



Earthing Method as Lifestyle Medicine to Reduce Hypertension in Pregnancy

Estiningtyas¹, Anindhita Yudha Cahyaningtyas¹, Muhammad Akhsin Muflikhun²

¹ Bachelor Nursing Program, Mitra Husada Health College, Karanganyar, Indonesia

² Department of Mechanical and Industrial Engineering, Gadjah Mada University, Yogyakarta, Indonesia

bidanesti@gmail.com

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Kata Kunci

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Earthing;
Grounding;
Preeklampsia

Abstrak

Hipertensi dalam kehamilan termasuk dalam 3 komplikasi utama yang terjadi pada 1 dari 10 wanita hamil. Hipertensi merupakan penyebab signifikan kematian dan kesakitan ibu dan bayi (termasuk eklamsi dan berat bayi lahir rendah). Earthing atau grounding merupakan terapi kontak langsung antara kulit dengan permukaan bumi (tanah, rumput, batu) yang memungkinkan transpor bebas elektron dari permukaan tanah ke seluruh tubuh. Tujuan penelitian adalah menganalisis pengaruh Earthing pada hipertensi dalam kehamilan. Desain penelitian adalah pre-experimental dengan satu kelompok pre-test dan post-test yang di desain selama 1 tahun penelitian. Populasi penelitian adalah ibu hamil dengan hipertensi di kota Surakarta, Jawa Tengah. Teknik sampling yang digunakan adalah purposive sampling, merekrut 20 responden. Durasi Earthing 1 jam setiap hari selama 30 hari. Hasil uji statistik P-value 0.000, t-count 25.065 > t-table 2.093 untuk tekanan darah sistolik; dan P-value 0.000, t-count 93.05 > t-table 2.093 untuk tekanan darah diastolik sebelum dan setelah dilakukan Earthing. Direkomendasikan bagi ibu hamil untuk melakukan Earthing atau grounding sebagai bagian dari pengobatan berbasis gaya hidup di rumah dengan menapakkan telapak kaki pada tanah setiap hari selama 1 jam. Praktik ini sangat bermanfaat untuk dilakukan selama kehamilan untuk mensuplai elektron dari tanah masuk ke seluruh tubuh.

Keywords

High blood pressure;
Hypertension
gravidarum;
Earthing;
Grounding;
Preeclampsia

Abstract

Hypertension in pregnancy is among the three highest complications in 1 in 10 pregnant women. It is a significant cause of morbidity and mortality for mothers and babies (including seizures and low birth weight (LBW)). Earthing or grounding is a direct contact therapy between the body and the earth's surface (soil, grass, sand or stone), which allows the free transport of electrons from the earth's surface to spread to the body through the skin. The research objective was to analyze the effect of Earthing on hypertension in pregnancy. The research design was a pre-experimental with a one-group pretest and posttest, designed for one year of study. The population of pregnant women with hypertension in Surakarta City, Central Java, with the sampling technique used was purposive sampling, recruiting 20 respondents. Earthing duration 1 hour every day for 30 days. The statistical analysis results in a P-value of 0.000, t-count 25.065 > t-table 2.093, for systolic blood pressure and P-value 0.000, t-count 93.05 > t-table 2.093 for diastolic blood pressure. It indicates a significant difference in pregnant mothers' systolic and diastolic blood pressure before and after Earthing. It is recommended for mothers to perform Earthing or grounding as a lifestyle medicine at home by placing bare feet on the soil every day for 1 hour. It is beneficial to do Earthing/grounding throughout the pregnancy or by using Earthing device that connects the electrons in the earth to the skin

Introduction

Hypertension in pregnancy is one of the three main complications of pregnancy which includes hypertension that occurs before pregnancy, gestational hypertension, preeclampsia and eclampsia. The incidence of hypertension in pregnancy in Indonesia is 24% the cause of maternal death (1) and is a significant cause of morbidity and mortality of mothers and infants worldwide(2). Hypertension in pregnancy leads to preeclampsia and eclampsia (seizures)(3); it is also the highest cause of neonatal death, namely the leading cause of low birth weight (4,5). Research reports that Earthing can reduce hypertension by reducing blood viscosity (6), a major factor in cardiovascular disease (7,8). A study of the application of Earthing in 10 patients who were not pregnant for 12 weeks showed a decrease in blood pressure varied from 8.6% to 22.7% or an average of 14.3% (6). In addition, the Earthing method also has a positive correlation with reducing the risk of hypertension, especially in balancing the functions of the unconscious nervous system, which regulates the function of organs in the body; reduces stress; balances the body's hormones associated with endocrine hypertension, namely hyperaldosteronism, catecholamines, thyroid hormones, and glucocorticoids (9).

Hypertension in pregnancy is the main cause of death among mothers in Indonesia (33%). Hypertension causes low birth weight (LBW), which accounts for 60-80% of infant deaths in the world (1), while in Indonesia, there are 7,150 cases (35.3%) (5). In Central Java, 1 out of 10 pregnant women gives birth to infants with LBW, where the highest percentage is Demak Regency (18.38%), and the second is Surakarta City (17.59%)(10).

The Earthing method substantially increases the zeta potential (repulsive force between particles), which then reduces the clumping of red blood cells, thereby reducing the viscosity which promotes blood circulation (11), increases the function of the autonomic nervous system from the sympathetic nervous system to dominance in the parasympathetic nervous system, increases heart rate variability, normalizes muscle tension, and normalizes the hormone cortisol (8) which are factors associated with a decrease in blood pressure.

In a survey of 6 pregnant women with hypertension in Surakarta City, Central Java, pregnant women with hypertension live in densely populated housing with very little access to soil or grass because the ground has been covered with cement, plaster or pavement. Six mothers rarely do physical exercise; three mothers are overweight, and five mothers experience moderate to high stress, all three of which are factors that influence hypertension in pregnancy.

This research is significant in becoming a lifestyle medicine modality for the prevention and treatment of hypertension in pregnancy which, according to online research journal searches, has never been published in Indonesia. Earthing is a natural, practical, effective and safe method with no side effects. Utilization of the results of this study is beneficial for pregnant women to utilize the Earthing method at any time, sustainable, easily accessible in community empowerment and independence. Earthing therapy will also help reduce the burden of BPJS health financing in cases of hypertension in pregnancy and LBW (12).

Earthing or grounding is a therapy that refers to direct contact between the surface of the earth, between the skin of the soles of the feet or hands and soil, grass, sand or rocks. Direct contact with the earth allows the free transport of electrons from the earth's surface to spread to the body through the skin. Research subjects reported that walking barefoot on the ground improves health and enables a feeling of well-being in the existing literature in different cultures around the world (7,13)

Earthing results in changes to the body's electrical state, as reported by Applewhite, an electrical engineer who is an expert at designing electrostatic systems in the electricity industry. He noted changes in the body's electrical potential to equal the ground's electrical potential through the transfer of electrons from the earth to the body (8). This study also confirms the findings of Richard Feynman, winner of the Nobel Prize, who said that when the body's electrical potential is equal to the earth's potential, the body becomes part of the earth's giant electrical system. The connection of the body to the earth can reject and reduce excess electrical voltage originating from the body's metabolism and sources of electricity from the neutral environment (14).

Research reports that the Earthing method can reduce hypertension by reducing blood viscosity, a major factor in cardiovascular disease (8,12), and blood circulation in general. Thus, blood that is more fluid allows the transport of oxygen and the need for nutrients for the tissues and cells of the body.

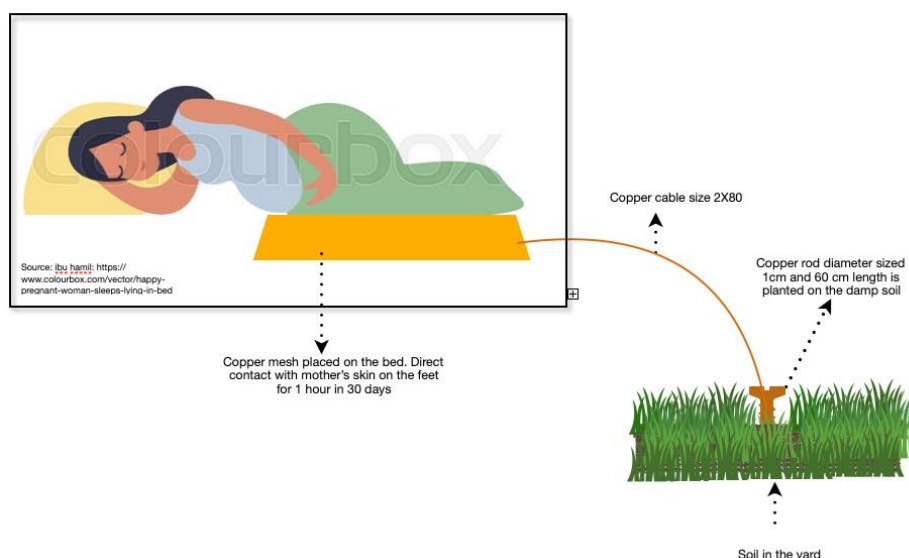


Figure 1. Mechanism of applying the earthing method to pregnant women with hypertension

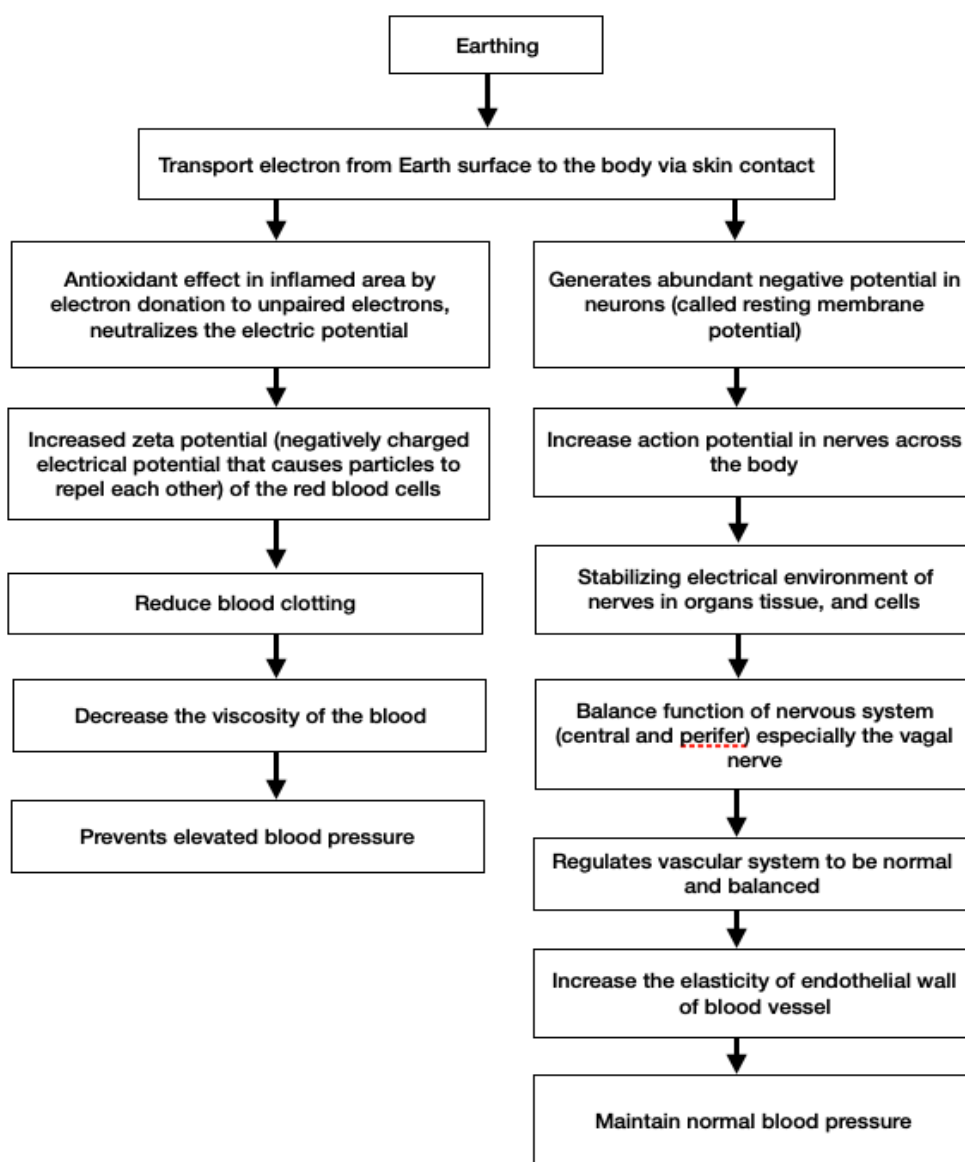


Chart 1. Mechanism of Action of Earthing on Hypertension in Pregnancy

Methods

This research was quasi-experimental in the Surakarta City Health Service Working Area from May to December 2022. The population in this study was pregnant women with hypertension, including hypertension before pregnancy, gestational hypertension, and preeclampsia. Sampling was taken using purposive sampling with the formula for experimental research sample sizes according to Supranto (2000) below:

The sample size in experimental research is calculated using the formula (15).

$$(t - 1) (r - 1) > 15.$$

Where t=number of treatment groups; r=number of replications

With t=1 group, then:

$$(1 - 1) (r - 1) > 15$$

$$r > 16$$

Restriction Criteria

Inclusion Criteria

- 1) pregnant women with gestational age > 20 weeks
- 2) have hypertension in pregnancy
- 3) Negative urine protein
- 4) willing to be a respondent for a specified period

Exclusion Criteria

- 1) have kidney disorders
- 2) have gestational diabetes

Research Instruments

The earthing system was constructed with lecturer PhD Engineering from the Faculty of Mechanical and Industrial Engineering UGM, consisting of 400-density copper mesh, 2x80 copper cables, and copper stakes planted in the ground with a diameter of 10mm and a length of 60cm. Data collection instrument in the form of a questionnaire containing sociodemographic characteristics of the mother, including age, parity, level of education, occupation, socioeconomic factors, and electronic blood pressure test to measure systolic and diastolic.

The tool assembly process was carried out by the research team by obtaining input from electronics practitioners to obtain the safest, most comfortable and more durable device design for the respondents.

Stage 1: Researchers use the grounding principle where pregnant women are connected to copper planted in the soil around the house. An overview was obtained from the screening process that most of the respondent's houses had yards, so copper cylinders/rods could easily be planted in the ground. In the home yard in the form of cement, a small hole will be made so that the grounding rod can be planted. The tool must fulfil the grounding function, measuring an electric voltage of 0.0 millivolts or close to it (3).

The first experiment was with grounding without tools, where the researcher's feet directly touched the ground/grass [4]. Figure 2 is leg-wearing rubber footwear (not grounding); the skin voltage reaches 274.8 millivolts. Meanwhile, when the feet are not wearing a base to directly touch the ground (figure 4), the electric voltage on the skin reaches 0.00 volts. The 0.00 millivolt is the basic principle of grounding as a reference used when assembling Earthing tools.

The equipment used is a grounding rod from a copper cylinder, solid copper cables, and an electronic pad commonly used for grounding patients in the operating room. However, the result obtained is a voltage measurement of around 50-60 millivolts, which means it is not grounded. Figure 3 shows the skin voltage is 63.4 millivolts. In addition, the use of an electronic pad where there is a sticky part similar to glue which will stick to the sensitive skin of pregnant women for 1 hour every day, is felt to be uncomfortable for pregnant women.



Figure 2. An experiment measuring skin voltage when not grounded/not Earthing, skin voltage 274.8 millivolts



Figure 3. An experimental measurement of skin voltage when grounded/ do Earthing, skin voltage 0.00 millivolts



Figure 4. The first device construction experiment resulted in a measurement of 63.4 millivolts, which means it is not grounded.

Stage 2: the tools used are a longer grounding rod, which is 50 cm, stranded copper cable, and copper mesh with a comfortable 200 density. From the experiment, it was found that the readable voltage was 145.5 millivolts (figure 5). After touching the earthing device, the voltage dropped to 8.8 millivolts (figure 6). The voltage of 8.8 millivolts is still accepted, and this grounding tool reduces the skin voltage to close to 0.00 millivolts.



Figure 5. Trial of assembling the Earthing device stage 2, where the skin voltage when not touching the Earthing device reads 145.5 millivolts.



Figure 6. Experiment assembling the Earthing device stage 2

Figure 6 showed where the skin voltage when it touches the Earthing device drops 145.5 millivolts to 8.8 millivolts instantly. By obtaining a voltage of 8.8 millivolts when touching the Earthing device, the research team decided to use the results of the second stage of the experiment by finishing to increase the safety and comfort of pregnant women.

Stage 3: The earthing device is improved with rubber lacquered which will increase the comfort of pregnant women (Figure 7,8), which is then tested again to see if the device continues to function (Figure 8). After getting a tool that performs optimally, then duplication of the tool is then carried out to be distributed to the respondents.



Figure 7. The tool is given a base of rubber lacquered



Figure 8. Top view of the tool, the cooper mesh



Figure 9. Final stage trial/finishing



Figure 10. The result of reading the skin voltage after Earthing is 3.9 millivolts which means the tool is functioning optimally.

Mechanism of Intervention:

The forms of intervention in the intervention group that was carried out after obtaining informed consent were (1) installation of a grounding device; (2) explaining the procedure for installing the grounding device: the mother sleeps or sits comfortably with her feet attached to the copper mesh without being restricted by cloth; (3) length of time of grounding for 1 hour/day for 30 days. Time of inspection and data collection to the group: (1) during the first visit; (2) data monitoring discomfort within 15 days and 30 days of using the device. To test the hypothesis, the researcher used the dependent t-test.

Results

Researchers were ready to take respondents to the hospital if there was a situation where there was at least one danger sign in pregnancy. The researcher also worked with an obstetrician to monitor the process. However, from previous research studies, no harmful side effects have occurred. From the research, it was found that this therapy is safe and natural

Table 1. Frequency distribution of respondents (Pregnant mother)

Characteristics	F	%
Mother's Age		
20-35 years	10	50
>35 years	10	50
Gestational age		
20-27 weeks	12	60
28-41 weeks	8	40
Level of education		
Senior High School	14	70
College	6	30
Parity		
Multigravida	13	65
Primigravida	7	35
	20	100

Table 1 shows the frequency distribution data for the characteristics of the respondents based on demographic data. The number of respondents aged 20-35 years (at low risk) is comparable to those aged > 35 years, namely ten respondents (50%) each. The majority of gestational age is between 20-27 weeks, namely 12 respondents (60%). Most of the respondents graduated from high school, namely as many as 14 respondents (70%). The highest number of parities is multipara, namely 13 respondents (65%).

Table 2. Frequency distribution of blood pressure before and after the Earthing system application

Variable	Measurement (mmHg)	Before Earthing		After Earthing	
		N	%	N	%
Blood pressure					
Sistole	110-139	0	0	14	70
	131-140	9	45	6	30
	141-150	11	55	0	0
Diastole	70-80	0	0	14	70
	81-90	11	55	6	30
	91-100	9	45	0	0
Total		20	100	20	100

Table 2 shows the blood pressure before and after the Earthing device application. Blood pressure is divided by systole and diastole to further analyze the effect on the systole and diastole. Table 2 indicated that before Earthing system, the majority of the pregnant mothers had systole 141-150 mmHg (11 or 55%), followed by 131-140 mmHg (9 or 45%). After Earthing, most had a normal blood pressure of 110-130 mmHg (14 or 70%) followed by 131-140 mmHg (6 or 30%), and no respondents had 141-150 mmHg. The exciting finding is that before Earthing, the highest frequency of systole was 141-150 mmHg (hypertension), then after Earthing, the majority had systole of 110-130 mmHg (normal). Before Earthing, most mothers had systole 81-90 mmHg (11 or 55%), and the rest had 91-100 mmHg (9 or 45%). After Earthing, most mothers had diastole 70-80 mmHg (normal), and the rest had 81-90 mmHg (6 or 30%).

Table 3. Statistical test of the systole and diastole before and after Earthing

Variable	Before Earthing	After Earthing	Sig. (2-tailed)	Paired sample t test (t-test)	t table at df 2
	Mean (mmHg)	Mean (mmHg)			
Sistole	142.8	128.45	0.000	25.065	2.093
Diastole	93.05	79.6	0.000	10.678	2.093

Table 3 shows the mean of systole was 142.8 mmHg decreased to 128.45 mmHg. The mean of diastole before Earthing was 93.05 mmHg decreased to 79.6 mmHg. Statistical analysis used a t-test on systole resulted in a t-count 25.065>t-table 2.093 with a P-value of 0.000 and for diastole resulted in a t-count of 93.05>t-table 2.093 with a P-value of 0.000, indicating a significant difference in the systole and diastole blood pressure before and after using Earthing device. The mean systole was reduced by 10.36%, and the mean diastole was decreased by 14.45% within 30 days of using Earthing device.

Discussion

The respondents' age was 20-35 years old and more than 35 years old was equal (10 respondents or 50% of each group). Aged 20-35 years are women at low risk of pregnancy compared to those above 35 years old. Mothers over 35 years old have a seven times higher risk compared to 20-35 years old (16,17). Advanced age more than 35 years old has undergone degenerative function in the reproductive system that results in the disruption of trophoblast invasion into the delicate layer of a blood vessel, the emergence of immunological reactions and free radicals. All that cause endothelial damage/injury, which will then cause an imbalance between vasoconstrictor levels (endothelin, thromboxane, angiotensin). Vasodilators such as nitricoxide and prostaxillin, as well as disorders of the coagulation of the blood. Would trigger the systemic vasospasm. The spasm of the vascular wall is the predictor of preeclampsia, followed by elevated blood pressure, urine protein and oedema (18).

However, another study in contrast with this finding in Indonesia stated that out of 324 pregnant women with high blood pressure, 211 women (65%) were aged 20-35 years old, whereas 113 women (35%) were aged <20 and >35 years old. Even though 20-35 years old is considered low risk, multiple pregnancies (multipara) contribute to preeclampsia (17). There are more factors contributing to preeclampsia among 20-35 years old mothers with pregnancy interval between 2-10 years, obesity with

IMT 25-29.9 (84 out of 216 respondents or 39%) and obesity which IMT 30 or more (102 out of 216 respondents or 48%) (19).

Among mothers with preeclampsia, most of the gestational age was 20-27 weeks (12 or 60%), and the others were 28-41 weeks (8 or 40%). These findings indicate that most pregnant mothers are diagnosed early in the second trimester. This early diagnosis allows mothers to get faster treatment and take earlier preventive measures to prevent complications and poor pregnancy outcomes for both mother and baby. The mother's education level is primarily high school graduates (14 or 70%), and the rest are university graduates (6 or 30%). This finding is in line with another study in Jakarta, Indonesia, where the majority of mothers were high school graduates (105 mothers out of 195 or 54%) (20). The same findings were found in studies of the risk of preeclampsia being higher in women with secondary or lower education by 1.7 times; another study found 5.1 times, and seven times (21-23). The middle level of education affects a person's ability to find information to care for himself and to keep his pregnancy healthy. The higher a person's education, the easier it will be to find and apply correct and adequate information for self-care and pregnancy.

Most mothers are multigravidas (13 or 65%) with a number of pregnancies 2-5, and primigravidas (7 or 35%). This result is in line with the findings of Anindya et al. (2022) in a study at the Madiun public hospital, Indonesia found that most mothers with preeclampsia were multigravidas (145 out of 216 or 67%) (21). Kinanti (2022), in the study of hypertension in pregnant women at a tertiary hospital in Surabaya, Indonesia, found that multigravidas experience more late-onset preeclampsia (85.4%) than primigravidas (35.6%) and early-onset preeclampsia occurs mainly in nulliparous women and primigravida (24).

According to the American College of Obstetricians and Gynecologists (ACOG), normal blood pressure in pregnancy is within systole 120 mmHg or below, and diastole is 80 mmHg or below. Cardiovascular physiology during pregnancy starts from the first trimester, with an increase in estrogen, progesterone and relaxin, which cause dilation of blood vessels (25-27). An increase in the renin-angiotensin-aldosterone system causes salt and fluid retention, which causes an increase in blood plasma volume (28). An increase in plasma volume must be responded to by a decrease in vascular resistance to maintain sufficient blood pressure to perfuse blood to the mother and fetus in the womb (29).

A study about gestational-age-specific reference range for blood pressure in pregnancy by Macdonald-Wallis et al. (2015) found that in normal pregnancy, the mean (95% reference range) systolic blood pressure and diastolic blood pressure for nulliparous women at 37 weeks was 116 mmHg (systolic), and 70 mmHg (diastolic). Characteristics of those pregnant women were less likely to be overweight/obese, less likely to be nulliparous and less likely to smoke throughout pregnancy than women who were considered to have an abnormal pregnancy due to either a medical condition (essential hypertension, preeclampsia, existing or gestational diabetes N1/4647) or an adverse perinatal outcome (preterm birth, small-for-gestational-age/SGA or large-for-gestational-age/LGA offspring; N=2404) [30]. Moreover, thirteen studies included a meta-analysis of the association between mental stress and gestational hypertension/preeclampsia. This study recruited 668,005 pregnant women. The results indicated that mental stress was associated with an increased risk of gestational hypertension (OR, 1.26; 95% confidence interval [CI], 1.00-1.59; P = 0.047) and preeclampsia (OR, 1.49; 95%CI, 1.27-1.74; P < 0.001). Meanwhile, stress-related work (OR, 1.50; 95% CI, 1.15-1.97; P = 0.003) and depression or anxiety (OR, 1.88; 95%CI, 1.08-3.25; P = 0.02) were positively associated with risk of hypertension in pregnancy (30).

To maintain normal blood pressure during pregnancy, controlling body mass index (BMI) within the normal range for pregnant mothers and avoiding smoking (active or passive) is crucial. Keeping BMI index normal throughout the pregnancy by keeping physical activity each day such as walking, swimming, regular pregnancy workout, eating a healthy balanced diet, keeping salt intake low, and limiting fat consumption, as well as exercising healthy coping mechanisms to manage stress, maintain normal BMI during pregnancy more likely to maintain normal blood pressure to prevent the adverse maternal and neonatal outcome.

Stratified reference ranges were higher among women with high pregnancy BMI categories (31). Another study investigating the factors associated with increased blood pressure and incident hypertension in early midlife found high BMI, weight gain, and serum lipids (32). The Copenhagen city study recently demonstrated a positive association between higher levels of non-fasting serum triglycerides and plasma C-reactive protein (CRP) levels, suggesting that elevated serum triglycerides are a marker for inflammation (33).

American College of Obstetrician and Gynecologist (ACOG) define hypertension in pregnancy as a systolic blood pressure of 140 mm Hg or higher and/or diastolic blood pressure of 90 mm Hg or higher. The pathophysiology of hypertension in pregnancy is due to reduced blood perfusion to the placenta, which induces vascular endothelial dysfunction. This is due to the ineffectiveness of the cytotrophoblastic invasion of the uterine spiral arteries (34). As a result, there is a decrease in placental oxygen levels and

inflammatory reactions, disturbances in the balance of angiogenic factors, and platelet aggregation, all of which cause vascular endothelial dysfunction manifested clinically as preeclampsia syndrome(34,35). Increased plasma and blood components lead to dysfunction of the vascular endothelium, making the endothelial wall thicken and harden(7).

Pregnancy-induced hypertension results in the adverse maternal and neonatal outcome a comparative study of two groups of pregnant mothers with gestational hypertension and normal pregnant women. Adverse fetal outcomes happened more likely among infants from hypertensive mothers. Outcomes related to GH were progression to preeclampsia/eclampsia, abruption placenta, and cesarean section indicated due to IUGR, IUD, fetal distress, absent diastolic flow, and bad obstetric history. Among mothers with gestational hypertension, 48% of cases had adverse outcomes and 36% related to the pathophysiology of gestational hypertension compared to mothers with normotension. Moreover, the adverse effect for neonatal was IUGR, IUD, fetal distress, and prematurity (36).

In addition, the neonatal outcomes of hypertension in pregnancy are preterm, low birth weight, and low head circumference measurement. Among newborns of hypertensive mothers, there was an increased risk small for gestational age (OR 2.4; CI 95% 1.6–3.6; $p < 0.00$), as well as a greater risk of being born with a weight less than 850 g (OR 2.4; 95% CI 1.2–3.5; $p < 0.00$). Newborns of hypertensive mothers also presented more necrotizing enterocolitis. On the other hand, premature newborns of normotensive mothers had more survival capacity against death (35).

Furthermore, chronic hypertension was associated with higher odds of preeclampsia (5.43 times), cesarean section (1,87 times), maternal mortality (4.80 times), preterm birth (2.23 times), stillbirth (2.32 times) and small for gestational age (1.96 times). However, a study that investigated the effect of treatment for hypertension in pregnancy indicated that maternal race/ethnicity does not influence the observed associations. Women with chronic hypertension on antihypertensive treatment (versus untreated) had higher odds of SGA (1,86 times)(37). This finding shows that medication treatment for gestational hypertension worsens the birth weight of the neonates to be low, leading to more complications and a lower chance of survival than the untreated.

The study of the electrical characteristics of blood by examining the zeta potential (i.e. a negatively charged electrical potential that causes particles to repel each other) found on the surface of the components of red blood cells has increased, thereby reducing the clumping of red blood cells (38). Magora et al. investigating the effect of using grounding mat during sleep on decreased blood viscosity (39). Brown & Chevalier (11) investigated how biological grounding or earthing during yoga exercise affected blood viscosity ($n=28$). Those who were grounded ($n=14$) had significant reduced diastolic blood viscosity ($p=0.031$) and systolic blood viscosity ($p=0.032$) post-exercise compared to those sham-grounded ($n=14$). Reduced blood clotting means a decrease in the thickness or viscosity of the blood. Poor zeta potential was found in patients with cardiovascular disease and diabetes (11). Furthermore, an experimental study of the application of Earthing in 10 hypertensive patients for 12 weeks showed a decrease in blood pressure varied from 8.6% to 22.7%, or an average of 14.3% (6).

Tali et al investigated the immediate effect on hypertensive patient of sitting for an hour barefeet and in direct contact with the ground ($n=28$). It showed significant decrease in diastolic blood pressure (DBP) ($p<0.0014$), systolic blood pressure (SBP) ($p<0.0001$) and mean blood pressure ($p,0.0001$) in those who were connected to earth (grounded). In the other group who were wearing footwear or ungrounded, no significant changes on blood pressure were observed (40,41). They concluded that remaining barefeet whenever possible is a simple, innovative, and cost-effective intervention to help reduce hypertension. In addition, the Earthing method also has a positive correlation with reducing the risk of hypertension, especially in balancing the functions of the unconscious nervous system, which regulates the function of organs in the body; reducing stress; balancing the body's hormones associated with endocrine hypertension, namely hyperaldosteronism, catecholamines, thyroid hormones, and glucocorticoids(9). Earthing can also be a lifestyle medicine, which means nonpharmacologic treatment integrated into daily activity.

Considering the adverse effect of the antihypertensive treatment among mothers with gestational hypertension, it is necessary to promote a safer and more effective solution that is attainable for pregnant mothers in the community. The function of Earthing therapy can increase the zeta potential of the solid components of blood to reduce blood viscosity, thereby increasing the elasticity of the endothelial walls of blood vessels. In addition, Earthing can improve the work of the vagal nerve, which regulates the profession of the vascular system to be expected and balanced. The benefits of Earthing in reducing high blood pressure are especially significant in reducing the risk of mortality and morbidity in pregnancy for the mother and fetus. However, there has never been any publication of Earthing clinical research on pregnant women at home or abroad. The novelty of this study was conducted on pregnant women with high blood pressure.

Conclusion

The statistical analysis results in a P-value of 0,000, t-count 25.065 > t-table 2.093 and for systole blood pressure and P-value 0.000, t-count 93.05 > t-table 2.093 for diastole blood pressure indicates that there is a significant difference on the systolic blood pressure and diastolic blood pressure of pregnant mothers before and after Earthing.

It is recommended for mothers to perform Earthing or grounding as a lifestyle medicine at home by putting bare feet on the soil minimum of 1 hour per day throughout the pregnancy or using Earthing device that connects the electron in the soil to the skin.

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