

The Main Risks of Fetal Alcohol Syndrome: An Integrative Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The consumption of alcoholic beverages by pregnant women poses a significant risk of harming the fetus, leading to permanent and irreversible physical, cognitive, and behavioral alterations. It can manifest as Fetal Alcohol Syndrome or Fetal Alcohol Effect, impair fetal development, and cause delays in labor. Identifying the consequences of maternal alcoholism on the fetus and newborn is crucial due to the toxic effects of ethanol and alcohol exposure biomarkers. This study presents an integrative literature review. Scientific articles available from 2009 to 2020 were searched and analyzed. According to the studies reviewed, alcohol consumption has increased over the years, particularly among women, especially adolescents, often as a result of life dissatisfaction. The research highlights the significant health risks associated with early alcohol consumption for both pregnant women and fetuses. Prevention of alcohol use is the most effective method to address this issue. These findings underscore the importance of healthcare professionals in implementing actions that support both users of the healthcare system and health promotion efforts.

Keywords: Alcoholism; fetal alcohol syndrome; alcohol consumption during pregnancy; common diseases; caused by alcohol consumption.

1. INTRODUCTION

The consumption of alcoholic beverages by pregnant women puts at risk great chances of harming the fetus, preventing permanent and irreversible physical, cognitive and behavioral changes. It can manifest as a complete condition, called Fetal Alcohol Syndrome (FAS), or an incomplete condition known as Fetal Alcohol Effect (FAE), in addition, it can have consequences on the mother-child relationship (POPOVAC; LANGE; BURD, 2015).

The primary side effects of alcohol consumption affect the central nervous system (CNS), among other effects, including cutaneous vasodilation, commonly referred to as flushing, addiction, self-limited diuresis, neurological degeneration such as dementia and peripheral neuropathies, progression to hepatic disease including cirrhosis and hepatic failure, tolerance, fetal developmental impairments, and delayed labor (MOREIRA; SOUZA, 2008).

Fetal Alcohol Syndrome (FAS) is a consequence of the teratogenic, toxic-metabolic action of alcohol on the embryo, secondary to maternal alcohol consumption during gestation[1-4]. Anomalies in fetuses resulting from ethanol use during gestation and postnatally cause facial dysmorphisms and fetal developmental impairments, such as deficits in motor functions,

cognition, attention, memory, information processing, and social interactions [5-9].

Therefore, this current study aims to raise awareness among pregnant women regarding the harmful effects of alcohol (ethanol) during gestation, emphasizing that the greater the quantity consumed, the higher the risks and problems that may be triggered by the chemical substance of alcohol (MAIA; ANDRADE; GUERRA, 2012). Consequently, I pose the following question: What are the consequences of maternal alcoholism on the fetus and newborn, due to the toxic effects of ethanol?

2. THEORETICAL REFERENCE

2.1 Pathologies Caused by Alcohol Use

For centuries, men and women have been consuming alcohol on different occasions and for different reasons: festivities, religious rituals, celebrations, among others. It is well-known that alcohol ingested in situations of stress, depression, among others, can lead to chemical dependency. Alcohol (ethanol) is a psychoactive drug that acts on the central nervous system, causing changes in the behavior of those who consume it. Thus, we can mention some common diseases that can be caused by excessive alcohol use, such as alcoholic liver disease cirrhosis, gastritis, cancer, pellagra,

dementia, alcoholic anorexia, etc. (CAD. PUBLIC HEALTH, 2004).

2.1.1 Gastritis

Gastritis is one of the common diseases that, when caused by alcohol, results in inflammation of the stomach wall, causing symptoms such as loss of appetite, burning in the stomach, nausea, and even vomiting. It can be easily treated by correcting alcohol intake, that is, by not consuming alcoholic beverages and maintaining a healthy diet daily, seeking assistance from a healthcare professional, the nutritionist (MONTEIRO ET AL., 2011).

2.1.2 Hepatic cirrhosis

Hepatic cirrhosis is a fairly common disease in people who have the habit of consuming alcoholic beverages, causing inflammation in the liver, presenting signs and symptoms such as yellowing of the eyes and skin and an increase in abdominal size. With the successive occurrence of episodes of hepatitis, hepatic cirrhosis occurs, which is nothing more than the destruction of liver cells, leading to its dysfunction and progressing to the patient's death. Therapy consists precisely of abstaining from alcohol and using medications prescribed by the doctor, and being monitored by the doctor. It is worth noting that good nutrition is one of the important factors for recovery [10].

2.1.3 Sexual impotence or infertility

The abusive use of alcoholic beverages can lead to sexual impotence or infertility, causing lesions to the body's nerves. In women, irregular menstrual cycles occur, leading to serious problems such as infertility. It is basically treated by avoiding the ingestion of alcoholic beverages and consulting with a fertility specialist, who will monitor the treatment and guide you about the risks, especially if pregnant [11].

2.1.4 Oral cancer

Alcohol consumption is a factor that poses serious risks for oral cancer. Studies show a link between alcohol consumption and the onset of seven types of cancer, including liver, rectum, larynx, colon, pharynx, breast, and esophagus. Treatment is done with medications, chemotherapy, surgeries, and laser radiation, being monitored by the specialist oncologist who

will assess appropriate procedures (MALIA; LOPEZ; CÓZAR, ET AL., 2007).

2.1.5 Pellagra

Pellagra, the absence of vitamin B3 (niacin), is a condition caused by the abusive ingestion of alcohol in large quantities. The lack of this vitamin causes brownish skin in various parts of the body, such as the face and hands, and can cause frequent itching and diarrhea. It is recommended to consult a dermatologist and a nutritionist to initiate vitamin replacement [12].

2.1.6 Dementia

The ingestion of ethanol in large quantities triggers mental retardation, which can lead to dementia, characterized by the absence of memory that progresses to total memory loss and may have difficulty moving. When the disease reaches an advanced stage, the person becomes totally dependent on a caregiver, needing assistance with dressing, walking, eating, among other activities. The psychiatrist will monitor the treatment by prescribing medications to delay dementia (ANJOS; SEGRE; MESQUITA, 2005).

2.1.7 Anorexia

When alcoholic beverages are ingested instead of a balanced diet, this is a sign of the first indication of developing alcoholic anorexia. It consists of an eating disorder that can lead to the onset of anorexia, causing bulimia. In this case, the consumption of alcohol is to suppress hunger. It is treated with medical and nutritional recommendations, therapies, and psychological counseling for proper body acceptance and mental comfort of the patient (SOUZA; BOURDIEU; DICHI, 2009).

3. ALCOHOL CONSUMPTION DURING PREGNANCY

Alcohol consumption during pregnancy can lead to serious health problems for the fetus, during prenatal care, birth, and even in the child's development, potentially leading to Fetal Alcohol Spectrum Disorders (FASD) [13].

3.1 Fetal Alcohol Syndrome

Fetal Alcohol Syndrome (FAS) is characterized by significant brain (CNS) and other organ disturbances, along with specific craniofacial

dysmorphias. It is a consequence of the teratogenic, metabolic action of alcohol on the embryo due to maternal alcohol consumption during gestation. It affects approximately 0.02 to 0.2% of American children and between 4-10% of children born to alcohol-dependent mothers (SANTOS, ET AL., 2008). It is diagnosed by the presence of growth deficiency, typical facial characteristics, and signs of central nervous system dysfunction. Children who present some of these characteristics but do not meet the diagnostic criteria are described as having fetal alcohol effects. Alcohol-related neurodevelopmental disorder includes those with CNS alterations without growth deficiency or facial characteristics. The consequences of FAS at birth include intrauterine growth retardation, central nervous system problems, dysmorphic facial features, and limb anomalies. Dysmorphic facial features include short palpebral fissures, thin upper lip, smooth philtrum, hypoplasia of the maxilla, and short nose (SANTOS, ET AL., 2008).

When ingested, alcohol is rapidly absorbed, on average 30% in the stomach and approximately 65% in the duodenum, enters the bloodstream, and reaches the liver, where it begins to be partially metabolized. The body seeks ways to eliminate it by destroying its molecules and expelling small amounts through urine, sweat, breath, etc. The remaining metabolized alcohol continues to exert its effects throughout the body, requiring several passes through the liver for complete breakdown. It is in the liver, therefore, that the chemical structure of alcohol is altered, and it is decomposed into carbon dioxide and water. Approximately 55% of adult pregnant women consume alcohol, of which 6% are classified as alcoholics (MELLO ET AL., 2001)

In pregnant women, alcohol crosses the placenta via maternal blood, enters the amniotic fluid, and reaches the fetus. Within about an hour, ethanol levels in fetal blood and amniotic fluid are equivalent to those in maternal blood. Acetaldehyde, in turn, crosses the placenta, but the level of this substance varies. The human placenta has limited metabolic capacity for alcohol metabolism, and the fetal liver lacks an efficient system to metabolize it, so alcohol levels are primarily reduced by re-entering the maternal circulation. The placenta is entirely permeable to alcohol passage to the fetus, meaning fetal blood alcohol concentration is quite similar to maternal blood alcohol

concentration. However, it is unlikely that a single mechanism explains all the adverse effects of ethanol exposure in utero; moreover, markers determining alcohol's action on fetal tissues have not yet been identified (JERONYMO, ET AL., 2014).

Central nervous system problems include microcephaly, irritability, tremors, and limb anomalies, including joint contractures and nail hypoplasia. These infants often experience continuous growth deficiency, neurobehavioral problems, and low IQ. Many newborns exposed to alcohol in utero do not exhibit all signs. Some authors believe that approximately one-third of neonates are preterm, and normal Apgar scores are rare, with metabolic reactions such as hypoglycemia, hypocalcemia, and jaundice being common. Alcohol Withdrawal Syndrome often appears during this period (REVISTA USP, DE ALMEIDA PITITTO., 2013).

The malformations associated with FAS range from 10% to 50%, affecting any organ or system. The brain, heart, and kidneys are particularly affected due to the toxic action of alcohol as an inhibitory factor in development, resulting in low birth weight and height (FORLENZA, ET AL., 2007).

According to Pittman, 1966:55,

"Ever since Emile Durkheim wrote his classic work entitled *Suicide*, sociologists have been deeply interested in the problems posed by the fact that the rates of different pathological phenomena vary in different groups. This interest quickly extended to alcoholism, as it was observed that, in the case of this disease, rates by groups were very different. An example of the above is the case of the different degrees of alcoholism in both sexes. "... I do not mean to imply that psychological or physiological theories are irrelevant to the understanding of alcoholism. I only intend to suggest that differences between groups that are not easily explained based on psychological or physiological concepts can be the subject of sociological analysis." Source: https://www.discogs.com/pt_BR/artist/54867-7-Eliana-Pittman.

The objective of this article is to identify the consequences of maternal alcoholism for the fetus and the newborn, analyzing the toxic effects of ethanol and alcohol exposure

biomarkers through a literature review. The specific objectives include identifying the consequences of alcoholism during pregnancy for the newborn and examining the toxic effects of ethanol on the maternal and fetal organism. This study aims to provide important insights into the impacts of alcohol consumption during pregnancy, highlighting the importance of awareness and prevention of these adverse effects on maternal and child health.

3.2 Search Type

The methodology adopted for this study was the integrative literature review, which allows for the search, critical evaluation, and synthesis of research results based on articles already

published on a specific topic. This approach contributes to obtaining a deeper understanding of a specific subject, such as fetal alcohol syndrome (MENDES; SILVEIRA; GALVÃO, 2008). To better organize the flow of analysis and selection of documents composing this study, we utilized a review structure similar to a systematic review (DOS SANTOS SILVA; DE OLIVEIRA, 2023).

3.3 Research Location and Sampling

In the bibliographical research, scientific articles found in the SCIELO, LILACS, and GOOGLE ACADEMIC databases were utilized, with full availability from 2009 to 2020.

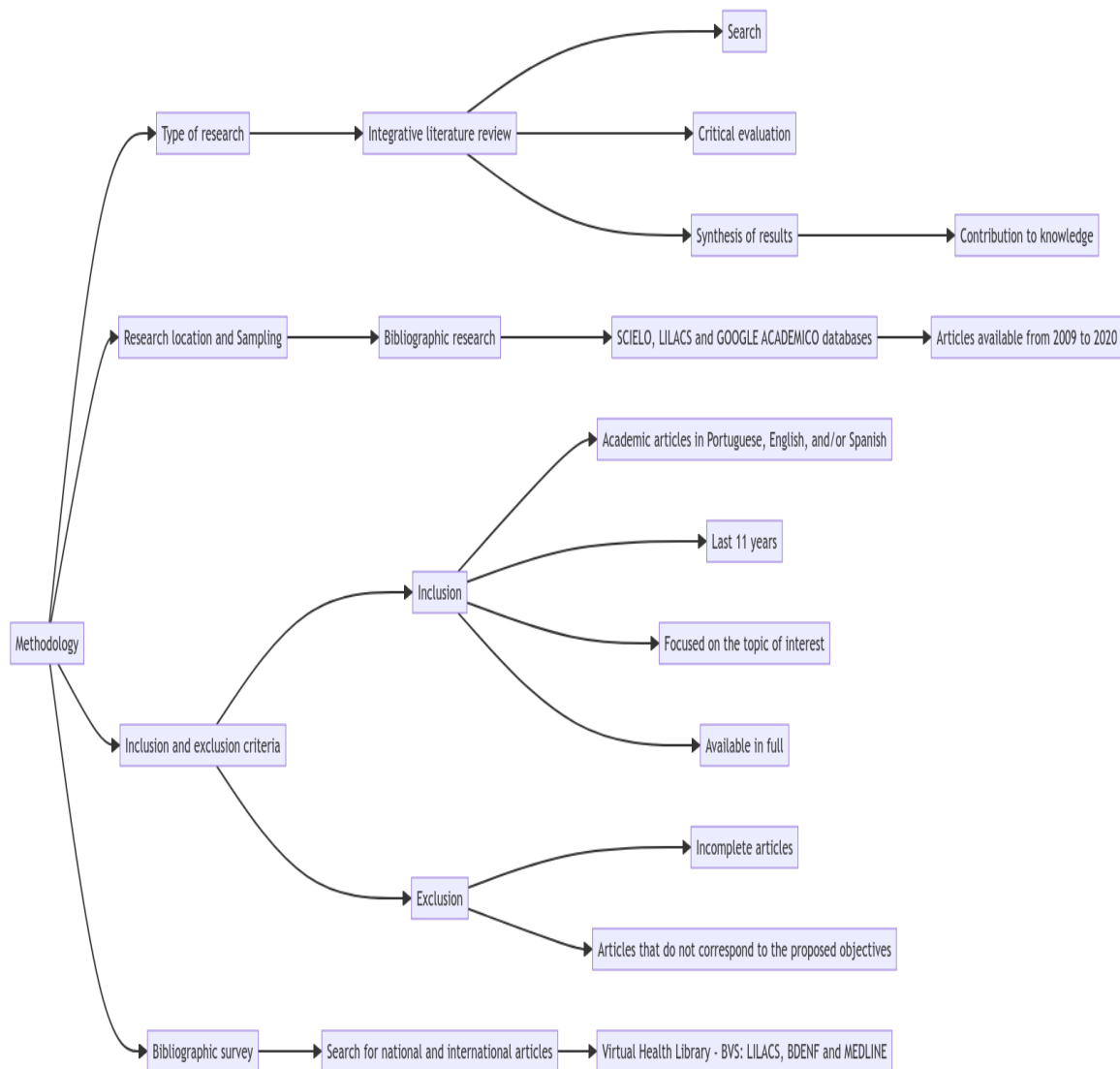


Fig. 1. Methodological Protocol

Source: Own authorship, 2020. Adapted from De Oliveira et al. [14]

Table 1. To conduct the bibliographic review, searches will be carried out for national and international articles available in the databases belonging to the Virtual Health Library (VHL): LILACS, BDEFN, and MEDLINE

Descriptors	Database	Article	Articles selected after the filter	Articles selected after reading two titles	Articles selected after reading of the summary	Selected articles
Syndrome Alcoholic	MEDLINE	581	305	13	7	2
	LILACS	23	10	4	3	1
Fetal.						
Fetal Alcohol Syndrome.	SCIELO	139	99	12	5	2
Illnesses Commons	SCIELO	108	76	15	4	3
Accused For the Consumption Of drinks Alcoholic.	BDEFN	54	5	3	2	1
Consumption Of drinks Alcoholic During the Gestation.	LILACS	56	28	8	2	1
Total		961	523	55	23	10

Source: Own authorship 2020

Table 2. Characterization of articles

Article	Magazine	Year	Title	Aim	Methodology
01	nursingMidwest Miner.	2019	Prevention of alcohol consumption during pregnancy: role of nurses in prenatal care.	Understand nurses in prenatal consultations regarding the prevention of consumption of alcoholic beverages by pregnant women.	Qualitative research, which used the narrative method, recorded conversations with nurses and others health professionals.
02	CoDAS. Brazilian society of Speech Therapy a.	2017	Oral narrative by individuals, with Fetal Alcohol Spectrum Disorder.	Investigate and compare oral narrative of individuals com disorder of the fetal alcohol spectrum, (TEAF).	20 participated individuals with FASD, of both sexes, ages between 6 to 16 years old. The oral narrative elicited through the book "Frog, where are you?".
03	Santa Catarina Medicine	2016	Only alcohol and tobacco	Obtain information on	He was conducted interviews with 157

Article	Magazine	Again	Title	Aim	Methodology
	Archives.		pregnant women in a maternity hospital in the south of Santa Catarina.	how many pregnant women use alcohol during pregnancy.	women, they were collected sociodemographic and gestational data, information on alcohol use, with significant the 95%, yousam for an act religious, festive, It is 29.4% were dependent mild, moderate or severe.
04	Unilus teaching and research.	2015	Knowledge of students entering a healthcare course about fetal alcohol syndrome.	Expand the knowledge of students in the nursing, from a private university, about the risks of FAS.	The data collection instrument was used, consisting of a questionnaire prepared by the researcher, with a subject related to FAS, being self-explanatory, and presented inform of interrogations and statements.
05	Pedro Ernesto University Hospital Magazine.	2014	Fetal alcohol syndrome - systematic review.	Through of this literary study possible to identify the main complications also SAF.	A systematic review was carried out after extensive research in the medical literature.
06	Brazilian Journal of Surgery and Clinical Research-BJSCR.	014	Repercussions of alcohol consumption during pregnancy - Study of the effects on the fetus.	The objective is to highlight, based on studies, the action of alcohol during pregnancy and its consequences, causing SAF.	To carry out the research, the methodological resource of bibliographic research was used.
07	Audiology Communication Research.	013	Aspects of fluency in the oral narrative of individuals with Fetal Alcohol Spectrum Disorder (FASD).	Identify physical and mental damage to the fetus.	9 individuals with TEAF, 2 with FAS, and 7 with Neurodevelopmental Disorder ntal Alcohol-Related (TNRA).
08	Think Nursing	2010	Assessment of alcohol consumption among pregnant women registered	Early detection of consume of alcohol that It allows	The research used the qualitative and narrative method, conducting interviews only with

			in the sisprenatal in Londrina/PR.	carrying out an intervention aimed at prevention regarding therapy. And make pregnant women in Londrina/PR aware of the problems that can affect the fetus, including APS.	pregnant women in the city of Londrina/PR.
09	Research Journal Care is fundamental Online.	2010	Fetal Alcohol Syndrome: reflections for obstetric and neonatal nursing practice.	This is a reflection article in order to serve the role of nurses in prevention, early screening and care provided to babies who have neurological repercussions of FAS.	The article is organized into three themes: definition of FAS, the nurse's role with the newborn with it, and the consequences of maternal alcoholism for the fetus and newborn.
10	Medical Science.	2009	Fetal Alcohol Syndrome – recurrence in two generations of a family.	Alcohol consumption during pregnancy involves health risks due to embryotoxicity and teratogenicity and causing AFS.	Case story.

Source: Own authorship 2020

Table 3. Categories analysis

Article	Objective 1: Identify the consequences of alcoholism during pregnancy for newborns.	Objective 2: What are the toxic effects of ethanol on the maternal and fetal organism
A1	Alcohol consumption during pregnancy involves a great risk involving embryotoxicity, causing APS.	Fetal malformation, spontaneous abortion, cognitive impairment and non-hereditary congenital anomalies, placental restriction occurs during the gestation period. Due to the use of alcohol, the mother can acquire STIs and transmit to the fetus.
A 2	It was observed that newborns presented deformities in the oral cavity, presenting TEAF.	This present study aimed at the effects caused by the use of alcohol during pregnancy, the fetus showed signs of TEAF.
A 3		This study aimed at the toxic effects

Article	Objective 1: Identify the consequences of alcoholism during pregnancy for newborns.	Objective 2: What are the toxic effects of ethanol on the maternal and fetal organism
	-	caused by the consumption of alcoholic beverages, festive and religious events, among others. Thus, the effects caused were: delay in intrauterine growth, resulting in prematurity.
A 4	It was identified that alcohol consumption during pregnancy can cause: microcephaly, neurodevelopmental changes.	Toxic effects can reach the CNS, and facial deformities of the fetus, unexplained behavioral changes such as hyperactivity, difficulties interacting with the half, mental problem.
A 5	Low weight and impaired growth of the newborn, in addition to facial deformities and bone structure.	Facial dysmorphism, growth restriction and structural, neurological or functional CNS abnormalities. Impaired intrauterine growth.
A 6	Alcohol use during pregnancy impairs the transport of folate to the fetus due to changes in the expression of binding and transport proteins, causing defects in neural tube formation and anomalies cardiac.	Restricted intrauterine growth-IUGR, and at 6 to 12 weeks of gestation presents microcephaly.
A 7	They presented deficiencies in pre-and/or post-natal development: facial dimorphism such as undefined lips, palpebral fissure, flat face. Furthermore, dysfunction in the central nervous system.	Dehydration and placental decrease. Fetus with facial deformities, microcephaly, lip changes.
A 8	Alcohol dependence of the newborn requiring treatment and medical monitoring, CNS changes, which may develop difficulties in communicating with the social environment.	The use of ethanol during pregnancy results in a series of consequences known as fetal alcohol disorders, its teratogenic effects, spontaneous abortion, placental abruption and meconium amniotic fluid.
A 9	Maternal alcohol intake throughout pregnancy leads to several changes such as growth retardation, pre- and post-natal, causing FAS.	The pregnant woman presents restricted uterine development and the fetus with characteristics of malformations and facial dysmorphism. In addition, mental retardation, another complication is that in breastfeeding, the drug or substance ingested by the mother can cause damage to the physical and emotional health of both.
A 10	On physical examination, the newborn presented a proportionate short stature, peculiar facies, brachycephalea, low implantation of hair on the back of the neck, convergent strabismus in the left eye, widened thorax with increased xiphosternal angle, flat feet, low implantation of ears, widened nasal septum, comptodactyly It is hyperextension of the fingers.	Embryotoxicity, and fetal teratogenicity.

Source: Own authorship 2020

3.4 Inclusion and Exclusion Criteria

The inclusion criteria will consist of academic articles in Portuguese, English, and/or Spanish, from the last 11 years, focusing on the topic of interest and available in full. On the other hand, exclusion criteria will be based on incomplete articles and articles that do not correspond to the proposed objectives.

3.5 Data Search Strategy

To answer the research question, descriptors from DeCS (Health Sciences Descriptors) will be used. DeCS is a structured and trilingual vocabulary created by BIREME that serves as a unified language for indexing articles, scientific journals, books, technical reports, among other materials. For article retrieval, the following descriptors will be used: "alcoholism", "fetal alcohol syndrome", "alcohol consumption during pregnancy", "common diseases caused by alcohol consumption".

3.6 Interpretation of Results

The interpretation of the results will be carried out by comparing the data evidenced in the analysis of the articles, according to the instrument (Appendices I and II), and the objectives proposed in the present study, addressing the research question.

4. RESULTS AND DISCUSSION

As studies have previously shown, alcohol consumption has increased over the years, particularly among women, especially those in adolescence, as a result of some form of life dissatisfaction. Thus, this work aims to raise awareness among young people and adults that the use of alcohol (ethanol) leads to serious health problems for the user, as well as for those in the gestational period, causing serious health problems for the fetus, ranging from malformation to non-conformities in the affected newborns' organisms, such as Fetal Alcohol Syndrome (FAS), which is a serious pathology but can be prevented (SILVA, 2010). Therefore, it is important to adopt prevention programs that advocate abstinence from alcohol during pregnancy and raise awareness among women about the possible consequences for their children (PINHEIRO; VANZ, 2009).

There is a need for sensitization of healthcare professionals and the implementation of

strategic plans for the early identification of alcohol consumption during pregnancy, support for pregnant alcohol consumers, and follow-up of newborns resulting from this situation. In this context, it is fundamental to coordinate policies both at the health level and in other domains, such as education, where the issue should not only be discussed and commented on by health professionals but also by professionals from other involved areas, such as education and health (ANDREDE; SOUZA, 2015).

A1 and A2 refer to alcohol consumption, when ingested by the pregnant woman, crosses the placental barrier, exposing the fetus to the same concentrations as the maternal blood. As a consequence of abusive alcohol use by the pregnant woman, it can result in Fetal Alcohol Syndrome (FAS), whose consequences consist of a set of physical, behavioral, and cognitive anomalies [15]. I agree with A3 and A4, which refer to toxic effects; the first trimester of pregnancy is a critical phase, with a risk of malformations and facial dysmorphism. In the second trimester, there is a higher incidence of spontaneous abortions. In the third trimester, the phase of gestation where maturation occurs. Fetal growth, exposure to alcohol, more severely damages the central nervous system (CNS), affecting the cerebellum, hippocampus, and prefrontal cortex, causing intrauterine growth retardation, resulting in prematurity and low birth weight, affecting postnatal growth (SILVA, 2014).

Thus, A5 and A6 affirm that the gestational phase in which fetal exposure to alcohol occurs represents a risk factor for its effect. If exposure occurs throughout pregnancy, the risk is higher, leading to future dependencies on ethanol use in newborns [16]. A7 and A8 affirm the action of alcohol on the embryo and fetus can cause irreversible effects with severe individual consequences, both for the pregnant woman and the newborn, with developmental stages potentially interfering with social relationships and the mother-child relationship [17].

It is worth noting that A9 and A10 address the ingestion of alcohol (ethanol) by the mother during pregnancy can result in a variety of consequences related to neurodevelopment, including mental retardation and deficiencies in cognitive capacity, attention, executive function, motor control, and behavior. The set of these manifestations is known as Fetal Alcohol Syndrome (FAS) [18-21].

5. CONCLUSION

Through the conducted research, it can be observed that the early use of alcoholic beverages is highly detrimental to both the health of the pregnant woman and the fetus. Prevention of alcohol use is the best method to combat this issue. Political campaigns targeting not only the primary audience (pregnant women) but also their guardians are needed to ensure they understand that it is a community responsibility.

It is believed that these preventive measures against alcohol use can help reduce unintended pregnancies, early alcoholism, and psychological illnesses resulting from alcohol consumption. Therefore, investment in health education and raising awareness among the population about the importance of this issue is necessary, thus contributing to favorable outcomes for the population.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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