UTILIZATION OF AUGMENTED REALITY E-PREGNANT AS EDUCATIONAL MEDIA FOR IMPROVING PREVENTION OF BEHAVIOR CARIES IN PREGNANT MOTHERS

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Pregnant women are one of the groups that are susceptible to dental and oral diseases. This is because during pregnancy there is an increase in the amount of the hormones estrogen and progesterone so that the acidity in the mouth increases which can increase the risk of caries. This condition causes babies to be born with low weight (LBW) and premature due to lack of nutrition. Thus, to reduce the magnitude of the incidence of caries in pregnant women, a learning media is needed. The technology in education that is currently developing is augmented reality. To produce an augmented reality application model of E-Pregnant as an appropriate and effective educational media in improving the behaviour of pregnant women towards the prevention of dental caries and decreasing the OHIS score. The type of research used is Research and Development and the research design used is Quasy experiment Pretest-Posttest group design. Variables in this study: Knowledge, attitudes, actions and OHIS scores were carried out for 21 days by opening the application 3 times a week and uploading photos 2 times a day. The research subjects were in 2 groups: 24 interventions using an e-pregnant caries application and 24 controls using a pocketbook. The Augmented Reality E-Pregnant Caries model is feasible as a medium for dental caries prevention education with 90% expert validation results. The results of the unpaired test stated that the effective application of increasing knowledge (Δ3.58), attitude (Δ15.63), action (Δ5.75), and also reduced the OHIS score (Δ0.60) compared to the control group. The Augmented Reality E-Pregnant Caries model is proven to be feasible as a caries prevention education media and its application is effective as an effort to improve caries prevention behaviour and reduce OHIS scores in pregnant women compared to the control group.

INTRODUCTION

Pregnant women are one of the groups that are susceptible to dental and oral diseases. During pregnancy, there are changes in the oral cavity. However, many pregnant women underestimate the importance of maintaining healthy teeth and mouth (Pinanty et al., 2020).

This happens because during pregnancy there is an increase in the amount of the hormones estrogen and progesterone accompanied by the habit of pregnant women who are lazy to maintain oral hygiene. teeth, dental caries and tooth mobility (Sajjan et al., 2015).

According to Riskesdas East Java 2018, dental and oral problems in Bojonegoro were high (Dan & Di, 2020). Based on data obtained from the Ngumpakdalem Health Center, Dander District, Bojonegoro Regency, pregnant women who had their teeth checked at the dental clinic in 2018 were 340 pregnant women and found 297 pregnant women with dental caries. After being grouped by age because the appropriate age for pregnancy is 20-30 years, it was found that 297 pregnant women and 181 women experienced dental caries (60.94%) and the remaining 116 experienced other dental and oral problems (39.05%) (Dan & Di, 2020).

Dental caries is a disease caused by bacteria destroying the hard tissues of the teeth. Dental caries is chronic and takes a long time to develop, so most sufferers experience the disease for life (Fatmasari et al., 2019). If left untreated, the disease will result in pain (pain), tooth loss and infection.

Health development is directed at increasing the knowledge and quality of the community in maintaining health from an early age. Counselling about the importance of maintaining dental and oral health is a way of utilizing current technology to share knowledge to always maintain dental and oral health. In addition, today's technology is access to information that is so fast and can be accessed by all circles of society (Bebe et al., 2018).

Information technology is developing so fast that it affects various existing media. The development of information and communication technology currently involves the multimedia field because it is effective in conveying information. The technology in the multimedia field that is currently developing is augmented reality (Hidayat, 2014).

Augmented Reality which is abbreviated as AR is an application that combines the real world with the virtual world in two-dimensional and three-dimensional forms that project in a real environment at the same time. Augmented reality can provide a variety of important information and users can use their senses in its application so that users can better understand easily learn and train.

Researchers will design and test an Android-based application by implementing the AR E-Pregnant Caries application at the Padangsari Health Center. This application contains information on the prevention of dental caries which is intended to make it easier for pregnant women to receive and understand the information contained clearly and can be done independently (Hakim, 2018).

METHODS

The type of research used is Research and Development and the research design used is Quasy experiment Pretest-Posttest group design. Variables in this study: Knowledge, attitudes, actions and OHIS scores. The study was conducted for 21 days by opening the application 3 times a week and uploading photos 2 times a day. The research subjects were in 2 groups: 24 interventions using an e-pregnant caries application and 24 controls using a pocketbook. Each sample will fill out a questionnaire sheet containing the sample's data and then the researcher will conduct an OHIS examination after filling out the questionnaire.

RESULTS AND DISCUSSION

The implementation of the test "Utilization of Android-Based Augmented Reality as an Educational Media to Improve Behavior About Caries in Pregnant Women" will analyze data which is divided into univariate and bivariate data analysis.

Univariate analysis

The model trial in this study was conducted on 48 pregnant women at the Padangsari Health Center consisting of 24 pregnant women as the control group and 24 pregnant women as the intervention group. The general description of the respondents is presented in the following table:

Table 1 Frequency Distribution of Intervention and Control Respondents Characteristics

Variable	Intervention Group		Control Group		P - volue
	n	%	n	%	
Education					
JHS	3	12,5	10	41,7	O,868*
SHS	10	41,7	6	25,0	
D3	4	16,7	3	12,5	
S1	6	25,0	5	20,5	
S2	1	4,2			
Total	24	100	24	99,7	
Gestational Age					
Trimester 1	3	12,5	7	29,2	0,272*
Trimester 2	10	41,7	7	29,2	
Trimestr 3	11	45,8	10	41,7	
Total	24	100	24	100	

Table 1 shows that the results of the homogeneity test on the education level data obtained a p-value of 0.868 (p>0.05), and then the data is homogeneous. The results of the homogeneity test at gestational age obtained a p-value of 0.272 (p>0.05), and then the data was homogeneous.

Bivariate analysis was used to test the differences between the two variables, in the early stages of model testing, it was done by testing for normality first and then testing the effectiveness of paired and unpaired variables.

A normality test is a test carried out to determine whether the data collected on each variable is normally distributed or not. This test uses the Shapiro-Wilk method because the number of samples in this study is less than 50 samples.

Table 2 Normality of Data in the Intervention and Control Group

Variable	*P – volue* Intervention	Control
PreTest Knowledge	0,017	0,031
Post Test Knowledge	0,001	0,003
PreTest Atittude	0,007	0,406
Post Test Atittude	0,001	0,054
PreTest Atittude	0,001	0,038
Post Test Atittude	0,001	0,018
PreTest OHIS	0,233	0,257
PreTest OHIS	0,208	0,061

The results of the data normality test in Table 1.2 show that pre-post knowledge, pre-post attitudes, pre-post actions and pre-post OHIS were normally distributed because p<0.05, while the pre-post control attitude values were not normally distributed because p >0.05. The existence of data that is not normally distributed, then the test carried out is a non-parametric test, namely by using the Wilcoxon test for paired tests and Mann-Whiteney tests for unpaired tests.

E-Pregnant Caries Model Effectiveness Test

Table 3 Testing the Effectiveness of Knowledge of Pregnant Women in the Intervention and Control Group

Variable	Group	Mean±SD Pre test	Mean±SD Post test	Delta±SD (Δ)	*p*
Knowledge	Intervensi	11,83±2,057	15,42±0,654	3,58±2,04	0,001*
	Control	11,54±1.841	13,58±0,776	2,04±1,63	0,001*
		*p=0,470**	*p=0,001***	*p=0,007***	

Table 3 Wilcoxon test to test the knowledge the results are meaningful. The effectiveness test of paired data on the knowledge of pregnant women showed that the p-value of the intervention group was 0.001 (p<0.05), meaning that the augmented reality of E-Pregnant Caries was effective in increasing the knowledge of pregnant women. The p-value of knowledge in the control group was 0.001 (p<0.05), meaning that the pocketbook used in the control group was also effective in increasing the knowledge of pregnant women. The increase in knowledge in the intervention group between before and after treatment occurred by 30%. Different things happened in the control group where knowledge increased only by 17%.

The results of the unpaired data effectiveness test for the pre-test of the intervention knowledge variable with a p-value of 0.470 (p>0.05), and a post-test with a

p-value of 0.001 (p<0.05), which means the use of the augmented reality model E - Pregnant Caries is effective in increasing the knowledge of pregnant women. Judging from the change in the mean value in the intervention group it became 15.42 while in the control group, it became 13.58.

The results of the effectiveness of the unpaired data test the value of change (Δ) pre-post test with a p-value of 0.007 (p<0.05), which means there is a significant change in increasing knowledge in the control and intervention groups with a difference value (Δ) in the intervention group of 3.58 and 2.04 in the control group.

The knowledge of pregnant women in this study increased significantly after being treated with AR E-Pregnant Caries. It can be concluded that AR E-Pregnant Caries increases the knowledge of pregnant women in the Padangsari Health Center area.

Table 4 Tests of the Effectiveness of Pregnant Women's Attitudes in the Intervention and Control Group

Variable	Group	Mean±SD Pre test	Mean±SD Post test	Delta±SD (Δ)	p
Attitude	Intervention	35,75±6,867	51,38±0,875	15,63±6.81	0,001*
	Control	37,21±4.653	48,08±4,510	10,88±6.12	0,001*
		p=0,426**	p=0,013***	p=0.016****	

Table 4 The Wilcoxon test shows that the results of the paired data effectiveness test for the attitude variable of pregnant women with the p-value of the intervention group are 0.001 (p<0.05), meaning that the augmented reality model of E-Pregnant Caries is effective in improving the attitudes of pregnant women. The p-value of the control group's attitude was 0.001 (p<0.05), meaning that the educational pocketbook used in the control group was also effective in improving the attitudes of pregnant women. The increase in attitude in the intervention group between before and after treatment occurred by 43%. Different things happened in the control group where attitudes increased only by 29%.

The results of the test of the effectiveness of unpaired data on the attitude variable pre-test with a p-value of 0.426 (p>0.05) and post-test with a p-value of 0.013 (p<0.05) which means that the use of the augmented reality model of E-Pregnant Caries is effective in improving maternal attitudes. pregnant. Judging from the change in the mean value in the intervention group it became 51.38 while in the control group, it became 48.8.
The results of the unpaired data effectiveness test the value of change (Δ) pre-post test with a p-value of 0.016 (p<0.05) which means there is a significant change in attitude improvement in the control and intervention groups with a difference value (Δ) in the intervention group of 15.63 and the control group of 10.88.

The attitude of pregnant women in this study increased significantly after being treated with AR E-Pregnant Caries. It can be concluded that AR E-Pregnant Caries improves the attitude of pregnant women in the Padangsari Health Center area.

Table 5 Testing the Effectiveness of Pregnant Women's Actions in the Intervention and Control Group

Variable	Group	Mean±SD Pre test	Mean±SD Post test	Delta±SD (Δ)	p
Actions	Intervention	10,83±2,929	16,58±0,584	5,75±2,88	0,001*
	Control	6,71±1.160	9.50±1.216	3,79±1,02	0,001*
		p=0,001**	p=0,001***	p=0,001****	

Table 5 The Wilcoxon test shows the results of the paired data effectiveness test for pregnant women's action variables with the p-value of the intervention group being 0.001 (p0 <05) meaning that the augmented reality model of E-Pregnant Caries is effective in increasing the actions of pregnant women. Increased action in the intervention group between before and after treatment occurred by 53%. Different things happened in the control group where the action increased only by 41%.

The results of the unpaired data effectiveness test for the pre-action variable with a p-value of 0.001 (p<0.05) and post-test with a p-value of 0.001 (p<0.05), which means that the use of the augmented reality model of E-Pregnant Caries is effective in improving the behaviour of pregnant women. Judging from the change in the mean value in the intervention group to 16.58 while in the control group to 9.50, which means that the use of pocketbooks in the control group is also effective in increasing the actions of pregnant women.

The results of the effectiveness test of unpaired data in the value of change (Δ) in the pre-post test showed a significant change in the actions of pregnant women in the control and intervention groups with a difference value (Δ) in the intervention group of 2.70 and the control group of 1.78.

The actions of pregnant women who were the subjects of this study increased significantly after being treated with AR E-Pregnant Caries. It can be concluded that AR E-Pregnant Caries increases the action seen from the act of brushing the teeth of pregnant women in the Padangsari Health Center area.

Table 6 Tests of the Effectiveness of OHIS for Pregnant Women in the Intervention and Control Group

Variable	Group	Mean±SD Pre test	Mean±SD Post test	Delta±SD (Δ)	p-value
OHIS	ntervention	2,713±0,830	2,108±0,868	0,60±0,47	0,001*
	Control	1,938±0,938	1,537±0,860	0,46±0,46	0,001*
		P=0,007**	P=0,025***	p=0,019****	

Table 6 The Wilcoxon test shows the results of the paired data effectiveness test of the OHIS score variable in pregnant women with the p-value of the intervention group being 0.001 (p0 <05) meaning that the augmented reality E-Pregnant Caries model is effective in reducing the OHIS score of pregnant women. The p-value of the OHIS score in the control group was 0.001 (p<0.05), meaning that the educational pocketbook used in the control group was also effective in reducing the OHIS score in pregnant women. There was a decrease in the OHIS score in the intervention group between before and after treatment by 22%. Different things happened in the control group where OHIS decreased by only 20%.

The results of the unpaired data effectiveness test on the OHIS score variable pre-test with a p-value of 0.007 (p<0.05) and a post-test p-value of 0.025 (p<0.05), which means the use of the augmented reality model of E-Pregnant Caries effective in reducing OHIS scores in pregnant women. Judging from the change in the mean value in the intervention group it became 2.108 while in the control group, it became 1.537.

The results of the effectiveness test of unpaired data in the value of change (Δ) pre-post test there was a significant change of 0.001 (p<0.05) in the decrease in OHIS scores in the control and intervention groups with a difference value (Δ) in the intervention group of 0.60 and in the control group of 0.048.

The OHIS of pregnant women in this study improved significantly after being treated with AR E-Pregnant Caries. It can be concluded that AR E-Pregnant Caries reduces the OHIS score of pregnant women in the Padangsari Health Center area.

The results of gathering information obtained the conclusion that pregnant women still need guidance such as education on how to brush their teeth properly and how to maintain healthy teeth and mouth during pregnancy. During pregnancy, there are changes in maintaining dental and oral hygiene for the worse. These changes are usually caused by feelings of nausea, vomiting, feelings of fear when brushing your teeth due to bleeding of the gums. During pregnancy, it is hoped that pregnant women can prevent and treat oral and dental health as early as possible, namely by knowing how to brush their teeth properly and correctly.(Santoso & Sutomo, 2017)

Maintaining the oral and dental health of pregnant women depends on their behaviour because the level of knowledge, attitudes, and actions are predisposing factors in behaviour. In shaping behaviour, efforts are needed which are supported by fun, useful and interesting learning media or counselling which involve pregnant women in dental and oral hygiene, and dental caries is not directly caused by pregnancy but due to poor dental and oral hygiene and lack of knowledge about maintenance of dental and oral hygiene.(Yuwansyah & Nuraen, 2020) To realize this, an easy-to-use media is needed, namely augmented reality E-Pregnant Caries.(Ismau et al., 2019)

The design of the model is the result of translating the analysis into a package form and creating a system and modifying a model, namely augmented reality which is currently developing in an increasingly sophisticated era, namely technology used to increase understanding in presenting material to be conveyed to the target. The

development method in this design is in the form of an augmented reality application E-Pregnant Caries. (Nurrochman et al., 2019)

The media is tested on several feasibility assessment indicators from the media and material aspects. The validation results from several experts indicate that the E-Pregnant Caries augmented reality model is appropriate for use as an educational medium for caries prevention in pregnant women (Mutia et al., 2023). This is considered important in developing an educational model to assess the feasibility of the theory, concepts developed and the feasibility of the model itself so that the resulting model can be useful for its users.(Marwiyah & Dahlia, 2008)

Based on the characteristics of pregnant women during pregnancy there are problems of nausea, vomiting, dizziness, dizziness, and laziness that can cause these pregnant women to pay less attention to the health of their teeth and mouth it can harm pregnant women and the development of their fetus. Based on this problem, it is necessary to provide counselling to pregnant women about oral health in preventing dental caries

The application of the E-Pregnant Caries augmented reality model in this intervention group can be used as a promotive and preventive medium that can be used by pregnant women during pregnancy as a provision in increasing knowledge, attitudes and actions in preventing caries during pregnancy. Pregnant women receive dental and oral health education that has an attractive appearance and easy-to-understand material so that they can take preventive measures for dental and oral diseases independently and appropriately.

The model test in this study was conducted on 48 pregnant women, namely the intervention of 24 pregnant women and 24 pregnant women as a control. Based on the results of the paired test analysis, it was shown that both the intervention group and the control group had significant differences in the knowledge scores before and after being given treatment. The results of testing the effectiveness of data on paired variables using the Wilcoxon test found that the p-value in the intervention group experienced an increase in knowledge with a value ($p < 0.05$), which means that the augmented reality E-Pregnant Caries model applied to the intervention group was effective in increasing knowledge in preventing the occurrence caries in pregnant women.

As well as in the control group which was given treatment in the form of pocketbooks also increased but experienced a slight increase in knowledge compared to the intervention group whose value was known ($p < 0.05$). The success of the E-Pregnant Caries augmented reality model can also be seen from the results of the unpaired effectiveness test using the Mann-Whitney knowledge pre-post test in the intervention group with a value ($p < 0.05$) which proves that the E-Pregnant augmented reality model Caries is more effective in increasing caries knowledge in pregnant women compared to using a pocket book about caries which is applied to the control group.

The increase in attitude occurred in the intervention group because the E-Pregnant Caries augmented reality model has interactive 3D animated video material as well as material about dental caries and its prevention which is packaged as attractively as

possible so that users, especially pregnant women, do not get bored reading the material contained in the developed model.

One of the behavioural components is that the actions of the respondents have a significant relationship to the condition of oral health and this also occurs in pregnant women who are experiencing changes both physiologically and psychologically. Utilization of the media is considered more effective than just communicating directly without using the media and there is no reciprocal relationship from the presenter to the respondent and vice versa. The use of educational media is more effective in changing a person's behaviour when compared to just two-way communication (Ramadhan et al., 2017).

The results of the research regarding the relationship between knowledge and the degree of dental and oral hygiene showed that for OHIS the bad category mostly came from the level of bad knowledge, namely before being given education about caries and the impact of dental and oral hygiene in pregnancy, and for OHIS the good category mostly came from respondents with knowledge good, namely after being given education about dental caries and the impact of poor dental health in pregnancy (Mukhbitin, 2018).

The existence of this condition shows that there is a relationship between knowledge and the degree of dental and oral hygiene (OHIS) for pregnant women at the Padangsari Health Center. This is a problem that needs to be addressed considering that dental and oral hygiene is a very determining factor in the process of maintaining dental and oral hygiene. This is also in line with research conducted by Appolonia Leu Obi et al, in 2017 regarding the DMF-T and OHIS indexes for pregnant women, where the worse the oral hygiene level of pregnant women, the worse the status of the gingiva.(Ismau et al., 2019)

CONCLUSION

Based on the results of this study, it can be concluded that the augmented reality model of E-Pregnant Caries is feasible and effective to improve caries prevention behaviour in pregnant women, as evidenced by: The augmented reality model of E-Pregnant is feasible and effective as an educational medium for improving the behaviour of pregnant women in preventing dental caries, as evidenced by expert tests, which is 90% with a very feasible category. The augmented reality E-Pregnant model is feasible and effective as an educational medium for knowledge, attitudes and actions as well as decreasing the OHIS score of pregnant women in the prevention of dental caries.

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