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Factors Associated with the Nutritional Status of Pregnant Women in Banjarmasin City: A Cross-Sectional Analytical Study

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ABSTRACT

Introduction: The nutritional status of pregnant women is a critical indicator of maternal and fetal health. Chronic Energy Deficiency (CED) during pregnancy increases the risk of obstetric complications, low birth weight, stunting, and contributes indirectly to maternal mortality. Indonesia continues to report one of the highest maternal mortality ratios in Southeast Asia. This study aimed to analyze factors associated with the nutritional status of pregnant women in Banjarmasin City.

Methods: This analytical cross-sectional study involved 100 pregnant women selected using accidental sampling. Nutritional status was assessed based on mid-upper arm circumference (MUAC), with MUAC <23.5 cm indicating CED. Independent variables included maternal knowledge, parity, maternal age, and toothbrushing habits. Data were collected using a structured questionnaire and analyzed using univariate and bivariate analyses with the Chi-Square test. Effect sizes were reported as prevalence ratios (PR) with a significance level of 0.05.

Results: The prevalence of CED among pregnant women was 52%. The majority of respondents had low levels of knowledge (59%), risk parity (88%), risk maternal age (63%), and bad toothbrushing habits (58%). Bivariate analysis showed significant associations between maternal knowledge (PR=2.08; p=0.001), maternal age (PR=1.59; p=0.012), and toothbrushing habits (PR=1.95; p=0.000) with nutritional status. Parity was not significantly associated with nutritional status (p=0.076).

Conclusion: Maternal knowledge, age, and toothbrushing habits were significantly associated with the nutritional status of pregnant women in Banjarmasin City. Strengthening nutrition education and healthy lifestyle behaviors through Posyandu services and antenatal education programs is essential to prevent CED and improve maternal and fetal health outcomes.

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INTRODUCTION

Fulfilling nutritional needs during pregnancy is the main factor in the mother's immunity, the success of the pregnancy process, and the quality of the child's growth and development in the future. Pregnant women should pay attention to their nutritional status so that the fetus grows optimally and reduces the risk of various complications, such as low birth weight, premature birth, fetal growth disorders in the womb, and cross-generational stunting. However, maternal malnutrition remains a public health challenge that needs more attention, especially in low- and middle-income countries, and contributes significantly to rising rates of maternal and newborn morbidity and mortality (1,2).

One of the most common forms of maternal undernutrition is Chronic Energy Deficiency (CED), a condition resulting from prolonged inadequate energy and nutrient intake. CED during pregnancy reflects cumulative nutritional deprivation and is commonly assessed using mid-upper arm circumference (MUAC), with values below 23.5 cm indicating increased nutritional risk. Global evidence demonstrates that maternal CED is associated with obstetric complications, impaired fetal growth, and an increased risk of maternal death, particularly in settings with limited access to quality maternal health services (3,4).

Maternal mortality remains a key indicator of women's health and health system performance. Although global maternal mortality has decreased over time, the pace and magnitude of improvement vary considerably across regions, with low- and middle-income countries remaining disproportionately affected. Maternal deaths are frequently linked to preventable causes, including hemorrhage, hypertensive disorders, infection, and underlying nutritional deficiencies that exacerbate pregnancy-related risks. Consequently, improving maternal nutritional status has been widely recognized as a strategic priority for reducing maternal and neonatal mortality worldwide.

In contrast, evidence regarding the role of parity in maternal nutritional status remains mixed, suggesting the need for context-specific investigation (5,6). The nutritional status of pregnant women is shaped by a complex interaction of biological, behavioral, and socioeconomic factors. Previous studies have consistently shown that maternal knowledge and health literacy influence dietary practices, nutrient intake, and utilization of antenatal care services during pregnancy (7,8). Maternal age outside the optimal reproductive range has also been associated with increased nutritional vulnerability due to physiological immaturity among younger women and declining nutritional reserves among older women (9).

The role of oral and dental health in maternal nutrition in recent years. Pregnancy-related hormonal changes increase susceptibility to oral health problems such as dental caries and periodontal disease, which may negatively affect dietary intake through pain, inflammation, and difficulty chewing. Emerging international studies suggest that poor oral hygiene behaviors during pregnancy are associated with reduced dietary quality and increased risk of maternal undernutrition; however, this relationship remains underexplored in many low- and middle-income country settings (10,11).

Despite the growing body of international literature on determinants of maternal nutritional status, several gaps remain. First, most studies in Indonesia have primarily focused on socioeconomic and obstetric factors, with limited attention to behavioral determinants such as oral hygiene practices. Second, evidence integrating maternal knowledge, age, parity, and oral hygiene behaviors within a single analytical framework is scarce, particularly in urban settings. Third, data examining these associations at the local level are essential to inform context-specific maternal health interventions.

Systematic reviews and empirical studies have consistently demonstrated that maternal age outside the optimal reproductive range, low educational attainment, and limited health literacy are associated with poor dietary intake and suboptimal nutritional status during pregnancy (7,9). Younger and older maternal age groups are particularly susceptible to nutritional vulnerability due to competing physiological demands, reduced access to health resources, and cumulative health risks.

Health-related behaviors play an increasingly recognized role in shaping maternal nutritional status. Emerging evidence suggests that oral and dental health may indirectly influence nutritional adequacy during pregnancy through mechanisms such as pain, inflammation, impaired mastication, and altered food choices (10,11). Poor oral hygiene practices, including inadequate toothbrushing habits, have been associated with reduced dietary quality and increased risk of nutritional deficiencies among pregnant women. However, this relationship remains underexplored in many low- and middle-income country contexts.

In Banjarmasin City, maternal mortality and CED among pregnant women continue to pose public health challenges. However, empirical evidence examining factors associated with maternal nutritional status in this setting remains limited. Addressing this gap is crucial for developing targeted and effective maternal nutrition programs.

Based on the Profile of the Banjarmasin City Health Office in 2023, it is known that the number of pregnant women is 12,752 people, and there are 15 cases of maternal mortality with a maternal mortality rate of 145/100,000 live births. The highest number of maternal deaths occurred in postpartum mothers, namely 9 cases of death, and increased compared to the previous year, while maternity deaths were 4 cases, and pregnant women were also 2 cases. Based on the cause of death, 4 people experienced bleeding, 5 people experienced hypertension disorders, 1 person was infected, and 5 more people experienced other causes of death. The death data in 27 Banjarmasin City Health Centers, with the most death cases, is at the Cempaka Putih Health Center with 3 cases, and the Kelayan Health Center with 3 cases of maternal deaths (12).

Pregnant women's nutrition needs attention because it greatly affects the development of the fetus it contains. Maternal nutritional status during pregnancy is closely linked to fetal growth and development, as nutrients required by the fetus are supplied through maternal intake and metabolic processes. Nutritional status is a factor that is contained at the individual level, factors that are directly influenced by the number of types of food intake and infection conditions are also interpreted as a person's physical condition which is determined by one or a combination of certain nutritional measures assessment of nutritional status can be carried out in four ways, namely clinically, biochemically, anthropometrically and food consumption surveys (13). The nutritional status of pregnant women can be influenced by socioeconomic health conditions of pregnant women, and various risks can occur if pregnant women experience malnutrition, namely abortion, stillbirths, and babies born with low body weight. The circumference of the upper arm can indicate the nutritional status of the pregnant woman (14).

Pregnancy is accompanied by physiological changes that increase susceptibility to dental and oral health problems, which can impact not only the mother's well-being but also the development of the fetus. Therefore, maintaining dental and oral health during pregnancy is an essential component of comprehensive maternal health care. Oral health is also important to maintain adequate nutritional intake. Adequate nutritional intake will avoid malnutrition in pregnant women; in this case, awareness and willingness are needed so that behavior will be realized and become a habit. Some pregnant women reported suboptimal oral hygiene practices, which may be influenced by factors such as limited awareness of oral health importance, pregnancy-related discomfort, competing daily responsibilities, and restricted access to dental care services (15).

Pregnancy is a physiological condition that can increase susceptibility to dental and oral health disorders, especially as a result of changes in hormone levels during pregnancy. These changes cause the oral and gum tissues to become more sensitive, making it easier for pregnant women to experience discomfort when eating. This can have an impact on decreased food intake, which ultimately has the potential to affect the growth and development process of the fetus in the womb. Pregnant women who experience nausea and vomiting cause an increase in the acidic atmosphere in the mouth. The increase in acidic atmosphere in the mouth makes bacteria multiply well, and causes plaque on the teeth that can accelerate tooth decay. Dental and oral problems tend to be ignored, if they are not perceived as a nuisance, pregnant women usually do not complain to the doctor or midwife who examines them (16,17).

Dental and oral health are often overlooked, as mothers are only focused on the health of their fetus. Changes around teeth and hygiene that get worse during pregnancy cause an increase in dental and oral diseases, such as the incidence of dental caries (18). Factors that can support the rapid caries process in pregnant women are the low pH of pregnant women's saliva, the intake of sugar-containing foods that pregnant women often consume, nausea and vomiting in the first trimester, and the tendency of pregnant women who are afraid or lazy to clean their teeth and mouth such as brushing their teeth and mouthwash because they can cause the mother to become nauseous and vomit (19,20).

Research results (21) show that mothers who are experiencing pregnancy usually pay less attention to dental and oral health, and during pregnancy, pregnant women also never get information about the importance of maintaining dental and oral health. This research is also supported by research (15), which expresses the importance of maintaining healthy teeth and mouth during pregnancy. The study also showed that very few mothers who experience pregnancy visit the dentist to check their dental health (18).

The occurrence of hormonal changes in pregnant women causes the condition of pregnant women to become lazy and weak, which results in lazy behaviour in brushing teeth, which increases the risk of dental and oral diseases, having an impact on the nutritional intake needed by pregnant women to support the development of the fetus in the womb. Pregnant women need various nutritional elements such as carbohydrates, proteins, vitamins, and minerals. The nutritional intake needed by pregnant women is more than that of non-pregnant women for the growth and development of the fetus in the womb. Nutritional needs are not enough to be seen from the number of portions of food consumed, but the food must contain enough nutrients. Pregnant women need good nutrients or nutrients for their fetal growth and development in order to achieve optimal health, improved quality of life, and good nutritional status and tooth growth in the fetus (22,23).

Dental and oral health have a reciprocal relationship with nutritional status. Good dental and oral condition plays an important role in supporting a person's ability to consume food optimally, while fulfilling balanced nutrition is also a major factor in maintaining dental and oral health. In pregnant women, adequate nutritional intake plays a very important role in preventing malnutrition problems. If the mother's food intake during pregnancy is insufficient, the nutritional needs of the fetus will still be prioritized by utilizing nutritional reserves from the mother's body, so that it has the potential to cause nutritional deficiencies in the mother. This condition can be characterized by various clinical symptoms, such as weight loss, feeling weak and tired easily, face looking pale complexion, tooth decay, hair loss, decreased appetite, and heart rhythm disorder (24).

The consequences of nutritional deficiencies during pregnancy will have an impact on the mother and her fetus, such as KEK (lack of caloric energy) in the mother, risk of premature birth, birth defects in the baby, babies born with low birth weight (BBLR), and stunting (25). In addition, the Ministry of Health of the Republic of Indonesia (2020) stated that low energy and protein intake in pregnant women contributes to the occurrence of CED and is one of the indirect factors that can increase the risk of maternal death (26).

CED in pregnant women reflects the increased nutritional needs of pregnant women that are not met during pregnancy, so that the nutritional needs of pregnant women are not sufficient. Prolonged and continuous lack of food intake that compromises the nutritional reserves of pregnant women can increase vulnerability to poor health outcomes during pregnancy (27). Pregnant women are a group that requires special attention, considering that the inadequacy of meeting nutritional needs during pregnancy can have a direct impact on the mother's health condition and the process of fetal growth and development. On this basis, this study aims to analyze various factors related to the nutritional status of pregnant women in Banjarmasin City through an analytical approach with a cross-sectional design. By examining aspects of maternal knowledge, age, parity, and oral hygiene practices, this study is expected to contribute relevant scientific evidence at the local level, while enriching the international literature and supporting the formulation of integrated interventions to improve the quality of maternal and fetal health.

METHOD

Types of Research

This type of research is quantitative, using a cross-sectional analytical survey approach with structured questionnaire instruments to obtain statistically analyzed numerical data. Nutritional status was measured using mid-upper arm circumference (MUAC), with values <23.5 cm indicating CED. The independent variables included maternal knowledge, age, parity, and toothbrushing habits.

Population and Sample/Informant

The population in this study is all pregnant women in Banjarmasin City, 12,752 people (28). For samples specified as many as 100 respondents, taken using the technique of accidental sampling with an accuracy level of 0.1 based on the Slovin formula.

Research Location

This research will be conducted at the Health Center in Banjarmasin City, South Kalimantan Province.

Instrumentation or Tools

The instrument in this study uses a questionnaire to collect data. The questionnaire contains questions about the identity of the respondents (name, address, cellphone number), the identity of the mother of the toddler, BB, TB, knowledge questions, parity, age, and toothbrush habits.

Data Collection Procedure

The research began by conducting a licensing process at the Banjarmasin City Health Office to obtain a copy of the letter to the Health Center in the Banjarmasin work area, then coordinating with the Health Centers to conduct research. For the research document, prepare informed consent sheets and questionnaires. Data collection was conducted by a team of four trained enumerators. Before fieldwork, enumerators received standardized training covering research ethics, questionnaire administration, interview techniques, anthropometric measurement procedures, and data recording from Maternal and Child Health (MCH/KIA) books. Ethical approval procedures included the preparation of informed consent forms, which were explained to all participants before enrollment. This training was conducted to ensure consistency and minimize inter-observer variability.

During data collection, enumerators assisted participants in completing structured questionnaires, obtained informed consent, recorded relevant information from the KIA books, and measured mid-upper arm circumference (MUAC) using a standardized non-elastic measuring tape. MUAC measurements were performed following established protocols, with instruments calibrated prior to use. Field supervision was conducted throughout the data collection process to ensure adherence to standardized procedures and data quality.

Data Analysis

The analysis was carried out in a univariate analysis to describe the distribution of each variable, and a bivariate use Chi-Square test to determine the relationship between independent variables (knowledge, parity, age, toothbrush habits) and dependent variables (nutritional status of pregnant women) with the level of significance $p \leq 0.05$. The hypothesis test uses the Chi-Square statistical test with a computerized system that is tailored to the purpose to be analyzed.

Knowledge scores were categorized based on the percentage of correct responses: good knowledge (≥76% of the total score), enough knowledge (56–75%), and less knowledge (≤55%). Maternal age was obtained and categorized based on obstetric risk criteria. Women aged 20–35 years at the time of data collection were classified as having non-risk age, while those aged <20 years or >35 years were classified as having risk age. This categorization is consistent with widely used maternal health risk frameworks. Parity was defined as the number of previous live births recorded in the MCH/KIA book. Parity was categorized into non-risk parity (primiparous or multiparous women with 1–3 previous births) and risk parity (women with ≥4 previous births). This classification was applied to reflect cumulative reproductive burden and its potential influence on maternal nutritional status. Oral hygiene behavior was assessed through a structured questionnaire focusing on toothbrushing practices during pregnancy. The questionnaire evaluated several aspects of oral hygiene, including toothbrushing frequency, timing of brushing (morning and before bedtime), and the use of toothpaste. Responses were scored to reflect the appropriateness of oral hygiene practices. Based on the total score, toothbrushing habits were categorized as good or poor, with higher scores indicating more appropriate oral hygiene behavior. Maternal nutritional status was assessed using mid-upper arm circumference (MUAC). A MUAC measurement of <23.5 cm was used to define CED, while MUAC ≥23.5 cm indicated non-CED nutritional status.

Ethical Consent

This research has been approved in the agreement on the Implementation of Beginner Lecturers of the 2025 Islamic University of Kalimantan MAB APBU Fund No.73/UNISKA-PUSLIT/IV/2025.

RESULT

The frequency distribution regarding the characteristics of the respondents, namely Education Level, employment status, and gestational age in this study is described in this table.

Table 1. Frequency Distribution of Respondent Characteristics Based on Education Level, Employment Status, and Gestational Age in Banjarmasin City

Characteristic	Description	f	%
Education Level	Higher Education (D3, Undergraduate)	37	37,0
	Secondary Education (High School / Equivalent)	19	19,0
	Basic Education (Elementary, Junior High / Equivalent)	44	44,0
Employment status	Work	34	34,0
	Not Working	66	66,0
Gestational Age	Trimester 1	17	17,0
	Trimester 2	54	54,0
	Trimester 3	29	29,0
Total		**100**	**100,0**

Source: Primary Data, 2025.

Based on table 1. The description of the respondents' characteristics shows that most respondent in Banjarmasin City have a basic level of education, namely graduates of elementary school and junior high school or equivalent, with a total of 44 people (44%). In addition, based on the data, the majority of respondents were not working or were housewives, namely 66 people (66%). Furthermore, most of the respondents were in the second trimester of pregnancy, with a total of 54 people (54%).

Variable frequency distribution in univariate analysis of variables of nutritional status of respondent, maternal knowledge, parity, age, and toothbrush habits.

Table 2. Distribution of Respondent Frequency Based on Nutritional Status, Knowledge, Parity, Age, and Toothbrush Habits of Pregnant women in Banjarmasin City.

Variable	Category	f	%
Nutritional Status	Not CED	52	52,0
	CED	48	48,0
Knowledge	Good	26	26,0
	Enough	15	15,0
	Less	59	59,0
Parity	No Risk	12	12,0
	Risk	88	88,0
Age	No Risk	37	37,0
	Risk	63	63,0
Toothbrush Habits	Good	42	42,0
	Bad	58	58,0
Total		**100**	**100,0**

Source: Primary Data, 2025

Based on Table 2, the univariate analysis showed that among the 100 respondents, the majority of respondent in Banjarmasin City had normal nutritional status, with 52 respondents (52%) not experiencing CED. The majority respondents had low levels of knowledge 59 respondents (59%), the majority respondents were at risk parity as many as 88 respondents (88%), some respondents were in the risk age category of 63 respondents (63%), most respondents had bad toothbrushing habits as many as 58 respondents (58%) in Banjarmasin City.

Distribution of bivariate analysis of factors related to the nutritional status of respondent in Banjarmasin City.

Table 3. Bivariate Analysis of Factors Related to the Nutritional Status of Pregnant women in Banjarmasin City

Variable	Category	Nutritional Status of Pregnant women				Total		PR	*p-value*
		Not CED		CED					
		n	%	n	%	n	%		
Knowledge	Good	19	73,1	7	26,9	26	100	*2.08*	*0,001*
	Enough	10	66,7	5	33,3	15	100		
	Less	23	39,0	36	61,0	59	100		
Parity	No Risk	9	75,0	3	25,0	12	100	*2.04*	*0,076*
	Risk	43	48,9	45	51,1	88	100		
Age	No Risk	24	64,9	13	35,1	37	100	*1.59*	*0,012*
	Risk	28	44,4	35	55,6	63	100		
Toothbrush Habits	Good	29	69,1	13	30,9	42	100	*1.95*	*0,000*
	Bad	23	39.7	35	60,3	58	100		
Total		**52**	**52,0**	**48**	**48,0**	**100**	**100**		

Source: Primary Data, 2025

Based on Table 3, the proportion of respondent with normal nutritional status was higher among those with good knowledge (73.1%) and sufficient knowledge (66.7%), whereas the majority of respondents with low knowledge experienced CED (61%). Bivariate analysis using the Chi-square test showed a statistically significant association between maternal knowledge and nutritional status *(PR=2.08; p=0.001)*. Respondent with poor knowledge had a 2.08 times higher prevalence of CED compared to those with good/adequate knowledge. Higher levels of maternal knowledge were associated with better nutritional status, highlighting the role of health literacy in shaping dietary practices and health-related behaviors during pregnancy.

Regarding parity, most respondents with low-risk parity had normal nutritional status (75%), while more than half of those with high-risk parity experienced CED (51.1%). However, the association between parity and maternal nutritional status was not statistically significant *(p=0.076)*. In contrast, parity was not significantly associated with nutritional status in this study, indicating that the number of previous births alone may not adequately capture nutritional risk without considering interpregnancy spacing, maternal recovery, and socioeconomic context.

For maternal age, respondents in the low-risk age category predominantly had normal nutritional status (64.9%), whereas those in the high-risk age group were more likely to experience CED (55.6%). This association was statistically significant *(PR=1.59; p=0.012)*. The association between maternal age and nutritional status reflects physiological and social vulnerabilities at both extremes of reproductive age. Respondent of high-risk age had a 1.59 times higher prevalence of CED compared to those of non-risk age. Younger and older respondent may face increased nutritional demands or reduced physiological reserves, which can predispose them to CED.

In terms of oral hygiene behavior, respondent with good toothbrushing habits were more likely to have a normal nutritional status (69.1%), while the majority of those with poor toothbrushing habits experienced CED (60.3%). The Chi-square test indicated a statistically significant association between toothbrushing habits and maternal nutritional status *(PR=1.95; p=0.000)*. Notably, oral hygiene behavior emerged as a significant correlate of maternal nutritional status. This finding suggests a potential behavioral pathway through which poor oral health may indirectly affect dietary intake and nutritional adequacy during pregnancy, possibly through pain, inflammation, or impaired mastication. Poor toothbrushing habits nearly doubled the prevalence of CED. While causal relationships cannot be established due to the cross-sectional design, this result extends existing models of maternal nutrition by highlighting oral hygiene as a relevant, yet often overlooked, factor.

DISCUSSION

Nutritional Status of Pregnant women

The univariate analysis showed that out of a total of 100 respondents, 52% of respondent had normal nutritional status, while 48% experienced Chronic Energy Deficiency (CED) in Banjarmasin City. Although the majority of respondents did not experience CED, the proportion of undernourished respondent remains substantial

and indicates a persistent public health concern. The results of the study found that most respondent did not experience CED, this is due to the educational background of most of the respondents who have the last secondary education (SMA/SMK), some respondents do not work and most of the respondents are in the 2nd trimester of pregnancy where in this period, early pregnancy symptoms such as nausea generally subside, the mother's energy increases and the belly begins to enlarge as the fetus develops.

CED in respondent reflects an inadequate intake of energy and essential nutrients during pregnancy. The nutritional status of the mothers in this study was assessed using upper arm circumference (MUAC), with a threshold of <23.5 cm as a CED indicator. MUAC is a practical and reliable measure of maternal nutritional reserves that is strongly correlated with adverse pregnancy outcomes, especially in low and middle-income countries (26).

There are 3 factors that cause CED, including direct factors, namely, infectious diseases, and the amount of food intake. The factors are not, namely, knowledge, activities of respondent, and family income. Biological factors are age and gender distance. In line with research at the Pringsewu Health Center, where most respondent (86%) with a ratio of 6:7 do not have CED (29). The findings of this study are consistent with previous research conducted in the Pringsewu Health Center area, which reported that the majority of respondent did not experience CED, although a notable proportion remained nutritionally at risk. These similarities suggest that maternal undernutrition remains a recurring issue across different regions, underscoring the need for context-specific strategies to strengthen maternal nutrition interventions.

The Relationship of Knowledge to the Nutritional Status of Pregnant women

Based on table 2, the proportion of respondent with normal nutritional status was higher among respondents with good knowledge (73.1%) and sufficient knowledge (66.7%), whereas the majority of respondents with low knowledge experienced CED (61%). Bivariate analysis using the Chi-square test demonstrated a statistically significant association between maternal knowledge and nutritional status (p=0.001).

In this study, 59% of respondents were classified as having low levels of knowledge. This finding may reflect variability in educational attainment and differential access to health information related to maternal nutrition. Maternal knowledge regarding CED can be influenced by exposure to nutrition education, counseling, and information obtained through health services and media platforms.

Maternal knowledge was found to be significantly associated with nutritional status in this study, supporting existing evidence that health literacy plays a crucial role in shaping dietary behaviors during pregnancy. Previous studies have demonstrated that respondent with higher levels of nutrition knowledge are more likely to adopt appropriate dietary practices and utilize antenatal care services effectively, thereby reducing the risk of maternal undernutrition (7,8). However, the presence of CED among some women with adequate knowledge in the present study suggests that knowledge alone may be insufficient to ensure optimal nutritional status without supportive socioeconomic and environmental conditions. However, given the cross-sectional design, causal inference cannot be established, and the relationship between maternal knowledge and nutritional status may be influenced by unmeasured confounding factors, such as socioeconomic conditions, dietary intake, and utilization of antenatal care services.

From the results of data analysis, most of the respondents had less knowledge as much as 59% this was strengthened because there were still respondent with a background in education after graduating from junior high school and high school, so that some respondents did not know about the causes and impacts of CED for pregnancy, how to prevent the danger of CED for the fetus and the gestational age at risk of CED. Knowledge about CED is greatly influenced by whether respondents are exposed to information about CED, whether respondents often hear about CED, or the ease of getting education through counseling, mass media, and social media. Respondent's knowledge can be increased if accompanied by compliance with ANC visits at least 6 times during pregnancy and reading the information contained in the KIA book.

This is in accordance with the theory that education is an effort to provide knowledge so that there is an increase in positive behavior, in this case, regarding the health efforts of respondent. Factors that affect knowledge are age, integration, environment, socio-culture, education, information, experience, and employment (30,31). The results of the study are in line with research at the South Alalak Health Center, which showed that respondent's

knowledge about the incidence of CED with a high percentage was in the category of lack of knowledge at 86.2%, sufficient knowledge at 9.2%, and good knowledge at 4.6% (32)

Parity Relationship to Nutritional Status of Pregnant women

Based on table 2, the results showed that most of the respondents were included in the risk parity group, which was 88 people (88.0%). In the group of mothers with non-risk parity, the majority had normal nutritional status or did not experience CED (75.0%). Meanwhile, in the at-risk parity group, the proportion of mothers who experience CED is slightly higher, at 51.1%. However, the results of bivariate analysis using the Chi-square test did not show a statistically significant relationship between parity and the nutritional status of respondent ($p = 0.076$). Thus, the null hypothesis is not rejected, which indicates that parity does not have a significant relationship with the nutritional status of respondent in Banjarmasin City.

In the present study, parity was not significantly associated with CED among respondent. This divergence may be explained by several factors. First, differences in parity categorization and measurement across studies may contribute to inconsistent findings. While some studies distinguish parity more granularly or incorporate interpregnancy intervals, the current study classified parity based solely on the number of previous live births, which may not fully capture reproductive burden. Second, the sample characteristics in this study, particularly the predominance of respondents with risk parity, may have reduced variability and limited the ability to detect statistically significant differences. Third, contextual factors such as access to antenatal care services, nutritional supplementation programs, and family support systems in the study setting may mitigate the potential nutritional impact of higher parity.

Mothers with a lot of parity tend to be undernourished, and are more prone to experiencing CED due to dual responsibility to the family and lack of focus on personal health, as well as the assumption that previous pregnancies went smoothly, while first respondent often lack experience and lack awareness of nutritional needs during pregnancy, so they eat potluck and do not prioritize optimal nutritional intake for the fetus.

Parity describes a woman's condition based on the number of births she has experienced. The results showed that most respondent who experienced CED were in the high-risk parity group, which reflected poor nutritional status. These findings also show that the incidence of CED is more experienced by mothers with primigravida or nullipara status. Based on the results of the significance test, the primigravida/nulipara group of mothers was shown to have a significant influence on the incidence of CEDs, which is suspected to be related to limited experience in dealing with previous pregnancies, thus affecting the ability to maintain adequate nutritional intake during pregnancy (33). Nutritional conditions, physical health, emotional well-being, and maternal experiences during pregnancy play an important role in determining the quality of the baby born and the process of growth and development in the future. Mothers who have their first pregnancy and experience CED generally do not have an adequate understanding of nutritional needs during pregnancy, including proper food consumption patterns. In addition, various studies show that most mothers who are in their first pregnancy are under 20 years old, so they are included in the high-risk gestational age group (34). These findings are in line with the results of a study conducted on respondent in Banyumas Regency, Central Java, in 2022, which emphasizes the importance of increasing nutritional intake, regularity of antenatal service visits (ANC), and managing pregnancy spacing as a strategic effort to reduce the risk of CED and various adverse health impacts (35,36).

Parity has been discussed in the literature as one of several reproductive characteristics associated with maternal nutritional vulnerability during pregnancy. Women with higher parity, particularly those with a history of multiple previous births, may experience cumulative physiological demands that coincide with increased nutritional challenges. In such contexts, repeated pregnancies without adequate recovery may contribute to reduced maternal energy reserves, which can have implications for both maternal and fetal well-being. In this context, Akbarini (2022) reported a strong association between high parity and CED among respondent, with substantially higher odds of CED observed in women with multiple previous births compared with those of lower parity (37).

The Relationship of Age to the Nutritional Status of Pregnant women

Based on table 2, respondent in the non–high-risk age category predominantly had normal nutritional status (64.9%), whereas more than half of those in the high-risk age group experienced CED (55.6%). Bivariate analysis

using the Chi-square test indicated a statistically significant association between maternal age and nutritional status (p=0.012).

In more detail, of the 37 respondents who were in the non-risk age group, as many as 24 people (64.9%) did not experience CED. On the other hand, of the 63 respondents who were included in the high-risk age group, as many as 35 people (55.6%) experienced CEDs. These results show that malnutrition problems in respondent are more commonly found in the high-risk gestational age group.

The age of the mother has long been known as one of the biological factors associated with the vulnerability of nutritional status during pregnancy. In this study, the proportion of occurrences of CED was found to be higher in respondent who were in the risk age group compared to the non-risk age group, and the association proved to be statistically significant. Although respondent in the age range who are not at risk are generally considered to be more physically or psychologically prepared to undergo pregnancy, the findings of this study show that being in this age group does not necessarily guarantee optimal nutritional conditions. Cases of malnutrition are also still found in mothers of non-at-risk age, which indicates that nutritional status during pregnancy is influenced by various interacting factors, such as the mother's level of knowledge about nutrition, socioeconomic conditions, and direct health factors, including infections. Overall, the results of this study confirm that maternal age is indeed related to nutritional status, but these influences need to be understood in a more comprehensive and multidimensional framework, not as a single stand-alone factor.

Mothers who experience pregnancy at a young age (< 20 years) or old age (> 35 years) need more nutrients than pregnant mothers at the time of healthy reproductive age (20-35 years old). A pregnancy that occurs at a young age causes a competition for nutrients between the fetus and its mother. Mothers who become pregnant in adolescence or are less than 20 years old need a lot of nutrients to meet the nutritional needs of the mother and the fetus she is carrying. This happens because the mother is still in her growing age (38).

The age of respondent affects their nutritional needs. Too young people need a lot of nutrients for their own growth and development, so that they cannot provide optimal nutrition to the fetus, labile emotions and mental are not ready, causing respondent to easily experience shocks, which results in a lack of attention to the fulfillment of nutritional needs during pregnancy. Meanwhile, in old age, she needs a large amount of additional energy for her pregnancy because the function of her organs has weakened, but she is required to work optimally during pregnancy for the growth and development of her fetus (39).

The findings in this study are in line with the results of a study conducted by Senja Atika Sari HS et al. (2022). Based on the analysis of 108 respondents, the majority of respondent are in the healthy reproductive age group, namely 20-35 years, as many as 84 people (77.8%), while the remaining 24 people (22.2%) are outside this age range. The study also showed a significant relationship between age factors and the incidence of CED in respondent, with a p-value of 0.027. Respondent who are in the risk age group, namely less than 20 years or more than 35 years, have a chance of experiencing CED about 3.1 times greater than mothers who are at optimal reproductive age (40).

The results of this study are consistent with the findings of a study conducted in the work area of the Ganjar Agung Health Center, West Metro District. In the study, respondent with a risk age, namely less than 20 years and more than 35 years, were recorded as many as 13 people (36.1%) and included in the case group, while mothers with a healthy reproductive age (20–35 years) amounted to 23 people (63.9%). Analysis of the difference in proportion test using continuity correction showed a p-value of 0.027 ($p < 0.05$) with an odds ratio value of 3.134 (CI 95%: 1.230–7.986). These findings indicate a statistically significant relationship between maternal age and the incidence of CED in pregnancy. Statistically, respondent in the age group under 20 years or over 35 years have about three times greater risk of experiencing CED compared to mothers in the age range of 20–35 years. Therefore, the age of the mother can be seen as one of the important factors that affect the likelihood of the occurrence of CEDs, where pregnancies outside the optimal reproductive age period tend to increase the risk of the condition (41).

The research is also in accordance with that conducted by Syakur (2020), who stated that there is a relationship between knowledge, eating frequency, age, parity, and education with the incidence of CED in respondent (42).

The Relationship of Toothbrush Habits to Pregnant women's Nutritional Status

The results of a study on 100 respondent in the city of Banjarmasin found that the majority had the worst toothbrushing behavior, with a bad category of 58%. The proportion of respondents who have good toothbrush habits mostly has a non-CED nutritional status of 69.1%, and the proportion of respondents who have poor toothbrushing habits mostly has a CED nutritional status of 60.3%. Statistical results using the chi-square test are known to be p-value = 0.000, where $p<\alpha$ (0.05), then Ha is accepted, H0 is rejected, which means that statistically there is a relationship between the habit of brushing teeth and the nutritional status of respondent in the city of Banjarmasin in 2025.

The findings indicated a statistically significant association between oral hygiene behaviors and maternal nutritional status. Respondent who reported suboptimal toothbrushing practices showed a higher prevalence of CED compared with those who reported good oral hygiene practices. From a conceptual perspective, this association may be explained through several interrelated pathways. Poor oral hygiene during pregnancy increases the risk of dental caries and periodontal disease, conditions that can cause pain, inflammation, and discomfort during mastication.

The association between oral hygiene practices and maternal nutritional status observed in this study is supported by international evidence. Previous studies have suggested that poor oral health during pregnancy may contribute to reduced dietary intake and nutritional inadequacy through pain, inflammation, and impaired mastication (10). In addition, the significant association between oral hygiene practices and maternal nutritional status highlights an important behavioral pathway that complements the role of knowledge. Poor oral health during pregnancy may adversely affect dietary intake through pain, discomfort, and inflammation, ultimately limiting food variety and nutritional adequacy. This interpretation is consistent with international evidence indicating that oral health status is closely linked to dietary quality and nutritional outcomes among respondent (11). Taken together, these findings suggest that maternal nutritional status reflects the interaction of cognitive factors, such as knowledge and health literacy, and behavioral factors, including oral hygiene practices, rather than isolated determinants.

The better the toothbrushing behavior of respondent, the better the condition of the periodontal tissue of respondent. There is a strong relationship between gestational age and periodontal tissue condition. This occurs due to increased estrogen metabolism and prostaglandin synthesis, which contribute to the gingival changes observed during pregnancy, resulting in increased gingivitis, periodontitis, and tooth shaking. The results of the toothbrushing behavior test with periodontal tissue conditions showed that there was a meaningful relationship, namely, the better the tooth brushing behavior, the better the condition of periodontal tissue.

Dental and oral health maintenance measures carried out include the time and frequency of brushing teeth, how to brush teeth, choosing a toothbrush, the use of fluorescent toothpaste, the act of maintaining dental and oral hygiene after vomiting and consuming food, food consumption patterns, the frequency of fruit and vegetable consumption, the frequency of check-ups to the dentist or dental health services in a year and treatment measures at the time of toothache (43).

Based on the results of the study, most of the respondents carried out the correct dental and oral hygiene maintenance measures, namely brushing their teeth 2 times a day, but the time was not right. This erroneous toothbrushing action is done after waking up in the morning, namely before breakfast and during the afternoon shower. The best time to brush your teeth is after breakfast and before going to bed at night. Only 1st trimester respondent do toothbrushing 1 time, this is because they often feel nauseous every time they brush their teeth, so they do it only to get rid of bad breath.

The results of the study on the selection of toothbrushes were good; respondents used a toothbrush with fine bristles and small tips, and it was carried out according to the officer's instructions. Dental and oral health maintenance measures are what respondents do related to disease prevention, how to improve skin health, and how to obtain appropriate treatment. Meanwhile, respondents who are included in the bad category are those who do not gargle every time they vomit or rarely brush their teeth in the morning. This is in accordance with the results of filling out the questionnaire that some respondents never immediately gargle or brush their teeth every time they finish vomiting.

In general, there are several things that need to be emphasized to respondent in maintaining dental and oral health to avoid dental and oral disease during pregnancy, namely, if respondent experience vomiting, immediately clean their mouth by rinsing their mouth with a cup of water.

Sarwono in Widi ER said that one of the factors that affects the level of dental and oral hygiene is behavioral factors. Behavior is a form of individual experience and interaction with his or her environment, especially those related to health. Effective dental and oral hygiene is strongly influenced by individual awareness and self-directed health behaviors, given that such practices are typically carried out independently in the home environment, completely dependent on the retention of understanding, awareness, and willingness of the individual to maintain their oral hygiene (44).

The results of this study are in accordance with the statement (45), which conveyed that toothbrushing behavior is influenced by the way you brush your teeth, the frequency and time of brushing your teeth, and the tools and materials for brushing teeth. Dental health problems can be caused by behavioral factors or actions that neglect dental and oral hygiene. Gestational age, which in this case is used as the trimester of pregnancy, shows a strong relationship with the condition of periodontal tissue, and indicates that tartar is present in the third trimester of pregnancy. In each trimester of pregnancy, respondent experience various behavioral changes in maintaining healthy teeth and mouth, which are also influenced by fluctuations in pregnancy hormones. This condition can increase the formation of plaque in the oral cavity, thus potentially worsening the health of teeth and surrounding tissues. The findings of this study are in line with the results of a study on the behavior of maintaining dental and oral health in respondent at the Bahu Health Center, Manado. The study showed that most respondent have good dental and oral health maintenance practices, with a percentage of 83.7% (16).

Interpretation of Key Findings

The results of this study explained that most pregnant women did not experience CED, namely 52 respondents (52%). This shows that the understanding and attention to nutritional completeness during pregnancy is quite good in the region. Pregnant women's knowledge has been shown to have a meaningful relationship with nutritional status (p-value = 0.001), which indicates that the better the mother's knowledge of nutrition and health, the better her nutritional status will be. In addition, the age factor also had a significant effect (p-value = 0.012), showing that pregnant women at the ideal age tend to have better nutritional status than those who are too young or too old. Oral hygiene habits, especially toothbrushing habits, also showed a significant association with nutritional status (p-value = 0.000), possibly because oral health affects appetite and ability to consume nutritious foods. Meanwhile, the parity factor or number of births did not show a meaningful relationship with the nutritional status of pregnant women (p-value = 0.076), indicating that the frequency of childbirth did not directly affect the nutritional condition of pregnant women. Overall, these findings affirm the importance of improving nutritional knowledge and healthy living behaviors to maintain the nutritional status of pregnant women in Banjarmasin City.

Comparison with Previous Studies

The results of this study show that there is a conformity with various previous studies related to factors that affect the nutritional status of pregnant women. In the knowledge, this study found a significant relationship between the level of knowledge of pregnant women and their nutritional status (p-value = 0.001). This finding is in line with research conducted at the South Alalak Health Center, which showed that most pregnant women with the least knowledge category were less likely to experience CED by 86.2% (32). This strengthens the view that education level and access to information are important factors in improving health behaviors, including in maintaining nutritional status during pregnancy (30).

Meanwhile, the results of the research on Parity showed that there was no meaningful relationship between parity and the nutritional status of pregnant women (p-value=0.076). However, these results have similarities with previous studies that highlighted that mothers with high parity and primigravida are at risk of developing CED, mainly due to a lack of attention to nutritional needs or limited pregnancy experience. However, in the context of the study in Banjarmasin, the parity factor does not appear to be the main determinant, which is likely due to the existence of relatively equal social support and health services (34).

This study found a significant relationship between maternal age and nutritional status (p-value = 0.012). These findings are consistent with the results that also found that pregnant women at the age of <20 years or >35 years are at a higher risk of developing CED compared to healthy reproductive age (20–35 years). This condition is caused by different biological, psychological, and nutritional needs, where the age of being too young still needs

nutrition for self-growth, while old age experiences a decline in the function of the reproductive organs and metabolism (40,41).

The results of the research related to Toothbrush habits also showed a meaningful relationship with the nutritional status of pregnant women (p-value=0.000). These findings reinforce the results of research at the Manado Shoulder Health Center, which shows that good dental and oral health maintenance behaviors contribute to the overall health of mothers (16). In addition, the affirmation that dental and oral hygiene has a close relationship with the health of the body, since infections or oral disorders can affect appetite and nutrient absorption (45,46).

Limitations and Precautions

The interpretation of the findings is subject to a number of methodological constraints related to the design and implementation of this study. First, the research design uses a cross-sectional approach, so that the causal relationship between variables cannot be directly proven. Second, several potential confounding factors—such as household income, dietary intake, and frequency of antenatal care (ANC) visits—were not fully measured or controlled for, which may have influenced the observed relationships. Third, maternal knowledge and toothbrushing habits were assessed using self-reported questionnaires, making the data susceptible to recall bias and social desirability bias. In addition, the study did not include clinical oral examinations or biochemical assessments of nutritional status (e.g., hemoglobin or serum albumin levels); consequently, the findings primarily reflect behavioral and anthropometric dimensions rather than clinical or biochemical indicators.

Despite these limitations, the findings provide meaningful insights into factors associated with the nutritional status of pregnant women, particularly from educational and behavioral perspectives. Strengthening nutrition-related knowledge remains a key component of maternal health promotion and can be prioritized through antenatal education programs delivered at Posyandu, primary health centers (Puskesmas), and pregnancy classes. Educational content should be tailored to women's educational backgrounds and local sociocultural contexts to enhance relevance and effectiveness. Furthermore, the findings suggest that maternal health interventions should address not only dietary intake but also supportive health behaviors, including oral hygiene and general health maintenance. Integrating nutrition education with basic dental and oral health promotion within routine antenatal care services may enhance the comprehensiveness of maternal health programs.

From an academic perspective, this study highlights the need for future research employing longitudinal or intervention-based designs to better assess changes in maternal nutritional status over time and to clarify potential causal pathways. Subsequent studies are encouraged to incorporate additional variables—such as household economic status, food security, family support, and detailed dietary assessments—to provide a more comprehensive understanding of the determinants of the nutritional status of pregnant women in Banjarmasin City.

Recommendations for Future Research

It is necessary to increase health education for pregnant women through Posyandu activities and pregnant women classes to increase knowledge about balanced nutrition, the selection of nutritious foods, and the importance of regular pregnancy checkups. Health workers are expected to be more active in providing counseling on the importance of maintaining oral and dental hygiene during pregnancy because good toothbrushing habits have been proven to affect the nutritional status of pregnant women. Local governments and related agencies need to strengthen nutrition intervention programs with a focus on at-risk age groups and the provision of social support to prevent CED in pregnant women.

CONCLUSION

The findings indicate that the majority of pregnant women in Banjarmasin have good nutritional status or do not experience CED, namely as many as 52 respondents (52%). Statistical analysis demonstrated significant associations between the nutritional status of pregnant women and several individual-level factors, including nutritional knowledge, age, and toothbrush habits. This means that the better the mother's knowledge about nutrition, the more optimal her nutritional status will be, especially in the productive age group with healthy living behaviours such as maintaining dental and oral hygiene. In contrast, parity was not significantly associated with nutritional status in this study population, suggesting that the number of previous pregnancies alone may not be a decisive determinant

of maternal undernutrition in this context. Overall, these results confirm the importance of improving nutrition education and habituating healthy behaviours as an effort to prevent CED in pregnant women in Banjarmasin City.

AUTHOR'S CONTRIBUTION STATEMENT

The main author (Ari Widyarni) makes reports on activities, licensing management & data collection. The second author (Elsi Setiandari Lely Octaviana) management of licensing & data recapitulation. The third author (M. Bahrul Ilmi) created articles & references. The fourth author (M. Febriza Aquarista) collected the literature & the final results. The fifth author (Edy Ariyanto) coordinates with the manager of the activity venue

CONFLICTS OF INTEREST

The author has no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors use AI in the creation of references and interpretation of key findings.

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