

The Relationship Between Diet and the Healing Process of Post-Cesarean Section Wounds in Postpartum Women

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Abstract. The postpartum period is a time of recovery that requires optimal nutritional support, especially for mothers who have undergone a cesarean section (CS), as the surgical wound healing process is greatly influenced by adequate nutrient intake. An unbalanced diet can slow tissue regeneration and increase the risk of wound complications. This study aimed to analyze the relationship between dietary patterns and the post-Cesarean section wound healing process in postpartum mothers at the Kotamobagu City General Hospital. The study employed an observational analytical design with a cross-sectional approach. The sample consisted of 40 postpartum mothers who had undergone a Cesarean section, selected using purposive sampling. Dietary patterns were assessed using a questionnaire covering meal frequency and the adequacy of protein, vitamin, and mineral intake, while the wound healing process was evaluated using the REEDA Scale. Data analysis was performed using univariate and bivariate analyses with the Spearman's Rho test at a 95% significance level. The results showed that the majority of respondents had good dietary patterns (42.5%) and wound healing in the "good" category (47.5%). Bivariate analysis revealed a significant association between dietary patterns and the wound healing process following a cesarean section ($p=0.005$; $r=0.432$), indicating a positive correlation of moderate strength. These findings suggest that the better a postpartum mother's dietary pattern, the more optimal the wound healing process achieved. Nutrition education during the antenatal and postpartum periods needs to be strengthened as part of evidence-based midwifery care to accelerate a mother's recovery following a cesarean section.

Keywords: Cesarean Section; Dietary Patterns; Postpartum Mothers; REEDA Scale; Wound Healing.

1. Background

The postpartum period is a phase of physiological recovery that begins after childbirth and lasts up to six weeks postpartum, characterized by uterine involution, hormonal adaptation, and the healing of tissues traumatized during childbirth. For mothers who undergo a cesarean section (CS), the recovery process becomes more complex because it involves the healing of incisions in the abdominal wall and uterus. Post-CS wound healing is a biological process comprising the hemostasis, inflammation, proliferation, and remodeling phases, which are influenced by various factors, such as nutritional status, age, comorbidities, wound hygiene, mobility, and the mother's dietary patterns during the postpartum period (Guo & DiPietro, 2016; Sandy-Hodgetts et al., 2020). Among these factors, dietary patterns are a modifiable component that plays a crucial role in supporting tissue regeneration by providing the energy, protein, vitamins, and minerals required during the wound healing process (Stechmiller, 2017).

The rate of cesarean section (CS) deliveries has continued to rise globally over the past two decades. The World Health Organization (WHO) reports that approximately 21% of births worldwide are performed via CS, with an upward trend projected to reach nearly 30% by 2030 if current trends continue (WHO, 2021). Although cesarean section is an effective procedure for saving the lives of mothers and infants under certain indications, it carries risks of postoperative complications, including delayed wound healing, surgical site infections, wound dehiscence, and prolonged hospital stays (Betrán et al., 2021). Globally, the incidence of post-CS wound infections is reported to range from 3–15%, with higher rates in low- and middle-income countries due to limited access to health care, poor nutritional status, and low adherence to wound care (WHO, 2021; Sandy-Hodgetts et al., 2020).

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In Indonesia, the trend in cesarean section deliveries is also on the rise. The 2023 Indonesian Health Survey (SKI) reported that the proportion of cesarean section deliveries has exceeded WHO recommendations in several regions, in line with increasing access to obstetric care. On the other hand, postoperative complications, including impaired wound healing, remain a cause of postpartum maternal morbidity and contribute to increased demand for follow-up care as well as the burden of healthcare costs (Indonesian Ministry of Health, 2024). Studies at various hospitals in Indonesia show that delayed wound healing after a C-section is still common, particularly among mothers with inadequate nutritional intake, anemia, obesity, diabetes, or those who practice food restrictions during the postpartum period (Fitriani et al., 2021; Sari et al., 2022).

The wound healing process is highly dependent on adequate nutrient intake. Protein plays a role in collagen synthesis and the formation of new tissue, while vitamin A, vitamin C, vitamin E, zinc, and iron are involved in fibroblast formation, angiogenesis, immune response, and tissue remodeling (Stechmiller, 2017). Conversely, an unbalanced diet or restrictions on certain foods due to cultural beliefs can lead to nutritional deficiencies, inhibit collagen formation, prolong the inflammatory phase, increase the risk of infection, and ultimately slow wound healing (Norman et al., 2021). These conditions not only affect the mother's health but can also interfere with successful breastfeeding, prolong the recovery period, and reduce the quality of life for postpartum mothers.

Various studies have demonstrated a link between nutritional status and wound healing. Norman et al. (2021) emphasize that adequate nutrition is a key determinant of successful postoperative wound healing. Research by Sandy-Hodgetts et al. (2020) found that mothers with good nutritional status had a lower risk of wound complications compared to those with inadequate nutritional intake. In Indonesia, studies by Fitriani et al. (2021), Sari et al. (2022), and Rahmawati et al. (2023) also indicate that a healthy diet is associated with faster wound healing in mothers following a cesarean section. Nevertheless, research findings across various regions still show variations influenced by sociocultural characteristics, dietary habits, and access to nutrition education.

Kotamobagu City General Hospital is one of the referral hospitals that performs a relatively high number of cesarean sections. However, information regarding the relationship between dietary patterns and the post-cesarean wound healing process in postpartum mothers at this hospital remains limited. In fact, identifying factors that influence wound healing is crucial as a basis for developing more effective nutrition education interventions tailored to the characteristics of the local community.

Based on this background, this study aims to analyze the relationship between dietary patterns and the post-Cesarean section wound healing process in postpartum women at the Kotamobagu City General Hospital. The study results are expected to serve as a scientific basis for the development of nutrition education during the postpartum period, improve the quality of evidence-based midwifery services, and support the acceleration of postpartum recovery through the optimization of a balanced diet.

2. Theoretical Review

Post-Cesarean section (CS) wound healing is a biological process that proceeds through the phases of hemostasis, inflammation, proliferation, and remodeling until optimal new tissue is formed. The success of this process is influenced by various factors, such as age, health status, infection, mobility, wound care, and the mother's nutritional status. Among these factors, diet is a modifiable factor because it plays a role in providing the energy, protein, vitamins, and minerals needed for collagen synthesis, angiogenesis, fibroblast proliferation, and tissue regeneration (Guo & DiPietro, 2016; Norman et al., 2021).

A balanced diet during the postpartum period is characterized by adequate intake of protein, vitamin A, vitamin C, vitamin E, iron, and zinc. Deficiencies in these nutrients can prolong the inflammatory phase, inhibit collagen formation, increase the risk of surgical site infections, and slow postoperative wound healing (Stechmiller, 2017; Sandy-Hodgetts et al., 2020). Conversely, meeting adequate nutritional needs has been shown to accelerate tissue regeneration and reduce complications following a cesarean section.

Various studies support the relationship between nutritional status and wound healing. Norman et al. (2021) reported that adequate nutrition is a key determinant in the postoperative wound healing process. Sandy-Hodgetts et al. (2020) demonstrated that good nutritional status is associated with a lower incidence of surgical site complications. In Indonesia, studies by Fitriani et al. (2021), Sari et al. (2022), Rahmawati et al. (2023), and Wulandari et al. (2024) also

found that postpartum women with good dietary habits experienced faster post-Cesarean section wound healing compared to those with poor dietary habits. These findings indicate that nutrition education during the postpartum period is an important component of evidence-based midwifery care.

3. Research Methods

This study employed a quantitative approach with an observational analytical design and a cross-sectional study design to analyze the relationship between dietary patterns and the post-Cesarean section wound healing process in postpartum women at the Kotamobagu City General Hospital. The study population consisted of all postpartum women who had undergone a Cesarean section and were receiving care at the Kotamobagu City General Hospital during the study period. Based on the study data, the sample consisted of 56 respondents selected using purposive sampling according to the inclusion criteria: postpartum women on days 2 through 7 after a cesarean section, who were willing to participate, and who did not have severe obstetric complications or illnesses that could affect the wound healing process.

The independent variable was dietary patterns, which were assessed using a questionnaire covering meal frequency and the adequacy of protein, vitamin, and mineral intake, and then categorized as good, adequate, or inadequate. The dependent variable was the post-Cesarean section wound healing process, measured using the REEDA Scale (Redness, Edema, Ecchymosis, Discharge, Approximation) and classified as good, adequate, or poor. Respondent characteristic data included age, education, occupation, parity, days post-Cesarean section, medical history, and nutritional status (BMI).

Univariate analysis was used to describe the frequency distribution of each variable. The relationship between dietary patterns and the wound healing process was analyzed bivariate using the Spearman's Rho test, with a significance level of $p < 0.05$. All respondents provided informed consent before the study was conducted in accordance with the principles of health research ethics.

4. Results And Discussion

Table 1. Demographic Data.

	Var	n	F (%)
Ages	<20 years old	6	15.0
	20–35 years old	32	80.0
	>35 years old	2	5.0
Education	No education	1	2.5
	Elementary school	13	32.5
	Junior high school	23	57.5
	High school	2	5.0
	College	1	2.5
Employment	Housewife	39	97.5
	Civil Servant	1	2.5
Parity	First-time mother	17	42.5
	Multipara	23	57.5
Post-C-section	Day 2	28	70.0
	Day 3	12	30.0
BMI	Very thin	0	0
	Thin	10	25.0
	Normal	30	75.0
	Overweight	0	0
	Obese	0	0
Total		30	100

(Source: primary data, 2026).

An evaluation of the demographic characteristics (age, education level, employment status) and clinical profiles (parity, days post-C-section, and Body Mass Index/BMI) of the respondents at the Kotamobagu City General Hospital is presented in Table 1. Based on Table 1, the majority of respondents were in the healthy reproductive age group (20–35 years), totaling 32 people (80.0%). In terms of education, most respondents had completed junior high school, accounting for 57.5%. The occupational profile showed an overwhelming majority of housewives (97.5%). In terms of clinical parameters, the multiparous group constituted the largest proportion (57.5%), with the majority in the postpartum period on the

second day after cesarean section (70.0%), and having a normal nutritional status or BMI (75.0%).

Table 2. Research Data.

	Var	n	F (%)
Eating pattern	Poor	8	20.0
	Fair	15	37.5
	Good	17	42.5
Wound healing	Poor	4	10.0
	Fair	17	42.5
	Good	19	47.5
Total		30	100

(Source: primary data, 2026).

An overview of the quality of daily dietary patterns and the success rate of Cesarean section wound healing in postpartum women is summarized in Table 2. The descriptive analysis in Table 2 shows that the dietary indicators for postpartum mothers were mostly in the “good” (42.5%) and “fair” (37.5%) categories, although 20.0% of respondents still had an inadequate diet. Consistent with this, the clinical outcomes of post-C-section wound healing were predominantly in the “good” (47.5%) and “adequate” (42.5%) categories, while only 10.0% of postpartum mothers experienced “poor” wound healing.

Table 3. Statistical Analysis (Numerical Data).

Independent variable	N	P-Value	r	Dependent variable
Eating pattern	30	0.005*	0.432	Wound healing

Spearman's Rho

*significant (Source: primary data, 2025).

To test the correlation hypothesis and measure the strength of the relationship between dietary patterns and the surgical wound healing process, the non-parametric Spearman's Rho statistical test was used, as presented in Table 3. The results of the Spearman's Rho test in Table 3 demonstrate a statistically significant relationship with a P-value of 0.005 ($p < 0.05$). The correlation coefficient of $r = 0.432$ indicates a positive relationship with a moderate level of strength. This empirically confirms that the better the quality of the dietary patterns adopted by postpartum mothers, the more optimal the healing process of Cesarean section surgical wounds at the Kotamobagu City General Hospital.

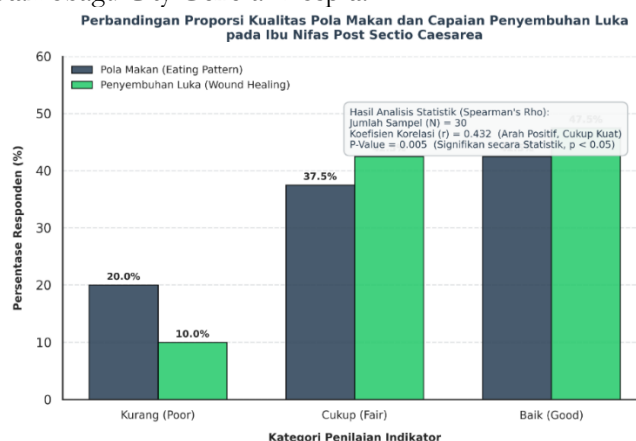


Figure 1. Comparative Distribution.

Comparative Distribution of Mothers' Dietary Patterns and Post-Cesarean Section Wound Healing Status (N = 30). The grouped bar chart shows a consistent upward trend between the quality of nutritional intake and the level of postoperative recovery. Respondents in the “Good” category dominated both parameters (42.5% for dietary patterns and 47.5% for tissue healing). Inferential analysis using Spearman's Rho nonparametric test confirmed a statistically significant positive correlation of moderate strength ($r = 0.432$, $p = 0.005$); which mathematically indicates that increased maternal adherence to the postoperative diet contributes linearly to accelerated wound healing during the early postpartum period (days 2 through 3) at the Kotamobagu City General Hospital.

Discussion

The findings of this study at Kotamobagu City General Hospital empirically confirm that dietary patterns play an important role and have a significant relationship with the speed

and quality of the wound healing process in postpartum mothers following a cesarean section (CS). Using Spearman's Rho statistical test, a fairly strong positive correlation was found ($r = 0.432$; $p = 0.005$), indicating that meeting nutritional needs through a regular, balanced, and adequate diet linearly accelerates the regeneration of skin and fascia tissue that underwent incision during the surgical procedure.

Physiologically, the surgical wound healing process is a complex biological pathway divided into the inflammatory, proliferative, and maturation phases. These phases are highly dependent on the availability of macronutrients and micronutrients in the mother's body. According to a study by Al-Mubarak et al. (2022), a high protein intake is a key factor in collagen synthesis, granulation tissue formation, and neovascularization in major surgical wounds. When a postpartum mother's diet is categorized as "Good" (42.5%), her intake of essential amino acids is optimal, thereby accelerating the closure of surgical wound edges. Conversely, if a postpartum mother's diet is poor, the body enters a catabolic phase that inhibits fibroblast migration, prolongs the inflammatory phase, and increases the risk of wound dehiscence or surgical site infection (Anggraeni et al., 2024; Kurniawan & Ramadhani, 2025).

The sociodemographic characteristics of the respondents in this study also influenced dietary patterns and wound healing. The majority of respondents were in the healthy reproductive age range of 20–35 years (80.0%) and had a normal BMI (75.0%). This age group biologically possesses a much higher metabolic rate and cellular regeneration capacity compared to high-risk age groups (Sari et al., 2022). A normal baseline nutritional status also provides adequate energy and protein reserves to support the early phase of wound healing on days 2 and 3 post-SC, which are crucial periods for cellular proliferation (Lestari & Putri, 2025).

However, there are specific challenges related to the respondents' educational backgrounds, as the majority had completed junior high school (57.5%) and were homemakers (97.5%). According to Hasanah and Nur (2023), lower secondary education levels are often correlated with limited exposure to health information and the strong influence of food taboos during the postpartum period. In some regions, there remains a cultural taboo against postpartum mothers eating fish, eggs, or meat due to concerns that these foods may cause itching or a fishy odor at the wound site. In reality, these foods are high-quality sources of animal protein and are rich in albumin (Pratama et al., 2024).

Therefore, the moderate correlation coefficient ($r = 0.432$) indicates that post-CS wound healing is not influenced by a single dietary factor but is multifactorial in nature. Other clinical factors, such as the surgeon's suturing technique, the sterility of the operating room, the mother's personal hygiene, and early postoperative mobilization, also play a significant role in determining wound healing outcomes (Widyaningrum et al., 2023). Postpartum mothers with adequate or good dietary patterns, when supported by adequate early mobilization, will experience increased blood circulation to peripheral areas, thereby facilitating the distribution of oxygen and nutrients to the wound tissue (Thompson et al., 2024).

Clinically, the results of this study have important implications for nursing and midwifery services at the Kotamobagu City General Hospital. Structured postpartum nutrition education must be provided from the antenatal period through the postoperative period to dispel myths about dietary restrictions. Providing a varied high-calorie, high-protein (HCHP) diet has been shown to significantly minimize the percentage of poor wound healing, which in this study was still found to be 10.0%. By ensuring an optimal diet, the length of stay for post-cesarean section (CS) mothers can be shortened, reducing healthcare costs and improving the mothers' quality of life as they care for their infants (Martin et al., 2022).

5. Conclusion

This study demonstrates a significant association between dietary patterns and the post-Cesarean section wound healing process in postpartum mothers at Kotamobagu City General Hospital ($p=0.005$; $r=0.432$). The better the quality of the dietary patterns adopted by postpartum mothers, the better the surgical wound healing outcomes achieved. These findings suggest that meeting nutritional needs during the postpartum period plays a crucial role in supporting tissue regeneration and accelerating postoperative recovery. However, the moderate strength of the association indicates that wound healing is also influenced by other factors, such as nutritional status, early mobilization, wound care, comorbidities, and wound hygiene. This study has limitations due to its cross-sectional design, relatively small sample size, and the fact that it was conducted at a single hospital; therefore, the results cannot yet be

widely generalized. Future research is recommended to use a longitudinal or cohort design with a larger sample size and to include other variables that may potentially influence wound healing. Healthcare professionals are encouraged to enhance nutrition education from the antenatal period through the postpartum period and to provide guidance on nutritional intake and wound care to accelerate the recovery process for mothers following a cesarean section.

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