

Risk factors of preeclampsia in Nigeria and Poland

Damilola Ola, Joanna Suliburska

Department of Human Nutrition and Dietetics, Faculty of Food Science and Nutrition, Poznan University of Life Sciences, Poznan, Poland

Abstract

Preeclampsia is a risk of maternal and fetal morbidity and mortality in the world. This article investigates the risk factors associated with the development of preeclampsia in Nigeria and Poland. In Nigeria, the frequency of preeclampsia is 2–16.7%, and there are over 37,000 preeclampsia-related deaths each year. Preeclampsia affects 2–5% of pregnant women in Poland, and in this European country, the mortality is rather low. The significance of metabolic syndrome, genetic factors, maternal age, available resources, self-medication, polyhydramnios, and infections that contribute to the development of preeclampsia through the most recent research was identified and investigated. Sociodemographic and sociocultural traits and access to healthcare also affect the likelihood of having preeclampsia. This review article provides valuable insights to academics and healthcare practitioners highlighting the preeclamptic risk factors in two countries in different regions of the world – one African and one European.

Key words: pregnancy, preeclampsia.

Corresponding author: Joanna Suliburska, Department of Human Nutrition and Dietetics, Faculty of Food Science and Nutrition, Poznan University of Life Sciences, 31 Wojska Polskiego St, 60-624 Poznan, Poland, e-mail: joanna.suliburska@up.poznan.pl

Introduction

Preeclampsia is one of the most important complications in pregnancy and is a threat to the health and life of women and fetuses. According to conservative estimates, these illnesses cause 76,000 maternal and 500,000 newborn deaths annually [1, 2]. Preeclampsia occurs seven times more frequently in developing nations than in industrialized countries, according to estimates from the World Health Organization [3, 4]. Preeclampsia occurs 3–5% of the time in most industrialized nations and 2–10% of the time globally [5]. It was discovered as a serious health concern because it contributes to both maternal and fetal morbidity and mortality globally. The occurrence of preeclampsia is associated with a high risk for the course of preg-

nancy. It is estimated that 10% of pregnant women in the world die of preeclampsia [6].

Preeclampsia is related to placental dysfunction and disturbed vascular growth [7]. Several studies have suggested that dysfunction of placental mitochondria can play a crucial role in disrupting placental growth and function [8, 9]. Furthermore, inadequate adaptation of maternal arteries supplying the placenta, leading to insufficient placental perfusion, is often the underlying cause of preeclampsia [10]. Several studies have indicated correlations between placental location, blood supply, and pregnancy outcomes [11–14]. There is evidence that placenta dysfunction may be recognized as a critical factor in the development of preeclampsia [15].

Preeclampsia is common in Nigeria, where 37,000 women are affected annually [16]. In Southern Nigeria,

the prevalence rate of preeclampsia ranges from 5.6% to 7.6% of pregnancies [17]. The findings from a recent multicenter study conducted in Nigeria highlight the substantial impact of preeclampsia on maternal morbidity and mortality. Efforts to reduce the mortality of pregnant women in Nigeria focus on building the capacity to recognize early symptoms of preeclampsia and addressing the appropriate treatment of this disease during pregnancy [18, 19].

High maternal and perinatal mortality from preeclampsia is caused by delays in diagnosis and lack of access to adequate therapy [20]. It is highlighted that in most African countries including Nigeria, appropriate prevention should be used to reduce the risk of preeclampsia [4]. The prevention of preeclampsia could be accomplished by losing weight and regular exercise and reducing stress in nonpregnant patients. During pregnancy, nutritional and pharmacological factors such as calcium, magnesium, and antioxidant intake, reducing salt intake, and low-dose aspirin before 16 weeks in high-risk groups, play a great role in the prevention of preeclampsia. Moreover, effective treatment of chronic hypertension and reducing stressful situations during pregnancy are important to decrease the risk of preeclampsia development [21].

Screening and better monitoring of women with high-risk factors may help in the prevention, early diagnosis, and treatment of preeclampsia.

This narrative review aims to determine the risk factors associated with the occurrence of preeclampsia in pregnant women in Nigeria and Poland. Identifying these factors may help to minimize the risk of complications during pregnancy (Figure 1).

Methods

To find the literature regarding risk factors of preeclampsia, PubMed, Scopus, Web of Science, and Medline were searched with the search terms: “preeclampsia” AND “Nigeria” AND “Poland” AND “factors” AND “risk” with approximately 80 results (excluding duplicates). The full-text screening of the manuscripts and available original and review papers were included. Only English and Polish-language articles were selected.

The main risk factors of preeclampsia in Nigeria and Poland

Socio-economic and socio-cultural factors

Preeclampsia risk has been connected to socioeconomic status, which is frequently linked to educational level. Educational status is often associated with socioeconomic factors, such as income level and occupation. Women’s access to healthcare, nutritional status, the living environment, and overall health condition can all be affected by socioeconomic status.

It is known that patient education and counseling could avoid 50% of pregnancy-related hypertension (PRH) problems [22, 23]. In Nigeria, the efforts to reduce maternal mortality focus on building the capacity to recognize the early symptoms of preeclampsia and introduce the proper treatment during pregnancy. Location, obstetric condition, and sociocultural traits all affect pregnant women’s health-seeking behaviors, according to a study done in Ogun State, Southwest Nigeria [24].

Lower education and lower financial status were identified as significant predictors of preeclampsia (PE) and gestational hypertension (GH) in Nigeria [25]. Lower socioeconomic indicators may contribute to an unhealthy lifestyle, including an unhealthy diet, pre-pregnancy obesity, smoking, and inadequate prenatal care. Moreover, lifestyle has an impact on health during pregnancy. It was found that physical activity significantly reduced (over three times) the risk of hypertension and its complications in pregnant women [26]. Also, some families in Nigeria sometimes disregard the value of prenatal care (ANC) and the seriousness of the warning symptoms associated with pregnancy because they do not perceive pregnancy as a condition requiring special care, and the majority are unaware of the symptoms of preeclampsia [24].

Metabolic syndrome

Metabolic syndrome in Poland

A connection was found between metabolic syndrome and placental malfunction, which is typically expressed during pregnancy as a hypertensive disease. A significant group of women was studied in Poland, and it was found that those who had any form of metabolic syndrome before becoming pregnant were more likely to experience a placental malfunction [27–29]. In a study conducted in Poland between 2011

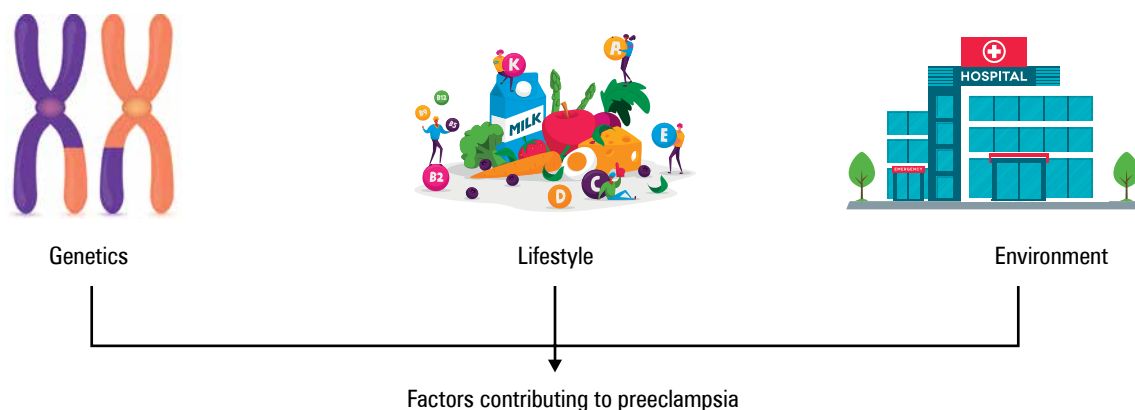


Figure 1. Factors contributing to preeclampsia

and 2012 including women of childbearing age, it was found that excessive body mass and accompanying metabolic abnormalities were quite prevalent and these disorders tended to rise with age [28].

Obesity has been recognized as a significant risk factor for pregnancy-induced hypertension and it is associated with several diseases, including diabetes, cardiovascular diseases, and skeletal diseases [30]. It was found that polycystic ovary syndrome and insulin resistance increase the risk of PE in obese women [30].

Maternal obesity is associated with insulin resistance, inflammation status (including placental inflammation), and compromised placental blood flow [31–33]. The inflammatory status and oxidative stress related to obesity are thought to amplify the underlying mechanisms involved in the pathogenesis of preeclampsia [34].

Pre-pregnancy obesity/overweight has been found to be of importance in predicting gestational hypertension (GH) and PE, as supported by several studies [34–37].

Proper nutrition during pregnancy is also essential to provide the necessary nutrients and adequate energy. In Poland, nutrition standards align with recommendations from the World Health Organization (WHO), the Institute of Medicine, and the European Food Safety Authority (EFSA) [38]. Polish guidelines recommend four to five meals a day, with increased energy consumption in the second and third trimesters by 360 and 475 kcal/day, respectively.

Metabolic syndrome in Nigeria

Hypertensive disorder in pregnancy (HDP) is one of the most prevalent pregnancy health problems in Nigeria [39]. It affects approximately 5–10% of pregnancies in Nigeria and accounts for the majority of antenatal admissions [40–43]. To prevent the condition and its complications, it is necessary to focus on early preventive activities and provide intensive supervision for pregnant women [41].

The majority of maternal fatalities are caused by obstetric crises, such as hemorrhage, sepsis, obstructed labor, and hypertensive disorders, with eclampsia being the most common cause of maternal and perinatal mortality documented in Nigeria [44]. Higher body mass index (BMI) values are associated with increased activation of the sympathetic nervous system, which leads to lipolysis and the release of free fatty acids into the circulation [45]. Obesity increases the risk of preeclampsia and other obstetric complications such as gestational diabetes and hypertension [46–48]. In Nigeria, the prevalence of obesity and metabolic syndrome among women of childbearing age is increasing, which further exacerbates the risk of hypertensive disorders in pregnancy [47–49]. Several studies in Nigeria have shown that pregnant women with metabolic disorders, obesity and low physical activity are at high risk of HDP development [50–53]. Moreover, it was found that obesity increases the risk of preeclampsia development during pregnancy 3–4 times [54].

Genetic factors/preexisting preeclampsia

According to the study by Musa *et al.* [41], preexisting preeclampsia is known to be a main risk factor for the de-

velopment of preeclampsia in Nigeria. It was also discovered that preeclampsia was considerably more likely to occur throughout the gestational follow-up period among women with a prior history of preeclampsia and a BMI of > 25 kg/m² measured at 20 weeks of pregnancy. Preeclampsia risk is higher in pregnant women with chronic hypertension, and women who develop preeclampsia and cardiovascular disease. These findings were supported among Polish women. The fundamental pathophysiology of placental perfusion, which is important in the development of early-onset PE, may be influenced by maternal genetics [55].

The influence of genetic factors on placental abnormalities and preeclampsia can be attributed to various mechanisms [56]. Maternal genetics may impact the regulation of genes involved in placental development, vascular function, and immune response, all of which play a role in the pathogenesis of preeclampsia. Specific genetic variants, gene-gene interactions, and genetic pathways are being explored to gain a deeper understanding of the underlying genetic factors contributing to placental abnormalities [57]. Studies conducted in both Poland and Nigeria emphasize the relevance of genetic factors in the development of placental abnormalities associated with preeclampsia. Continued research in this field will provide valuable insights into the relationship between genetics and preeclampsia, leading to advances in risk prediction, early detection, and personalized prevention and treatment that can ultimately improve maternal and fetal outcomes.

Other factors linked with preeclampsia in Nigeria and Poland

Comparative risks and predictors of preeclamptic pregnancy in Nigeria and Poland was presented in Figure 2 [58–61].

Specific factors linked with preeclampsia in Nigeria

Pregnancy nulliparous women

Nulliparity refers to women who are experiencing their first pregnancy and have not previously given birth. Nulliparity has long been considered a risk factor of preeclampsia

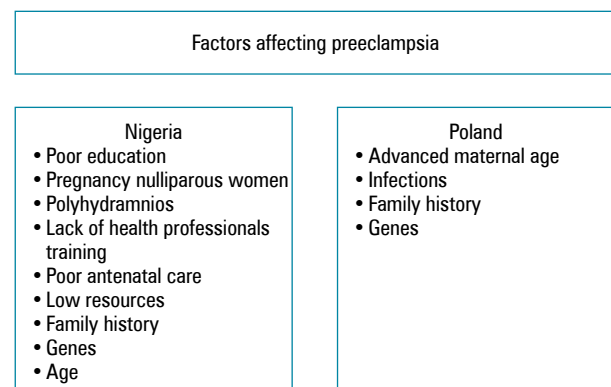


Figure 2. Comparative risks and predictors of preeclamptic pregnancy in Nigeria and Poland [58–61]

[62]. In several studies conducted among pregnant women preeclampsia was diagnosed more often in nulliparous women than in women with subsequent pregnancies [63].

In Nigeria, preeclampsia is more frequently diagnosed in nulliparous women compared to those who have had previous pregnancies [64]. However, it is important to note that the prevalence of nulliparity and its impact on preeclampsia can vary across different regions and communities within Nigeria. Factors such as cultural practices, socio-economic status, access to healthcare, and education levels can influence the prevalence of nulliparity and its association with preeclampsia among pregnant Nigerian women [1].

Several hypotheses have been proposed to explain the association between nulliparity and preeclampsia. It is suggested that the maternal immune response and adaptations to pregnancy may differ in nulliparous women compared to multiparous women [65]. Nulliparous women may have different health-seeking behaviors, nutritional patterns, or levels of physical activity compared to multiparous women [66]. Further investigation is needed to explain these mechanisms.

Polyhydramnios

Polyhydramnios is an excessive accumulation of amniotic fluid [67]. In Nigeria, there is an association between polyhydramnios and the development of preeclampsia (PE) [68]. It is suggested that the extra amniotic fluid puts more pressure on the uterine blood arteries, which reduces blood flow to the placenta. As a result, the fetus may receive less oxygen and nutrients, which may increase the risk of fetal disorders and raise the risk of preeclampsia [69].

It has been revealed that, as the uterus expands during pregnancy, adjacent organs such as the lungs, stomach, rectum, and bladder may exert additional pressure on the uterus and placenta. This added pressure often is associated with polyhydramnios. Notably, several studies have demonstrated that polyhydramnios serves as a predictive factor for the development of preeclampsia [6].

Lack of professional training

Inadequate knowledge and skills of medical staff may be related to the risk of preeclampsia in Nigeria. Due to health professionals' training and the creation of preeclampsia care protocols, the prevalence and case fatality rates may have decreased and preeclamptic patients may have better medical care in Nigeria [70]. Early detection and timely treatment may inhibit the severity and progression of eclampsia and its associated consequences [4]. Clinicians need to know and detect the common preeclampsia risk factors. Full knowledge and responsibility allow for the creation of a risk assessment protocol for quick and easy identification of pregnant women who are at high risk [71].

Poor antenatal care (ANC)

Preeclampsia is responsible for 40% of maternal mortality in Northern Nigeria, where there is a strong link between the low healthcare level and the inappropriate referral system. Many pregnant women in Nigeria first seek care at primary healthcare centers (PHCs), especially most rural

residents; however, readiness for primary care is often substandard compared to hospital counterparts [72]. According to current WHO recommendations, pregnant women should make at least 8 ANC visits to obtain a healthy pregnancy [73]. A study conducted by the National Population Commission (NPC) revealed that only 57% of pregnant women in Nigeria receive at least four ANC visits from trained clinicians [74]. While efforts are being made to improve access to ANC services, it is equally crucial to ensure that the services received are of good quality.

Quality of care (QOC) depends on three components: structure (adequacy of the physical environment and systems), process (components of care delivered), and outcomes (satisfaction/status of clients) [75, 76]. Early detection during antenatal care with improved access to hospital care and medical staff may easily identify and treat severe preeclampsia cases, leading to better overall maternal health. This approach reduces the risk of maternal morbidity and mortality associated with preeclampsia, enhancing the well-being of pregnant women and promoting positive pregnancy outcomes [77–91].

Self-medication

Pregnancy-related hypertension and self-medication, including the use of herbal remedies, were found to be correlated with preeclampsia [92]. Pregnant women use herbal remedies for several reasons, including perceiving them as more effective and safer, with better accessibility, lower cost, and traditions of their use [93]. However, the majority of herbal products have adverse effects and teratogenic potential.

Scientists suggested that using herbal treatments during pregnancy might cause an imbalance in the synthesis of prostaglandins, which might lead to preeclampsia development. In Nigeria, access to traditional medicine is easier than access to drugs, and this method of treatment is also common among pregnant women [92]. Using traditional medicine instead of adequate healthcare services may be a risk factor for disorders in maternal and fetus health [24, 93].

Low resources

There are regional variations in PE prevalence and fatality. Compared to women in high-resource nations, women in low-resource countries have a higher risk of having preeclampsia [29]. Nigeria has a high infant mortality rate (512 per 100,000 live births), a high fertility rate (5.3 children per woman), and a high maternal mortality ratio (512 per 100,000 live births) compared to other low-income sub-Saharan African countries (67 deaths per 1000 live births) [74]. Also, preeclampsia and eclampsia appear to be correlated with low socio-educational levels, as determined by patient occupation and school attendance.

Age

Teenagers (aged under 19) were shown to have a greater risk of developing eclampsia [66]. Advanced maternal age (AMA), defined as a mother who is 35 years or above at the time of delivery, is also considered a significant risk factor associated with adverse pregnancy in Nigeria. A retrospec-

tive study carried out on pregnant women with preeclampsia outcomes at a hospital in north-central Nigeria revealed that there was a significant relationship between eclampsia and advanced maternal age [77].

Other risk factors of preeclampsia in Poland

Advanced maternal age

Since the early 1990s, women in Poland have been less likely to become pregnant, and fewer children are born [79]. People under 18 years of age made up over 21% of the entire population in 2001 [69], but in 2021 this percentage was only about 18%. Risk factors for PE among Polish women include age (> 35 years), race (African-American), (family) history of PE, multiple gestations, intrauterine growth restriction, obesity, chronic hypertension, pharmacological interventions for induction of ovulation, pregestational diabetes mellitus type I or II, gestational diabetes mellitus, systemic lupus, and the antiphospholipid syndrome [80].

While the birth rate in young women (under 20) is declining, fertility rates among women over 30 are increasing. Women in most European countries including Poland give birth to their first child usually after the age of 30 [81]. Despite government efforts to increase the number of births, the fertility rate in Poland has been steadily declining in recent years [82]. Oxidative stress, inflammation, and altered angiogenic factors are suggested to play crucial roles in the association between advanced maternal age and PE [82–85].

Periodontitis

According to Polish epidemiological reports, periodontitis is diagnosed in 11–12% of all pregnant women [61, 87]. It is an infection-driven inflammatory disease in tooth-supporting tissues (i.e., the periodontium). The most recent epidemiological study demonstrated that it occurs in approximately 30% of the Polish population between the ages of 34 and 45 [88].

Periodontitis is characterized by chronic inflammation and infection in the periodontium. The association between periodontitis and an increased risk of developing preeclampsia during pregnancy has been investigated. Cohort trials indicated that periodontitis may result in an increased risk of developing PE in pregnancy (5-fold). This relationship has also been confirmed by three meta-analyses carried out in this field [89]. The potential mechanism is the inflammatory response triggered by periodontal infection.

Inflammatory mediators released in response to periodontitis can affect the endothelial cells lining the blood vessels, leading to endothelial dysfunction and impaired vasodilation, which are characteristic features of preeclampsia [90]. Significant similarities have also been observed between microorganisms in the oral cavity and those present in the placenta, suggesting a potential relationship between oral bacteria and placental dysfunction [91].

Conclusions

There are certain similarities and disparities in the risk factors for preeclampsia in Nigeria and Poland. Sociodemo-

graphic factors, socio-cultural factors, genes, and metabolic syndrome, including hypertension, are major risk factors for preeclampsia in both countries. Other risk factors that showed differences between the two countries are poor antenatal care, polyhydramnios, and self-medication specific for Nigeria, but the incidence of infectious disorders (periodontitis), and advanced age are characteristic for Poland. To reduce the risk of complications during pregnancy, pregnant women should maintain a healthy lifestyle, treat any existing disorders, and receive regular prenatal care.

Conflict of interest

The authors declare no conflict of interest.

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