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Effectiveness of the Elsimil Program Supported by Family Assistance Teams on Knowledge, Attitudes, and Nutritional Expectations Among Prospective Brides: A Quasi-Experimental Study

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ABSTRACT

The *Elsimil* application (Electronic Ready for Marriage and Pregnancy) was developed as a screening, education, and assistance tool for prospective brides. This study aimed to analyze the effectiveness of the *Elsimil* application combined with support from the Family Assistance Team (Tim Pendamping Keluarga/TPK) on nutritional knowledge, attitudes, and expectations among prospective brides in Palu City. This study employed a quantitative approach using a quasi-experimental design with a non-randomized control group and a pretest–posttest design. The sample size was calculated using the formula for testing differences between two proportions, yielding a total of 54 respondents. Participants were randomly assigned to an intervention group (n = 27) and a control group (n = 27). Baseline data revealed significant differences in age and education level, with the control group being older and more highly educated. The intervention group received education through the *Elsimil* application, accompanied by TPK support, while the control group received conventional nutrition education using a booklet. Data were analyzed using the Mann–Whitney test and were supplemented with consideration of baseline confounders. Statistical analysis showed no significant differences between the intervention and control groups in terms of nutritional knowledge ($p = 0.162$), attitudes ($p = 0.340$), or nutritional expectations ($p = 0.330$). While the Elsimil application provides a digital platform for education, technical barriers and baseline demographic imbalances, particularly in education levels, significantly influenced the outcomes. Improvements in user interface design, offline accessibility, and targeted facilitator training are needed to enhance the application's effectiveness compared to traditional media.

Key Messages:

- The integration of the digital Elsimil application with Family Assistance Team (TPK) support demonstrates comparable effectiveness to traditional booklet-based interventions in enhancing nutritional knowledge, attitudes, and expectations among prospective brides, with its overall impact being moderated by technical barriers and socio-demographic factors.

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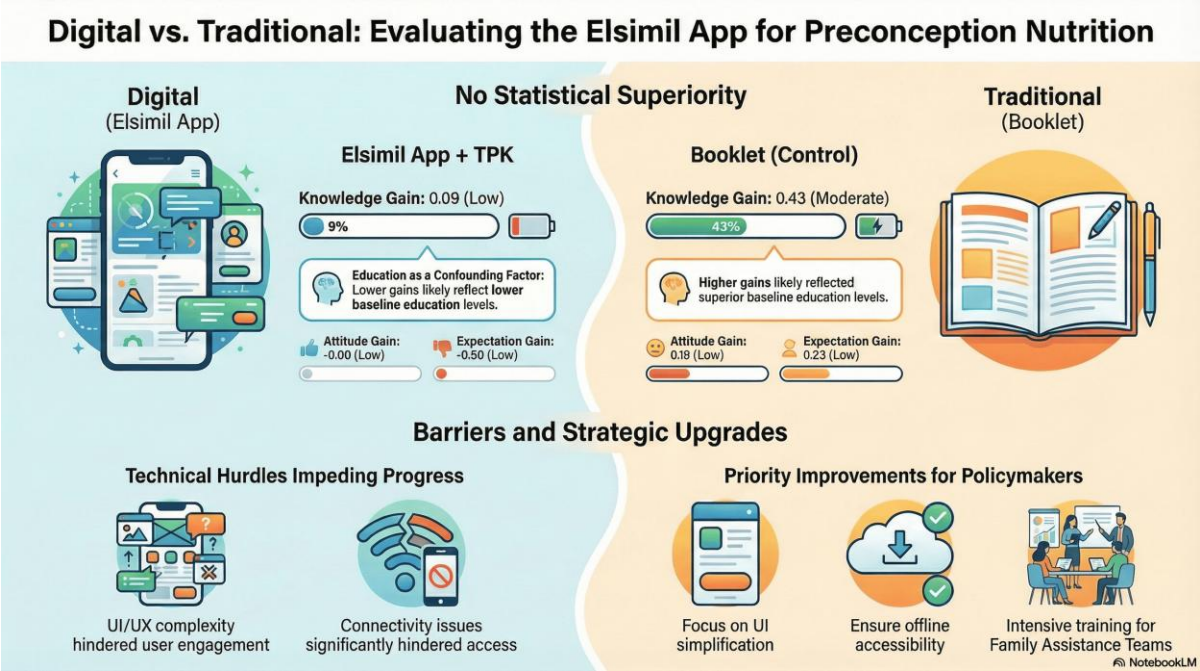
GRAPHICAL ABSTRACT



INTRODUCTION

Undernutrition remains a major public health concern in many parts of the world, including Indonesia. This condition is commonly associated with an imbalance between energy and protein intake that fails to meet physiological requirements (1). Among women, particularly prospective brides, nutritional status plays a crucial role in determining reproductive health and future fetal development (2). Women of reproductive age who experience chronic undernutrition have been reported to face a 2.045-fold higher risk of miscarriage compared with women with normal nutritional status (3).

Based on trends from the Indonesia Health Surveys (2007–2023), the prevalence of underweight (BMI < 18.5) among Indonesian adults has declined, dropping from 12.3% in 2007 to 7.5% in 2023 (4). Data from the Basic Health Research Survey (RISKESDAS) indicate a decline in undernutrition among adult women from 10.1% in 2013 to 7.8% in 2018 (5). In Central Sulawesi, the prevalence of underweight women decreased from 10.5% in 2013 to 7.2% in 2023. Despite this overall improvement, the proportion of undernourished prospective brides has increased, particularly in Palu City, where prevalence rose from 43% in 2021 to 43.47% in 2022.

Multiple factors influence women's nutritional status, with knowledge of nutrition among the most important determinants (1). Previous studies have demonstrated that adequate nutritional knowledge contributes significantly to preconception readiness (6). In response to this need, the National Population and Family Planning Board (BKKBN) launched the *Elsimil* application (7). However, despite its nationwide implementation, there remains a significant research gap regarding its empirical efficacy and user compliance compared to traditional TPK-led booklet interventions.

In this study, "nutritional expectations" are defined as outcome expectancies based on Social Cognitive Theory. This refers to a prospective bride's estimate or belief that adopting specific dietary behaviors will lead to positive nutritional outcomes and a healthy pregnancy. This study aimed to evaluate the effectiveness of the *Elsimil* application combined with TPK assistance in improving nutritional knowledge, attitudes, and expectations among prospective brides in Palu City.

METHODS

This study employed a quantitative approach, using a quasi-experimental design with a non-randomized control group and a pretest–posttest framework. In this design, participants were allocated to the intervention and control groups without randomization. Female prospective brides residing in South

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Palu District, East Palu District, and West Palu District were assigned to the intervention group, while those residing in Mantikulore District served as the control group. Participants were selected using a purposive sampling technique. The study population consisted of women of reproductive age who were planning to marry, able to communicate effectively, owned a mobile phone, and were willing to provide written informed consent to participate in the study.

A total of 54 participants were included, comprising 27 individuals in the intervention group and 27 in the control group (consistent with the calculated analytical sample). Data on knowledge, attitudes, and nutritional expectations were collected using a structured questionnaire consisting of 17 knowledge items, 19 attitude statements, and 14 nutritional expectation statements. All instruments had previously undergone validity and reliability testing, with Cronbach's alpha values exceeding 0.70. Difference tests and gain score analyses were applied to assess the effectiveness of the *Elsimil* application combined with Family Assistance Team *(Tim Pendamping Keluarga/TPK)* support. The research procedure began with obtaining official permissions from district and sub-district authorities, the National Population and Family Planning Board (BKKBN), and the Office of Religious Affairs (KUA). Pretests were then administered to both the intervention and control groups. The intervention group received nutrition education through the *Elsimil* application, accompanied by direct assistance from the TPK, while the control group was provided with a booklet and a brief educational session entitled "Planning a Healthy Pregnancy" issued by the Ministry of Health of the Republic of Indonesia (2021). Following a one-month intervention period, posttests were administered to both groups.

Data analysis was performed using SPSS, focusing on nonparametric tests due to the data distribution, while acknowledging that baseline education level served as a covariate in interpreting the results. This study received ethical approval from the Research Ethics Committee of the Faculty of Medicine and Health Sciences, Faculty of Medicine, Universitas Tadulako (Approval No. 800/UN28.10/KL/2025).

RESULTS

The majority of respondents in both the intervention (55.6%) and control (63.0%) groups were aged 20–25 years. In the intervention group, the remaining respondents were aged 26–35 years (44.4%), whereas in the control group, a substantial proportion were aged 36–38 years (37.0%). Regarding educational attainment, most respondents in the intervention group had completed senior high school or vocational high school (48.1%). In contrast, the majority of respondents in the control group had attained tertiary education (74.1%). A considerable proportion of participants in the intervention group also held a tertiary-level qualification (40.7%), while 25.9% of respondents in the control group had completed high school. Regarding employment status, nearly half of the respondents in the intervention group (44.4%) and more than half in the control group (51.9%) were not employed at the time of the study. Among employed individuals, the most common occupation in both groups was private-sector employment, accounting for 37.0% of the intervention group and 40.7% of the control group. Detailed characteristics of the respondents are presented in Table 1.

Table 1. Distribution of Respondent Characteristics

Characteristic	Intervention n (%)	Control n (%)
Age (years)		
20 -25	15 (55.6)	17 (63)
26 – 35	12 (44.4)	0 (0)
36 – 38	0 (0)	10 (37)
Education level		
Primary school	1 (3.7)	0 (0)
Junior high school	2 (7.4)	0 (0)
Senior/vocational high school	13 (48.1)	7 (25.9)
Tertiary education	11 (40.7)	20 (74.1)
Occupation		
Unemployed	12 (44.4)	14 (51.9)
Civil servant	3 (11.1)	1 (3.7)
Private-sector employee	10 (37)	11 (40.7)
Self employed	2 (7.4)	1 (3.7)

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At baseline, none of the respondents in either the intervention or the control group demonstrated poor nutritional knowledge. Most participants in the intervention group (85.2%) and the control group (70.4%) were classified as having good nutritional knowledge. Similarly, no respondents in either group exhibited poor attitudes toward nutrition. Most participants in the intervention group (63.0%) and the control group (70.4%) showed moderate attitudes, while a smaller proportion in the intervention group (37.0%) and the control group (25.9%) had good attitudes. Regarding nutritional expectations, none of the respondents in either group were categorized as having poor expectations. The majority of participants in both the intervention and control groups demonstrated good nutritional expectations (88.9%). A detailed distribution of baseline knowledge, attitudes, and nutritional expectations is presented in Table 2.

Table 2. Baseline Distribution of Knowledge, Attitudes, and Nutritional Expectations

Variable	Pre – test Intervention n (%)	Pre – test Control n (%)
Knowledge		
<60% (Poor)	0 (0)	0 (0)
60 – 80% (Moderate)	4 (14.8)	8 (29.6)
>80% (Good)	23 (85.2)	19 (70.4)
Attitude		
<60% (Poor)	0 (0)	0 (0)
60 – 80% (Moderate)	17 (63)	19(70.4)
>80% (Good)	**10 (37)**	7 (25.9)
Expectations		
<60% (Poor)	0 (0)	0 (0)
60 – 80% (Moderate)	3 (11.1)	3 (11.1)
>80% (Good)	24 (88.9)	24 (88.9)

As shown in Table 3, median knowledge scores increased by 1.00 and 2.00 in the intervention and control groups, respectively, indicating an overall improvement in knowledge in both groups. However, a statistically significant change in median knowledge score was observed only in the control group ($p = 0.000$), whereas the change in the intervention group was not statistically significant ($p = 0.419$). These findings indicate that there was no significant difference in knowledge levels among female premarital participants before and after receiving education through the Elsimil application, accompanied by Family Assistance Team support. In contrast, participants who received education through the booklet intervention showed a significant improvement in knowledge. The difference in post-test median knowledge scores between the intervention and control groups was −1.00, indicating that the median post-test knowledge score in the intervention group was lower than that of the control group. Nevertheless, the Mann–Whitney test showed that this difference was not statistically significant ($p = 0.162$). Therefore, no significant difference in knowledge outcomes was identified between participants educated using Elsimil with Family Assistance Team support and those who received booklet-based education. Regarding nutritional expectations, none of the respondents in either group were classified as having low expectations. The majority of participants in both the intervention and control groups demonstrated good nutritional expectations (88.9%).

A similar pattern was observed for attitudes. Both groups showed a median increase of 2.00 from pre-test to post-test, indicating an overall improvement in attitudes. However, a statistically significant change in median attitude score was observed only in the control group ($p = 0.011$), whereas no significant change was observed in the intervention group ($p = 0.832$). The difference in post-test median attitude scores between the intervention and control groups was −2.00, suggesting that the improvement in attitudes was smaller in the intervention group than in the control group. Despite this difference, the Mann–Whitney test revealed no statistically significant difference in post-test attitude scores between the two groups ($p = 0.340$). Overall, these findings indicate that education delivered through the *Elsimil* application, with Family Assistance Team support, did not result in significantly greater improvements in knowledge or attitudes than booklet-based education.

The median difference in nutritional expectation scores before and after the intervention in the

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intervention group was −2.00, indicating that the post-test median expectation score was lower than the pre-test value. Accordingly, no statistically significant change in nutritional expectations was observed in this group following the intervention (p = 0.444). In contrast, the control group showed a median difference of 4.00, indicating an increase in expectation scores after receiving educational materials. This change was statistically significant (p = 0.004). These findings suggest that there was no meaningful change in nutritional expectations among prospective brides who received education through the *Elsimil* application with Family Assistance Team support, whereas a significant improvement was observed among those who received booklet-based education. The difference in post-test median expectation scores between the intervention and control groups was −2.00, indicating that the median post-intervention score in the intervention group remained lower than that of the control group. However, the Mann–Whitney test revealed that this difference was not statistically significant (p = 0.330). Therefore, no significant difference in nutritional expectations was identified between participants who received education via *Elsimil* with Family Assistance Team support and those who received conventional booklet education.

Table 3. Differences in Knowledge, Attitudes, and Nutritional Expectations of Prospective Brides in the Intervention and Control Groups Before and After the Intervention

Variable	Pre – test Median (SD)	Post – test Median (SD)	Δ Post - Pre	*P – value* (<0.05)
Knowledge				
Intervention	30.00 (2.53)	31.00 (2.50)	1.00↑	0.419^{++}
Control	30.00 (2.88)	32.00 (1.76)	2.00↑	0.00^{++}
Δ Post intervention- control		-1.00↓		0.612^{+}
Attitude				
Intervention	58.00 (6.20)	60.00 (6.36)	2.00↑	0.832^{++}
Control	60.00 (5.29)	62.00 (6.01)	2.00↑	0.011^{++}
Δ Post intervention- control		-2.00↓		0.340^{+}
Expectation				
Intervention	74.00 (6.61)	72.00 (7.24)	-2.00↓	0.444^{++}
Control	70.00 (5.72)	74.00 (5.24)	4.00↑	0.004^{++}
Δ Post intervention- control		-2.00↓		0.330^{+}

+Mann-Whitney Test, $^{++}$Wilcoxon Test

Overall, the effectiveness of the *Elsimil* application, along with Family Assistance Team support and booklet-based education, remained low across most outcome variables. An exception was observed for the knowledge variable in the control group, where booklet-based education demonstrated moderate effectiveness. These findings indicate that the null hypothesis (H_0) was accepted, and the alternative hypothesis (H_1) was rejected, meaning that the *Elsimil* application with Family Assistance Team support did not show superior effectiveness compared with conventional booklet-based education.

The comparison of effectiveness between the two interventions, assessed using gain score analysis, is presented in Table 4.

Table 4. Comparison of the Effectiveness of the Elsimil Application with Family Assistance Team Support and Booklet-Based Education on Knowledge, Attitudes, and Nutritional Expectations Using Gain Score Analysis

Variable	Intervention (Elsimil + TPK)		Control (Booklet)	
	Gain Score	Category	Gain Score	Category
Knowledge	0.09	Low effectiveness	0.43	Moderate effectiveness
Attitude	-0.00	Low effectiveness	0.19	Low effectiveness
Expectation	-0.50	Low effectiveness	0.23	Low effectiveness

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DISCUSSION

The findings of this study indicate that the integration of the *Elsimil* application with Family Assistance Team (TPK) support did not yield statistically significant improvements in knowledge, attitudes, or nutritional expectations compared to traditional booklet-based education ($p > 0.05$). While digital health interventions are often perceived as superior, this research suggests that both the *Elsimil* app and the printed booklet were equally effective within the context of preconception education. This aligns with the World Health Organization (WHO, 2013), which emphasizes preconception care as a key intervention, yet underscores that its success is heavily contingent upon the suitability of the medium for the target population (8). These findings are further supported by a systematic review by Nurleli et al. (2025), highlighting that the efficacy of mobile health (mHealth) interventions is often moderated by the psychosocial delivery and reception of information by the participants (9).

The significant improvement in knowledge observed within the control group ($p < 0.001$) warrants a critical examination through the lens of baseline confounding variables, specifically educational attainment. A majority of control group participants held tertiary degrees (74.1%), significantly outnumbering those in the intervention group (40.7%). According to Zimmerman et al. (2014) (10) and Nutbeam (2008) (11), health literacy maintains a strong positive correlation with formal education levels, as more educated individuals possess a greater capacity to process and internalize health information from printed media. Consequently, the knowledge gains in the control group likely reflect their superior baseline cognitive capabilities rather than inherently demonstrating that the booklet is a more effective medium than the digital application.

Technical barriers emerged as the primary limiting factor hindering the effectiveness of the *Elsimil* application in this study. Reports from the intervention group regarding user interface (UI/UX) complexity and connectivity disruptions mirror common obstacles in community-based mHealth implementation (12). . Based on the Technology Acceptance Model (TAM) perspective, perceived ease of use is a critical determinant of a user's intention to engage with technology (13). These technical issues, coupled with varying levels of digital literacy, likely led to suboptimal engagement with the application's nutritional modules compared to the immediate accessibility of the physical booklet.

From a theoretical standpoint, the variable "Nutritional Expectations" in this study was operationalized as outcome expectancies within the Social Cognitive Theory (SCT) framework. These expectations refer to the belief among prospective brides that adopting healthy dietary behaviors will lead to positive outcomes for fetal health and future pregnancy (14). The lack of statistically significant differences suggests that such deep-seated cognitive constructs are difficult to alter through short-term informational interventions alone. Shifting outcome expectancies and self-efficacy requires more interactive and sustained approaches (15). Therefore, the *Elsimil* application may need to incorporate more persuasive and interactive features rather than serving as a purely one-way informational repository.

CONCLUSION

In conclusion, while the Elsimil application represents a vital innovation for preconception screening, its current effectiveness is moderated by technical constraints and the socio-demographic backgrounds of its users. It is essential to incorporate feedback from field assistants, such as the TPK, to refine the application's operational functionality at the community level. Key recommendations for policymakers include simplifying the user interface, enabling offline mode, and providing intensive training for TPK members to bridge the digital divide in the field. Future research is encouraged to utilize Randomized Controlled Trial (RCT) designs with strict controls for educational variables to more accurately validate the effectiveness of these digital health tools.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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