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Fetal Alcohol Syndrome: a complex case of teratogenic effects of maternal alcohol consumption and clinical management

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ABSTRACT

Introduction and purpose

Maternal alcohol consumption during pregnancy is a well-documented risk factor for adverse fetal outcomes, encompassing a spectrum of disorders known as Fetal Alcohol Spectrum Disorders (FASD). Fetal Alcohol Syndrome (FAS), the most severe form of FASD, manifests with craniofacial anomalies, growth retardation, neurological deficits, and cognitive impairments, imposing lifelong challenges on affected individuals.

This article presents a case report of a 4-week-old female newborn with suspected Fetal Alcohol Syndrome, highlighting the clinical complexities and diagnostic challenges associated with FAS. The infant exhibited characteristic dysmorphic features and cardiac abnormalities, underscoring the diverse spectrum of health issues linked to maternal alcohol consumption.

Conclusion

A presented case report illustrating the clinical complexities of FAS underscores the importance of early recognition and multidisciplinary management. Early identification of FAS is imperative to mitigate long-term outcomes, emphasizing the importance of a

multidisciplinary and holistic approach to clinical care. Strategies for addressing maternal alcohol consumption include targeted education, preconception counseling, and innovative therapeutic modalities.

This case report underscores the need for ongoing research and collaborative efforts to reduce the prevalence and impact of FASD on affected individuals and society.

Key words: fetal alcohol syndrome, FAS, alcohol, teratogenic effect of alcohol

INTRODUCTION

Alcohol, possessing the capability to traverse the placental barrier unhindered, stands as an established teratogen. The negative effects of alcohol consumption during pregnancy have long been known. There is no safe dose of alcohol during pregnancy, so any exposure carries the risk of negative effects on the prenatal development of the fetus and the subsequent development of the child, which is referred to as Fetal Alcohol Spectrum Disorders (FASD) [1]. The most severe form of such disorders is FAS, known as Fetal Alcohol Syndrome.

Despite the known effects of alcohol consumption during pregnancy, cases of FAS are still encountered. Fetal alcohol spectrum disorders (FASD) continues to be a common cause of intellectual disability in infants and children, with an estimated incidence of 9.1 out of every 1,000 U.S. live births [2]. In Europe, the prevalence of FAS is estimated to be between 2-5% [3]. In Poland, out of 300,000 births, approximately 1,000 babies are born with Fetal Alcohol Syndrome (FAS) [4].

The consumption of alcohol by pregnant women is primarily associated with inadequate education regarding the effects of alcohol on pregnancy development, as well as the widespread availability of alcohol and previous addiction [5,6,7]. Teratogen affects fetal development at every stage of pregnancy and it is a cause of pregnancy miscarriages, preterm delivery and fetal hypotrophy [8,9,10]. One of the most probable mechanisms of alcohol's teratogenic effects is the induction of fetal hypoxia, as well as the direct toxicity of alcohol or acetaldehyde [11]. Alcohol metabolism is responsible for the formation of oxidative stress,

which disrupts the body's functioning at the cellular level, especially in the sensitive fetal brain, leading to abnormal development. [31]

Alcohol causes a number of physical, developmental and cognitive disorders in the developing fetus. The characteristic picture of FAS includes craniofacial anomalies (most commonly short palpebral fissures, smooth philtrum, and thin upper lip vermilion), growth retardation, neurological abnormalities, cognitive impairment and birth defects [12]. These disorders result in many problems later in life, such as hearing and speech problems [13,14]. Symptoms usually vary in severity, from slightly reduced intelligence to severe mental retardation [15]. Anomalies affecting the joints, limbs, and cardiovascular system are frequently observed as well [16].

FAS exhibits variability in its characteristic phenotype across cases, contributing to undiagnosed instances and complicating the resemblance of the clinical presentation to other disease entities. The diagnosis of fetal alcohol syndrome is made on the basis of symptoms and the fact that the mother consumed alcohol during pregnancy.

FAS syndrome is incurable, highlighting the profound and irreversible consequences of alcohol exposure during pregnancy [17]. Most children with FAS require ongoing psychological or psychiatric care, speech therapy and rehabilitation. FAS symptoms persist into adulthood, potentially leading to secondary psychosocial problems and disability in the absence of proper psychological care [18].

This underscores the imperative to prevent such exposures, with abstinence from alcohol during pregnancy emerging as the most crucial preventive measure against FAS [19]. Therefore, an important aspect is to spread knowledge about the harms of alcohol consumption during pregnancy.

CASE REPORT

A 4-week-old female newborn from a neglected, uncontrolled pregnancy, during which the mother smoked cigarettes and drank alcohol, with suspected fetal post-alcoholic syndrome, was transferred from the county hospital to the Neonatal Pathology Department of the University Children's Hospital in Lublin for diagnosis of a heart murmur from 2 weeks of age. Baby from 2nd pregnancy and 2nd delivery born by cesarean section at 38 hbd due to

deceleration on KTG, rated at 10 points according to the Apgar score, with birth weight of 1920 g (below 5th percentile), with features of intrauterine dystrophy.

After the birth, the mother judicially relinquished her rights to the child. The only deviation presented by the baby was thrombocytopenia, which was treated effectively with intravenous immunoglobulins due to the absence of other abnormalities, an immunological cause was suspected. In the first 10 days of life, the baby was very restless, crying, reluctant to eat, presenting opisthotonos while crying and sleeping. The appetite improved from the 3rd week of life.

Upon admission to the Newborns' Pathology Department, attention was drawn to the child's retroflexed position, microcephaly, signs of hypotrophy, and facial dysmorphic features (flattened bitemporal skull, mild plagiocephaly, narrow upper lip, shallow-set and widely spaced eyes, saddle nose with upturned tip, smoothed nasal groove, micrognathia, low-set ears, and short fingers). Above the heart an audible murmur of 3/6 on the Levin scale was heard.

The results of the blood cultures performed and the test for Toxo - with both IgG and IgM being negative. The ultrasound examination performed suspected a liver hemangioma. In the right lobe of the liver, a hyperechogenic lesion measuring 8 x 5 mm was visualised, which may correspond to a hemangioma. The liver size in the anterior axillary line is 48 mm, indicating the liver was not enlarged. The rest of the abdominal organs showed no abnormalities. In the transfontanellar ultrasound examination of the head, a flat space measuring 7 mm was visible medially, posteriorly, and below the corpus callosum, which may correspond to a pineal cyst. The rest of the brain structures and choroid plexuses showed no abnormalities.

Performed ECG and 24-hour Holter ECG monitoring showed no significant arrhythmia. Echocardiography revealed perimembranous ventricular septum defect (VSD).

The child was consulted by geneticist (blood was drawn for molecular testing - aCGH - the examination result was being processed), neurologically (with the recommendation of a control transfontanellar ultrasound and MRI of the brain to diagnose the pineal cyst) and by rehabilitation physician (on examination: forced deviated positioning, asymmetric with shortening of the right side of the trunk and right sternocleidomastoid muscle, head/face turning to the left and features of plagiocephaly, with recommendation for further rehabilitation).

During hospitalisation the gradual improvement in the infant's condition was observed. The patient was interested in her surroundings, made eye contact, and responded with a smile to a smile. The girl has been fed with the formula and body weight has increased. Laboratory tests have maintained normal values of morphological and biochemical parameters.

Due to the mother's relinquishment of her rights to the child, an adoption procedure was initiated for the girl. The child was discharged with recommendation to continue oral treatment with spironolactone - daily 1x ¼ of one 25 mg tablet (1-3 mg per kilogram of body weight) was included in the treatment as well as iron and vitamin supplementation - Actiferol start - 1 x daily; vitamin D3 400 IU/day. Physiotherapy treatments were continued, and a check-up at the neurological and audiology clinic and a follow-up cardiological examination were scheduled.

DISCUSSION

In Fetal Alcohol Syndrome (FAS), there are many somatic, cognitive and behavioral abnormalities. Characteristic features include: widely spaced eyes, short, upturned nose, smooth philtrum, micrognathia, low-set ears, impaired prenatal and/or postnatal growth, impaired neurological development, and neurobehavioral disturbances [20,21]. A comparable scenario was noted in the presented case.

FAS may also correlate with a range of cardiac diseases, highlighting the need to consider a broad spectrum of health issues in the clinical assessment of children with FAS [22]. Increasingly, cases of persistent ductus arteriosus, tricuspid valve insufficiency, as well as cardiac arrhythmia (including tachycardia episodes and irregular pulse) are being described [23]. Research demonstrates that maternal alcohol consumption during pregnancy often results in congenital heart defects, such as ventricular and atrial septal defects [24]. The most common heart defect observed in FAS is a ventricular septal defect, as in our patient's case. Depending on the size of the defect, the course may be asymptomatic, but in cases of cyanosis or Eisenmenger syndrome, surgical intervention may be necessary. [25]

In the presented case of a newborn female, echocardiography revealed a ventricular septal defect, which correlates with studies which examined the impact of alcohol abuse during pregnancy on cardiac disorders in children. The patient was transferred to the Cardiology Department of the University Children's Hospital in Lublin, where she underwent comprehensive diagnostics, treatment, and observation.

It is important to emphasize the need for proper diagnosis of patients with FAS. It is estimated that over seven percent of children with FASD have never been diagnosed and seven percent of children with FASD have been misdiagnosed [26]. Many patients are diagnosed after years; and they require a change in treatment approach and implementation of a different type of therapy. Erroneous or missed diagnoses of FAS often lead to secondary disabilities. Unfortunately, FASD can often be missed or misdiagnosed due to underreporting of maternal alcohol use, or lack of characteristic facial traits leading to a misdiagnosis of ADHD (*attention deficit hyperactivity disorder*). Early diagnosis leads to the best results in minimizing symptoms for long-term development [27].

In the presented case, the patient's obstetric history was burdened, and the pregnancy was not monitored. The newborn was promptly examined and referred to the Cardiology Department, where diagnostics were performed and treatment initiated. Knowing the risk of specific disorders, the medical team could efficiently implement appropriate therapies. This underscores the crucial importance of a comprehensive history-taking in the proper diagnosis of patients exposed to one of the teratogenic factors, such as alcohol.

According to research, women who have consumed alcohol during pregnancy mostly have lower levels of education, low rates of planned pregnancies which is associated with lower levels of knowledge about the risks of drinking alcohol during pregnancy [28]. Low educational level and lack of planning pregnancy are significant risk factors for alcohol consumption by pregnant women. It is also important to consider the general pattern of alcohol consumption before pregnancy diagnosis, the most common drinking pattern is that women who drink alcohol about three months before pregnancy diagnosis continue consuming to the first trimester of pregnancy [27]. Additionally, some women are also smokers, which also affects the abnormal development of the fetus [32,33]. Confirmation of alcohol consumption by a pregnant woman should be an indication for education on the harmful effects of alcohol on the fetus. Women should be advised to stop drinking alcohol immediately upon confirmation of pregnancy and encouraged to undergo antenatal care [27, 29].

Regarding the treatment of children with Fetal Alcohol Syndrome (FAS), an innovative, non-invasive therapy has recently been developed, which involves central neuromodulation through repetitive transcranial magnetic stimulation (rTMS). This method is still under further investigation; however, it gives hope for improving the quality of life for children struggling with executive function, attention, and socio-emotional regulation dysfunctions [30]. Various therapies can also help patients develop appropriate behavioral responses necessary for daily functioning. Therapies such as sensory integration, sleep-based therapies, and cognitive therapies can bring positive effects.

CONCLUSION

To summarize, alcohol represents a significant teratogenic risk factor which has detrimental effects on fetal development. The well-recognized association between alcohol consumption during pregnancy and Fetal Alcohol Spectrum Disorders (FASD), including the most severe manifestation - Fetal Alcohol Syndrome (FAS), underscores the critical imperative for preventive measures. The presented case report provides as an example the multifaceted clinical manifestations of FAS, highlighting the importance of early recognition and comprehensive management. The observed cardiac abnormalities underscore the diverse spectrum of health issues associated with FAS, necessitating a holistic approach to diagnosis and treatment. Timely identification of FAS is paramount, as missed or misdiagnosed cases can lead to distant disabilities and hinder optimal therapeutic results. Efforts to address maternal alcohol consumption during pregnancy should prioritize education, preconception care, and early intervention strategies. Enhancing maternal awareness and promoting abstinence from alcohol during pregnancy are essential in preventing FAS and mitigating its long-term consequences. Moreover, ongoing research into innovative therapeutic paths offers hope for improving the quality of life for individuals affected by FAS.

Disclosure

Author's contribution

Conceptualization: Sylwia Koziej, Emilia Kowalczyk; methodology: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; software: Emilia Kowalczyk, Julia Bajorek; check: Sylwia Koziej, Joanna Borkowska and Julia Bajorek; formal analysis: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; investigation: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; resources: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; data curation: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; writing - rough preparation: Emilia Kowalczyk, Sylwia Koziej, Joanna Borkowska and Julia Bajorek; writing - review and editing: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska and Julia Bajorek; visualization: Sylwia Koziej, Emilia Kowalczyk; supervision: Sylwia Koziej; project administration: Sylwia Koziej, Emilia Kowalczyk, Joanna Borkowska.

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