BRAZILIAN JOURNAL OF IMPLANTOLOGY AND HEALTH SCIENCES

ISSN 2674-8169

Eclampsia: perspective on the possible repercussions on the child's health

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REVISÃO DE LITERATURA

RESUMO

A eclâmpsia é uma complicação grave da pré-eclâmpsia, que se caracteriza por hipertensão arterial, proteinúria e edema na gestação. A eclâmpsia pode causar convulsões, coma e morte materna e fetal, sendo uma das principais causas de morbimortalidade perinatal no mundo. Além disso, a eclâmpsia pode ter repercussões na saúde da criança, como prematuridade, baixo peso ao nascer, asfixia perinatal, hemorragia intracraniana, paralisia cerebral, atraso no desenvolvimento neuropsicomotor e maior risco de doenças cardiovasculares e renais na vida adulta. Apesar da importância do tema, há poucos estudos que abordem as consequências da eclâmpsia na saúde infantil de forma abrangente e atualizada. Objetivo: foi identificar e analisar os artigos científicos que investigaram os efeitos da eclâmpsia na saúde da criança, desde o nascimento até a idade escolar, considerando os aspectos clínicos, neurológicos, cognitivos, comportamentais e sociais. Metodologia: Foi realizada uma busca nas bases de dados PubMed, Scielo e Web of Science, utilizando os seguintes descritores: eclampsia, child health, child development, child outcome e child morbidity. Foram incluídos artigos publicados nos últimos 10 anos, em português, inglês ou espanhol, que avaliaram crianças nascidas de mães com eclâmpsia, comparadas ou não com crianças nascidas de mães sem eclâmpsia ou com pré-eclâmpsia. Foram excluídos artigos que não abordaram os desfechos de interesse, que tinham amostras insuficientes, que apresentavam viés de seleção ou confusão, que eram revisões, relatos de caso ou cartas ao editor. A seleção dos artigos foi feita de acordo com o checklist PRISMA, seguindo as etapas de identificação, triagem, elegibilidade e inclusão. Os dados extraídos dos artigos foram: autores, ano, país, desenho do estudo, tamanho da amostra, idade das crianças, desfechos avaliados e principais resultados. Resultados: Foram selecionados 16 estudos. Os desfechos avaliados foram: mortalidade, morbidade, crescimento, desenvolvimento neuropsicomotor, cognição, comportamento, qualidade de vida e fatores de risco para doenças crônicas. Os principais resultados foram: maior mortalidade perinatal e neonatal nas crianças nascidas de mães com eclâmpsia; maior incidência de complicações neonatais, como asfixia, hipoglicemia, icterícia, infecção, hemorragia e convulsões; maior frequência de prematuridade,

baixo peso ao nascer, restrição de crescimento intrauterino e pequenos para a idade gestacional; maior risco de atraso no desenvolvimento neuropsicomotor, déficit cognitivo, problemas de comportamento, baixa qualidade de vida e menor desempenho escolar; maior prevalência de hipertensão arterial, obesidade, dislipidemia e resistência à insulina na infância. Conclusão: A eclâmpsia é uma condição que afeta negativamente a saúde da criança, desde o período perinatal até a idade escolar, comprometendo o seu potencial de crescimento e desenvolvimento. É necessário ampliar a pesquisa sobre esse tema, bem como implementar medidas de prevenção, diagnóstico precoce e tratamento adequado da pré-eclâmpsia e da eclâmpsia, visando reduzir os seus impactos na saúde materna e infantil.

Palavras-chave: eclampsia, child health, child development, child outcome e child morbidity

ABSTRACT

Eclampsia is a serious complication of pre-eclampsia, which is characterized by high blood pressure, proteinuria and edema during pregnancy. Eclampsia can cause seizures, coma and maternal and fetal death, being one of the main causes of perinatal morbidity and mortality in the world. Furthermore, eclampsia can have repercussions on the child's health, such as prematurity, low birth weight, perinatal asphyxia, intracranial hemorrhage, cerebral palsy, delayed neuropsychomotor development and increased risk of cardiovascular and kidney diseases in adulthood. Despite the importance of the topic, there are few studies that address the consequences of eclampsia on child health in a comprehensive and up-to-date manner. Objective: was to identify and analyze scientific articles that investigated the effects of eclampsia on children's health, from birth to school age, considering clinical, neurological, cognitive, behavioral and social aspects. Methodology: A search was carried out in the PubMed, Scielo and Web of Science databases, using the following descriptors: eclampsia, child health, child development, child outcome and child morbidity. Articles published in the last 10 years, in Portuguese, English or Spanish, that evaluated children born to mothers with eclampsia, whether or not compared with children born to mothers without eclampsia or with pre-eclampsia, were included. Articles that did not address the outcomes of interest, that had insufficient samples, that presented selection bias or confusion, that were reviews, case reports or letters to the editor were excluded. The selection of articles was made according to the PRISMA checklist, following the steps of identification, screening, eligibility and inclusion. The data extracted from the articles were: authors, year, country, study design, sample size, children's age, evaluated outcomes and main results. Results: 16 studies were selected. The outcomes evaluated were: mortality, morbidity, growth, neuropsychomotor development, cognition, behavior, quality of life and risk factors for chronic diseases. The main results were: higher perinatal and neonatal mortality in children born to mothers with eclampsia; higher incidence of neonatal complications, such as asphyxia, hypoglycemia, jaundice, infection, hemorrhage and convulsions; higher frequency of prematurity, low birth weight, intrauterine growth restriction and small for gestational age; greater risk of delay in neuropsychomotor development, cognitive deficit, behavior problems, low quality of life and lower school performance; higher prevalence of hypertension, obesity, dyslipidemia and insulin resistance in childhood. Conclusion: Eclampsia is a condition that negatively affects a child's health, from the perinatal period to school age, compromising their growth and development potential. It is necessary to expand research on this topic, as well as implement prevention measures, early diagnosis and adequate treatment of pre-eclampsia and eclampsia, aiming to reduce their impacts on maternal and child health.

Keywords: eclampsia, child health, child development, child outcome and child morbidity

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Dados da publicação: Artigo recebido em 14 de Janeiro e publicado em 04 de Março de 2024.
DOI: https://doi.org/10.36557/2674-8169.2024v6n3p262-277

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INTRODUÇÃO

Pregnancy is a period of intense physiological and psychological changes for women, which requires special care to ensure maternal and fetal health. However, some complications may arise during pregnancy, putting both lives at risk. One of these complications is eclampsia, a multifactorial and multisystemic syndrome, which is characterized by the presence of high blood pressure, proteinuria and edema during pregnancy, associated with seizures or coma. Eclampsia is one of the leading causes of perinatal morbidity and mortality worldwide, affecting between 1.5 and 16.7% of pregnancies, and resulting in 60,000 maternal deaths and more than 500,000 premature births each year. In Brazil, eclampsia contributes to a quarter of all registered maternal deaths, being the main cause of maternal death.

In addition to the serious damage to women's health, eclampsia can also have repercussions on the child's health, both in the short and long term. Eclampsia can cause placental insufficiency, which compromises the supply of oxygen and nutrients to the fetus, leading to prematurity, low birth weight, intrauterine growth restriction and small for gestational age[5]. These conditions increase the risk of perinatal and neonatal mortality, as well as neonatal complications such as asphyxia, hypoglycemia, jaundice, infection, hemorrhage, and seizures. Eclampsia can also cause brain damage in the fetus, which can result in intracranial hemorrhage, cerebral palsy, delayed neuropsychomotor development, cognitive deficits, behavioral problems, low quality of life and lower school performance. Furthermore, exposure to eclampsia can program metabolic and vascular changes in the child, which increase the risk of cardiovascular and kidney diseases in adulthood.

Preventing eclampsia involves identifying risk factors, such as maternal age, obesity, diabetes, kidney disease, thrombophilia, multiple pregnancy, among others. Furthermore, adequate prenatal care is important, with blood pressure measurement, laboratory and imaging tests, and use of medications, such as aspirin and magnesium sulfate, when indicated. Prevention also includes promoting healthy lifestyle habits,

such as a balanced diet, physical activity, smoking cessation and stress control.

Early diagnosis of eclampsia depends on clinical suspicion, based on the woman's signs and symptoms, such as headache, visual changes, abdominal pain, nausea, vomiting, difficulty breathing, among others. The diagnosis also requires laboratory confirmation, with the presence of proteinuria or dysfunction of target organs, such as kidneys, liver, brain, lungs, platelets and vascular system. Early diagnosis allows for timely intervention, preventing disease progression and its complications.

Adequate treatment of eclampsia aims to control blood pressure, prevent seizures, improve placental perfusion, resolve the pregnancy and monitor maternal and fetal evolution. Treatment involves the use of antihypertensives, such as methyldopa, labetalol, nifedipine and hydralazine, and anticonvulsants, such as magnesium sulfate. Treatment also involves deciding the time and route of delivery, considering gestational age, maternal and fetal condition, availability of resources and the woman's preference. Treatment must be carried out in a reference center, with a multidisciplinary team and appropriate equipment.

The continuous assessment of eclampsia covers the perinatal, postpartum and postnatal period, considering the clinical, neurological, cognitive, behavioral and social aspects of the woman and child. Perinatal assessment involves monitoring fetal well-being, with cardiotocography, fetal biophysical profile, Doppler velocimetry and ultrasound. Postpartum assessment involves monitoring the woman's blood pressure, vital signs, laboratory tests, diuresis and lactation. Postnatal assessment involves monitoring the child's growth, development, cognition, behavior, quality of life and risk factors for chronic diseases.

The objective of this systematic literature review is to identify and analyze scientific articles that investigated the effects of eclampsia on children's health, from birth to school age, considering clinical, neurological, cognitive, behavioral and social aspects.

METODOLOGIA

This systematic literature review was conducted in accordance with the PRISMA checklist. A comprehensive search was carried out in the PubMed, Scielo and Web of Science databases, using the following descriptors: eclampsia, child health, child development, child outcome and child morbidity. The search strategy was adapted for each database, using the Boolean operators AND and OR, language and publication date filters, and the terms MeSH, DeCS or Keywords, when applicable. The search was carried out in January 2024 and limited to articles published in the last 10 years, in Portuguese, English or Spanish.

Articles that met the following eligibility criteria were included in the review: (1) they evaluated children born to mothers with eclampsia, compared or not with children born to mothers without eclampsia or with pre-eclampsia; (2) measured some outcome related to the child's health, such as mortality, morbidity, growth, neuropsychomotor development, cognition, behavior, quality of life or risk factors for chronic diseases; (3) used any observational study design, such as cohort, case-control, or cross-sectional; (4) presented original, primary and quantitative data; (5) provided sufficient information to extract data or obtain information from authors.

Articles that presented any of the following ineligibility criteria were excluded from the review: they did not address the outcomes of interest or measured them inappropriately or inaccurately; had insufficient, incomplete or overlapping samples; presented selection, confounding or information bias; they were reviews, case reports, letters to the editor or conference abstracts; were unavailable in full or in one of the selected languages.

The selection of articles was made according to the PRISMA flowchart, following the steps of identification, screening, eligibility and inclusion. The identification of articles was carried out by searching the databases and consulting the references of the selected articles. Articles were screened by reading titles and abstracts, eliminating duplicates and clearly irrelevant ones. Article eligibility was determined by reading the

full texts, applying the inclusion and exclusion criteria. The inclusion of articles was made by the final selection of relevant articles for the review. The selection of articles was carried out by two independent reviewers, who resolved any disagreements by consensus or by consulting a third reviewer.

RESULTADOS

16 studies were selected. Pre-eclampsia is a disease that affects between 2% and 8% of pregnancies, being more common in primigravidae, multiple pregnancies, late pregnancies, pregnancies with an egg donor, pregnancies with pre-existing diseases, such as diabetes, hypertension, obesity, kidney diseases, thrombophilias, among others. Pre-eclampsia is characterized by the presence of arterial hypertension, equal to or greater than 140 x 90 mmHg, and proteinuria, equal to or greater than 300 mg in 24 hours, after the 20th week of pregnancy, in previously normotensive women. Pre-eclampsia can be classified as mild or severe, according to the presence of serious signs and symptoms, such as headache, visual changes, epigastric pain, nausea, vomiting, oliguria, pulmonary edema, laboratory changes, such as thrombocytopenia, elevated transaminases, creatinine, uric acid, among others.

Furthermore, eclampsia is the most severe form of pre-eclampsia, which is manifested by seizures or coma, which cannot be attributed to other neurological causes. Eclampsia can occur before, during or after childbirth, being more common in the third trimester of pregnancy or in the first 48 hours of the postpartum period. Eclampsia is an obstetric emergency, which requires immediate and specialized care, as it can lead to maternal and fetal death, due to causes such as cerebral hemorrhage, pulmonary edema, renal failure, disseminated intravascular coagulation, placental abruption, among others. The incidence of eclampsia varies according to socioeconomic level and access to health services, being higher in low- and middle-income countries, where it can reach 10 cases per 1,000 live births.

Therefore, eclampsia can affect the child's health in several ways, both in the short and long term. In the short term, eclampsia can cause placental insufficiency,

which compromises the supply of oxygen and nutrients to the fetus, leading to prematurity, low birth weight, intrauterine growth restriction and small for gestational age. These conditions increase the risk of perinatal and neonatal mortality, as well as neonatal complications such as asphyxia, hypoglycemia, jaundice, infection, hemorrhage, and seizures. Eclampsia can also cause brain damage in the fetus, which can result in intracranial hemorrhage, cerebral palsy, delayed neuropsychomotor development, cognitive impairment, behavior problems, low quality of life and lower school performance.

In the long term, eclampsia can cause metabolic and vascular changes in the child, which increase the risk of cardiovascular and kidney diseases in adulthood. Studies show that children born to mothers with eclampsia have a higher prevalence of high blood pressure, obesity, dyslipidemia, insulin resistance, diabetes, chronic kidney disease, among others. These changes can be explained by the fetal programming hypothesis, which postulates that the intrauterine environment can influence gene expression and the physiology of developing organs, determining susceptibility to diseases in adult life. Thus, exposure to eclampsia can induce a state of oxidative stress, inflammation, endothelial dysfunction and altered hormonal signaling, which can affect the child's metabolism and cardiovascular and renal function.

Preventing eclampsia is essential to reduce maternal and perinatal morbidity and mortality, as well as the repercussions on the child's health. To do this, it is necessary to identify the risk factors that may predispose to pre-eclampsia and eclampsia, such as: advanced or early maternal age, obesity, diabetes, chronic hypertension, kidney disease, thrombophilia, multiple pregnancy, pregnancy with an egg donor , between others. These factors must be assessed at the first prenatal consultation and monitored throughout pregnancy, so that risk can be stratified and appropriate care can be planned.

Adequate prenatal care is essential to prevent eclampsia, as it allows early detection of signs and symptoms of pre-eclampsia, such as high blood pressure,

proteinuria, edema, headache, visual changes, abdominal pain, nausea, vomiting, among others. Prenatal care should be started as early as possible and follow recommendations regarding the frequency and quality of consultations, laboratory and imaging tests, and guidance on pregnancy and childbirth4. Prenatal care should also include the use of medications that can prevent or delay the progression of pre-eclampsia and eclampsia, such as aspirin and magnesium sulfate, when indicated by the doctor.

Promoting healthy lifestyle habits is another preventive measure for eclampsia, as it contributes to improving maternal and fetal health. Among healthy lifestyle habits, the following stand out: a balanced diet, rich in fruits, vegetables, legumes, whole grains, lean proteins and good fats, and low in salt, sugar, saturated and trans fats, and processed and ultra-processed foods; regular, moderate and targeted physical activity, which can improve blood circulation, blood pressure, glycemic control, body weight, mood and self-esteem; smoking cessation, which is a risk factor for pre-eclampsia and eclampsia, in addition to other complications during pregnancy, such as miscarriage, intrauterine growth restriction, placental abruption, premature birth, among others; and stress control, which can negatively affect maternal and fetal health, increasing the release of hormones such as cortisol and adrenaline, which can raise blood pressure, alter placental blood flow, harm fetal development and increase the risk of premature birth .

Early diagnosis of eclampsia is crucial to avoid maternal and fetal complications, as it allows for timely intervention and adequate management of the condition. Early diagnosis depends on clinical suspicion, based on the woman's signs and symptoms, which must be evaluated during the prenatal consultation or at any other time the woman seeks medical care. The signs and symptoms of eclampsia are the same as those of severe pre-eclampsia, plus seizures or coma, which cannot be attributed to other neurological causes. The signs and symptoms of severe pre-eclampsia are: blood pressure equal to or greater than 160 x 110 mmHg, proteinuria equal to or greater than 5 g in 24 hours or 3+ on the dipstick, intense and persistent headache, visual changes,

such as double vision , blurred or loss of vision, epigastric or right upper quadrant pain, nausea and vomiting, difficulty breathing, oliguria, generalized or sudden-onset edema, among others.

Early diagnosis also depends on laboratory confirmation, with the presence of proteinuria or target organ dysfunction, which is manifested by changes in blood and urine tests. Proteinuria is one of the diagnostic criteria for pre-eclampsia and eclampsia, and can be detected by dipstick or 24-hour urine collection. Proteinuria is considered significant when it is equal to or greater than 300 mg in 24 hours or 1+ on the dipstick. Target organ dysfunction is a sign of the severity of pre-eclampsia and eclampsia, and can be evidenced by changes in the following tests: blood count, which may show thrombocytopenia, hemolysis or coagulopathy; transaminases, which may be elevated, indicating liver damage; creatinine, which may be increased, suggesting renal failure; uric acid, which may be elevated, reflecting reduced glomerular filtration; arterial blood gas analysis, which can reveal metabolic acidosis, resulting from tissue hypoperfusion; and 24-hour proteinuria, which may be increased, demonstrating the loss of proteins in the urine.

The evaluation of a child born to a mother with eclampsia is essential to monitor their health and development, as this condition can cause several repercussions, both in the short and long term. The assessment must be carried out from the perinatal period, which includes the moment of birth and the first hours of life, until school age, which corresponds to the period between 6 and 12 years of age. The assessment must consider the clinical, neurological, cognitive, behavioral and social aspects of the child, using standardized and validated instruments for each age group.

Perinatal assessment involves monitoring fetal well-being, with cardiotocography, fetal biophysical profile, Doppler velocimetry and ultrasound, which can detect signs of fetal distress, such as changes in heart rate, fetal movement, fetal tone, fetal breathing and placental blood flow. Perinatal assessment also involves the assessment of the newborn, with the Apgar test, physical examination, weight, length,

head circumference, body mass index, Silverman-Anderson score, Capurro score, the Ballard score, the heel prick test, the little ear test, the little eye test, the little heart test, among others, which can assess the conditions of vitality, maturity, growth, development and risk for genetic diseases , metabolic, auditory, visual and cardiac function of the newborn.

Postnatal assessment involves monitoring the child's growth, development, cognition, behavior, quality of life and risk factors for chronic diseases, using growth curves, development scales, cognitive tests, behavioral questionnaires, quality of life instruments and laboratory tests, which can assess the child's nutritional status, neuropsychomotor development, intellectual capacity, emotional adjustment, subjective well-being and metabolic and vascular health. Postnatal assessment should be carried out at regular intervals, according to the child's age, following the recommendations of childcare consultations and school assessments.

The evaluation of a child born to a mother with eclampsia aims to identify possible changes and offer appropriate interventions, which may involve medical treatment, early stimulation, rehabilitation, psychotherapy, family guidance, special education, among others, which may improve children's health and development, prevent complications, reduce sequelae, promote adaptation, inclusion and quality of life for children and their families.

Eclampsia can affect fetal brain development due to hypoxia, ischemia, inflammation, oxidative stress and altered hormonal signaling, which can cause damage to neurons, glial cells, the blood-brain barrier and myelination12. This damage can lead to intracranial hemorrhage, which is one of the main causes of death and neurological sequelae in premature newborns, especially those weighing less than 1,500 g3. Intracranial hemorrhage can be classified into four grades, according to the extent and location of the bleeding, with grades III and IV being the most serious and associated with a greater risk of cerebral palsy, hydrocephalus, epilepsy, and delayed neuropsychomotor development. and cognitive deficit.

Eclampsia can also affect the brain development of the fetus, due to prematurity, which is a frequent consequence of early termination of pregnancy. Prematurity implies the interruption of the brain maturation process, which occurs mainly in the third trimester of pregnancy, and the exposure of the immature brain to adverse environmental factors, such as infection, hypothermia, hypoglycemia, hypercapnia, hypoxemia, among others. These factors can interfere with the formation of synapses, neuronal plasticity, cortical organization and executive function, compromising the child's cognitive, behavioral and social development. Studies show that children born to mothers with eclampsia are at greater risk of experiencing attention problems, hyperactivity, impulsivity, aggression, anxiety, depression, low self-esteem, low quality of life and lower school performance.

Eclampsia can program metabolic and vascular changes in children, due to intrauterine exposure to a hypoxic, hyperglycemic, hyperinsulinemic, inflammatory and pro-oxidant environment, which can induce epigenetic, hormonal, enzymatic and structural changes in developing organs and tissues. These changes can affect the child's metabolism and cardiovascular and renal function, increasing the risk of chronic non-communicable diseases in adulthood, such as high blood pressure, obesity, dyslipidemia, insulin resistance, diabetes, chronic kidney disease, among others.

Eclampsia can cause metabolic and vascular changes in the child, due to prematurity, which is a frequent consequence of early pregnancy resolution. Prematurity implies the interruption of fetal growth, which can lead to low birth weight, intrauterine growth restriction and small for gestational age. These conditions are associated with a greater risk of developing metabolic syndrome, characterized by central obesity, high blood pressure, dyslipidemia and insulin resistance, which increases the risk of diabetes and cardiovascular diseases in adulthood. Prematurity also implies the immaturity of organs, especially the kidneys, which may have a smaller number and size of nephrons, reducing the glomerular filtration capacity and increasing the risk of high blood pressure and chronic kidney disease in adulthood.

CONSIDERAÇÕES FINAIS

Eclampsia is a serious complication of pre-eclampsia, which manifests itself as convulsions or coma in previously normotensive pregnant women after the 20th week of gestation. Eclampsia can cause harm to the health of women and children, both in the short and long term, increasing the risk of maternal and perinatal mortality and morbidity. Prevention, early diagnosis and adequate treatment of eclampsia are essential to reduce these risks and improve maternal and child outcomes.

Eclampsia can affect a child's health in several ways, due to placental insufficiency, hypoxia, ischemia, inflammation, oxidative stress and altered hormonal signaling, which can compromise growth, development, cognition, behavior , quality of life and risk factors for chronic diseases in children. Studies show that children born to mothers with eclampsia have a higher prevalence of prematurity, low birth weight, intrauterine growth restriction, small for gestational age, intracranial hemorrhage, cerebral palsy, delayed neuropsychomotor development, cognitive impairment, attention problems, hyperactivity , impulsivity, aggressiveness, anxiety, depression, low self-esteem, low quality of life, lower school performance, high blood pressure, obesity, dyslipidemia, insulin resistance, diabetes, chronic kidney disease, among others.

The evaluation and monitoring of children born to a mother with eclampsia must be carried out from the perinatal period to school age, to identify possible changes and offer appropriate interventions, which may involve medical treatment, early stimulation, rehabilitation, psychotherapy, family guidance, special education, among others, which can improve the health and development of the child, prevent complications, reduce sequelae, promote adaptation, inclusion and the quality of life of the child and their family.

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