Original Article

Midwifery Counseling Strategies to Prevent Unintended Pregnancies among Young Mothers

Andi Sitti Umrah[1], Andi Kasrida Dahlan[1], Juliani[1]

[1] Faculty of Health Sciences, Universitas Muhammadiyah Palopo, South Sulawesi, Indonesia

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Correspondence

Andi Sitti Umrah, Faculty of Health, Universitas Muhammadiyah Palopo, Palopo, South Sulawesi, Indonesia.

Email

andiumrah89@gmail.com

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ABSTRACT

Background: Unintended pregnancy (UP) among young mothers is a pressing reproductive health issue that has drawn widespread attention globally. This phenomenon is deeply concerning as it poses serious physical and psychological risks, particularly for young mothers, and also endangers the well-being of their newborns. This study aims to analyze the effectiveness of behavior-based midwifery counselling interventions in preventing unintended pregnancies among young mothers.

Methods: This pre-experimental pre-post-test study involved 102 randomly selected young mothers under 20 years old who were at risk of unintended pregnancy and not using contraception. The sample size was calculated using General Power Analysis. Data were collected using validated questionnaires and observation sheets. The intervention consisted of six weekly counseling sessions covering unintended pregnancy, contraception, reproductive health, attitude change, behavioral decision-making, and reinforcement. The study followed CONSORT guidelines for non-randomized trials and received ethical approval from Universitas Muhammadiyah Palopo (Protocol No. 045/KEP/III.3.AU/F/2024). Data were analyzed using the Wilcoxon test in SPSS v28..

Results: The findings revealed significant improvements in knowledge (from 33 to 83), attitudes (from 40 to 80), and behavior (from 30 to 70) after the intervention. Wilcoxon test results indicated statistically significant differences before and after the intervention across all three variables ($\rho < 0.001$; $< \alpha = 0.05$).

Conclusion: Behavior-based midwifery counselling is effective in preventing unintended pregnancy among young mothers. This study recommends implementing structured counselling programs and midwife training for more effective prevention strategies.

Keywords: Behavior; Midwifery Counselling; Unintended Pregnancy; Young Mothers.

Implications for Practice:

- Developing and integrating structured, behavior-based midwifery counselling programs into routine reproductive health services for young mothers, with a focus on improving knowledge, attitudes, and preventive behaviors related to unintended pregnancy.
- Enhancing the training of healthcare professionals, especially midwives, in behavioral counselling techniques. Training should cover motivational interviewing, cognitive-behavioral strategies, problem-solving skills, and effective communication of reproductive health and contraception information.
- Improving access to and the quality of contraceptive services by ensuring adequate availability and providing accurate, unbiased information on available options.
- Encouraging family and community involvement, recognizing the influence of social and cultural norms on reproductive health behaviors.
- Personalizing interventions through individual assessments and tailoring approaches to young mothers'

Implications for Practice:

specific needs, preferences, and social contexts.

- Promoting further research on the effectiveness of interventions among subgroups of young mothers and conducting periodic evaluations of counselling programs.

Introduction

Unintended pregnancy among young mothers remains a significant challenge in efforts to improve reproductive health, both globally and in Indonesia. Globally, an estimated 21 million pregnancies occur each year, approximately 50% of which are unintended, with 12 million resulting in live births. Additionally, around 1.5 out of every 1,000 women experience unintended pregnancies annually (World Health Organization (WHO), 2024a). Indonesia is among the countries with a high prevalence of unintended pregnancy among adolescents and young mothers. In 2022, 40 out of every 1,000 girls aged 15–19 were reported to have experienced pregnancy (Muthmainnah et al., 2020; World Population Review, 2024). In South Sulawesi Province, similar issues are evident, with approximately 29.5% of births occurring among young mothers, or about 24.7 births per 1,000 women of reproductive age between 15 and 19 years old (Badan Pusat Statistik, 2023). This issue has become a significant focus of the Indonesian government in supporting the achievement of Sustainable Development Goal (SDG) Pillar 3: ensuring healthy lives and promoting well-being for all at all ages.

Pregnancy among young women is also frequently associated with unsafe abortion or complications such as eclampsia, postpartum endometritis, and systemic infections. Infants born from unintended pregnancies are at greater risk of low birth weight, premature birth, and various severe neonatal conditions (Luttges et al., 2021; Puspitaningrum et al., 2023; Wong et al., 2020). In addition to physical risks, young mothers are also highly vulnerable to psychological challenges, including a lack of physical, emotional, and financial readiness to care for their babies (Chakole et al., 2022; Cheetham, 2022; A. S. Putri et al., 2023).

It highlights the urgent need for more effective and integrated preventive strategies for UP among adolescents and young mothers (Dartiwen & Aryanti, 2024; Malka et al., 2020; Praniska et al., 2023; I. M. Putri & Ismiyatun, 2020; SM Sefryani & Putri, 2022). Despite the implementation of various prevention programs, many young mothers remain trapped in cycles of unintended pregnancy due to limited knowledge or awareness of available contraceptive options (Klein et al., 2020; Niemeyer Hultstrand et al., 2021; Shange & Maharaj, 2023). A fundamental problem is the low acceptance and use of contraception among young mothers, influenced by various factors such as social norms, cultural beliefs, stigma, and limited access to reliable health information and services (Puspitaningrum et al., 2023; World Population Review, 2024). Therefore, developing more effective strategies to prevent UP is imperative, one of which is midwifery counselling.

Midwifery counselling is a healthcare approach used to provide individuals or families with information, support, and guidance on reproductive health and sexuality throughout the life cycle (Cheetham, 2022; Phillippi & Kantrowitz-Gordon, 2023; Sajedi et al., 2024). Counselling has proven effective in increasing young mothers' knowledge and understanding of reproductive health, sexuality, and contraceptive options (Tharpe et al., 2021). However, to ensure success, counselling should not be limited to providing information; it must also incorporate behavioral approaches that

influence individuals' attitudes and actions (Agung et al., 2023; Roy & Mathiesen, 2024). The effectiveness of counselling is often influenced by individuals' understanding, attitudes, and behaviors regarding pregnancy and the surrounding sociocultural environment (Roy & Mathiesen, 2024). Therefore, counselling strategies should aim to enhance knowledge and foster habit and attitude change that support pregnancy prevention. Behavior-based counselling models emphasize cognitive and behavioral shifts that enable individuals to make more informed decisions regarding their reproductive health (Phillippi & Kantrowitz-Gordon, 2023).

Behaviorist Theory, which centers on stimulus-response mechanisms, provides a foundational framework for understanding how behavioral change can be achieved (Sari et al., 2020; Suriati & Yusnidar, 2020; Wilcox et al., 2024). In this context, behavioral interventions aim to stimulate individuals to respond to specific cues in ways that promote positive behavioral change. This approach may involve accurate information delivery, developing healthy habits, and reinforcing positive behaviors that support planned pregnancy for UP prevention among young mothers. Therefore, behavior-based counselling could serve as a more effective strategy for reducing UP rates among young mothers by addressing not only knowledge gaps but also the attitudinal and behavioral factors that contribute to unintended pregnancy.

In addition to behaviorist Theory, this study explicitly adopts the Theory of Planned Behavior (TPB) as the conceptual framework for designing and measuring the research variables. TPB posits that the prevention of unintended pregnancy is influenced by three key determinants: attitude, subjective norms, and perceived behavioral control, which together shape intention and, ultimately, actual behavior. Accordingly, the variables in this study were constructed in alignment with the core components of TPB to provide a comprehensive understanding of the factors influencing preventive behaviors against unintended pregnancy among young mothers.

Research on midwifery counselling as a preventive strategy for UP among young mothers remains limited. Most studies focus on health education or informational interventions, with a minimal exploration of the psychological and behavioral factors essential to decision-making and sustained behavioral change. The novelty of this study lies in its integrative approach that incorporates behaviorist Theory into midwifery counselling—an area that remains underexplored in previous research. By adopting behaviorist principles, this study aims to demonstrate how techniques such as positive reinforcement, stimulus control, and habit modification can be employed in midwifery interventions to prevent UP (Guindon & Lane, 2019; Levers & Hyatt-Burkhart, 2019). Through this approach, young mothers are expected not only to gain knowledge about the risks and consequences of unintended pregnancy but also to develop improved attitudes and preventive behaviors. This study examines the effectiveness of behavior-based midwifery counselling interventions in preventing unintended pregnancy among young mothers by examining their impact on knowledge, attitudes, and behaviors related to preventive decision-making.

This study contributes both theoretically and practically to the prevention of unintended pregnancy. Theoretically, it advances the development of more effective intervention models for UP prevention, particularly for young mothers, and can be adapted across various regions by considering local characteristics. The study offers practical, actionable insights for healthcare professionals, particularly midwives, to reduce UP rates

through a more systematic and behavior-focused counselling approach.

Methods

Study Design

This study employed a quantitative approach with a pre-experimental pre-post-test design. The research involved a group of young mothers who received behavior-based midwifery counselling as an intervention. Before the counselling intervention, the participants were first assessed (pre-test) on their knowledge, attitudes, and behaviors related to Unintended Pregnancy (UP). A second assessment (posttest) was conducted following the intervention to measure changes in these variables.

Participants

The study was conducted in South Sulawesi Province, specifically in the City of Palopo, North Luwu Regency, and Luwu Regency, representing a diverse regional area. Data collection took place from May to October 2024. The population and sample consisted of young mothers under the age of 20 who were at risk of experiencing unintended pregnancy and not using contraceptive methods. The sample size was determined using the General Power Analysis and Sample Size formula, resulting in 102 participants. A simple random sampling technique was employed to ensure the diversity and representativeness of the respondents.

Instruments

Type of Instrument. The primary research instrument was a comprehensive questionnaire based on relevant theoretical frameworks. The questionnaire aimed to assess the respondents' knowledge, attitudes, and behaviors regarding Unintended Pregnancy (UP) and the behavior-based midwifery counselling intervention. Each item was carefully constructed to explore respondents' understanding, perspectives, and actions concerning critical issues in UP prevention. The knowledge variable was measured using multiple-choice questions, while attitudes and behaviors were assessed using a Likert scale to capture the intensity of responses.

Additionally, a structured observation sheet was used to support the implementation of the intervention. This sheet was a systematic guide for researchers to record the counselling sessions with each respondent in detail. It documented key aspects of the counselling process to ensure accurate interactions and information delivery records.

Question Design and Measurement Scale. The questionnaire includes the knowledge variable, consisting of 20 multiple-choice questions using the Guttman scale (score 1 for a correct answer and 0 for an incorrect answer). The attitude variable consists of 15 questions using the Likert scale (Score 1 = Strongly Disagree, 2 = Disagree, 3 = Agree, 4 = Strongly Agree). The behavior variable consists of 15 questions using the Likert scale (Score 1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Always).

Instrument Testing. The questionnaire underwent a series of validity and reliability tests to ensure the quality and reliability of the collected data. Expert validation from professionals in midwifery and psychology confirmed that each item accurately measured the intended constructs. Construct validity was verified using the Pearson Product-Moment correlation (all items were valid with r-calculated > r-table = 0.444), and reliability was confirmed through high Cronbach's Alpha values (knowledge = 0.982; attitude = 0.873; behavior = 0.857), indicating that the instrument was appropriate for use.

Intervention

This study utilized primary data collection, beginning with a pre-test to assess respondents' baseline conditions. The participants then received a six-week series of counselling sessions conducted weekly. Each session's content was validated by experts in midwifery and psychology, focusing on the following topics: introduction to unintended pregnancy (Session 1), contraceptive methods and prevention (Session 2), reproductive health and sexuality (Session 3), identifying attitudes toward unintended pregnancy and initiating change (Session 4), behavioral change and preventive decision-making (Session 5), and evaluation and commitment reinforcement (Session 6). The counselling techniques included motivational interviewing, cognitive-behavioral strategies, and problem-solving skills. The quality of counselling implementation was supported by prior behavioral change training attended by the research team to enhance foundational knowledge and counselling skills. The impact of the intervention was evaluated through a posttest conducted at two different time points: one week after the counselling concluded to assess changes in knowledge and attitudes, and six weeks after completion to assess behavioral change.

In this study, the research team participated in behavior change counseling training in the health sector, organized by the Indonesian Health Association. As a follow-up, the midwives involved in the intervention received intensive training in behavior-based counseling techniques, including motivational interviewing, cognitive-behavioral strategies, and problem-solving skills. Throughout the intervention process, the midwives were also provided with regular supervision by the principal research team to ensure adherence to the protocol and to maintain the consistent quality of counseling implementation.

Data Collection

Data collection followed a systematic and structured procedure by the established research protocol to ensure the integrity and quality of the data. After obtaining research approval, the study was conducted in Palopo City, North Luwu Regency, and Luwu Regency in South Sulawesi Province. Participants were informed about the study's objectives and procedures and provided written informed consent. The questionnaire was designed using simple language for clarity. Counselling sessions (interventions) were documented using structured observation sheets. Data security and anonymity were ensured through unique codes and secure data storage. Researchers fostered good rapport with participants to promote honest responses **(Figure 1).**

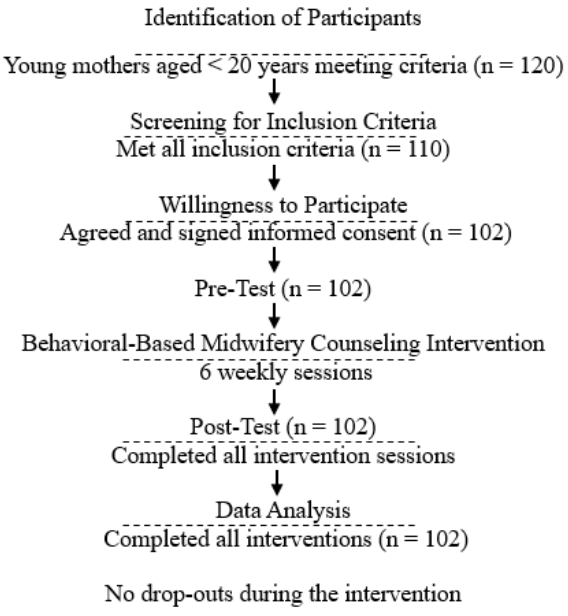

Figure 1. Flowchart CONSORT

Data Analysis

Data analysis included descriptive statistics to present an overview of participants' knowledge, attitudes, and behaviors before and after the counselling intervention. Bivariate analysis using the Wilcoxon Signed-Rank Test was conducted to identify significant differences between pre-test and posttest scores within the same group receiving the intervention. All analyses were performed using SPSS Statistics 28. This research follows CONSORT guidelines for non-randomized trials (Schulz et al., 2010).

Ethical Considerations

This study received ethical approval from the Health Research Ethics Committee of the Institute for Research and Community Service (LPPM) at Universitas Muhammadiyah Palopo, with approval number: 045/KEP/III.3.AU/F/2024. All participants signed informed consent forms before their involvement in the study, with assurances of confidentiality, the right to withdraw at any time, and access to a complaint mechanism in case any issues arose during the research process.

Results

Based on **Table 1,** the majority of respondents were aged 16 or 17 years (24.5% for each group), had completed junior high school (53.9%), and were categorized as primiparous (84.3%).

Table 1. Respondent Characteristics

Respondent Characteristics	Frequency (F)	Persentage (%)
1. Age		
15 years old	20	19,6
16 years old	25	24,5
17 years old	25	24,5
18 years old	15	14,7
19 years old	17	16,7
2. Education		
Elementary School	25	24,5
Junior High School	55	53,9
Senior High School	22	21,6
3. Number of Children		
Primipara	86	84,3
Multipara	16	25,7

Based on **Table 2,** the results of the Kolmogorov-Smirnov normality test indicate that the data were not normally distributed (p-value < 0.05). Thus, the paired t-test assumptions were not met.

Table 2. Normality Test Kolmogorov-Smirnov Analysis

Variable	Median	Minimum-Maximum	P Value
1. Knowledge			
Before intervention	33	20 - 40	0,00
After intervention	73	40 - 83	0,00
2. Attitude			
Before intervention	40	30 - 50	0,00
After intervention	70	70 - 90	0,00
3. Behavior			
Before intervention	30	10 - 40	0,00
After intervention	70	50 - 66	0,00

Table 3 shows an increase in the mean scores for all variables after the intervention. The average knowledge score of respondents increased from 33 to 83, attitude from 40 to 80, and behavior from 30 to 70. The Wilcoxon test results indicate a statistically significant difference between all three variables' pre-test and posttest scores ($\rho < 0.001 < \alpha = 0.05$). This data suggests that the behavior-based midwifery counselling strategy was effective in preventing unintended pregnancy among young mothers.

Furthermore, the analysis of positive ranks shows that most respondents experienced an increase in the knowledge variable, with 100 showing

improvement and 2 showing no change (ties). In the attitude variable, 101 showed improvement, and one showed a decrease. For the behavior variable, 79 showed improvement, and 23 had no change (ties).

In addition to the Wilcoxon test, this study also presents the differences in median scores (Δ) and effect sizes (r) for each key variable. Knowledge increased by a median difference of 50 points (from 33 to 83), attitude by 40 points (from 40 to 80), and behavior by 40 points (from 30 to 70) following the intervention. The effect sizes for knowledge (r = 0.84), attitude (r = 0.82), and behavior (r = 0.79) indicate a significant effect, demonstrating that the behavior-based midwifery counseling intervention had a clinically important impact on improving knowledge, attitudes, and preventive behaviors related to unintended pregnancy among young mothers.

A more precise visualization of the score changes in all three variables is presented in Figure 1, which illustrates the improvements in knowledge, attitude, and behavior before and after the intervention.

Table 3. Effectiveness of behavior-based midwifery counselling strategy in preventing unintended pregnancy among young mothers

Variabel	Median	Δ Median	Z	Nilai ρ	Effect Size (r)
1. Knowledger					
Before intervention	33	50	- 8,45	<0,001	0,84
After intervention	83				
2. Attitude					
Before intervention	40	40	- 8,30	<0,001	0,82
After intervention	80				
3. Behavior					
Before intervention	30	50	- 8,00	<0,001	0,79
After intervention	70				

Wilcoxon Test
- Knowledge (negative ranks (0[a]); positive ranks (100[b]); ties (2[c])
- Attitude (negative ranks (1[a]); positive ranks (101[b]); ties (0[c])
- Behavior (negative ranks (0[a]); positive ranks (79[b]); ties (23[c])

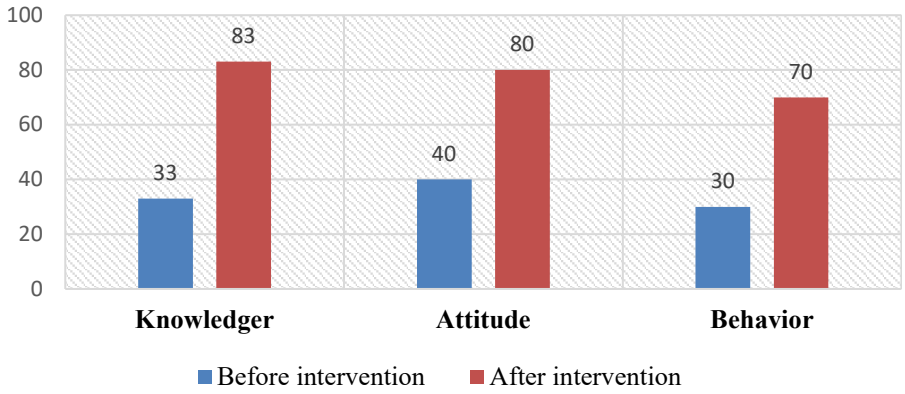

Figure 1. Changes in the values of each variable before and after the intervention

Figure 1 illustrates the changes in each of the study's main variables—knowledge, attitude, and behavior—before and after the behavior-based midwifery counseling intervention. A clear and substantial improvement is observed across all variables following the intervention. Specifically, the median knowledge score of the respondents increased sharply from 33 before the intervention to 83 afterward. For the attitude variable, the median score also rose significantly from 40 to 80. Similarly, the median behavior score increased from 30 to 70 after the intervention. This visualization reinforces the previously reported statistical findings, demonstrating that the behavior-based midwifery counseling intervention had a substantial positive impact on knowledge, attitudes, and preventive behaviors related to unintended pregnancy among young mothers. These results affirm the effectiveness of the intervention in enhancing the key factors that contribute to the prevention of unintended pregnancy.

Discussion

Behavior-based counselling has been empirically proven to generate better health outcomes through measurable behavioral modifications. After implementing behavior-based midwifery counselling, this study demonstrated significant improvements in young mothers' knowledge, attitudes, and behaviors. The substantial increase in mean scores across all three variables—knowledge (from 33 to 83), attitude (from 40 to 80), and behavior (from 30 to 70)—indicates the positive impact of the intervention. The results of the Wilcoxon Signed-Rank Test, which revealed statistically significant differences in all variables before and after the intervention ($\rho < 0.001$; $< \alpha = 0.05$), confirm the effectiveness of the behavior-based midwifery counselling strategy in preventing unintended pregnancies (UP) among young mothers. The low p-value (< 0.001) proves that the intervention led to meaningful changes. These findings align with prior research, which supports the notion that counselling interventions adopting a behavioral approach can be an effective initial strategy to facilitate long-term, cost-effective health behavior change. Such interventions have enhanced motivation, decision-making confidence, and patients' self-efficacy (Dogra et al., 2022; Han et al., 2024; Medendorp et al., 2021).

Further analysis of positive ranks offers deeper insight into the direction of changes in each variable. Most respondents showed improvements post-intervention in the knowledge domain, indicating that the counselling effectively increased their understanding of UP and its prevention. A nearly universal improvement was also observed in attitudes, with most participants developing more positive perceptions after the intervention. For behavior, most respondents adopted more preventive practices; however, a considerable proportion (23 individuals) showed no behavioral change (ties). This finding suggests that while the intervention effectively influenced knowledge and attitude, behavior change may require additional time or more intensive strategies for certain individuals. It is consistent with earlier studies, which found that behavior change counselling can be effective for health professionals in guiding patients to adopt healthier behaviors. In practice, health workers respected patients' choices and used open-ended questions to encourage discussion about desired changes (Dragomir et al., 2019). On the other hand, inconsistencies in the quality of behavior change counselling when addressing behavioral comorbidities highlight the challenges of maintaining depth and effectiveness under time

constraints and complex patient needs (Claus et al., 2023).

In this study, the effectiveness of behavior-based midwifery counselling centred on identifying and modifying beliefs, attitudes, and behavioral intentions underlying UP prevention practices. The counselling incorporated behavior-change techniques such as motivational interviewing, cognitive-behavioral strategies, and problem-solving skills. These techniques empowered young mothers to increase their knowledge (e.g., understanding UP risks, contraceptive options, and the importance of family planning), develop positive attitudes (e.g., greater acceptance of contraception and preventive practices), and adopt preventive behaviors (e.g., actively seeking information, communicating with partners, and using appropriate contraceptive methods). Prior research has shown that asking personal questions and demonstrating concern for the midwife's positive atmosphere correlates with patient openness. Longer consultations have also been associated with increased patient information sharing, underscoring the importance of empathy and sufficient time allocation (Martin et al., 2016)

These findings are theoretically grounded in the Theory of Planned Behavior (TPB) by Ajzen (1991), which posits that behavioral intention is the closest predictor of actual behavior, influenced by attitudes, subjective norms, and perceived behavioral control (Bowden & Bassett, 2024; Bowden & Manning, 2017; Hayden, 2017). The behavior-based midwifery counselling in this study effectively targeted these antecedents. Increases in knowledge contributed to the development of positive attitudes toward contraception. Counselling sessions may also have influenced subjective norms by providing social support and information, and enhanced perceived behavioral control by improving understanding of contraceptive accessibility and effectiveness.

Other studies further support the consistent effectiveness of behavior-based midwifery counselling in influencing health behavior. For example, counselling based on the Health Belief Model has proven effective in improving the nutritional behavior of pregnant women (Saadatnia et al., 2021), while midwife-oriented group counselling has been linked to empowerment and self-care in pregnancy (Houshmandpour et al., 2019). In addition, approaches emphasizing social support, emotional expression, and cognitive restructuring have shown the potential to enhance self-efficacy and confidence in postpartum women (Asadzadeh et al., 2020; Houshmandpour et al., 2019). More broadly, the effectiveness of counselling approaches in women's health is influenced by their theoretical orientation; humanistic, feminist, and multicultural orientations tend to correlate with higher competence (Han et al., 2024). Moreover, the quality of the therapeutic relationship, shaped by cultural humility and empathy, plays a critical role in the success of counselling interventions (Charmaz & Thornberg, 2021). Considering the importance of establishing therapeutic and empowering relationships, especially in addressing health behavior challenges, the behavior-based approach in midwifery—as evidenced in this study—offers a relevant framework. By helping mothers identify and overcome barriers and enhancing their ability to seek timely assistance, behavior-based counselling improves adherence to care plans and, ultimately, better maternal and infant outcomes. This approach empowers women to be active agents in their health care, aligning with the woman-centered philosophy of midwifery practice (Jagadesan, 2023; World Health Organization (WHO), 2024b).

This study has several limitations that should be acknowledged. First, the use of a one-group pretest-posttest quasi-

experimental design without a control group limits the ability to attribute observed changes solely to the intervention. The absence of a comparison group makes the findings vulnerable to external influences such as maturation, repeated testing effects, or other events occurring independently of the intervention. Additionally, unmeasured factors such as individual motivation, family support, and social environment may also have influenced the outcomes (Ekawati, 2022). Second, the sample was drawn from a specific region and included only young mothers who met the inclusion criteria, thereby limiting the generalizability of the findings to broader populations or different cultural and geographical contexts. Therefore, the results should be interpreted with caution. Future research is recommended to adopt experimental designs with control groups and to expand the sampling scope in order to enhance external validity and the generalizability of the findings.

Relevance to Clinical Practice

This study concludes that behavior-based midwifery counselling is effective in preventing unintended pregnancy (UP) among young mothers by significantly improving their knowledge, attitudes, and preventive behaviors. These findings underscore the importance of integrating behavior-based counselling into midwifery services as a core strategy to reduce UP rates and enhance young women's reproductive health. Structured programs and well-trained midwives in behavioral counselling techniques are essential in empowering young mothers to make informed reproductive decisions. However, implementation may face challenges such as limited time, high workloads, and persistent cultural or social barriers that hinder counseling acceptance. Addressing these barriers requires strategic efforts, including adjusting service schedules, involving community health volunteers, and promoting community-based education. Further research using experimental designs with control groups, broader geographic coverage, and longer follow-up periods is recommended to assess effectiveness, alongside qualitative studies exploring the lived experiences of young mothers and midwives. Identifying key factors influencing successful implementation in clinical settings is also crucial. Therefore, it is recommended that national and local health and education policymakers incorporate behavior-based counseling into the reproductive health curriculum to strengthen provider capacity and ensure sustainable, equitable access to such services across Indonesia.

Conclusion

This research provides valuable insights for clinical practice, particularly in improving the nutritional intake of pregnant women through educational approaches. The findings demonstrate that structured nutrition education significantly enhances understanding and promotes healthy eating behaviors among pregnant women, thereby contributing to improved nutritional status and better pregnancy outcomes. Such education effectively supports pregnant women in making informed dietary choices, helping to prevent macro- and micronutrient deficiencies that may lead to conditions such as anemia and low birth weight (LBW). The study confirms its primary aim and hypothesis—assessing the effect of nutrition education on improving nutritional intake—by revealing significant increases in carbohydrate, protein, iron, vitamin A, and calcium intake following the intervention. These results reinforce the role of nutrition education in positively influencing dietary behavior, particularly when integrated into antenatal care

services at primary healthcare settings like Community Health Centers (Puskesmas) and Integrated Health Posts (Posyandu). The practical application of this research includes delivering brief yet impactful education sessions during routine pregnancy check-ups, using tools such as leaflets, visual aids, and examples of locally available nutritious foods. Given that healthcare workers are often pressed for time and pregnant women may not always be available for separate counseling sessions, a simple 15-minute session at the end of antenatal visits can still deliver essential information without disrupting service flow. Tailoring educational content based on varying literacy levels and involving family members, such as husbands, can further enhance effectiveness. Therefore, it is recommended that Community Health Centers allocate dedicated time for nutrition education and provide capacity-building for midwives and health cadres to deliver engaging, accessible, and culturally appropriate materials that promote sustainable nutritional practices among pregnant women.

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CrediT Authorship Contributions Statement

Andi Sitti Umrah: Conceptualization, Methodology, Supervision, Writing Original Draft, Investigation, Resources, Data Curation, Project Administration, Review & Editing, Visualization, and Funding Acquisition

Andi Kasrida Dahlan: Software, Validation, Formal Analysis, Writing - Review & Editing

Conflicts Of Interest

We declare no known conflicts of interest, whether financial or personal, that might have appeared to influence the work presented in this paper.

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