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Original Research

Impact Of Nutsi-Smartphone Application On Nutritional Knowledge Among Breastfeeding Mothers: A Quasy-Experimental Study

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ABSTRACT

Background: *Nutrition knowledge among breastfeeding mothers is a key factor in good nutrition status. Some breastfeeding mothers in Indonesia suffer from inadequate nutrition status, which may affect exclusive breastfeeding practice. However, few breastfeeding women have adequate nutritional knowledge. Health education about adequate nutrition during lactation is highly needed.*

Methods: *This was a quasi-experimental study with a control group, pretest, and post-test design. It was conducted at the work area of the Panyingkiran Public Health Center, Majalengka Regency, West Java Province, Indonesia. This study used a consecutive sampling method and involved 78 respondents, divided into 39 respondents in the intervention group and 39 respondents in the control group. Data was collected using a set of questionnaires to collect demographic and nutritional data. Then, the data were analyzed using the Wilcoxon test and Chi-square test.*

Results: *This study found that there was a significant difference between pre-test and post-test scores in the intervention group (t=0,000 p<0,05). There was no significant difference between pre-test and post-test scores in the control group (t=1, p >0,05). Furthermore, there was a significant difference in post-test scores between the intervention and control groups (t=0,000 p<0,05).*

Conclusion: *The developed smartphone application-Nutsi-was effective in increasing nutritional knowledge among lactation mothers. Health care providers may use Nutsi as a health promotion media in order to improve nutrition knowledge among pregnant women.*

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INTRODUCTION

The Infant Mortality Rate (IMR) is the number of infant deaths per 1000 live births. IMR is an indicator to assess people's welfare in the health sector. South East Asia is one of the regions that has the highest infant mortality rate (WHO, 2022). IMR in Indonesia is around 19.548 per 1000 live births in 2020 (UNICEF, 2022). IMR may be prevented by practicing exclusive breastfeeding, especially among children in developing countries (Mbonye, 2022).

Providing exclusive breastfeeding may save an infant's life in developing countries (Pretorius et al., 2021). Exclusive breastfeeding was influenced significantly by maternal nutritional status (Glanny Anindya, Salimo, Lanti, & Dewi, 2020). Maternal nutrition affects breastmilk composition. Poor maternal nutrition status is significantly associated with low breastmilk quantity and quality.

Breastmilk DHA levels is associated significantly with maternal fish diet (Adhikari, Kudla, Nyakayiru, & Brouwer-Brolsma, 2021). Food consumption during lactation affects breastmilk micronutrients among lactating women (Bzikowska-Jura et al., 2018). Adequate nutrition for lactating mothers is important for both maternal and child health. Sufficient nutrients during breastfeeding are needed in order to produce high quality breastmilk and prevent breastfeeding mothers from malnutrition (Marshall et al., 2022).

Unbalanced maternal nutrition during breastfeeding affects the breastfeeding mother, such as fatigue, which also may cause low breastmilk supply. Insufficient nutrient intake may cause a breastfeeding mother to take the deficient nutrient from the body's stores (UNICEF, 2022b). The impacts of nutritional deficiencies in breastfeeding mothers are anemia, iodine deficiency disorders, vitamin D deficiency, lack of protein energy, and decreased breastmilk supply (Winarsih, 2018).

Maternal eating behavior and dietary intake significantly affect exclusive breastfeeding duration (Specht, Rohde, Olsen, & Heitmann, 2018). A breastfeeding mother should pay attention to nutritional intake such as fluid volume, supplements, food intake in order to produce a high quality of breastmilk (Widyastutik, Chartasim, Trisnawati, & Selviana, 2021). Breastfeeding mothers' nutritional needs are higher than non-breastfeeding mothers' (UNICEF, 2022b). Breastmilk supply is influenced by the frequency of nipple sucking and the volume of breastmilk is influenced by maternal hydration status (Kominiarek & Rajan, 2016).

Maternal nutritional knowledge affects nutritional status among breastfeeding mothers. Nutrition knowledge is a key factor which may influence eating behavior among breastfeeding mother (Tritya, 2017). Breastfeeding mothers who had high nutrition knowledge tended to practice an adequate diet (Tessema, Girma, Mekonnen, & Mebratu, 2020). A previous study found that the majority (57.8%) of breastfeeding mothers in developing countries had low nutritional knowledge (Desisa Hundera, 2015). In addition, nutritional information related to sufficient nutrition among breastfeeding mothers may affect breastmilk production (Widyastutik et al., 2021).

Breastfeeding mothers need appropriate information about nutrition during breastfeeding in order to achieve better knowledge about nutrition in breastfeeding mothers so that they can apply awareness of breastfeeding mothers in order to realize their nutritional needs during the lactation period. Previous studies revealed that more than one third (35.7%) of breastfeeding mothers in Indonesia suffered from poor nutrition Triatmaja, I, & Hidayat, (2018) and the majority of the breastfeeding mothers (65.5%) had a lack of knowledge about nutrition during breastfeeding in Indonesia. Good nutrition practice affects the exclusive breastfeeding duration Rohman, Ichsan, Lestari, & Agustina, (2021) and breastmilk production (Prialita, 2021). Therefore, increasing knowledge about appropriate nutrition among Indonesian breastfeeding mothers is highly needed.

Nurses play an important role in providing health education related to adequate nutrition during breastfeeding. The development of information and communication technology in the current era shows the use of the internet and social media (APJII,

2018). There are so many innovations and changes in communication media that are increasingly attracting public interest. Various methods and media have been used for health education, such as a smartphone application (Ependi, Anggraeni, & Kartikasari, 2022).

A smartphone application was effective to increase the husband's knowledge and support for exclusive breastfeeding practice Budianto & Handayani, (2017) and pre-marital sex knowledge among teenagers (Turah, Anggraeni, & Setiawati, 2019). There is no previous study aimed at developing a smartphone application for nutritional knowledge among breastfeeding women. This study aimed to develop and determine the effect of *Nutsi* on nutritional knowledge among breastfeeding women.

MATERIALS AND METHOD

The research design used in this study was a quasi-experimental with a control group pretest and posttest design. It was conducted at Majalengka Regency, West Java Province, in July-August 2020. The population in this study were breastfeeding women who had children aged 0–24 months old. The inclusion criteria in this study were women who were breastfeeding, had a child aged 0–24 months old, had an Android-based smartphone, could read, and were willing to participate in this study.

The exclusion criteria in this study were respondents who had visual impairments and respondents who withdrew from the study. They were enrolled using a convenience sampling method. The total sample was 78 respondents, which was divided into 39 respondents in the intervention group and 39 respondents in the control group.

Subjects that met all the inclusion criteria were informed about this study's purpose, benefits, procedure, and potential risks. They were also assured of their anonymity and provided information on how to install the Nutsi application and answer the questionnaire. All of the subjects signed consent to show their agreement to participate in this research. This study had Institutional Review Board and Ethics approval from the Committee of the Faculty of Health Sciences, Jenderal Sudirman University (Number. 116/EC/KEPK/VI/2020).

This study used the Demographic Characteristics Questionnaire, which was developed by the researchers, and the Balanced Nutrition Knowledge of Breastfeeding Mothers Questionnaire, developed by (Ma'munah, 2015). The researchers modified the questionnaire and tested it for content validity. In this study, the researcher conducted a content validity test to add and change more appropriate sentences on several question items, which were assessed by two maternity specialist nurses working as nurse practitioners.

The results of the content validity test of the Balanced Nutrition Knowledge of Breastfeeding Mothers Questionnaire were obtained with a mean value of 4.2, while the mean value of the results of sentence grammar was obtained at 4.55. The intervention in this research is health education through a smartphone application named Nutsi (Lactation Nutrition), which can be downloaded from the Playstore for free. The researcher did a literature review to create the content of the application, including the definition and benefits of breastfeeding.

The nutritional needs of breastfeeding mothers, the importance of nutrition for breastfeeding mothers, daily meal arrangements, and examples of healthy diet menus for breastfeeding mothers. Then, the researchers asked three experts in the breastfeeding area to provide content validity approval for the application contents. Respondents in both intervention and control groups were asked to fill out a Demographic Data

Questionnaire and a pretest using the Balanced Nutrition Knowledge of Breastfeeding Mothers Questionnaire.

After that, respondents in the intervention group were asked to download Nutsi on their smartphones and read the content of Nutsi. Respondents in both the intervention and control groups were asked to do a posttest using the Balanced Nutrition Knowledge of Breastfeeding Mothers Questionnaire one day after the pretest. Then, researchers provided information to respondents in the control group about Nutsi and let them download it on their smartphones.

Data was analyzed using a univariate and bivariate analysis method. The univariate analysis results presented in the frequency distribution a percentage of age, mother's education, occupation, and income. The bivariate analysis in this study was carried out with the Wilcoxon test and Kolmogorov-Smirnov test (Dahlan, 2019).

RESULTS

The characteristics of the respondents are shown in table 1. The majority of respondents in both groups were aged 20-35 years old, graduated Senior High School, housewives, low income (< IDR 1.750.000). The homogeneity values in both groups were p >0.05, which means that the demographic data in both groups were homogeneous.

Table 1. Demographic Characteristics of Respondents

Characteristics	Intervention group		Control group		Total	%	*p*
	n	(%)	n	(%)			
Age							
<20 years	2	5.1	2	5.1	4	5.1	0.788
20-35 years old	29	74.4	27	69.2	56	71.8	
>35 years old	8	20.5	10	25.6	18	23.1	
Level of Education							
Primary School	4	10.3	10	25.6	14	17.9	
Junior High School	10	25.6	9	23.1	19	24.4	0.169
Senior High School	13	33.3	13	33.3	26	33.3	
University	12	30.8	7	17.9	19	24.4	
Working status							
Housewives	30	76.9	36	92.3	66	84.6	0.117
Working	9	23.1	3	7.7	12	15.4	
Income							
< IDR 1.750.000	24	61.5	25	64.1	49	62.8	1
>IDR 1,750,001	15	38.5	14	35.9	29	37.2	

The difference in pretest scores for breastfeeding knowledge between the intervention and control groups was shown in Table 2 ($p > 0.05$). The results of the analysis of the Chi-Square test conditions are not met, so an alternative that can be done is the Kolmogorov-Smirnov test (Dahlan, 2019).

Table 2. Differences of pretest score between the intervention and control group

Group	Knowledge level						Total		*p*
	Good		Moderate		Low				
Pretest	**n**	**%**	**n**	**%**	**n**	**%**	**n**	%	
Intervention	8	20.5	27	69.2	4	10.3	39	100	0.986
Control	12	30.8	22	56.4	5	12.8	39	100	

The difference in posttest scores for breastfeeding knowledge between the intervention and control groups was shown in Table 3. There was a difference in the post-test scores in the level of breastfeeding knowledge between the intervention and control groups ($p<0.05$).

Table 3. Differences of pretest score between the intervention and control group

Group	Knowledge level						Total		*p*
	Good		Moderate		Low				
Posttest	**n**	**%**	**n**	**%**	**n**	**%**	**n**	%	
Intervention	38	97.4	1	2.5	0	0	39	100	0.000
Control	11	28.2	23	59.0	5	12.8	39	100	

Table 4 showed that there was a difference between the pretest and posttest scores in the intervention group ($p<0.05$) and there was no significant difference between the pretest and posttest scores in the control group ($p>0.05$).

Table 4. The Difference of Pretest and Posttest Scores within the Intervention and Control Groups

Group	Knowledge Level						Total		*p*
	High		Medium		Low				
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	
Intervention									
Pretest	8	21	27	69	4	10	39	100	0.000
Posttest	38	97	1	3	0		39	100	
Control									
Pretest	12	31	22	56	5	13	39	100	1
Posttest	11	28	23	59	5	13	39	100	

DISCUSSION

In this study, the majority of respondents in both groups were in the age range of 20–35 years old. Mothers with an age range of 20 to 35 years have a safe age for pregnancy, childbirth, and breastfeeding, so that it can be said that this age is very supportive for breastfeeding (Cato, Sylvén, Henriksson, & Rubertsson, 2020). Most of the respondents' education level was senior high school.

Education is one of the factors that influence knowledge (Notoatmodjo, 2014). Education is also an important factor in getting and digesting information more easily (Minato et al., 2019). Most of the respondents have graduated from senior high school. Higher education causes a better understanding of health knowledge (Zajacova & Lawrence, 2018).

The majority of respondents' occupations in this study were housewives. According to the Indonesian Ministry of Health (2002), mothers who do not work tend

to pay more attention to their daily diet and have the opportunity to prepare healthy food menus for themselves and their families. Meanwhile, mothers who work with prominent working conditions, excessive activity, and lack of rest at work are at risk of nutritional deficiency if it occurs for a long time (Beluska-Turkan et al., 2019).

The majority of respondents in this study had a low income. According to Scaglioni et al., (2018), relevant factors involved in eating behaviors are socioeconomic aspects and education. In this study, 19 respondents graduated with bachelor's degrees; however, their jobs were as honorary teachers, whose minimum wages were still far below the minimum wages in Majalengka District. Someone with a high wage level can meet the necessary needs, including their nutritional needs (Hapsari, 2013).

According to Quin (2006), economic factors can influence the need for information and education. However, family income does not directly affect knowledge but is related to the availability of facilities that can support the need for broad insight and information (Notoatmodjo, 2010). In this study, the majority of respondents had a significant increase in nutritional knowledge but a lack of information about nutritional practice after getting the Nutsi application.

The results of this study found that there was no difference in pretest between the intervention and control groups. It might be because the characteristics of respondents based on age, education level, and family income are homogeneous, so that the characteristics of respondents do not affect the level of knowledge about nutrition among breastfeeding mothers. This result supports previous studies which revealed that there was no significant difference in pretest scores between the intervention and control groups before respondents got the "Nutri Quiz Story" application Fahrizki, (2017) and the "Gapin" application (Turah, Anggraeni & Setiawati, 2019).

Health education is provided by several types of media in order to increase human knowledge (Turah, Anggraeni & Setiawati, 2019). The results of this study support previous study results which found that the android application media may increase posttest score in the intervention group. Previous studies revealed that the "Breastfeeding Father" application was an effective way to increase posttest scores of exclusive breastfeeding knowledge among respondents in an intervention group (Budianto & Handayani, 2017). In addition, there are a variety of internet-based e-technologies that professionals can use to promote, educate, and support breastfeeding women (Almohanna, Win, & Meedya, 2020).

The source of information is a main factor influencing knowledge. The media is a key to making health education successful. The Nutsi application is an effective way to increase nutritional knowledge among breastfeeding mothers. The medium used in this study is a smartphone application, which in this day and age has been widely used as a learning medium in the world of education and health (Divya & Kumar, 2016).

This smartphone application media has advantages, including learning materials that can be presented in various methods, can be given to broad targets, and can be accessed anywhere and anytime (Kusumadewi, 2009). Internet-based health education is an interesting means to increase knowledge and attitudes among young people in Indonesia nowadays (Anggraeni, Aji, Setyani, Rahmawati & Kartikasari, 2018). Besides that, breastfeeding interventions through mobile apps are encouraging because of their relative simplicity and continuous availability (Almohanna et al., 2020).

CONCLUSION

This study developed a smartphone application "Nutsi" as an effective educational medium to increase knowledge of breastfeeding mothers' nutrition. Mothers who received health education about nutrition during breastfeeding through the Nutsi smartphone application experienced increased knowledge compared to those who did not use the Nutsi smartphone application. The Nutsi smartphone application can be used to increase knowledge and also prepare women for lactation.

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