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Analysis of risk factors for gestational hypertension and preeclampsia: literature review

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ABSTRACT

Based on Disability Adjusted Life Years (DALYs), there are four main disease burdens, namely ischemic heart disease, cerebrovascular disease (including stroke and hypertension), diabetes and tuberculosis infectious disease. Gestational hypertension is very closely related to CVD (cardiovascular disease) with the potential for preeclampsia to have an impact on premature birth or small babies for the gestational age, stillbirths, low birth weight babies, etc. The research objective was to analyze the risk factors for gestational hypertension and preeclampsia. Methods: This study is a literature review based on the PRISMA guidelines. using electronic databases namely Google scholar, Sciencedirect and Pubmed with a period from 2017 to 2022 with the keywords "Hypertension, risk factors, high risk pregnancy". Results: The prevalence of hypertension and pre-eclampsia varies between countries. In Bangladesh, the prevalence of pre-eclampsia: 14.4%, without history of hypertension, 5.4% prevalence of pre-eclampsia with chronic hypertension, the same as Ethiopia. The incidence of gestational hypertension is 6%, in Ireland, gestational hypertension is 5.9% and 4.6% of pre-eclampsia. In France hypertension was 7.4% and pre-eclampsia was 2.0%, gestational hypertension was 4.2%, HELLP syndrome was 10.4%. Hypertension is associated with risk factors for pregnancy, lifestyle and sociodemographic factors. Conclusion: Prevention, timely diagnosis and prompt management of hypertension in pregnancy should be intensified so as to reduce morbidity and severity of adverse birth outcomes.

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INTRODUCTION

Based on Disability Adjusted Life Years (DALYs), there are four major disease burdens: ischemic heart disease, cerebrovascular disease (including stroke and hypertension), diabetes and tuberculosis infection. In pregnant women, about 10% of pregnancies experience hypertensive disorders in pregnancy, in the United States hypertension in pregnancy contributes greatly to the cause of maternal mortality. Hypertensive disorders in pregnancy are classified into 4 categories including gestational hypertension, pre eclampsia-eclampsia, chronic hypertension and super preeclampsia (Peart, 2017). In Indonesia, infectious and non-communicable diseases account for 23% of maternal deaths. Previous trends through 2019 show a decrease in the incidence of disease cases except HIV/AIDS and the largest increase in non-communicable diseases in pregnancy Ryan, Mahmood and Laurence, 2021).

Gestational hypertension is an increase in blood pressure during pregnancy without proteinuria, which is expected to return to normal by week 12 postpartum. Pre eclampsia is gestational hypertension with protrinuria or other systemic manifestations. Gestational hypertension has the potential to become pre eclampsia. Therefore resources to predict, diagnostic tools and clinical profile of this client must be considered in order to avoid falling into the condition of preeclampsia (Yemane et al., 2021). Gestational hypertension is closely related to CVD (cardiovascular disease) in either the first or second pregnancy but is significantly higher for the incidence of preeclampsia and has the potential for premature birth or small babies for the duration of the pregnancy.(Kristin et al., 2018). Hypertension significantly increases the risk of future chronic conditions such as kidney disease and cardiovascular disease including stroke and also increases multimorbidity (Dolgushina et al., 2021).

Maternal near misses during pregnancy were related to relevant severe maternal illnesses including postpartum hemorrhage, hypertension during pregnancy, diabetes, anemia, hepatopathy, nephroma and tissue disease with morbidity rates of 11.92%, 10.15%, 9.34%, 8.57%, 3.13%, 0.56% and 0.55%, respectively. Monitoring the main causes of near misses in pregnant women is important to reduce morbidity and mortality (Yang et al., 2018). Measuring vital signs is the first step in detecting the risk of hypertension, early screening systems can help in identifying clients at risk especially supported by technology that is automated in calculating the presence of abnormalities, this should be supported by trained staff, adequate access and accurate and reliable equipment in measuring vital signs to avoid delays in initiating treatment for hypertension in pregnancy.(Vousden, Nathan and Shennan, 2018). Home blood pressure monitoring has the potential to be more accurate and can help in maintaining stability but pregnant women are emphasized to access antenatal visits according to established recommendations. Pregnant women are taught how to measure and record blood pressure using a validated digital machine and this is assessed once or twice a week depending on clinical need (Perry et al., 2018),

Women with a history of hypertension in previous pregnancies have an increased risk of developing hypertension again in subsequent pregnancies (Babore et al., 2021). Some research results show that risk factors for hypertension in pregnancy include first pregnancy, twin pregnancy, obesity, pregestational diabetes mellitus, history of chronic hypertension and family history (Peart, 2017). Prevention, timely diagnosis and prompt management of hypertension in pregnancy can reduce adverse morbidity and severity (Shantanam and MUELLER, 2018). It is important to know the risk factors for hypertension in pregnancy so that it can be minimized. Therefore, this study aims to analyze the risk factors for gestational hypertension and pre-eclampsia.

RESEARCH METHOD

This research is a literature review based on PRISMA guidelines. The process carried out in the literature review is to search for several research journal articles published through online

databases, an integrated analysis process is carried out. Some of the electronic databases used in this study are Google scholar, Sciencedirect and Pubmed with a time span of 2017 to 2022 with the keywords "Hypertension, risk factors, high risk pregnancy". The study selection process is shown in the diagram. Data from the selected articles were extracted including: year, country of origin, population, and setting, study design, research objectives, methods, interventions and research results. This literature review used guidelines to analyze the quality of reporting among the selected studies. The guidelines used were Critical Appraisal Skill Program Tools (CASP) and Quality Assessment to assess the risk of bias of the selected studies.

Synthesized Findings

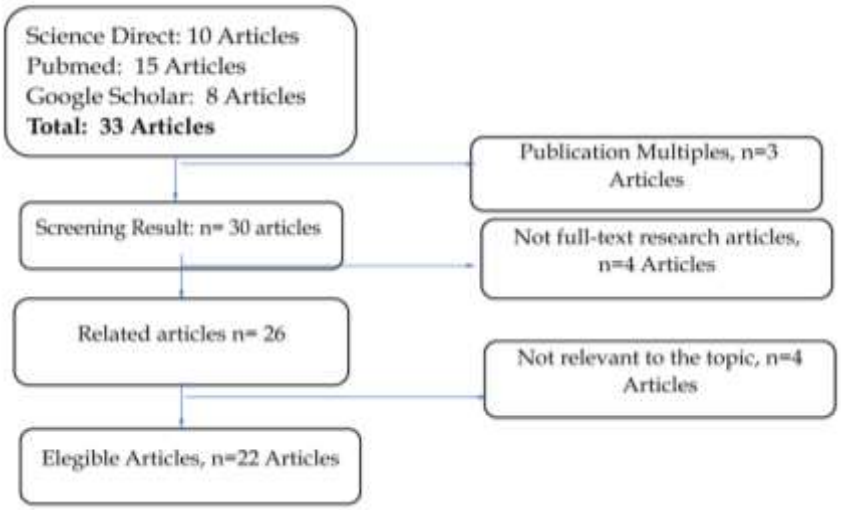

Figure 1. Prism Flow Diagram

RESULTS AND DISCUSSIONS

Research Results

Table 1. Research Result

No.	Researcher (Year), Country	Destination	Study	Methods	Results
1.	Ananya Dutta Mou et al (2021) Bangladesh (Mou *et al.*, 2021)	To estimate the prevalence of pre-eclampsia and identify risk factors for pre-eclampsia.	Anthropometric data, sociodemographic and lifestyle information using questionnaires, blood samples, serum lipid profile, liver enzymes, uric acid and creatinine using standardized methods.	Cross sectional, period Oct 2019 - Oct 2020 N=111	Pre-eclampsia prevalence: 14.4%, about 10% of pregnancies were found to have pre eclampsia (gestational age > 20 mg without history of hypertension). 5.4% prevalence of pre eclampsia with chronic hypertension, incomplete ANC (AOR 6.83) more likely to have pre eclampsia
2.	Shu-Han You (2018) Taiwan	To evaluate trends, incidence and risk factors of early and late pre-eclampsia	Includes all pregnancy outcomes ≥20 mg in live or stillborn bbls. Data were collected electronically (Taiwan birth registry and National Health Insurance Research). Jan	Retrospective population-based cohort study, N=2.994.347	Preeclampsia adjusted after increased 1.1% (2001), 1.3% (2012), 1.3% (2014). The trend of onset of preeclampsia increased from 0.7% (2001) to 0.9% (2014), old age, primipara, stroke, DM, chronic hypertension and hyperthyroidism are risk factors

			1, 2001 and Dec 31, 2014		for preeclampsia.
3	Fatima Ousamani et al (2018) Morocco and the Netherlands	To investigate the knowledge status of Hypertension in pregnancy among pregnant women in Morocco and the Netherlands.	Interviews based on topic list, recorded, transcribed, coded and analyzed	Qualitative, N= 19 (9 in the Netherlands and 10 in Morocco)	50% of respondents have never heard of, have no knowledge of hypertension in pregnancy
4.	Awol Yamane (2021) Ethiopia	To assess the incidence of gestational hypertension, progression to preeclampsia and other factors.	Baseline and follow-up clinical and laboratory data.	Prospective cohort study N=240 with hypertension in pregnancy	Incidence of gestational hypertension 6%, progression rate 17.1%. The significant predictors included history of gestational hypertension, anemia during pregnancy, spontaneous abortion TM 2.
5.	Tao Xiaong et al (2018) China	To assess the association between hypertensive disorders in pregnancy and stillbirths	Data from China's national maternal poverty surveillance system for 2012 to 2016	China National surveillance system method	Association between hypertensive disorders in pregnancy and stillbirth. Stillbirth rate of 21.9 per 1,000 births. aRR 6.66 for hypertensive disorders subtype, Pre eclampsia 4.15, for pre eclampsia: 2.32, chronic hypertension and 1.21 for gestational hypertension.
6.	Lisa Corrigan et al (2021) Ireland	To identify the number of pregnancies affected by hypertension and risk factors	Maternity hospital data for 2016 was extracted from the National Hospital Inpatient Request Data System.	Descriptive, Chi-square analysis and Pearson multivariable regression N=60.188	Pregnant women with HDK 5.9% (n=3531) and 4.6% (n=2790) had pre-eclampsia. History of DM, gestational DM and age > 40 years were significant for the incidence of hypertension in pregnancy.
7.	Xun Li et al (2018) China	To investigate adverse maternal and perinatal risk factors for preeclampsia.	Secondary data from medical records in 5 Chinese hospitals between January 2014 and December 2016.	Retrospective analysis, N=1396 mothers with preeclampsia	Significant risk factors include maternal age > 35 yrs, multiple births, assisted reproductive technology, rural, history of hypertension, male fetus, multigravida, polycystic ovary syndrome, hemolysis, elevated liver enzymes, low platelet count syndrome, interhepatic pregnancy cholestasis, cardiovascular disease, gestational Dm, systemic lupus erythematosus, thyroid disease and liver disease.
8.	Vallerie Olie et al (2021) France	To estimate the prevalence and associations in hypertension in pregnancy	Mothers followed during pregnancy and 6 weeks postpartum between 2010 and 2018	Prospective cohort study using French National Health insurance data	Hypertension complicating pregnancy 7.4%, pre-eclampsia 2.0% and gestational hypertension 4.2%. HELLP syndrome was 10.4% of preeclampsia cases.
9.	Kohei Ogawa et al (2022) Japan	To investigate whether LBW is significant for gestational hypertension and DM.	Secondary data from JPHC-NEXT, using a questionnaire	Population-based cohort study in Japan N=46.36	Pregnancy hypertension is significant for LBW (<1,500 g), AOR 1.60, BW 1,500-2,499 g with AOR 1.16 and BW > 2,500 g with AOR 1.13.
10.	Nisha I parikh et al 92017) Sweden	To determine the association between gestational	Medical record data with Vasterbotten intervention program data	Logistic linear regression, n= 15,896	Pregnancy factors include parity, age at first delivery, preeclampsia, gestational DM, placental abruption, small for

	hypertension and the risk of cardiovascular disease.		gestational age or stillbirth.

Discussion

This literature review covers several countries namely Bangladesh, Taiwan, Morocco Netherlands, Ethiopia, China, Ireland, Japan, France, Sweden. The prevalence of hypertension and pre-eclampsia varied between countries. Bangladesh showed the prevalence of pre eclampsia: 14.4%, without history of hypertension, 5.4% prevalence of pre eclampsia with chronic hypertension, similar to Ethiopia Incidence of gestational hypertension 6%, in Ireland gestational hypertension 5.9% and 4.6% pre eclampsia. In France hypertension 7.4% and pre eclampsia 2.0%, gestational hypertension 4.2%, HELLP syndrome 10.4%.

Risk Factors for Gestational Hypertension and Pre eclampsia

Hypertension is defined as systolic blood pressure ≥140 mmHg and diastolic ≥90 mmHg. Hypertension is associated with pregnancy, lifestyle and sociodemographic factors. The results of a study in Ireland showed that a history of diabetes mellitus, gestational diabetes and age > 40 years were significant with the incidence of hypertension in pregnancy.(Corrigan et al., 2021). This is in line with the results of research in Sweden that pregnancy factors include parity, age at first birth, preeclampsia, gestational diabetes mellitus, placental abruption, small gestational age or stillbirth (Parikh et al., 2017). Pregnant women with old age and chronic hypertension have a higher risk of early onset preeclampsia (You et al., 2018).

One in two pregnant women or about 50% of pregnant women do not have good knowledge of hypertension. Moroccan or Dutch women's knowledge of hypertension; signs and symptoms is limited (Ouasmani et al., 2018). Pre-eclampsia and gestational hypertension are more common in primiparous women (Genc et al., 2021).(Genc et al., 2021). This is supported by the results of research that significant risk factors include maternal age> 35 years, multiple births, assisted reproductive technology, living in rural areas, history of hypertension, male fetus, multigravida, having polycystic ovary syndrome, hemolysis, elevated liver enzymes, low platelet count syndrome, interhepatic pregnancy cholestasis, cardiovascular disease, gestational diabetes mellitus, systemic lupus erythematosus, thyroid disease and liver disease.(Li et al., 2018).

Age-adjusted incidence rate of hypertension in pregnancy 6.2 (95% CI: 6.1-6.4), nulliparous pregnancy with a history of hypertension IRR 2.9 (95% CI: 2.8-3.0)(Olié et al., 2021). History of DM (AOR 4.3; 95% CI: 3.2-5.7. p<0.001), gestational DM (AOR 3.5; 95% CI: 2.5-4.9; p<0.001) and age >40 years (AOR 1.5; 95% CI: 1.3-1.7, p<0.001) were significantly associated with the diagnosis of hypertension in pregnancy (Corrigan et al., 2021).

Impact of Hypertension Risk on birth

Based on the results of research in Ethiopia that gestational hypertension is associated with anemia during pregnancy, spontaneous abortion (Yemane et al., 2021). Studies in China show an association between hypertensive disorders in pregnancy and stillbirth. The stillbirth rate was 21.9 per 1,000 births. aRR 6.66 for hypertensive disorders subtype, Pre eclampsia 4.15, for pre eclampsia: 2.32, chronic hypertension and 1.21 for gestational hypertension(Xiong et al., 2018).

The results of research in Japan (2022) that pregnancy hypertension is significant for LBW (<1,500gr), AOR 1.60, BW 1,500-2,499 grams with AOR 1.16 and BW> 2,500 grams AOR 1.13. The positive association of hypertension with birth weight may be due to the mechanism of impaired endothelial function resulting in increased von Willebrand factor leading to increased blood, increased plasma insulin levels and decreased glucose tolerance through low nephrons leading to reduced renal function (Ogawa et al., 2022). To minimize the incidence of stillbirth, more attention

should be paid to chronic hypertension and pre-eclampsia in singleton and superimposed pregnancies. Better quality antenatal care and better guidelines (Xiong et al., 2018).

Management of Gestational Hypertension and pre eclampsia

Early detection provides an opportunity to manage follow-up and/or treatment, which can reduce complications of hypertension in pregnancy (Ouasmani et al., 2018). Based on multiple observational and interventional studies, adherence to the DASH (Dietary approaches to stop hypertension) diet during pregnancy improves hemodynamic adaptation, which can reduce the risk of gestational hypertensive disorders. DASH is a daily diet high in fruits, vegetables, whole grains. Nuts and lean dairy products and low in animal protein, sugar and sodium (Wiertsema et al., 2021)

Management for pregnant women at risk of hypertension includes the administration of Methyldopa and labeltalol is considered the main choice, in addition to angiostensis-converting enzyme (ACE) inhibitors and angiostensis receptor blockers (ARBs) need to be withdrawn / avoided if hypertensive women want to get pregnant, routine control to evaluate hypertension, education on the increased risk for eclampsia (Lu et al., 2018) Aspirin is universally recommended to reduce the risk of preeclampsia with recommended doses according to gestational age(Shantanam and MUELLER, 2018). Research in China revealed that a dose of aspirin 100 mg per day starting from 12 to 20 weeks of pregnancy continued until 34 weeks of pregnancy did not reduce the incidence of preeclampsia in high-risk pregnant women (Lin et al., 2022).

CONCLUSION

The prevalence of hypertension in pregnancy and pre-eclampsia varies between countries. In Bangladesh showed the prevalence of pre eclampsia: 14.4%, without history of hypertension, 5.4% prevalence of pre eclampsia with chronic hypertension, similar to Ethiopia Incidence of gestational hypertension 6%, in Ireland gestational hypertension 5.9% and 4.6% pre eclampsia. In France hypertension 7.4% and pre eclampsia 2.0%, gestational hypertension 4.2%, HELLP syndrome 10.4%. Hypertension is associated with pregnancy-related factors, lifestyle and also sociodemographic factors. Early detection of signs and symptoms of gestational hypertension, followed by daily monitoring of measurements at home is recommended to minimize the severity of adverse events. Administering methyldopa and improving the DASH (Dietary approaches to stop hypertension) diet during pregnancy is beneficial to support management interventions in pregnancy hypertension.

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