews, it was found that adolescents' perceptions of PHS are by the technology acceptance model theory. Adolescent perceptions are grouped into 4 themes, namely adolescent awareness of preconception health, intention of use, perception of use, and perceived usefulness towards the use of PHS. The sub-themes of the results of this study consist of new information, preparation for healthy pregnancy from adolescents, embarrassment to visit, negative stigma, easy service procedures, available online services, and perceptions of the benefits of prevention efforts. The preconception health e-module increases awareness and utilization of PHS for adolescents. This study suggests using e-modules to expand the reach of education about PHS in adolescents.

1 Introduction

Women's health status during preconception determines the quality of women's health during pregnancy and the baby born. (1–7) Good health status during the preconception period is known to reduce mortality rates for pregnant women and babies born. Mothers who experience poor health conditions during preconception are at risk for abortion, anemia during pregnancy, maternal death and having babies with low birth weight conditions, premature birth, stillbirth, neonatal, and child death. (8)

Women's health during the preconception period can be maintained through preconception care in health services. (3, 9, 10) Preconception health is pre-pregnancy health and lifestyle and is an important determinant of a healthy pregnancy and normal fetal development. (11–13) Preconception care is an intervention given to women of reproductive age and their partners before conception to improve the health outcomes of women during pregnancy, newborns, and children. (14) Interventions include physical, genetic, psychosocial, environmental, and behavioral risk screening. (9)

Preconception care is given from adolescence to near conception. (1, 15) Interventions carried out during adolescence are effective in reducing the risk factors of negative pregnancy outcomes due to adolescent pregnancy and unplanned pregnancy. (1, 16) Pregnancy in adolescence has a mortality rate twice as high compared to pregnancy in women aged 20–29 years. To date, it is known that about sixty million

teenagers give birth every year worldwide. (17) and about 12 million adolescents in developing countries. An estimated 3.6 million abortions occur annually in adolescent girls globally. (15) In Indonesia alone, it is reported that 6,431 adolescents aged 15–24 years have given birth. In South Africa, the prevalence of pregnancy among AGYW aged 10–24 years is 25%. (18) Adolescents are forced to become mothers because they become pregnant in adolescence without sufficient knowledge to maintain the health of themselves and the children born.

Although maintaining health before pregnancy is very important, only a small percentage of women of reproductive age including adolescents take advantage of PHS (PHS). (19) (20) The utilization rate of preconception care ranges from 16.2–22.3%. The lowest utilization rate was found in Ethiopia at 16.27%, (14) followed by Africa at 18.72%, and the highest found in the Western Guji Zone, Southern Ethiopia at 22.3%. (19) Among women who use PHS, only 15% of women in the Ethiopian town of Debre Tabor Northwest make good use of preconception care. (20)

Low utilization of PHS is associated with the level of awareness and access to information about preconception health. (21–23) The level of self-awareness is influenced by the level of knowledge in adolescents. (24) Currently, adolescents' level of knowledge about preconception health is reported to be low varying between 26.8% – 38.4%. (12, 25) Another study found that the level of awareness of the importance of preconception health in adolescents and women of reproductive age is still low. (26, 27)

Education with face-to-face methods has not been optimal to increase awareness and utilization of PHS in adolescents. Material on preconception health is generally given to adolescents in schools. Education with face-to-face methods requires adolescents to attend according to a predetermined time and place. (28, 29). In this way, not all adolescents can access knowledge about preconception health. In addition, there is a perception of taboo that prevents adolescents from attending face-to-face education classes. (30)

The use of e-modules offers options to overcome barriers of place and time for adolescents to access information about PHS. (31) Today, most teenagers access and share information through online media. (32) Teenagers consider online media reliable for learning because of easy access and freedom of movement. (33) All activities of adolescent life such as communication, education, buying, and selling are carried out by utilizing Internet media.

Through the E-module, it is possible to increase access to information and the intention of utilizing PHS for adolescents. Based on the theory of the Technology Acceptance Model (TAM), the use of online media as a learning medium is influenced by perceived ease of use, perceived usefulness, and intention of use. (34–37)

This research is important to address the problem of access to information and PHS for adolescents. In addition, research on the implementation of TAM theory in preconception health education is still limited. Based on this, this study is intended to explore the use of e-modules in increasing awareness and utilization of PHS for adolescents based on TAM theory.

2 Methods

Study Design

The design of this study is an exploratory qualitative study. The study was conducted in May–November 2020 in Karangasem Regency, Bali Province, Indonesia. The subjects of this study were late adolescents, aged 17–25 years.

Method Sampling

The informants in this study were selected purposively based on their role in PHS. A total of 12 informants were used in this study consisting of general practitioners, obstetricians and gynecologists, holders of maternal and child health programs at PHC, information and computer experts, adolescents, and parents of adolescents. The informant inclusion criterion is an informant who is willing to participate by filling out a consent form to participate. The exclusion criteria are participants who do not complete the required interview. Informed consent was given to all informants to seek consent as participants in this study.

Data Collection

Data was collected by in-depth interview method. The instruments in this study are in-depth interview guidelines, and researchers as interviewers. The interview guidelines were prepared by the researchers themselves based on the preconception care framework and the TAM. Each type of informant is asked different questions according to the emphasis of the information you want to explore. The content test is conducted before interview guidelines are used. Content testing is done to ensure questions are understood by informants.

Interviews were conducted at work for informants, health workers, and communication technology experts. Interviews were conducted at each home for teenagers and parents. Interviews were conducted \pm 30 minutes per informant. Before the interview begins, the informant is briefed on the purpose and benefits of the research, then the informant is asked to sign a consent form as an informant.

Data analysis

The data is analyzed by thematic method, where from the results of the interview, the interview script is prepared first and then the theme is compiled. The stages of analysis carried out include coding, data reduction, categorizing to find themes, interpretation, presenting data, and making conclusions or verification

3 Results

The mean age of adolescent informants is 19.4 years, and the mean of additional informants is 45.8 years. The informant's lowest education level is senior high school and the highest is undergraduate.

Most of the informants have no occupation (Table 1).

Table 1
Informant characteristics

Code	Participant	Age (year)	Sex	Education	Occupation
D1	Obstetrics and gynecology specialist	49	P	Undergraduate	Doctor
D2	Head of Health Center/Youth Program holder	46	L	Undergraduate	Doctor
I1	Information and computer experts	38	L	Undergraduate	Lecturer
R1	Adolescent	16	L	Senior high school	None
R2	Adolescent	24	L	Senior high school	None
R3	Adolescent	17	P	Senior high school	none
R4	Adolescent	18	P	Senior high school	None
R5	Adolescent	20	L	Senior high school	None
R6	Adolescent	19	L	Senior high school	None
R7	Adolescent	22	P	Senior high school	None
OT1	Teen parents	55	L	Senior high school	None
OT2	Teen parents	41	P	Undergraduate	Private employee

Implementation of TAM theory in the use of preconception health e-module

In Table 2, 4 themes are shown consisting of awareness about preconception health, perceived ease of use, use, benefits, and intention to use PHS. The four themes refer to the TAM theory. Each theme consists of one or more sub-themes inferred from informant statements. The theme of awareness is inferred from the perception of informants who assess the topic of PHS as new information. Teenagers are reading about the topic of preconception health for the first time, just realizing that pregnancy needs to be prepared to avoid negative pregnancy outcomes. The intention of adolescents to utilize PHS is driven by the perception that healthy pregnancy needs to be prepared for adolescents. Adolescent intentions are also inhibited by shame and negative stigma if adolescents visit PHS. Adolescents also perceive ease of use of PHS based on simple procedures, affordable places, and service costs. The

benefits of PHS are perceived as useful for preventing illness during pregnancy. In more detail, the results of exploring the use of preconception health e-modules are presented in Table 2.

Table 2
Themes and sub-themes implementation of the technology acceptance model theory in the use of preconception health e-module

Quotes	Sub-themes	Themes
First time reading about preconception health Just realized that getting pregnant needs preparation Just realized that there is a negative outcome of pregnancy	New information for teens	Awareness about PHS
Adolescents can be screened for nutritional status, risk of reproductive health problems, and immunization Preparation for a healthy pregnancy can start in adolescence Consultation on maintaining healthy behavior as a teenager	Preparation for a healthy pregnancy starts in adolescence	The intention of use of PHS
Want but embarrassed if you go to the doctor	The embarrassment of visiting the doctor	
Want but afraid of the negative environmental stigma	Stigma negative	
The examination is simple and painless Service places are available in many places Don't pay much	Easy service procedure Accessible service places Affordable cost	Perceived ease of use of PHS
It would be easier if there were online services	Online service available	
It is better to prevent than to cure It costs a lot if it hurts	Disease prevention benefits	Perceived usefulness of PHS

Adolescent awareness of PHS

Based on the results of the interview, a new subtheme of information for adolescents was found. This subtheme was concluded from 3 statements from informants including adolescents who read about preconception health for the first time, just realized that pregnancy needs preparation/planning, and just realized that not all pregnancies are in normal status. Here are some statements from informants about preconception health awareness for adolescents after reading the preconception health e-module. Adolescents find the content of the e-module Preconception Health interesting and easy to understand and convey material that is considered new by adolescents such as the following statement.

"..... enjoyed reading this material... Eee... interesting because it involves women's issues, especially adolescent girls.....and... relatively easy to understand the contents..."(R3, 17)

"..... this concerns an important issue for adolescents, especially women ..."(R6, 19)

"...for me, this is a new thing...when it comes to the health of the female organs... I've heard... but... Acute pregnancy problems have never been, ashamed if you want to ask..." (D1, 49)

Other informants assessed that through the use of preconception health e-modules, adolescents have new insights into pregnancy preparation or planning, such as the following statement.

".....in my opinion, this module provides the information adolescents need about their reproductive health, especially in preparing for preconception...." (D2, 46)

"..... Yes, add insight because the content is complete and thorough. If they read and perceive the contents of this module, teenagers will know themselves better so that they can avoid pregnancy at a young age..." (OT,1)

"..... Pregnant adolescents are increasing. It may be influenced by the teenager's ignorance in maintaining his sexual behavior. Well, this module is here to provide insight into the importance of preparation before pregnancy, including knowledge about the ideal age of a healthy pregnancy....." (D1, 49)

Adolescent awareness of poor pregnancy outcomes after reading the preconception health e-module, such as the following informant statement

"... Actually, it's not just teenagers... But all women need to know that health needs to be maintained to avoid bad outcomes like low birth weight, stunting, etc."(D2, 46)

"...I think... pregnant huh... just get pregnant... and gave birth to a baby... yes, I just found out if someone gave birth but the baby was not healthy..." (R4, 18)

"...it turns out that there are also many risks of getting pregnant, yes...babies who are stillborn or deformed.....that's eee... can still be prevented huh?..." (R7, 22)

The intention of use of preconception care service

The conclusion of the Thema intention of use is obtained from 3 sub-themes, namely preparation for a healthy pregnancy starting from adolescence, embarrassment of visiting health services, and negative stigma. According to informants, adolescents can take advantage of nutritional status screening services, detection and consultation of risks of reproductive health problems, and immunization, as the following informant statements.

"...that the preconception limitation ... from adolescence to adulthood before pregnancy... so pregnancy preparation is very good if done early... so there are many opportunities for handling if problems are

encountered" (D1, 49)

".....for adolescents we provide nutritional statuses screening services such as weight weighing, height and arm circumference....truss there is also although rarely anyone does risk screening for reproducible case problems... It can also be consultation... in addition, vaccination and blood-added tablet are also provided....."(D2,18)

"..... After reading this e-module, I came to know that not only pregnant women visit obstetrics and pregnancy doctors..." (OT1, 55)

".....yes I have been measured my weight and height at school....immunization as well but if I come to the public health center (PHC) or to the doctor it hasn't..." (R1, 16)

Through this e-module, adolescents began to know that many services were available to adolescents, but adolescent informants admitted that they were embarrassed to use PHS, such as the following statement.

".....it is very rare for adolescents to use these services (meaning preconception care services) unless they are already pregnant..." (D2.46)

".....I communicate more often with friends... want to consult a doctor... just ashamed....and thought of various kinds....." (R3, 17)

"... if it's his child... want to say you want to consult.... I must allow it.... Even if I deliver... let me know and can support you if there is a problem...(OT2, 45)

The intention of adolescents to utilize PHS is hindered by negative stigma perceptions, such as the stigma of being a delinquent teenager and the stigma of getting pregnant before marriage. Here are statements from some informants.

".....once I sent a friend to an obstetrician for consultation on menstrual pain... At that time I was very worried if there were other visitors who recognized me.... Heeee...." (R5.20)

"...the average teenager who comes to check is accompanied by parents or relatives..... (D2, 45)

"... Obstetrician doctors are pregnant people, if we go there... Presumably dah pregnant... Ntar in gossip is pregnant first (meaning pregnant before marriage),..... (R4, 18)

"... I was interested in consultation, but there was a fear of being mistaken for various things (meaning bad deeds)....(R7, 22)

Perceived ease of use of Preconception services

Based on the statements of informants from the interviews, it can be concluded that the theme of perceived use for PHS consists of 4 sub-themes, namely easy service procedures, easy access service

places, affordable costs, and online services available. PHS is considered available in many places, such as the following excerpt.

" ... Teenagers can come to the general practitioner practice, specialist, to PHC, clinic or hospital to get DNA consultation screening services... now it depends on the ability of the teenager himself..... ((D1, 56)

".....I just found out... After reading... consultation can be anywhere....just adjust to the BPJS..... (R2, 24)

"..... means you can consult at the PHC near your house..... (R5, 20)

In addition to being available in many places, informants also convey easy procedures when conducting preconception screening, such as the following statement.

".....as for the examination procedures... Relatively the same as the examination of Mrs. Hami's case... So everyone who wants to seek treatment or check.. must be registered first, then enter the waiting room waiting for their turn....for examination starting from the anamnesis, then examined as needed... After that, get therapy and counseling according to the case, and the procedure is completed..... (D2, 45)

" ... The procedure is the same as other case patients....maybe what often hampers is the long waiting queue....so it takes a lot of time to check.....we overcome it by making an appointment before coming to consult..... (D1.56)

The affordable cost sub-theme is inferred from the following quote.

"...currently almost all services have discovered BPJS, so cost is not a problem when checking....."

"...which requires more money, if a laboratory or other sophisticated examination is carried out... will require additional fees, but.....if based on preconception service standards....visitors do not need to pay anymore (D2, 45)

Adolescent informants also know that digital PHS are available, such as the following quote.

"..... I can look on the internet....it turns out that consultation can be done by phone"

".....it's good if online services....can consult without many people knowing....."

".....there is also a lack of this online service....in the end even though they come directly for screening....for example blood checks must come or the lab staff who come to the house....."

Perceived usefulness Preconception Health Service

Most informants said that after reading the module, they had a perception of the benefits of this preconception service. The perceived benefit is the preventive benefit. This perception of benefit is inferred from the informant's statement that it is better to prevent than to cure and it costs a lot if sick. In

general, informants convey many benefits after reading the preconception health e-module, such as the following excerpt.

".....the content of this module is very suitable for teenagers because this module discusses things that are often ignored at a young age even though the content is very useful at this age and often occurs in everyday life.....". (R2, 24; R3, 17; R6, 19)

"..... The e-module is easily accessible....because of its content... It's very useful to understand if teenagers read it..." It is very useful to understand if teenagers read it (I1, 38)

".... It can already open insights for teenagers. Very capable if teenagers want to read and understand the contents of the module..... Yes, because this module contains knowledge that can add insight to teenagers....." it has been able to open insights for teenagers. Very capable if teenagers want to read and understand the contents of the module..... Yes, because this module contains knowledge that can add insight to teenagers (D1, 56; D2, 46)

".....interesting to read..... explain to adolescents, the content of the module is appropriate for adolescents because adolescence is one of the phases that have the opportunity to prepare for the phases of life...."(OT2, 41)

The benefits of preconception nursing services are considered as prevention efforts that are more effective and efficient than treatment efforts, as the following statement.

"... After thinking about it... It is also difficult if there is already a problem of illness,... treating it is difficult....it's better to prevent it first..... (R1.16)

"..... Adolescents should be encouraged to further prevent from treating....this important... Because prevention efforts are often considered to have no results....invisible.... there are results..... (D2, 45)

The perception of benefits to preconception nursing services is assessed as the efficiency of medical costs, as the following quote.

"..... if dah is sick... need additional costs....even if there is insurance..... (OT1.55)

"..... Prevention and treatment efforts are the same cost...only if you are sick... then the cost required... more... plus other miscellaneous expenses... (D2, 45).

The results of the interview can conclude that the e-module provides new insights that are very useful for teenagers. The perception of the benefits of PHS coupled with the perception of ease of use and persieve of use, increases adolescent intention of use towards PHS.

4 Discussion

Low awareness of adolescents about preconception health requires educational efforts, peer support, and communication between adolescents and parents. (38) The preconception health e-module is provided as an effort to overcome the "taboo" factor barrier in seeking knowledge about preconception health. E-modules provide a high chance of being read compared to printed modules. (39–43). The deployment of printed modules is relatively limited compared to electronic modules. Based on the opinions of material and media experts, it is reported that e-modules are more practical than printed modules. (44)

The study found that material on preconception health was assessed as new information for adolescents. Adolescents find out about preconception health after reading the preconception health e-module. Adolescent awareness is also growing regarding the importance of preparing for pregnancy to avoid negative pregnancy outcomes. This finding is in line with research conducted on high-school Lebanese students that found that adolescents' awareness of preconception health is low. (45) Low adolescent understanding and practice of preconception health have consequences of unsafe sexual relations and the occurrence of teenage pregnancy. (46)

Adolescence is a very appropriate momentum to improve preconception health status. (47) Efforts related to preconception health are given from adolescence to near conception, namely before pregnancy occurs or 2 years before conception (1, 15) adolescents who utilize PHS are still low. (47) There may be a "taboo" perception to talk about women's health such as menstruation, premarital sex, and pregnancy for unmarried teenagers. (30, 39, 48)

Taboo can be interpreted as a prohibition against certain behaviors such as communicating about reproductive health and pregnancy. (38) This prohibition is an obstacle for adolescents to seek sexual and reproductive health advice or services, including preconception health care. This taboo perception problem is associated with gender norms, cultural influences, development programs, and health systems. (40) Other reasons are low awareness, feelings of discomfort, and embarrassment when talking about reproductive health topics including preconceptions. (32)

Referring to the acceptance model theory, it is found that the use of PHS is influenced by intention, perceived ease of use and perceived usefulness of using e-modules. Adolescent intent to utilize preconception services was found to increase after reading the PHS e-module. Adolescents perceive the intention towards the use of preconception services as preparation for a healthy pregnancy since adolescence. Services available to adolescents are screening on nutritional status, risk of reproductive health problems, counseling and immunization. This finding is consistent with the results of other studies and recommendations from the WHO which found that preconception care provides opportunities for adolescent girls to obtain optimal health status on an ongoing basis. (49) The interventions provided in preconception care are biomedical, behavioral and social health interventions, services, support and counseling. (15, 50) Based on these findings, optimization of Preconception Care in the process needs to be done. (1)

Adolescents' intention to use preconception services can be hampered by the embarrassment of visiting the doctor and negative stigma. Adolescents may experience poor health if they do not access

preconception services due to this shame and negative stigma. Stigma and shame can affect inequities for individuals and groups to get good health care. (51, 52) Stigma is characterized by the presence of shame, reprehension, or a sense of rejection that leads to discriminatory behavior toward individuals or groups (52, 53) Therefore, stigma and shame from adolescents need to be anticipated to ensure all adolescents have access to PHS.

Barriers to access to information about PHS in adolescents can be overcome through education using e-modules. (54–57) Online preconception health service education provides opportunities for adolescents to access services indefinitely, can choose content as needed safely and uninterrupted. In this study, it was found that adolescents perceive the ease of using PHS through Easy procedures, easy service places, and affordable service costs. Teenagers also perceive that the ease of this service will be better if online services are available. This finding is linear with the results of other studies that find that advances in digital technology and online resources provide good benefits for the development of e-health and e-learning services in the future. (58) (59) (60)

The use of e-modules is also considered useful in adding new knowledge about the benefits of preventing disease risk during pregnancy. The findings were met linearly with a systematic review finding that the use of e-modules was useful for providing information and education about preventing disease risk during pregnancy. (61, 62) This is possible because e-modules can offer educational content about PHS that is comprehensive, cost-effective, time, safety and experience with technology. (63, 64) E-modules are also considered to have ease of use for information transfer for adolescents. (65) Digital education methods can provide access to information about the same PHS to all adolescents. (60)

The potential bias in this research may come from the population of research. The subject of this research was only adolescents who were studying, therefore less representative of the population. Based on the research area, the informant in this research only came from one district area therefore, the result was less variation

5 Conclusions

The use of e-modules in PHS increases awareness, intention, perception of ease of use, and usefulness in the utilization of PHS for adolescents. The use of e-modules can also overcome barriers to psychic access, time, place, and cost to obtain information about PHS. This study suggests the use of e-modules to expand the range of education in adolescents.

Abbreviations

PHS
Preconception Health Service
PHC
Public Health Center

Declarations

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Author contributions

LSA led the conceptualization, methodology, investigation, formal analysis, data curation, software, supervision, original draft writing, review and editing, and funding raising.

NWAU, IGASD, and IKAM have supporting roles in investigation, formal analysis, writing – original draft and writing – review and editing.

LM, NKADUDs, and LNS have a supporting role in data collection, review writing, and editing.

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Data Availability

The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate.

This research was carried out following the ethical provisions of the Ethics Commission of the Faculty of Medicine/Sanglah Central General Hospital Denpasar with Protocol No: 1746/UN 14.2.2.VII.14/LT/2021. This research was carried out based on research ethics and regulations in the local area. In addition, all participants have signed informed consent as a sign of willingness to participate.

Consent for publication

This is not applicable.

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