



Nutritional knowledge and dietary practices during pregnancy among pregnant women at Hoan My Sai Gon Hospital

Bui Duc Lam¹, Phan Thi Tuyet Ha¹, Phan Thi Tuyet Mai², Le Thi Kim Phung²

¹Hoan My Sai Gon Hospital; ²Nguyen Tat Thanh University

ABSTRACT

Objective: To assess nutritional knowledge and dietary practices during pregnancy among pregnant women attending Hoan My Sai Gon Hospital, examine selected demographic, social, and pregnancy-related factors associated with knowledge and practice, and to determine the relationship between nutritional knowledge and dietary practice scores. **Subjects and methods:** A cross-sectional study included 392 pregnant women receiving antenatal care during March–June 2026. Nutritional knowledge was assessed using a 15-item questionnaire adapted from the Italian Pregnancy Nutrition Knowledge Questionnaire (ItPreNKQ). Dietary practice was assessed using a 12-food-group Quality Eating Index (QEI) converted to a 0–100 scale. Descriptive statistics, Chi-square tests, Pearson correlation, and multivariable linear regression were performed ($p < 0.05$). **Results:** The mean knowledge score was 10.01 ± 2.10 out of 15; 54.1% of participants had moderate knowledge, 30.1% good knowledge, and 15.8% poor knowledge. The lowest correct-response rates concerned the recommended daily iron intake (40.6%), fish with high mercury content (47.2%), and recommended gestational weight gain for women who were overweight before pregnancy (47.4%). The mean QEI score was 54.18 ± 12.85 out of 100; 35.2% had good dietary practice and 64.8% required improvement. Higher education was independently associated with higher knowledge scores ($\beta = 0.353$; $p < 0.001$; adjusted $R^2 = 0.128$). Knowledge score was the only variable independently associated with QEI score in the reported multivariable model ($\beta = 0.416$; $p < 0.001$; adjusted $R^2 = 0.170$). Knowledge and QEI scores were moderately and positively correlated ($r = 0.419$; $p < 0.001$), although 47.5% of women with good knowledge still did not achieve good dietary practice. **Conclusion:** Nutritional knowledge was predominantly moderate, whereas the proportion of pregnant women achieving good dietary practice remained low. Nutritional knowledge was positively associated with dietary practices but only a limited proportion of the variance in dietary behavior. Antenatal nutrition care should combine nutrition education with individualized counseling, behavior-change support, and follow-up of dietary practices.

Keywords: Nutritional knowledge; dietary practices; pregnant women; pregnancy; antenatal care.

INTRODUCTION

Adequate maternal nutrition is essential for maternal health, fetal growth, and favorable pregnancy outcomes. Pregnancy increases requirements for energy and multiple nutrients, while both nutritional deficiencies and excessive or imbalanced intake may adversely affect maternal and infant outcomes ¹. Nutrition counseling during antenatal care can improve nutrition-related behaviors and outcomes, particularly when information is tailored to the needs and circumstances of pregnant women ².

Knowledge is an important foundation for healthy dietary behavior, but it does not automatically translate into appropriate practice. Pregnant women may receive nutrition information from health professionals, family members, social media, and other sources, yet gaps can persist in the practical application of recommendations ³. In Vietnam, recent studies have reported substantial limitations in nutrition literacy and uneven awareness of nutrition and supplementation during pregnancy ⁴⁻⁷.

Assessment of both knowledge and dietary practice is therefore useful for identifying actionable gaps in antenatal care. The present study used a 15-item knowledge questionnaire adapted from the Italian Pregnancy Nutrition Knowledge Questionnaire and a 12-food-group Quality Eating Index to capture complementary aspects of pregnancy nutrition ^{8,9}. However, evidence from Vietnam remains limited regarding the quantitative relationship between nutritional knowledge and broader dietary practice, particularly the extent to which adequate knowledge translates into good dietary practice.

This study aimed to: (1) determine the level of nutritional knowledge during pregnancy; (2) determine the level of dietary practice; (3) identify selected demographic, social, and pregnancy-related factors associated with knowledge and dietary practice; and (4) determine the relationship between nutritional knowledge and dietary practice scores among pregnant women attending Hoan My Sai Gon Hospital.

SUBJECTS AND METHODS

Study participants: Participants were pregnant women attending antenatal care at the Department of Obstetrics, Hoan My Sai Gon Hospital. Eligible women had a gestational age of at least 12 weeks, were able to communicate in Vietnamese and understand the questionnaire, and voluntarily agreed to participate after receiving study information.

Women were excluded if they had medical or obstetric conditions requiring a medically prescribed therapeutic diet or specialized nutritional management, including severe pre-existing diabetes, insulin-treated or diet-managed uncontrolled gestational diabetes, chronic kidney disease, severe gastrointestinal or hepatic disorders, or multiple gestations. Eligibility was assessed before the interview through a review of electronic medical records at the Obstetrics Clinic and confirmed by self-report during screening. Women who were unable or unwilling to complete the interview, or who had cognitive or psychiatric conditions that could compromise the reliability of questionnaire responses, were also excluded.

Study setting, period, and design: An analytical cross-sectional study was conducted at the Department of Obstetrics, Hoan My Sai Gon Hospital, Ho Chi Minh

City, from March to June 2026. Official data collection began only after ethics approval was granted on March 18, 2026.

Sample size and sampling: The minimum sample size was calculated using the single-proportion formula with a 95% confidence level, $p = 0.50$, and $d = 0.05$, yielding 384.16 and rounded up to 385 participants. Convenience sampling method was employed. In practice, the research team collected data from 392 study subjects.

Data collection instruments and scoring: The questionnaire had three components.

Part 1: collected demographic, social, obstetric, and pre-pregnancy characteristics.

Part 2: Nutritional knowledge was assessed using a 15-item single-choice questionnaire adapted from the Italian Pregnancy Nutrition Knowledge Questionnaire (ItPreNKQ) ⁸. From the original 38-item pool, an expert panel of four Doctorate-degreed nursing specialists selected 15 core items aligned with WHO and Vietnamese Ministry of Health maternal nutrition guidelines, while removing items specific to European food culture. The 15 items covered four essential domains: gestational weight gain targets by pre-pregnancy BMI (2 items), essential micronutrients including folic acid, iron, calcium, and omega-3/DHA (8 items), dietary safety and restrictions regarding caffeine, alcohol, and high-mercury fish (3 items), and daily fruit/vegetable serving targets (2 items).

Each correct answer received 1 point, and incorrect or unanswered items received 0 points (total score: 0–15). Knowledge scores were categorized based on adapted Bloom's cut-off criteria: good (≥ 12 points),

moderate (8–11 points), and poor (< 8 points).

Part 3: Dietary practice was evaluated using a Quality Eating Index (QEI) adapted from Susetyowati et al. (2025), covering 12 food groups ⁹. Frequency and portion-size components were scored so that higher values consistently represented more appropriate dietary practice, including reverse-direction scoring for food groups that should be limited. The raw total was converted to a 0–100 scale; $QEI \geq 60$ indicated good practice and $QEI < 60$ indicated practice requiring improvement ⁹.

Translation, cultural adaptation, and validation: Both instruments underwent a formal forward-back translation protocol conducted independently by four bilingual health researchers. The expert panel (4 nursing PhDs) evaluated the adapted items for clarity, relevance, and cultural applicability to Vietnamese pregnant women, establishing an S-CVI/Ave of 0.93 for ItPreNKQ and 0.95 for QEI. Pilot testing among 30 pregnant women demonstrated strong feasibility (average completion time: 12.3 ± 2.4 minutes). Internal consistency reliability yielded a Kuder-Richardson Formula 20 (KR-20) coefficient of 0.752 for the dichotomously scored knowledge scale and a Cronbach's alpha of 0.897 for the QEI practice scale.

Data collection procedure: Data collectors were trained in study procedures, standardized interviewing, record checking, and research ethics. Interviews were conducted in a private area after informed consent. Questionnaires were reviewed immediately for completeness and logical consistency, and data quality was periodically supervised throughout the collection period.

Data analysis: Data were entered, cleaned, and analyzed using SPSS version 26.0. Categorical variables were summarized as frequencies and percentages, and continuous variables using mean $\pm$ standard deviation with median and interquartile range when appropriate. Chi-square tests assessed associations between categorical variables. Pearson correlation assessed the linear relationship between the knowledge score and QEI score. Multivariable linear regression was used separately for the knowledge score and QEI score. Results are reported using unstandardized B, standard error, standardized β , t statistics, p values,

R^2 , and adjusted R^2 . All tests were two-sided and $p < 0.05$ was considered statistically significant.

Ethical considerations: The study was approved by the Biomedical Research Ethics Committee of Nguyen Tat Thanh University (Certificate No. 38/GCN-NTT). Approval was granted on March 18, 2026, and the certificate was issued on March 25, 2026. Participation was voluntary, informed consent was obtained, and withdrawal was permitted at any time without affecting medical care. Survey data were coded and stored without direct identifiers in the analytical dataset.

RESULT

Table 1. General characteristics of pregnant women participating in the study (n=392)

Variable	Category	n	%
Age (years)	<25	66	16.8
	25–30	142	36.2
	31–35	130	33.2
	>35	54	13.8
Education	Primary/Lower secondary	24	6.1
	Upper secondary	85	21.7
	College/University	220	56.1
	Postgraduate	63	16.1
Occupation	Homemaker	70	17.9
	Manual worker	51	13.0
	Office employee	199	50.8
	Self-employed/Business	72	18.4
Residence	Urban	290	74.0
	Rural	102	26.0

Variable	Category	n	%
Current children	None	197	50.3
	1	147	37.5
	2	37	9.4
	≥3	11	2.8
Trimester	First	48	12.2
	Second	187	47.7
	Third	157	40.1
Pre-pregnancy BMI	Underweight (<18.5)	75	19.1
	Normal (18.5–22.9)	229	58.4
	Overweight (23.0–27.4)	63	16.1
	Obesity (≥27.5)	25	6.4

Mean age: 30.0 ± 5.6 years (range 19–43). Mean pre-pregnancy BMI: 21.5 ± 3.7 kg/m².

Most participants were 25–35 years old (69.4%), 72.2% pregnant women had college/university education or higher, 74.0% pregnant women lived in urban areas,. Nearly half were in the second trimester (47.7%), and 58.4% pregnant women had a normal pre-pregnancy BMI. However, 16.1% pregnant women were overweight.

Table 2. Correct-response rates for individual nutritional knowledge items (n = 392)

Knowledge items	Correct content	Correct answer n (%)
Recommended gestational weight gain with normal pre-pregnancy BMI	11–16 kg	261 (66.6)
Recommended gestational weight gain when overweight before pregnancy	7–11 kg	186 (47.4)
When folic acid supplementation should begin	3 months before pregnancy or immediately after pregnancy is detected	268 (68.4)
Good food sources of folate	Green leafy vegetables, legumes, whole grains	292 (74.5)
Main reason for folic acid supplementation	Prevention of neural tube defects	309 (78.8)

Knowledge items	Correct content	Correct answer n (%)
Recommended daily iron intake during pregnancy	27 mg/day	159 (40.6)
Measure to improve non-heme iron absorption	Take iron with vitamin C	250 (63.8)
Safe caffeine limit during pregnancy	< 200 mg/day	272 (69.4)
Alcohol recommendation during pregnancy	Avoid alcohol completely	336 (85.7)
Reason omega-3 needs increase during pregnancy	Supports fetal brain and visual development	276 (70.4)
Dietary recommendation to help meet omega-3 needs	Eat fish at least 2–3 times/week	202 (51.5)
Reason calcium needs increase during pregnancy	Supports fetal bone development	339 (86.5)
Good sources of calcium	Milk, cheese, yogurt, green vegetables	358 (91.3)
Recommended daily fruit and vegetable servings	≥5 servings/day	229 (58.4)
Fish to limit because of high mercury content	Shark, swordfish, large tuna	185 (47.2)

Correct-response rates ranged from 40.6% to 91.3%. The highest rates were for calcium-rich food sources (91.3%), the role of calcium (86.5%), and avoiding alcohol during pregnancy (85.7%). The lowest rates were for recommended daily iron intake (40.6%), identification of high-mercury fish (47.2%), and recommended weight gain for women who were overweight before pregnancy (47.4%).

Table 3. Distribution of nutritional knowledge and dietary practice scores (n = 392)

Indicator	Level/summary	score	%
Knowledge score	Mean ± SD	10.01 ± 2.10/15	
	Median (IQR)	10 (8–12)	
Knowledge level	Good (≥12)	118	30.1
	Moderate (8–11)	212	54.1
	Poor (<8)	62	15.8

Indicator	Level/summary	score	%
QEI score	Mean $\pm$ SD	54.18 $\pm$ 12.85/100	
	Median (IQR)	53.5 (45.1–63.1)	
Dietary practice	Good (QEI $\geq$ 60)	138	35.2
	Needs improvement (QEI <60)	254	64.8

The mean knowledge score was 10.01 ± 2.10 out of 15, equivalent to approximately 66.7% of the maximum score. Moderate knowledge accounted for the largest group (54.1%). The mean QEI score was 54.18 ± 12.85 out of 100, and 64.8% of participants were classified as needing improvement in dietary practice.

Table 4. Dietary practice scores by QEI food group (n = 392)

Food group	Mean $\pm$ SD	Meeting criterion (%)
Rice/noodles/bread/main grains	4.08 ± 1.03	58.4
Tubers/refined grains	2.81 ± 0.93	28.1
Green vegetables/vegetables	3.67 ± 0.86	43.6
Fruit	3.92 ± 0.84	55.9
Tofu/tempeh/soy foods	2.90 ± 0.92	56.4
Milk and dairy products	3.77 ± 0.84	45.9
Eggs	3.56 ± 0.88	62.0
Red meat/white meat/poultry	3.88 ± 0.80	53.6
Processed meat/cold cuts/sausages	2.39 ± 0.94	44.4
Nuts/vegetable oils	2.77 ± 0.90	49.5
Sweets/processed foods	2.37 ± 0.93	45.4
Animal fat/lard	2.62 ± 0.94	35.7

Dietary practice varied across food groups. Higher scores were observed for staple grains, fruit, meat/poultry, and dairy. Lower scores and/or low proportions meeting criteria were observed for refined grains/tubers, processed meats, sweets/processed foods, animal fats, and the use of nuts and vegetable oils. Only 43.6% met the criterion for vegetables.

Table 5. Multivariable linear regression for nutritional knowledge score (n = 392)

Predictor	B	SE	β	t	p
Constant	8.92	0.43	—	20.80	<0.001
College/University education or higher	1.66	0.22	0.353	7.47	<0.001
Urban residence	0.42	0.23	0.087	1.82	0.069
Ability to pay: fair/high	-0.37	0.21	-0.086	-1.81	0.070
≥ 1 child	-0.15	0.20	-0.036	-0.75	0.451
Office employee	-0.11	0.20	-0.025	-0.54	0.593
Age 25–35 years	0.07	0.22	0.016	0.35	0.730
Second/third trimester	-0.13	0.30	-0.021	-0.44	0.660

Model: $R^2 = 0.143$; adjusted $R^2 = 0.128$; $F(7,384) = 9.18$; $p < 0.001$.

College/university education or higher was the only predictor independently associated with the knowledge score in the reported model ($B = 1.66$; $\beta = 0.353$; $p < 0.001$). The model explained 12.8% of the variance after adjustment.

Table 6. Multivariable linear regression for dietary practice QEI score (n = 392)

Predictor	B	SE	β	t	p
Constant	29.98	3.29	—	9.11	<0.001
Knowledge score (0–15)	2.54	0.30	0.416	8.40	<0.001
College/University education or higher	0.46	1.42	0.016	0.33	0.745
≥ 1 child	-1.56	1.19	-0.061	-1.31	0.190
Normal pre-pregnancy BMI	-0.85	1.20	-0.033	-0.71	0.479
Office employee	1.04	1.19	0.040	0.88	0.381
Age 25–35 years	0.16	1.29	0.006	0.12	0.901
Urban residence	-1.26	1.36	-0.043	-0.93	0.353

Model: $R^2 = 0.185$; adjusted $R^2 = 0.170$; $F(7,384) = 12.41$; $p < 0.001$. Ability to pay was not included in the reported QEI multivariable model.

Knowledge score was the only variable independently associated with QEI score in the reported multivariable model. Each 1-point increase in knowledge was associated with an average 2.54-point higher QEI score after adjustment ($\beta = 0.416$; $p < 0.001$).

Table 7. Relationship between nutritional knowledge and dietary practice (n = 392)

Knowledge level	Good practice n (%)	Needs improvement n (%)	Total
Good (≥ 12)	62 (52.5)	56 (47.5)	118
Moderate (8–11)	72 (34.0)	140 (66.0)	212
Poor (< 8)	4 (6.5)	58 (93.5)	62
Total	138 (35.2)	254 (64.8)	392

Pearson correlation between continuous knowledge score and QEI score: $r = 0.419$; $p < 0.001$. Cross-tabulation: $\chi^2 = 38.16$; $df = 2$; $p < 0.001$.

Knowledge and QEI scores were moderately and positively correlated ($r = 0.419$; $p < 0.001$). The proportion with good dietary practice increased from 6.5% pregnant women with poor knowledge to 34.0% pregnant women with moderate knowledge and 52.5% pregnant women with good knowledge. Nevertheless, 47.5% of participants with good knowledge still required improvement in dietary practice.

DISCUSSION

Nutritional knowledge during pregnancy: The mean knowledge score was 10.01 ± 2.10 out of 15, and more than half of participants were classified as having moderate knowledge. Only 30.1% achieved the study-defined good knowledge level. This pattern indicates that general awareness was present but knowledge was uneven across specific recommendations. A Vietnamese study at Hanoi Medical University Hospital also reported variation in nutrition knowledge among pregnant women, although direct comparison should be cautious because instruments and cutoffs differed ¹⁰.

The most prominent gaps in the present study concerned quantitative and application-oriented items, including recommended daily iron intake, identification of fish with high mercury content, and recommended gestational weight gain among women who were overweight before pregnancy. Similar unevenness has been reported

internationally. Adylbekova et al. found that substantial proportions of pregnant women had incomplete nutrition knowledge even when they had access to dietary information ¹¹. Rizk et al. reported stronger knowledge in some commonly discussed food-safety topics but lower knowledge of selected micronutrients and fish-related recommendations ¹². Olloqui-Mundet et al. likewise identified gaps in practical knowledge related to iron intake and absorption ¹³.

Nutrition education should therefore move beyond general messages toward clear and individualized explanations that are consistent with current national and international recommendations, while considering pre-pregnancy BMI, gestational age, and individual dietary practices. Teach-back can be used to verify whether the woman understands the recommendation rather than assuming that information has been retained.

Dietary practices during pregnancy:

Only 35.2% of participants met the study threshold for good dietary practice, and the mean QEI score was 54.18 ± 12.85 out of 100. This finding indicates that overall dietary quality remained suboptimal in a substantial proportion of participants, despite generally moderate levels of nutritional knowledge.

This finding is consistent with reports that exposure to nutrition information does not guarantee high diet quality. In Australian pregnant women, Phillips et al. found that diet quality remained suboptimal despite widespread access to nutrition information¹⁴. El Habbal et al. also reported low adherence to several pregnancy-specific dietary recommendations in the United States¹⁵. In Vietnam, Do Hai Anh reported that adherence to individual micronutrient practices may coexist with suboptimal gestational weight gain, illustrating that a single favorable behavior does not necessarily reflect overall dietary quality⁶.

Food-group analysis in the present study identified practical targets for counseling. Consumption patterns were relatively better for staple grains, fruit, meat/poultry, and eggs, whereas vegetables, nuts and vegetable oils, refined grains, processed meats, sweets/processed foods, and animal fats showed greater room for improvement. A multidimensional diet-quality measure is useful because it captures both foods that should be encouraged and foods that should be limited¹⁶.

Factors associated with knowledge and dietary practice: Education was significantly associated with nutritional knowledge in both the bivariate analysis and the multivariable model. Women with college/university education or higher had,

on average, a 1.66-point higher knowledge score after adjustment. However, the adjusted R^2 of 0.128 indicates that education and the other variables included in the model explained only 12.8% of the variance in knowledge scores, suggesting that other unmeasured factors may also contribute to differences in pregnancy nutrition knowledge.

At the bivariate level, age group, education, and ability to pay were significantly associated with dietary practice categories. After adjustment in the reported QEI linear regression model, age and education were no longer statistically significant, whereas knowledge score remained independently associated with QEI. Ability to pay was not included in the reported multivariable QEI model; therefore, its independent association after adjustment cannot be determined from this analysis. These findings should be interpreted as associations rather than causal effects.

The moderate positive correlation between knowledge and QEI scores ($r = 0.419$, $p < 0.001$) and the significant regression coefficient for knowledge are consistent with an association between higher nutritional knowledge scores and better dietary quality. Nevertheless, the adjusted R^2 for the QEI model was only 0.170, and nearly half of women with good knowledge still did not achieve good practice. Qualitative research in Vietnam has identified barriers and facilitators to healthy eating during pregnancy, including pregnancy-related symptoms, food availability, family influence, beliefs, and practical circumstances, suggesting that nutritional knowledge alone may not be sufficient to support healthy dietary practices¹⁷. International evidence similarly emphasizes that knowledge, attitudes,

access, and contextual factors interact in shaping dietary behavior³.

Practical implications for antenatal care: A feasible clinic-based approach would include: brief screening of knowledge and dietary practice at the first antenatal visit; individualized counseling focused on one or two achievable behaviors; use of teach-back to confirm understanding; and reassessment at a subsequent visit. Priority counseling topics from this study are daily iron recommendations, safe fish selection, gestational weight gain according to pre-pregnancy BMI, and increasing vegetable intake. Women with QEI <60, inappropriate weight gain, or complex dietary barriers may benefit from more intensive counseling or referral to a nutrition professional.

Strengths and limitations: The study included 392 valid participants, exceeding the calculated minimum sample size, and used instruments that underwent cultural adaptation and pilot testing. The pilot showed acceptable internal consistency for the knowledge scale and high internal consistency for the QEI. Combining descriptive analysis, correlation, and multivariable regression provided complementary views of the knowledge-practice relationship.

Several limitations should be considered. First, the cross-sectional design does not establish temporal sequence or causality. Second, dietary practice was primarily self-reported and may be affected by recall and social-desirability bias. Third, convenience sampling at one private hospital, with a relatively high proportion of urban and highly educated participants, limits generalizability to other pregnant populations. Fourth, the theoretical KAP framework could not be fully tested because attitude was

not measured. Finally, the multivariable models explained only a modest proportion of the variance, suggesting that important behavioral, social, economic, family, and pregnancy-symptom factors were not fully captured.

CONCLUSION

Among 392 pregnant women attending Hoan My Sai Gon Hospital, nutritional knowledge was predominantly moderate, with a mean score of 10.01 ± 2.10 out of 15. Good dietary practice was achieved by 35.2%, while 64.8% required improvement; the mean QEI score was 54.18 ± 12.85 out of 100. Important knowledge gaps involved daily iron requirements, high-mercury fish, and gestational weight gain in women who were overweight before pregnancy. Higher educational attainment was independently associated with higher nutritional knowledge scores. Nutritional knowledge was moderately and positively correlated with dietary practice ($r = 0.419$; $p < 0.001$), and higher knowledge scores were independently associated with higher QEI scores in the multivariable model. However, the relatively modest proportion of explained variance, together with the finding that 47.5% women with good nutritional knowledge still had dietary practices requiring improvement, suggests that nutritional knowledge alone may not fully account for differences in dietary practices.

RECOMMENDATIONS

Hoan My Sai Gon Hospital may consider developing and evaluating a brief antenatal nutrition counseling package that addresses the knowledge and dietary practice areas identified in this study. Nurses, midwives, physicians, and nutrition professionals

should use individualized counseling with specific behavioral goals and follow-up rather than relying only on general information.

Future studies should include multiple public and private hospitals and urban and rural settings, and should consider longitudinal or interventional designs. Additional variables such as attitudes, self-efficacy, family and social support, food access, detailed economic barriers, and pregnancy-related symptoms should be measured to better explain variation in dietary practice.

REFERENCES

1. Marshall NE, Abrams B, Barbour LA, Catalano P, Christian P, Friedman JE, et al. The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol.* 2022;226(5):607-632. doi:10.1016/j.ajog.2021.12.035.
2. Dewidar O, John J, Baqar A, Madani MT, Saad A, Riddle A, et al. Effectiveness of nutrition counseling for pregnant women in low- and middle-income countries to improve maternal and infant behavioral, nutritional, and health outcomes: a systematic review. *Campbell Syst Rev.* 2023;19(4):e1361. doi:10.1002/cl2.1361.
3. McCarthy EK, Ni Riada C, O'Brien R, Minogue H, McCarthy FP, Kiely ME. Access to nutrition advice and knowledge, attitudes and practices of pregnant women in Ireland: a cross-sectional study. *J Hum Nutr Diet.* 2024;37(5):1159-1169. doi:10.1111/jhn.13342.
4. Nguyen HT, Tran HTT, Dao-Tran TH, Huang LC. Nutrition literacy in Vietnamese pregnant women: a cross-sectional study. *Health Promot Int.* 2025;40(1):daae187. doi:10.1093/heapro/daae187.
5. Le QT, Huynh NKT, Hoang TDT. Awareness of nutrition and supplements among pregnant and preconception women: a real-world study in Vietnam. *Womens Health Rep.* 2023;4(1):506-516. doi:10.1089/whr.2023.0014.
6. Do HA. Nutritional practices and gestational weight gain among pregnant women in Hanoi in 2020. *Vietnam Med J.* 2023;526(2). doi:10.51298/vmj.v526i2.5522.
7. Dong DT, Tran LT. Assessment of nutritional status among pregnant women presenting for delivery at Cu Chi Regional General Hospital. *Vietnam Med J.* 2022;520(1A):335-339. doi:10.51298/vmj.v520i1A.3802.
8. Callegaro S, Bertolotti E, Kaihura CT, Dall'Asta A, Scazzina F, Rosi A. Development and validation of the Italian Pregnancy Nutrition Knowledge Questionnaire (ItPreNKQ): a nutrition knowledge questionnaire for pregnant Italian women. *Nutrients.* 2025;17(5):901. doi:10.3390/nu17050901.
9. Susetyowati S, Huriyati E, Faza F, Sanubari NDG, Syaury A. Development of a quality eating index and its relationship with nutritional status in adults. *J Public Health Res.* 2025;14(2):22799036251329420. doi:10.1177/22799036251329420.
10. Nguyen Thi Bich V, Nguyen Le M, Do Nam K, Nguyen Thuy H, Nguyen Bao N. Knowledge and attitudes toward nutritional care among pregnant women attending Hanoi Medical University Hospital in 2024. *Tap chi Y hoc Viet Nam.* 2025;550(2). doi:10.51298/vmj.v550i2.14212.
11. Adylbekova P, Balantekin K, Feeser K, Temple J. Association among nutrition knowledge, food frequency, and food

insecurity during pregnancy. *BMC Nutr.* 2025;11(1):69. doi:10.1186/s40795-025-01051-z.

12. Rizk J, Andreou E, Hileti D, Ghaddar A, Zampelas A. Nutrition knowledge among pregnant women in Lebanon: a cross-sectional study. *Womens Health (Lond).* 2024;20:17455057241272216. doi:10.1177/17455057241272216.

13. Olloqui-Mundet MJ, Cavia MDM, Alonso-Torre SR, Carrillo C. Dietary habits and nutritional knowledge of pregnant women: the importance of nutrition education. *Foods.* 2024;13(19):3189. doi:10.3390/foods13193189.

14. Phillips A, Bucher T, Pristijono P, Fenton S. The relationship between diet quality, nutrition self-efficacy and sources of nutrition information in Australian pregnant women: a cross-sectional analysis.

Am J Health Promot. 2025;39(7):1027-1036. doi:10.1177/08901171251336931.

15. El Habbal N, Filatava EJ, Overton NE, Gregas M, Gregory KE. Pregnancy-specific dietary guidelines for Americans are not met: findings from a pilot study. *Reprod Female Child Health.* 2023;2(4):253-257. doi:10.1002/rfc2.63.

16. Robb L, Joubert G, Walsh CM. Diet quality indexes for use during pregnancy: a scoping review. *Nutr Rev.* 2024;82(11):1622-1630. doi:10.1093/nutrit/nuad138.

17. Nguyen-Hoang A, Eades C, Harris FM, Cheyne H. Barriers and enablers toward healthy eating and weight gain among pregnant women in Vietnam: a qualitative study with analysis informed by the theoretical domains framework and COM-B model. *Appetite.* 2024;203:107710. doi:10.1016/j.appet.2024.107710.