ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 04, pp.11283-11287, April, 2020

DOI: https://doi.org/10.24941/ijcr.37263.04.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

HYPERTENSION AND PREGNANCY IN AFRICA SOUTH OF THE SAHARA: REVIEW

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ARTICLE INFO

Article History:
Received 08th January, 2020
Received in revised form
24th February, 2020
Accepted 18th March, 2020
Published online 30th April, 2020

Key Words:
Hypertension,
Pregnancy,
Africa south of the Sahara

ABSTRACT

Background: Hypertensive disorders of pregnancy are public health problems. Women with Hypertensive disorders of pregnancy are five times more likely to have perinatal death compared with women who have no hypertensive disorders of pregnancy. **Objectives**: The aim of this review is to determine associated factors and describe maternal and fetal outcomes of hypertension disorders in pregnancy in africa south of the sahara. **Methods**: We did a comprehensive literature review using the databases Pub Med/Medline, and search engine google scholar. We selected sources of publications and conducted an analysis of articles in order to keep the most relevant ones concerning our problematic. The search consisted of a literature review of databases PubMed/ Medline and search engines Google scholar. Keywords in english were: hypertension, pregnancy, africa south of the sahara. Keywords in french were: hypertension artérielle, grossesse, afrique au sud du sahara. Mesh terms were: hypertension, pregnancy, africa south of the sahara. **Results**: Fifteen articles were selected. Prevalence of hypertensive disorders in pregnancy ranges from 1.2% to 18.25%. Several factors were associated with hypertension disorders in pregnancy. These factors included, age of women; parity, level of education, residence area, lifestyle. There are many maternal consequences including premature delivery, cesarean delivery, preeclampsia and eclampsia, postpartum hemorrhage, maternal death. Fetal outcomes are also dramatic, including preterm birth, stunting, low birth weight, poor APGAR, respiratory distress or perinatal death. **Conclusion**: This review shows that hypertensive disorders in pregnancy cause a high burden of morbidity mortality both in mothers as in their offspring.

Citation: ***MALIK Koussoh Simone, COULIBALY Madikiny, BAYO Syntyche, KOUMI Marie Dorothée.*** **2020.** "Hypertension and pregnancy in africa south of the sahara : review", *International Journal of Current Research*, 12, (4), 11283-11287.

INTRODUCTION

World wide, 10 % of all pregnancies are complicated by hypertension (Muti *et al*., 2015). Hypertensive disorders in pregnancy are a major cause of morbidity and mortality among women and their offspring (Fong *et al*., 2013; Khan *et al*., 2006) and the burden of these disorders is greatest in low and middle income countries (LMICs) (North *et al*., 2011; Park *et al*., 2014). In fact, hypertensive disorder of pregnancy is a global public health concern both in developed and developing countries. However, the risk that a woman in a developing country will die of the complications of hypertensive disorders of pregnancy is approximately 300 times higher than that for a woman in a developed country (Kahsay *et al*., 2018). In Africa, 9.1 % of maternal deaths are due to hypertensive disorders of pregnancy (ref 1 de article pumed 6).

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In Africa south of the sahara, hypertensive disorders of pregnancy, which are associated with about 16% of maternal mortality, are the leading cause of maternal death (after hemorrhage) (Fokom-Domgue and Noubiap, 2015). Hypertensive disorders of pregnancy are public health problems. Women with Hypertensive disorders of pregnancy are five times more likely to have perinatal death compared with women who have no hypertensive disorders of pregnancy (Ngoc *et al*., 2006) and pregnancy-associated hypertension remains an important cause of maternal and fetal morbidity and mortality (James and Nelson-Piercy, 2004). Hypertensive disorders of pregnancy can be classified into four categories: gestational hypertension, preeclampsia-eclampsia, chronic hypertension, and preeclampsia superimposed upon underlying hypertension (American College of Obstetricians and Gynecologists and Task Force on Hypertension in Pregnancy, 2013). Preeclampsia alone is estimated to account for about 40% to 60% of maternal deaths in developing countries (Lakew *et al*., 2013; Moodley, 2004).

The majority of women with controlled-chronic hypertension under appropriate management will have successful outcomes, however, pre-pregnancy hypertensive women with poorly-controlled blood pressure in the first trimester have significantly increased risk of target organ damage in both mothers and fetuses (Lu *et al*., 2018).

Objective: The aim of this review is to determine associated factors and describe maternal and fetal outcomes of hypertension disorders in pregnancy in africa south of the sahara.

METHODES

Literature review: We did a comprehensive literature review using the databases PubMed/Medline, and search engine google scholar. We selected the sources of the publications and conducted an analysis of the articles in order to keep the most relevant ones concerning our problematic.

Database and search engine: The search consisted of a literature review of the following databases and search engines:

PubMed / Medline (National Library of Medicine) Google scholar

Selection criteria: Selection was made on the basis of reading the titles, then the abstracts and finally by reading the body of the article.

Inclusion criteria*:* Inclusion criteria were constituted by:

- The types of articles (Original articles, book chapter)
- The language (English and French)
- Location (Africa south of the Sahara)
- The date of publication (the last ten years).

Non-inclusion criteria: Non-inclusion criteria included article types such as letters to editor, editorials, theses and reports

Mesh terms and keywords: For search in the database and the search engine, we used the following Mesh terms and keywords in English and French:

The keywords in english were: hypertension, pregnancy, africa south of the sahara. The keywords in french were: hypertension artérielle, grossesse, afrique au sud du sahara. The Mesh terms were: hypertension, pregnancy, africa south of the sahara

Research strategy: The various keywords and Mesh Terms have been combined using « AND » in english and « ET » in french. The equations that allowed us to do the google scholar search were Hypertension artérielle ET grossesse ET afrique au sud du sahara, those used for the PubMed search were hypertension AND pregnancy AND africa south of the Sahara.

Selection of articles : The selection of articles was done in three steps. The first step consisted in the analysis by reading the titles of the articles ; then, for the second step, we made an analysis by reading the summary of the articles. Finally, the third step allowed us to read the body of the articles and select those corresponding to the inclusion criteria.

RESULTS

A total of 786 articles were identified by combining keywords when searching the Medline/PubMed data base and the google scholar search engine. We selected 292 with the PubMed database and 494 with the google scholar search engine. After reading the titles, 62 articles were selected, 26 articles were identify after reading abstracts. Finally, 15 articles were selected for this review. Figure 1 describes the selection procedure and the reasons for excluding articles. These 15 articles come from 6 countries and several methodologies have been used. Table 1 shows some characteristics of the articles which are authors, study year, study design and studt country.

Topics covered : Several aspects have been addressed in the selected articles such as prevalence and factors associated with hypertension disordres in pregnancy, socio-demographic, clinical and biological characteristics of women with hypertension during pregnancy, maternal and fetal consequences of hypertension disorders in pregnancy. One study examine the knowledge of the nursing staff (midwife) and the management of women with hypertension during pregnancy another the association of HIV and hypertension in women during pregnancy and predictive factors of hypertension disorders in pregnancy.

Prevalence and riks factors : Prevalence of hypertensive disorders in pregnancy ranges from 1.2% to 18.25% (Berhe *et al*., 2018; Gudeta and Regassa, 2019; Seyom *et al*., 2015). Several factors were associated with hypertension disorders in pregnancy. These factors included, age of women ; the parity, the level of education, residence area, lifestyle. Women with hypertensive disorders in pregnancy were older than those without hypertensive disorders in pregnancy ; they have multiparity and low education level (Berhe *et al*., 2018; Gudeta and Regassa, 2019; Muti *et al*., 2015; Seyom *et al*., 2015) and they live in rural areas (Kahsay *et al*., 2018). Kahsay *et al*. (2018) noted also that, the pre-pregnancy BMI was higher in women with hypertensive disorders than in those with normal pregnancies (20.36 ± 3.0 Vs 19.8 ± 2.6) ($P = .05$). Vegetable and fruit use were found to be less frequent in hypertensive disorders of pregnancy as compared with the normotensive women (42.7% Vs 60.4 and 54.5% Vs 87.7%). Likewise, frequency and volume of coffee use was demonstrated to be higher among with hypertensive disorders in pregnancy when compared with thoses without disorders (P=. 01, P=. 03) (Kahsay *et al*., 2018).

Maternal and fetal outcome of hypertensive disorders in pregnancy: There are many maternal consequences including premature delivery, cesarean delivery, preeclampsia and eclampsia, postpartum hemorrhage, maternal death(Berhan and Endeshaw, 2015; Muti *et al*., 2015; Nakimuli *et al*., 2016; Seyom *et al*., 2015). Fetal outcomes are also dramatic, including preterm birth, stunting, low birth weight, poor APGAR, respiratory distress or perinatal death (Kahsay *et al*., 2018; Mulualem *et al*., 2019; Muti *et al*., 2015; Seyom *et al*., 2015). A study investigate the association between HIV status, ART, and development of pregnancy-associated hypertension (Stoner *et al*., 2016). According to this study, women receiving ART had significantly increased odds of PAH when compared with HIV-negative women. One study assess the role of the biomarkers placenta growth factor (Antwi *et al*., 2018). It's aim was to assess whether the addition of the biomarkers, placental growth factor (PIGF) and

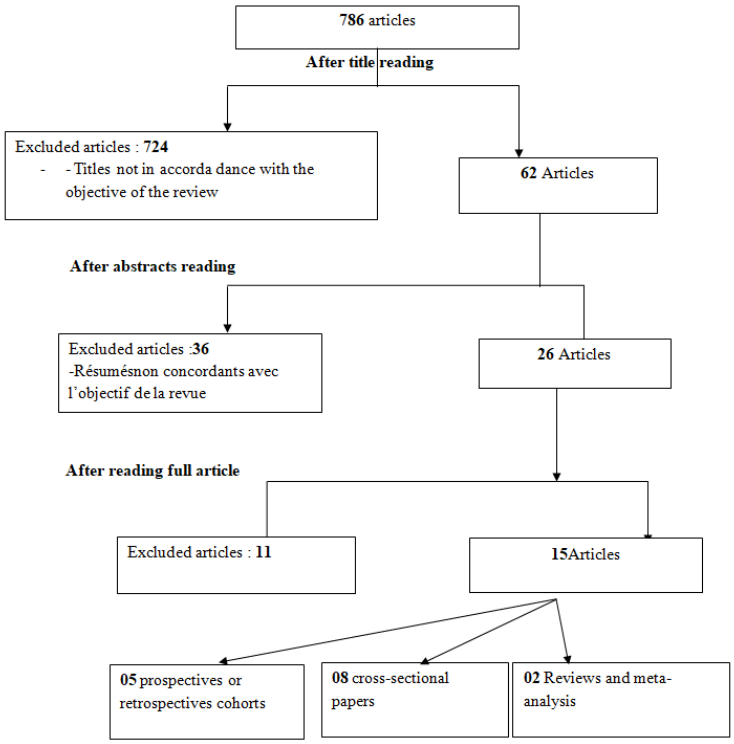

Figure 1. study selection process

Authors	Study year	Study design	Country
(Muti *et al*., 2015)	September 2012	Cross-sectional	Zimbabwe
(Seyom *et al*., 2015)	January 1, 2010 to December 1st 2013	Retrospective cohort	Ethiopia
(Stoner *et al*., 2016)	February 1st 2006 to December 31 2012	Retrospective cohort	Zambia
(Nakimuli *et al*., 2016)	March 1, 2013 to February 28, 2014	Prospective cohort	Uganda.
(Berhe *et al*., 2018)		Systematic review and meta analyse	Ethiopia
(Antwi *et al*., 2018)	July 2012 to March 2014	Prospective cohort	Ghana
(Ephraim *et al*., 2014)	December 2013 to May, 2014.	Cross-secttional	Ghana
(Mulualem *et al*., 2019)		Systematic review and meta analyse	Ethiopia
(Stellenberg and Ngwekazi, 2016)		Cross-sectional	South Africa
(Adu-Bonsaffoh *et al*., 2017)	January 1, 2013 to February 28, 2013	Cross-sectional	Ghana
(Van Middendorp *et al*., 2013)	July to September 2008 in rural March to May 2010 in urban Ghana.	Cross-sectional	Ghana
(Salomon *et al*., 2019)	June to August 2015.	Cross-sectional	Nigeria
(Kahsay *et al*., 2018)	June 2017 to November 2017.	Cross-sectional	Ethiopia
(Gudeta and Regassa, 2019)	October 01, to November 30, 2016.	Cross - sectional	Ethiopia
(Berhan and Endeshaw, 2015)	2008 to 2013	Retrospective cohort	Ehtiopia

pregnancy-associated protein A (PAPP-A) to a previously developed prediction mode based on maternal clinical characteristics (diastolic blood pressure, family history of hypertension in parents, history of gestational hypertension in a previous pregnancy, parity, height and weight) improved prediction of gestational hypertension. This investigation noted that The addition of PlGF and PAPP-A together to the model markedly improved its predictive ability, with an increase in AUC from 0.75 to 0.82 for multiparous women and 0.89 to 0.95 for primigravid women, whereas adding either one of the two had only marginal effect. Ephraim (2014) assessed the levels of serum Ca^{2+} and Mg^{2+} in women presentingpre-eclampsia and pregnancy-induced hypertension, compared to that in normal pregnancy and factors that may contribute to an increased risk of pre-eclampsia and pregnancy-induced hypertension. There was a significantly lower mean serum Ca^{2+} and Mg^{2+} levels amongst pregnant women with hypertensive disorders than in the corresponding control group ($p < 0.0001$). This survey observed that there was no significant difference in the mean serum Ca^{2+} ($p = 0.538$) and Mg^{2+} ($p = 0.211$) levels between women with pregnancy-induced hypertension and those with pre-eclampsia (Ephraim *et al*., 2014). One study (Stellenberg and Ngwekazi, 2016) determine the knowledge about hypertensive disorders during pregnancy of registered midwives working in midwifery obstetrical units. This research has shown the number of participants who correctly answered questions related to specific aspects of hypertensive disorders in pregnancy. The results noted that many participants were not able to define hypertension (33.7%), gestational hypertension (43.6%) or chronic hypertension during pregnancy (29.7%). Furthermore, 27.7% had no understanding about pre-eclampsia, 43.6% did not associate obesity as a risk factor with the development of pre-eclampsia and 36.6% had no knowledge about the effects of pre-eclampsia on the mother. Two papers were systematics review and meta-analysis (Berhe *et al*., 2018; Mulualem *et al*., 2019). Berhe (2018) estimate the national pooled prevalence of hypertensive disorders of pregnancy in Ethiopia and regions and Mulualem (2019) determine the effect of pregnancy-induced hypertension and multiple pregnancies on preterm birth.

According to these studies, preterm birth was higheramong mothers who had pregnancy induced hypertension compared to mothers with no pregnancy-induced hypertension.

DISCUSSION

This review noted that hypertensive disorders in pregnancy in Africa remain a public health problem. The prevalence of these hyperpertensive disorders is variable but is higher than in developed countries. In this review the prevalence varies from 1.2 to 18.25% while in developed or emerging countries it varies from 1.5% in Sweden to 7.5% in Brazil (Gaio *et al*., 2001; Yücesoy *et al*., 2005). This review showed that several factors were associated with hypertension disorders in pregnancy. These factors included, age of women ; the parity, the level of education, residence area, lifestyle and diet. This result is consistent with several studies (Conde-Agudelo and Belizán, 2000; Guerrier *et al*., 2013; Robinson *et al*., 2005). Individual factors such as obesity, multiple foetuses or mother's ages were associated with high prevalence of hypertension disorders in pregnancy and obesity increases the odds of developing hypertension disorders in pregnancy by 10 times (Bener and Saleh, 2013). Concerning lifestyle and diet, mothers who consume less fruits in their diets were at higher risk of developing hypertensive disorders of pregnancy (Brantsæter *et al*., 2009; Guerrier *et al*., 2013; Mulualem *et al*., 2014). Fruits are rich in micronutrients and many of the vitamins and minerals play antioxidant role which could in turn help in the prevention of hypertensive disorders of pregnancy. This review also found that there was a significantly lower mean serum Ca^{2+} and Mg^{2+} levels amongst pregnant women with hypertensive disorders than in the corresponding. This was also supported by a systematic review and meta-analysis of studies whereby calcium intake was found to be protective to hypertensive disorders of pregnancy in a multivariable analysis (Schoenaker *et al*., 2014). This review noted a high burden of the marternal and fetal outcomes regarding hypertensive disorders in pregnancy.Several studies have reported a high burden in hypertensive disorders in pregnancy (Ali *et al*., 2011; David *et al*., 2014; Fatemeh *et al*., 2010). Hypertensive disorders are among the commonest causes of severe morbidity and mortality in women, but are also associated with significant perinatal morbidity and mortality especially in the developing world. This calls for increased investments to increase research into how to address this burden in particular and on how to improve the quality of obstetric care. There are other major challenges in the management of hypertension disorders in pregnancy in developing countrie including poor laboratory support, delay in receiving care in health facilities, lack of adequately resourced neonatal intensive care unit and poor referral system such as transportation. The biggest indisputable underlying factor associated with the above management related issues is extreme poverty characteristic of most developing countries (Sahn and Stifel, 2000).

Limitations: The search strategy was limited to articles published in english or french, the database was limited to PubMed/Medline and the search engin to google scholar. This can be a source of bias

Conclusion

This review shows that hypertensive disorders in pregnancy cause a high burden of morbidity mortality both in mothers as in their off spring. This calls for interventions to reduce the burden and improve quality of care in hypertensive disorders of pregnancy.

Key points

- Prevalence of hypertension disorders in pregnancy varies from 1.2 to 18.25%
- Several factors were associated with hypertension disorders in pregnancy.
- There are many maternal and perinatal outcome in pregnancies complicated with hypertensive disorder of pregnancy

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