

The Effects of Acupressure on Vomiting, Stress, and Anxiety in Chinese Pregnant Women with Hyperemesis Gravidarum

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Abstract: *Objective:* To investigate the role of acupressure therapy in helping pregnant women with HG reduce the frequency or severity of vomiting and relieve stress and anxiety. *Method:* A quantitative study with a quasi-experimental design and non-equivalent group design was used. Sixty-six valid data points were obtained from pregnant mothers diagnosed with HG in a general hospital in Linyi City. These pregnant women received either acupressure ($n = 33$) or general therapeutic care ($n = 33$). They completed standardized questionnaires designed to assess vomiting, anxiety, and stress levels. *Results:* Data showed no differences between the experimental and control groups before the intervention. After the intervention, there were significant differences in anxiety ($P \leq 0.05$) and stress ($P \leq 0.05$) scores between the two groups. However, there was no significant difference in vomiting scores ($P > 0.05$) between the two groups after the intervention. The anxiety and stress scores of the experimental group were significantly lower than those of the control group post-intervention, while the vomiting scores of the two groups were similar. *Conclusion:* The findings suggest that acupressure significantly reduces anxiety and stress in pregnant women with hyperemesis gravidarum (HG) and also helps reduce vomiting. Acupressure presents a viable clinical option for pregnant women seeking relief from HG symptoms.

Keywords: Acupressure; Anxiety; Stress; Nausea; Vomiting

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1. Introduction

1.1. Study background

Early pregnancy reaction is a prevalent condition that usually starts between five and six weeks into pregnancy and lasts between 14 and 16 weeks. According to the literature, 80% to 90% of pregnant mothers experience symptoms in the early stages of pregnancy, 50% experience vomiting symptoms, and 1% to 2% develop severe vomiting during pregnancy ^[1].

The pathogenesis of hyperemesis gravidarum (HG) remains unclear. However, most clinical views suggest that HG is closely related to genetics, oxidative stress, psychological factors, *Helicobacter pylori*,

gastrointestinal factors, fetal sex, maternal education level, and elevated serum human chorionic gonadotropin levels [2]. Numerous studies have shown that HG is a severe complication of early pregnancy, leading to a decline in the physiological, social function, and quality of life of pregnant women. It also causes physical and psychological discomfort, increasing the likelihood of anxiety, depression, and other negative emotions [3]. HG can adversely affect the mother, fetus, and offspring. Medical personnel often lack understanding of the disease, resulting in inadequate treatment measures, reduced quality of life for pregnant women, and further aggravation of HG, which can harm the fetus and affect subsequent pregnancies [4].

For treating HG, the American College of Obstetricians and Gynecologists (ACOG) currently recommends vitamin B6 combined with doxylamine as the first-line treatment [5]. Studies have found that gabapentin is more effective than standard care in reducing vomiting symptoms and increasing oral nutrition, and overall satisfaction in outpatient patients with HG. Xue *et al.* [6] reported that an intravenous high-nutrition program compared with conventional infusion treatment not only improved HG but also alleviated the negative emotions of pregnant women.

Some researchers have found that Chinese chiropractic and acupressure, which are simple, cost-effective, and safe procedures, can shorten the treatment duration for HG patients, improve outcomes, and enhance their mood. Patients were more likely to try traditional Chinese medicine than Western medicine. Additionally, some acupoint stimulation can help reduce anxiety [7]. Acupressure, which originated in Chinese culture, is closer to nature and life practices, making it easily accepted and understood by patients. These treatments have fewer side effects and are more readily accepted because they are simple, cheap, and easy to administer [8]. Researchers believe that acupressure can help relieve vomiting and anxiety. Adlan *et al.* [9] found that using acupressure bands at Neiguan points for 12 hours a day for three days alleviated ketonuria symptoms in hospitalized patients with HG and reduced the length of hospital stay. However, an Iranian study found that auricular pressure effectively controlled nausea in pregnant women but not vomiting [10]. Hu *et al.* [11] used *Huangdi Neijing's* five-tone therapy combined with auricular point sticking, showing that this therapy could effectively improve patients' adverse psychological states and clinical efficacy.

1.2. Problem statement

The purpose of this study was to investigate the efficacy of acupressure as a therapy for pregnant women with HG in terms of vomiting frequency and severity, as well as stress and anxiety. Specifically, it sought to answer the following questions:

- (1) What are the anxiety scores of pregnant women before and after the intervention?
- (2) What are the stress scores of pregnant women before and after the intervention?
- (3) What are the frequency and severity of nausea and vomiting in pregnant women before and after the intervention?
- (4) Is there a significant difference in anxiety scores before and after the intervention?
- (5) Is there a significant difference in stress scores before and after the intervention?
- (6) Is there a significant difference in the frequency and severity of nausea and vomiting before and after the intervention?

1.3. Study significance

The findings of this study may benefit mothers with hyperemesis gravidarum. It also plays a vital role in nursing service, education, and research.

- (1) Nursing practice: The results of this study may help nurses understand whether acupressure is an

effective therapy for pregnant women experiencing vomiting and anxiety. This can assist professional nurses in developing actions in their practice to improve the anxiety and stress of pregnant women affected by HG.

- (2) Nursing administration: The results can provide clinical nursing staff with more options and research support for managing pregnant women with HG. Caregivers can add acupressure options to their management strategies, allowing patients to choose their treatment methods while actively managing psychological pressure and pregnancy vomiting.
- (3) Nursing education: The results could provide nursing educators with more knowledge about acupressure for use in evidence-based teaching. This can be included in the curriculum to improve nursing students' abilities to care for mothers with HG. Nursing workers can also educate women with HG and their families.
- (4) Nursing research: The results can serve as a basis and reference for researchers to expand their studies and conduct more comprehensive investigations. This study will help future researchers to explore the effects of acupressure on relieving anxiety in pregnant women.
- (5) Scope and limitations: The purpose of this study is to find out the effects of acupressure on HG, stress, and anxiety. This study used a quantitative, quasi-experimental, and non-equivalent group design. Inclusion criteria were pregnant women aged 25–45 years, primigravida in their 2nd–5th month, with PUQE scores greater than 7 points, diagnosed with HG by a doctor, willing to participate, without a history of infectious or special diseases, able to receive intervention in hospital for up to three weeks, and possessing reading and writing skills. Exclusion criteria included mothers diagnosed with mental illness, suffering from organic disease, contraindicated to acupressure, suffering from other severe physical diseases, or undereducated and unable to understand the questionnaire contents. The study was conducted at a public hospital in Linyi City, Shandong Province, China. Some limitations of this study include the potential for participants to overestimate or underestimate their levels of stress and anxiety, and the inability to completely exclude the influence of eating patterns on the vomiting degree of pregnant women.

2. Literature review

This chapter reviews studies, related literature, and theoretical and conceptual literature related to the research problem, research paradigm, hypotheses, and definition of terms. Related studies were sourced from primary sources, journals, books, and conceptual literature through the internet from CNKI (China National Knowledge Infrastructure), Maternal and Child Nursing, EBSCO Host, Google Scholar, PubMed, and Wiley.

2.1. Hyperemesis Gravidarum (HG)

Hyperemesis gravidarum (HG) is characterized by severe vomiting during pregnancy that begins before the 22nd week of gestation and can occur with or without metabolic disturbances^[12]. Due to the severity of nausea and vomiting, HG is the leading cause of sick leave and hospitalization in early pregnancy^[13]. Currently, HG is generally considered a disease of unknown pathophysiological origin^[14], although the view that mercury poisoning has a psychological origin still exists. Women with HG report a lack of support from their healthcare providers^[15]. The prevalence of HG is approximately 0.3%–3%, depending on clinical criteria and the population considered. In most cases, HG is more common among young women, first-time pregnancies, non-smokers, and non-whites.

2.2. Stress and anxiety disorder

Nausea and vomiting during the first trimester of pregnancy are common and generally accepted as part of normal physiology. However, HG is a condition characterized by severe nausea and vomiting that begins before 22 weeks of gestation. The incidence of HG is high, but its pathogenesis remains unclear. While morning sickness usually ends before 16 weeks, 2% of pregnant women can develop a condition so severe that it requires hospitalization. Although there are no accepted diagnostic criteria, HG is characterized by persistent vomiting and nausea, weight loss of more than 5% of pre-pregnancy body weight, ketonuria, electrolyte abnormalities (low blood potassium), and dehydration (high urine specific gravity). In addition to physical symptoms, HG can also affect the quality of life and mental state of pregnant women^[16]. Constant vomiting poses a significant psychological challenge for pregnant women, linking severe morning sickness with anxiety and depression^[17]. This provides an essential basis for this research. Studies by Annagur and others^[18] have shown that patients with HG suffer from anxiety and mood disorders, with higher proportions of somatization and hostility than the general population.

2.3. Acupressure

Traditional Chinese acupressure has been used as an effective antiemetic for many years. Acupressure therapy is a preferred choice for pregnant women as it is accessible, cheap, and effective in reducing the frequency of nausea and vomiting in the first trimester^[19]. Acupressure stimulates the meridian system, improves qi and blood circulation, and corrects the pathological states of the organs^[20]. One study showed that most patients experienced relief from nausea and vomiting through acupressure, suggesting it may effectively shorten the duration of morning sickness in the first trimester^[21].

2.4. Theoretical framework

The purpose of this study was to discuss the effects of acupressure on HG, stress, and anxiety. According to the characteristics of acupressure, this study was based on Meridian theory and Acupoint theory.

Meridian theory is applied in clinical diagnosis and treatment. The primary mechanism of HG is gastric dysfunction caused by retrograde menstruation. According to the Meridian theory, different treatments are applied for different causes. *Huangdi Neijing*, the earliest medical work in China, symbolizes the formation of the Meridian theory. It posits that the liver, as the “general officer,” regulates qi and mental emotions. When the patient is under significant pressure, the liver should be treated to straighten out and regulate qi.

By pressing acupoints to stimulate the corresponding points, meridians can be dredged, and the circulation of qi and blood can be regulated to achieve therapeutic purposes. Massaging certain acupoints can relieve depression, improve qi and blood movement, and effectively relieve stress^[22].

According to Meridian and Acupoint theories, HG is treated with syndrome differentiation. Commonly used meridians and corresponding points include the Neiguan point on the pericardial meridian, the Zusanli point on the stomach meridian, and the Gongsun point. Acupressure on these points can regulate the stomach, alleviate pain, reduce vomiting, and calm the mind, significantly relieving HG symptoms^[23].

2.5. Research paradigm

Hyperemesis gravidarum (HG) causes the mother to experience varying levels of stress and anxiety. A total of 66 pregnant women diagnosed with hyperemesis gravidarum participated in the study. They all had stress levels greater than 15 and anxiety levels greater than 22. Their Pregnancy Unique Quantification of Emesis and Nausea (PUQE) scores were both greater than 7. This study used acupressure to relieve hyperemesis gravidarum (HG) and stress and anxiety in the mother. The research paradigm of this study is shown in **Figure 1**.

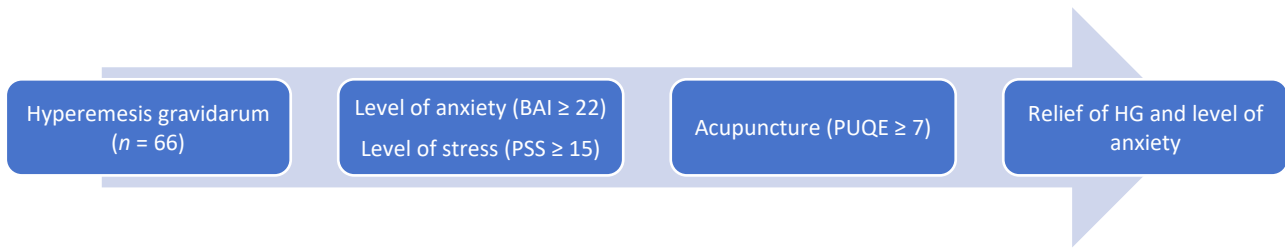


Figure 1. Research paradigm

2.6. Statement of hypotheses

The study tested the following null hypotheses:

H₀: There is no significant difference in the levels of anxiety before and after the intervention.

H₀: There is no significant difference in the levels of stress before and after the intervention.

H₀: There is no significant difference in the frequency of nausea and vomiting of pregnant mothers before and after the intervention.

2.7. Definition of terms

This section presents the conceptual and operational definitions of variables and related terms used in the study.

2.7.1. Hyperemesis gravidarum (HG)

- (1) Conceptual definition: Hyperemesis gravidarum is extreme, persistent nausea and vomiting during pregnancy. It can lead to dehydration, weight loss, and electrolyte imbalances.
- (2) Operational definition: In this study, the pregnant woman was diagnosed with hyperemesis gravidarum. She was aged 25 to 45 years, in her first pregnancy of 2 to 5 months, presented with persistent vomiting and severely impaired eating, and had a PUQE score greater than 7 points.

2.7.2. Anxiety

- (1) Conceptual definition: The American Psychological Association ^[24] defines anxiety as an emotion characterized by feelings of tension, worried thoughts, and physical changes like increased blood pressure.
- (2) Operational definition: In this study, anxiety refers to the negative emotions that affect the mood and physical conditions of pregnant women with hyperemesis gravidarum (HG). The researcher measured the anxiety scores of mothers with hyperemesis gravidarum by having them fill out 21 items on the BAI scale. Those with BAI scores indicating moderate or higher anxiety were included.

2.7.3. Stress

- (1) Conceptual definition: In psychology, stress is a feeling of emotional strain and pressure ^[25].
- (2) Operational definition: In this study, stress was defined as the feeling that pregnant women with hyperemesis gravidarum were unable to cope with mental or emotional strain. The researcher asked participants to complete the Perceived Stress Scale (PSS-14) to measure the extent to which they felt stressed. Participants with PSS scores greater than 15 were included.

2.7.4. Acupressure points

- (1) Conceptual definition: Acupoints mainly refer to the specific points on the meridian lines of the human

body. Traditional Chinese medicine treats diseases by stimulating these points through acupuncture, massage, and pressure. Most acupoints are located at nerve endings and blood vessels.

- (2) Operational definition: In this study, the researcher stimulated specific meridian acupoints associated with pregnancy vomiting through massage and pressure. The mothers laid on their backs while the researcher applied varying degrees of pressure to the acupoints with their hands, within the patient's acceptable level.

2.7.5. Acupressure

- (1) Conceptual definition: Acupressure is based on the theory of Zangfu meridians and collaterals of traditional Chinese medicine, combined with anatomical and pathological diagnoses from Western medicine. It involves manipulating specific parts of the body surface to regulate physiological and pathological conditions, achieving therapeutic purposes.
- (2) Operational definition: In this study, the researcher applied manipulation to the acupoints to induce a sensation of local swelling. All acupoints, except those on the abdomen, were used. The specifications and operating procedures of acupressure were followed precisely.

3. Research methodology

This section outlines the research design, methodology, locale, subject sampling, sampling technique, data gathering, and statistical treatment.

3.1. Research design

The researcher employed a quantitative study, utilizing a quasi-experimental design with non-equivalent groups.

Quantitative research involves collecting and analyzing numerical data to find patterns, make predictions, test causal relationships, and generalize results to broader populations. It is often used to standardize data collection and generalize findings ^[26].

Experimental design involves manipulating one or more independent variables and measuring their effect on one or more dependent variables. This requires defining main variables, creating procedures to test hypotheses, and predicting their relationships ^[27].

Non-equivalent group design involves selecting existing groups that appear similar, with only one group experiencing the treatment ^[28]. Acupressure was performed according to the standards and requirements of the Acupressure Code of Practice (2006) to ensure standard and effective operations.

3.2. Population and sample

Inclusion criteria for the study were: (1) Pregnant women aged 25–45 years; (2) Primigravida in their 2nd–5th month; (3) PUQE scores greater than 7 points; (4) Diagnosed with hyperemesis gravidarum (HG) by a doctor; (5) Willing to participate in the investigation; (6) No history of other infectious or particular diseases; (7) Able to receive hospital intervention for up to three weeks; (8) Possessing reading and writing skills.

Exclusion criteria included: (1) Diagnosed with a mental illness; (2) Suffering from organic disease; (3) Contraindications to acupressure; (4) Suffering from other severe physical diseases; (5) Undereducated and unable to understand the questionnaire.

The sample comprised 66 patients who presented with pregnancy vomiting. Based on evaluation indexes like pressure, anxiety, and pregnancy sickness frequency, and using relevant literature, the sample size was calculated as 33 participants per group, totaling 66.

3.3. Research locale

The study was conducted at Linyi City Jing Kai Dian Yu General Hospital, a public hospital managed by the government with relatively perfect medical equipment and sufficient financial support.

3.4. Research instruments

- (1) Demographic profile questionnaire: This instrument collected demographic information including age, education, occupation, family status, and past medical conditions, confirming the basic information about the participants in the initial data collection step.
- (2) Beck Anxiety Inventory (BAI): Compiled by Aaron T. Beck in 1985, this 21-item self-report instrument measures the severity of anxiety in adults over 17 years old. The BAI is a screening tool for anxiety, reflecting its degree but not diagnosing anxiety disorders. It is reliable (Cronbach's alpha coefficient of 0.941 among Chinese graduate students) and valid, correlating significantly with the Self-Rating Anxiety Scale (SAS). Scoring: (a) 0–21, Low anxiety; (b) 22–35, Moderate anxiety; (c) 36 and above, Severe anxiety.
- (3) Perceived Stress Scale (PSS)-14: The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress. Designed by Cohen *et al.* ^[29], it assesses the degree to which situations in one's life are appraised as stressful. Items are intended to reflect how unpredictable, uncontrollable, and overloaded respondents find their lives. Cohen *et al.* showed significant correlations between the PSS and various stress measures ^[29], establishing it as the most widely used stress perception measurement scale in China. Reliability and validity testing of the PSS showed good results, with an α coefficient of 0.78. The correlation coefficient between the total score and each item ranged from 0.37 to 0.53, indicating high internal consistency and surface homogeneity. The PSS-14 comprises 14 items that measure the extent to which individuals find their life circumstances unpredictable, uncontrollable, and overloaded. Scores are obtained by reverse scoring the positively stated items (4, 5, 6, 7, 9, 10, and 13) and then summing the scores across all 14 items. Respondents rate each item on a 5-point Likert scale, ranging from 0 ("Never") to 4 ("Very often"). Scores range from 0 to 56, with higher scores indicating higher perceived stress. Scoring: (a) 0–14, Low stress; (b) 15–28, Moderate stress; (c) 28–42, High stress; (d) 42–56, Very high stress.
- (4) Pregnancy Unique Quantification of Emesis and Nausea (PUQE)-24: Neda Ebrahimi published a new version of the Pregnancy Unique Quantification of Emesis and Nausea (PUQE) in 2009. PUQE is a certified system for assessing the severity of nausea and vomiting in early pregnancy ^[30]. The PUQE score correlates with quality of life and has clinical utility. Substantial concordance exists between the indices, with an intraclass correlation coefficient of 0.71 ^[31]. The updated version rates the severity of NVP based on nausea, vomiting, and dry vomiting over 24 hours. Total score (sum of replies to items 1, 2, and 3): (a) ≤ 6 , Mild nausea and vomiting during pregnancy; (b) 7–12: Moderate nausea and vomiting during pregnancy; (c) ≥ 13 : Severe nausea and vomiting during pregnancy
- (5) Code of operation for acupuncture (2006; **Figure 2**): The State Administration of Traditional Chinese Medicine of China commissioned the China Association of Traditional Chinese Medicine to revise the "Operation Procedures of Traditional Chinese Medicine Nursing Routine Technology" issued in 1999. The revised version was reissued in 2006 and published by the China Publishing House of Traditional Chinese Medicine ^[32]. This code standardizes Traditional Chinese nursing practices, improves the level of care, and reflects the academic development in the field.

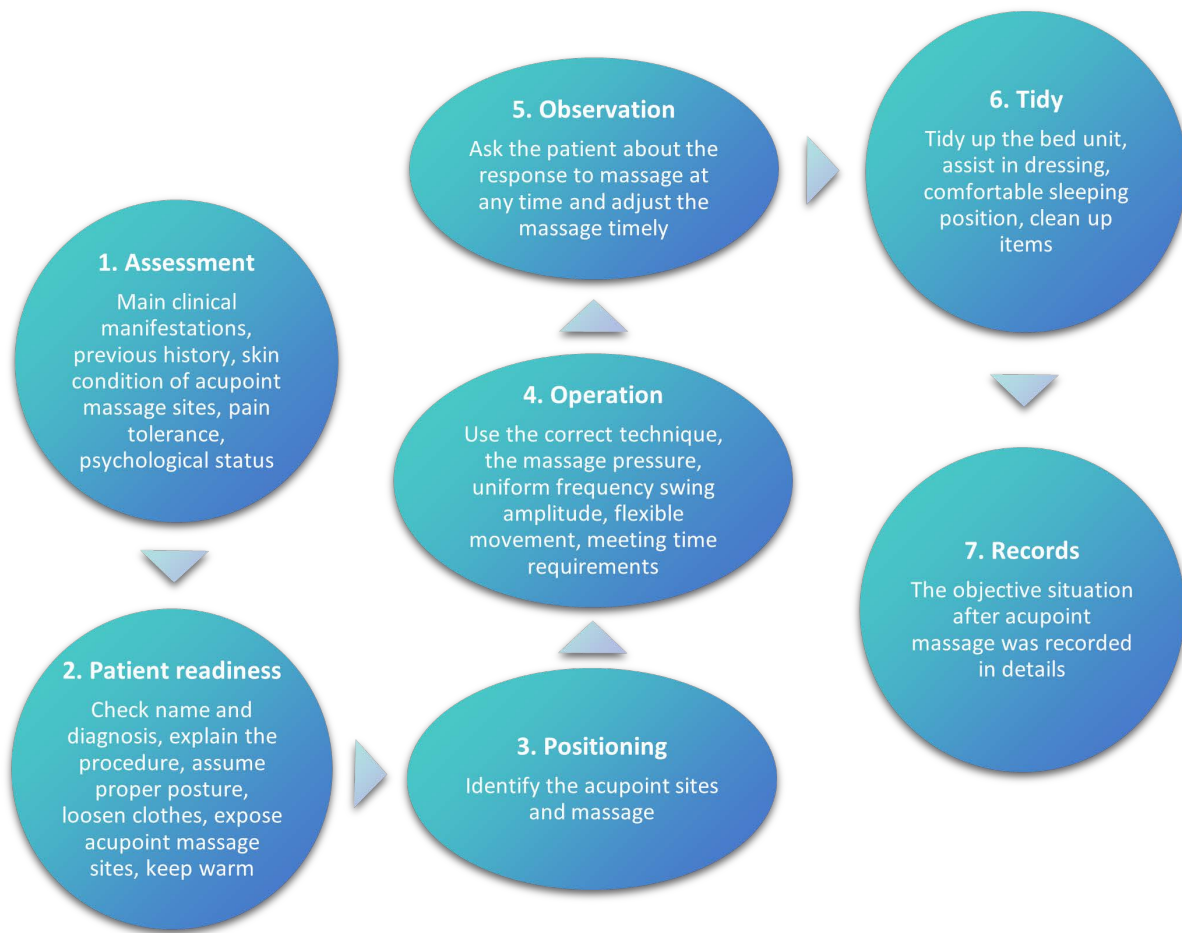


Figure 2. Code of operation for acupressure (2006)

3.5. Data collection procedure

Data collection involves collecting, measuring, and analyzing accurate insights from research using standard validation techniques, as shown in **Figure 3**. The researcher evaluated her hypothesis based on the collected data.

- (1) Phase 1 (Approval): Obtain written approval from Far Eastern University's Ethics Review Board and the hospital's medical director where the study will be conducted.
- (2) Phase 2 (A letter to the hospital): The researcher wrote a letter to the hospital and received approval from the hospital administration and the head of the maternity ward to conduct the study there.
- (3) Phase 3 (Screening and selecting participants): The investigator chose interviewees through purposive sampling. Mothers who met the inclusion criteria were included in the study, while those who did not were excluded. Interviewees were selected based on patient admission information to ensure only subjects with hyperemesis gravidarum (HG) were included.
- (4) Phase 4 (Ensuring informed consent): The researcher explained the content and purpose of the study to the participants, helping them understand the study process. Informed consent was obtained from all participants, and their requests and suggestions were listened to and considered.
- (5) Phase 5 (Data collection): With informed consent, respondents provided anonymous responses to demographic questionnaires and rating forms. All participants were assigned unique numbers to use when filling out the questionnaires and rating forms. Participants were divided into a control group and

an experimental group; (a) Control group: Received standard treatment, including fluids, medications, and routine care, but no acupressure intervention; (b) Experimental Group: Received acupressure intervention three times a week, each session lasting 15–20 minutes. After each session, participants were interviewed to assess discomfort or the need to withdraw. Participants could leave the study at any time. After one month, both groups completed the BAI, PSS-14, and PUQE-24 scales.

- (6) Phase 6 (Intervention protocol): In this study, 71 patients with hyperemesis gravidarum were initially enrolled. Five patients withdrew during the trial, leaving 66 participants who met the inclusion criteria ($n = 66$). These patients were divided into a control group ($n = 33$) and an intervention group ($n = 33$); (a) Control group treatment: (i) The researcher met with the pregnant women, introducing the experimental process; (ii) The researcher evaluated clinical manifestations and medical history, and administered questionnaires including PUQE, BAI, PSS, and demographic profiles; (iii) The researcher confirmed the participants' names and diagnoses and provided explanations; (iv) The researcher instructed patients to follow routine treatment, including anti-emetic drugs, and provided oral education on measures to relieve vomiting; (v) The researcher inquired about the patients' responses to treatment; (vi) Detailed records of the objective situation after therapy were kept. Questionnaires were administered three times over three weeks; (vii) Routine treatment continued as prescribed; (b) Experimental group treatment: (i) The researcher met with the pregnant women, introducing the experimental process; (ii) The researcher evaluated clinical manifestations, medical history, skin condition of the acupoint massage site, and pain tolerance. Questionnaires including PUQE, BAI, PSS, and demographic profiles were administered; (iii) The researcher confirmed the participants' names and diagnoses, and prepared for acupressure by ensuring proper posture, hand relaxation, and warmth; (iv) The researcher identified acupoints according to the cause of the vomiting and massaged acupoints other than the abdomen; (v) The researcher applied correct techniques, ensuring uniform pressure, frequency, and amplitude, for 10 to 15 minutes per session; (vi) The researcher inquired about the patient's responses to treatment and adjusted techniques as needed; (vii) Participants rested for 10 minutes after acupressure, with assistance in dressing and comfort; (viii) Detailed records of the objective situation after acupressure were kept; (ix) Subsequent treatments were scheduled, with sessions spaced one day apart over three weeks.
- (7) Phase 7 (Statistical treatment): The researcher used SPSS 26.0 for data analysis. Descriptive statistics were used to analyze anxiety, stress, nausea, and vomiting among pregnant women in the control and experimental groups. Differences in scores of anxiety, stress, nausea, and vomiting before and after the intervention were tested for statistical significance using P-values.

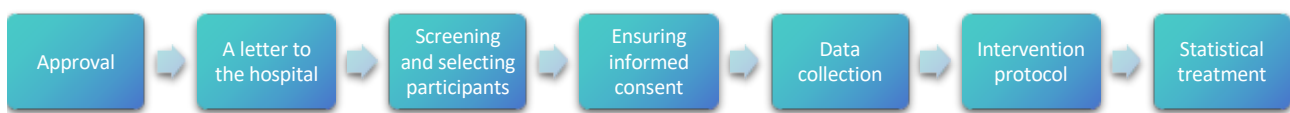


Figure 3. Data collection procedure

3.6. Ethical considerations

- (1) Social value: This study aims to support and help pregnant women with hyperemesis gravidarum by reducing their stress and anxiety. It also seeks to raise public awareness about HG. The findings will be shared with society and the subjects based on the appropriateness and usefulness of the dissemination plan as determined by the IRC.

- (2) Informed consent: Informed consent was obtained from all respondents following medical and research ethics guidelines. Participants were fully informed of all procedures and could withdraw from the study at any time without penalty.
- (3) Vulnerability of research participants: Mothers experiencing hyperemesis gravidarum were identified as physically and mentally vulnerable. The study ensured that the language used in the questionnaire was respectful and non-offensive.
- (4) Risk, benefits, and safety: The researchers aimed to minimize harm and maximize benefits. The study was conducted in a maternity ward with readily available hospital staff. Participants were provided with a safe, warm, and comfortable environment. No physical or psychological harm was inflicted on the participants.
- (5) Privacy and confidentiality: The anonymity of individuals and organizations involved in the study was ensured. All personal information, including medical condition, name, age, and contact details, was kept confidential. Participants were identified by codes rather than names.
- (6) Justice: In research ethics, justice refers to the fair selection of research subjects. Participants who met the inclusion criteria were randomly selected to fairly share the risks and benefits of the research. Respondents could withdraw from the study at any time without repercussions.
- (7) Transparency: The researcher maintained transparency with all parties involved, ensuring that any information affecting participants' rights, health, and safety was fully disclosed. This transparency extended to any factors that might influence a participant's decision to give or withhold informed consent.

4. Presentation, analysis, and interpretation of data

This chapter presents the research results, analysis, and interpretation of the data collected using appropriate statistical measures.

4.1. What are the pregnant women's anxiety scores before and after intervention?

Table 1 shows the anxiety scores of the intervention and control groups before and after the intervention.

Table 1. Anxiety score of pregnant women before and after intervention

Intervention	Group	Mean	Standard deviation	Interpretation
Before	Experimental group	40.15	9.798	Severe anxiety
	Control group	40.55	10.488	Severe anxiety
After	Experimental group	28.39	8.653	Moderate anxiety
	Control group	33.70	9.729	Moderate anxiety

Before the intervention, both groups had anxiety scores that indicated severe anxiety, but after the intervention, both groups had anxiety scores that indicated moderate anxiety. The BAI score of the experimental group after acupressure was significantly lower than that of the control group, suggesting that acupressure can effectively reduce the anxiety level of pregnant women with hyperemesis gravidarum (HG). Hyperemesis gravidarum may be closely related to psychological and social factors. Pregnant women with chronic anxiety and depression often experience vomiting, nausea, and even early obstructed labor during pregnancy ^[22].

4.2. What are the stress scores of pregnant women before and after intervention?

Table 2 shows the stress scores of the intervention and control groups before and after the intervention.

Table 2. Stress scores of pregnant women before and after intervention

Intervention	Group	Mean	Standard deviation	Interpretation
Before	Experimental group	36.06	8.884	High stress
	Control group	35.82	10.209	High stress
After	Experimental group	21.82	6.957	Moderate stress
	Control group	26.91	9.485	Moderate stress

Before the intervention, both groups had stress scores that indicated high stress, but after the intervention, both groups had stress scores that indicated moderate stress. The experimental group's stress scores after intervention were significantly lower than the control group's. Acupressure can help pregnant mothers relax, relieve physical fatigue, release pressure, and reduce stress. According to traditional Chinese medicine, acupressure can activate the functions of the five Zang and six Fu organs, improve circulation and metabolism, regulate the nervous system, and strengthen the body [33].

4.3. What are the pregnant women's frequencies of nausea and vomiting before and after intervention?

Table 3 shows the frequency scores of nausea and vomiting in the intervention and control groups before and after the intervention.

Table 3. Vomiting and nausea frequency scores of pregnant women before and after intervention

Intervention	Group	Mean	Standard deviation	Interpretation
Before	Experimental group	11.64	2.219	Moderate
	Control group	11.76	2.264	Moderate
After	Experimental group	5.79	1.516	Mild
	Control group	8.21	2.162	Moderate

Before the intervention, both groups had moderate frequencies of nausea and vomiting, but the frequencies of the experimental group were reduced to mild after the intervention. The PUQE score of the experimental group was significantly lower than that of the control group after acupressure, suggesting that acupressure was effective in reducing nausea and vomiting in pregnant women with HG. Studies have confirmed that acupressure, particularly at points like Neiguan, Zusanli, and Gongsun, can effectively relieve hyperemesis gravidarum by regulating the stomach, providing analgesia, antiemesis, and calming the mind [22]. Traditional Chinese medicine has shown excellent therapeutic effects on HG compared to traditional rehydration therapy [34].

4.4. Is there a significant difference in the pregnant women's anxiety scores before and after intervention?

Table 4 shows the changes in anxiety scores before and after the intervention.

Table 4. Differences in pregnant women’s anxiety scores before and after intervention

Group	Intervention	Mean ± SD	<i>t</i>	<i>P</i>	Interpretation	Decision
Experimental group	Before	40.15 ± 9.798	5.167	0.000	Significant	Reject H ₀
	After	28.39 ± 8.653				
Control group	Before	40.55 ± 10.488	2.750	0.008	Significant	Reject H ₀
	After	33.70 ± 9.729				

Abbreviation: SD, standard deviation. $P \leq 0.05$ indicates significance

The results indicate a significant decrease in anxiety scores in both groups, with the experimental group showing a more substantial reduction. Anxiety is common among pregnant women with HG, and acupuncture has been shown to effectively reduce anxiety and related symptoms^[19,35].

4.5. Is there a significant difference in the pregnant women’s stress scores before and after intervention?

Table 5 shows the changes in stress scores before and after the intervention.

Table 5. Differences in pregnant women’s stress scores before and after intervention

Group	Intervention	Mean ± SD	<i>t</i>	<i>P</i>	Interpretation	Decision
Experimental group	Before	36.06 ± 8.884	7.250	0.000	Significant	Reject H ₀
	After	21.82 ± 6.957				
Control group	Before	35.82 ± 10.209	3.673	0.000	Significant	Reject H ₀
	After	26.91 ± 9.485				

Abbreviation: SD, standard deviation. $P \leq 0.05$ indicates significance

The stress scores decreased significantly in both groups, with the experimental group showing a more pronounced reduction. Stress can interfere with gastric acid secretion control, leading to increased nausea and vomiting^[36].

4.6. Is there a significant difference in the pregnant women’s frequencies of nausea and vomiting before and after intervention?

Table 6 shows the changes in the frequency scores of nausea and vomiting before and after the intervention.

Table 6. Differences in pregnant women’s frequency of nausea and vomiting before and after intervention

Group	Intervention	Mean ± SD	<i>t</i>	<i>P</i>	Interpretation	Decision
Experimental group	Before	11.64 ± 2.219	7.145	0.000	Significant	Reject H ₀
	After	5.79 ± 1.516				
Control group	Before	11.76 ± 2.264	6.506	0.000	Significant	Reject H ₀
	After	8.21 ± 2.162				

Abbreviation: SD, standard deviation. $P \leq 0.05$ indicates significance

The results indicate significant reductions in nausea and vomiting frequencies in both groups, with the

experimental group showing a more substantial decrease. Treatment based on syndrome differentiation can improve therapeutic effects and relieve symptoms of nausea and vomiting in pregnant women^[37].

5. Summary of findings and conclusions

5.1. Summary of findings

- (1) The experimental and control groups exhibited severe anxiety before the intervention. After the intervention, the anxiety score of the experimental group was significantly lower than that of the control group. Both groups' anxiety levels decreased to moderate after the intervention.
- (2) Both the experimental and control groups experienced high stress before the intervention. Post-intervention, the stress levels of both groups were reduced to moderate. The stress level in the experimental group was significantly lower than in the control group.
- (3) Before the intervention, the scores for the frequency of nausea and vomiting were moderate in both the experimental and control groups. After the intervention, although the nausea and vomiting scores decreased, the control group still showed moderate vomiting. The experimental group, however, experienced a decrease to mild nausea and vomiting, with their mean and standard deviation significantly lower than those of the control group.
- (4) There were significant differences in anxiety scores between the experimental and control groups before and after the intervention.
- (5) There were significant differences in stress scores between the experimental and control groups before and after the intervention.
- (6) The frequency scores of nausea and vomiting between the experimental and control groups before and after the intervention were statistically significant.

5.2. Conclusions

The results of this study indicate that acupressure, guided by meridian and acupoint theory, can effectively alleviate the symptoms of hyperemesis gravidarum and reduce the frequency of nausea and vomiting. There is evidence that acupressure not only reduces vomiting in pregnant women but also significantly decreases anxiety and stress in those with hyperemesis gravidarum (HG). The data also showed that acupressure is more effective in helping pregnant women with hyperemesis gravidarum (HG) reduce anxiety and stress compared to traditional care.

Disclosure statement

The authors declare no conflict of interest.

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