

# Knowledge on and Understanding of Preventive Measures on Gestational Hypertension: Basis for a Health Education Model

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**Abstract:** *Background:* Gestational hypertension is a significant contributor to maternal and perinatal morbidity and mortality. Improving pregnant women's knowledge of the condition and its preventive measures is essential to promote early recognition, effective disease management, and better pregnancy outcomes. *Objectives:* This study examined pregnant women's knowledge of gestational hypertension, assessed their understanding of preventive measures, and developed a health education model based on the survey findings. *Methods:* A quantitative descriptive-correlational design was adopted. A total of 84 pregnant women diagnosed with gestational hypertension from Shucheng People's Hospital in Anhui Province were recruited by purposive sampling. Validated self-developed questionnaires were used for data collection, with Cronbach's  $\alpha$  coefficients ranging from 0.961 to 0.989. Descriptive statistics, Pearson correlation and multiple linear regression analyses were applied for data processing. *Results:* Participants possessed moderate overall knowledge of gestational hypertension regarding its causes, clinical manifestations and treatment. Obvious knowledge gaps existed in clinical features related to multiple pregnancies and chronic kidney disease. Among preventive-measure dimensions, items about prenatal check-ups and nutrition obtained the highest scores, while travel safety and gestational sexual activity had relatively lower scores. Knowledge level of gestational hypertension was positively and significantly correlated with understanding of preventive measures ( $\beta = 0.720$ ,  $*p < 0.01$ ). Family history of hypertension and gravida were significant influencing factors for knowledge level. Advanced age, higher education background, employment status and regular attendance at Hypertensive Disorders of Pregnancy (HDP) clinics were predictive of higher scores for preventive-measure comprehension. *Conclusion:* Better knowledge and preventive awareness of gestational hypertension facilitate disease management and optimize maternal-infant outcomes. A four-dimensional integrated health education model focusing on risk stratification, multimodal education, interdisciplinary-family joint support and continuous dynamic monitoring is proposed. It is recommended to optimize clinical nursing practice, embed maternal health education into nursing education curricula, and carry out large-sample multi-center studies to improve care quality for patients with gestational hypertension.

**Keywords:** Gestational hypertension; Hypertensive disorders of pregnancy (HDP); Knowledge level; Preventive measures; Health education model; Pregnant women

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# 1. Introduction

## 1.1. Background of the study

Improving maternal health remains a core global public-health priority and an important target of United Nations Sustainable Development Goal (SDG) 3, which aims to cut preventable maternal mortality and guarantee healthy life for mothers and newborns. Even with continuous progress in obstetric care worldwide, numerous pregnant women still suffer from avoidable pregnancy-related complications each year. Timely prenatal surveillance can identify and intervene in most of these adverse conditions. Pregnancy-related complications not only raise the risk of maternal illness and death, but also trigger a series of unfavorable fetal-neonatal consequences including preterm birth, fetal growth restriction and perinatal death, bringing long-term health burden and socioeconomic loss to families and communities <sup>[1]</sup>.

Gestational hypertension ranks among the top leading causes of maternal and perinatal morbidity and mortality across the globe <sup>[1]</sup>. According to WHO statistics, gestational hypertension results in roughly 42 000 preventable maternal deaths annually, accounting for 14–16% of global pregnancy-associated mortality <sup>[2]</sup>. In China, the prevalence of gestational hypertension has climbed from 4.57% in 2018 to 7.04% in 2023. Advanced maternal age, pre-pregnancy overweight and insufficient prenatal health education contribute to higher incidence in western inland regions. In accordance with 2022 diagnostic criteria released by the International Society for the Study of Hypertension in Pregnancy (ISSHP), gestational hypertension refers to newly-occurring systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg after 20 weeks of gestation among previously normotensive women, without proteinuria or end-organ damage evidence <sup>[3]</sup>. Distinct from more serious hypertensive disorders in pregnancy, gestational hypertension can be largely prevented or well-controlled by early risk screening, regular prenatal monitoring and standardized prenatal health education <sup>[2]</sup>.

Existing evidence confirms that maternal health cognition exerts critical effects on gestational hypertension prevention and pregnancy prognosis <sup>[4]</sup>. Insufficient awareness of risk factors, warning signs and self-protective behaviors acts as a modifiable risk factor for disease onset. Targeted prenatal health education represents a cost-effective strategy for lowering incidence of gestational hypertension <sup>[5]</sup>. The exact pathogenesis of gestational hypertension has not been fully clarified <sup>[6]</sup>. Considering fetal safety limits pharmacological options during gestation, clinical guidelines universally stress prevention and early intervention <sup>[7]</sup>. Therefore, enhancing pregnant women's knowledge about gestational hypertension and corresponding preventive measures is of great value for early case detection, promotion of healthy behaviors and individualized antenatal care.

Current domestic and international studies mostly focus on patients already diagnosed with gestational hypertension, attaching more importance to pharmacotherapy and inpatient nursing rather than preventive education for high-risk populations <sup>[5]</sup>. Few research teams simultaneously compare knowledge status between undiagnosed high-risk pregnant women and women living with gestational hypertension, which creates barriers to identifying differentiated educational demands. Moreover, evidence-based structured health-education models built upon real-world maternal questionnaire data are scarce <sup>[8]</sup>. Such models are urgently needed to support primary prevention for high-risk groups as well as secondary clinical management for confirmed patients. Filling these research gaps will greatly promote preventive maternal healthcare and clinical nursing practice.

For the above reasons, this research investigates knowledge level and preventive-measure understanding among high-risk pregnant women and patients diagnosed with gestational hypertension. On the basis of

empirical survey data, this study constructs a stratified evidence-based health education model, helping obstetric nurses deliver patient-centered individualized prenatal education, improve preventive maternal health service quality and achieve better maternal-neonatal outcomes.

## 1.2. Statement of the problem

Gestational hypertension severely threatens maternal and fetal safety and contributes greatly to maternal-perinatal adverse events<sup>[1]</sup>. Its etiology is multifactorial, jointly influenced by diverse maternal and environmental elements. Exploring pregnant women's mastery of gestational-hypertension-related knowledge and standardized preventive measures can produce empirical foundations for targeted nursing interventions and reduce disease occurrence. This study evaluates participants' knowledge and preventive cognition. Survey findings serve as empirical basis for developing a stratified health-education model. It should be noted that the health-education model is the final output of this project instead of a statistical hypothesis waiting for testing.

Six concrete research questions are put forward as follows:

- (1) What is the demographic profile of participants in terms of:
  - ① ☐ maternal age
  - ② ☐ current gestational age
  - ③ ☐ gravida (total lifetime pregnancies) and parity (number of live births)
  - ④ ☐ educational attainment
  - ⑤ ☐ monthly household income
  - ⑥ ☐ occupation
  - ⑦ ☐ familial history of hypertensive disorders in pregnancy
- (2) What is the level of knowledge of pregnant women on gestational hypertension as to:
  - ① ☐ the causes
  - ② ☐ signs and symptoms
  - ③ ☐ identification of severe maternal-fetal complications
  - ④ ☐ fundamental principles of gestational hypertension prevention
- (3) What is the participants' level of understanding of preventive measures for gestational hypertension in terms of:
  - ① ☐ regular prenatal check-up compliance
  - ② ☐ balanced gestational nutrition management
  - ③ ☐ safe gestational physical exercise
  - ④ ☐ scientific sleep schedule
  - ⑤ ☐ safe gestational sexual activity guidance
  - ⑥ ☐ reasonable pregnancy travel arrangements
  - ⑦ ☐ appropriate occupational adjustments during pregnancy
  - ⑧ ☐ standardized medication guidance and drug safety precautions

- (4) Is there a significant relationship between the participants' level of knowledge and level of understanding of preventive measures for gestational hypertension?
- (5) Is there a significant difference in the level of knowledge on gestational hypertension when the participants are grouped according to:
  - ① ⊖ their demographic profile
  - ② ⊖ the associated clinical characteristics of gestational hypertension
- (6) Is there a significant difference in the level of understanding of preventive measures for gestational hypertension when subjects are grouped according to:
  - ① ⊖ their demographic profile
  - ② ⊖ the associated clinical characteristics of gestational hypertension

### **1.3. Significance of the study**

The findings of this research help improve pregnant women's awareness of gestational hypertension and standardize their preventive behaviors during early gestation. The study yields theoretical and practical value for clinical nursing service, nursing education, and nursing research as follows:

#### **1.3.1. Nursing service**

This study enables obstetric nurses to formulate individualized, evidence-based care plans tailored to participants' clinical manifestations and cognitive levels of gestational hypertension prevention. The stratified health education model developed in this research can act as a standardized clinical guide for managing pregnant women with gestational hypertension. Furthermore, the research results can comprehensively elevate overall obstetric care quality, reduce maternal-fetal adverse events, and strengthen patient safety and long-term gestational health outcomes. The model can be embedded into hospital routine obstetric workflows to update clinical prenatal education protocols and build standardized training materials for frontline nurses, providing reliable evidence to support hospital obstetric risk management policies and regular vocational training. All survey data provides localized real-world evidence to advance evidence-based nursing interventions for gestational hypertension prevention.

#### **1.3.2. Nursing education**

The findings of this study can be integrated into the Maternal and Child Health Nursing curriculum, particularly in prenatal and high-risk pregnancy care. Nursing educators may use the results to develop innovative teaching strategies, such as simulation, case-based learning, and technology-enhanced education. These approaches can strengthen nursing students' clinical skills, critical thinking, patient education, and evidence-based practice while reinforcing patient-centered professional values. The proposed health education model also serves as a practical framework for teaching effective maternal health education. Furthermore, the study supports competency-based nursing education and aligns with national and international standards for preparing nurses to provide safe, high-quality care for women with gestational hypertension.

#### **1.3.3. Nursing research**

The findings of this study provide baseline data for future local and international research on gestational hypertension prevention. The researcher-developed questionnaire and health education framework offer

useful tools for future nursing studies and may guide the development of evidence-based clinical guidelines and maternal health policies. Furthermore, the study promotes research engagement among nurses by encouraging participation in preventive nursing research and supports their continuous professional development through the application of evidence-based practice.

#### **1.4. Scope and limitations of the study**

This study employed a cross-sectional quantitative design to assess pregnant women's knowledge of gestational hypertension and their understanding of standardized preventive measures <sup>[9]</sup>. Based on the findings, a stratified health education model was developed to provide differentiated educational guidance for two groups:

- (1) high-risk pregnant women without gestational hypertension
- (2) women diagnosed with gestational hypertension.

The study was conducted at Shucheng People's Hospital, a tertiary hospital in Anhui Province, China, over a four-week period in November 2025. Participants were recruited through purposive sampling and selected according to the established inclusion and exclusion criteria. Data were collected using a validated researcher-developed questionnaire to determine participants' knowledge of gestational hypertension, understanding of preventive measures, and the demographic and obstetric factors associated with these variables.

Several limitations should be considered when interpreting the findings. First, the use of a cross-sectional design limited the study to assessing participants' knowledge and understanding at a single point during pregnancy. Consequently, causal relationships could not be established, changes in knowledge and self-management behaviors over time could not be examined, and the effectiveness of the proposed health education model could not be evaluated because it was developed from survey findings rather than tested through clinical intervention.

Second, the use of purposive sampling from a single tertiary hospital may have introduced selection bias and limited the representativeness of the sample. Variations in outpatient attendance and participants' willingness to complete the questionnaire may have further influenced participant recruitment. As a result, the findings may not be generalizable to pregnant women receiving care in community health centers, rural healthcare facilities, or institutions with different healthcare systems and patient populations.

Third, data were obtained through a self-administered questionnaire, making the study susceptible to recall bias, social desirability bias, and inaccurate self-reporting. Although the questionnaire demonstrated excellent reliability, participants' educational backgrounds, literacy levels, and interpretation of survey items may have influenced response accuracy <sup>[10]</sup>. Environmental distractions during data collection, despite the use of a quiet room, and practical constraints within the clinical setting may also have affected questionnaire completion.

Finally, time, resource, ethical, and methodological constraints influenced the scope of the investigation. Data collection was completed within a four-week period using available personnel and resources, limiting sample expansion and long-term follow-up. To protect participants' privacy and minimize respondent burden, sensitive personal information was not comprehensively explored. Moreover, the study examined only selected demographic and obstetric variables. Other factors, such as health literacy, socioeconomic status, cultural beliefs, family and social support, previous health education, and access to healthcare resources,

were beyond the researcher's control and may have influenced participants' knowledge and understanding of gestational hypertension.

Despite these limitations, the study provides valuable baseline evidence on pregnant women's knowledge of gestational hypertension and preventive measures. The findings offer an evidence-based foundation for the proposed stratified health education model and contribute to future nursing research, maternal health education, clinical practice, and policy initiatives aimed at improving the prevention and management of gestational hypertension.

### **1.5. Clear research gap clarification**

Three prominent gaps in existing domestic and international research are addressed in this study:

- (1) Most prior studies only recruit patients diagnosed with gestational hypertension and exclude undiagnosed high-risk pregnant women, lacking comparative analysis of prevention knowledge between the two populations <sup>[4]</sup>.
- (2) Existing literature largely focuses on post-onset treatment and inpatient nursing interventions, with insufficient systematic investigation into maternal baseline knowledge and understanding of prenatal preventive strategies <sup>[5]</sup>.
- (3) Few localized stratified health education frameworks are developed based on real maternal cognitive survey data to provide differentiated primary prevention for high-risk women and secondary clinical management for diagnosed patients <sup>[8]</sup>.

### **1.6. Definition of independent and dependent variables**

#### **1.6.1. Independent variables**

- (1) Demographic characteristics: maternal age, gestational age, gravida, parity, educational attainment, monthly household income, occupation.
- (2) Clinical associated characteristics: family hypertension history, gestational weight, negative prenatal mood, prenatal check-up compliance.

#### **1.6.2. Dependent variables**

- (1) Level of knowledge about gestational hypertension
- (2) Level of comprehension of gestational hypertension preventive measures

#### **1.6.3. Adaptability explanation of the proposed health education model**

Although data are collected from both high-risk undiagnosed participants and diagnosed patients, the stratified health education model contains two differentiated modules to cover the research goal of primary prevention:

- (1) Primary prevention module for high-risk pregnant women without gestational hypertension: focusing on early risk screening, lifestyle adjustment and regular prenatal monitoring to avoid disease onset.
- (2) Secondary management module for diagnosed gestational hypertension patients: focusing on symptom monitoring, complication prevention and safe daily self-management. The dual-module design ensures the model can be applied to all target groups rather than only women with confirmed gestational hypertension.

## **2. Review of related literature**

### **2.1. Knowledge on gestational hypertension**

Gestational hypertension remains one of the most severe pregnancy-related complications worldwide, contributing to high maternal-neonatal morbidity and mortality <sup>[1]</sup>. Digital-health-education modes have proven effective for improving maternal awareness <sup>[11]</sup>. Mobile health applications and online prenatal courses can enhance pregnant women's mastery of blood-pressure monitoring, warning-sign recognition and preventive interventions, which brings special benefits for residents of remote areas with scarce medical resources.

Domestic and foreign scholars have launched abundant Knowledge-Attitude-Practice (KAP) cross-sectional surveys targeting gestational-hypertension awareness among gravidas <sup>[12]</sup>. International research demonstrates that most childbearing-age women hold incomplete cognition of disease warning manifestations and daily preventive behaviors; insufficient knowledge directly reduces self-management compliance <sup>[4]</sup>. Domestic cohort surveys also report that Chinese pregnant women generally obtain moderate scores on gestational-hypertension knowledge, and disease cognition is positively correlated with mastery of preventive measures <sup>[8]</sup>. Nevertheless, most domestic studies test knowledge or practice dimension separately. Investigations that simultaneously measure and analyze both disease knowledge and preventive-measure comprehension are relatively rare, forming the core research gap this study intends to fill.

### **2.2. Treatment of hypertension in pregnancy**

Therapy for gestational hypertension is not limited to blood-pressure control; comprehensive multidisciplinary care is required to prevent maternal-fetal severe complications such as severe preeclampsia, eclampsia and placental abruption. Current clinical interventions consist of antihypertensive medication, intensive maternal-fetal monitoring, lifestyle modification, psychological support and timely delivery when necessary <sup>[7]</sup>.

Growing research evidence reveals the connection between psychological stress and hypertensive disorders in pregnancy <sup>[13]</sup>. Anxiety, depression and emotional stress activate neuroendocrine responses and cause vasoconstriction and blood-pressure elevation. Patients suffering from gestational hypertension often experience fear for fetal safety and delivery risks. Unrelieved negative emotion will deteriorate physical condition. Compared with normotensive pregnant women, women with gestational hypertension exhibit significantly higher prenatal-anxiety level <sup>[13]</sup>. Hence psychological counseling and mental-health intervention constitute indispensable segments of obstetric care.

Patient-centered individualized nursing interventions produce favorable maternal outcomes <sup>[14]</sup>. Health education, emotional counseling, dietary guidance and continuous monitoring can elevate pregnant women's gestational-hypertension knowledge and relieve maternal anxiety. Subjects receiving regular nursing support achieve better treatment adherence and self-care performance. Health-education interventions improve gravidas' understanding of medication compliance, dietary management, warning-sign identification and blood-pressure surveillance. Sufficient disease knowledge enables pregnant women to participate actively in self-care and make informed health-related decisions.

Multidisciplinary teamwork involving obstetricians, nurses, dietitians and mental-health professionals optimizes management effects for hypertensive disorders in pregnancy, covering both physiological and psychological needs of patients. Lifestyle modification acts as fundamental therapeutic component: healthy dietary pattern with low sodium and sufficient high-quality protein, moderate physical activity and

adequate rest contribute to stable blood-pressure control and lower complication risk <sup>[7]</sup>. WHO highlights the importance of regular prenatal surveillance, timely referral of high-risk pregnancies and continuous maternal education for reducing mortality caused by gestational hypertension <sup>[2]</sup>. Pregnant women ought to receive systematic popularization of danger signs, medication requirements and the significance of routine antenatal visits.

### 2.3. Prevention of hypertension in pregnancy

Multimodal preventive strategies for hypertensive disorders of pregnancy cover routine antenatal surveillance, standardized blood-pressure screening, individualized nutrition guidance, structured physical activity, psychological-stress regulation and systematic risk stratification <sup>[15]</sup>. WHO recommends no less than eight scheduled antenatal visits throughout gestation to detect abnormal blood pressure early and mitigate severe maternal-fetal adverse events <sup>[2]</sup>. Targeted prenatal health education is recognized as cost-effective primary-prevention measure across global maternity-care research <sup>[5]</sup>. Pregnant women receiving integrated education about modifiable risk factors, warning manifestations and evidence-based self-management show better adherence to gestational-hypertension prevention protocols. Clinicians should deliver priority-tailored counseling for advanced-age, obese and multiparous patients to strengthen their awareness of early preventive care.

In accordance with updated ACOG clinical guidance, scheduled blood-pressure monitoring commencing from early pregnancy serves as core screening measure <sup>[16]</sup>. Pregnant individuals with positive family history of hypertension, pre-pregnancy obesity, multiple gestation or persistent prenatal anxiety need intensified antenatal assessment frequency to capture emerging gestational-hypertension signals timely. Nutritional adjustment occupies foundational preventive status. Calcium, magnesium and potassium supplementation together with low-sodium high-protein dietary pattern can regulate vascular endothelial function and decrease risk of gestational blood-pressure rise <sup>[15]</sup>. Reasonable gestational-weight control is vital for patients with pre-pregnancy overweight. Moderate standardized physical exercise improves peripheral vascular compliance during pregnancy <sup>[17]</sup>; sedentary lifestyle correlates with higher incidence of hypertensive disorders. Individualized low-intensity exercise schemes are advised for low-risk pregnant populations without contraindications.

Numerous cross-sectional and cohort studies confirm demographic, physiological and psychological predictive factors for gestational hypertension: maternal age  $\geq 35$  years old, pre-pregnancy BMI  $\geq 24$  kg/m<sup>2</sup>, multiparity, inadequate prenatal nutrition, sedentary habit, poor sleep quality, sustained prenatal anxiety and irregular antenatal attendance <sup>[4]</sup>. Though risk-screening workflows have been widely applied in prenatal settings, existing literature puts excessive emphasis on pathological-mechanism exploration. Research treating maternal subjective health cognition as mediating variable linking risk exposure and disease onset remains insufficient. Few domestic KAP surveys quantitatively measure disease knowledge together with multi-dimensional preventive cognition so as to support stratified prenatal-education design <sup>[8]</sup>.

### 2.4. Synthesis of literature review

Three major research streams about gestational-hypertension are summarized: pathological-risk-factor exploration, clinical therapeutic regimen research and population-oriented preventive-intervention studies. By comparing domestic and international literature, four key research gaps are identified. First, research-content bias: most existing publications explore pathogenesis and post-diagnosis treatment, while quantitative

research focusing on pre-disease knowledge and preventive cognition among high-risk pregnant women is scarce <sup>[5]</sup>. Second, insufficient integrated-variable analysis: unified analytical frameworks incorporating demographic background, disease knowledge, preventive cognition and self-management behavior are rarely constructed; internal correlation among core variables remains underexplored. Third, shortage of localized intervention models: traditional health education follows one-size-fits-all popularization mode, lacking risk-stratified educational schemes matching cognitive characteristics of Chinese pregnant women <sup>[8]</sup>. Fourth, inadequate subgroup-comparison research: domestic studies seldom contrast knowledge and preventive-cognition differences across subgroups divided by age, education and parity, failing to supply targeted nursing references for clinical practitioners.

Guided by these four gaps, this study selects Nola Pender's Health Promotion Model as theoretical basis <sup>[18]</sup>. Through questionnaire-based quantitative survey and inter-group statistical comparison, this paper evaluates pregnant women's gestational-hypertension knowledge and preventive cognition, analyzes subgroup differences of core cognitive indicators, and finally develops a risk-stratified health-education model suitable for grassroots obstetric nursing in China.

## 2.5. Theoretical framework

Nola J. Pender's Health Promotion Model (HPM) is adopted as exclusive theoretical framework for this investigation <sup>[18]</sup>. The HPM explains influencing factors of health-promoting behaviors and fits well for studying pregnant women's knowledge and preventive practice concerning gestational hypertension. Distinct from general psychological-motivation theories, HPM focuses on formation process of clinical population's health-promotion behaviors. Its multi-layer logical structure matches variable setting of this gestational-hypertension-prevention research perfectly. Several recent obstetric-nursing studies targeting gestational-hypertension have verified such theoretical-matching relationship.

The core logical chain of Pender's HPM includes three layers: individual characteristic and risk-background factors; behavior-specific cognition and self-efficacy; health-promotion behaviors driven by intervention measures. Adapted for gestational-hypertension-prevention scenario, the transmission path is "demographic background factors → gestational-hypertension knowledge level → gestational-hypertension preventive cognition → nursing stratified-health-education intervention → maternal self-management behaviors → final research and clinical outcomes". Each layer corresponds exactly to research variables in this survey.

Individual & Risk Background Factors represent exogenous independent variables, covering maternal age, gestational age, parity, education level, family income, pre-pregnancy BMI, family hypertension genetic history, prenatal psychological stress and adverse obstetric history. These demographic and risk characteristics produce baseline divergence in pregnant women's acquisition of gestational-hypertension knowledge and formation of preventive cognition.

Behavior-Specific Cognitions & Self-Efficacy constitute core research variables measured by questionnaires, containing two dimensions: gestational-hypertension knowledge level (19-item scale covering etiology, clinical signs, hazards and treatment); gestational-hypertension preventive-cognition level (61-item multi-dimensional scale involving prenatal examination, diet, exercise, sleep and other preventive behaviors). Auxiliary cognitive variables include perceived disease risk, perceived preventive benefits-barriers, family support and accessibility of medical resources, which reflect maternal self-efficacy. Interactive correlation

between knowledge level and preventive cognition serves as central research hypothesis of this study.

Modifiable Nursing Intervention is intervening variable. Based on cognitive defects and risk stratification identified from questionnaire data, nurses implement targeted measures: risk-stratified classified health education, one-on-one personalized prenatal counseling, multidisciplinary joint guidance of obstetrics-nutrition-psychological team, and digital-oriented maternal-health popularization.

Intermediate Behavioral Outcomes stand for dependent behavioral variables. Driven by sufficient gestational-hypertension knowledge and positive preventive cognition, pregnant women form standardized self-management behaviors: active home blood-pressure self-monitoring, long-term normalized daily-lifestyle management, and timely medical consultation once warning symptoms emerge.

Final Research & Clinical Outcomes are expected results. Theoretically, this research constructs localized risk-stratified gestational-hypertension health-education model adapted for Chinese pregnant women. Clinically, the model can lower overall gestational-hypertension incidence, reduce severe maternal-fetal complication risks and improve standardized perinatal-nursing quality in primary-level medical institutions.

All questionnaire indicators of this survey conform to adapted HPM logic, linking maternal background, cognitive level and stratified-nursing-intervention into one integrated analytical system. Three null hypotheses are derived from layered logic of HPM:

H<sub>01</sub>: There is no significant relationship between subjects' knowledge level and their understanding of preventive measures for gestational hypertension.

H<sub>02</sub>: There is no significant difference in gestational-hypertension knowledge level when subjects are grouped by profile variables.

H<sub>03</sub>: There is no significant difference in comprehension level of preventive measures for gestational hypertension when subjects are grouped by profile variables.

### **3. Research methodology**

#### **3.1. Research design**

This study applies quantitative descriptive-correlational research design <sup>[9]</sup>. Descriptive quantitative research is suitable for systematically measuring and describing knowledge level and preventive-measure understanding of pregnant women via numerical data and statistical inference. Correlational design explores relationships among variables without manual manipulation, which helps judge whether higher knowledge level correlates with better mastery of preventive measures. Meanwhile, it identifies demographic and clinical factors influencing cognition status, providing empirical basis for constructing gestational-hypertension-oriented health-education model.

#### **3.2. Population and sample**

Research subjects are pregnant women clinically diagnosed with gestational hypertension, recruited by purposive sampling. A-priori power analysis was finished before subject enrollment. Preset parameters: medium effect size = 0.4,  $\alpha = 0.05$ , statistical power = 0.80. Calculation output shows minimum required sample size = 84 participants. Eighty-four valid questionnaires were collected after eliminating incomplete and invalid copies, satisfying pre-calculated sample requirement.

### 3.2.1. Inclusion criteria

- (1) Aged  $\geq 18$  years old;
- (2) Gestational age  $\geq 20$  weeks;
- (3) Clinically diagnosed with gestational hypertension by obstetric physicians;
- (4) Possess basic literacy to independently finish self-administered questionnaire;
- (5) Voluntarily sign written informed consent for participation.

### 3.2.2. Exclusion criteria

- (1) Suffering from essential hypertension or diabetes mellitus;
- (2) Combined with heart, liver, kidney and other vital-organ diseases;
- (3) Visual-auditory impairment or intellectual disorder;
- (4) Mental-illness history;
- (5) Unable to cooperate with nursing work effectively;
- (6) Having other pregnancy-related complications besides gestational hypertension;
- (7) Recurrent-abortion, premature-delivery or drug-abuse history;
- (8) Exposure to hazardous substances or viral infection during pregnancy.

## 3.3. Research locale

Investigation took place in Shucheng People's Hospital, a tertiary-level general hospital located in Anhui Province. Its Department of Obstetrics and Gynecology is key clinical department, and the hospital is the unique national high-risk-maternal-monitoring unit within Lu'an city. It supplies comprehensive maternal-health services including prenatal education, prenatal screening, mother-infant school programs, prenatal diagnosis and high-risk-pregnancy management.

## 3.4. Research instrument

Self-designed four-point Likert-style questionnaire serves as main data-collecting tool, consisting of three sections. Section 1 collects participants' demographic profile. Section 2 is 19-item knowledge scale for gestational hypertension, investigating etiology, clinical signs, medication and treatment, with scoring from 1(low knowledge) to 4(high knowledge). Section 3 is 61-item scale assessing comprehension of preventive measures, covering regular prenatal check-ups, nutrition, physical exercise, sleep, sexual activity, travel and occupational adjustment; scoring ranges from 1(low understanding) to 4(high understanding).

Three experts conducted content validation: one senior obstetrics-gynecology chief physician, one maternal-child-nursing associate professor (master supervisor), and one obstetric-ward head nurse with rich clinical health-education experience. Experts scored each item on relevance, clarity and rationality, raised revision suggestions for ambiguous statements concerning sexual activity, travel and occupational-prevention items. Questionnaire was revised twice according to expert feedback before formal pilot test. Pilot test was performed on 12 eligible gestational-hypertension pregnant women; pilot-sample data were not incorporated into formal analysis dataset. Four ambiguous items in preventive-practice scale were rephrased after pilot-test feedback. Patient medical-chart documentary analysis was also conducted to obtain obstetric-history, blood-test and vital-sign clinical information.

Reliability test: Cronbach's  $\alpha$  of preventive-measure dimension = 0.989; Cronbach's  $\alpha$  of knowledge dimension = 0.961. Both values far exceed acceptable threshold 0.7, indicating excellent internal consistency

<sup>[10]</sup>. Validity test: preventive-measure scale KMO = 0.878, Bartlett sphericity test  $\chi^2 = 5552.555$ , df = 1953,  $*p^* < 0.001$ ; knowledge-level scale KMO = 0.945, Bartlett sphericity test  $\chi^2 = 1188.538$ , df = 171,  $*p^* < 0.001$ . KMO values above 0.8 prove good suitability for factor analysis; significant Bartlett test results confirm correlation among items and satisfactory construct validity <sup>[12]</sup>.

### 3.5. Data-gathering procedure

Firstly, obtain academic-ethical approval from Far Eastern University Institute of Nursing and administrative permission from Shucheng People's Hospital. Secondly, outpatient-clinic nurses screen eligible pregnant women according to inclusion-exclusion criteria with non-probabilistic purposive sampling. Thirdly, fully inform participants of research purpose, procedure, benefit and safety guarantee. Subjects sign written informed consent under the premise of knowing that they have a right to withdraw at any time without damaging routine medical service. Fourthly, four-week on-site questionnaire distribution is carried out after prenatal consultation. Filling time is controlled within 30 minutes. Invalid incomplete questionnaires are eliminated. All data are anonymized with coding and kept strictly confidential only for academic research. Fifthly, valid data are imported into Microsoft Excel for sorting and preliminary cleaning. Finally, processed dataset is imported into IBM SPSS Statistics for statistical analysis.

### 3.6. Statistical treatment of data

Descriptive statistics (frequency, percentage, mean, standard deviation) are used to describe demographic-clinical profile, knowledge level and preventive-measure comprehension level. Pearson-correlation test is adopted to examine correlation between knowledge score and preventive-measure-understanding score. One-way ANOVA and independent-samples *t*-test are utilized to compare score differences among subgroups divided by demographic and clinical-associated characteristics. Multiple linear regression is performed to screen independent influencing factors for knowledge level. Pre-designed statistical-analysis templates are completed before data collection to avoid missing key indicators <sup>[9]</sup>.

### 3.7. Ethical considerations

This study possesses obvious social value by generating evidence for gestational-hypertension-oriented health-education model and improving obstetric-nursing quality. Pregnant women are classified as vulnerable research subjects for medical, cognitive, socioeconomic and power-imbalance reasons. The research only uses paper self-administered questionnaires, without invasive examination or clinical intervention. Physical risk for participants is extremely low. Participation is completely voluntary. No monetary reward is provided for enrollment. Small practical pregnancy-care gifts are offered merely as gratitude for subjects' time.

All identifying information such as name and contact details is not recorded on questionnaires. Subjects are distinguished by unique coding to guarantee anonymity. Researcher treats every participant equally and fairly without discrimination. Full-procedure informed consent is implemented. Conflict-of-interest self-disclosure is completed: this cross-sectional survey receives no external commercial funding, pharmaceutical-enterprise sponsorship or special hospital research grant. Questionnaire design, data collection and statistical analysis are independently finished without third-party interference.

Data security management: identifying personal information is stored in separate AES-256-encrypted database, physically isolated from de-identified research data. Grade-authorization access-control mechanism is executed. All researchers sign confidentiality agreement. Research data will be preserved for

five years after study completion and destroyed via physical shredding and secure digital overwriting upon retention-period expiration under ethics-committee supervision.

## 4. Results and discussion

### 4.1. Results

Eighty-four participants clinically diagnosed with gestational hypertension finished valid questionnaires. Thirty-three subjects were older than 35 years old, accounting for 39.29% of total sample. Nearly 45.24% respondents held bachelor's degree or above. Diversified distribution existed in occupation, household monthly income, parity and fetal quantity.

Participants obtained moderate-to-high scores on gestational-hypertension knowledge. Highest-scoring risk-factor item was autoimmune-disease-related risk ( $M = 3.631$ ,  $SD = 1.159$ ). Multiple-pregnancy-related risk acquired lowest mean value ( $M = 3.417$ ,  $SD = 1.273$ ); chronic-kidney-disease-related characteristic had maximum standard deviation ( $SD = 1.427$ ), reflecting huge individual cognitive divergence. For symptom-identification dimension, high-blood-pressure indicator gained highest score ( $M = 3.726$ ,  $SD = 1.320$ ), while visual-abnormality warning sign got relatively low score ( $M = 3.476$ ,  $SD = 1.256$ ). Concerning treatment-care measures, subjects understood the necessity of drug therapy well ( $M = 3.690$ ,  $SD = 1.251$ ), but cognition about monitoring frequency was insufficient ( $M = 3.536$ ,  $SD = 1.330$ ).

In preventive-measure dimension, prenatal-check-up and nutrition-management items achieved higher scores. In contrast, travel-safety and gestational-sexual-activity-guidance items had lower comprehension scores. There existed obvious cognitive blind spots: Valsalva-maneuver risk during physical exercise, pre-exercise fluid-replenishment requirement, travel-emergency-medical-resource preparation and supine-hypotensive-syndrome risk during rest.

Pearson correlation test rejects  $H_{01}$ : significant strong positive correlation between gestational-hypertension-knowledge total score and preventive-measure-understanding total score ( $r = 0.720$ ,  $p < 0.001$ ). Multiple-linear-regression model was statistically significant ( $F = 4.508$ ,  $p < 0.001$ , adjusted  $R^2 = 0.388$ ). Number of fetuses presented significant negative predictive effect for knowledge level ( $B = -0.296$ ,  $p = 0.046$ ). One-way ANOVA partially rejects  $H_{02}$  and  $H_{03}$ : significant score differences among subgroups divided by age, education, employment status, household income, parity, hypertension-family-history and clinical-intervention-receiving status ( $p < 0.05$ ). No statistically-significant inter-group difference was found according to fetal quantity ( $p > 0.05$ ). Subjects with advanced age, higher education background, employment experience, positive hypertension-family-history and receiving specialized HDP-clinic service obtained significantly higher knowledge and preventive-cognition scores.

### 4.2. Discussion

Participants' overall knowledge and preventive-cognition remained at moderate level, with prominent cognitive weak points in multiple-pregnancy risk, atypical preeclampsia ocular warning signs and partial exercise-safety specifications. The strong positive correlation between disease knowledge and preventive-measure understanding is consistent with core proposition of Nola Pender's Health Promotion Model, which states behavior-specific cognition serves as prerequisite for health-promotion behaviors<sup>[18]</sup>. Multiple-fetus pregnancy predicts lower knowledge score possibly because antenatal care for multiple-gestation patients focuses heavily on fetal-growth surveillance while ignoring

gestational-hypertension-risk popularization.

Obvious subgroup cognitive stratification was observed. Advanced-age, well-educated, employed and high-income pregnant women owned better cognitive performance, which can be explained by richer pregnancy-related experience, stronger health-information-acquisition capacity and more adequate health-resource access. Subjects who received complication-related health education, owned home blood-pressure monitor and attended HDP specialized outpatient clinic achieved higher cognition scores, which directly proves the effectiveness of clinical prenatal-education intervention. It is worth noticing that participants with adverse obstetric-history showed relatively low cognition scores, possibly resulting from psychological avoidance coping toward pregnancy-complication-related information<sup>[13]</sup>.

Based on empirical survey outcomes, this study constructs four-dimensional integrated health-education model for gestational-hypertension:

- (1) Risk-stratified individualized baseline assessment: classify pregnant women into high-risk, intermediate-risk and low-risk groups according to age, education, obstetric-history, family-disease-history and fetal quantity, so as to deliver differentiated educational content;
- (2) Precise modular phased health-education system: set up basic-disease-cognition module, self-management-skill module and emergency-warning-identification module, adjust educational emphasis following different gestational stages;
- (3) Multi-dimensional social-technical-support system: build interdisciplinary-cooperation team consisting of obstetricians, specialized nurses, dietitians and psychological counselors; develop digital maternal-health tools; promote family-member joint-participation mode;
- (4) Dynamic-monitoring closed-loop quality-improvement mechanism: construct home-community-hospital three-tier monitoring network, adopt knowledge-behavior-clinical-outcome three-dimensional evaluation system and form “assessment-intervention-reassessment” closed-loop management<sup>[15]</sup>.

### 4.3. Limitations

This investigation has several methodological shortcomings. First, single-center purposive-sampling limits external validity of research outcomes. Second, cross-sectional design cannot demonstrate causal relationships among variables<sup>[9]</sup>. Third, sample size of multiple-pregnancy subgroup is small, reducing statistical stability of subgroup-comparison results. Fourth, prenatal-anxiety and psychological-stress indicators are not incorporated into analytical framework. Fifth, the four-dimensional health-education model is built from cross-sectional questionnaire data, without prospective-intervention verification of actual clinical effect. Future multi-center large-sample longitudinal research, psychological-variable-involved comprehensive investigation and randomized-controlled-trial verification for intervention-model effect are urgently needed<sup>[5]</sup>.

## 5. Summary, conclusions, and recommendations

### 5.1. Summary

This descriptive-correlational cross-sectional study adopted purposive sampling to recruit 84 gestational-hypertension-diagnosed outpatients from one Anhui tertiary-level hospital. Self-compiled 19-item knowledge scale (Cronbach's  $\alpha = 0.961$ ) and 61-item preventive-measure-comprehension scale (Cronbach's  $\alpha = 0.989$ ) with satisfactory construct validity were used for data collection<sup>[10,12]</sup>. Descriptive statistics, Pearson correlation,

multiple linear regression and one-way ANOVA were applied for hypothesis testing. A four-dimensional stratified health-education framework was established on the basis of inter-group cognitive-difference statistics.

Hypothesis testing results:  $H_{01}$  was rejected (strong positive correlation existed between knowledge and preventive-measure-understanding,  $r = 0.720$ ,  $p < 0.001$ ).  $H_{02}$  and  $H_{03}$  were partially rejected: most demographic-clinical subgroups displayed significant score differences, while fetal quantity did not produce statistically-significant score variance.

## 5.2. Conclusions

- (1) The sample covered diversified distribution in age, education, household income, parity and clinical-risk indicators. Different subgroups possessed differentiated baseline background features relevant to gestational hypertension.
- (2) Participants' overall knowledge of gestational hypertension stayed at moderate level. Distinct knowledge gaps existed in risks of multiple gestation, chronic-kidney-disease-related risk factors and atypical ocular warning signs of severe preeclampsia <sup>[4]</sup>.
- (3) Participants' mastery of seven categories of preventive behaviors was uneven. Cognitive deficiencies concentrated in exercise-safety knowledge, travel-emergency preparation and standardized rest-posture requirements <sup>[17]</sup>.
- (4) Significant strong positive linear statistical association existed between gestational-hypertension-knowledge total score and preventive-measure-comprehension total score within this sample.
- (5) Statistically-significant knowledge-score differences existed among subgroups divided by age, education, occupation, household income, parity and hypertension-family-history; fetal quantity showed no significant inter-group difference <sup>[4]</sup>.
- (6) Preventive-measure-comprehension scores presented remarkable disparities across most demographic-clinical subgroups; fetal grouping brought no statistical difference.
- (7) Variable-correlation relationships observed in this sample conform to core logical path of Nola Pender's Health Promotion Model, supplying localized cross-sectional evidence for model application in Chinese gestational-hypertension-oriented obstetric-nursing research <sup>[18]</sup>.

## 5.3. Implications

### 5.3.1. Clinical nursing

The four-dimensional stratified-education framework summarized from sample cognitive characteristics can provide reference for obstetric-nursing staff to design prenatal-guidance content <sup>[14]</sup>. Special attention should be paid to low-cognition subgroups: young gravidas, low-educational-level patients, unemployed pregnant women and primiparas. Common cognitive blind-spots discovered in this survey ought to be supplemented into routine prenatal-popularization content <sup>[5]</sup>.

### 5.3.2. Nursing teaching

Cognitive-gap data obtained from this research can serve as supplementary teaching material for Maternal-Child-Health-Nursing curriculum. Teachers may organize scenario-simulation training aiming at diversified cognitive demands of high-risk-pregnancy subgroups.

### 5.3.3. Nursing research

Two validated self-developed measurement scales can be reused for future domestic cross-sectional surveys on maternal gestational-hypertension-health-literacy <sup>[8]</sup>. Correlation and subgroup-difference statistics offer baseline descriptive data for subsequent observational studies.

## 5.4. Recommendations

### 5.4.1. For clinical-nursing settings

Clinicians may carry out targeted supplementary prenatal counseling for low-cognition subgroups according to sample-summarized cognitive characteristics. Cognitive blind-spots including multiple-gestation risk, exercise safety and travel-emergency management can be added into regular health-education content <sup>[2]</sup>. Medical institutions may choose to pilot-apply the four-dimensional health-education framework under research-project arrangement instead of directly taking it as universal mandatory clinical protocol.

### 5.4.2. For nursing education

Nursing colleges can incorporate survey-derived cognitive-gap data into Maternal-Child-Health-Nursing teaching. Educators may flexibly use seven preventive-measure dimensions concluded in this paper for scenario-simulation-teaching design.

### 5.4.3. For future nursing research

Multi-center longitudinal surveys should be conducted to verify whether variable-correlation relationships discovered in this single-center sample exist in broader pregnant-woman populations <sup>[5]</sup>. Randomized-controlled trials are required to test real-intervention effectiveness of the proposed four-dimensional education model. Researchers can add prenatal-anxiety and other psychological variables into analytical framework <sup>[13]</sup>. Shortened screening versions of original multi-item scales can be developed to satisfy rapid-assessment demands in outpatient scenarios <sup>[12]</sup>. Regional comparative investigations across different-grade medical institutions are encouraged to enrich domestic baseline data of gestational-hypertension-related maternal cognition <sup>[8]</sup>.

## Disclosure statement

The authors declare no conflict of interest.

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