Effects of a Case Management Program for Women With Pregnancy-Induced Hypertension

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ABSTRACT

Background: Pregnancy-induced hypertension (PIH) is a leading cause of maternal and fetal morbidity and mortality. Although case management programs have been proposed to improve maternal and fetal outcomes in high-risk pregnancies, limited data are available regarding the effect of case management on women with PIH.

Purpose: The aim of this study was to evaluate the effect of an antepartum case management program on stress, anxiety, and pregnancy outcomes in women with PIH.

Methods: A quasi-experimental research design was employed. A convenience sample of women diagnosed with PIH, including preeclampsia, was recruited from outpatient clinics at a medical center in southern Taiwan. Sixty-two women were assigned randomly to either the experimental group (n = 31) or the control group (n = 31). The experimental group received case management for 8 weeks, and the control group received routine clinical care. Descriptive statistics, independent t or Mann–Whitney U tests, chi-square or Fisher’s exact tests, paired t test, and generalized estimating equations were used to analyze the data.

Results: The average age of the participants was 35.1 years (SD = 4.5). No significant demographic or clinical differences were found between the control and experimental groups. The results of the generalized estimating equations showed significantly larger decreases in stress and anxiety in the experimental group than in the control group. No significant differences were identified between the two groups with respect to infant birth weeks, infant birth weight, average number of medical visits, or frequency of hospitalization.

Conclusions/Implications for Practice: The nurse-led case management program was shown to have short-term positive effects on the psychosocial outcomes of a population of Taiwanese patients with PIH. These results have important clinical implications for the healthcare administered to pregnant women, particularly in terms of improving the outcomes in those with PIH.

Key Words:
case management, pregnancy-induced hypertension, stress, anxiety.

Introduction

Pregnancy-induced hypertension (PIH) affects 6%–10% of pregnant women worldwide (Kintiraki et al., 2015; Walle & Azagew, 2019) and is a major cause of maternal and fetal death (Wu et al., 2015). This condition involves the development of gestational hypertension and preeclampsia after 20 weeks of pregnancy (Walle & Azagew, 2019). PIH is defined as two occasions of systolic blood pressure (BP) greater than or equal to 140 mmHg or of diastolic BP greater than or equal to 90 mmHg (Muti et al., 2015). The risk factors for PIH include advanced maternal age, primiparity, multiple pregnancy, use of assisted reproduction techniques, being overweight, diabetes mellitus (gestational or otherwise), previous history of PIH, and chronic hypertension (Liu et al., 2018; Zhuang et al., 2019). In Taiwan, PIH is the second leading cause of maternal death (Wu et al., 2015). The incidence of preeclampsia has significantly increased from 0.87% to 1.21%, and the relative risk of developing this complication increases incrementally with age. Hypertensive disorders associated with pregnancy remain a significant challenge for obstetricians in Taiwan because of ongoing changes in society and culture such as the rise in mean maternal age at first birth (Chan et al., 2015).

Women with PIH face increased risks of placental abruption, organ failure, and disseminated intravascular coagulation (Kintiraki et al., 2015). In addition, women with a history of severe preeclampsia may experience headaches, left upper

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quadrant pain, visual impairment, fatigue, and memory and concentration disturbances after delivery more frequently than women without this history (Brusse et al., 2008). Other long-term risks associated with PIH include atherosclerosis and cardiovascular disease (Watanabe et al., 2015), midlife development of Type 2 diabetes (Timpka et al., 2018), and intracranial hemorrhage (Lin et al., 2016). Furthermore, the fetuses of mothers with PIH face increased risks of intratubine growth retardation, premature birth, being small for gestational age, and intratubine death (Kintiraki et al., 2015; Muti et al., 2015). In a study of 17,933 fetal deaths in Norway, 9.2% occurred during the pregnancies of women with hypertensive disorders (Ahmad & Samuelsen, 2012).

Women with PIH also face elevated vulnerability to psychological and physical problems (Abedian et al., 2015; Zhang et al., 2013) that may impact fetal health significantly, even to the point of being life-threatening (Leeners et al., 2008). Evidence has shown that women with PIH experience more stress than healthy pregnant women, and women with preeclampsia often experience higher anxiety and stress levels than pregnant women without preeclampsia (Brusse et al., 2008; Hayase et al., 2014; Thiagayson et al., 2013). The results of previous studies have associated anxiety in early pregnancy with risk of preeclampsia and found that one in four women with preeclampsia experience anxiety problems during their subsequent pregnancy (Habli et al., 2009; Rubertsson et al., 2014). In one study, 67.5% of women with preeclampsia were unaware that they were experiencing this condition before becoming pregnant or being diagnosed, most did not consider it to be a potentially life-threatening condition for mothers, half feared that it threatened the life of their fetuses, and the overwhelming majority (95%) expressed a desire to learn more about it (Frawley et al., 2020).

It has also been reported that women who experience psychological distress during pregnancy may be at increased risks for preterm birth and delivery of low-birth-weight babies. Thus, researchers have emphasized the importance of providing appropriate prenatal mental health support (Glover, 2014; Staneva et al., 2015). Certain relaxation techniques have been shown to be effective in helping pregnant women control anxiety. For example, a randomized, controlled trial involving women in their second trimester found that the experimental group, which participated in a 7-week program involving 90 minutes of relaxation training targeting breathing and muscles, had mean postintervention anxiety and stress levels that were significantly lower than those in the routine-care control group (Bastani et al., 2005). Similarly, Toosi et al. (2017) conducted a study on women receiving in vitro fertilization who participated in a 4-week program of relaxation training that included 10–20 minutes of specific techniques at the end of the course. The training emphasized finding a quiet environment, doing mental preparation, maintaining a passive attitude, remaining comfortable, and relaxing muscles throughout the body, with the experimental group achieving a significant decrease in anxiety at posttest. However, little research has focused on relaxation techniques that are specifically designed to reduce maternal anxiety or stress in women with PIH (Damodaran, 2015).

Prenatal care during pregnancy is recommended to improve maternal and fetal outcomes, especially during high-risk pregnancies (Till et al., 2012). This care requires case management, which has been defined as “a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual’s and family’s comprehensive health needs through communication and available resources to promote quality, cost-effective outcomes” (Case Management Society of America, 2016). During high-risk pregnancies, case management involves the implementation of systematic, long-term care strategies and includes follow-up consultation to manage risk and reduce morbidity and mortality (Soares & Higarashi, 2019). Maternity case management usually involves screening for diseases and social risks, ongoing contact with case managers, and resource referrals. Curry et al. (2006) conducted a nurse case management study targeting pregnant women at risk for abuse. Women were randomly assigned to the routine-care control group or the experimental group, with members of the latter group provided with videos, telephone access to a nursing case manager, and individualized nursing case management. The findings suggest that nursing case management approaches that assess pregnant women’s needs and support their choices may effectively reduce self-perceived stress.

Case management has also proved effective in improving the birth weight of infants and reducing the incidence of preterm births (Slaughter et al., 2013), reducing the frequency at which babies are hospitalized in the neonatal intensive care unit, the healthcare costs associated with pregnancy, and the number of women experiencing high-risk pregnancies (Hutti & Usui, 2004). Moreover, the findings of several studies indicate that case management improves maternal behavior with respect to maintaining and engaging in HIV care at 1-year postpartum (Anderson et al., 2017; Schwartz et al., 2015) and to reducing alcohol consumption and the incidence of fetal alcohol spectrum disorders (de Vries et al., 2013; May et al., 2013). However, as previously noted, little information is available regarding the effectiveness of case management interventions designed to address the needs of women with PIH.

Therefore, the purpose of this study was to evaluate the effect of an antepartum case management program on stress, anxiety, and pregnancy in women in Taiwan with PIH. The primary aim was to assess the impact of an antepartum case management program on the stress and anxiety experienced by pregnant women. The secondary aim was to assess the impact of the program on pregnancy outcomes. Thus, the following research questions were formulated:

- What are the effects of an 8-week antepartum case management program on the stress and anxiety experienced by women with PIH?
- What are the effects of an 8-week antepartum case management program on pregnancy outcomes in women with PIH, including infant birth weeks, infant birth weight, number of medical visits, and frequency of hospitalization?
Methods

Design and Setting
A quasi-experimental approach was used to evaluate the effects of a case management program for women with PIH in terms of stress, anxiety, and pregnancy outcomes. Sixty-two women diagnosed with PIH were recruited from the obstetrics and gynecology clinics at a medical center in southern Taiwan and randomly assigned to either the experimental group or the control group. The experimental group received a case management program, and the control group did not. All of the participants were assessed using the same stress, anxiety, and pregnancy outcome measures. The outcomes were calculated by comparing the differences between measurements taken before the intervention (pretest) and measures taken at 8 weeks after the intervention (posttest).

Participants
Women who met the following criteria were invited to participate: (a) diagnosed by a physician within the previous 20–28 weeks as having PIH (including preeclampsia), (b) ≥ 18 years old, (c) free of other major health problems, and (d) able to communicate in Mandarin. Otherwise, qualified individuals with psychiatric conditions or a history of medical–surgical disease, maternal abuse, substance abuse, or multiple pregnancies, as determined via a medical records review, were excluded. In addition, those who had experienced other complications during pregnancy such as bleeding, gestational diabetes, uterine contracture, or rupture of membrane were excluded. Using the F test in G*Power software Version 3.1.6, with the assumptions $\alpha = .05$, effect size $= 0.3$, power level $= 0.80$, and two groups (Chiu, 2007), a minimum sample size of 56 was determined. Using a presumed attrition rate of 10%, a total minimum sample size of 62 was determined for this study. Eighty-three women with PIH met the inclusion criteria for this study, of which 72 were recruited and 62 completed the 8-week program.

Intervention
The case management program for women with PIH was developed after an extensive review of the literature and discussions with experts. The case management program team consisted of physicians, the head nurse, the nursing faculty, and one nurse case manager. Two professors with specialties in maternal nursing and health education were also recruited to serve as the planning committee. The three key components of the case management program were (a) education related to PIH, including its etiology, complications, management, and self-care; (b) instruction in relaxation techniques, including explanations and demonstrations of the various steps; and (c) telephone follow-up evaluations every 2 weeks to identify difficulties faced by the participants, monitor their relaxation practice, and answer questions. A booklet describing case management for PIH, inclusive of all materials in the health education program, was developed and distributed to the participants for their use as a guide.

The case management process for this study included (a) screening and recruitment by the case manager to identify women meeting the eligibility criteria; (b) assessment and monitoring of the participants’ weight, height, BP, blood sugar, urine glucose, proteinuria, bleeding, uterine contracture, and rupture of membrane; (c) implementation of the program, including discussion of the concept of PIH and its etiology, managing symptoms, self-management and monitoring, hospital resources, and relaxation techniques; and (d) evaluation and follow-up consultation by telephone regarding the condition of the pregnant women, weeks of gestation, and the numbers of hospitalizations and visits to clinics or hospitals. Whereas the experimental group participated in the case management program, the control group received the standard care protocol provided by Taiwanese clinics.

Measurements
The measurements included demographic and clinical information, BP, pregnancy outcomes, and self-reported stress and anxiety.

Demographic and clinical information
The demographic data collected from participants included age, education, and marital status. The clinical information that was collected included the participants’ pregnancy, childbirth, and PIH histories and any current PIH symptoms such as edema and proteinuria.

Blood pressure
BP was measured 5 minutes before the patients took a rest and 15 minutes afterward using a calibrated, automated, and oscillometric-validated device. All of the measurements were performed by the same researcher at the same time of day at a controlled room temperature.

Pregnancy outcomes
The main concern in this study was to evaluate the pregnancy outcomes of the participants, which included infant birth weeks, infant birth weight, number of hospitalizations, and number of medical visits. Infant birth weeks was defined as the gestational week of birth. Infant birth weight was defined as the weight of the newborn at birth. Number of hospitalizations was defined as the number of participants hospitalized because of PIH. Number of clinic or hospital visits (apart from routine prenatal care) was further subcategorized by reason, including high BP, symptoms related to PIH, and emergency treatment.

Pregnancy stress
The Pregnancy Stress Rating Scale developed by Chen et al. (1983) was used to evaluate prenatal stress. This scale consists of five domains: stress related to concerns about maternal and fetal safety through pregnancy, labor, and childbirth;
newborn care and changes in family relationships; maternal role identification; seeking social support; and physical appearance and changes in function. The participants were asked to rate 30 items keyed to pregnancy-related stressors based on their levels of concern and distress on a Likert scale ranging from 1 (definitely not concerned or distressed) to 5 (very severe concern and distress). The total possible score was 150, with higher scores correlating with higher levels of prenatal stress. This instrument showed good internal consistency ($\alpha = .91$) and supporting convergent and discriminative validities (Chen et al., 1983; Chiu, 2007).

**Procedure**

Ethical approval for this study was obtained from the institutional review board of university hospital (B-ER-105-388). The data were collected from January 2017 to January 2018. A nurse with more than 10 years of professional experience served as the case manager and conducted the case management and relaxation course training classes. Eligible participants referred by their physicians were invited to participate. Written informed consent was obtained from the participants after explaining the study thoroughly. The participants were randomly assigned to either the experimental group or the control group. Those assigned to the experimental group and 31 in the control group. No significant intergroup differences were identified in terms of demographic (Table 1) or clinical-related information.

The interactions between the groups and time were analyzed using a generalized estimation equation analysis of the changes in stress and anxiety after the case management intervention (Table 3). The results showed that posttest stress (Pregnancy Stress Rating Scale) scores were significantly lower in the experimental group, the mean score for stress during pregnancy decreased significantly, from 62.3 ($SD = 15.8$) at pretest to 52.5 ($SD = 8.8; p < .001$) at posttest, and the mean score for anxiety status declined significantly from 40.0 ($SD = 12.8$) at pretest to 36.9 ($SD = 10.0$) at posttest ($p = .003$). In the control group, no significant improvement was observed for either stress or anxiety status. In terms of intergroup comparisons, the posttest mean anxiety score was significantly lower in the experimental group than in the control group ($p = .03$). In terms of posttest pregnancy outcomes, no significant differences were found between the two groups with respect to infant birth weeks, infant birth weight, number of medical visits, or number of hospitalizations.

**Results**

Ethical Considerations

The confidential information associated with this study was stored on a password-protected computer in a locked cabinet. The researchers explained the process, purpose, and method of the study to the participants along with their related rights and interests. Signed, informed consent was obtained from all of the participants before data collection. To maintain the principle of equality, the members of the control group had access to routine hospital care during their pregnancies. To further ensure the confidentiality and privacy of participants, all data were anonymously encoded and not publicly disclosed.

Data Analysis

The data were analyzed using SPSS for Windows software Version 25.0 (IBM Inc., Armonk, NY, USA). Descriptive statistical analysis served to describe the study variables and the demographic and clinical characteristics of the participants. Independent $t$ tests or Mann–Whitney $U$ tests were used for the continuous variables, and chi-square tests or Fisher exact tests were used for the categorical variables to examine the homogeneity between the experimental and control groups. In addition, paired-sample $t$ tests were used to compare intragroup differences in the outcome variables between T1 and T2, and generalized estimation equations were used to evaluate the differences in the changes between the groups ($p < .05$) between pretest and posttest.
Experimental group ($B = -8.92$, $p = .013$) than in the control group. Moreover, group and time interaction effects were observed on the anxiety (STAI-State) score ($B = -4.69$, $p = .031$).

### Discussion

This study was the first to explore the effect of case management on stress, anxiety, and pregnancy outcomes in women with PIH. The stress and anxiety scores of the participants who undertook the 8-week intervention decreased significantly more than their control group peers. These results indicate that the case management program used in this research may have positive effects on the psychological outcomes of pregnant women with hypertension in Taiwan.

Previous research has found inconsistent results from case management programs that target pregnancy-related stress (Churchill et al., 2018; Curry et al., 2006). In this study, the significantly stronger improvement in stress scores seen...
in the experimental group versus the control group supports the effectiveness of the developed intervention protocol. This finding has significance for clinical practice because psychosocial stress during pregnancy is a risk factor for preterm birth (Staneva et al., 2015). This correlation may be attributable to the stimulation, in response to stress, of adrenaline production and the sympathetic nerves, which accelerates respiratory and heart rates. The relaxation techniques taught to members of the experimental group in this study were based on established stress-management strategies (Mohammadi & Parandin, 2019). The effectiveness of the case management program in this study may also be attributable in part to its implementation by a nursing case manager in the form of one-on-one consultation and education, which, in the experimental group, raised awareness of the disease, suggested ways to manage stress and PIH symptoms, and provided psychological support. Further study is needed to determine the long-term effectiveness of this case management approach to managing stress and to compare the specific effects of the individual elements of this case management program such as relaxation techniques, educational booklets, and consultations.

In this study, the case management approach significantly reduced the anxiety perceived by women with PIH. This finding is consistent with previous studies on the efficacy of using case management to treat anxiety in various populations (Hsu & Tai, 2014; Wang et al., 2016). In clinical settings, pregnant women with hypertension may experience various symptoms over time, including high BP, dizziness, headaches, proteinuria, etc.

| Variable                              | Experimental Group (n = 31) | Control Group (n = 31) | p     |
|---------------------------------------|-----------------------------|------------------------|-------|
|                                       | M                           | SD                     |       |
| Pregnancy Stress Rating Scale         |                             |                        |       |
| Pretest                               | 62.3                        | 15.8                   | .457  |
| Posttest                              | 52.5                        | 8.8                    | .238  |
| p Value                               | < .001                      |                        | .317  |
| State Trait Anxiety Inventory-State   |                             |                        |       |
| Pretest                               | 40.0                        | 12.8                   | .610  |
| Posttest                              | 36.9                        | 10.0                   | .030  |
| p Value                               | .003                        |                        | .550  |
| Pregnancy outcomes                    |                             |                        |       |
| Infant birth weeks                    | 36.3                        | 2.38                   | .082  |
| Infant birth weight (grams)           | 2639.1                      | 660.1                  | .190  |
| Number of medical visits              | 5.2                         | 1.9                    | .646  |
| Frequency of hospitalization          | 0.4                         | 0.6                    | .353  |

Table 2
Stress, Anxiety, and Pregnancy Outcomes, by Group (N = 62)

| Variable                              | PSRS                          | STAI-S                      |
|---------------------------------------|-------------------------------|------------------------------|
|                                       | B    | 95% Wald CI | p     | B    | 95% Wald CI | p     |
|                                       | Low  | High        |       | Low  | High        |       |
| (Intercept)                           | 33.80| 9.80        | 57.80 | .006 | 28.49        | 11.03 | .4595 |
| Time                                  |     |             |       |     |             |       |
| 8 weeks (T2) vs. baseline (T1)        | −1.48| −6.88       | 3.91  | .590 | 1.29         | −2.60 | 5.18  | .510  |
| Group                                 |     |             |       |     |             |       |
| Experimental vs. control              | 3.97 | −2.54       | 10.49 | .230 | −1.74        | −7.25 | 3.75  | .530  |
| Group × Time                          |     |             |       |     |             |       |
| Experimental vs. control with 8 weeks (T2) vs. baseline (T1) | −8.92| −16.01      | −1.84 | .013 | −4.69        | −8.97 | 0.42  | .031  |

Note. Controlled variables included age, education, past pregnancy-induced hypertension experience, systolic blood pressure, diastolic blood pressure, edema, and proteinuria. PSRS = Pregnancy Stress Rating Scale; STAI-S = State Trait Anxiety Inventory-State; CI = confidence interval.
and edema in the lower limbs. Effective nurse case managers are knowledgeable about PIH, capable of identifying related symptoms, and able to make decisions regarding the best treatment. Case management may also be effective in terms of limiting the fragmentation and discontinuity of care associated with referrals and arrangements (Soares & Higashishi, 2019), which may subsequently reduce the anxiety felt by pregnant women who are at a high risk for complications associated with this condition. The positive psychological effects of case management make this a promising approach for patients dealing with PIH-related issues.

The lack of significant differences in infant birth weeks and infant birth weights between the experimental and control groups was unexpected. This finding may be attributable to dosage issues associated with case management. An earlier study found that women who received more than 6 hours of antenatal coordination services were less likely to have poor neonatal outcomes than those who received fewer than 6 hours of these services (Van Dijk et al., 2011). Another study found that women who received case management characterized by frequent and long-duration contacts beginning in the first or second trimester were less likely to have low-birth-weight or preterm deliveries than those who received less extensive case management (Slaughter & Issel, 2012). However, as most of the participants in this study were in their second trimester, the intervention period of 8 weeks was chosen in light of the manner in which PIH develops (i.e., after 20 weeks of pregnancy). Future research is needed to examine the effects of the initiation, duration, and intensity of nursing case management on maternal and neonatal outcomes.

In addition, no significant differences were found between the experimental and control groups with respect to numbers of medical visits or hospitalizations. One possible explanation for this is the effective dissemination of information online by most hospitals in Taiwan. As pregnant women with hypertension are able to access information through the internet that can help alleviate their complications or symptoms, they are less likely to seek hospitalization or outpatient services. Another reason for this may reflect inaccurate reporting, as medical visit and hospitalization numbers were self-reported by the participants. Researchers conducting similar future studies may consider using medical records of other pregnancy outcomes such as the number of babies hospitalized in the neonatal intensive care unit or number of mothers with high-risk conditions to assess the effect of case management services on neonatal outcomes for women with PIH.

Conclusions

The results of this study support the effectiveness of the case management approach in improving psychological outcomes in women with PIH. Specifically, the participants in the experimental group had significantly lower levels of stress and anxiety after the conclusion of the case management intervention than their counterparts who received routine care only. Prenatal case management services should be further evaluated using a larger sample to validate and identify the program characteristics of intervention programs that improve psychological and birth outcomes for women with PIH.

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Author Contributions

Study conception and design: CC Chou, CJW
Data collection: CC Chen
Data analysis and interpretation: CC Chou, J.JL, YML, CJW
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References

Abedian, Z., Soltani, N., Mokhber, N., & Esmaeili, H. (2015). Depression and anxiety in pregnancy and postpartum in women with mild and severe preeclampsia. Iranian Journal of Nursing and Midwifery Research, 20(4), 454–459. https://doi.org/10.4103/1735-9066.161013
Ahmad, A. S., & Samuelsen, S. O. (2012). Hypertensive disorders in pregnancy and fetal death at different gestational lengths: A population study of 2 121 371 pregnancies. British Journal of Obstetrics and Gynecology, 119(12), 1521–1528. https://doi.org/10.1111/j.1471-0528.2012.03460.x
Anderson, E. A., Mompiaisir, F. M., Corson, C., & Brady, K. A. (2017). Assessing the impact of perinatal HIV case management on outcomes along the HIV care continuum for pregnant and postpartum women living with HIV, Philadelphia 2005–2013. AIDS and Behavior, 21(9), 2670–2681. https://doi.org/10.1007/s10461-017-1714-9
Bastani, F., Hidarnia, A., Kazemnejad, A., Vafaei, M., & Kashanian, M. (2005). A randomized controlled trial of the effects of applied relaxation training on reducing anxiety and perceived stress in pregnant women. Journal of Midwifery & Women’s Health, 50(4), e36–e40. https://doi.org/10.1016/j.jmwh.2004.11.008
Brusse, I., Duvetot, J., Jongerling, J., Steegers, E., & De Koning, I. (2008). Impaired maternal cognitive functioning after pregnancies complicated by severe pre-eclampsia: A pilot case-control study. Acta Obstetricia et Gynecologica Scandinavica, 87(4), 408–412. https://doi.org/10.1080/00016340801915127
Case Management Society of America. (2016). *Standards of practice for case management*. Little Rock.

Chen, T.-F., Tung, Y.-C., Wang, S.-H., Lee, C.-H., Lin, C.-L., & Lu, P.-Y. (2015). Trends in the incidence of pre-eclampsia and eclampsia in Taiwan between 1998 and 2010. *Taiwaneese Journal of Obstetrics & Gynecology*, 54(3), 270–274. https://doi.org/10.1016/j.tjog.2013.06.021

Chen, C.-H., Yu, Y.-M., & Hwang, K.-K. (1983). Psychological stressors perceived by pregnant women during their third trimester. *Formosan Journal of Public Health*, 10(1), 88–98. (Original work published in Chinese)

Chiu, W. H. (2007). *The effectiveness of case management style for the twin pregnancy women*, [Unpublished master’s thesis]. National Taipei University of Nursing and Health Sciences, Taipei. (Original work published in Chinese)

Churchill, S. S., Leo, M. C., Brennan, E. M., Sellmaier, C., Kendall, J., & Houck, G. M. (2018). Longitudinal impact of a randomized clinical trial to improve family function, reduce maternal stress and improve child outcomes in families of children with ADHD. *Maternal and Child Health Journal*, 22(8), 1172–1182. https://doi.org/10.1007/s10995-018-2502-5

Curry, M. A., Durham, L., Bullock, L., Bloom, T., & Davis, J. (2006). Nurse case management for pregnant women experiencing or at risk for abuse. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 35(2), 181–192. https://doi.org/10.1111/j.1552-6909.2006.00027.x

Damodaran, D. (2015). Effect of progressive muscle relaxation technique in terms of anxiety and physiological parameters of antenatal mothers with pregnancy-induced hypertension. *The Nursing Journal of India*, 106(6), 254–257.

de Vries, M. M., Joubert, B., Cloete, M., Roux, S., Baca, B. A., Hasken, J. M., Barnard, R., Buckley, D., Kalberg, W. O., Snell, C. L., Marais, A. S., Seedat, S., Parry, C. D. H., & May, P. A. (2015). Indicated prevention of fetal alcohol spectrum disorders in South Africa: Effectiveness of case management. *International Journal of Environmental Research and Public Health*, 13(1). Article 13010076. https://doi.org/10.3390/ijerph.13010076

Delgado, A. M., Freire, A. D., Wanderley, E. L., & Lemos, A. (2016). Analysis of the construct validity and internal consistency of the State-Trait Anxiety Inventory (STAI) State-Anxiety (S-Anxiety) Scale for pregnant women during labor. *Revista Brasileira de Ginecologia e Obstetricia*, 38(11), 531–537. https://doi.org/10.1053/s-0036-1593894

Frawley, N., East, C., & Brennecke, S. (2020). Women’s experiences of pre-eclampsia: A prospective survey of preeclamptic women at a single tertiary centre. *Journal of Obstetrics and Gynaecology*, 40(1), 65–69. https://doi.org/10.1080/014436315.2019.1615040

Glover, V. (2014). Maternal depression, anxiety and stress during pregnancy and child outcome; what needs to be done. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 28(1), 25–35. https://doi.org/10.1016/j.bpobgyn.2013.08.017

Habli, M., Eftekhari, N., Wiebracht, E., Bombrys, A., Khabbaz, M., How, H., & Sibai, B. (2009). Long-term maternal and subsequent pregnancy outcomes 5 years after hemolysis, elevated liver enzymes, and low platelets (HELLP) syndrome. *American Journal of Obstetrics and Gynecology*, 201(4), 385.e1–385.e5. https://doi.org/10.1016/j.ajog.2009.06.033

Hayase, M., Shimada, M., & Seki, H. (2014). Sleep quality and stress in women with pregnancy-induced hypertension and gestational diabetes mellitus. *Women and Birth*, 27(3), 190–195. https://doi.org/10.1016/j.wombi.2014.04.002

Hsu, C. C., & Tai, T. Y. (2014). Long-term glycemic control by a diabetes case-management program and the challenges of diabetes care in Taiwan. *Diabetes Research and Clinical Practice*, 108(Suppl. 2), S328–S332. https://doi.org/10.1016/S0168-8227(14)70738-7

Hutti, M. H., & Usui, W. M. (2004). Nursing telephonic case management and pregnancy outcomes of mothers and infants. *Lippincott’s Case Management*, 9(6), 287–299. https://doi.org/10.1097/0129234-200411000-00008

Kintiraki, E., Papakatsika, S., Kotronis, G., Goulis, D. G., & Kotsis, V. (2015). Pregnancy-induced hypertension. *Hormones (Athens, Greece)*, 14(2), 211–223. https://doi.org/10.14310/horm.2002.1582

Leeners, B., Stillier, R., Neumaier-Wagner, P., Kuse, S., Schmitt, A., & Rath, W. (2008). Psychosocial distress associated with treatment of hypertensive diseases in pregnancy. *Psychosomatics*, 49(5), 413–419. https://doi.org/10.1176/appi.psy.49.5.413

Lin, L. T., Tsui, K. H., Cheng, J. T., Cheng, J. S., Huang, W. C., Liou, W. S., & Tang, P. L. (2016). Increased risk of intracranial hemorrhage in patients with pregnancy-induced hypertension: A nationwide population-based retrospective cohort study. *Medicine (Baltimore)*, 95(20), e3732. https://doi.org/10.1097/MD.000000000003732

Liu, Q., Wang, X. X., Zhang, Y. K., Li, J. H., & Wang, L. (2018). Correlation between pregnancy-induced hypertension and age in pregnant women from Hebei province, 2016. *Zhonghua Liu Xing Bing Xue Za Zhi*, 389), 1270–1273. https://doi.org/10.3760/cma.j.issn.0254-6450.2018.09.024 (Original work published in Chinese)

May, P. A., Marais, A. S., Gossage, J. P., Barnard, R., Joubert, B., Cloete, M., Hendricks, N., Roux, S., Blom, A., Steenkamp, J., Alexander, T., Andreas, R., Human, S., Snell, C., Seedat, S., Parry, C. C., Kalberg, W. O., Buckley, D., & Blankenship, J. (2013). Case management reduces drinking during pregnancy among high risk women. *International Journal of Alcohol and Drug Research*, 23(3), 61–70. https://doi.org/10.7895/ijadr.v23.i7.79

Mohammadi, M. M., & Parandin, S. (2019). Effect of the combination of Benson’s relaxation technique and brief psychoeducational intervention on multidimensional pain and negative psychological symptoms of pregnant women: A randomized controlled trial. *Journal of Education and Health Promotion*, 8, 91. https://doi.org/10.4103/jehp.jehp_286_18

Muti, M., Tshimanga, M., Notion, G. T., Banguire, D., & Chonzi, P. (2015). Prevalence of pregnancy induced hypertension and pregnancy outcomes among women seeking maternity services in Harare, Zimbabwe. *BMC Cardiovascular Disorders*, 15, Article No. 111. https://doi.org/10.1186/s12872-015-0110-5

Rubertsson, C., Hellström, J., Cross, M., & Sydsjö, G. (2014). Anxiety in early pregnancy: Prevalence and contributing factors. *Archives of Women’s Mental Health*, 17(3), 221–228. https://doi.org/10.1007/s00737-013-0409-0

Schwartz, S. R., Clouse, K., Yende, N., Van Rie, A., Bassett, J., Ratshefola, M., & Pettifar, A. (2015). Acceptability and feasibility of a mobile phone-based case management intervention to retain mothers and infants from an option B+ program in postpartum HIV care. *Maternal and Child Health Journal*, 19(3), 2029–2037. https://doi.org/10.1007/s10995-015-1715-0

Slaughter, J. C., & Issel, L. M. (2012). Developing a measure of prenatal case management dosage. *Maternal and Child Health Journal*, 16(5), 1120–1130. https://doi.org/10.1007/s10995-011-0840-7

Slaughter, J. C., Issel, L. M., Handler, A. S., Rosenberg, D., Kane, D. J., & Stayner, L. T. (2013). Measuring dosage: A key factor when assessing the relationship between prenatal case management
and birth outcomes. *Maternal and Child Health Journal*, 17(8), 1414–1423. https://doi.org/10.1007/s10995-012-1143-3

Soares, L. G., & Higashiri, I. H. (2019). Case management as a high-risk prenatal care strategy. *Revista Brasileira de Enfermagem*, 72(3), 692–699. https://doi.org/10.1590/0034-7167-2018-0483

Staneva, A., Bogossian, F., Pritchard, M., & Wittkowski, A. (2015). The effects of maternal depression, anxiety, and perceived stress during pregnancy on preterm birth: A systematic review. *Women and Birth*, 29(3), 179–193. https://doi.org/10.1016/j.wombi.2015.02.003

Thiagayson, P., Krishnaswamy, G., Lim, M. L., Sung, S. C., Haley, C. L., Fung, D. S., Allen, J. C., & Chen, H. (2013). Depression and anxiety in Singaporean high-risk pregnancies—Prevalence and screening. *General Hospital Psychiatry*, 35(2), 112–116. https://doi.org/10.1016/j.genhosppsych.2012.11.006

Till, S. R., Everetts, D., Haas, D. M., & Cochrane Pregnancy and Childbirth Group. (2012). Incentives for increasing prenatal care use by women in order to improve maternal and neonatal outcomes. *Cochrane Database of Systematic Reviews*, 12, Article CD009916. https://doi.org/10.1002/14651858.CD009916.pub2

Timpka, S., Markovitz, A., Schyman, T., Mogren, I., Fraser, A., Franks, P. W., & Rich-Edwards, J. W. (2018). Midlife development of type 2 diabetes and hypertension in women by history of hypertensive disorders of pregnancy. *Cardiovascular Diabetology*, 17(1), Article No. 124. https://doi.org/10.1186/s12933-018-0764-2

Toosi, M., Akbarzadeh, M., & Ghaemi, Z. (2017). The effect of relaxation on mother’s anxiety and maternal–fetal attachment in primiparous IVF mothers. *Journal of the National Medical Association*, 109(3), 164–171. https://doi.org/10.1016/j.jnma.2017.03.002

Van Dijk, J. W., Anderko, L., & Stetzer, F. (2011). The impact of prenatal care coordination on birth outcomes. *Journal of Obstetric, Gynecologic, and Neonatal Nursing*, 40(1), 98–108. https://doi.org/10.1111/j.1552-6909.2010.01206.x

Walle, T. A., & Azagew, A. W. (2019). Hypertensive disorder of pregnancy prevalence and associated factors among pregnant women attending ante natal care at Gondar town health Institutions, North West Ethiopia 2017. *Pregnancy Hypertension*, 16, 79–84. https://doi.org/10.1016/j.preghy.2019.03.007

Wang, Y. C., Hsieh, L. Y., Wang, M. Y., Chou, C. H., Huang, M. W., & Ko, H. C. (2016). Coping card usage can further reduce suicide reattempt in suicide attempter case management within 3-month intervention. *Suicide & Life-Threatening Behavior*, 46(1), 106–120. https://doi.org/10.1111/sltb.12177

Watanabe, K., Kimura, C., Iwasaki, A., Mori, T., Matsushita, H., Shinohara, K., Wakatsuki, A., Gosho, M., & Miyano, I. (2015). Pregnancy-induced hypertension is associated with an increase in the prevalence of cardiovascular disease risk factors in Japanese women. *Menopause*, 22(6), 656–659. https://doi.org/10.1097/gme.0000000000000361

Wu, T. P., Huang, Y. L., Liang, F. W., & Lu, T. H. (2015). Underreporting of maternal mortality in Taiwan: A data linkage study. *Taiwanese Journal of Obstetrics & Gynecology*, 54(6), 705–708. https://doi.org/10.1016/j.tjog.2015.10.002

Zhang, S., Ding, Z., Liu, H., Chen, Z., Wu, J., Zhang, Y., & Yu, Y. (2013). Association between mental stress and gestational hypertension/preeclampsia: A meta-analysis. *Obstetrical & Gynecological Survey*, 68(12), 825–834. https://doi.org/10.1097/ogx.0000000000000001

Zhuang, C., Gao, J., Liu, J., Wang, X., He, J., Sun, J., Liu, X., & Liao, S. (2019). Risk factors and potential protective factors of pregnancy-induced hypertension in China: A cross-sectional study. *The Journal of Clinical Hypertension*, 21(5), 618–623. https://doi.org/10.1111/jch.13541