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The Effect of Nursing Interventions in Women With Gestational Hypertension: A Systematic Review and Meta-Analysis

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ABSTRACT

Pregnancy-related hypertensive disorders are significant global causes of maternal morbidity and mortality. Quality nursing care is essential for pregnant women with hypertension to ensure a healthy pregnancy and delivery. This study aimed to systematically synthesize evidence on the effectiveness of nursing interventions for women with gestational hypertension. A systematic review and meta-analysis were conducted following PRISMA guidelines. Literature was searched across seven electronic databases from August 1 to September 27, 2023. Thirteen studies, encompassing 1458 women with gestational hypertension, were included. Quality assessment indicated that 10 randomized controlled trials were rated as good, one as fair, and all quasi-experimental studies as good quality. Various nursing interventions were analyzed, including training programs, home-based comprehensive nursing, case management, vascular symptom management, music therapy, and clinical nursing pathways. Meta-analysis results revealed that nursing interventions significantly reduced systolic and diastolic blood pressure, anxiety, depression, and hospital length of stay. These findings suggest that nursing interventions can effectively improve health outcomes for women with gestational hypertension, positively impacting at least one outcome in all included studies.

PROSPERO Registration Number: CRD42023444829

1 | Introduction

Pregnancy-related hypertensive disorders are major global causes of maternal morbidity and mortality. It has been estimated that preeclampsia complicates 2%–8% of pregnancies all over the world (The American College of Obstetricians and Gynecologists (ACOG) 2020). These conditions include general hypertension, which is characterized by elevated blood pressure without proteinuria or other organ dysfunction; preeclampsia, defined as new-onset hypertension after 20 weeks of gestation accompanied by proteinuria or signs of end-organ damage; and eclampsia, a severe progression of preeclampsia characterized by seizures or coma in the absence of other neurological conditions (The American College of Obstetricians and Gynecologists (ACOG) 2020; Witcher 2018).

Although gestational hypertension poses risks for both the mother and the fetus, it also has a negative physiological and psychological impacts on the woman. Hypertensive disorders in pregnancy can lead to both long-term and short-term complications. Renal failure, stroke, respiratory failure, and death are among the complications that can occur during and after pregnancy (The American College of Obstetricians and Gynecologists (ACOG) 2020; Roberts et al. 2017). Additionally,

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Summary

- Nursing interventions significantly reduce blood pressure, anxiety, depression, and hospital stay length among women with gestational hypertension, underscoring nursing's critical role in managing hypertensive disorders in pregnancy.
- Educational interventions, home-based care programs, comprehensive nursing interventions, nurse-led case management programs, and vascular symptom management strategies significantly improve health outcomes of women, highlighting the essential role of nursing in managing hypertensive disorders in pregnancy.
- Psychosocial approaches such as Turkish classical music therapy and nursing theory-based clinical pathways contribute to both physical and psychological well-being, emphasizing the importance of a holistic nursing approach to maternal care.

obstetric complications such as gestational diabetes and hypertension increase the risk of problems that may affect perinatal mental health, such as depression, anxiety, and postpartum psychosis (Caropreso et al. 2020; Koutra et al. 2018). Patients with gestational hypertension experience higher levels of psychological stress than typical pregnant women, which increases their vulnerability to postpartum depression (Pan et al. 2021). Therefore, quality nursing care is critical for pregnant women with hypertension to have a healthy pregnancy and delivery process. Nursing interventions such as prenatal consultation and education, case management programs, and home visits may improve maternal and fetal health outcomes in high-risk pregnancies with high morbidity and mortality rates (Ferreira et al. 2016).

Previous studies have demonstrated that nursing interventions such as prenatal consultations, case management, health education, psychological support, dietary guidance, and home visits significantly improve maternal outcomes, including reductions in blood pressure, anxiety, depression, and stress (Jiang and Wang 2019; Ni et al. 2020). However, the adoption of these interventions into clinical practice varies significantly across healthcare settings and regions, influenced by factors like resource availability, staff training, institutional policies, and awareness of evidence-based practices (Degu et al. 2022). A comprehensive research synthesis is needed to evaluate the evidence of nursing interventions regarding the health outcomes of women diagnosed with gestational hypertension. Demonstrating the effectiveness of nursing interventions in addition to standard care can help bridge the gap between research and clinical practice. This evidence can guide the development of guidelines and protocols for the care of pregnant women with gestational hypertension. However, no study combining the findings from these studies has been found in the literature. Therefore, this systematic review and meta-analysis aim to determine the effect of nursing interventions on maternal outcomes in women with pregnancy-induced hypertensive disorder.

2 | Materials and Methods

2.1 | Protocol and Registration

This is a systematic review and meta-analysis study. The principles of the PRISMA (Preferred Reporting Items for Systematic Review and Meta-analysis) Statement were followed, and the relevant checklist was used for the development of the study protocol, the conduct of the study, and the drafting of the manuscript (Page et al. 2021). To prevent duplications and compare with completed studies during the planning stage, the protocol of this study was registered on the PROSPERO database (Date: July 23, 2023, Registration No: CRD42023444829). The review of the literature, the selection of articles, data extraction, and the quality assessment of the included articles were performed independently by three of the researchers (M.N.T., K.E., and S.S.) to avoid the risk of any potential bias. Each step during this process was reviewed at meetings with the participation of all three researchers to achieve consensus. Also, with the participation of the three researchers, sessions were held to conduct a pilot study to test the following stages of this research, including the keyword search using the PubMed search engine, the selection of articles, data extraction, and the assessment of the quality of selected articles.

2.2 | Eligibility Criteria

To formulate the research question, we applied the PICOS model (Participants, Interventions, Comparisons, Outcome, and Study Design) (Higgins et al. 2011). The study included pregnant women with gestational hypertension as the target population. The evaluated outcomes included both physical and mental health measures, such as pregnancy duration (as defined in the studies), blood pressure, anxiety levels, hospital stay length (in days), and depression.

Eligible studies were experimental and quasi-experimental studies published in English or Turkish, with no time restrictions. Studies were excluded if they lacked a clear methodology or full text, had an observational design, involved animal experiments, or focused on non-nursing-led interventions for women with gestational hypertension. According to this, inclusion and exclusion criteria are shown in Table 1.

2.3 | Search Strategy

The literature search for this study was performed in the period between August 1, 2023, and September 27, 2023, in electronic databases including PubMed, EBSCO (Medline, CINAHL), Embase (OVID) Web of Science, PsycINFO (all via Ovid SP), Scopus, Cochrane (see Appendix 1). Following the identification of eligible studies, their reference lists were examined to ascertain the necessity for additional searches.

2.4 | Study Selection

The Endnote 20 reference management tool was used for data management within the scope of this systematic review and meta-analysis. All citations were reviewed across

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TABLE 1 | Inclusion and exclusion of study criteria.

Inclusion criteria		Exclusion criteria
Study Population	Pregnant women with gestational hypertension	Studies without clear methodology or full text Studies with observational design Studies involving animal experiments Studies involving non-nursing-led interventions in women with gestational hypertension
Intervention	Nurse-led or mainly nursing care interventions	
Comparison	Standard care	
Outcomes	Physical and mental health outcomes included measures such as duration of pregnancy as defined in the studies, blood pressure, anxiety level, length of hospital stay (days), and depression	
Study design	Experimental and quasi-experimental studies published in English and Turkish, without any time constraints	

seven databases to remove duplicates. Three researchers independently identified suitable articles for inclusion using Covidence, excluded duplicates during the review, and assessed the eligibility of articles based on titles, abstracts, and full texts. The researchers screened articles according to inclusion and exclusion criteria (Table 1) and resolved any discrepancies through group discussions. Standardized and predefined data extraction forms were used to ensure validity and high quality of the data. PRISMA flowchart was applied to document and report the screening results.

2.5 | Data Extraction

After screening, identifying, and assessing the quality of the selected studies, data were extracted using a pre-prepared form by researchers. The extracted information included author information, year of publication of study, study setting, study design, sample size, study group characteristics (as defined in the studies), year of data collection, duration, time and type of intervention, comparison group characteristics, and physical and mental health problems (as defined in the studies) (Table 2). The data extraction process was performed independently by the first and second authors. A final check of the data was made by the third author.

2.6 | Methodological Quality Assessment of Studies

Once we have identified the relevant studies, evaluated for quality using the JBI Critical Appraisal Checklist for Randomized Clinical Trials and Quasi-Experimental Studies published by the Joanna Briggs Institute. The checklist for randomized controlled trials consisted of 13 items, and the checklist for quasi-experimental studies consisted of nine items (Tufanaru et al. 2020). One of the following responses, including "Yes," "No," "Unclear," or "Not Applicable" was attained for each item. We evaluated the methodological quality level of the studies included in this research as good (with a score of 80%–100%), fair (50%–79%), and low (Goldsmith et al. 2007). The quality assessment process was carried out independently by the first and second authors. Subsequently, all three researchers convened to discuss the findings, resolve any discrepancies, and compile a comprehensive report.

2.7 | Data Analysis

Following this systematic review, data from individual studies were quantitatively pooled and reanalyzed using meta-analysis. A systematic review synthesizes and evaluates the overall body of evidence, while a meta-analysis provides a statistical summary of the quantitative findings (Centre for Reviews and Dissemination 2009). This approach was undertaken because it would allow for a more comprehensive analysis of the effect of nursing interventions on gestational hypertension. This decision was also based on the similarity of study designs, interventions, and outcome measures, which justified the pooling of data for meta-analysis. The characteristics, main outcomes, and quality assessments of the included studies are presented in tables as part of the systematic review findings. The mean, standard deviation, sample size, post-test, and p values of the studies were used. The Odds Ratio (OR) were calculated for categorical variables. The effect size (Hedge's g and 95% confidence intervals [CI]) was calculated to represent the difference between the intervention group's mean and the control group's mean divided by the combined standard deviation (Deliktas et al. 2016). Hedges' g is similar to Cohen's d and may be interpreted using the same standards: 0.2 is small, 0.5 is medium, and 0.8 is large.

Heterogeneity between studies was assessed using Cochran's Q test ($p < 0.10$) and Higgins' I^2 (0%–40%, 30%–60%, 50%–90%, and 75%–100%) test (Higgins et al. 2011). Generally, an I^2 value greater than 50% is considered large enough to question the validity of the study results (Bown and Sutton 2010). The evaluation of publication bias of the studies was also examined with Orwin's fail-safe N, Egger's regression test, Tau coefficient, and Begg's adjusted rank correlation test (Begg and Mazumdar 1994; Egger et al. 1997). Egger's regression test is also a method used to test the asymmetry of the funnel plot, while Orwin's fail-safe N shows how many studies with a zero effect size are needed to evaluate the overall effect size obtained as a result of the meta-analysis as statistically insignificant. In cases where Egger's p value is not statistically significant ($p > 0.05$), it is interpreted that the studies are

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TABLE 2 | The list of studies included in the systematic review.

Author(s), Year, Country	Study design, year	Data collection tools	Sample size, groups and participant characteristics, maternal age	Characteristics of the intervention	Conclusions
Abazarnejad et al. 2019, Iran	RCT, January 30 2017–March 31 2017	Spielberger State–Trait Anxiety Inventory (STAI)	I: 22 C: 22, women with preeclampsia, 17–30 yrs.: 11 and 11 31–46 yrs.: 11 and 11	Individual psycho-educational counseling	Psycho-educational counseling can significantly reduce the anxiety level in pregnant women with preeclampsia
Alnuaimi et al. 2020, Jordan	RCT	—	I: 57 C: 56, pregnant women who were at high risk of preeclampsia, Below 20: 2 and 2 20–27 yrs.: 22 and 24 28–35 yrs.: 20 and 20 Above 35: 13 and 10	2-h educational program about preeclampsia with self-monitoring of blood pressure and urine protein and routine care	A significant difference was also found in terms of the mean diastolic blood pressure between the control group and the interventional group
Amanak et al. 2019, Turkiye	RCT, October 2013–July 2015	PSEQ-AP (The acceptance of pregnancy subscale)	I: 68 C: 64, Pregnant women with diagnosis of gestational hypertension, 26.60 ± 5.19 and 26.52 ± 4.83	Training lasting 20–40 min each session, twice at 20–24 weeks of pregnancy, once at 30–34 weeks and once on the second day after delivery, the impact of prenatal education based on the Roy Adaptation Model	RAM-based education had a positive effect on the women's systolic and diastolic blood pressure outcomes and shortened the duration of stay in the hospital
Chou et al. 2021, Taiwan	RCT	State–Trait Anxiety Inventory (STAI)	I: 31 C: 31, Women with pregnancy ınduced hypertension, 34.8 and 35.4	Nurse-led case management program	The results of the generalized estimating equations showed significantly larger decreases in stress and anxiety in the experimental group than in the control group
Gomathi et al. 2020, India	RCT	WHO QOL – BREF	I: 55 C: 51, Women with pregnancy ınduced hypertension: (27 and below): 80 (28–37): 23 (38–47): 0 (48 and above): 3	Vascular Symptom Management Package (VSMP)	Significant increase in the QOL score in the experimental group. Hence, it can be interpreted that VSMP is effective in improving the QOL

(Continues)

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TABLE 2 | (Continued)

Author(s), Year, Country	Study design, year	Data collection tools	Sample size, groups and participant characteristics, maternal age	Characteristics of the intervention	Conclusions
Jiang and Wang 2019, China	RCT, May 2014–July 2015	Self-Rating Depression Scale (SDS), Self-Rating Anxiety Scale (SAS)	I: 84 C: 84, patients with pregnancy induced hypertension syndrome, 31.9 ± 5.3 and 31.5 ± 4.8	Comprehensive nursing intervention	Comprehensive nursing intervention can effectively improve blood pressure, anxiety, and depression levels and reduce hospitalization times
Latha et al. 2015, India	RCT, March 2014–February 2015	—	I: 52 C: 51, Mothers with gestational hypertension, 25.3 + 4.3 and 24.7 + 3.5	Three Auxiliary Nurse Midwives (ANM) were trained on antenatal care aspects pertaining to gestational hypertension. Home based care program	Women on home care decrease in mean systolic blood pressure and a significant decrease in mean diastolic blood pressure. In the conventional care group, an increase in mean systolic blood pressure and a significant decrease in mean diastolic blood pressure
Ni et al. 2020, China	Quasi-Experimental, November 2017–September 2019	Self-rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS)	I: 50 C: 42, patients with gestational hypertension, 26.58 ± 5.25 and 25.74 ± 5.139	Health education	Health education can significantly reduce blood pressure, which is worthy of promotion and application in clinical practice
Pan et al. 2018, China	RCT	—	I: 44 C: 45, Pregnant women with gestational hypertension, 34.4 ± 4.3 and 33.2 ± 3.0	Prenatal health education and nutritional guidance	Blood pressure of the treatment group were significantly lower than those of the control group, and the blood pressure decreased significantly more than that of the conventional group
Pan et al. 2021, China	RCT, November 2018–January 2020	Hamilton Anxiety Scale (HAMA), Hamilton Depression Scale (HAMD), Quality of Life Comprehensive Assessment Questionnaire (GQOLI-74)	I: 35 C: 35, Patients diagnosed with gestational hypertension, 30.4 ± 3.6 and 30.7 ± 2.8	Comprehensive care during the perinatal period	The decrease in depression scores decreased significantly in the control group, and no significant difference was found in quality of life

(Continues)

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TABLE 2 | (Continued)

Author(s), Year, Country	Study design, year	Data collection tools	Sample size, groups and participant characteristics, maternal age	Characteristics of the intervention	Conclusions
Toker and Kömürcü 2017, Türkiye	RCT, December 2012–February 2014	State trait anxiety inventory (STAI TX-I)	I: 35 C: 35, Pregnant women with a diagnosis of pre-eclampsia, 30.69 ± 5.60 and 30.60 ± 6.10	Turkish classical music therapy	Music Therapy had a minimalizing effect on a lowering effect on blood pressure, Although it seems not to have an effect on anxiety levels in our study, participants relaxed while listening to music
Ugurlu et al. 2021, Türkiye	RCT, May 2015–March 2016	—	I: 47 C: 53, pregnant women, who were in their 12th to the 20th gestational weeks at least 1 risk factors of preeclampsia: 20–24: 7 and 5 25–29: 18 and 29 30–34: 11 and 7 35 and over: 11 and 12	4 training and counseling session using the preeclampsia education booklet and following the booklet's sections	That is found no statistically significant differences in the total systolic and diastolic blood pressure averages. Preeclampsia developed in 4 of the pregnant women (7.6%) in the control group but not at all in the intervention group
Zhou et al. 2021, China	Quasi-Experimental, January 2018–December 2019	Self-Rating Anxiety Scale (SAS) Self-Rating Depression Scale (SDS)	I: 43 C: 42, gestational hypertension patients: 20~41: 28.62 ± 3.47 30~39: 34.63 ± 2.02 21~40: 28.48 ± 3.39 31~40: 35.25 ± 1.94	Time nursing theory based clinical nursing pathway	Application of time nursing theory based clinical nursing pathway in clinical nursing of gestational hypertension patients can help to control blood pressure, promote natural delivery, improve maternal and infant outcomes and alleviate patient's negative emotions

Abbreviations: C: Control; GSES: General Self-Efficacy Scale; HAMA: Hamilton Anxiety Scale; HAMD: Hamilton Depression Scale; HPLP-II: Health Promoting Lifestyle Profile-II Scale; I: Intervention; RCT: Randomized controlled trial; SAS: self-rating anxiety scale; SDS: Self-rating Depression Scale; SES: Self-Efficacy Scale; STAI TX-I: State-Trait Anxiety Inventory; STAI: Spielberger State–Trait Anxiety Inventory; WHO QOL—BREF: World Health Organization Quality of Life Brief Version.

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distributed symmetrically in the funnel plot. Additionally, the tau coefficient is expected to be close to 1. In this case, a two-tailed *p* value result greater than 0.05 indicates that there is no publication bias (Benligül et al. 2022). Meta-analysis data was analyzed on the Comprehensive Meta-Analysis (CMA) 3 (Borenstein et al. 2010).

3 | Results

3.1 | Search Results

The literature search revealed a total of 1453 records for published articles. When duplicates were excluded and eligible articles were selected based on the review of headings and abstracts, 18 articles remained. After the examination of the full texts of these studies according to the inclusion criteria, 13 studies were included in the meta-analysis (Figure 1).

3.2 | Characteristics of Studies and Participants

Eleven of the studies included in this research were randomized controlled trials (Abazarnejad et al. 2019; Amanak et al. 2019; Alnuaimi et al. 2020; Chou et al. 2021; Gomathi et al. 2020; Jiang and Wang 2019; Latha et al. 2015; Ugurlu et al. 2021; Pan et al. 2018; Pan et al. 2021; Toker and Kömürcü 2017) and two were quasi-experimental studies (Ni et al. 2020; Zhou et al. 2021). The studies were conducted in the years between 2015 and 2022. Five studies were conducted in China (Jiang and Wang 2019; Ni et al. 2020; Pan et al. 2018; Pan et al. 2021; Zhou et al. 2021), one was conducted in Iran (Abazarnejad et al. 2019), two were conducted in India (Gomathi et al. 2020; Latha et al. 2015), one was conducted in Taiwan (Chou et al. 2021), one was conducted in Jordan (Alnuaimi et al. 2020), and the remaining three studies were conducted in Turkey (Amanak et al. 2019; Toker and Kömürcü 2017; Ugurlu et al. 2021). The total sample size of the studies was 1234 (intervention group: 623 participants; control group: 611 participants). The participants' age in the included studies was 17 years and above (Table 2).

3.3 | Characteristics of Intervention

The studies included in this systematic review and meta-analysis were performed educational interventions in six studies (Abazarnejad et al. 2019; Alnuaimi et al. 2020; Amanak

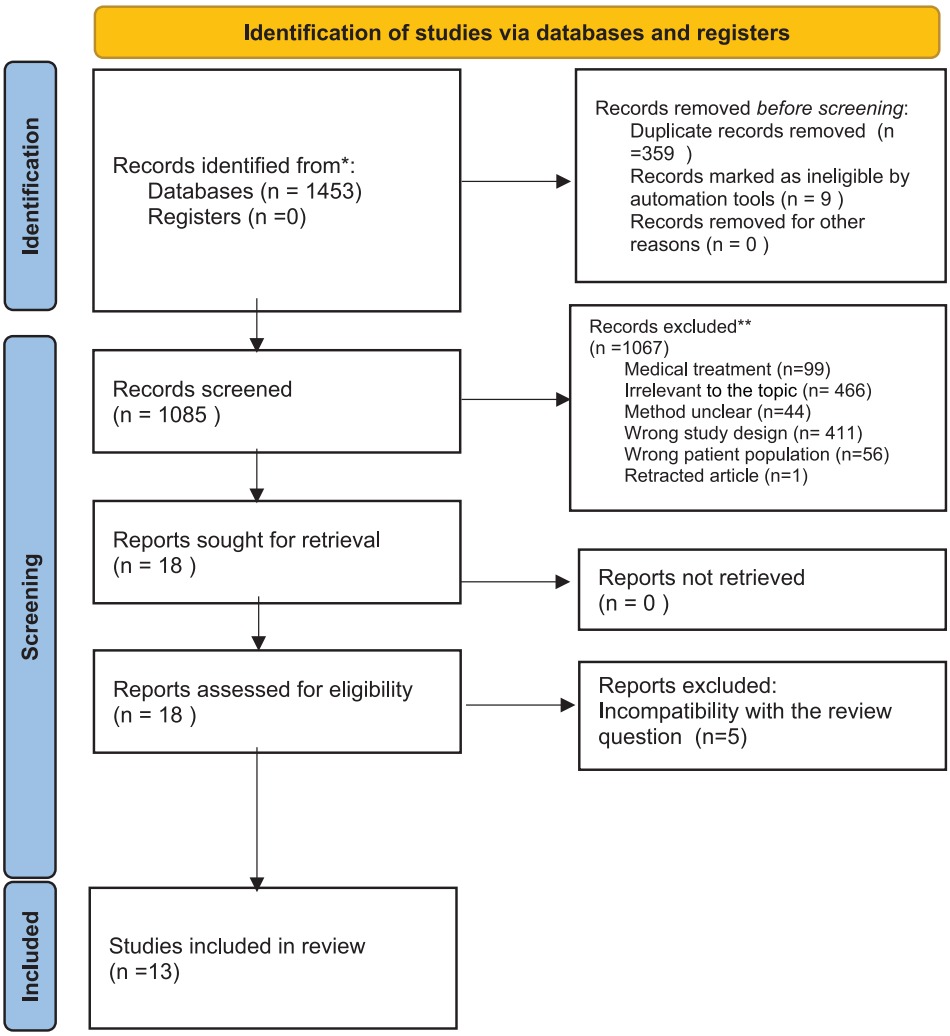


FIGURE 1 | PRISMA flow diagram.

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TABLE 3 | Quality assessment scores of studies.

Studies	JBI critical appraisal checklist questions for randomized controlled studies													Quality score of the study
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	
Abazarnejad et al. 2019	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Alnuaimi et al. 2020	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Chou et al. 2021	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Gomathi et al. 2020	Y	Y	N/A	Y	N	N	Y	N/A	Y	Y	Y	Y	Y	%69.23
Jiang and Wang 2019	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Amanak et al. 2019	Y	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Latha et al. 2015	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Pan et al. 2018	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Pan et al. 2021	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Toker and Kömürcü 2017	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Ugurlu et al. 2021	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	%84.61
Question quality score	%100	%100	%81.81	%90.90	%0	%0	%100	%90.90	%100	%100	%100	%100	%100	
	JBI critical appraisal checklist questions for quasi-experimental studies													
Ni et al. 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y					%100
Zhou et al. 2021	Y	Y	Y	Y	Y	Y	Y	Y	Y					%100
Question quality score	%100	%100	%100	%100	%100	%100	%100	%100	%100					

Abbreviations: N/A: Not Applicable; N: No; Y: Yes.

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et al. 2019; Ni et al. 2020; Ugurlu et al. 2021; Pan et al. 2018). Other interventions included a home-based care program (Latha et al. 2015), two comprehensive nursing interventions (Jiang and Wang 2019; Pan et al. 2021), a nurse-led case management program (Chou et al. 2021), a vascular symptom management program (Gomathi et al. 2020), a Turkish classical music therapy intervention (Toker and Kömürcü 2017), and a nursing theory-based clinical nursing pathway (Zhou et al. 2021). Studies focusing on educational interventions for pregnant women have investigated a variety of approaches to promote health and well-being. Education on hypertension and preeclampsia has been provided in various formats, including different numbers of sessions and booklets on blood pressure monitoring (Alnuaimi et al. 2020; Amanak et al. 2019; Ugurlu et al. 2021). Some studies have specifically focused on psychological counseling (Abazarnejad et al. 2019) or dietary and mental health education (Ni et al. 2020). In the study by Pan et al. (2018), dietary education was combined with psychological support to address gaps in both physical and mental health. In some studies, the intervention covered not only the pregnancy period but also the delivery and postpartum periods (Amanak et al. 2019; Jiang and Wang 2019; Pan et al. 2021; Zhou et al. 2021). Jiang and Wang (2019) divided nursing care into five main areas: health education, psychological support, basic nursing care, dietary guidance, and delivery care. The case management program described by Chou et al. (2021) included a team led by professors in maternal nursing, focusing on three main areas: education on gestational hypertension, relaxation techniques, and biweekly follow-up by phone. Another program to manage vascular symptoms provided education on fetal health, sleep habits, recognition of warning signs, and compliance with interventions (Gomathi et al. 2020). In a Turkish classical music therapy study, participants listened to music for 30 min per day over 7 days, focusing on relaxation (Toker and Kömürcü 2017). Zhou et al. (2021) implemented a nursing theory-based clinical pathway, which included patient room organization, health education, psychological support, dietary guidance, condition observation, medication management, and comprehensive care from delivery to postpartum and discharge. Based on theoretical nursing foundations, this model aims to provide patient-centered care and support the overall well-being of pregnant women. Interventions were administered in a hospital setting in nine studies (Abazarnejad et al. 2019; Amanak et al. 2019; Gomathi et al. 2020; Jiang and Wang 2019; Ni et al. 2020; Pan et al. 2018; Pan et al. 2021; Ugurlu et al. 2021; Zhou et al. 2021), and both at home and in the hospital setting in four studies (Alnuaimi et al. 2020; Chou et al. 2021; Latha et al. 2015; Toker and Kömürcü 2017). The duration of training sessions was reported in the other studies as varying from 20 to 45 min (Abazarnejad et al. 2019; Amanak et al. 2019; Toker and Kömürcü 2017).

3.4 | Quality Assessment Results

The quality assessment scores of randomized controlled studies revealed that 10 studies were rated as having a good quality and one study was rated as having a fair quality. The quasi-experimental studies were rated as having a good quality (Table 3).

3.5 | Outcomes

In this systematic review, the studies examined the effects of various interventions targeting conditions such as preeclampsia and gestational hypertension during pregnancy. Outcomes assessed across these studies included a range of psychosocial and physiological factors, such as anxiety, depression, quality of life, and blood pressure. Measurement tools prominently featured in these studies include the State–Trait Anxiety Inventory (STAI) (Abazarnejad et al. 2019; Chou et al. 2021; Jiang and Wang 2019; Ni et al. 2020; Toker and Kömürcü 2017; Zhou et al. 2021), Self-Rating Depression Scale (SDS) (Jiang and Wang 2019; Ni et al. 2020; Zhou et al. 2021), and Hamilton Anxiety Scale (HAMA) (Pan et al. 2021) to evaluate anxiety and depression levels. For assessing quality of life, instruments like the WHO QOL-BREF (Gomathi et al. 2020) and Quality of Life Comprehensive Assessment Questionnaire (GQOLI-74) (Pan et al. 2021) were used. Additionally, physiological measures such as blood pressure monitoring and urine protein tracking were implemented to support the psychological outcomes (Table 2). These measurement tools played a crucial role in understanding the effects on psychological outcomes and in distinguishing the differences between intervention and control groups.

The studies reviewed indicate that various interventions, such as psycho-educational counseling, educational programs, nurse-led case management, and comprehensive nursing interventions, have generally positive effects on both psychological and physiological outcomes for pregnant women. Interventions like counseling and case management were particularly effective in reducing anxiety and stress levels, while structured educational programs contributed to lower blood pressure in high-risk pregnant women. Some studies reported improvements in quality of life (e.g., through the Vascular Symptom Management Package) and reduced hospitalization duration for intervention groups. Other interventions, such as music therapy, demonstrated a calming effect, although their impact on anxiety was not statistically significant. Additionally, nurse-led or education-based interventions helped reduce the incidence of complications like preeclampsia and improved maternal and infant outcomes. In summary, these findings highlight the potential for diverse, non-pharmacological interventions to positively impact mental health, quality of life, and physiological indicators in pregnant women at risk for hypertensive complications.

3.6 | Results of Meta-Analysis

The meta-analysis of the eight included studies showed a statistically significant effect of nursing intervention on the systolic blood pressure of women. According to the evaluation of the results of the meta-analysis, the Q value was 191.875 ($p < 0.001$) and the I^2 value was 95.831% (Figure 2). According to these values, it has been determined that there is a heterogeneous structure. Due to the heterogeneous structure, the random effect model was examined and the effect size was −1.431 (95% CI: −2.145: −0.717) and statistically significant ($p < 0.001$, Figure 2). Orwin's fail-safe N value was obtained as 9273 (taking −0.001) to make the effect size −1.431

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insignificant according to the random effect model. As a result of Kendall's tau analysis, the test value was obtained as −0.22 and it was determined that there was no publication bias according to this value ($p = 0.202$). According to Egger's regression analysis method, the β0 value was −13.833, the t value was 2.515, and the p value was 0.020. According to this result, there is a publication bias risk (Figure 2).

The effects of nursing interventions on diastolic blood pressure were investigated. The meta-analysis of the eight included studies showed a statistically significant effect of nursing intervention on the diastolic blood pressure of women. According to the evaluation of the results of the meta-analysis, the Q value was 229.873 ($p < 0.001$) and the I^2 value was 96.520% (Figure 2). According to these values, it has been determined that there is a heterogeneous structure. Due to the heterogeneous structure, the random effect model was examined and the effect size was −1.756 (95% CI: −2.552: −0.961) and statistically significant ($p < 0.001$, Figure 2). Orwin's fail-safe N value was obtained as 8949 (taking −0.001) to make the effect size −1.756 insignificant according to the random effect model. As a result of Kendall's tau analysis, the test value was obtained as −0.22, and it was determined that there was no publication bias according to this value ($p = 0.202$). According to Egger's regression analysis method, the β0 value was −14.160, the t value was 3.72, and the p value was 0.003. According to this result, there is a publication bias risk.

A meta-analysis was conducted to investigate the nursing interventions for anxiety. According to the evaluation of the results of the meta-analysis, the Q value was 22.374 ($p < 0.001$) and the I^2 value was 73.18% (Figure 2). According to these values, it has been determined that there is a heterogeneous structure. Due to the heterogeneous structure, the random effect model was examined, and the effect size was −0.806 (95% CI: −1.143: −0.470) and statistically significant ($p < 0.001$, Figure 2). Orwin's fail-safe N value was obtained as 5918 (taking −0.001) to make the effect size of −0.806 insignificant according to the random effect model. As a result of Kendall's tau analysis, the test value was obtained as 0.23, and it was determined that there was no publication bias according to this value ($p = 0.22$). According to Egger's regression analysis method, the β0 value was 3.245, the t value was 0.811, and the p value was 0.022. According to this result, there is a publication bias risk.

A meta-analysis was performed to investigate the nursing intervention on the depression levels of women. According to the evaluation of the results of the meta-analysis, the Q value was 3.668 ($p < 0.001$) and the I^2 value was 18.20% (Figure 2). According to these values, it has been determined that there is not a heterogeneous structure. Due to the structure, the fixed effect model was examined and the effect size was −0.895 (95% CI: −1.099: −0.691) and statistically significant ($p < 0.001$, Figure 2). Orwin's fail-safe N value was obtained as 3582 (taking −0.001) to make the effect size of −0.895 insignificant according to the random effect model. As a result of Kendall's tau analysis, the test value was obtained as −0.66 and it was determined that there was no publication bias according to this value ($p = 0.087$). According to Egger's regression analysis method, the β0 value was −4.239, the t value was 2.462, and the p value was 0.06. According to this result, there is no publication bias.

The meta-analysis of the two included studies showed a significant effect of nursing intervention on the length of stay at the hospital for women. According to the evaluation of the results of the meta-analysis, the Q value was 8.226 ($p = 0.004$) and the I^2 value was 87.84%. According to these values, it has been determined that there is a heterogeneous structure. Due to the heterogeneous structure, the random effect model was examined, and the effect size was −0.769 (95% CI: −1.446: −0.093) and statistically significant ($p < 0.001$, Figure 2). It is not appropriate to analyze bias values because there are fewer than three studies.

The meta-analysis of the four included studies showed an insignificant effect of nursing intervention on the development of preeclampsia. According to the evaluation of the results of the meta-analysis, the Q value was 24.845 ($p < 0.001$) and the I^2 value was 83.9% (Figure 2). According to these values, it has been determined that there is a heterogeneous structure. Due to the structure, the random effect model was examined and the OR was 0.387 (95% CI: 0.091: 1.649) and insignificant ($p > 0.001$, Figure 2). According to Egger's regression analysis method, the β0 value was 0.459, the t value was 0.144, and the p value was 0.44. According to this result, there is no publication bias.

4 | Discussion

This systematic review and meta-analysis study aimed to assess the impact of nursing interventions on the health outcomes of pregnant women with gestational hypertension. The study synthesized findings from 13 previous studies that examined the effects of nursing interventions on women's health. Our findings are significant as they offer evidence-based insights crucial for enhancing the well-being of pregnant women with gestational hypertension. The results revealed that nursing interventions demonstrate moderate to high efficacy in reducing anxiety, depression levels, length of hospital stay, and blood pressure among women with gestational hypertension.

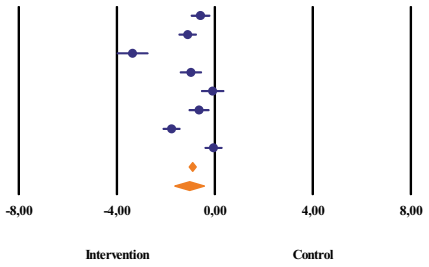
Quality assessments indicate that most randomized controlled trials are of good quality. This increases the reliability of the studies and supports the validity of the results obtained. The types of interventions include educational interventions, home care programs, nursing interventions, and a variety of approaches such as music therapy. Consistent with our findings, educational interventions are designed to provide information about hypertension and preeclampsia, psychoeducational counseling, and dietary education to participants (Umamah et al. 2022). In addition, nurse-led case management programs are designed to monitor the health status of pregnant women and provide education (Kung'u et al. 2018; Moshi et al. 2018). It has been observed that such interventions have positive effects on the psychological and physiological health of participants. Similarly, the results of studies in the literature show that various interventions have positive effects on the psychological well-being of pregnant women and improve their quality of life. In particular, nursing-based interventions and structured education programs have been reported to be effective in reducing blood pressure in high-risk pregnant women (Amoakoh-Coleman et al. 2016; Thapa et al. 2021).

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Notably, among the nursing interventions on gestational hypertension reviewed in these studies, there is a distinct absence of technological approaches. While many interventions focus on traditional methods and telephone follow-ups, none leverage modern technology like mobile health (mHealth) applications, wearable devices for continuous monitoring, or digital platforms for real-time feedback and support. This gap is significant, as technological tools could enhance patient engagement, enable continuous monitoring of blood pressure, and provide timely interventions, which are crucial for managing gestational hypertension. Incorporating technology could also facilitate personalized care, allowing for more flexible, accessible, and responsive interventions (Ibrahim and Jahanfar 2024; Moulaei et al. 2021; Noronha et al. 2023). The absence of technology-based

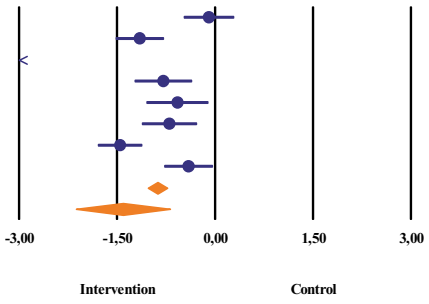
a. Systolic blood pressure

Model	Study name	Outcome	Statistics for each study						
			Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Latha et al., 2015	Systolic blood pressure	-0,582	0,200	0,040	-0,974	-0,190	-2,913	0,004
	Amanak et al., 2019	Systolic blood pressure	-1,107	0,186	0,035	-1,471	-0,742	-5,948	0,000
	Pan et al., 2018	Systolic blood pressure	-3,357	0,328	0,107	-4,000	-2,714	-10,239	0,000
	Zhou et al., 2021	Systolic blood pressure	-0,973	0,228	0,052	-1,419	-0,527	-4,274	0,000
	Toker et al., 2016	Systolic blood pressure	-0,089	0,237	0,056	-0,553	0,374	-0,378	0,705
	Ni et al., 2020	Systolic blood pressure	-0,642	0,213	0,045	-1,059	-0,225	-3,016	0,003
	Jiang et al., 2019	Systolic blood pressure	-1,765	0,181	0,033	-2,120	-1,409	-9,734	0,000
	Alnuaimi et al., 2020	Systolic blood pressure	-0,052	0,187	0,035	-0,419	0,314	-0,280	0,780
Fixed			-0,923	0,074	0,006	-1,068	-0,777	-12,433	0,000
Random			-1,050	0,306	0,093	-1,649	-0,451	-3,435	0,001



b. Diastolic blood pressure

Model	Study name	Outcome	Statistics for each study						
			Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Latha et al., 2015	Diastolic blood pressure	-0,093	0,196	0,038	-0,477	0,291	-0,475	0,634
	Amanak et al., 2019	Diastolic blood pressure	-1,151	0,187	0,035	-1,517	-0,784	-6,152	0,000
	Pan et al., 2018	Diastolic blood pressure	-7,550	0,604	0,364	-8,733	-6,367	-12,507	0,000
	Zhou et al., 2021	Diastolic blood pressure	-0,791	0,223	0,050	-1,229	-0,354	-3,543	0,000
	Toker et al., 2016	Diastolic blood pressure	-0,574	0,241	0,058	-1,047	-0,101	-2,377	0,017
	Ni et al., 2020	Diastolic blood pressure	-0,698	0,214	0,046	-1,117	-0,279	-3,263	0,001
	Jiang et al., 2019	Diastolic blood pressure	-1,452	0,173	0,030	-1,791	-1,114	-8,403	0,000
	Alnuaimi et al., 2020	Diastolic blood pressure	-0,405	0,189	0,036	-0,775	-0,035	-2,143	0,032
Fixed			-0,882	0,075	0,006	-1,029	-0,735	-11,764	0,000
Random			-1,410	0,367	0,135	-2,129	-0,690	-3,838	0,000



c. Meta-analysis results for anxiety levels

Model	Study name	Outcome	Statistics for each study						
			Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Zhou et al., 2021	Anxiety	-1,367	0,239	0,057	-1,836	-0,898	-5,716	0,000
	Toker et al., 2016	Anxiety	-0,239	0,237	0,056	-0,704	0,226	-1,008	0,313
	Jiang et al., 2019	Anxiety	-0,962	0,162	0,026	-1,280	-0,643	-5,924	0,000
	Abazarnejad et al., 2019	Anxiety	-0,053	0,296	0,088	-0,633	0,528	-0,178	0,859
	Chou et al., 2021	Anxiety	-0,642	0,257	0,066	-1,146	-0,138	-2,495	0,013
	Pan et al., 2021	Anxiety	-1,198	0,257	0,066	-1,702	-0,694	-4,659	0,000
Fixed			-0,810	0,093	0,009	-0,993	-0,628	-8,684	0,000
Random			-0,760	0,199	0,039	-1,149	-0,371	-3,827	0,000

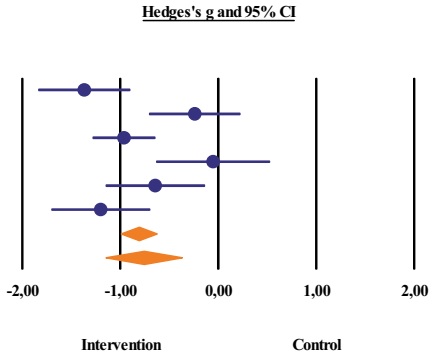
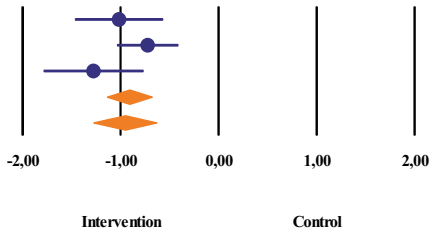


FIGURE 2 | Forest plots of the effects of nursing interventions.

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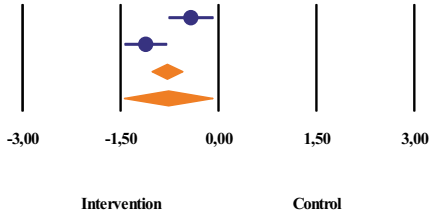
d. Meta-analysis results for depression

Model	Study name	Outcome	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Zhou et al., 2021	Depression	-1,017	0,229	0,052	-1,465	-0,568	-4,446	0,000
	Jiang et al., 2019	Depression	-0,724	0,159	0,025	-1,035	-0,413	-4,564	0,000
	Pan et al., 2021	Depression	-1,276	0,260	0,068	-1,785	-0,767	-4,911	0,000
Fixed			-0,911	0,116	0,014	-1,139	-0,683	-7,819	0,000
Random			-0,955	0,163	0,027	-1,275	-0,635	-5,851	0,000



e. Meta-analysis results for length of stay hospital

Model	Study name	Outcome	Hedges's g	Standard error	Variance	Lower limit	Upper limit	Z-Value	p-Value
	Amanak et al., 2019	Length of stay hospital	-0,422	0,175	0,031	-0,765	-0,079	-2,409	0,016
	Jiang et al., 2019	Length of stay hospital	-1,112	0,165	0,027	-1,436	-0,788	-6,734	0,000
Fixed			-0,787	0,120	0,014	-1,023	-0,552	-6,552	0,000
Random			-0,769	0,345	0,119	-1,446	-0,093	-2,229	0,026



f. Meta-analysis results for development pre-eclampsia

Model	Study name	Outcome	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value
	Chou et al., 2021	Pre-eclampsia	1,681	0,616	4,591	1,014	0,311
	Latha et al., 2015	Pre-eclampsia	0,761	0,285	2,029	-0,546	0,585
	Amanak et al., 2019	Pre-eclampsia	0,079	0,034	0,180	-6,015	0,000
	Ugurlu et al., 2021	Pre-eclampsia	0,116	0,006	2,209	-1,433	0,152
Fixed			0,356	0,210	0,603	-3,844	0,000
Random			0,368	0,070	1,940	-1,178	0,239

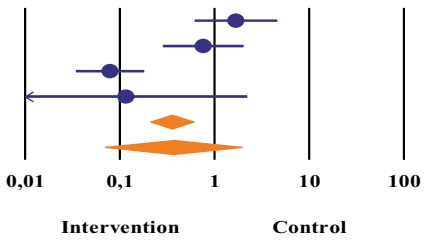


FIGURE 2 | (Continued)

approaches in these studies suggests an area of opportunity for future research to explore how digital tools might improve outcomes for pregnant women managing hypertension.

In this study, nursing interventions were found to have a high/moderate impact on the diastolic and systolic blood pressure of women. Similar findings were reported in a systematic review of educational nursing interventions for hypertensive disorders of pregnancy, where significantly greater reductions in Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were observed (Gholami et al. 2022). Additionally, the meta-analysis included studies examining the effect of nurse-led exercise interventions. Consistent with our study, a meta-analysis focusing solely on exercise's effect on blood pressure during pregnancy showed a significant reduction in blood pressure among women (Vizcaino et al. 2023). Moreover, another meta-analysis on mind–body interventions highlighted a reduction in systolic and/or diastolic blood pressure as the primary outcome for women with hypertension and/or preeclampsia during pregnancy. These findings underscore the importance of nurse-led interventions in managing blood pressure during pregnancy. However, there is a lack of standardization in nursing interventions across these

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studies and the current review. Further research is warranted to ascertain the full impact of standardized nursing practices.

Women with obstetric complications, categorized as high-risk pregnancies, are at an elevated risk of developing prenatal depression, as observed due to the association between prenatal depression and various obstetric factors (Ribeiro et al. 2022). Meta-analysis findings indicate that nursing interventions in women with gestational hypertension positively influence mental health outcomes such as depression and anxiety. Hypertensive disorders of pregnancy can exacerbate anxiety and stress levels, which in turn can elevate blood pressure. Thus, maintaining lower levels of anxiety and stress is crucial for pregnant women with hypertension (Puspitasari et al. 2020). Additionally, literature reviews have demonstrated that mobile-health interventions for hypertensive disorders of pregnancy reduced maternal anxiety and depression through enhanced knowledge (Rivera-Romero et al. 2018). Furthermore, studies in the literature have revealed that theory-based nursing interventions have a positive effect on mental health outcomes such as anxiety and depression in women diagnosed with high-risk pregnancies (Keles and Eroğlu 2023; Puspitasari et al. 2020). Considering the findings of this study and existing literature, it is evident that planned and systematic nursing interventions play a crucial role in addressing anxiety and depression during this period.

In this study, nursing interventions were found to potentially shorten the length of hospital stay. Nursing and midwifery care play a crucial role in perinatal services, aiming to reduce maternal hospitalization, rehospitalization, and healthcare system costs (Altman et al. 2017). While evidence specifically on the length of hospital stay in gestational hypertension is limited, another study conducted in the general population, where mothers underwent an empowerment program for discharge, demonstrated a significantly shorter length of neonatal hospitalization in the intervention group (Moradi et al. 2018). Shortening hospital stays has the potential to decrease the risk of infection and foster stronger family bonds by transitioning the recovery process to the home environment (Digenis et al. 2020). Nevertheless, further studies are warranted to corroborate these findings.

Furthermore, our meta-analysis results indicated that nursing interventions did not significantly affect the development of preeclampsia in women with gestational hypertension. In another systematic review of educational interventions for pregnant women diagnosed with preeclampsia, some studies reported that educational interventions significantly reduced the rate of preeclampsia development, while others found no effect (Gholami et al. 2022). Therefore, these results underscore the need for further research to elucidate the impact of nursing interventions on the development of preeclampsia.

4.1 | Strengths and Limitations

The strengths of this systematic review include the examination of recent experimental studies, the use of similar reliable measurement tools in the included studies, the examination of studies published in English, and the inclusion of studies with quality assessment scores of mostly moderate and good qualities. However, the study has some limitations. The first limitation of this study is the variability in evaluation, intervention type, and follow-up periods among the included studies. The dissimilarity may introduce potential bias and hinder the ability to directly compare the outcomes across studies. Second, some of the meta-analysis results were obtained from only two studies and studies with small sample sizes. Third, in our meta-analysis, due to the limited number of experimental studies available, we included quasi-experimental studies to enrich the dataset and provide a broader understanding of the intervention's effects. However, we acknowledge that including quasi-experimental studies may introduce potential biases, as these studies often lack randomization, which can impact the robustness of causal inferences. Future research could benefit from a more stringent selection of experimental studies to strengthen the validity of the findings. Finally, heterogeneity between studies was high, which might have compromised the strength of the results. Therefore, to avoid the effect of heterogeneity between studies, the random effects model was chosen in the relevant meta-analyses. Future studies in this area would benefit from a more standardized approach to evaluation, intervention types, and follow-up periods to enhance comparability across studies. Additionally, conducting larger-scale experimental studies with rigorous randomization processes is recommended to strengthen causal inferences and minimize potential biases associated with quasi-experimental designs. Efforts to reduce heterogeneity in study designs and sample characteristics would also contribute to more consistent findings, potentially enabling the use of fixed-effect models and enhancing the overall reliability of meta-analytic results. Lastly, the inclusion of studies with larger sample sizes and higher methodological quality would further improve the robustness and generalizability of findings in future meta-analyses.

5 | Conclusion

The results of this systematic review and meta-analysis show that nursing interventions implemented in the care of women with gestational hypertension significantly reduce blood pressure, reduce hospital stays, and positively affect anxiety and depression levels. These findings demonstrate the potential of nursing interventions to improve physical and mental health outcomes in this patient group and emphasize the need for such interventions to be included in clinical practice. In addition, the results obtained provide important ground for the development of more effective approaches to managing gestational hypertension in nursing practice.

5.1 | Relevance to Clinical Practice

By demonstrating the effectiveness of nursing interventions in reducing blood pressure, anxiety, depression, and hospital stay length among women with gestational hypertension, our research underscores the vital role of nursing care in managing pregnancy-related hypertensive disorders. Integrating these evidence-based interventions into clinical guidelines and protocols can enhance maternal health outcomes, reduce maternal morbidity and mortality, and ensure healthier pregnancy and delivery processes. These interventions not only improve physical health parameters but also address psychological well-being, offering a comprehensive approach to patient care. Therefore,

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healthcare providers should prioritize and implement these nursing strategies in their practice to provide optimal care for pregnant women with hypertension.

Author Contributions

Maide Nur Tumkaya: conceptualization, methodology, visualization, formal analysis, writing – review and editing, writing – original draft, investigation. **Sehma Sen:** conceptualization, writing – original draft, writing – review and editing, methodology, formal analysis, investigation. **Kafiye Eroglu:** writing – review and editing, supervision, conceptualization, investigation, writing – original draft, methodology, formal analysis.

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Ethics Statement

The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

All data generated or analyzed during this study are included in this published article (Table 1).

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