

Maternal Knowledge is Power to Protect Hypertensive Pregnancies

Brandie Smith

UMKC School of Nursing and Health Studies

N5624

Dr. Deb Pankau

Abstract

Hypertensive disorders in pregnancy are a leading cause of maternal mortality. Lack of awareness of disease severity and recognition of complications in high-risk pregnant women may lead to life-threatening complications for both mother and baby. Low maternal health literacy, health beliefs, and negative interactions with medical providers increase the risk of adverse birth outcomes and decreased satisfaction with childbirth experiences. This evidence-based quality improvement project is a pre-post-test design that aims to improve maternal health literacy in high-risk pregnant women via a 1-hour education course, self-monitoring home blood pressure monitoring, follow-up education as needed until delivery, and a 4-week postpartum telehealth follow-up. Pre- and post-online intervention questionnaires administered during the education course and four weeks postpartum measured outcomes for improved maternal health literacy level, compliance with home blood pressure monitoring, and satisfaction with childbirth experience. Five pregnant women participated in this study, and 3 out of 5 participants had limited maternal health literacy levels, and 2 had sufficient maternal health literacy levels prior to the education class. One participant completed all surveys with improved maternal health literacy level at 4 weeks postpartum, reported home blood pressure monitoring at least twice per day, and 83% childbirth satisfaction. A correlation between maternal health literacy level and adherence to treatment should be further studied with a larger sample to determine effectiveness.

Keywords: prenatal education, home blood pressure monitoring, gestational hypertension, pre-eclampsia, high-risk pregnancy, low-income pregnant women, maternal health literacy, childbirth beliefs

	3
Maternal Knowledge is Power to Protect Hypertensive Pregnancies	6
Significance (Economic, Policy, Health System)	6
Local Issue	8
Diversity Considerations	9
Problem, Purpose	9
Purpose.....	10
Review of the Evidence	10
Search Strategies	10
Evidence Themes	11
HPD Management.....	11
Maternal Health Literacy	12
Remote Surveillance	13
Health Beliefs.....	14
Health Equity	15
Childbirth Satisfaction	17
Evidence Discussion	18
Limitations and Gaps	20
Theory	20
Health Belief Theory.....	20
Methods.....	22

IRB Approval, Site Approval, Ethical Issues	22
Funding	23
Setting and Participants.....	23
EBP Intervention.....	24
Facilitators & Barriers.....	25
Change Process, EBP Model	26
Project Design.....	28
Validity	29
Outcomes	29
Measurement Instruments	29
Maternal Health Literacy Inventory in Pregnancy Questionnaire (MHELIP).....	30
Birth Satisfaction Scale-Revised Indicator (BSS-RI).....	30
Quality of Data.....	31
Analysis Plan	31
Conclusion	39
References.....	41
Appendix.....	50
Appendix A- Cost Table	50
Appendix B- Definitions.....	52
Appendix C- PRISMA Diagram.....	53

.....	53
Identification	53
Screening	53
Eligibility	53
Included	53
Appendix E- Evidence Grid.....	93
Appendix F- Theory to Application Diagram.....	95
Appendix G- Logic Model.....	96
Appendix H- Project Timeline.....	97
Appendix I- Intervention Flow	98
Appendix J- Intervention Materials	99
Appendix K- Faculty DNP Project Approval	101
Appendix L- IRB Determination	102
Appendix N- Informational Letter	104
Appendix N- Permission for Tools	111
Appendix O- Data Collection	112
Appendix P- Descriptive Statistics	113
Appendix Q- Outcomes, tool analysis table	115

Maternal Knowledge is Power to Protect Hypertensive Pregnancies

Hypertensive disorders in pregnancy (HDP) are the second leading cause of maternal morbidity and mortality and remain a global health crisis for women and infants. Severe and life-threatening complications can increase the risk of developing severe pre-eclampsia and severe features. Health literacy predicts health status, behaviors, and outcomes to a greater degree than age, economic status, race, and ethnicity. Low maternal health literacy, health beliefs, and negative interactions with medical providers are key factors that lead to adverse outcomes in HDP. Care plan strategies for hypertensive disorders in pregnancy should include patient education, accurate home blood pressure monitoring, and promoting healthy behaviors. Clinicians must modify perinatal care to include disease-related curriculum and increase surveillance to manage HDP effectively, improve birth outcomes, and reduce long-term morbidity for both mother and infant.

Significance (Economic, Policy, Health System)

Hypertensive disorders in pregnancy refer to conditions that can affect a pregnant woman's blood pressure levels and include chronic hypertension, gestational hypertension, pre-eclampsia, eclampsia, and postpartum hypertension (Bello et al., 2017). Sixteen percent of maternal deaths occur because of complications associated with HDP, and significant morbidity related to long-term effects exists for both mother and baby (ACOG, 2020). The etiology is a dysfunction in the development of the fetoplacental unit, which results in decreased placental perfusion, which may lead to vascular resistance, fetal growth restriction, and hypoxia (Metoki et al., 2022). Risk factors associated with HDP are a genetic or environmental disposition, obesity, severe anemia, history of cardiac or renal disease, history of diabetes mellitus, advanced or adolescent maternal age, nulliparity, and genitourinary problems.

Maternal blood pressure measurement is the fundamental component for the diagnosis of gestational hypertension with a sustained systolic blood pressure (SBP) ≥ 140 mm Hg or a sustained diastolic blood pressure (DBP) ≥ 90 mm Hg (Hurrell et al., 2022). Accurate blood pressure readings are crucial to diagnosing HDP. ACOG (2020) recommends checking blood pressure with every clinic visit and self-monitoring at home to evaluate for elevated risk for pre-eclampsia (Hurrell et al., 2022). Diet and modified prenatal exercise are first-line treatments to manage a new diagnosis of maternal hypertension. If blood pressure remains uncontrolled, anti-hypertensive medications may be prescribed in pregnancy's second and third trimesters (Hurrell et al., 2022). Weekly antenatal testing starting at 32 weeks' gestation includes monitoring fetal growth, biometrics, and placental function studies (ACOG, 2020).

Maternal hypertension with proteinuria is classified as pre-eclampsia and is a late progression of HDP (Hurrell et al., 2022). Characteristics of severe features of pre-eclampsia include hypertension (SBP ≥ 160 mm Hg or DBP ≥ 100 mm Hg) with maternal acute kidney injury, liver dysfunction, neurological features, hemolysis or thrombocytopenia, or fetal growth restriction (Metoki et al., 2022). Pre-eclampsia increases the risk for adverse maternal and fetal outcomes, which include stillbirth, placental abruption, preterm birth, postpartum bleeding complications, and life-long cardiovascular, renal, and neurological problems for both mother and baby (Metoki et al., 2022). Current guidelines recommend that daily low-dose aspirin (LDA) administration for all pregnant women at risk of developing pre-eclampsia is effective for prevention (Metoki et al., 2022).

Maternal knowledge of HDP plays a crucial role in disease management and prevention of complications. Studies have shown a correlation between HDP, diet, and lifestyle factors, warranting the need to address knowledge gaps through patient education and surveillance

(Gholami et al., 2022). High-risk pregnant women may not participate in treatment recommendations due to a lack of understanding and knowledge of the severity of HDP (Gholami et al., 2022). A shared decision-making approach between the patient and the medical care team can prevent complications, improve outcomes, increase satisfaction, and reduce long-term comorbidities. Education platforms that accommodate the unique needs of high-risk pregnant women and address social determinants of health (SDOH) that limit access to adequate care and resources can improve the chance of health outcomes for HDP.

Maternal knowledge deficit is a modifiable factor, and a perinatal education program and follow-up until recommended delivery and the postpartum period can lead to improved clinical outcomes (Artieta-Pinedo et al., 2017). It may also foster trust and support between the provider and patient, increasing satisfaction with the childbirth experience and reducing implicit bias. This holistic approach to patient care would encourage adopting appropriate health behaviors in high-risk pregnant women diagnosed with HDP and lead to healthier long-term habits. Telehealth and remote monitoring devices can address the unique needs of vulnerable pregnant women and increase access to education and care (DeNicola et al., 2020). Reducing knowledge deficits may improve health behaviors and adherence to home blood pressure monitoring and treatment recommendations and reduce adverse outcomes in the postpartum period.

Local Issue

Hypertensive pregnancy disorders are a common reason for hospitalization and preterm births in the Greater Kansas City (GKC) area. Currently, there are no local perinatal education programs that address the specific needs of pregnant women with hypertensive disorders. The burden of understanding and symptom management relies too heavily on patient knowledge, compliance, and assuming populations have equal access to resources (Putra et al., 2020).

Prenatal visits, weekly labs, and biophysical scans provide patient-provider interaction, and education during these encounters can be overwhelming and time-consuming. Historically, teaching has been done upon initial diagnosis during a routine clinic visit or follow-up telephone encounter to review lab results (Putra et al., 2020). Clinicians managing HDP in GKC area have expressed that reinforcement and more patient education are needed.

Diversity Considerations

Pregnant women with hypertensive pregnancy disorders are considered high-risk and typically have multiple appointments weekly with a primary obstetric provider and specialists. These patients have limited time and resources, and attending traditional childbirth education classes is unrealistic (Nawabi et al., 2021). Traditional childbirth classes can last two to eight hours, cost money, and are scheduled over several weeks. Unique challenges facing low- and middle-income (LMIC) pregnant women, especially women of color or rural backgrounds (Putra et al., 2020). Pregnant women in this demographic account for 99% of maternal deaths, and black women are three to four times more likely to suffer adverse outcomes than their white counterparts (Ross et al., 2019). This public health crisis compounds reduced access to maternity education, adequate prenatal care, postpartum care, and clinician support. These factors reveal a vulnerable population status may contribute to low maternal health literacy and poor adherence to treatment recommendations, leading to increased risk for adverse outcomes (Harris et al., 2020). Healthcare providers must improve maternal health literacy in high-risk pregnant women by addressing barriers and challenges to ensure access to appropriate education and clinical care.

Problem, Purpose

Problem Statement

High-risk pregnant women with limited resources and a lack of understanding of HDP management lead to a higher risk of adverse clinical outcomes than populations with more available resources, access to education, and clinical support. There are no local perinatal education programs specific to HDP in the Greater Kansas City area to address the needs of this high-risk population.

Intended Improvement

Purpose

This evidence-based quality improvement (EBQI) intervention aims to improve clinical management quality with a holistic and cost-effective approach to empower high-risk pregnant mothers with HDP to make informed decisions during the perinatal period to reduce adverse outcomes and increase access to education and resources.

Review of the Evidence

Inquiry

Does a perinatal education program over twelve weeks specific to pregnant women diagnosed with hypertensive disorders improve maternal health literacy, empower positive health beliefs, and reduce adverse outcomes (severe preeclampsia and preterm births) in a virtual community setting in the Greater Kansas City area?

Search Strategies

A comprehensive search of major databases and scholarly search engines was conducted to find research literature for this inquiry. UMKC Health Sciences Library, Google Scholar, Science Direct, Ovid, and PubMed were utilized. The keywords used to search were prenatal education, gestational hypertension, pre-eclampsia, home blood pressure monitoring, low-

income pregnant women, high-risk pregnancy, and childbirth beliefs. A total of 44 published studies were reviewed and relevant to this inquiry.

Evidence Themes

In the studies reviewed, three themes emerged relating to this inquiry: low maternal health literacy, inaccurate health beliefs, and negative interactions with healthcare providers as key contributors leading to adverse outcomes and patient dissatisfaction with their childbirth experience. The overarching theme that aligns with the goals of this project inquiry is increasing maternal health literacy levels, improving home blood pressure monitoring, and increasing access to clinician support. Subthemes that emerged from the literature are empowerment, ownership of the health, fostering positive relationships, and increasing childbirth satisfaction. The literature supports that perinatal education classes and extended clinician support via telehealth are effective platforms and consider the unique needs of high-risk pregnant women. Several studies have found that educational interventions can improve knowledge, build trusting relationships, and modify health beliefs to support positive outcomes in childbirth.

HPD Management

Controlling blood pressure includes maintaining a healthy diet during pregnancy. Diet counseling and education are necessary for managing HDP to ensure appropriate intake of nutrients and encouraging foods that lower the risk for pre-eclampsia (Wiertsema et al., 2021). Evidence has suggested the Mediterranean and DASH diet have proven effective in reducing complications in HDP. These diets are low in animal protein, sugar, and sodium, which can help reduce inflammatory responses that contribute to poor endothelial function and vascular resistance (Wiertsema et al., 2021). Maternal adherence to a Mediterranean diet pattern is

associated with lower blood pressure in mid-to-late pregnancy and improved placental blood flow (Wiertsema et al., 2021).

Relaxation exercise techniques reduce adverse effects and improve pregnancy outcomes in HPD (Naseh et al., 2022). Complementary approaches such as prenatal yoga are appropriate for reducing the risk of pre-eclampsia and postpartum risks (Karthiga et al., 2022). Inflammation is a critical factor in the danger of developing pre-eclampsia when hypertension is present during pregnancy, and yoga practice decreases the markers associated with inflammatory response (Karthiga et al., 2022). A clinical trial conducted on 100 high-risk women who received 16 weeks of prenatal yoga concluded anxiety and stress were significantly lower than the control group receiving routine antenatal care only (Naseh et al., 2021). Structured yoga during pregnancy is safe and has reduced the risk of fetal growth restriction and preterm birth (Karthiga et al., 2022). Prenatal yoga classes also teach skilled breathing and relaxation techniques that reduce stress, improve blood flow, increase self-confidence, and increase feelings of control of the body (Leutenegger et al., 2022).

Maternal Health Literacy

Maternal health literacy (MHL) refers to a woman's ability to obtain, process, and understand basic health information and services needed to make appropriate health decisions. Maternal health literacy is vital to a healthy pregnancy and impacts pregnancy outcomes and health care quality. There is strong evidence in recent literature proving low maternal health literacy influences health behaviors and decision-making, which leads to a lower rate of treatment adherence, poor disease management, and increased risk for complications and adverse outcomes (Nawabi et al., 2021). Pregnant women diagnosed with hypertensive disorders must

have accurate knowledge and understanding to enhance communication about their health decisions and take appropriate actions to implement positive health behaviors (Putra et al., 2020).

Inadequate maternal health literacy can also affect the management of HDP. Women with low maternal health literacy may have difficulty understanding the purpose of medications prescribed for HDP, adhering to daily blood pressure monitoring, and recognizing complications to report to their providers (Taheri et al., 2020). They may also lack the resources to follow diet and exercise recommendations to prevent complications associated with HDP. The proposed perinatal education class aligns with provider engagement to ensure patients understand and utilize information to safeguard and promote their and their baby's health (Taheri et al., 2020).

Remote Surveillance

Telehealth Follow-up visits reinforce health behaviors, adherence to treatment recommendations, and the opportunity to change the current regimen to manage HDP effectively (DeNicola et al., 2020). Telehealth has become increasingly used in women's healthcare and has been associated with improved obstetric outcomes (DeNicola et al., 2020). This healthcare delivery method has effectively mitigated potential health risks associated with access to prenatal care (DeNicola et al., 2020). Smartphone technology allows the use of applications and enhanced communication with providers, and studies have shown an increase in healthy eating during pregnancy, increased physical activity, and improved communication with providers (DeNicola et al., 2020). Clinicians can utilize telehealth visits to discuss the reported findings or respond to incidental elevated blood pressures, eliminating the burden of a clinic visit without sacrificing quality care (Steele et al., 2023). Patients can also be referred to the triage unit for further workup and evaluation during a telehealth encounter to reduce delays in treatment in hypertensive crisis or signs of worsening pre-eclampsia.

Home blood pressure monitoring (HBPM) allows mothers to actively manage their health and communicate findings with their providers to facilitate dialogue in shared decision-making (Yeh et al., 2022). Clinicians managing HDP should analyze all HMBP results and make recommendations as needed (Tremonti et al., 2017). Smart health devices can link to smartphone applications and transfer data to a report for providers to review (Yeh et al., 2022). Result logs can help providers respond to elevated readings, reinforce education needs, and adjust treatment plans if necessary. Remote HMBP is recommended as adjunct management of HDP to assist providers in the early detection of pre-eclampsia and prompt treatment (Albradrani et al., 2023).

Health Beliefs

Health behaviors are based on the perception and belief patterns of individuals. People are more likely to act if they believe they are susceptible to disease, believe their condition has serious consequences, the benefits outweigh the barriers, and believe they can engage in health behavior (Abbaspour et al., 2016). Widespread myths and misconceptions can be present and passed down through cultural and community practices, leading to improper management and disease self-care (Boene et al., 2016). Cultural understanding lived experiences, and knowledge influences health beliefs and impact effectively managing care in pregnant women with high-risk medical conditions (Robbins et al., 2021).

Multiple studies have recognized that education is essential to pregnancy and birth outcomes (Putra et al., 2020). The most critical factor in predicting the health of pregnant women is information about adequate prenatal care and adherence to prescribed regimens (Putra et al., 2020). Pregnant women diagnosed with HDP need to be educated and empowered to contribute to making their pregnancy safer, and a perinatal education program can provide clinician support to monitor symptoms and disease management (Putra et al., 2020). Health beliefs about

preventative behaviors and the treatment of disease can contribute to unnecessary fears leading to poor compliance with treatment recommendations (Abbaspour et al., 2016).

Effective management of HPD requires a holistic approach that incorporates knowledge, lifestyle changes, and behavior modifications during pregnancy, postpartum, and lifespan to minimize the impact of the disease. Educating mothers on the benefits of preventative lifestyle recommendations like prenatal yoga and diet modifications can facilitate their participation and thus help improve health outcomes (Desmukh et al., 2020). Understanding the therapeutic effect of medications prescribed, such as low-dose aspirin therapy to reduce pre-eclampsia risk and anti-hypertensive medications to control blood pressure if needed, allows the patient to make decisions they are comfortable with to maintain the health of their pregnancy.

Pregnancy and childbirth are an immense transition for mothers, and high-risk pregnancy conditions compound anxiety and worry (Mohaghegh et al., 2022). Reliance on what is familiar such as cultural beliefs and advice of trusted individuals, provides comfort and a sense of control for pregnant mothers who ultimately want their childbirth experience filled with memorable and joyous moments. Birth plans are written documents that allow pregnant women to express their needs and choices for their childbirth experience (Mohagheh et al., 2022). In HPD, delivery is recommended at 37 weeks' gestation and will likely result in labor induction. High-risk pregnant women can create a birth plan that follows best practices for HDP and implement the safe preferences they wish to have during childbirth. Birth plans empower mothers as they prepare for labor, reduce labor interventions, facilitate communication with their medical team, and increase maternal satisfaction with their childbirth experience (Mohagheh et al., 2022).

Health Equity

A high prevalence of HDP is present in underserved populations that are predominantly low-income and minority demographics (Pasha et al., 2021). Several studies have found lower quality of care related to bias from providers that perpetuate systemic systems of racism and discrimination (Pasha et al., 2021). Pregnancy is a vulnerable time for all women, and unconscious biases, stereotypes, and prejudices cause harm that contributes to maternal and neonatal mortality, especially for women of color in the United States (Russell et al., 2021). Implicit bias is unintentional and activated quickly and unknowingly based on situational cues. For vulnerable pregnant women, these cues are linked to skin color, accent, clothing, and religion (Afulani et al., 2021). Explicit bias refers to conscious attitudes about certain groups and can manifest as discrimination and racism. These biases influence treatment recommendations and foster negative perceptions about patients' intelligence, risk behavior, and adherence, and feeling less connected to them (Afulani et al., 2021).

A comparison study (2021) examined medical providers' role in health disparities and factors associated with differential care. Differential treatment has been linked to appearance, perceptions, assumptions, ability, and ability to pay for timely services (Afulani et al., 2021). Women's social status, level of education, economic status, and attitude were identified as factors in provider perceptions (Afulani et al., 2021). Providers in this study acknowledged treating poor women disrespectfully, believed they had lower expectations, and lacked the resources to hold them accountable for negligent care (Afulani et al., 2021). This study also revealed that some providers perceive that women with more education have a better understanding of the information presented, are easier to deal with, and have connections with persons of political influence and power (Afulani et al., 2021).

In the United States, Black women are at higher risk for HPD and three to four times more likely to die from maternal complications than White women (Ross et al., 2019). Socioeconomic status does not attenuate the risk for HPD or maternal mortality in Black women (Ross et al., 2019). Race is often treated as a genetic factor to explain biological differences and fails to recognize the social context and proxy of cultural experiences that fuel racial bias in science and medicine (Fasanya et al., 2021). Many studies have found that the increased incidence of HPD and maternal mortality rate in Black women is mainly due to racial disparity and unequal access to adequate care (Fasanya et al., 2021). Protective benefits of higher education, income, and social status do not affect health outcomes for pregnant black women and their babies (Fasanya et al., 2021). Black women from affluent backgrounds have added stress as they must combat racism in more predominantly white spaces than low-income black women (Fasanya et al., 2021).

Childbirth Satisfaction

Childbirth is a significant transition and milestone in a woman's life. Women with high maternal health literacy have higher satisfaction with their childbirth experience (Hajipour et al., 2017). A 2021 study found that many women do not feel well-informed or involved in decision-making during their pregnancy and HPD (Helou et al., 2021). Interactions with providers are crucial in patients' understanding and decision-making regarding their care (Martin et al., 2017). Shared decision-making leads to better maternal health outcomes in HDP and higher satisfaction scores from new mothers.

A recent study showed most women feel that technological advances in healthcare interventions fit easily into their lifestyle and increase access to providers (Thomas et al., 2021). High-risk pregnant women report feeling secure and enhanced engagement with providers

through remote blood pressure monitoring in HDP (Thomas et al., 2021). With appropriate education and training in blood pressure equipment, remote monitoring allows patients to play a crucial role in managing their and their baby's health.

Evidence Discussion

For this inquiry, the review of evidence supports the need for childbirth education to be modified to include education for high-risk mothers with consideration for their unique needs. Perinatal education is a social activity that aims to address knowledge deficits and social determinants and meet the diverse needs of high-risk pregnant women (Yee et al., 2021). High-risk mothers need tailored education regarding self-management of HDP, which may improve birth outcomes and reduce mortality rates for women and infants. Perinatal education increases knowledge and maternal health literacy, so pregnant women can adapt to pregnancy changes and recognize complications.

A review of studies showed that women who receive perinatal education have higher rates of term vaginal deliveries, fewer medical interventions, are more likely to initiate breastfeeding, and are less likely to develop postpartum depression (Abbaspour et al., 2020, Artieta-Pinedo et al., 2017, Ekhtiari et al., 2014, Fondjo et al., 2019, Gholami et al., 2022, Hong et al., 2021, Nawabi et al., 2021, Putra et al., 2020, Sagaie et al., 2018, Taheri et al., 2020). Improving knowledge of HDP and promoting a healthy pregnancy empowers high-risk pregnant women to make informed decisions about their childbirth experience. Substantial evidence supports educational interventions to improve outcomes and reduce adverse events associated with HDP (Abbaspour et al., 2020, Artieta-Pinedo et al., 2017, Ekhtiari et al., 2014, Fondjo et al., 2019, Gholami et al., 2022, Hong et al., 2021, Nawabi et al., 2021, Putra et al., 2020, Sagaie et al., 2018, Taheriet al., 2020). Improving maternal health literacy in high-risk pregnant women

diagnosed with HDP contributes to prevention, control, and management. A review of studies has proven that knowledge, awareness of complications, and clinician follow-up are essential to reducing adverse outcomes. Information provided in perinatal education and clinician support may change the attitudes and beliefs of mothers in managing their medical condition and preparing for childbirth (Abbaspour et al., 2020, Artieta-Pinedo et al., 2017, Ekhtiari et al., 2014, Fondjo et al., 2019, Gholami et al., 2022, Hong et al., 2021, Nawabi et al., 2021, Putra et al., 2020, Sagaie et al., 2018, Taherie et al., 2020).

A systematic review concluded that telehealth interventions decrease the need for high-risk obstetric visits while maintaining maternal and fetal outcomes, and another study found reductions in diagnosed pre-eclampsia in women with gestational hypertension (DeNicola et al., 2020). Telehealth follow-up augments clinical surveillance and allows continued education to reduce adverse events and long-term effects of HDP postpartum (Thomas et al., 2021). Home blood pressure monitoring for women diagnosed with HDP is a safe method with solid fidelity and positive patient acceptability (Albadrani et al., 2023). A 2021 study included telehealth interventions with home blood pressure monitoring, which effectively managed postpartum hypertension and reduced adverse outcomes for the population studied. Studies have also shown that patients favor remote monitoring devices due to a sense of empowerment and a lack of disruption in their daily routine (Thomas et al., 2021; Helou et al., 2021; Martin et al., 2017, Steele et al., 2023).

Strengths

The literature revealed a solid link between the prevalence of HPD and racial disparities (Harris et al., 2020). It is critical to understand better how these disparities in health impact maternal mortality. A systematic review concluded critical factors of the utilization of clinical

services, experiences of institutional racism in accessing and receiving prenatal care, and elevated inflammatory markers from chronic stress associated with racism (Harris et al., 2020). Substantial evidence supports the development of interventions to address racial bias and discrimination in patient education, clinic, and inpatient settings (Harris et al., 2020). Quality improvement measures are supported in the literature to improve, develop, and investigate at-home and community-based interventions to address social determinants influenced by diversity (Harris et al., 2020).

Limitations and Gaps

This inquiry is supported by multiple quantitative and qualitative studies that show the benefits of improving maternal health literacy through education and clinician support systems that can reduce fear of childbirth and empower mothers to share in decision-making in the childbirth process. However, minimal literature exists on concepts and theories that address maternal health literacy specific to high-risk pregnancy, HDP, and related outcomes. Furthermore, there is a lack of literature that presents new approaches related to the unique needs of high-risk pregnant women and how prenatal education programs can accommodate this population. There is also scarce literature regarding high-risk childbirth curricula and remote blood pressure monitoring for antepartum care. The inquiry for this project addresses the gap in research and literature and contributes to improving maternal health literacy and birth outcomes to reduce maternal mortality.

Theory

Health Belief Theory

Nurse educators have widely used the health belief model to analyze behavior based on individuals' perceptions and belief patterns (Ekhtairi et al., 2014). According to this model, a

person is more likely to act if they believe they are susceptible to disease, believe their condition has serious consequences, the benefits outweigh the barriers, and think they can engage in healthy behaviors (Artieta-Pinedo et al., 2017). This model is appropriate for childbirth education concerning health promotion and effective for high-risk pregnancies related to disease prevention and management.

An essential factor in predicting the health of pregnant women and their babies is information about healthy pregnancy, adequate prenatal care, and adherence to prescribed regimens, especially in high-risk pregnancies (Safaie et al., 2018). High-risk pregnant women need education and empowerment, which could contribute to safer and healthier pregnancies by utilizing the information obtained and coping strategies for self-care and managing their condition (Sangeetha & Baby, 2018). Adopted beliefs and practices regarding preventative behaviors can play an essential role in fears and self-efficacy regarding childbirth and parenting, and childbirth education can aid in readiness to enhance knowledge and self-care (Sangeetha & Baby, 2018). Attitudes, beliefs, and self-efficacy impact health behaviors, and childbirth education that is specific to hypertensive disorders and meets the unique needs of low-income and minority women can improve maternal and infant outcomes for this vulnerable population (Artieta-Pinedo et al., 2017).

High-risk prenatal education classes provide practical care by promoting health and individual growth based on the unique challenges of this population of pregnant women (Clark, 2016). Maternity education for high-risk pregnant women should support a mutually created environment between the educator and client by fostering knowledge, empowerment, and healing (Clark, 2016). All pregnant women, regardless of demographics and background, have the right to the highest attainable standard of health. Socioeconomic status is a significant factor

associated with pregnancy outcomes even with universal healthcare systems in place, and telehealth is a cost-effective alternative that allows flexible options to access medical care and close surveillance of high-risk pregnancy conditions (Afulani et al., 2021).

Providers must understand and address barriers that influence outcomes for all pregnant women, especially high-risk populations. Clinical management of HPD needs to evolve with technology, become patient-centered, and reduce health disparities that limit access to quality care. Health disparities exist in communication and treatment offered to women from different racial, ethnic, and cultural backgrounds, which has a systemic effect that contributes to higher maternal mortality rates for vulnerable women of color (Russell, 2021). Providers are morally obligated to provide culturally competent care that is free of bias and discrimination. They must understand how bias, prejudice and discrimination are harmful and contribute to this population's adverse maternal outcomes. Perinatal education programs can empower mothers to speak up, ask questions, and advocate for themselves.

Methods

IRB Approval, Site Approval, Ethical Issues

The University of Missouri-Kansas City Internal Review Board (IRB) deemed this project evidence-based quality improvement (EBQI) and not Human Subjects Research. The project lead coordinated with a local birth doula and obtained approval for the recruitment site. The approval letter was signed and included in Appendix M. Research ethics for this project included privacy, protection, confidentiality, and investigator research conflicts.

Pregnant women have a right to privacy; the information obtained was kept confidential throughout the study and upon completion. The project lead ensured that protected health information (PHI) collected from participants was securely stored and not shared with

unauthorized parties. Participants received an informational letter describing the project and participation instructions before enrollment.

All goals for this quality improvement project aligned with the pregnant participants' health and well-being. The project lead was not employed by the recruitment site or participating providers and had no monetary investment in this project. Acknowledgment and disclosure of potential ethical issues allow the project to be conducted ethically and effectively. There are currently no conflicts of interest for this project.

Social and cultural demographics were a crucial consideration for this quality improvement project. This project considered the diverse backgrounds of the expectant mothers enrolled in the study, including cultural practices and health beliefs related to childbirth and illness management. This project did not promote a particular race, socioeconomic class, education level, relationship status, or cultural or religious belief system. The curriculum and guidance provided unbiased health information to all participants. All written materials for this project were fifth-grade literacy level, and available in multiple languages to ensure comprehension of the information provided to all participants.

Funding

Funding was needed for smart home blood pressure kits, printing of educational materials supplies, incentives for self-care, and audiovisual equipment for remote platforms. Funding was secured for this project through corporate donations (monetary and promotional products) and personal funds from the project lead. The total cost of this project was \$5000.00.

Setting and Participants

The project setting was the virtual platform Zoom for the 1-hour education class and email for follow-up until 4 weeks postpartum. Social media platforms provide equitable access to

antepartum inpatients and nontraditional schedules. Additionally, classes were scheduled in the evenings and weekends.

Inclusion criteria for eligibility were pregnant women with chronic hypertension or new gestational hypertension, at least 10 weeks gestation, and residing within 50 miles of the GKC area. Exclusion criteria were less than 10 weeks gestation or already delivered. The sampling method for this study was convenience sampling from pregnant women attending classes at a maternal wellness center or attending routine prenatal appointments with an obstetric provider. A total of five women participated in this study.

EBP Intervention

This program intervention delivers perinatal education via a 1-hour class with a curriculum on health promotion and education on the management of HDP. The project lead taught 4 classes in groups of one to two participants. The topics discussed focused on defining HDP, healthy diet recommendations, safe prenatal exercise regimens, home blood pressure monitoring, medication management, preparation for induction of labor, preterm and early-term breastfeeding, and postpartum care. Relaxation and effective coping strategies were reviewed, along with free vouchers for prenatal yoga (virtual or in-person), and a low-intervention childbirth class was given to participants.

Childbirth preparation incentives from community vendors were given to participants to promote continued learning and provide access to resources for self-care (see appendix). The project lead continued to be available via email to participants throughout the study as a resource for questions and further guidance, as needed, until four weeks postpartum. Participants completed a pre- and post-intervention questionnaire during the initial education class and 4-weeks post-partum via a Redcap survey link.

Facilitators & Barriers

Stakeholders for this quality improvement project include participants, birth partners, obstetric providers, birth doulas, and hospital systems. All stakeholders have expressed support for the proposed intervention because it is known that hypertensive disorders in pregnancy can exacerbate suddenly and progress to severe quickly. High-risk pregnant women need to understand disease management and have access to clinicians, education, guidance, and support (Helou et al., 2021). Improving maternal health literacy can empower expectant mothers to take ownership of their care and make decisions they feel comfortable with.

This intervention fosters a trusting and cohesive relationship between the patient and key stakeholders. Perinatal education and follow-up enhance the knowledge of women diagnosed with HDP and empower informed decisions regarding their pregnancy and childbirth experience (Gholami et al., 2022). The training and support for HBPM can ensure accuracy with clinical evidence to support interventions and involve patients in their care. Knowledge deficits can be recognized, and education can be reinforced to promote healthy behaviors.

Telehealth via Zoom provides an accessible platform for pregnant patients to have increased access to clinicians and receive education and guidance (DeNicola et al., 2020). This reduces the number of antenatal visits without compromising adequate disease management and recognition of warning signs (Pasha et al., 2021). Earlier detection of complications in HDP and prompt treatment reduce costs associated with treating this disease, which burden patients, clinics, and the healthcare system (Metoki et al., 2022). Telehealth interventions can improve overall outcomes related to high-risk obstetric conditions and provide an accessible opportunity for the clinician to review blood pressure logs and evaluate health status.

Barriers for high-risk pregnant women seeking education, resources, and continued guidance are primarily related to health disparities. Health disparities in vulnerable populations include a lack of economic resources, access to care, access to maternity educators, implicit bias, and follow-up specific to adequate self-care (Harris et al., 2020). Some women live in remote locations where childbirth classes are not accessible in person, and internet access may be limited or unavailable. Social barriers include stigmatization or judgment towards pregnant women who are single mothers, economic status, race or ethnic background, and religious or cultural practices (Harris et al., 2020). A lack of access to maternity education specific to high-risk pregnancy conditions such as HDP is a current barrier in the GKC area, which supports the need for this project intervention.

Utilization of the telehealth platform is a cost-effective approach that increases access to education, surveillance, and guidance for high-risk pregnant women (DeNicola et al., 2020). Telehealth visits can be billed to insurance providers and are more cost-effective for healthcare providers and this vulnerable population (DeNicola et al., 2020). The virtual education classes can supplement clinical care for women diagnosed with HDP. Hospital and clinic systems can partner with maternity educators in the community to provide additional support and guidance to this population and improve outcomes for both mother and baby. This intervention can help raise awareness and reduce adverse events and health disparities.

Change Process, EBP Model

Health promotion and patient education are critical strategies for enhancing health behaviors and improving clinical outcomes in HDP (Artieta-Pinedo et al., 2017). Women's health nurse practitioners must recognize and act to reduce disparities among vulnerable pregnant women. Perinatal education for high-risk women should be specialized to promote appropriate

education, teach healthy prevention strategies and autonomy, and empower the patient to take ownership of their prenatal care and that of their unborn child (Artieta-Pinedo et al., 2017). This quality improvement project is accessible, affordable, culturally competent, and patient-centered. Specialized perinatal education in vulnerable high-risk populations should be a priority intervention to improve the health outcomes for women and their children.

Transition to motherhood is a significant life event for women of childbearing age and establishing maternal roles (Mohaghegh et al., 2022). High-risk pregnancy conditions such as HDP have increased role strain and loss of control, which can interfere with establishing maternal identity and parenting their newborn (Mohaghegh et al., 2022). Research studies have shown a strong association between stressful life events, lack of childbirth education and planning, and limited social support systems leading to maternal role maladaptation (Mohaghegh et al., 2022). Perinatal education, training, and continuous support have been shown to encourage positive health behaviors, enhance support systems, and reduce complications associated with high-risk pregnancies (Hong et al., 2021).

Studies have shown the positive impact of educational interventions to improve maternal health literacy and motivate pregnant women to access, understand, and utilize the information to maintain their health during pregnancy (Abbaspour et al., 2016). This protective benefit would aid high-risk pregnant women in shared decision-making and management of their medical condition. A perinatal education class provides the opportunity to train mothers on properly taking their blood pressure and the importance of monitoring for early detection of complications (Helou et al., 2021).

Raised blood pressure is often associated with psychosocial stress factors, diet, and activity level (Robbins et al., 2021). Perinatal education can introduce strategies for stress

management and encourage a DASH diet, which has proven to be beneficial in lowering blood pressure and improving placental blood flow in mid-to-late pregnancy (Wiertsema et al., 2021). Prenatal yoga incorporates skilled breathing and relaxation techniques to manage stress (Leutenegger et al., 2022) and decrease inflammatory responses associated with endothelial dysfunction, contributing to higher blood pressure (Karthiga et al., 2022). Relaxation exercises demonstrated in prenatal yoga classes can reduce adverse outcomes in HDP and are recommended for high-risk pregnancies (Naseh et al., 2022).

The Health Belief Model constructs focus on pregnant women taking ownership of their pregnancy and willingness to change unhealthy behaviors to reduce adverse outcomes imperative to managing illness (Abbaspour et al., 2016). High-risk pregnant women need an education tailored to their specific needs so they may take a central role in making decisions regarding disease management and childbirth (Artieta-Pinedo et al., 2017). Knowledge, attitudes, and beliefs impact health behaviors and a person's willingness to change to improve clinical outcomes (Deshmukh et al., 2020). Perinatal education should foster an environment mutually created between the patient and their medical providers that encourages empowerment, partnership, and healing. A low-intervention childbirth class can help high-risk mothers integrate their birth preferences with consideration of their medical condition to ensure safety and respect autonomy.

Project Design

This quasi-experimental evidence-based quality improvement project is a single-cohort comparison study that will examine the effect of maternal health literacy level on the management and outcomes of HDP. Self-reported questionnaires will be used pre- and post-

intervention to measure maternal health literacy level, compliance with home blood pressure monitoring, and birth satisfaction.

Validity

Internal validity in this study determines the causal relationship between maternal health literacy level, treatment adherence, and birth satisfaction. Increasing maternal health literacy may improve adherence to treatment recommendations, enhance patient-provider communication, and reduce adverse birth outcomes associated with HDP. External validity was controlled by limiting participants to pregnant women diagnosed with chronic hypertension, gestational hypertension, or pre-eclampsia after 10 weeks gestation. Women less than 10 weeks gestation can obscure data and have a higher risk for adverse outcomes unrelated to HDP. This study can be generalized and reproduced for women with diverse demographic backgrounds for further health disparities and equity studies.

Outcomes

Primary outcomes for this evidence-based quality improvement project were Improved maternal health literacy level, increased adherence to routine home blood pressure checks, and increased childbirth satisfaction. Secondary outcomes include term delivery of at least 37 weeks gestation and positive interactions with providers.

Measurement Instruments

For this study, self-reported questionnaires were administered, including a demographic questionnaire and two instruments to measure outcomes. The Maternal Health Literacy Inventory in Pregnancy (MHELIP) and the Birth Satisfaction Scale-Revised Indicator (BSS-RI). A screening and enrollment survey collected patient demographics:

Maternal Health Literacy Inventory in Pregnancy Questionnaire (MHELIP)

The MHELIP tool developed by Taheri et al. (2021) measured maternal health knowledge and functional health literacy. Functional health literacy includes subdomains of maternal health information search, maternal information assessment, maternal health decision-making, and behavior (Taheri et al., 2021). Experts evaluated the validity of this tool, and convenience sampling of pregnant women was modified based on feedback. It has a content validity ratio (CVR) of 0.51 and a content validity index (CVI) of 0.79 (Taheri et al., 2020). Permission to use the MHELIP was obtained from the author before the beginning of the study (see Appendix N).

Birth Satisfaction Scale-Revised Indicator (BSS-RI)

The BSS-RI is a six-item questionnaire that measured two domains of birth satisfaction: stress and emotional response to labor/birth and quality of care (Martin et al., 2017). This tool was revised from the BSS-R to be a brief satisfaction indicator and minimal burden to the responding participants while providing meaningful information to determine critical factors related to outcomes being measured for this study (Martin et al., 2017). This instrument was modified to a three-point scoring system with each item (agree, somewhat agree, disagree) ranging in score from 0-2, respectively. Higher scores indicate increased satisfaction with childbirth experience and perceived good quality of care. The internal consistency of this tool was assessed using Cronbach's coefficient alpha, and acceptable internal reliability was indicated at 0.70 (Martin et al., 2017). Permission to use the BSS-RI tool was obtained prior to this study (see Appendix N).

Quality of Data

Methods to promote data quality include a G* power analysis, baseline and pre-post data, and comparison to benchmark studies. Baseline data included: Pre-post intervention data was collected from self-reported questionnaires at the time of education class and at 4 weeks postpartum. The project lead reviewed the quality assurance and accuracy of data collection. The project lead calculated a G*power analysis for a paired t-test, which showed that a minimum of 27 eligible participants was needed to achieve statistical significance and retain power (0.8) and alpha coefficient (0.05). The project lead compared previous data from benchmark studies and feedback from the five participants.

Analysis Plan

The study could not reach power, and descriptive statistics were used to report patient demographics, MHELIP scores pre- and post-intervention, BSS-RI score, and number of times blood pressure was taken daily. Demographic data collected were age, race, education level, income, marital status, and gestational age.

Results

Settings and Participants

The recruitment site was a local community wellness center for pregnant and postpartum women, obstetric providers, and maternity educators in Kansas City. Enrollment was obtained via flyers handed out to hypertensive pregnant women attending classes at the wellness center, hospitals, or at scheduled prenatal appointments. The project lead reviewed the screening surveys

completed for inclusion criteria and emailed eligible participants a link to the enrollment survey so they could participate in the study. The 1-hour education class was on Zoom, with additional time for participant questions and discussion. A total of five pregnant women participated in this study (N=5). Demographics of the study population included age, race, education level, marital status, and household income.

Intervention Course, Actual

Once participants completed the screening and enrollment surveys, a bag with educational materials and supplies needed to attend the Zoom class was available for pick up at the wellness center. A link to sign up for the available classes was emailed to each participant so that they could schedule the class and attend. Demographic data was collected during screening, and enrollment surveys were completed. The pre-intervention MHELIP survey was distributed before the education class began.

Educational content was delivered with lectures, discussions, demonstrations, and videos. Written course materials were at the sixth-grade literacy level to improve communication for optimal patient teaching. During the class, participants were educated on accurately taking their blood pressure. They were shown how to use smart blood pressure monitors and ensure proper cuff size via video and demonstration. They were shown how to download the application to their mobile device to keep track of blood pressure readings and generate reports to review with their providers at scheduled appointments. A follow-up email was sent to the participants within two weeks after their reported due date to complete the post-intervention surveys, which included the MHELIP, BSS-RI, and birth outcome. The project lead also expressed thanks for their time and participation.

Outcome Data by Subtopic

The mean age was 33.4 years, with an age range of 27-41 years. All five participants were white, married, college-educated (2 or more years), and had high household incomes (>\$100,000). One participant completed all surveys to obtain all data to measure outcomes. Pre-intervention MHELIP questionnaires revealed that within the group, 3 out of 5 scored limited maternal health literacy level (50.1-66), and 2 out of 5 scored sufficient (66.1-84). The MHELIP score post-intervention for 1 participant increased to 81.25 (+20.84), indicating desired maternal health literacy. Home blood pressure monitoring for this participant was reported > 2 times daily.

Discussion

Successes

The participants who completed all surveys showed improvement post-intervention with maternal health literacy, compliance with daily home blood pressure monitoring, and delivery at 38 weeks gestation. All five participants felt that the surveys were short and easy to understand and complete. Although some of the women in the group had some knowledge of hypertension in pregnancy, they all stated they learned new information regarding self-care and management of their hypertensive pregnancy condition.

The smart blood pressure monitor provided to all participants was well received by the group and stated as easy to use and convenient as a tool to discuss with their providers at routine appointments. One participant stated that she had a high blood pressure reading at the office, and she showed the provider logs from her device, and they discussed a plan and follow-up as opposed to preterm delivery. A participant also stated that the smart blood pressure monitor was

a “lifesaver” during the postpartum period when she had higher blood pressure readings after delivery and was subsequently put on oral blood pressure medications and closer surveillance.

Study Strengths

The major strengths of this study were positive engagement and productive discussions regarding self-care and addressing the specific needs of each participant. Participants were receptive to the information provided and took advantage of the additional classes offered after the class. They also expressed appreciation for the explanations on diet, exercise, treatment recommendations, and learning how to take their blood pressure properly. Many of the participants discussed that their providers had told them about this information, but they did not fully understand the necessity for recommendations and how it may benefit their pregnancy and postpartum recovery.

Results Compared to Evidence in the Literature

Evidence in the literature regarding maternity education specific to HDP was limited and has not shown consistent results for effectiveness in HDP (Mueller et al., 2020). The results found in this study support the need for further research on the effectiveness of improving maternal health literacy and birth outcomes for HDP. Childbirth education can improve birth outcomes by empowering pregnant women to make informed decisions regarding their care (Mueller et al., 2020). Previous studies have shown that pregnant women have poor knowledge about the cardiovascular risks of HDP (Gholami et al., 2022). Participants in this project expressed that they did not fully understand the risks and recommendations for treatment during

the prenatal and postpartum period. This was further revealed when 3 of the 5 participants scored limited maternal health literacy levels prior to the educational intervention.

Curriculum and teaching focused on the needs specific to HDP and served to enhance the traditional education model for childbirth. Health behaviors are a complex and multifactorial process, especially during pregnancy (Putra et al., 2020). Perinatal education in this study includes options for high-risk pregnant women to help them prepare for birth and reduce medical interventions (Mueller et al., 2020) and apply it to the reality of their medical condition. The participants in this study stated that after the information in the class was presented, they planned to implement the suggestions for diet, exercise, stress management, and sleep quality into their lifestyle even after the postpartum period. Additionally, they confirmed the curriculum helped them better understand treatment regimens from their providers, including medications, labs, and delivery recommendations. Participants were made aware of the benefits, risks, and alternatives to managing HDP and expressed confidence in making decisions with their providers. By improving the confidence of expectant mothers, they can ask more questions and will have a greater capacity to process and apply to managing their pregnancy and childbirth experience (Mueller et al, 2020).

Benchmark studies have shown that women want more knowledge regarding high-risk pregnancy conditions and want to take part in managing their care (Gholami et al., 2022). Telehealth and remote devices are safe and easy to use to help pregnant women have access to providers and take ownership of managing their health (Thomas et al., 2021). Participants in this study stated that the Zoom class was very convenient and caused less disruption to their lives, and the remote blood pressure monitor provided reduced stress levels about readings and keeping

log. Results from one participant showed higher satisfaction with their overall childbirth experience and confidence in managing cardiovascular health going forward.

Interpretation

Expected & Actual Outcomes

The expected outcomes of this educational intervention were increasing maternal health literacy level, compliance with home blood pressure monitoring, and childbirth satisfaction. Results showed success for all three outcomes with the limited number of participants, and further research is needed. To achieve statistical significance, the project lead expected to have a larger sample size, with a diverse population of high-risk pregnant mothers in terms of race, household income, and education level. The sample size was homogenous in demographics and cannot be generalized to other vulnerable women with HDP.

Intervention Effectiveness

The class focused on self-management of HDP and provided knowledge and strategies to manage the condition and reduce the likelihood of complications such as severe preeclampsia and preterm birth. This educational intervention collaborated with the local community of obstetric educators, doulas, and providers to improve outcomes for this vulnerable population of women. The project design considered factors of accessibility, cultural sensitivity, and individual health circumstances. This study's results support the effectiveness of the women who participated.

Intervention Effectiveness Revision

To address the small sample size and lack of diversity in demographics, marketing strategies, and stronger partnerships are needed from the obstetric community. Efforts to increase awareness of the class and the risks of HDP would benefit all stakeholders involved. This can include the project lead setting up lunch meetings with clinics, doulas, and maternity educators to disseminate the project and aid in the recruitment of participants. Marketing can also extend to social media with community pages and live podcasts. Pre-recorded sessions on key points from the curriculum with a link to participate in the class can also be added to the community page.

Impact on Health System, Costs, and Policy

Perinatal education classes can positively impact the healthcare system by potentially reducing overall costs associated with managing complications related to HDP. Educating pregnant women on how to manage their condition effectively may reduce medical interventions, hospitalizations, and long-term health issues for both mother and baby. Policymakers, government, and healthcare institutions could consider incentivizing and mandating the provision of these classes to promote better maternal and fetal outcomes to address the current maternal health crisis.

Limitations

Internal Validity Effects

There were several limitations to this study. All data was self-reported, and low recruitment led to a small sample size. The sample size in this study did not meet a minimum of 27 participants to reach power, based on a calculation using the G*-power analysis tool. Completion of follow-up surveys at 4 weeks postpartum for all participants was not aligned with

their expected due dates by the time the study was completed. The duration of the study was not realistic, based on the time of diagnosis, recommended surveillance, and scheduled delivery. Some participants had expected due dates or scheduled delivery dates (induction or cesarean section) after the project concluded and were not able to complete the post-intervention surveys to include in the data.

External Validity Effects

During recruitment for participants, an unexpected change occurred due to one of the sites declining to participate prior to implementation. The rationale-given was a compliance issue with the corporate office as it relates to access of patient records. The project lead was notified within weeks of implementation and had to obtain approval from another site. Initial recruitment depended on the ability to access patients and notify them of the project, so this challenge reduced the potential number of participants enrolled and demographics.

Sustainability

Sustainable strategies to increase recruitment for the class and diversity of demographics, include community engagement, digital outreach, and partnerships with healthcare providers. These efforts can enhance the visibility of the education class and contribute to the long-term sustainability of the program to benefit high-risk pregnant women. Engaging the local community can include presence during prenatal classes at the wellness center and creating a visual display with flyers. Hosting information sessions via social media was done prior to project implementation with the owner of the wellness center, and continuing live education sessions monthly can engage the prenatal community and reach a broader audience. Establishing

a referral system with local obstetric providers and maternity educators and meeting with them quarterly to provide feedback to address the diverse needs of their patient population can enhance inclusivity.

Efforts to Minimize the Study Limitations

The recruitment process was modified to create flyers with instructions for voluntary participation, which were handed out by maternity educators, doulas, and obstetric providers in the community instead of one site. The project lead also adjusted the weeks' gestation to at least ten weeks gestation instead of 28 weeks. The project site also reposted the podcast interview about the program one month before the conclusion of the study to increase the number of participants. To diversify the population, the project lead contacted a federally funded health clinic and was notified of how to initiate approval. It was determined that approval would be outside the study timeline.

Conclusion

Practical Usefulness of Intervention

This project is a practical and valuable solution to address the adverse outcomes associated with hypertensive disorders in pregnancy. It adopts a cost-effective multidimensional approach for patients and generates revenue for clinical practices.

Further Study of Intervention

Through further research, the effectiveness of this intervention can be determined with respect to maternal health literacy levels and adherence to treatment, and the role of perinatal education can be established in promoting health and wellness in high-risk pregnancies.

Dissemination

The project lead presented the project results at a health disparities conference in New Orleans, Louisiana, in April 2024. A manuscript will be submitted to the Nursing for Women's Health (NWH) journal for publication in Spring 2024.

Impact to Healthcare

This educational intervention offers evidence-based strategies to improve clinical care and outcomes for hypertensive disorders in pregnancy, and it is a game-changer in addressing a public health crisis while reducing health disparities. By empowering patients to adopt positive health beliefs and behaviors, we can reduce the adverse outcomes associated with hypertensive disorders in pregnancies.

References

- Abbaspour, M., Mazloomi, S., Sharifzadeh, G., Javadifar, E., & Kardan, M. (2016). The effectiveness of an educational intervention based on the health belief model in preventing high-risk behaviors among pregnant women. *Modern Care Journal*, *13*(4). <https://doi.org/10.5812/modernc.59366>
- ACOG. (2020). Gestational hypertension and preeclampsia. *ACOG Practice Bulletin*, *135*(6), Article 222.
- Afulani, P. A., Ogolla, B. A., Oboke, E. N., Ongeri, L., Weiss, S. J., Lyndon, A., & Mendes, W. (2021). Understanding disparities in person-centred maternity care: The potential role of provider implicit and explicit bias. *Health Policy and Planning*, *36*(3), 298–311. <https://doi.org/10.1093/heapol/czaa190>
- Albadrani, M., Tobaiqi, M., & Al-Dubai, S. (2023). An evaluation of the efficacy and the safety of home blood pressure monitoring in the control of hypertensive disorders of pregnancy in both pre and postpartum periods: A systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, *23*(1). <https://doi.org/10.1186/s12884-023-05663-w>
- Artieta-Pinedo, I., Paz-Pascual, C., Grandes, G., & Espinosa, M. (2017). Framework for the establishment of a feasible, tailored and effective perinatal education programme. *BMC Pregnancy and Childbirth*, *17*(1). <https://doi.org/10.1186/s12884-017-1234-7>
- Ashfar, Y., Wang, E. T., Mei, J., Esakoff, T. S., Pisarska, M. D., & Gregory, K. D. (2017). Childbirth education class and birth plans are associated with vaginal delivery. *BIRTH*, *44*(1).

- Bello, N. A., Zhou, H., Cheetham, T., Miller, E., Getahun, D., Fassett, M. J., & Reynolds, K. (2021). Prevalence of hypertension among pregnant women when using the 2017 american college of cardiology/american heart association blood pressure guidelines and association with maternal and fetal outcomes. *JAMA Network Open*, 4(3), e213808. <https://doi.org/10.1001/jamanetworkopen.2021.3808>
- Boene, H., Vidler, M., Sacoer, C., Nhama, A., Nhacolo, A., Bique, C., Alonso, P., Sawchuck, D., Qureshi, R., Macete, E., Menéndez, C., von Dadelszen, P., Sevene, E., & Munguambe, K. (2016). Community perceptions of pre-eclampsia and eclampsia in southern mozambique. *Reproductive Health*, 13(S1). <https://doi.org/10.1186/s12978-016-0135-y>
- Clark, C. (2016). Watson's human caring theory: Pertinent transpersonal and humanities concepts for educators. *Humanities*, 5(2), 21. <https://doi.org/10.3390/h5020021>
- De Giuseppe, R., Bocchi, M., Maffoni, S., Del Bo, E., Manzoni, F., Cerbo, R., Porri, D., & Cena, H. (2021). Mediterranean diet and lifestyle habits during pregnancy: Is there an association with small for gestational age infants? an italian single centre experience. *Nutrients*, 13(6), 1941. <https://doi.org/10.3390/nu13061941>
- DeNicola, N., Grossman, D., Marko, K., Sonalkar, S., Butler Tobah, Y. S., Ganju, N., Witkop, C. T., Henderson, J. T., Butler, J. L., & Lowery, C. (2020). Telehealth interventions to improve obstetric and gynecologic health outcomes. *Obstetrics & Gynecology*, 135(2), 371–382. <https://doi.org/10.1097/aog.0000000000003646>
- Deshmukh, S., Seely, E. W., Brickley, T., & Zera, C. (2019). Knowledge and attitudes toward prenatal yoga among women with high-risk pregnancies. *International Journal of Yoga Therapy*, 30(1), 63–68. <https://doi.org/10.17761/2020-d-19-00034>

- Ekhtiari, Y. S., Majlessi, F., Foroushani, A. R., & Shakibazadeh, E. (2014). Effect of a self-care educational program based on the health belief model on reducing low birth weight among pregnant Iranian women. *International Journal of Preventative Medicine*.
- Fasanya, H. O., Hsiao, C. J., Armstrong-Sylvester, K. R., & Beal, S. G. (2020). A critical review on the use of race in understanding racial disparities in preeclampsia. *The Journal of Applied Laboratory Medicine*, 6(1), 247–256. <https://doi.org/10.1093/jalm/jfaa149>
- Gholami, K., Norouzkhani, N., Kargar, M., Ghasemirad, H., Ashtiani, A., Kiani, S., Sajedi Far, M., Dianati, M., Salimi, Y., Khalaji, A., Honari, S., & Deravi, N. (2022). Impact of educational interventions on knowledge about hypertensive disorders of pregnancy among pregnant women: A systematic review. *Frontiers in Cardiovascular Medicine*, 9. <https://doi.org/10.3389/fcvm.2022.886679>
- Harris, M., Henke, C., Hearst, M., & Campbell, K. (2020). Future directions: Analyzing health disparities related to maternal hypertensive disorders. *Journal of Pregnancy*, 2020, 1–5. <https://doi.org/10.1155/2020/7864816>
- Helou, A., Stewart, K., Ryan, K., & George, J. (2021). Pregnant women's experiences with the management of hypertensive disorders of pregnancy: A qualitative study. *BMC Health Services Research*, 21(1). <https://doi.org/10.1186/s12913-021-07320-4>
- Hong, K., Hwang, H., Han, H., Chae, J., Choi, J., Jeong, Y., Lee, J., & Lee, K. (2021). Perspectives on antenatal education associated with pregnancy outcomes: Systematic review and meta-analysis. *Women and Birth*, 34(3), 219–230. <https://doi.org/10.1016/j.wombi.2020.04.002>
- Hurrell, A., Webster, L., Chappell, L. C., & Shennan, A. H. (2022). The assessment of blood pressure in pregnant women: Pitfalls and novel approaches. *American Journal of*

Obstetrics and Gynecology, 226(2), S804–S818.

<https://doi.org/10.1016/j.ajog.2020.10.026>

Kalafat, E., Leslie, K., Bhide, A., Thilaganathan, B., & Khalil, A. (2019). Pregnancy outcomes following home blood pressure monitoring in gestational hypertension. *Pregnancy Hypertension*, 18, 14–20. <https://doi.org/10.1016/j.preghy.2019.07.006>

Karthiga, K., Pal, G., Dasari, P., Nanda, N., Velkumary, S., Chinnakali, P., Renugasundari, M., & Harichandrakumar, K. T. (2022). Effects of yoga on cardiometabolic risks and fetomaternal outcomes are associated with serum nitric oxide in gestational hypertension: A randomized control trial. *Scientific Reports*, 12(1). <https://doi.org/10.1038/s41598-022-15216-4>

Kitt, J., Fox, R., Frost, A., Shanyinde, M., Tucker, K., Bateman, P. A., Suriano, K., Kenworthy, Y., McCourt, A., Woodward, W., Lapidare, W., Lacharie, M., Santos, M., Roman, C., Mackillop, L., Delles, C., Thilaganathan, B., Chappell, L. C., Lewandowski, A. J.,...Leeson, P. (2023). Long-term blood pressure control after hypertensive pregnancy following physician-optimized self-management. *JAMA*, 330(20), 1991. <https://doi.org/10.1001/jama.2023.21523>

Leutenegger, V., Grylka-Baeschlin, S., Wieber, F., Daly, D., & Pehlke-Milde, J. (2022). The effectiveness of skilled breathing and relaxation techniques during antenatal education on maternal and neonatal outcomes: A systematic review. *BMC Pregnancy and Childbirth*, 22(1). <https://doi.org/10.1186/s12884-022-05178-w>

Maisi, S., Suryono, S., Widyawati, M., Suwondo, A., & Kusworowulan, S. (2017). Effectiveness of lavender aromatherapy and classical music therapy in lowering blood pressure in

pregnant women with hypertension. *Belitung Nursing Journal*, 3(6), 750–756.

<https://doi.org/10.33546/bnj.301>

Martin, C. R., Hollins Martin, C., & Redshaw, M. (2017). The birth satisfaction scale-revised indicator (bss-ri). *BMC Pregnancy and Childbirth*, 17(1). <https://doi.org/10.1186/s12884-017-1459-5>

Metoki, H., Iwama, N., Hamada, H., Satoh, M., Murakami, T., Ishikuro, M., & Obara, T. (2022). Hypertensive disorders of pregnancy: Definition, management, and out-of-office blood pressure measurement. *Hypertension Research*, 45(8), 1298–1309.

<https://doi.org/10.1038/s41440-022-00965-6>

Mohaghegh, Z., Javadnoori, M., Najafian, M., Montazeri, S., Abedi, P., Leyli, E., & Bakhtiari, S. (2022). Implementation of birth plans integrated into childbirth preparation classes for vaginal birth: A qualitative study of women, their husbands and clinicians' perspectives in iran. *BMC Pregnancy and Childbirth*, 22(1). <https://doi.org/10.1186/s12884-022-05305-7>

Mueller, C. G., Webb, P. J., & Morgan, S. (2020). The effects of childbirth education on maternity outcomes and maternal satisfaction. *The Journal of Perinatal Education*, 29(1), 16–22. <https://doi.org/10.1891/1058-1243.29.1.16>

Murphy, K., Berk, J., Muhwava-Mbabala, L., Booley, S., Harbron, J., Ware, L., Norris, S., Zarowsky, C., Lambert, E. V., & Levitt, N. S. (2023). Using the com-b model and behaviour change wheel to develop a theory and evidence-based intervention for women with gestational diabetes (iindiago). *BMC Public Health*, 23(1).

<https://doi.org/10.1186/s12889-023-15586-y>

- Naseh, Z., Bahadoran, P., & Valiani, M. (2022). Effect of relaxation technique on anxiety, stress, and depression scores of high-risk pregnant women prone to preeclampsia and the physiological indicators of their babies. *Avicenna Journal of Nursing and Midwifery Care*, 30(3), 211–220. <https://doi.org/10.32592/ajnmc.30.3.211>
- Nawabi, F., Krebs, F., Venedey, V., Shukri, A., Lorenz, L., & Stock, S. (2021). Health literacy in pregnant women: A systematic review. *International Journal of Environmental Research and Public Health*, 18(7), 3847. <https://doi.org/10.3390/ijerph18073847>
- Ocktariyana, Murdiningsih, Rohaya, Hindun, S., & Franciska, Y. (2023). Effect of yoga practice in reducing blood pressure, platelet blood count, and proteinuria in pregnant women with mild preeclampsia. *Journal of Integrative Nursing*, 5(1), 33. https://doi.org/10.4103/jin.jin_69_22
- Pasha, M., Brewer, L. C., Sennhauser, S., Alsawas, M., & Murad, M. (2021). Health care delivery interventions for hypertension management in underserved populations in the united states: A systematic review. *Hypertension*, 78(4), 955–965. <https://doi.org/10.1161/hypertensionaha.120.15946>
- Putra, D., Prihatanto, F., & Lestari, P. (2020). Health literacy and pre-eclampsia knowledge of pregnant mother in primary health care in surabaya. *Biomolecular and Health Science Journal*, 3(2), 83. <https://doi.org/10.20473/bhsj.v3i2.22026>
- Rhomadona, S. W., & Primihastuti, D. (2020). Combination of prenatal gentle yoga exercises and lavender aromatherapy inhalation to improving sleep quality in trimester III pregnant women. *Journal of Midwifery*, 5(1). <https://doi.org/ISSN 2598-3180>
- Robbins, T., Hanlon, C., Kelly, A. H., Gidiri, M., Musiyiwa, M., Silverio, S. A., Shennan, A. H., & Sandall, J. (2021). Pills and prayers: A comparative qualitative study of community

- conceptualisations of pre-eclampsia and pluralistic care in ethiopia, haiti and zimbabwe. *BMC Pregnancy and Childbirth*, 21(1). <https://doi.org/10.1186/s12884-021-04186-6>
- Ross, K. M., Dunkel Schetter, C., McLemore, M. R., Chambers, B. D., Paynter, R. A., Baer, R., Feuer, S. K., Flowers, E., Karasek, D., Pantell, M., Prather, A. A., Ryckman, K., & Jelliffe-Pawlowski, L. (2019). Socioeconomic status, preeclampsia risk and gestational length in black and white women. *Journal of Racial and Ethnic Health Disparities*, 6(6), 1182–1191. <https://doi.org/10.1007/s40615-019-00619-3>
- Russell, S. (2021). Eradicating racism from maternity care begins with addressing implicit bias. *Nursing for Women's Health*, 25(3), 167–169. <https://doi.org/10.1016/j.nwh.2021.03.005>
- Safaie, S. Z., Rahebi, S. M., Haghjou, S. N. M., & Leili, E. K. (2018). The relationship between maternal health literacy and pregnancy outcome in postnatal wards. *Journal of Biochemical Technology*, (2), 120–127.
- Sangeetha, C., & Baby, P. (2018). Assessment of knowledge, practice and attitudes regarding preeclampsia among women with pregnancy induced hypertension at selected hospital, bangalore. *International Journal of Nursing Education*, 10(3), 23. <https://doi.org/10.5958/0974-9357.2018.00060.0>
- Steele, D. W., Adam, G. P., Saldanha, I. J., Kanaan, G., Zahradnik, M. L., Danilack-Fekete, V. A., Stuebe, A. M., Peahl, A. F., Chen, K. K., & Balk, E. M. (2023). Postpartum home blood pressure monitoring. *Obstetrics & Gynecology*, 142(2), 285–295. <https://doi.org/10.1097/aog.0000000000005270>
- Taheri, S., Tavousi, M., Momenimovahed, Z., Direkvand-Moghadam, A., Rezaei, N., Sharifi, N., & Taghizadeh, Z. (2021). Determining health literacy level and its related factors among

- pregnant women referred to medical and health centers of tehran in 2019: A cross-sectional study. *Shiraz E-Medical Journal*, 22(10). <https://doi.org/10.5812/semj.109592>
- Taheri, S., Tavousi, M., Momenimovahed, Z., Direkvand-Moghadam, A., Tiznobaik, A., Suhrabi, Z., & Taghizadeh, Z. (2020). Development and psychometric properties of maternal health literacy inventory in pregnancy. *PLOS ONE*, 15(6), e0234305. <https://doi.org/10.1371/journal.pone.0234305>
- Thomas, N. A., Drewry, A., Racine Passmore, S., Assad, N., & Hoppe, K. K. (2021). Patient perceptions, opinions and satisfaction of telehealth with remote blood pressure monitoring postpartum. *BMC Pregnancy and Childbirth*, 21(1). <https://doi.org/10.1186/s12884-021-03632-9>
- Tran, K., Padwal, R., Khan, N., Wright, M.-D., & Chan, W. (2021). Home blood pressure monitoring in the diagnosis and treatment of hypertension in pregnancy: A systematic review and meta-analysis. *CMAJ Open*, 9(2), E642–E650. <https://doi.org/10.9778/cmajo.20200099>
- Tremonti, C., Beddoe, J., & Brown, M. A. (2017). Reliability of home blood pressure monitoring devices in pregnancy. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*, 8, 9–14. <https://doi.org/10.1016/j.preghy.2017.01.002>
- Urizar, G. G., Murillo, J., & Miller, K. (2023). Factors associated with prenatal health behaviors among low-income, ethnic minority women. *International Journal of Environmental Research and Public Health*, 20(3), 1695. <https://doi.org/10.3390/ijerph20031695>
- Wiertsema, C. J., Mensink-Bout, S. M., Duijts, L., Mulders, A. J., Jaddoe, V. V., & Gaillard, R. (2021). Associations of dash diet in pregnancy with blood pressure patterns, placental

- hemodynamics, and gestational hypertensive disorders. *Journal of the American Heart Association*, 10(1). <https://doi.org/10.1161/jaha.120.017503>
- Yee, L. M., Silver, R., Haas, D. M., Parry, S., Mercer, B. M., Wing, D. A., Reddy, U., Saade, G. R., Simhan, H., & Grobman, W. A. (2021). Association of health literacy among nulliparous individuals and maternal and neonatal outcomes. *JAMA Network Open*, 4(9), e2122576. <https://doi.org/10.1001/jamanetworkopen.2021.22576>
- Yeh, P., Rhee, D., Kennedy, C., Zera, C. A., Lucido, B., Tunçalp, Ö., Gomez Ponce de Leon, R., & Narasimhan, M. (2022). Self-monitoring of blood pressure among women with hypertensive disorders of pregnancy: A systematic review. *BMC Pregnancy and Childbirth*, 22(1). <https://doi.org/10.1186/s12884-022-04751-7>

Appendix

Appendix A- Cost Table

Project Budget	Project Info						Budget Summary			
	Project Lead:		Brandie Smith				Budget	Actual	Under(Over)	
	Start Date:		6/1/23				\$ 5,000	\$ 4,151	\$ 849	
	Labor		Materials		Fixed Costs					
Tasks	Hrs	Rate	Units	\$/Unit	Material	Travel	Other	Budget	Actual	Under(Over)
Curriculum and Teaching Supplies								\$ 1,100	\$ 851	\$ 249
Healthy Pregnancy booklets			50	\$8.00				400.00	400.00	-
Printing paper			2	\$10.00				50.00	20.00	30.00
Binders			2	\$25.50				100.00	51.00	49.00
Folders			2	\$15.00				40.00	30.00	10.00
Business Card sleeve			2	\$15.00				30.00	30.00	-
Pens and Highlighters			2	\$15.00				30.00	30.00	-
Dividers			2	\$15.00				50.00	30.00	20.00
AV Equipment			1	\$60.00				100.00	60.00	40.00
Bags			50	\$4.00				300.00	200.00	100.00
Home Blood Pressure Monitors								\$ 2,500	\$ 2,500	\$ -
Cuff Kits			50	\$50.00				2,500.00	2,500.00	-
Class Incentives								\$ 1,400	\$ 800	\$ 600
Pregnancy Sample Boxes- discounted			50	\$6.50					325.00	(325.00)

Birth Ball Kits-Donated			50	\$0.00					-	-
Breastfeeding Starter Kits-donated			50	\$0.00					-	-
Baby Bath Samples			1	\$25.00					25.00	(25.00)
Breastfeeding Samples-donated			50	\$0.00					-	-
Water bottles			50	\$2.00					100.00	(100.00)
Journals			50	\$2.00					100.00	(100.00)
Yoga Mat			50	\$5.00					250.00	(250.00)

Appendix B- Definitions

Placenta: the circular, flat organ in the pregnant uterus that serves as the exchange station for nutrients and oxygen.

Umbilical cord: structure that contains blood vessels that connect the baby to the placenta.

Preterm birth: an infant born before 37 weeks' gestation.

Gestation hypertension: defined as blood pressure greater than or equal to 140/90 mm Hg, two readings 4 hours apart.

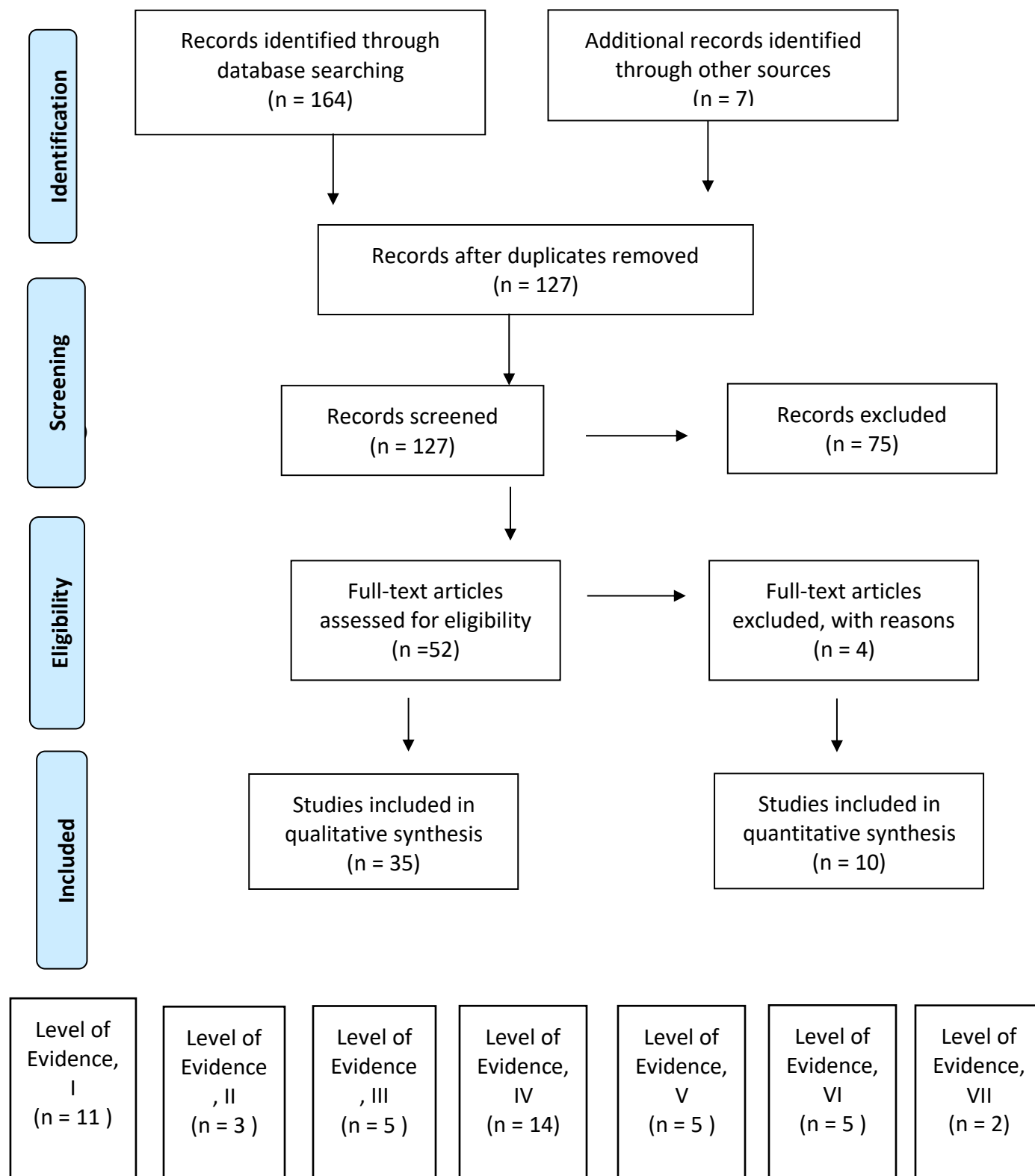
Preeclampsia: maternal hypertension and proteinuria OR signs and symptoms of severe features or fetal distress.

Fetal growth restriction: estimated fetal weight less than 10th percentile, or abdominal circumference less than 10th percentile.

Induction: the use of medication or amniotomy (rupture of membranes) to stimulate labor contractions.

Cesarean birth: the method used to birth a baby through a surgical incision in the abdomen and uterus.

Appendix C- PRISMA Diagram



Adapted from Moher D, Liberati A, Tetzlaff J, Altman DG. The PRISMA Group (2009). *Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097 Adapted for DNP Project, UMKC 2023.

Appendix D- Evidence Table

First author, Year, Title, Journal	Purpose	Research Design ¹ , Evidence Level ² & Variables	Sample & Sampling, Setting	Measures & Reliability (if reported)	Results & Analysis Used	Limitations & Usefulness
HPD Management (16 studies)						
ACOG (2020). Gestational hypertension and preeclampsia. ACOG Practice Bulletin, Number 222.	Clinical management guidelines for OB/Gyn.	EBPG			<p>Low-dose aspirin is recommended for moderate and risk pregnant women starting at 12-16 weeks' gestation.</p> <p>Anti-hypertensive medication should be initiated for acute onset of severe hypertension.</p> <p>Blood pressure monitoring daily, and at weekly clinic visits are recommended.</p> <p>Growth scans every 3-4 weeks, and</p>	

					<p>weekly antenatal testing starting at 32 weeks' gestation.</p> <p>Delivery is recommended at 37 weeks' gestation if no signs of severe features are present.</p>	
<p>Pasha et al. (2020). Health care delivery interventions for hypertension management in underserved populations in the United States: A systematic review. Hypertension.</p>	<p>Examine QI efforts aimed to improve BP control through a change in health care delivery in low resource settings. To understand what components of these interventions led to their success in these settings.</p>	<p>Quantitative, non-experimental.</p> <p>Level 1 evidence.</p> <p>Variables: study design, sample size, patient demographics, setting, description of interventions and control, mechanism of BP measurement, baseline percent control, percent improved, mean/median</p>	<p>26 studies reviewed; 48,187 patients diagnosed with hypertension .</p> <p>PRISMA, randomized and observational studies included.</p> <p>Disadvantaged, underinsured, low-income and minority settings.</p>	<p>Reduction of BP.</p> <p>Proportion of patients with controlled BP.</p>	<p>All but three studies showed improvement in percent BP control or absolute reduction of SBP or DBP.</p> <p>Majority of the studies included more than one intervention.</p> <p>Nurse integration with home blood pressure monitoring was more successful in reducing blood pressure.</p>	<p>Limitations:</p> <p>High degree of heterogeneity among studies.</p> <p>Many studies did not evaluate complications and side effects of interventions.</p> <p>Studies generally did not report adverse events.</p> <p>Most studies reported measurements around 12 months making it difficult to deduce long-term effects of interventions.</p> <p>Usefulness:</p> <p>The findings in this study help inform</p>

		reduction in SBP and DBP, assessment of study methodological quality.				evidence-based practices for health care delivery interventions aimed to reduce disparities in hypertension in under-resourced settings.
Kitt et al (2023). Long-term blood pressure control after hypertensive pregnancy following physician-optimized self-management. JAMA.	Evaluate whether remote self-monitoring and physician-guided titration of antihypertensive medications provide better blood pressure control than usual outpatient care during the first 9 months postpartum	Quantitative, RCT. Level 2 evidence. Variables: 1:1 self-monitoring along with physician-optimized antihypertensive titration or usual postnatal care	220 postpartum women. 112 intervention group, 108 control group. Randomized. Hospital in the UK.	24-hour diastolic blood pressure at 9 months postpartum, adjusted baseline for postnatal blood pressure	Intervention was associated with a 6/5 mmHg lower ambulatory blood pressure at 9 months postpartum.	Limitations: Unblinded trial. COVID-19 pandemic prompted new recommendations for home blood pressure monitoring. Provision of home monitors to all participants might have diluted intervention impact. Medication titration undertaken by a small group of secondary-care research clinicians. Usefulness: Program was associated with improved blood pressure control during

						the postnatal period after HDP compared with usual antihypertensive treatment.
Ocktariyana et al (2023). Effect of yoga practice in reducing blood pressure, platelet blood count, and proteinuria in pregnant women with mild preeclampsia. Journal of Integrative Nursing.	Determine the effects of yoga practice on mild preeclampsia.	Quantitative, Experimental study with pre-post intervention. Level 3 evidence. Variables: Pre- and post-intervention BP, proteinuria, platelet count	40 pregnant women with mild preeclampsia. 30 minutes of yoga practice each week for 1 month. Maternal and neonatal hospital in Indonesia.	Blood pressure blood platelet count, dipstick proteinurinalysis t-test, Wilcoxon, McNemar, $p < 0.001$, 95% CI	Decrease in systolic BP, diastolic BP after the intervention. No significant difference in blood platelet count and proteinuria.	Limitations: Accuracy of dipstick analysis in predicting significant proteinuria is poor. Small sample size. Lack of variation in the duration of yoga practice. Usefulness: Yoga exercise during pregnancy (upper 20 weeks of gestation) significantly decreased systolic and diastolic blood pressure in mild preeclampsia patients.
Wiertsema et al (2021). Associations of DASH diet in pregnancy with blood pressure	Examine the association of maternal DASH diet score with systolic and	Quantitative, population-based prospective cohort study.	3414 pregnant women. Convenience sampling.	Semi-quantitative food frequency questionnaire (FFQ). Self-	Higher maternal adherence to DASH diet was associated with lower mid-pregnancy diastolic	Women were all Dutch ethnicity, definition of HDP have been updated since this

<p>patterns, placental hemodynamics, and gestational hypertensive disorders. Journal of American Heart Association.</p>	<p>diastolic blood pressure and placental vascular function throughout pregnancy</p>	<p>Level 4 evidence.</p> <p>Variables: Maternal DASH score, BP, placental hemodynamic parameters, diagnosis of gestational hypertension</p> <p>Covariates: maternal age, education level, parity, BMI, taking folic acid supplement, smoker status, ETOH use</p>	<p>Medical center in the Netherlands</p>	<p>report, quintile rating 1-5.</p> <p>Omron 907 automated digital sphygmomanometer,</p> <p>Ultrasound measures of umbilical pulse artery pulsatility index (UmPI), uterine artery resistance index (UtRI), bilateral third trimester uterine artery notching</p> <p>Power: 80%, 0.08SD</p> <p>1-way ANOVA, Chi-square tests (, multiple linear regression model R²= 0.13, 0.15, 0.14, 0.16</p>	<p>blood pressure and lower mid- to late-pregnancy umbilical artery vascular resistance.</p>	<p>study, low-risk populations.</p> <p>Further studies are needed to assess if DASH diet has more positive effects on HDP in high-risk populations.</p>
---	--	--	--	--	--	---

<p>Leutenegger et al (2022). The effectiveness of skilled breathing and relaxation techniques during antenatal education on maternal and neonatal outcomes: a systematic review. BMC Pregnancy and Childbirth.</p>	<p>Investigate the effects of skilled breathing and relaxation techniques provided in antenatal education classes on maternal and neonatal birth outcomes</p>	<p>Systematic Literature Review (included RCTs, non RCTs, quasi-experimental studies).</p> <p>Level 1 evidence.</p> <p>Maternal and neonatal outcomes measured were satisfaction with labor and birth experience, duration of labor, pain levels, need of pharmacologic al support for pain management, mobility during labor, mode of birth, fetal blood sampling (fetal capillary blood pH), and</p>	<p>Total of 10 studies included in this review.</p> <p>PRISMA, 9 RCTs 1 quasi-experimental</p> <p>Literature search was conducted in MEDLINE, CINAHL, Clinicaltrials.gov, Cochrane Library, Embase and MIDIRS</p>		<p>The results provided evidence that breathing, and relaxation techniques improve self-efficacy, lower the requirement of pharmacological support (specifically epidural anesthesia), and reduce reported pain levels during labor.</p>	<p>Limitations: Interventions and adherence were heterogenous and could not be meta-analyzed.</p> <p>Lack of blinding in the included studies</p> <p>Target population was low-risk pregnant women with no reported fear of childbirth.</p> <p>Usefulness: This study highlights the importance of providing education and instruction on breathing and relaxation techniques to reduce complications in childbirth.</p>
--	---	--	---	--	--	--

		Apgar score at 5 minutes.				
Naseh et al (2022). Effect of relaxation technique on anxiety, stress, and depression scores of high-risk pregnancy women prone to preeclampsia and the physiological indicators of their babies. Avicenna Journal of Nursing Midwifery and Care.	Determine the effect of relaxation on stress, anxiety, and depression in a group of women susceptible to preeclampsia, and the physiological indicators of their babies.	Randomized control trial. Level 2 evidence. Gestational age, literacy level, parity, hx of hypertension, smoker/alcohol status BP, DASS21 score Neonatal indices: height, weight, head circumference, 1- and 5-minute APGAR scores	High-risk Pregnant women (n= 100) Random sampling. Acute Care hospital (Iran)	Stress/anxiety level: Anxiety and Stress Scales (DASS21) Depression level: Edinburgh Postpartum Depression Scale (EPDS) Neonatal physiological indicators: hospital birth records Data analyzed using SPSS Level of significance: $p < 0.05$	The relaxation method is effective in reducing stress and anxiety in this type of high-risk pregnant mother but does not affect depression. No significant differences in the physiological indicators of the newborns.	Limitations: None listed Usefulness: The finding raises the possibility that the benefits of relaxation may be clinically meaningful. Recommended that body relaxation should be taught to all high-risk pregnant women. More attention should be paid to relaxation techniques in childbirth preparation classes since it is an uncomplicated technique that can be easily taught and practiced by pregnant women to reduce their stress and anxiety. The findings in this study can be used in

						various fields such as practice, education, management, and research.
Karthiga et al (2022). Effects of yoga on cardiometabolic risks and fetomaternal outcomes are associated with serum nitric oxide in gestational hypertension: a randomized control trial. Scientific Reports.	Assess the role of 20-week yoga practice on incidence of hypertension, lessen inflammatory milieu, decrease cardiometabolic stress and improve the fetomaternal outcomes.	Quantitative, experimental, RCT. Level 2 evidence. Maternal outcomes: hypertension incidence, cardiometabolic risks (insulin resistance, lipid risk factors, oxidative stress, inflammation) Fetomaternal outcomes: preterm birth, fetal growth restriction, PROM, mode of delivery, duration of labor	234 pregnant women. Random sampling. Community medical center in India.	Autonomic Function Test (AFT) pre and post intervention. ANCOVA, P value <0.05 Pearson correlation, r= -0.319, p< 0.001 Multiple regression analysis, 95% CI	Twenty-week yoga practice decreased the incidence of hypertension, improved fetomaternal and neonatal outcomes, and reduced cardiometabolic risks associated with HDP.	Recruitment limited to 2 nd and 3 rd trimester, no measurement of diagnostic markers for preeclampsia Usefulness: demonstrates the safety and efficacy of yoga practice in preventing complications and risks associated with HDP.

		Neonatal outcomes: birth weight, APGAR score, RDS, NICU admission				
Afshar et al (2017). Childbirth education class and birth plans are associated with a vaginal delivery. BIRTH.	Investigate the relationship between birth preparedness and mode of delivery.	Quantitative, retrospective cross-sectional study Level 3 evidence. Demographics: Age, gestational age, parity, BMI, Race Variables: Mode of delivery, Childbirth class attendance, birth plan	14,630 women who delivered. Convenience sampling. Large, tertiary, urban center in California.	ANOVA, Chi-square test, Fisher exact test, Pearson's correlation coefficient (95% CI, $p < 0.001$) Linear regression analyses ($p < 0.05$) Logistic regression analyses ($p < 0.05$)	Patient education and birth preparation may influence the mode of delivery and is associated with vaginal births.	Study had higher proportion of white women and lower proportion of women with higher BMI. Childbirth education and birth plans could be used for quality improvement tools to decrease rates of cesarean section.
Bello et al (2021). Prevalence of hypertension among pregnant women when using 2017 american college of	Determine if 2017 guidelines of AHA better identifies women at risk for preeclampsia, eclampsia, or	Quantitative, cohort study Level 4 evidence.	137, 389 pregnancies of women who delivered from 2009-2014.	ACC/AHA criteria Mean (SD), CI 95%	Applying lower ACC/AHA BP criteria to pregnant women resulted in a 17.8% increase in the	Limitations: Did not examine hypertensive use, only included live births, no information on maternal aspirin use.

<p>cardiology/American heart association blood pressure guidelines and association with maternal and fetal outcomes. JAMA.</p>	<p>adverse fetal/neonatal events compared with current ACOG definition.</p>	<p>Variables: Diagnosis of preeclampsia or eclampsia, preterm birth, SGA, NICU admission withing 28 days of delivery.</p> <p>Demographics: patient history, maternal vital signs, BMI, race, ethnicity</p>	<p>Convenience sampling.</p> <p>Large U.S. regional health system.</p>		<p>prevalence of hypertension.</p> <p>Reclassification markedly improved the appropriate identification of maternal risk for preeclampsia.</p>	<p>Usefulness: Increases beneficial initiation of aspirin therapy to reduce risk for preeclampsia, appropriate identification will help intensify clinical surveillance for vulnerable populations, target women for educational programs during pregnancy aimed at cardiovascular lifestyle modification to reduce future risk.</p>
<p>Metoki et al (2022). Hypertensive disorders of pregnancy: Definition, management, and out-of-office blood pressure measurement. Hypertension Research.</p>	<p>Focused on recent reports on HDP, including those related to blood pressure management and classification.</p>	<p>Qualitative, narrative review</p> <p>Level 5 evidence.</p>			<p>Blood pressure measurements are a fundamental component of the diagnosis of HDP.</p> <p>Out of office BP measurements are essential for pregnant women.</p> <p>The risk of antihypertensive medication use needs</p>	

					<p>to be carefully assessed based on baseline and prescribed blood pressure measurements.</p> <p>Digital platform among high-risk pregnancies significantly reduced prenatal visits, ultrasounds, and hypertension-related hospitalizations.</p>	
<p>Hurrell et al (2022). The assessment of blood pressure in pregnant women: pitfalls and novel approaches. American Journal of Obstetrics & Gynecology.</p>	<p>Outline the classifications of HDP, recommended BP devices, potential pitfalls, and sources of inaccurate measurements.</p>	<p>Qualitative, expert review</p> <p>Level 7 evidence.</p>			<p>BP measurement is vital and fundamental to HDP diagnosis and management.</p> <p>Results need to be accurate and consistent for the safety of pregnant women.</p> <p>Abnormal results must be acted on with appropriate measures.</p>	

<p>Rhomadona et al (2020). Combination of prenatal and gentle yoga exercises and lavender aromatherapy inhalation to improving sleep quality in trimester iii of pregnant women. Journal of Midwifery.</p>	<p>Determine if the application of a combination of prenatal gentle yoga and lavender aromatherapy will effectively affect sleep quality in pregnant women and reduce sleep disorders in the third trimester of pregnancy.</p>	<p>Quantitative, quasi-experimental two group comparison design.</p> <p>Level 3 evidence.</p> <p>Demographics: Age, parity, gestational age, profession, education level</p> <p>Variables: Sleep quality,</p>	<p>30 pregnant women.</p> <p>Convenience sampling</p> <p>Private midwifery clinic in Indonesia.</p>	<p>Pittsburgh Sleep Quality Index (PSQI) score</p> <p>Univariate and Bivariate analysis (mean, SD)</p> <p>Wilcoxon test (p< 0.05)</p> <p>Mann Whitney (p< 0.05)</p>	<p>Combination of prenatal gentle yoga and inhalation of lavender aromatherapy improved sleep quality and reduced sleep disturbances in third trimester pregnant women.</p>	<p>Limitations:</p> <p>Usefulness: Practicing prenatal yoga and regular inhalation of lavender aromatherapy can improve sleep quality without the use of medication.</p> <p>Promoting good sleep quality during pregnancy can reduce adverse outcomes for both mother and baby.</p>
<p>De Guiseppe et al (2021). Mediterranean diet and lifestyle habits during pregnancy: Is there an association with small for gestational age infants? An Italian single centre experience. Nutrients.</p>	<p>Explore the association between SGA and maternal adherence to the Mediterranean diet and lifestyle habits.</p>	<p>Quantitative, quasi-experimental, comparison study.</p> <p>Level 3 evidence.</p> <p>Variables: Adherence to Mediterranean diet, physical</p>	<p>100 pregnant women (age 16-44 years).</p> <p>Convenience sampling.</p> <p>Private clinic in Italy.</p>	<p>Diet adherence: MEDI-LITE score >9</p> <p>Physical Activity: METS score <699</p> <p>Smoking and alcohol use: self-reported</p>	<p>Mediterranean diet was associated with reduced risk of SGA.</p>	<p>Limitations: Small sample size</p> <p>Previous disease and risk factors may have impact on results.</p> <p>Women in this study were interviewed towards the end of pregnancy.</p> <p>Usefulness:</p>

		<p>activity level, smoking/alcohol consumption</p> <p>Demographic data: parity, pre-gestational BMI, gestational weight gain, pregnancy-related diseases, type of delivery</p>		<p>Neonatal growth curve (< 10th percentile)</p>		<p>Mediterranean diet is a healthy diet pattern and should be adopted during pregnancy.</p> <p>Providers should engage in counseling activity regarding health diet and physical activity during preconception and pregnancy.</p>
<p>Maisi et al (2017). Effectiveness of lavender aromatherapy and classical music therapy in lowering blood pressure in pregnant women with hypertension. Belitung Nursing Journal.</p>	<p>Examine the effect of lavender aromatherapy and classical music therapy in lowering blood pressure in pregnant women with hypertension.</p>	<p>Quantitative, quasi-experimental with pretest-posttest control group.</p> <p>Level 3 evidence.</p> <p>Variables: Blood pressure measurement</p> <p>Demographics:</p>	<p>52 pregnant women.</p> <p>Random sampling.</p> <p>Community health center in Indonesia.</p>	<p>Digital sphygmomanometer (Mean, median, SD)</p> <p>Kruskal Wallis test (p< 0.05)</p> <p>Mann Whitney test (p< 0.05)</p> <p>Post Hoc test</p>	<p>Combination of lavender aromatherapy and classical music had the highest effect on lowering blood pressure.</p> <p>This combination simultaneously has calming effects, balance, comfort, sense of openness and confidence, while also reducing stress, pain, anxiety,</p>	<p>Limitations: BP measurements were conducted at the same time each day and further study is needed.</p> <p>Usefulness: Combination of these two interventions is recommended to lower blood pressure in pregnant women with hypertension.</p>

		Age, parity, gestational age			unbalanced emotion, frustration and provide a sense of relaxation that can affect blood pressure, heart rate and breathing.	
Mohaghegh et al (2022). Implementation of birth plans integrated into childbirth preparation classes for vaginal birth: a qualitative study of women, their husbands, and clinician's perspectives in Iran. BMC Pregnancy and Childbirth.	Explore perceptions of birth plan implementation in Iran from the perspective of women, their husbands, and clinicians.	Qualitative study Level 6 evidence. Variables: Birth plan use Demographics: Women- age group, education level, employment status, gravidity; Husbands- age group, education level; Clinicians- specialty, degree, duration of work experience.	10 postpartum women, 4 husbands, 2 obstetricians, 9 midwives Purposeful sampling 4 public health centers, 2 private hospitals, 1 armed forces hospital in Iran.	Semi-structured interviews with codes and categories assigned. Peer debriefing Member checks Data analysis- MAXQDA software	5 main categories: 1) Guide and pattern of preparing for childbirth pathway. 2) Women's empowerment and sense of triumph. 3) Facilitating and enhancing communication. 4) Successful transition to parenthood and women's satisfaction. 5) Challenges associated with implementation of the birth plan.	Limitations: COVID-19 pandemic restricted interviews to telephone and may have restricted the development of communication. Interviews were conducted only with women who had vaginal birth. Usefulness: The birth plan accompanied with childbirth preparation classes increases the likelihood of a successful vaginal birth and the desire for having another child. Birth plans are effective in terms of women's

					Overarching theme: Birth plan: the missing link in promotion of vaginal birth plan in Iran.	empowerment for vaginal birth and satisfaction during childbirth and the postpartum period. This can be an effective intervention at reducing the rate of cesarean sections.
Maternal Health Literacy (11 studies)						
Hong et al (2021). Perspectives on antenatal education associated with pregnancy outcomes: Systematic review and meta-analysis. Women and Birth.	Investigate the impact of various antenatal education programs on pregnancy outcomes to aid the development of future guidelines related to maternal and fetal health.	Quantitative review, systematic review. Level 1 evidence.	23 studies included (14 RCTs, 9 observational studies). PRISMA. Literature search was conducted through Cochrane Library, PubMed, EMBASE, CINAHL, and Korean Studies	Meta-analysis was conducted using fixed- or random effect models, pooled relative risk ratio (RR), 95% CI.	Antenatal education can reduce maternal stress, improve self-efficacy, lower the cesarean birth rate, decrease the use of epidural anesthesia. Cochrane's Q-test, p< 0.1	Usefulness: antenatal education should be standardized to elucidate its actual mental and physical health effects.

			Information Service System databases.			
Gholami et al (2022). Impact of educational interventions on knowledge about hypertensive disorders of pregnancy among pregnant women: A systematic review. <i>Frontiers in Cardiovascular Medicine</i> .	Investigate the effect of interventional educations on the knowledge of pregnant women about HDP.	Quantitative, non-experimental, systematic review. Level 1 evidence.	6 articles containing 819 women, (all RCTs). PRISMA. Literature search conducted through PubMed/MEDLINE, Scopus, Goodle Scholar, and CENTRAL databases.	Cochrane risk of bias tool	Educational intervention strategies have a positive and significant impact on increasing the awareness of pregnant women about HDP. This may reduce the severe complications caused by HDP. Maternal knowledge and awareness strongly affect the health and can be attributed to differences in prenatal care and reduction of adverse delivery outcomes.	Limitations: small number of studies reviewed Usefulness: with the implementation of educational programs, the health status of mothers and their babies are improved due to appropriate actions.
Yee et al (2021). Association of health literacy among nulliparous individuals and maternal and	To assess the association between maternal literacy and maternal and neonatal outcomes	Quantitative, secondary analysis of large multi-center cohort.	9341 pregnant women. Convenience sampling.	REALM-SF Score (7-item), mean, Cronbach alpha of 0.81	Inadequate maternal health literacy is associated with a variety of adverse maternal and neonatal outcomes.	Usefulness: Health literacy intervention strategies can improve health-related knowledge, appropriate use of healthcare,

neonatal outcomes. JAMA.	among nulliparous individuals.	Level 4 evidence.	Large, multi-center health system in U.S.		<p>Inadequate health literacy is associated with poorer pregnancy specific knowledge and some health behaviors.</p> <p>X2 and t-tests, Poisson regression models</p> <p>95% CI P< 0.05</p>	adherence to medical treatment, and some health outcomes.
Putra et al (2020). Health literacy and pre-eclampsia knowledge of pregnant mother in primary health care in Surabaya. Biomolecular and Health Science Journal.	Find the connection between health literacy and knowledge of preeclampsia.	<p>Quantitative, non-experimental, cross-sectional study.</p> <p>Level 4 evidence.</p> <p>Variables: Age, education level, parity, occupation, father's occupation, health literacy test, knowledge of PE.</p>	79 pregnant women.	Modified Short Assessment of Health Literacy English (SAHLE), 18 items, <14 = low health literacy.	<p>This study showed that the better the health literacy of the mother correlates to better knowledge of preeclampsia.</p> <p>Women with low health literacy can affect their ability to seek healthcare, and adherence to care plans.</p> <p>Chi square, Spearman's Rho, p< 0.05</p>	<p>Limitations: Only included two primary health centers, measuring tool has not been used in previous studies.</p> <p>Usefulness: Healthcare providers should improve communication and information regarding pregnancy and preeclampsia, and explain in a way that patients can understand depending on their health literacy.</p>

<p>Taheri et al (2021). Determining health literacy level and its related factors among pregnant women referred to medical and health centers of Tehran 2019: a cross-sectional study. Shiraz E-Med Journal.</p>	<p>Determine the level of health literacy and its related items among pregnant women.</p>	<p>Quantitative, quasi-experimental, cross-sectional study.</p> <p>Level 4 evidence.</p> <p>Variables: MHELIP score, age, education, income, employment status, parity, gestational age, spouse's education, participation in pregnancy classes, access to the internet.</p>	<p>270 pregnant women.</p> <p>Convenience sampling.</p> <p>Medical and health centers in Iran.</p>	<p>MHELIP questionnaire, likert 1-5.</p> <p>Cronbach alpha of 0.94.</p>	<p>Limited health literacy had a high prevalence among pregnant women.</p> <p>Results showed positive correlation between mean score and increasing age, education level.</p> <p>Descriptive statistics analyzed with Pearson and Spearman correlation coefficients, $p < 0.05$</p>	<p>Limitations: study was limited to urban areas</p> <p>Usefulness: The findings of this study can be used by maternal health professionals as an influential contributor to health literacy along with promoting their counseling skills can help to upgrade health literacy in pregnant women.</p>
<p>Nawabi et al (2021). Health literacy in pregnant women: a systematic review. International Journal of Environmental Research and Public Health.</p>	<p>Assess health literacy levels in pregnant women, whether health literacy levels are associated with outcomes during pregnancy, and whether effective interventions exist to improve the</p>	<p>Quantitative, non-experimental, systematic review.</p> <p>Level 1 evidence.</p>	<p>14 studies</p> <p>PRISMA</p> <p>Literature search conducted through PubMed and EBSCO.</p>		<p>Women with limited health literacy had more negative beliefs regarding medication.</p> <p>Women with adequate health literacy scored better on knowledge-based questionnaires.</p>	<p>Limitations: Studies with substantial level of evidence are lacking, educational level was not standardized.</p>

	health literacy of pregnant women.				The role of providers is crucial as they provide women with counseling and medication adherence is also dependent on the provider's responsiveness to the women's ability to understand health information.	
Artieta-Pinedo et al (2017). Framework for the establishment of a feasible, tailored, and effective perinatal education program. BMC Pregnancy and Childbirth.	Assess women needs, identify factors that influence the desired outcomes, and propose a framework for developing new perinatal education based on guidance.	Qualitative, non-experimental, literature review. Level 5 evidence.			New perinatal education should be ongoing and focused on each woman.	
Safaie et al (2018). The relationship between maternal health literacy and pregnancy outcome in postnatal wards. Journal of Biochemical Technology.	Determine the relationship between maternal health literacy and pregnancy outcomes.	Quantitative, descriptive analysis, cross-sectional study. Level 4 evidence. Variables: General health	191 postpartum women. Random sampling. Postnatal ward in Iran.	Maternal Health Literacy and Pregnancy Outcome Questionnaire (MHLAPQ) Cronbach alpha: 84%	There is a significant relationship between mother's education and income level with health literacy and cesarean section rates.	Limitations: Usefulness: By promoting health literacy undesirable postnatal outcomes can be reduced.

		<p>literacy score, pregnancy outcome (current labor method, abnormal bleeding postpartum, first minute Apgar score)</p> <p>Demographics: age, mother's occupation and education level, Husband's occupation and education level, salary level, place of residence, history of stillbirth, use of ferrous sulfate, use of multivitamin, previous labor method, unwanted pregnancy.</p>		<p>Descriptive statistics (mean, SD)</p> <p>Spearman correlation coefficient, Mann-Whitney Test, Kruskal-Wallis test (CI 95%, $p < 0.05$)</p>		
--	--	---	--	---	--	--

<p>Ekhtiari et al (2014). Effect of a self-care educational program based on the health belief model on reducing low birth weight among pregnant Iranian women. International Journal of Preventative Medicine.</p>	<p>Assess the effect of a self-care educational program based on the Health Belief Model (HBM) on reducing Low birth weight (LBW) among a sample of pregnant Iranian women.</p>	<p>Quantitative, randomized control trial.</p> <p>Level 2 evidence.</p> <p>Variables: Knowledge assessment score, birth weight</p> <p>Demographics: maternal age, family size, education level, occupation, housing, history of participation in self-care classes</p>	<p>270 pregnant women.</p> <p>Random sampling.</p> <p>Two health-care centers in Iran.</p>	<p>Knowledge and attitude of HBM constructs questionnaire- Likert scale (Cronbach's alpha 0.80)</p> <p>Chi-square test, logistic regression analysis (95% CI, $p < 0.05$)</p>	<p>LBW was significantly reduced in the intervention group.</p> <p>Results of this study suggest that self-care education based on HBM during pregnancy reduces the risk of LBW.</p>	<p>Limitations: the effect of social and environmental factors on outcomes was not studied.</p> <p>Usefulness: HBM model can identify factors associated with beliefs of individuals which influence their behaviors.</p> <p>Implementation of such programs can be economic and valuable.</p>
<p>Abbaspour et al (2016). The effectiveness of an educational intervention based on the health belief model in preventing</p>	<p>Analyze the effectiveness of an educational intervention based on the Health Belief Model (HBM) in</p>	<p>Quantitative, randomized control trial.</p> <p>Level 2 evidence.</p>	<p>44 pregnant women.</p> <p>Random sampling.</p>	<p>2-part questionnaire pretest- posttest (Cronbach's alpha 0.8)</p>	<p>HBM-based education intervention is effective in increasing the rate of high-risk pregnancy preventative</p>	<p>Limitations: Shortage of educational facilities in the study setting.</p> <p>Pregnant women's different personal and cultural characteristics.</p>

<p>high-risk behaviors among pregnant women. Modern Care Journal.</p>	<p>preventing high-risk behaviors among pregnant women.</p>	<p>Variables: Knowledge assessment score</p> <p>Demographics: age, educational status, number of children, interval between pregnancies</p>	<p>2 healthcare centers in Iran.</p>	<p>Wilcoxon, Mann-Whitney U, Chi-square tests ($p < 0.05$, 95% CI)</p>	<p>behaviors from 12.5% to 18%.</p> <p>This intervention significantly improves pregnant women's knowledge and perceived susceptibility, severity, benefits, and barriers with respect to preventative behaviors.</p>	<p>Reluctance of participants to participate in some courses of the educational program due to lack of public transportation facilities.</p> <p>Usefulness: Health education programs based on the health belief model can effectively prevent high-risk behaviors among pregnant women.</p>
<p>Remote Surveillance (7 studies)</p>						
<p>DeNicola et al (2020). Telehealth interventions to improve obstetric and gynecologic health outcomes: a systematic review. Obstetrics & Gynecology.</p>	<p>Review the effectiveness of telehealth interventions for improving obstetric and gynecologic outcomes.</p>	<p>Quantitative, systematic review.</p> <p>Level 1 evidence.</p> <p>Variables:</p>	<p>47 Studies, included 31,967 participants.</p> <p>PRISMA</p> <p>Search engines: ClinicalTrials.gov, Cochrane</p>	<p>Cochrane Collaboration Tool</p> <p>ROBINS-I</p>	<p>Telehealth interventions improved obstetric outcomes and decreased the need to for high-risk monitoring office visits while maintaining maternal and fetal outcomes.</p>	<p>Limitations: Review only included peer-reviewed research.</p>

			Library, Cochrane Collaboration Registry of Controlled Trials, EMBASE, PubMed, MEDLINE		One study found reductions in diagnosed preeclampsia among women with gestational hypertension.	
Albadrani et al (2023). An evaluation of the efficacy and the safety of home blood pressure monitoring in the control of hypertensive disorders of pregnancy in both pre and postpartum periods: a systematic review and meta-analysis. BMC Pregnancy and Childbirth.	Evaluate the efficacy and safety of HBPM in the control of HDP.	Quantitative, systematic review. Level 1 Evidence Variables: investigating the use of HBPM in comparison with conventional office monitoring in the control of HDP or normal pregnant women at high risk for HDP	91 eligible studies reviewed, 15 met inclusion criteria. PRISMA Search engines: Cochrane collaboration tool, PubMed, Scopus, Web of Science, Cochrane Library	preeclampsia, cesarean section, induction of labor, postpartum readmission, live birth, gestational age at delivery, birth weight, IUGR, SGA, NICU admission	HBPM was equally effective as office monitoring. HBPM was safe for mothers, neonates, and fetuses. Reduces risk induction of labor, postpartum readmission, and improves birth weight.	Limitations: Limited data to assess postpartum outcomes. Heterogeneity of outcomes. Usefulness: HBPM appears a promising alternative to office monitoring.

<p>Tran et al (2021). Home blood pressure monitoring in the diagnosis and treatment of hypertension in pregnancy: a systematic review and meta-analysis. CMAJ.</p>	<p>Assess current practices in the prescription and use of HBPM in pregnancy.</p>	<p>Quantitative, systematic review and meta-analysis.</p> <p>Level 1 evidence.</p> <p>Variables: comparison of office and HBPM of pregnant people.</p>	<p>21 articles included in review (RCT, observational).</p> <p>Search engines: MEDLINE, Embase, CENTRAL</p>	<p>Patient education, HBPM device, monitoring schedule, adherence, diagnostic thresholds, comparison of home vs office monitoring.</p>	<p>Measurement taken 3-36 times per week.</p> <p>3rd trimester home blood pressure corresponds with office blood pressure.</p> <p>Systolic and diastolic pressure values measured at home were lower than office values by 4 mmHg.</p>	<p>Limitations:</p> <p>Search strategy limited to English publications which may contribute to publication bias.</p> <p>Lack of contemporary RCTs on this topic.</p> <p>Poor availability of quality data.</p> <p>Homogeneity.</p> <p>Usefulness:</p> <p>Further studies needed to prioritize the use of validated home measuring devices and standardized measurement schedules and should establish treatment targets.</p>
<p>Steele et al (2023). Postpartum home blood pressure monitoring: a systematic review. Obstetrics & Gynecology.</p>	<p>Assess the effectiveness of postpartum HBPM compared with clinic based follow up and the comparative effectiveness of alternative HBPM regimens.</p>	<p>Quantitative, systematic review.</p> <p>Level 1 evidence.</p> <p>Variables: effect of postpartum</p>	<p>13 studies included (3 RCTs, 2 non-randomized comparative studies, 8 single-arm studies).</p> <p>Search engines:</p>	<p>BP adherence, antihypertensive treatment, BP control, severe maternal outcomes, patient-reported outcomes, healthcare utilization,</p>	<p>Most patients were satisfied with management related to HBPM.</p> <p>HBPM compared with office-based follow-up was associated with reduced racial</p>	<p>Limitations:</p> <p>Evidence for the effectiveness of home BP monitoring compared with clinic-based care was sparse.</p> <p>Insufficient evidence to conclude that home BP monitoring reduces</p>

		HBPM on postpartum maternal and infant outcomes, health care utilization, and harm outcomes.	Medline, Cochrane, EMBASE, CINAHL, and ClinicalTrials.gov	infant-related outcomes, adverse events, reduction of health disparities.	disparities in office-based follow-up.	severe maternal morbidity and mortality or reduces racial disparities in clinical outcomes. Usefulness: HBPM likely improves ascertainment of BP, which is necessary for early recognition of HTN in postpartum individuals. May compensate for racial disparities in clinical outcomes.
Yeh et al (2022). Self-monitoring of blood pressure among women with hypertensive disorders of pregnancy: a systematic review. BMC Pregnancy and Childbirth.	To expand on the evidence base of the WHO guidelines on self-care interventions and home-based blood pressure monitoring in hypertensive disorders in pregnancy.	Quantitative, systematic review. Level 1 evidence. Variables: Effectiveness of intervention (, values and preferences of end-users and providers, cost information,	91 studies reviewed, 6 met inclusion criteria for SMBP effectiveness. PRISMA-RCTs, non-RCTs and observational studies included that compared SMBP at home	Data was extracted standardized forms and summarized findings. Cochrane Collaboration Tool Comprehensive Meta-Analysis (CMA)	6 studies met inclusion criteria for effectiveness, 7 studies for values and preferences, 1 study for cost review. SMBP is generally not associated with adverse maternal and neonatal outcomes. Pregnant women and providers generally support use of SMBP.	Limitations: Usefulness: Multiple databases searched, hand search and secondary search. Effectiveness and acceptance by pregnant women examined. SMBP during pregnancy is feasible and acceptable and associated with

			with clinic setting. Search strategy: PubMed, CINAHL, LILACS, EMBASE	GRADE Evidence Profile Table	SMBP is cost saving for a health system.	outcomes like clinic BP monitoring.
Kalafat et al (2019). Pregnancy outcomes following home blood pressure monitoring in gestational hypertension. Pregnancy Hypertension.	To assess the safety and efficacy of home blood pressure monitoring (HBPM) and office blood pressure measurements in a cohort of pregnant women with gestational hypertension.	Quantitative, cohort study. Level 4 evidence. Variables: Adverse fetal, maternal, neonatal outcomes, blood pressure measurements SBP > 140 mmHg or DBP > 90 mmHg Demographics: Maternal age, parity, self-reported ethnicity, mode	143 pregnant women. Convenience sampling. Hospital in London, England.	Sphygmomanometer Wilcoxon rank sum test, t-test, Fisher's exact test, Shapiro-Wilk test (p< 0.05, 95% CI)	HBPM in women with gestational hypertension results in significantly less antenatal visits per week for monitoring than women with standard pathway of care.	Limitations: Lack of statistical power to ensure safety for rare adverse outcomes. Larger studies are needed to compare HBPM among clinicians and researchers. Usefulness: GH is the most common form of HDP and has a different outcome profile compared to other HDP. Large cohort of GH pregnancies and use of measurement device

		of conception, smoking status				validated for pregnancy.
Tremonti et al (2017). Reliability of home blood pressure monitoring devices in pregnancy. Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health.	Examine blood pressure readings collected on pregnant women who were using their own devices at home.	Quantitative, retrospective cohort study. Level 4 evidence. Variables: BP measurements, brand of machine, cuff size Demographics: maternal age, gestational weeks	127 pregnant women. Convenience sampling. Community outpatient setting in Australia.	Sphygmomanometer (Omron MIT Elite Plus was validated for this study)	A wide variety of devices are used, and few have been formally validated for use in pregnancy. Up to 25% of the devices used by participants in this study had a difference of at least 5 mmHg.	Recommended that clinicians perform their own analysis of devices and accuracy prior to using HBPM protocol for pregnant women, even for validated devices.
Health Beliefs (7 studies)						
Deshmukh et al (2020). Knowledge and attitudes toward prenatal yoga among women with high-risk pregnancies.	Evaluate attitudes and knowledge about prenatal yoga and to investigate barriers and facilitators to	Quantitative, two-group comparison cohort study.	100 pregnant women, two groups-yoga experience and yoga naïve.	Self-reported questionnaire, 28 questions, multiple choice.	Lack of prior yoga experience is a potentially modifiable barrier to participation in yoga	Limitations: Questionnaire was not validated.

International Journal of Yoga Therapy.	yoga participation in high-risk pregnant women receiving prenatal care through a Maternal Fetal Medicine practice.	<p>Level 4 evidence.</p> <p>Variables: Attitudes and knowledge about yoga, barriers, and facilitators to practicing yoga.</p> <p>Demographics: Age, race, ethnicity, education, primary language, parity, gestational age, pregnancy complications.</p>	<p>Convenience sampling.</p> <p>Maternal Fetal Medicine practice in Boston.</p>	<p>Fisher's exact test, Wilcoxon rank-sum test ($p < 0.05$)</p> <p>Bivariate, univariate, multivariate logistic regression (95% CI)</p>	<p>practice with high-risk pregnancies.</p> <p>Prior yoga experience was the strongest predictor of willingness to attend a prenatal yoga class.</p> <p>Women with high-risk pregnancies who lack prior yoga experience may benefit from additional education to facilitate participation.</p>	<p>Only English-speaking women were offered the survey.</p> <p>Usefulness: This study can help with future recruitment and retention efforts in prenatal yoga programs and clinical studies.</p> <p>Valuable understanding about logistical barriers to participation in prenatal yoga programs.</p>
Robbins et al (2021). Pills and prayers: a comparative qualitative study of community conceptualizations of pre-eclampsia and pluralistic care in Ethiopia, Haiti, and Zimbabwe. BMC	Explore lived experiences and local understandings of preeclampsia in three under-resourced settings.	<p>Qualitative, cross-cultural comparative study.</p> <p>Level 6 evidence.</p> <p>Variables:</p>	<p>89 participants including pregnant and postpartum women, support systems, health care leaders.</p> <p>Convenience sampling.</p>	<p>In-depth interviews and focus group discussions.</p> <p>Template analysis for cross country comparison based on Social Learning Theory</p>	<p>Raised blood pressure was attributed to psychosocial stress and dietary factors, eclampsia was attributed to spiritual manifestations.</p> <p>Pluralistic care was driven by attribution of causes, social</p>	<p>Limitations: Systemic and structural barriers were not included.</p> <p>Local languages were used to collect data.</p> <p>Study settings may not be generalized.</p>

Pregnancy and Childbirth.		Health and development indicators	Ethiopia, Haiti, and Zimbabwe.	and Health Belief Model.	<p>norms, and expectations related to alternative care and trust in biomedicine.</p> <p>Divergence centered around nuances in religious or traditional practices relating to maternal care and pregnancy.</p>	<p>Usefulness: Engaging faith, traditional caregivers, and wider community may help bridge coherent conceptualizations of preeclampsia and access to life-saving care in women diagnosed with preeclampsia.</p> <p>This study included a broad perspectives from multiple stakeholders.</p>
Boene et al (2016). Community perceptions of pre-eclampsia and eclampsia in southern Mozambique. Reproductive Health.	Describe the community understanding of preeclampsia and eclampsia as a crucial step to improve maternal and perinatal health in Southern Mozambique.	<p>Qualitative, thematic analysis.</p> <p>Level 6 evidence.</p> <p>Variables: Local names and perceived causes, warning signs, prevention strategies, perceived consequences,</p>	<p>20 focus group discussions with pregnant women, partners and husbands, matrons and traditional birth attendants, and mothers and mothers-in-law</p> <p>10 in-depth interviews with traditional healers, matrons, and a</p>	<p>Olympus AS-2400 used to record and transcribe focus groups discussions and interviews.</p> <p>Data analysis (mean, median, SD)</p> <p>Codes assigned prior to thematic analysis.</p>	<p>The terms of preeclampsia and eclampsia are not known but condition is understood as hypertension and seizures and not necessarily related to pregnancy.</p> <p>Local beliefs regarding cause, treatment and management are not aligned with biomedical perspective.</p>	<p>Limitations: Results are not generalizable to other settings.</p> <p>Due to translation of the data, some subtleties of meanings may have been lost.</p> <p>Usefulness: Effective community-based interventions must be designed and implemented with aim at increasing awareness and associated risks.</p>

		<p>traditional treatments</p> <p>Demographics: Age, gender, education level, occupation, marital status, literacy level, level of urbanization, population density, distance to trading center, presence of a referral facility</p>	<p>traditional birth attendant.</p>			<p>Appropriate and culturally sensitive education materials should include information about HDP causes, warning signs and consequences.</p> <p>Health professionals should be aware of local beliefs about HDP.</p>
<p>Sangeetha et al (2018). Assessment of knowledge, practice, and attitudes regarding preeclampsia among women with pregnancy induced hypertension at selected hospital, Bangalore. Indian Journals.</p>	<p>Assess, correlate, and associate the knowledge, attitude, and practice of preeclampsia among PIH women.</p>	<p>Qualitative, non-experimental descriptive design.</p> <p>Level 6 evidence.</p> <p>Variables: Knowledge score, level of attitude, level of practice</p>	<p>100 pregnant women.</p> <p>Purposeful sampling.</p> <p>Tertiary care center in Bangalore.</p>	<p>Structured knowledge questionnaire and checklist</p>	<p>PIH women had inadequate knowledge in the aspects of basic knowledge, effects of preeclampsia, and measure to manage the condition.</p> <p>Majority of women had favorable level of practice and attitude.</p> <p>Attitude demonstrated significant association with their education.</p>	<p>Limitations:</p> <p>Usefulness: Creating awareness about preeclampsia can reduce complications and maternal negligence.</p> <p>PIH mothers require knowledge and attitude on various aspects of preeclampsia especially in areas of diet, rest, basic</p>

		Demographics: Age, education level, ethnicity, income, parity, neighborhood				knowledge, and measures to manage preeclampsia. Targeting women with PIH to have regular monitoring and enhancing knowledge is a preventative step to reduce maternal and fetal morbidity in terms of HDP.
Urizar et al (2023). Factors associated with prenatal health behaviors among low-income ethnic minority women. International Journal of Environmental Research and Public Health.	Describe health behaviors of low-income, ethnic minority women during pregnancy and identify certain demographic and psychosocial characteristic associated with health behaviors in this population.	Qualitative, mixed methods, embedded, cross-sectional study design. Level 6 evidence. Variables: Coping strategies, prenatal health behaviors (nutrition, exercise, stress management) Demographics: age, education	100 pregnant women. Quota sampling. Several prenatal clinics and community health organizations in Southern California.	Planning and Prenatal Social Support Questionnaire-PSSQ (Cronbach's alpha 0.84) Perceived Stress Scale-PSS-4 (Cronbach's alpha 0.69) Pregnancy Experience Scale-PES (Cronbach's alpha 0.83, 0.89) Center for Epidemiologic	Less than 25% of women used cognitive behavioral stress management. A substantial proportion of women are engaging in unhealthy prenatal behaviors. Preventative and treatment interventions are needed to address systemic and individual-level factors for low-income families and health coping patterns.	Usefulness: Collaborative care model is needed to support prenatal health providers to link patients to resources. Additional training is needed to support health care providers and community workers in delivery of interventions that can teach pregnant women coping strategies and incorporate prenatal health behaviors.

		level, household income, ethnicity, marital status, BMI, gestational age, parity, planned pregnancy		Studies Depression Scale-CESD (Cronbach's alpha 0.81) Cardiovascular Risk Assessment-CRA	Interventions should be culturally tailored to address beliefs that may influence health behaviors.	
Health Equity (6 studies)						
Ross et al (2019). Socioeconomic status, preeclampsia risk and gestational length in black and white women. Journal of Racial and Ethnic Disparities.	Examine whether race (Black versus White) and SES (using education and insurance status) independently predict risk for preeclampsia, without preexisting hypertension.	Quantitative, population-based cohort study. Level 4 evidence. Variables risk of preeclampsia, gestational age at birth Demographics: Age, race, income level,	718,604 black and white pregnant women. Purposeful sampling. Population study in California.	Logistic regression model Path analysis testing Codes assigned indicating preeclampsia diagnoses or cardiometabolic risk for preeclampsia	White women were lower risk for preeclampsia, higher SES further reduced risk. Black women were at higher risk for preeclampsia, SES did not attenuate the risk.	Limitations: Data was obtained from hospital discharge records and limited information of psychosocial factors. Income on household income and size is unknown. Usefulness: These finding highlight the unique challenges faced by Black women in the U.S. and the importance of studying

		education, insurance status, smoking status, parity, prenatal care, BMI				health disparities at the intersection of race, ethnicity, and SES.
Afulani et al (2021). Understanding disparities in person-centered maternity care: the potential role of provider implicit and explicit bias. Health Policy and Planning.	Examine provider implicit and explicit SES biases related to perinatal care, provider level factors associated with implicit and explicit biases, provider general perceptions of factors that contribute to differential perinatal care.	Mixed method study, single cohort study. Level 4 evidence. Variables: SES and explicit bias measures, implicit bias measures Demographics: Facility type, position, years in practice, gender, age, marital status, number of children, education level, monthly salary, perceived social status of self, social	101 maternity care providers. Purposeful sampling. Rural county in western Kenya.	IAT test (Mean, Median, SD) Clark's guidelines for thematic analysis ANOVA ($p < 0.05$, 95% CI)	Evidence of both implicit and explicit bias in provider's perceptions of women contribute to disparities in perinatal care through varied and contradictory pathways to care. Women's appearance evokes unconscious behaviors towards them. Situational factors influence quality of care. Provider's perception on women's ability to understand, cooperate, advocate for themselves, and hold provider's accountability	Limitations: Social desirability is key limitation in studying implicit and explicit bias. Borderline internal consistency in provider perceptions of explicit bias. Usefulness: Findings provide evidence for potential role of both implicit and explicit SES biases in perinatal care disparities. Multilevel approaches including interventions targeted at women and providers, as well as healthcare systems and policies are needed to improve perinatal care

		mobility, religion, training on interpersonal interactions.			influence quality of care. Implicit bias was prevalent in this study.	and eliminate disparities.
Harris et al (2020). Future directions: analyzing health disparities related to maternal hypertensive disorders. Hindawi Journal of Pregnancy.	A literature review that aims to promote the development of interventions and strategies that better address and prevent hypertensive disorders of pregnancy.	Qualitative, systematic review. Level 5 evidence. Variables: Factors that influence the prevalence of maternal hypertensive disorders in racially and ethnically diverse women Demographics: Maternal age, level of education, U.S. born status, nonmetropolita	30 studies reviewed. PRISMA Electronic databases: CINAHL, MEDLINE, EBSCO, and PubMed	English language studies from 2010 to 2019. Peer appraisal.	Healthcare organizations should acknowledge that maternal mortality reflects maternal health of a population. QI interventions need to be implemented to investigate at-home and community-based interventions that address earlier disparities in access to care.	Usefulness: Priority should be placed on development of interventions that are accessible to women located in both resource-rich and resource-poor settings during early pregnancy to address racial bias and discrimination in both the outpatient and clinic setting.

		n residence, pre-pregnancy obesity, excess weight gain during pregnancy, gestational diabetes.				
Fasanya et al (2021). A critical review on the use of race in understanding racial disparities in preeclampsia. JALM.	Broad overview of racial disparities in preeclampsia incidence, morbidity, mortality, and potential mechanisms of action.	Qualitative, narrative review. Level 5 evidence. Variables: Preeclampsia incidence, morbidity, mortality, stress level, access to care Demographics: Ethnicity, immigrations status, socioeconomic status,	40 studies reviewed.		Black and African American women are at consistently higher risk for preeclampsia incidence, morbidity, and mortality than their white counterparts. Asian women are consistently lower risk of preeclampsia, Hispanic women remains unclear. Preeclampsia disparities in racial groups were identified. Existing studies identify racial	Usefulness: Consideration of race is defined and used in study. Distinguish between the “biology of race” and the “biology of racism.” Recognition that societal history of racism and structural violence may become biologically embodied in individuals. Clinicians must improve their understanding of racial disparities through

					differences as biologically inherent despite other possible explanatory mechanisms.	better and more thoughtful research design and discussions about the intersectionality of race and medicine.
Russell (2021). Eradicating racism from maternity are begins with addressing implicit bias. NWH Journal.	Commentary highlighting the effects of systemic racism in perinatal care of Black women and the need for training health care providers about implicit bias.	Qualitative, editorial. Level 7 evidence. Variables: Racial disparities, implicit bias		Proposed measurement tools: Hospital Consumer Assessment of Healthcare Providers and Systems Survey-27 item questionnaire. Implicit Association Test		Usefulness: Implicit bias training can help people become aware of how their implicit bias affects others. Unconscious bias training can serve as a basis for developing remediation and disciplinary strategies for employees who choose not to adhere to outlined expectations.
Birth Satisfaction (5 studies)						
Thomas et al (2021). Patient perceptions, opinions, and satisfaction of telehealth with remote blood pressure monitoring	Assess patient perspectives and experiences regarding daily postpartum blood pressure monitoring via	Quantitative, secondary analysis of single-site non-RCT, cross-sectional design.	214 postpartum women. Purposeful sampling.	Self-administered questionnaire, 41 questions, Likert Scale. (Cronbach alpha 0.94)	Postpartum women perceived the remote telehealth intervention was a safe, easy to use method that represented an	Limitations: Single site with a relatively homogenous population and small sample size.

<p>postpartum. BMC Pregnancy and Childbirth.</p>	<p>telehealth with remote patient monitoring.</p>	<p>Level 3 evidence.</p> <p>Variables: Post-participation satisfaction survey results-ease of use, privacy, burden of care, satisfaction</p> <p>Demographics: Age, BMI at delivery, race, marital status, hypertension diagnosis, insurance status</p>	<p>Private Clinic in Wisconsin.</p>	<p>Descriptive statistics (mean, median, SD)</p> <p>Logistic regression, odds ratio, Wilcoxon rank sum test, Chi-square test, Fisher's exact test ($p < 0.05$, CI 95%)</p>	<p>acceptable burden care and overall satisfying method for postpartum blood pressure monitoring.</p> <p>Privacy concerns were minimal.</p> <p>95% of women preferred remote care for postpartum follow-up.</p>	<p>This study did not include a control group.</p> <p>Lack of control group does not introduce volunteer bias.</p> <p>Usefulness: Telehealth with remote blood pressure monitoring has high rates of acceptance among respondents.</p> <p>This may represent an important and useful method of data collection regarding postpartum blood pressure trends, improve compliance with blood pressure recommendations, and reduce admission rates to ultimately improve maternal health.</p>
<p>Martin et al (2017). The birth satisfaction scale-revised indicator (BSS-RI). BMC Pregnancy and Childbirth.</p>	<p>Develop a short birth satisfaction indicator utilizing items from the Birth Satisfaction Scale-Revised</p>	<p>Quantitative, cross-sectional study.</p> <p>Level 4 evidence.</p>	<p>4578 women.</p> <p>Random sampling.</p>	<p>6 items selected from BSS-R questionnaire, simplified 3-point scoring system with</p>	<p>This instrument was found to have valid psychometric properties with minimal burden to the women responding.</p>	<p>Limitations: This instrument excludes women's antenatal and postnatal experience.</p>

	(BSS-R) to measure birth satisfaction and possible key performance indicators for perinatal service delivery evaluation.	<p>Variables: Women's satisfaction with care, experience of labor and birth.</p> <p>Demographics: Geographical location, age</p>	Birth registration records from England.	<p>higher scores representing birth satisfaction (Cronbach's alpha 0.70).</p> <p>Descriptive statistics (mean, median, SD)</p> <p>Pearson's correlation coefficient, Shapiro-Wilks, Kaiser-Meyer-Olkin, Hense-Zirkler, Spearman's rho, Mann-Whitney U ($p < 0.05$, CI 95%)</p>		<p>Response rate to the survey was modest.</p> <p>Usefulness: This indicator has evidence-based key performance indicator for maternity services.</p> <p>This tool can be used in a range of study designs and situations as an effective way of monitoring women's satisfaction with their intrapartum care.</p>
Helou et al (2021). Pregnant women's experiences with the management of hypertensive disorders of pregnancy: a qualitative study. BMC Health Services Research.	To explore pregnant women's perspectives and experiences with clinical management of HDP.	<p>Qualitative study, face-to-face interview.</p> <p>Level 6 evidence.</p> <p>Variables: Attitudes towards monitoring of hypertensive</p>	<p>27 pregnant women.</p> <p>Convenience and purposive sampling.</p> <p>Antenatal clinics in Melbourne, Australia.</p>	<p>Audio recorded interviews.</p> <p>Thematic analysis and codes assigned.</p>	Many women did not feel they were well informed of treatment and management decisions and had a desire to be more informed and more involved in decision-making.	<p>Limitations: Women with poor English skills were not included in this study.</p> <p>Small sample size.</p> <p>Usefulness: Women diagnosed with any form of HDP should be part of decision-making</p>

		<p>disorders of pregnancy, attitudes and perception towards development and management of complications, perception of pregnant women with chronic hypertension</p> <p>Demographics: Country of birth, other health conditions, gestational age, time of HTN diagnosis, subtype of hypertension, severity of hypertensive disease, antihypertensive medication</p>				<p>pertaining to monitoring of BP and progression to preeclampsia as well as timing and mode of delivery.</p> <p>Women diagnosed with HDP should have their BP monitored postpartum to identify any risk of developing severe cardiovascular events.</p>
--	--	--	--	--	--	--

Appendix E- Evidence Grid

Evidence Grid	Theme	Theme	Theme	Theme	Theme	Theme
Article (last name of first author, date)	HDP Management	Maternal Health Literacy	Remote Surveillance	Health Beliefs and Behaviors	Health Equity	Birth Satisfaction
Abbaspour et al., 2016		X				
ACOG, 2020	X					
Afulani et al., 2021					X	
Albadrani et al., 2023			X			
Artieta-Pinedo et al., 2017		X				
Afshar et al., 2017	X					
Bello et al., 2021	X					
Boene et al., 2016				X		
Clark, 2016					X	
DeGuiseppe et al., 2021	X					
DeNicola et al., 2020			X			
Deshmukh et al., 2019				X		
Ekhtiari et al., 2014		X				
Fasanya et al., 2020					X	
Gholami et al., 2022		X				
Harris et al., 2020					X	
Helou et al., 2021				X		
Hong et al., 2021		X				
Hurrell et al., 2022	X					
Kalafat et al., 2019			X			
Karthiga et al., 2022	X					
Kitt et al., 2023	X					
Leutenegger et al., 2022	X					
Maisi et al., 2017	X					
Martin et al., 2017						X
Metoki et al., 2022	X					
Mohaghegh et al., 2022	X					
Murphy et al., 2023						
Naseh et al., 2022	X					
Nawabi et al., 2021		X				

Ocktariyana et al., 2023	X					
Pasha et al., 2021	X					
Putra et al., 2020		X				
Rhomadona et al., 2020	X					
Robbins et al., 2021				X		
Ross et al., 2019					X	
Russell, 2021					X	
Safaie at al., 2018		X				
Sangeetha, 2018				X		
Steele et al., 2023			X			
Taheri et al., 2020		X				
Taheri et al., 2021		X				
Thomas et al., 2021						X
Tran et al., 2021			X			
Tremonti et al., 2017			X			
Urizar et al., 2023				X		
Wiertsema et al., 2021	X					
Yee et al., 2021		X				
Yeh et al., 2022			X			

Appendix F- Theory to Application Diagram

Maternal Knowledge is Power to Protect Hypertensive Pregnancies

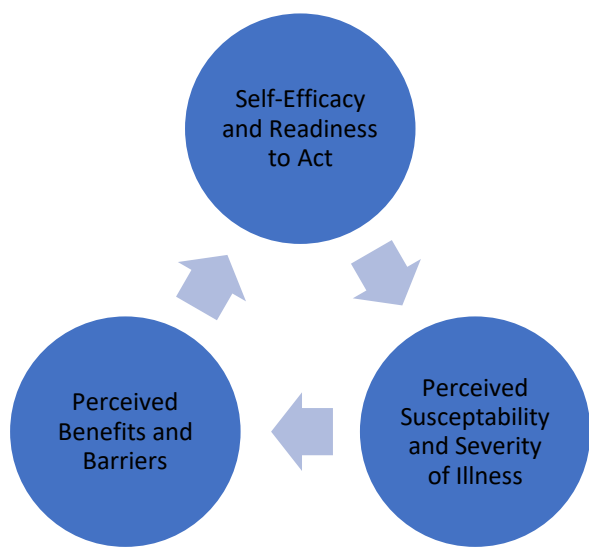
Inquiry
Does a perinatal education program specific to women diagnosed with hypertensive pregnancy disorders improve maternal health literacy, empower positive health beliefs, and reduce adverse outcomes?

Theories:
Health Belief Model
Theory of Caring

Concepts:
Maternal Health Literacy
Health Equity
Childbirth Satisfaction

Chosen Theory:
Health Belief Model

Main Concept:
Maternal health literacy



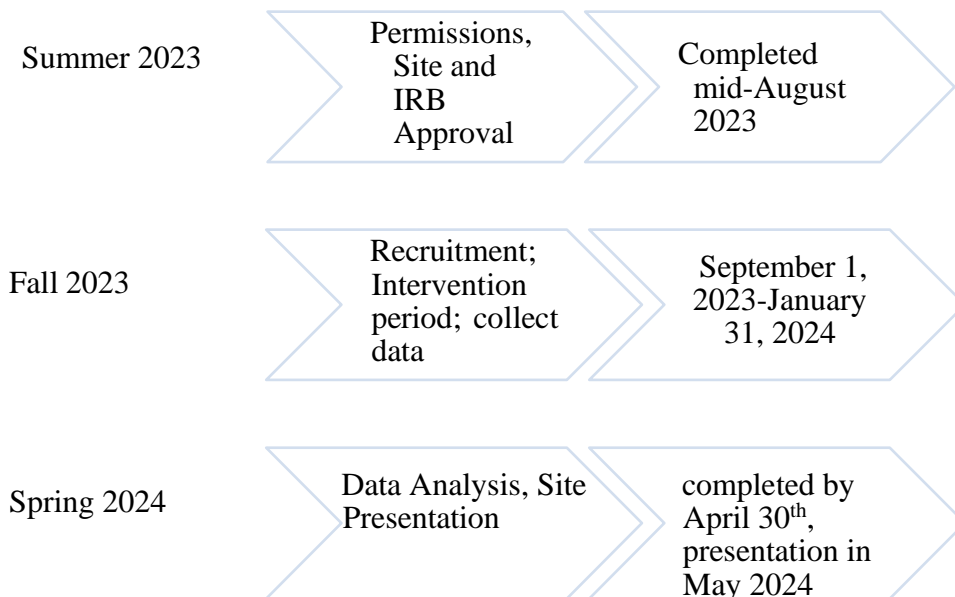
Appendix G- Logic Model

OVERARCHING GOAL:	Improving maternal health literacy in pregnant women diagnosed with HPD to reduce adverse birth outcomes.	LOGIC MODEL DATE:	3/19/2023
--------------------------	---	--------------------------	-----------

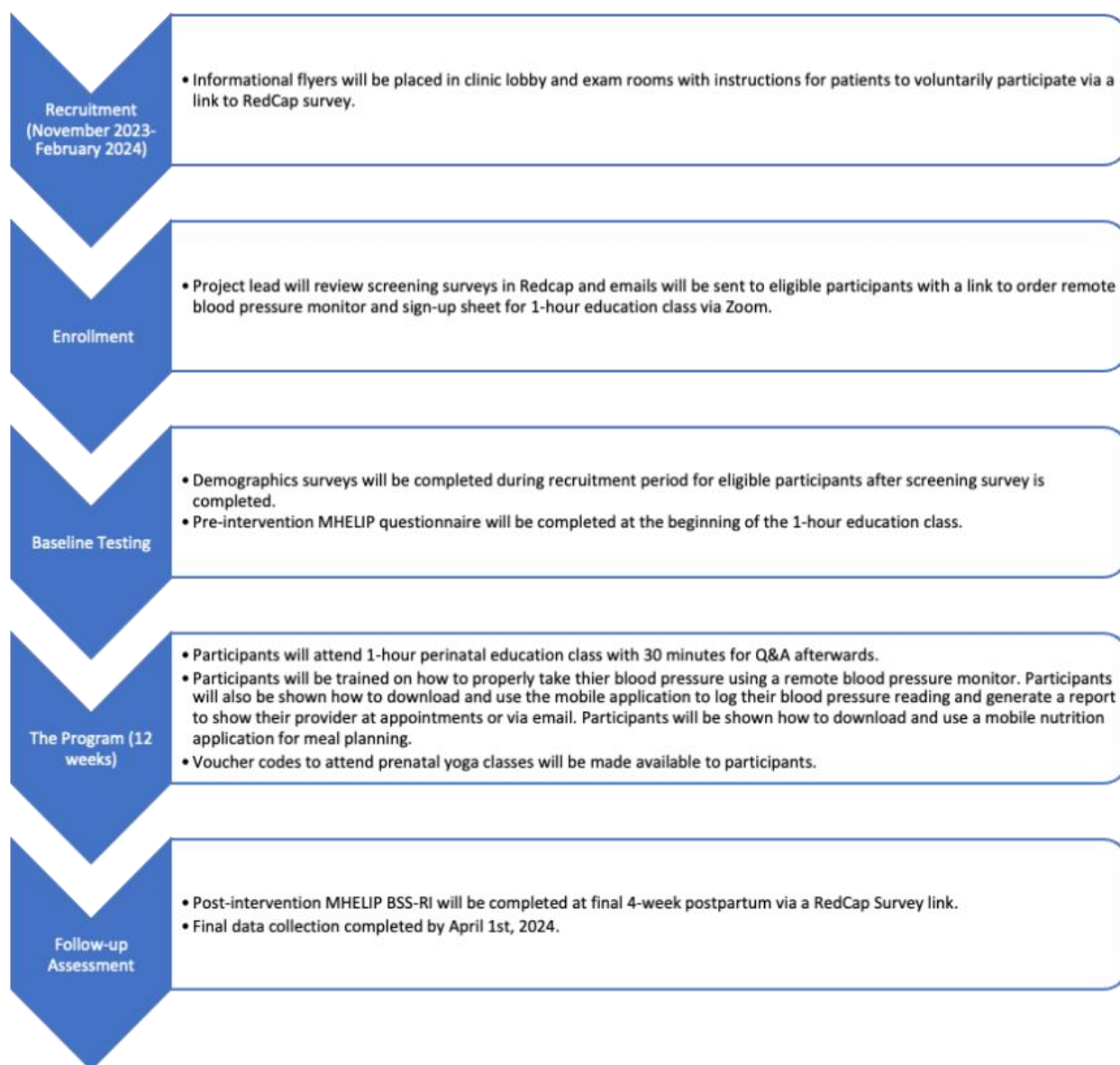
INPUTS	OUTPUTS		OUTCOMES	
Mobilized Resources	Activities and Interventions	Specific processes to measure	Short-term outcomes and measures	Long-term outcomes reflecting program objectives
<p>Obstetric providers (physicians, nurse midwives and nurse practitioners)</p> <p>High-risk childbirth course curriculum (digital)</p> <p>Birth Doulas</p> <p>Childbirth Educators</p> <p>Printed books, handouts</p> <p>Demonstration models and teaching supplies</p> <p>AV equipment for telehealth visits</p> <p>Vendor samples and giveaways</p> <p>Funding for cost of attendance and learning materials for each participant</p>	<p>Interactive quizzes on HPD</p> <p>Group discussions on nutrition, exercise, and stress management.</p> <p>Demonstrations and “teach-back” activities including accurate blood pressure monitoring and healthy meal planning.</p> <p>Prenatal yoga session and low intervention childbirth preparation class vouchers handed out to each participant.</p> <p>Birth planning specific to induction of labor.</p> <p>Newborn care activities specific to NICU admission, premature infant care.</p> <p>Breastfeeding activities specific to milk supply and preterm delivery. Clear teaching to using the breast pump and maintaining lactation.</p>	<p>Maternal health literacy level</p> <p>Childbirth Satisfaction</p> <p>Birth outcome data</p>	<p>Increased knowledge of gestational hypertension, preeclampsia.</p> <p>Understands the importance of healthy behaviors and self-care.</p> <p>Understand the process of induction of labor, medical interventions and share-decision making.</p> <p>Understand the care of premature infants and NICU stay.</p> <p>Understands the realities of need for breast pump and how to properly maintain milk supply.</p> <p>Decreased chance of hypertension incidence and/or severe features.</p> <p>Increased likelihood of a vaginal delivery at 37 weeks’ gestation.</p>	<p>Satisfaction with childbirth experience.</p> <p>Adoption of healthy beliefs and behaviors and reducing long-term risk associated with cardiovascular disease.</p> <p>Promotion of a positive transition to motherhood.</p>

ASSUMPTIONS (root cause analyses, prior learning/experience)
<p>Perinatal education classes can improve knowledge, increase adherence to treatment recommendations, and reduce adverse outcomes associated with hypertensive disorders of pregnancy.</p> <p>Low-income and minority pregnant women are disproportionately impacted and face unique barriers to accessing education and adequate high-risk prenatal care.</p> <p>Perinatal education can empower pregnant women to have confidence in their decisions and actions regarding their pregnancy, childbirth experience and the health of themselves and their children.</p>

EXTERNAL FACTORS (barriers/facilitators)
<p>Barriers: implicit bias, cost, social acceptance, health beliefs, transportation, time constraints, chronic stressors, hospital inpatient status.</p> <p>Facilitators: Vouchers, insurance billing, live-virtual option, evening/weekend classes, incentives from vendors for attendance, increase provider interaction.</p>

Appendix H- Project Timeline

Appendix I- Intervention Flow



Appendix J- Intervention Materials

High Blood Pressure in Pregnancy Class Outline

- I. Introductions
- II. What are Hypertensive Disorders in Pregnancy?
 - a. Definition
 - b. Risk Factors
 - c. Signs and Symptoms
- III. Complications
 - a. High blood pressure
 - b. Preeclampsia
 - c. HELLP Syndrome and Eclampsia
 - d. Preterm Birth
- IV. Managing Hypertensive Pregnancy in Pregnancy
 - a. Blood pressure monitoring and Fetal Surveillance
 - b. Diet and Exercise
 - c. Stress Management
 - d. Sleep quality
 - e. Medications
 - f. Delivery Recommendations
- V. Warning Signs and Getting Help
 - a. Severe Features
 - b. Hospital admission
 - c. Induction of Labor and Cesarean section

d. NICU admission

VI. Self-Monitoring Blood Pressure Demonstration

VII. Q&A

Appendix K- Faculty DNP Project Approval



August 22, 2023

UMKC DNP Student:
Brandie Smith

Congratulations. The UMKC Doctor of Nursing Practice (DNP) Faculty Team have approved your DNP project proposal, *Improving Maternal Health Literacy to Reduce Outcomes*.

Sincerely,

A handwritten signature in blue ink that reads "Cheri Barber".

Cheri Barber, DNP, RN, PPCNP-BC, FAANP
Clinical Associate Professor
DNP Program Director
UMKC School of Nursing and Health Studies barberch@umkc.edu

A handwritten signature in blue ink that reads "Lyla Lindholm".

Lyla Lindholm, DNP, RN, ACNS-BC
Clinical Assistant Professor, DNP Faculty
MSN-DNP Program Coordinator
UMKC School of Nursing and Health Studies lindholml@umkc.edu

Debbie C. Pankau DNP, APRN, FNP-BC
Clinical Assistant Professor
DNP Project Course Faculty
UMKC School of Nursing and Health Studies pankaud@umkc.edu

Brian Galacio, DNP, MSN, RN-BC
Adjunct Faculty
DNP Project Course Faculty
UMKC School of Nursing and Health Studies b.galacio@umkc.edu

DNP Faculty Mentor: Dr. Sellers
UMKC School of Nursing and Health Studies

UNIVERSITY OF MISSOURI-KANSAS CITY

2464 Charlotte • Kansas City, MO 64108-2718 • p 816 235-1700 • f 816 235-1701 www.umkc.edu/nursing • nurses@umkc.edu
an equal opportunity/affirmative action institution

Appendix L- IRB Determination

Project deemed QI.

Appendix M- Site Approval

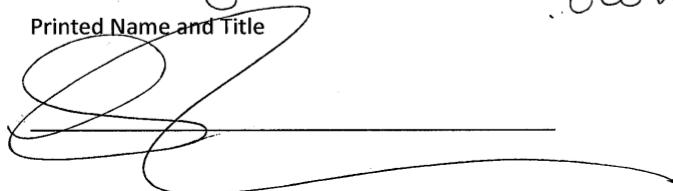
November 15, 2023

To Whom It May Concern,

This letter acknowledges that a request by Brandie Smith to leave informational flyers for clients to voluntarily participate in a clinical project study entitled "Improving maternal health literacy to reduce adverse outcomes in hypertensive disorders in pregnancy," is approved at Home Holistic from November 15, 2023, through March 15, 2024. Once Brandie receives approval for her project from the UMKC Institutional Review Board, access will be provided for the approved project.

Ashley Walburn MFT ERYT
owner of home holistic

Printed Name and Title



Signature/Date

Appendix N- Informational Letter

Dear Madam:

Thank you for participating in this study. Your time is valuable and greatly appreciated.

The goal of this study is to decrease the risk of complications for you and your unborn baby and ensure the safety and health of both of you. Your responses may also help us understand more about improving maternal health literacy and birth outcomes in hypertensive disorders in pregnancy.

You can decide whether to take part in this study or not. Your participation does not affect your relationship with your provider. If you choose to participate, you may stop at any time. If you do participate, you are free to skip any questions or discontinue at any time.

The perinatal education class will be Zoom sessions (that you can join via computer, tablet, or smartphone) lasting approximately 1 hour with time for Q&A afterward. The first survey will be completed during this time as well. A required follow-up survey will occur at 4 weeks postpartum via email with a second survey link.

The surveys will take about 15 minutes to complete.

Voucher codes for a remote blood pressure monitor and to attend additional prenatal classes will be provided, which you may use at your discretion during the duration of the study.

Your responses to the surveys will be kept confidential. All reported information post-study cannot be linked back to specific participants.

For any questions regarding this study, please contact Brandie at: 816-651-4194 or blfc59@umsystem.edu.

Please click the link below to participate in the study:
(link inserted here)

Sincerely,
Brandie Smith, RN, BSN, DNP Student
Project Lead
UMKC School of Nursing and Health Studies
PHONE: 816-651-4194
E-MAIL: blfc59@umsystem.edu

Appendix O- Measurement Tools

The maternal health literacy inventory in pregnancy (MHELIP)

Item	I don't know at all	I know a little	I know something	I know a lot	I know fully
1.I know natural physical changes during pregnancy.					
2.I know natural psychological changes during pregnancy.					
3.I know proper nutrition during pregnancy.					
4.I know personal health care.					
5.I know Proper activity and status in pregnancy.					
6.I know proper exercise during pregnancy.					
7.I know pregnancy supplements (vitamins).					
8.I know the appropriate referral timing for pregnancy examinations (visits).					
9.I know diagnostic examination (ultrasound and tests) of maternal and fetal health in pregnancy.					
10.I know the acceptable and normal amount of weight gain during pregnancy.					
11.I know common pregnancy problems such as nausea, vomiting, lower back pain.					
12.I know injecting safe (allowed) vaccines during pregnancy.					
13.I know the proper sexual relation during pregnancy.					
14.I know the normal number of fetal movements.					

15.I know the factors affecting fetal health such as photography, medications, chemicals such as botox, etc .					
16.I know risk signs in pregnancy.					
17.I know pregnancy disease symptoms such as gestational diabetes, high blood pressure in pregnancy and other diseases.					
18.I know childbirth such as the advantages and disadvantages of each of the natural delivery methods and cesarean section and their associated care.					
19.I know the methods of pain relief in vaginal delivery.					
20.I know neonatal and infant care in the postpartum period.					
21.I know required postpartum care of mother.					
Item	Not at all	rarely	sometimes	most often the times	always
22.I acquire information from written materials such as books, educational notes, pamphlets and medication brochures.					
23.I acquire information from radio and television.					
24.I acquire information from internet sources such as websites, instagram and telegram.					
25.I acquire information from other pregnant women.					
26.I acquire information from family, friends and acquaintances.					
27.I acquire information from healthcare professionals such as a physician or midwife.					

28.It is easy for me to read and pronounce pregnancy-related vocabulary from information sources such as books, educational booklets, internet, telegram and Instagram.					
29.The information obtained from different sources of information are understandable for me.					
30.I know valid and verified sources for getting the right pregnancy related information.					
31. I ask of the doctor or midwife to make sure pregnancy related information.					
32.I Evaluate the accuracy of pregnancy-related information obtained from online sources such as websites, instagram and telegram.					
33.I Evaluate the accuracy of pregnancy-related information obtained from friends and relatives					
34. I able to control/management physical and psychological changes in pregnancy.					
35.I implement a proper diet for pregnancy.					
36.I implement necessary measures for personal health care during pregnancy.					
37.I adhere to the principles of activity and proper condition during pregnancy.					
38.I take pregnancy supplements as prescribe by doctor or midwife.					
39.I consult with the doctor or midwife for taking any type of medication during pregnancy (chemical and herbal).					
40.I attend for prenatal care (examinations) as scheduled.					

41.I Perform ultrasound and tests in pregnancy recommended by healthcare professionals such as doctor or midwife.					
42.I monitor and control the weight gain during pregnancy.					
43.I use the appropriate methods of sexual relation during pregnancy.					
44.I avoid taking actions that are harmful to pregnancy.					
45.I see the doctor or midwife as soon as possible when any signs of danger in pregnancy is observed.					
46.I ask the doctor or midwife for further explanation if the information and recommendations are not clear enough.					
47.I participate in decision making about pregnancy issues with the doctor or midwife (providing personal opinions).					
48.I pay attention to the accuracy and appropriateness of information given to other pregnant women.					
<p>Maternal Health Knowledge: 1-21 question</p> <p>Search for maternal health information: 22-27 question</p> <p>Assessment of Maternal Health Information:28-33 question</p> <p>Maternal Health Decision Making and Behavior:34-48 question</p>					

Manual for scoring the maternal health literacy inventory in pregnancy (MHELIP)

	Number of items	Minimum possible raw score	Maximum possible raw score
Maternal Health Knowledge	21 (item 1-21)	21	105
Search for maternal health information	6 (item 22-27)	6	30
Assessment of Maternal Health Information	6 (item 28-33)	6	30
Maternal Health Decision Making and Behavior	15(item 34-48)	15	75

To calculate each subscale or total score for the MHELIP, first we added raw scores and linearly transferred it to a score from 0 to 100 using the following formula.

$$\text{Score} = \frac{\text{Raw score} - \text{Minimum possible raw score}}{\text{Maximum possible raw score} - \text{Minimum possible raw score}} * 100$$

We ranked the MHELIP score to 4 categories: ‘inadequate’, ‘problematic’ (which together also define ‘limited’ health literacy), ‘sufficient and ‘excellent’ (which together also defined ‘desired’ health literacy):

Inadequate= 0–50

Problematic= 50.1–66

Sufficient= 66.1–84

Excellent=84.1-100

Birth Satisfaction Scale-Revised (BSS-RI)

Item	Agree	Agree to some degree	Disagree
I was not distressed at all during labor.			
I felt very anxious during my labor and birth.			
I felt well supported by staff during my labor and birth.			
I found giving birth a distressing experience.			
I felt out of control during my birth experience.			
The staff communicated well with me during labor.			

Martin et al., 2018

Appendix N- Permission for Tools

Permission was granted for the MHELIP tool and BSS-RI tool by Creative Commons.

<https://creativecommons.org/licenses/by/4.0>.

Appendix O- Data Collection

Age	Race	Education	Annual Household Income	Marital Status	Pre-MHL	Post-MHL	HBPM Adherence	Birth outcome	BSS-RI
38	White	≤ 2 years college	\$150,000+	Married	60.41	81.25	≥ 2 times/day	38 week c-section	15/18 (.83)
27	More than one race	More than 4-year degree	\$100,000-\$149,999	Married	56.25				
41	White	4-year degree	\$150,000+	Married					
30	White	More than 4-year degree	\$100,000-\$149,999						
31	White	More than 4-year degree	\$100,000-\$149,999	Married					

Appendix P- Descriptive Statistics

	Maternal Health Literacy Level	HBPM Adherence	Birth Satisfaction Score
Baseline pre-intervention (n=5)	Mean Score 62.81 (limited)		
Post-intervention (n=1)	Score 81.25	< 2 times/day	15 (.83)
MHELIP (N=5)		Mean Score (Pre-Intervention)	Mean Score (Post-Intervention)
Q1 (MHELIP)		3.4	
Q2 (MHELIP)		2.8	
Q3 (MHELIP)		3.4	
Q4 (MHELIP)		3.4	
Q5 (MHELIP)		3	
Q6 (MHELIP)		3	
Q7 (MHELIP)		2.6	
Q8 (MHELIP)		3	
Q9 (MHELIP)		3	
Q10 (MHELIP)		3.4	
Q11 (MHELIP)		3.8	
Q12 (MHELIP)		3.2	
Q12 (MHELIP)		3.2	
Q13 (MHELIP)		3	
Q14 (MHELIP)		2.2	
Q16 (MHELIP)		2.6	
Q17 (MHELIP)		3.2	
Q18 (MHELIP)		3.2	
Q19 (MHELIP)		2.6	
Q20 (MHELIP)		2.8	
Q21 (MHELIP)		2.4	
Q22 (MHELIP)		3.2	
Q23 (MHELIP)		1.8	
Q24 (MHELIP)		3.6	
Q25 (MHELIP)		2.8	
Q26 (MHELIP)		2.6	
Q28 (MHELIP)		4	

Q29 (MHELIP)		3.6	
Q30 (MHELIP)		3.8	
Q31(MHELIP)		4.2	
Q32 (MHELIP)		4.2	
Q33 (MHELIP)		4.2	
Q34 (MHELIP)		3.4	
Q35 (MHELIP)		3.2	
Q36 (MHELIP)		4.2	
Q37 (MHELIP)		3.4	
Q38 (MHELIP)		4.6	
Q39 (MHELIP)		4.8	
Q40 (MHELIP)		5	
Q41 (MHELIP)		5	
Q42 (MHELIP)		3.6	
Q43 (MHELIP)		4	
Q44 (MHELIP)		4.6	
Q45 (MHELIP)		5	
Q46 (MHELIP)		4.8	
Q47 (MHELIP)		4.6	
Q48 (MHELIP)		3.6	
Birth Satisfaction			Score (N=1)
Q49 (BSS-RI)			2
Q50 (BSS-RI)			2
Q51 (BSS-RI)			3
Q52 (BSS-RI)			3
Q53 (BSS-RI)			3
Q54 (BSS-RI)			2

Appendix Q- Outcomes, tool analysis table

	State Outcome or Demographics	Measurement	Tool validity and reliability if survey or similar*	Permission Need	Statistical Analysis Test
Primary Outcomes	Increasing maternal health literacy level	MHELIP	Cronbach alpha of 0.94	Y	Paired t-test, p< 0.05, 95% CI
	Home BP compliance (Twice daily)	Application logs		N	
Secondary Outcomes	Increased childbirth satisfaction	BSS-RI	Cronbach alpha of 0.77	Y	Paired t-test, p< 0.05, 95% CI
	Birth outcome (≥ 37 weeks' gestation)	Self-reported		Y	
Demographics	Age, race, gestational age, marital status, education level, income level	Self-reported	Not applicable	Not Applicable	Descriptive statistics: Frequency distribution, percentage, mean (SD)

Appendix R- Other Tables

Figure 1.

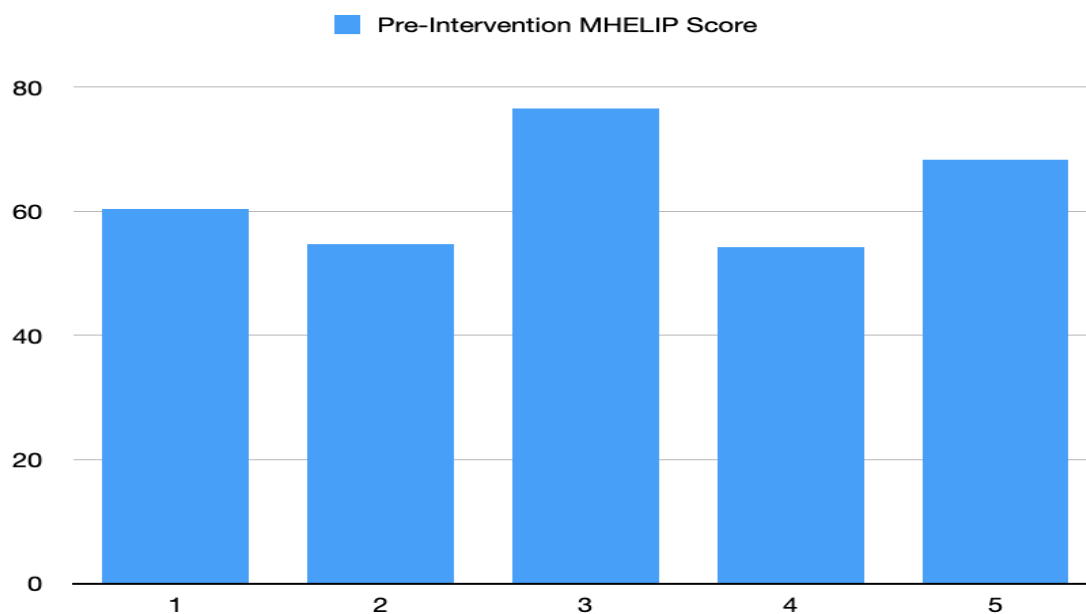


Figure 2. Comparison of Pre-Post MHELIP Score (N= 1)

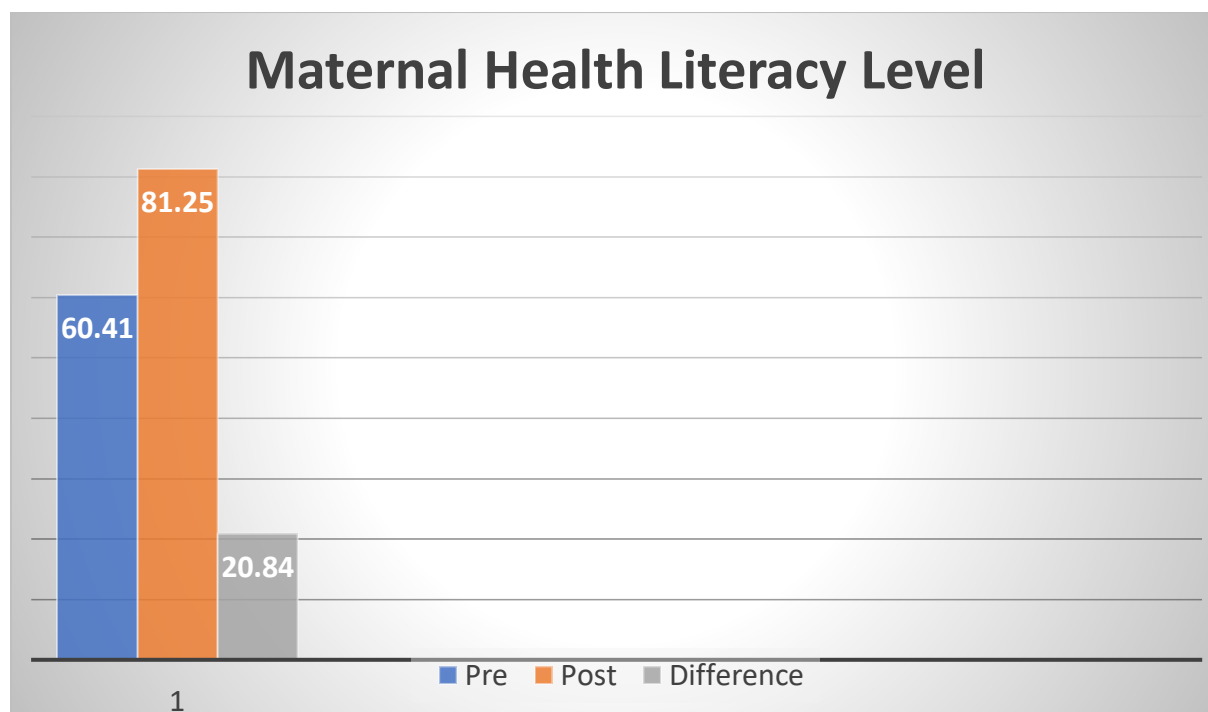


Table 1. Demographics of population

Sociodemographics	N (%)
Race	
White, non-Hispanic	4 (80.0)
More than one race	1 (20.0)
Education level	
Some college	1 (20.0)
4-year degree	3 (60.0)
More than 4-year degree	1 (20.0)
Household income	
\$100,000-149, 999	3 (60.0)
\$150,000+	2 (40.0)
Marital Status	
Married	5 (100.0)