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Effectiveness of Structured Preconception Nutritional Counseling on Pregnancy Readiness Among Women Planning Pregnancy in Rural North Sumatra, Indonesia

Ika Damayanti Sipayung [1], Nurmalina Hutahaean[2], Yasrida Nadeak[3], Fazila Itawari[4], Juwita Pakpahan[5]
[1, 2, 3,4,5] Department of Midwifery, Professional Midwife Education Program, STIKES Adi Husada, Surabaya, Indonesia

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Corresponding author*:
ikadamayanti951@gmail.com

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Abstract: Preconception nutritional readiness is an important component of maternal and neonatal health because women's nutritional status before pregnancy may influence pregnancy outcomes, fetal growth, and newborn health. However, structured preconception nutritional counseling has not been widely implemented in rural community settings, including among women planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia. **Objective:** This study aimed to examine the effectiveness of structured preconception nutritional counseling on pregnancy readiness among women planning pregnancy. **Methods:** This study used a quantitative approach with a quasi-experimental non-equivalent control group design. A total of 80 women of reproductive age who intended to conceive within one year were selected using purposive sampling and divided into an intervention group and a control group, with 40 respondents in each group. The intervention group received structured preconception nutritional counseling for eight weeks, while the control group received routine health education. Data were collected using a pregnancy readiness questionnaire and analyzed using descriptive statistics, paired sample t-tests, and independent sample t-tests. **Results:** The results showed that the intervention group experienced a significant increase in pregnancy readiness scores from 61.75 ± 8.42 to 84.20 ± 6.11 after the counseling program ($p < 0.001$). In contrast, the control group showed only a small and statistically insignificant increase from 62.10 ± 7.95 to 65.45 ± 7.38 ($p = 0.091$). Improvements were also observed in nutritional knowledge, dietary behavior, and folic acid awareness, with the highest improvement found in folic acid awareness. **Implications:** These findings imply that structured preconception nutritional counseling can be integrated into community-based maternal and reproductive health services to improve women's readiness before pregnancy. **Originality:** The originality of this study lies in its focus on structured nutritional counseling for women actively planning pregnancy in a rural Indonesian setting, providing practical evidence for strengthening preconception care at the community level.

Keywords: preconception care; nutritional counseling; pregnancy readiness; maternal nutrition; reproductive health.

INTRODUCTION

Maternal and neonatal health remains a critical public health issue because many pregnancy-related complications are associated with women's health conditions before conception. Women who enter pregnancy with inadequate nutritional status, poor dietary

practices, limited folic acid intake, or unrecognized reproductive health risks may have a higher probability of experiencing adverse maternal and neonatal outcomes. The World Health Organization reported that approximately 287,000 women died from pregnancy- and childbirth-related causes in 2020, showing that preventable maternal health problems remain a global challenge (World Health, 2023). From a preconception perspective, maternal nutrition before pregnancy is important because nutritional status at conception can influence placental development, fetal growth, and subsequent birth outcomes (King, 2016). Therefore, health promotion before pregnancy is increasingly recognized as an essential preventive strategy to support safer pregnancy and healthier newborns.

In Indonesia, maternal health services have generally been strengthened through antenatal care, childbirth services, and postpartum care; however, preconception care has not been fully integrated into routine community-based health services. The Ministry of Health of the Republic of Indonesia continues to emphasize maternal and child health as a priority area, including the prevention of anemia, nutritional problems, and pregnancy-related complications (Ministry of Health of the Republic of, 2023). Nevertheless, women who plan pregnancy may not always receive structured information regarding balanced nutrition, folic acid supplementation, healthy body weight, and reproductive health preparation before conception. This situation may be more visible in rural communities where access to structured preconception education is limited. In Bangun Rejo Village, North Sumatra, the absence of routine structured preconception nutritional counseling may reduce women's readiness to enter pregnancy in a healthy condition. This condition indicates the need for an educational intervention that is practical, community-based, and directly focused on improving pregnancy readiness among women planning pregnancy.

Previous literature has established preconception care as an important component of the maternal and child health continuum. Dean described preconception care as a set of interventions designed to identify and modify biomedical, behavioral, and social risks before pregnancy (Dean, Lassi, et al., 2014). WHO also emphasized that preconception care is intended to reduce maternal and childhood mortality and morbidity by addressing health risks before conception occurs (World Health, 2013). More recently, the FIGO Preconception Checklist highlighted that preconception care should include assessment and counseling related to nutrition, lifestyle, chronic disease risks, vaccination, reproductive planning, and psychosocial conditions (Benedetto et al., 2024). These studies show that preconception care is not limited to medical screening, but also includes

structured health education that helps women prepare for pregnancy more comprehensively.

Another group of studies has focused on nutritional risks and interventions before conception. Dean reported that preconception underweight, overweight, short stature, and micronutrient deficiencies may contribute to maternal and fetal complications (Dean, Mason, et al., 2014). Stephenson further emphasized that nutrition and lifestyle in the preconception period have important implications for future maternal and child health (Stephenson et al., 2018). In addition, Fleming explained that the period around conception is biologically important because parental nutrition, body composition, metabolism, and environmental exposures may influence offspring health across the life course (Fleming et al., 2018). Evidence from intervention studies also supports the importance of nutritional preparation before pregnancy. Dhaded found that preconception nutrition intervention improved newborn birth length and reduced stunting and wasting in South Asian settings (Dhaded et al., 2020), while Lassi showed that preconception and periconception interventions can improve maternal nutritional status and birth outcomes in low- and middle-income countries (Lassi et al., 2020).

A further category of research has examined counseling, education, and barriers to preconception care implementation. Barker argued that behavior change interventions before conception are promising strategies for improving women's nutrition and health-related behaviors (Barker et al., 2018). Berhane demonstrated that picture-based nutrition education and counseling improved knowledge and adherence to preconception iron-folic acid supplementation among women planning pregnancy (Berhane et al., 2022). Temel also showed that folic acid knowledge and intention to seek preconception care can increase after targeted educational intervention (Temel et al., 2015). However, implementation remains challenging because preconception care uptake is often limited by low awareness, lack of comprehensive programs, and insufficient counseling practices (M'Hamdi et al., 2017).

Although these studies confirm the importance of preconception nutrition and education, evidence regarding structured preconception nutritional counseling in rural Indonesian community settings remains limited. Most previous studies have examined general preconception care, nutritional risks, folic acid knowledge, or intervention effects in other countries, while fewer studies have directly assessed pregnancy readiness among women actively planning pregnancy in rural Indonesia.

Based on this gap, the present study aimed to examine the effectiveness of structured preconception nutritional counseling on pregnancy readiness among women planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia. Specifically, this study assessed changes in pregnancy readiness before and after the counseling intervention and compared pregnancy readiness outcomes between women who received structured nutritional counseling and those who received routine health education. Pregnancy readiness in this study includes nutritional knowledge, dietary behavior, folic acid awareness, body mass index awareness, and reproductive health preparedness. By focusing on women who intended to conceive within one year, this study is expected to provide practical evidence for strengthening community-based preconception care services.

This study is based on the argument that structured preconception nutritional counseling can improve pregnancy readiness by increasing women's knowledge, awareness, and health-related behaviors before conception. Health education can help women understand balanced dietary intake, micronutrient needs, folic acid supplementation, healthy weight management, and reproductive health preparation. This argument is consistent with evidence that counseling and behavior change strategies before pregnancy may improve preconception health practices (Barker et al., 2018). Therefore, the hypothesis of this study is that women who receive structured preconception nutritional counseling will have significantly higher pregnancy readiness scores than women who receive routine health education. If effective, this intervention may serve as a practical strategy to strengthen community-based preconception care and support healthier pregnancy outcomes in rural areas.

RESEARCH METHOD

This study used women of reproductive age who were planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia, as the unit of analysis. The main focus of the study was pregnancy readiness, which included nutritional knowledge, dietary behavior, folic acid awareness, body mass index awareness, and reproductive health preparedness. The target population consisted of 102 women of reproductive age who intended to conceive within the following 12 months. From this population, 80 eligible women were selected as respondents using purposive sampling and divided into two groups: 40 respondents in the intervention group and 40 respondents in the control group. The complete research flow is presented in Figure 1.

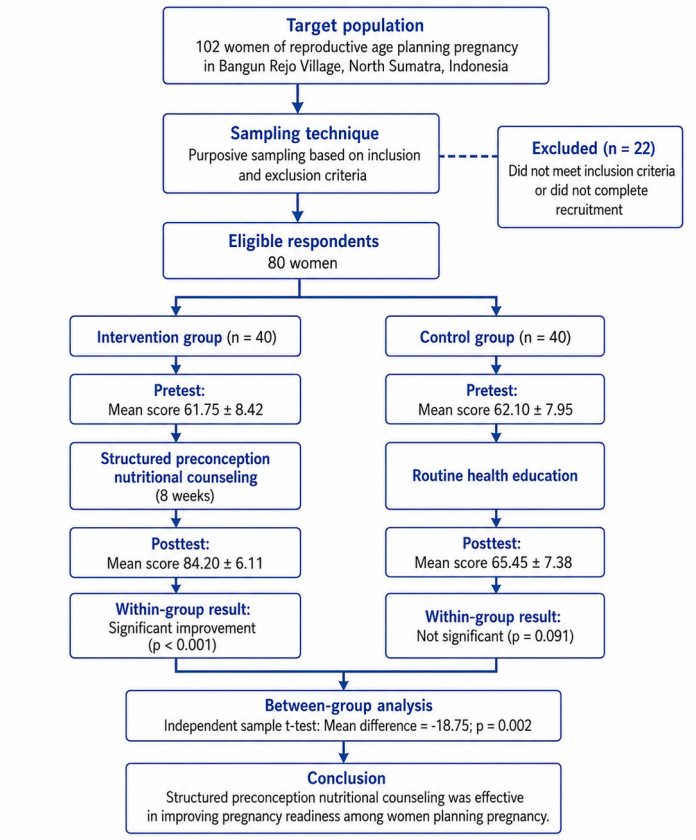

Figure 1. Flowchart Research

This study employed a quantitative approach with a quasi-experimental design using a non-equivalent control group design. This design was selected because the study aimed to examine the effectiveness of structured preconception nutritional counseling by comparing pregnancy readiness before and after the intervention between two groups. Random allocation was not fully feasible because the research was conducted in a community setting. Therefore, the intervention group received structured preconception nutritional counseling, while the control group received routine health education from local health services. This design allowed the researchers to evaluate whether the counseling intervention produced greater improvement in pregnancy readiness than routine health education.

The data used in this study were primary data obtained directly from respondents through a structured pregnancy readiness questionnaire. The questionnaire assessed several components of pregnancy readiness, including nutritional knowledge, dietary practices, folic acid supplementation awareness, body mass index awareness, and reproductive health preparedness. Demographic data, including respondents' age and educational level, were

also collected to describe the characteristics of the study participants. The questionnaire was administered twice, namely before the intervention as a pretest and after the eight-week intervention period as a posttest.

Data collection was conducted from January to April 2026. Respondents were recruited based on predetermined inclusion and exclusion criteria. The inclusion criteria were women of reproductive age, residing in Bangun Rejo Village, planning to become pregnant within one year, willing to participate in the study, and able to complete the questionnaire. Women who were already pregnant, had severe health conditions that could interfere with study participation, or were unwilling to complete the research procedures were excluded. The intervention group participated in an eight-week structured preconception nutritional counseling program. The counseling materials included balanced nutrition before pregnancy, folic acid supplementation, iron and micronutrient needs, healthy dietary practices, body mass index awareness, anemia prevention, and reproductive health preparation. The control group received routine health education provided by local health services.

The collected data were analyzed using descriptive and inferential statistics. Descriptive analysis was used to present respondents' demographic characteristics in the form of frequency and percentage. The Kolmogorov–Smirnov test was used to assess the normality of pregnancy readiness scores. Since the data were normally distributed, paired sample t-tests were used to analyze differences between pretest and posttest scores within each group, while independent sample t-tests were used to compare pregnancy readiness scores between the intervention and control groups. Statistical significance was set at $p < 0.05$. Ethical principles were applied throughout the study by obtaining respondents' consent, maintaining confidentiality, and ensuring voluntary participation.

RESULT

This study involved 80 women of reproductive age who were planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia. The respondents were divided into two groups, namely the intervention group and the control group, with 40 respondents in each group. The intervention group received structured preconception nutritional counseling for eight weeks, while the control group received routine health education. The results are presented based on respondents' characteristics, pregnancy readiness scores, changes in pregnancy readiness components, normality testing, and between-group comparison.

Table 1. Age Distribution of Respondents in the Intervention and Control Groups

Age (Years)	Intervention Group (n = 40)	%	Control Group (n = 40)	%
20–24	8	20.0	9	22.5
25–29	17	42.5	16	40.0
30–34	10	25.0	9	22.5
35–39	5	12.5	6	15.0
Total	**40**	**100.0**	**40**	**100.0**

Table 1 shows that most respondents in both groups were aged 25–29 years. In the intervention group, 17 respondents (42.5%) were in this age category, while in the control group, 16 respondents (40.0%) were aged 25–29 years. The distribution of respondents across age groups was relatively similar between the intervention and control groups.

Table 2. Educational Level of Respondents in the Intervention and Control Groups

Educational Level	Intervention Group (n = 40)	%	Control Group (n = 40)	%
Primary School	4	10.0	5	12.5
Secondary School	22	55.0	21	52.5
Higher Education	14	35.0	14	35.0
Total	**40**	**100.0**	**40**	**100.0**

Table 2 presents the educational level of respondents. Most respondents in both groups had completed secondary education, with 22 respondents (55.0%) in the intervention group and 21 respondents (52.5%) in the control group. Respondents with higher education accounted for 14 respondents (35.0%) in each group. These findings indicate that the educational background of respondents was generally comparable between the two groups.

Table 3. Comparison of Pretest and Posttest Pregnancy Readiness Scores

Group	Pretest Mean ± SD	Posttest Mean ± SD	p-value
Intervention	61.75 ± 8.42	84.20 ± 6.11	< 0.001
Control	62.10 ± 7.95	65.45 ± 7.38	0.091

Table 3 shows the comparison of pregnancy readiness scores before and after the intervention. In the intervention group, the mean pregnancy readiness score increased from 61.75 ± 8.42 before the intervention to 84.20 ± 6.11 after the intervention. The paired sample t-test showed that this increase was statistically significant, with $p < 0.001$. In the control group, the mean score increased from 62.10 ± 7.95 to 65.45 ± 7.38, but the change was not statistically significant, with $p = 0.091$.

Table 4. Changes in Components of Pregnancy Readiness After Nutritional Counseling

Component	Before	After	Improvement (%)
Nutritional Knowledge	62.4	87.2	39.7
Dietary Behavior	64.1	83.5	30.3
Folic Acid Awareness	58.6	84.8	44.7

Table 4 shows changes in the components of pregnancy readiness after the nutritional counseling intervention. All measured components improved after the intervention. Folic acid awareness showed the highest increase, from 58.6 to 84.8, with an improvement of 44.7%. Nutritional knowledge increased from 62.4 to 87.2, with an improvement of 39.7%, while dietary behavior increased from 64.1 to 83.5, with an improvement of 30.3%.

Table 5. Normality Test of Pregnancy Readiness Scores

Group	Kolmogorov–Smirnov Z	Asymp. Sig. (2-tailed)
Control Group	1.215	0.086
Intervention Group	1.187	0.092

Table 5 presents the results of the normality test using the Kolmogorov–Smirnov test. The Asymp. Sig. value was 0.086 for the control group and 0.092 for the intervention group. Since both values were greater than 0.05, the pregnancy readiness scores in both groups were normally distributed. Therefore, parametric statistical tests were appropriate for further analysis.

Table 6. Independent Sample t-test Results for Pregnancy Readiness Scores Between Groups

Assumption	Sig. (2-tailed)	Mean Difference
Equal variances assumed	0.002	-18.75
Equal variances not assumed	< 0.001	-18.75

Table 6 shows the results of the independent sample t-test comparing pregnancy readiness scores between the intervention and control groups after the intervention. The significance value was 0.002 under the equal variances assumed condition and < 0.001 under the equal variances not assumed condition. Both values were below 0.05, indicating a statistically significant difference in pregnancy readiness between the two groups.

The mean difference of -18.75 indicates that the posttest pregnancy readiness score in the intervention group was higher than that of the control group. These findings show that women who received structured preconception nutritional counseling had significantly

better pregnancy readiness than women who received routine health education. Overall, the results demonstrate that structured preconception nutritional counseling was effective in improving pregnancy readiness among women planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia.

DISCUSSION

The findings of this study showed that structured preconception nutritional counseling significantly improved pregnancy readiness among women planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia. The intervention group experienced a substantial increase in pregnancy readiness scores after participating in the eight-week counseling program, while the control group showed only a small and statistically insignificant improvement. The results also indicated improvements in several components of pregnancy readiness, including nutritional knowledge, dietary behavior, and folic acid awareness. Among these components, folic acid awareness showed the highest percentage of improvement. These findings suggest that structured counseling provided before conception can strengthen women's preparedness to enter pregnancy in a healthier condition.

The improvement in pregnancy readiness may be explained by the role of counseling as a structured educational process that increases knowledge, awareness, and motivation for behavioral change. Women who receive clear information about balanced nutrition, micronutrient needs, folic acid supplementation, healthy weight management, and reproductive health preparation may become more capable of identifying health risks before pregnancy. Increased knowledge can influence attitudes and decision-making, which subsequently encourages healthier dietary practices and better reproductive planning. In this study, the largest improvement was found in folic acid awareness, suggesting that specific and practical messages delivered through counseling may be easier for participants to understand and apply. Folic acid supplementation is a concrete preventive behavior, and when women understand its importance before conception, they may become more willing to adopt it as part of pregnancy preparation.

The results of this study are consistent with previous literature emphasizing the importance of preconception care in improving maternal and neonatal health. Dean explained that preconception care is needed to close the gap in the maternal and child health continuum by addressing risks before pregnancy occurs (Dean, Lassi, et al., 2014).

Similarly, WHO stated that preconception care includes biomedical, behavioral, and social interventions that aim to reduce maternal and childhood morbidity and mortality (World Health, 2013). The current study supports these concepts by showing that a structured educational intervention before pregnancy can improve women's readiness for conception, particularly in a rural community where routine preconception counseling is not yet fully established.

The findings also align with studies focusing on preconception nutrition and maternal health outcomes. Dean reported that nutritional risks before conception, including micronutrient deficiencies and unhealthy body weight, can influence pregnancy outcomes (Dean, Mason, et al., 2014). Stephenson emphasized that nutrition and lifestyle before pregnancy are important for future maternal and child health (Stephenson et al., 2018), while Fleming highlighted that the period around conception is a critical window that may influence long-term offspring health (Fleming et al., 2018). The present study adds to this evidence by demonstrating that nutritional counseling can improve pregnancy readiness before conception, not only by increasing general knowledge but also by strengthening practical awareness of dietary behavior and folic acid supplementation.

The improvement in folic acid awareness found in this study is also supported by previous intervention research. Berhane showed that nutrition education and counseling improved knowledge and adherence to preconception iron-folic acid supplementation among women planning pregnancy (Berhane et al., 2022). Temel also found that educational intervention could increase knowledge of folic acid supplementation and intention to seek preconception care (Temel et al., 2015). The similarity between these findings and the present study suggests that educational strategies are useful for improving specific preventive behaviors before pregnancy. However, the novelty of the present study lies in its focus on pregnancy readiness among women planning pregnancy in a rural Indonesian setting, where structured preconception nutritional counseling remains limited.

The results further indicate that counseling may influence pregnancy readiness through behavioral and psychological pathways. Pregnancy readiness is not only related to knowledge but also to the ability of women to translate information into daily practices. Nutritional counseling can help women understand the relationship between food intake, micronutrient adequacy, body mass index, and reproductive health. As a result, women may become more aware of the need to improve their diet, consume folic acid, monitor body weight, and prepare for pregnancy more responsibly. This finding supports the view

that preconception interventions should not be limited to medical screening but should also include health education and behavior change strategies.

From a broader public health perspective, the findings of this study have important implications for community-based maternal health services. Many maternal and neonatal risks begin before pregnancy, but health services are often accessed only after pregnancy is confirmed. This creates a missed opportunity for prevention. By integrating structured nutritional counseling into community health programs, health workers can reach women before conception and encourage healthier behaviors earlier. This approach is especially relevant in rural areas where access to information and reproductive health services may be limited. Therefore, the study contributes to the understanding that pregnancy preparation should begin before conception rather than only during antenatal care.

The positive implication of this finding is that structured preconception nutritional counseling can be used as a practical and low-cost intervention to improve pregnancy readiness. The intervention can be delivered through village health posts, community health centers, women's health groups, or premarital and family planning services. It may also strengthen women's autonomy in making reproductive health decisions. However, the implementation of this intervention may also face challenges. Counseling requires trained health workers, standardized materials, regular attendance, and community acceptance. Without adequate support, the intervention may not be implemented consistently or may only benefit women who are already motivated to seek health information.

Based on these findings, several actions are recommended. Community health centers should consider integrating structured preconception nutritional counseling into routine maternal and reproductive health services. Health workers should be provided with standardized counseling modules covering balanced nutrition, folic acid supplementation, iron intake, body mass index awareness, anemia prevention, and reproductive health preparation. Local governments and village health cadres may also support early identification of women planning pregnancy so that counseling can be provided before conception. In addition, health promotion programs should involve husbands and families because family support may influence dietary practices and health-seeking behavior. Future studies should involve larger samples, randomized designs, and longer follow-up periods to evaluate whether improved pregnancy readiness leads to better pregnancy outcomes, birth outcomes, and maternal health status.

CONCLUSION

This study found that structured preconception nutritional counseling improved pregnancy readiness among women planning pregnancy in Bangun Rejo Village, North Sumatra, Indonesia. Women who received the eight-week counseling intervention showed a significant increase in pregnancy readiness scores compared with women who received routine health education. The improvement was observed in several important components, including nutritional knowledge, dietary behavior, and folic acid awareness. These findings indicate that nutritional counseling before conception can help women prepare for pregnancy in a healthier and more informed manner.

The main contribution of this study lies in its focus on structured preconception nutritional counseling in a rural Indonesian community setting. While previous studies have discussed the importance of preconception care and maternal nutrition, this study provides practical evidence that community-based counseling can improve pregnancy readiness among women who are actively planning pregnancy. The findings may support the integration of preconception nutritional counseling into maternal and reproductive health services at the community level, particularly through health centers, village health posts, and family planning programs.

This study has several limitations. First, the quasi-experimental design did not allow full randomization of respondents, so potential differences between groups could not be completely controlled. Second, the use of purposive sampling and the relatively small sample size may limit the generalizability of the findings to broader populations. Third, pregnancy readiness was measured using a questionnaire, which may be influenced by respondents' self-report bias. Finally, this study only assessed readiness before pregnancy and did not follow respondents through pregnancy or birth outcomes. Future studies are recommended to use larger samples, randomized designs, and longer follow-up periods to examine whether improved pregnancy readiness leads to better maternal and neonatal outcomes.

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