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Original research

NUTRITIONAL STATUS OF PREGNANT WOMEN AT DELIVERY AND RELATED FACTORS IN THE DEPARTMENT OF OBSTETRICS, KON TUM PROVINCIAL GENERAL HOSPITAL IN 2024

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ABSTRACT

Background: *Appropriate nutrition during pregnancy is not only crucial for maternal health but also determines fetal development and the child's health from birth through adulthood. Nutritional deficiencies during pregnancy can increase the risks of obstetric complications, preterm birth, and low birth weight.*

Methods: *A descriptive cross-sectional study was conducted among 505 pregnant women aged 18 years or older who delivered at the Department of Obstetrics, Kon Tum Provincial General Hospital. Nutritional status was assessed by the scale developed by the Ho Chi Minh City Nutrition Center in collaboration with UNICEF in Viet Nam. Multivariate logistic regression was used to identify factors associated with nutritional risk among the study subjects.*

Results: *The prevalence of pregnant women at risk of nutritional disorders, as defined by the scale, was 27.9%. Multivariate logistic regression revealed that a history of hypertension (OR = 4.86; 95% CI: 1.60 - 14.78; p = 0.005) and poor maternal nutrition knowledge (OR = 1.56; 95% CI: 1.02 - 2.40; p = 0.042) were significantly associated with increased nutritional risk.*

Conclusions: *The screening tool of the Ho Chi Minh City Nutrition Center is useful for early detection of nutritional risk in pregnant women. Its incorporation in antenatal care may contribute to improved maternal nutrition. Early application of this scale and reinforced nutritional education - particularly for women with a history of hypertension - are recommended to optimize pregnancy outcomes.*

Keywords: *Nutrition scale, pregnancy, nutritional risk, Kon Tum, Viet Nam.*

I. INTRODUCTION

Maternal nutrition is a key determinant of maternal health and fetal development, with inadequate nutritional status associated with complications such as preterm birth and low birth weight [1, 2]. In Viet Nam, undernutrition remains prevalent while overweight and obesity are increasing, particularly among pregnant women who often fail to meet recommended nutrient intake or gestational weight gain [3, 4]. Kon Tum Province faces additional challenges due to socioeconomic disadvantage and limited access to nutrition and health services, which may further compromise maternal nutritional status [5]. However, evidence using standardized assessment tools remains scarce in such settings [4]. Therefore, this study aimed to assess the nutritional status of pregnant women at delivery and identify factors associated with their nutritional status.

II. MATERIALS AND METHODS

2.1. Study design and setting

A cross-sectional descriptive study was conducted from August 2023 to February 2024 at the Department of Obstetrics, Kon Tum Provincial

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General Hospital, Viet Nam. This hospital serves as the main referral facility for obstetric and neonatal care in the Central Highlands region, receiving both urban and rural patients, including a large proportion of ethnic minority women.

2.2. Study subjects

The study included pregnant women aged ≥ 18 years who were admitted for delivery at the Department of Obstetrics during the study period. Medical records were reviewed in combination with direct interviews.

Inclusion criteria included (1) women at term pregnancy admitted for delivery, (2) able to communicate and provide information, and (3) provided written informed consent.

Exclusion criteria were (1) women with severe complications requiring emergency surgery, (2) refusal to participate, or (3) incomplete data records.

2.3. Sample size and sampling

The sample size was calculated using the single population proportion formula, with p = 0.17 based on Do Dinh Trung et al. (2021), a precision of 0.04, and a 95% confidence level (Z = 1.96), yielding a minimum of 339 participants. Allowing for a 20% non-response rate, the target sample size was 407. Ultimately, 505 eligible women were consecutively recruited through convenience sampling on Mondays, Wednesdays, and Fridays until the sample size was achieved.

2.4. Data collection procedures

Data were collected by trained investigators using standardized procedures. Eligible women admitted for delivery were informed about the study and provided written consent. Face-to-face interviews using a structured, pre-tested questionnaire captured sociodemographic, obstetric, and health-related information. Anthropometric measurements followed WHO standards. All completed questionnaires were checked daily by the research supervisor for accuracy and completeness before data entry and analysis.

2.5. Nutritional assessment tool

Nutritional status at delivery was assessed using the Ho Chi Minh City Nutrition Center's Nutritional Scale, developed in collaboration with UNICEF Viet Nam. The tool integrates anthropometric, gestational, and clinical criteria (Table 1).

Table 1: Criteria for assessing nutrition during pregnancy

Characteristic	Criteria	Score
Pre-pregnancy BMI	18.5 - 24.9 kg/m²	0
	≥ 25 kg/m²	1
	< 18.5 kg/m²	1
Mid-upper arm circumference	≥ 23 cm	0
	< 23 cm	2
Weight gain during pregnancy	Within WHO recommended range	0
	Above or below recommendation	1
Pregnancy-related conditions	None	0
	Presence of hypertension, gestational diabetes, hyperemesis, anemia, or gastrointestinal disease	1

Within the Ho Chi Minh City Nutrition Center's assessment scale, both pre-pregnancy underweight (BMI < 18.5 kg/m²) and overweight or obesity (BMI ≥ 25 kg/m²) are assigned 1 point, as each represents a deviation from optimal nutritional status. Although distinct physiological states, both extremes are consistently associated with elevated risks of adverse maternal and perinatal outcomes. Underweight reflects inadequate energy and nutrient reserves, predisposing women to intrauterine growth restriction, preterm birth, and low birth weight. Conversely, overweight and obesity are linked to metabolic and obstetric complications, including gestational diabetes, hypertensive disorders, and fetal macrosomia. These associations align with international evidence demonstrating that departures from the normal BMI range (18.5-24.9 kg/m²) increase the likelihood of unfavorable pregnancy outcomes [1, 2, 6, 7]. In this scale, a total score < 2 indicates normal nutritional status, whereas scores ≥ 2 denote nutritional risk.

2.6. Study variables

The study collected data on four groups of variables. Sociodemographic characteristics included maternal age, residence, education, occupation, ethnicity, household size, and husband's occupation. Medical history covered personal or family hypertension and diabetes. Obstetric history included parity, previous preterm birth, miscarriage or abortion, and prior birth weights. Maternal nutrition knowledge was assessed using 14 items (maximum score 17); scores ≥ 13 (≥ 75%) indicated good knowledge. Nutritional practices were evaluated with eight items (maximum score 11); scores ≥ 8.25 (≥ 75%) were classified as good practices.

2.7. Data processing and analysis

Data were analyzed using SPSS 20.0. Descriptive statistics summarized participant characteristics, while Chi-square or Fisher's exact tests assessed associations at a significance level of $\alpha = 0.05$. Variables with $p < 0.05$ in univariate analysis were entered into a multivariate logistic regression model to identify independent predictors of nutritional risk, reported as adjusted odds ratios (AORs) with 95% confidence intervals (CIs).

2.8. Ethical considerations

The study was approved by the Biomedical Research Ethics Committee, Hue University of Medicine and Pharmacy (Approval No. H2023/332, dated June 2, 2023) and the Kon Tum Provincial General Hospital. Participation was voluntary and written informed consent was obtained. Participants could withdraw at any time without affecting their medical care. Data were anonymized and used exclusively for research purposes.

III. RESULTS

3.1. General characteristics of study participants

A total of 505 pregnant women were enrolled. The mean maternal age was 26.84 ± 6.26 years (range: 18-44), with 86.9% aged < 35 years. More than half (54.5%) resided in rural areas, and 67.3% belonged to ethnic minority groups. Educational attainment was generally low, with 40.0% completing lower secondary school and only 7.5% holding a college or university degree. Most participants were farmers (57.6%), and 80.8% lived in households of 3-5 members; over half of the husbands (54.5%) were also engaged in agricultural work.

Regarding medical history, 3.0% reported personal hypertension, 4.4% reported a family history of hypertension, and diabetes was uncommon (personal: 0.4%; family: 2.4%). Obstetric history showed prior preterm birth in 1.8%, miscarriage or abortion in 9.3%, previous low-birth-weight infants in 4.0%, and macrosomia in 4.8%. Parity distribution included 34.3% primigravida, 34.7% second pregnancies, and 31.0% multigravida.

In terms of nutrition-related indicators, 65.5% of women demonstrated good knowledge and 68.9% reported good nutritional practices. Nonetheless, a substantial proportion exhibited limited nutritional literacy, particularly among rural and ethnic minority participants.

3.2. Nutritional characteristics at delivery

The majority (82.2 %) had a normal pre-pregnancy BMI, while 12.3 % were underweight and 5.5 % were overweight/obese. Most women (92.5 %) had MUAC ≥ 23 cm; however, more than two-thirds (73.3 %) had gestational weight gain outside the recommended range. Pregnancy-related complications were observed in 15.1 % of participants (Table 2).

Table 2: Nutritional characteristics of pregnant women at delivery (n = 505)

Characteristic	Category	n	%
Pre-pregnancy BMI	< 18.5 kg/m²	62	12.3
	18.5 - 24.9 kg/m²	415	82.2
	≥ 25 kg/m²	28	5.5
Mid-upper arm circumference	≥ 23 cm	467	92.5
	< 23 cm	38	7.5

Characteristic	Category	n	%
Gestational weight gain	Within recommendation	135	26.7
	Above/below recommendation	370	73.3
Pregnancy-related conditions	None	429	84.9
		76	15.1

According to the Ho Chi Minh City Nutrition Center's scale, 27.9 % of pregnant women were classified as being at nutritional risk at delivery (Table 3).

Table 3: Nutritional status of pregnant women at delivery (n = 505)

Nutritional status	n	%
At nutritional risk (≥ 2 points)	141	27.9
Normal (< 2 points)	364	72.1
Total	505	100.0

3.3. Factors associated with nutritional status

Univariate analysis identified several factors potentially related to nutritional risk, including maternal age, education, occupation, history of hypertension, and nutritional knowledge. Variables with $p < 0.05$ were entered into a multivariate logistic regression model.

In the multivariate logistic regression analysis, two factors remained significantly associated with nutritional risk. Women with a history of hypertension had markedly higher odds of nutritional risk (AOR = 4.86; 95% CI: 1.60 - 14.78; p = 0.005). Poor nutritional knowledge was also associated with increased risk (AOR = 1.56; 95% CI: 1.02 - 2.40; p = 0.042). Other variables, including maternal education and occupation, were not significantly associated with nutritional risk after adjustment (Table 3).

Table 3: Multivariate logistic regression of factors associated with nutritional risk

Variable	Category	Adjusted OR	95 % CI	p-value
History of hypertension	No	1.00	-	-
	Yes	4.86	1.60 - 14.78	0.005
Maternal nutrition knowledge	Good	1.00	-	-
	Poor	1.56	1.02 - 2.40	0.042

IV. DISCUSSION

This cross-sectional study conducted among 505 pregnant women admitted for delivery at Kon Tum Provincial General Hospital revealed that 27.9 % were at risk of nutritional disorders according to the Ho Chi Minh City Nutrition Center's nutritional scale. This prevalence is notably higher than that reported in other Vietnamese studies using the same assessment tool, such as Do Dinh Trung et al. (2021) in Binh Thuan (17.0 %) and Dong Dang Tien et al. (2022) in Cu Chi (18.3 %). The elevated prevalence in Kon Tum may be explained by its geographical and socioeconomic characteristics: a mountainous setting, a large ethnic minority population, and limited access to health and nutrition services [5]. These structural factors contribute to dietary inadequacy and delayed antenatal care key determinants of maternal undernutrition [1, 3].

In this study, 73.3 % of participants had gestational weight gain outside the recommended range, indicating that both insufficient and excessive weight gain remain significant challenges. Abnormal

gestational weight gain is a global concern and is associated with adverse outcomes such as preterm birth, gestational diabetes, hypertensive disorders, and abnormal fetal growth [6-8]. Studies in low- and middle-income countries (LMICs) suggest that the prevalence of inadequate weight gain during pregnancy may exceed 50 %, particularly in rural areas where food insecurity and limited nutritional knowledge prevail [7, 9].

Our multivariate analysis identified two independent predictors of nutritional risk: a history of hypertension and poor nutrition knowledge. Women with hypertension had 4.86 times higher odds of being nutritionally at risk than those without (95 % CI: 1.60-14.78). Hypertensive disorders during pregnancy are known to affect maternal-fetal nutrient transfer, reduce placental perfusion, and contribute to fetal growth restriction [4]. Moreover, chronic hypertension may limit dietary diversity due to the need for restricted sodium or specific food avoidance, leading to nutrient imbalance. Early dietary counseling and regular blood pressure monitoring are therefore essential components of antenatal care for these women.

Poor maternal nutritional knowledge was another significant predictor (AOR = 1.56; 95 % CI: 1.02-2.40). Consistent with prior research in Indonesia and Ethiopia, women with limited understanding of healthy dietary practices were more likely to experience nutritional inadequacy and adverse pregnancy outcomes. Educational attainment and nutrition literacy directly influence dietary behavior, food selection, and compliance with supplementation [4, 10]. Structured antenatal education programs - especially those culturally adapted for ethnic minorities can therefore play a crucial role in improving pregnancy nutrition in remote provinces such as Kon Tum. Although differences in nutritional risk were observed across education and occupation levels, these associations were not significant in multivariate analysis. This suggests that education and employment influence maternal nutrition indirectly through mediators such as income, knowledge, and health service access. These findings align with previous studies emphasizing that socioeconomic factors, though important, may be overshadowed by proximal determinants like dietary diversity and antenatal care utilization.

Overall, our results reinforce the applicability of the Ho Chi Minh City Nutrition Center's scale as a rapid and contextually appropriate screening tool for nutritional risk in pregnant women. Its integration into antenatal services could facilitate early identification and intervention for at-risk individuals, particularly in under-resourced settings.

V. CONCLUSION

Approximately one in four pregnant women admitted for delivery in Kon Tum were classified as being at nutritional risk based on the Ho Chi Minh City Nutrition Center's scale. A history of hypertension and poor maternal nutrition knowledge were significant predictors of nutritional risk. Early integration of standardized nutritional screening into antenatal care, together with targeted education and counseling for high-risk groups, is recommended to improve pregnancy outcomes. These findings underscore the need to strengthen nutrition services within provincial hospitals and primary care systems, particularly in mountainous and ethnic minority regions of Viet Nam.

Conflict of interest

The authors declare that they have no conflicts of interest related to the content of this study.

REFERENCES

1. Langley-Evans SC, Pearce J, Ellis S. Overweight, obesity and excessive weight gain in pregnancy as risk factors for adverse pregnancy outcomes: A narrative review. J Hum Nutr Diet. 2022; 35(2): 250-264.
2. Mishra KG, Bhatia V, Nayak R. Maternal Nutrition and Inadequate Gestational Weight Gain in Relation to Birth Weight: Results from a Prospective Cohort Study in India. Clin Nutr Res. 2020; 9(3): 213-222.
3. 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 (New Rochelle). 2023; 4(1): 506-516.
4. National Institute of Nutrition (Viet Nam), Nutritional assessment form developed by the Ho Chi Minh City Nutrition Center in collaboration with UNICEF. 2019, NIN: Hà Noi.

5. 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).
6. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013; 382(9890): 427-451.
7. Nguyen CL, Hoang DV, Nguyen PTH, Ha AVV, Chu TK, Pham NM, et al. Low Dietary Intakes of Essential Nutrients during Pregnancy in Vietnam. Nutrients. 2018; 10(8).
8. UNICEF, Management of nutritionally at-risk mothers and children in Viet Nam. 2020: Ha Noi.
9. Do Dinh Trung, Le van Huynh, To Mai Xuan Hong. Assessment of nutritional status using the Ho Chi Minh City Nutrition Center's scale for pregnant women at delivery in Southern Binh Thuan General Hospital. Viet Med J. 2021; 504(2).
10. Dong Dang Tien, Tran Le Thuy. Assessment of nutritional status of pregnant women at delivery in Cu Chi Regional General Hospital. Viet Med J. 2022; 520(1A).