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Alcoholic fetal syndrome - a problem of the 21 st century?

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Summary

Fetal Alcohol Syndrome (FAS) is a disease entity that occurs in children who have been exposed to teratogenic alcohol durning fetal life. It includes neurobehavioral abnormalities and changes in the body structure and internal organs. The only reason for the occurrence of this type of disorder is the consumption of alcohol by a pregnant woman (even in small amounts). It is estimated that in Poland about 30% of women consume alcohol in this period (also in small amounts), while in the US every year is born about 40,000 children who are diagnosed with FAS or related disorders.

Keywords: pregnancy, alcohol, growth of child, teratogenicfactors

Admission

Fetal Alcohol Syndrome (FAS) or Fetal Alcohol Syndrome Disorder (FASD) is a description of a set of characteristic symptoms resulting from the effects of alcohol on the developing fetus (the body of the child), mainly the brain [1,2,3,4,5]. The effects of alcohol consumption by pregnant women lead to the development of physical, mental changes, behavior, learning (and thus the spectrum of congenital structural, neurocognitive and behavioral abnormalities [3]), which may additionally last a lifetime of offspring [6]. In addition, there are changes in the face - dysmorphs [2,4,7,8,9]. The term FAS was first used in 1973 by Jones and Smith [6, 10, 11]. The development and use of FAS definitions gave the possibility to classify a new and clinically diagnosed disease syndrome related to congenital malformations in mothers who consume alcohol during pregnancy [10]. It should be realized that alcoholism is a 21st century problem, and children who suffer from the teratogenic effects of alcohol consumed by their mothers are born more often than children with Down Syndrome - it is assumed that 1-3 children with FAS are born in Poland per 1,000 births [12], while the incidence rate of Down's syndrome is 1 in 660/800 births [9,13]. PARPA research shows that about 30% of Polish women drink alcohol while pregnant [14]. In Poland there are no verified, uniform guidelines or standards for the diagnosis, treatment and rehabilitation of children with FAS [3].

Teratogenic factors

Teratogenic factors are those that interfere with the development of the child in fetal life as a result of intoxication and lead to congenital impairments [1,15]. Their teratogenicity depends on genetic predisposition (mother, embryo), pregnancy period, as well as the path and time of action of the harmful agent, as well as sensitivity and susceptibility to their action [1,16]. There are often exposure to several teratogens at the same time (often people consuming alcohol, also smoking cigarettes). The fetus, under the influence of teratogen on it, is exposed to a higher risk of death, developmental anomalies, delayed growth or occurrence of functional disorders [15,16,17]. Acetaldehyde - a metabolite of ethyl alcohol, is considered to be the main factor resulting in damage to the fetus. It has been classified as so-called neurobehavioral teratogen.

Effect of teratogenic alcohol on the developing fetus

Two models are considered to characterize the effect of toxins on the developing fetus:

- linear dependence: direct correlation between effects and magnitude of operation,
- threshold relationship: the appearance of effects of toxins only after exceeding a certain level (minimum) [18].

The first model, indicating a linear relationship between mother's alcohol consumption and the development of offspring, emphasizes that there is no "safe" amount of alcohol consumed during pregnancy, because even a minimal amount can lead to undesirable effects.In turn, the threshold model proves the existence of a "safe" amount of alcohol consumed, the failure of which will prevent the occurrence of any undesirable symptoms.In practice, both models are confirmed in clinical trials depending on which of the effects of consuming ethanol is considered.

For this reason, in order to prevent any effects of alcohol prenatal treatment, total abstinence maintained by pregnant women is necessary [18].The highest sensitivity to the harmful effects of teratogens occurs between the second and tenth week of pregnancy. The first two weeks after fertilization, due to the small number of embryo-producing cells, are relatively safe (self-healing of damage or death of the embryo). By the tenth week, all embryo structures are shaped, hence the subsequent exposure carries a lower risk. The effects of alcohol consumption depending on the period of pregnancy are presented in the table below.

Table 1. Hazards resulting from drinking alcohol depending on the period of pregnancy

TRIMESTER	EFFECTS OF ALCOHOL CONSUMPTION
I	brain damage, abnormal cell development, damage to important organs (liver, kidneys, heart), face deformities, miscarriage;
II	brain damage, miscarriage (dangerous for mother's life and health), damage to muscle cells, skin, teeth, glands or bones of the child;
III	disorders of brain and lung development, slower fetal weight gain, premature labor;

Source: own study based on: Klecka M .: Pregnancy and alcohol. Caring for a child with FAS, ed. Educational PARPAMEDIA, Warsaw, 2013.

Nevertheless, the development of the Fetal Alcohol Syndrome is conditioned by many factors, i.e .:

- the amount of alcohol that mother will consume during pregnancy,
- frequency of alcohol consumption,
- the stage of fetal development in which it was exposed to alcohol,
- pregnancy phase, during which the woman drank the most alcohol,
- the state of nutrition of the pregnant woman during pregnancy, but also the state of nutrition before conception,
- receiving other psychoactive substances (belonging to teratogens),
- genetic predisposition in relation to the fetus and to a pregnant woman,
- the general health of a woman during pregnancy [6].

The consequences of intrauterine exposure to alcohol are called the alcoholic spectrum of developmental disorders (Fetal Alcohol Spectrum Disorders - FASD). It includes:

- full-blown fetal alcohol syndrome (FAS),
- partial Fetal Alcohol Syndrome (pFAS),
- alcohol-related neurodevelopmental disorder (Alcohol - Related Neurodevelopmental Disorders - ARND),
- alcohol-related birth defects (Alcohol - Related Birth Defects -ARBD) [8,13],
- alcoholic brain damage that occurs without physical, visible external deformities (Fetal Alcohol Effects - FAE) [13, 14, 15].

Fetal Alcohol Syndrome is a disease entity in which neurobehavioral abnormalities occur as well as changes in the body structure and internal organs affecting children of mothers who consumed alcohol while pregnant [16]. It should be emphasized that children with FAS, although they are most often found in dysfunctional families, may be born in every family [16].

Primary and secondary disorders

Primary disorders are disorders with which a newborn baby is born. They mainly include brain damage [16] including major changes in structure, incomplete development, lack of

corpus callosum, or lack of structure connecting two cerebral hemispheres with each other [6, 11]. However, some of the changes may remain very subtle and not noticeable at birth. Drinking alcohol by a pregnant woman leads to disorders of cell proliferation and migration. The changes may also concern electrophysiology and neurochemical balance of the brain which results in ineffective transmission of impulses [6], and also include synaptic connections, which leads to improper receptor work [11]. On the other hand, secondary disorders include those that have developed over the course of life, and are primarily conditioned by environmental factors: mental health problems, unfinished education, legal problems, early and / or irresponsible motherhood, institutionalization, inappropriate sexual behavior or problems with alcohol and drugs [6,8,11,16]. In addition, the following symptoms are distinguished: anxiety, anger, avoidance/ withdrawal, entering into the role of victim or persecutor, closure, impulsiveness or violent and shocking behavior [7].

Characteristics of the appearance of children affected by FAS

FAS includes structural abnormalities related primarily to the face, limitation of the range of motion in the joints and other (encountered sporadically). Nevertheless, it is the facial appearance that is the easiest part of diagnostics. The most specific and characteristic changes are associated with the eyelids. Visible wide eye spacing is visible. This is the result of shortening the facial swelling (reducing the distance between the inner and outer corners of the eyes). As a result, the eyes appear to be smaller and more remote [5,8,17]. Obligatory measurement of the length of the occlusal gap should be performed to exclude other reasons for this condition. In addition, one or both eyelid dips are observed [14,16, 17]. Other changes concern the slow development of the middle part of the face. The area under the upper lip and the eyes is underdeveloped. Hypoplasia includes flattening or collapse of this area, lowering the back of the nose. Delaying the growth of the nose over the face plane may result in the formation of a rounded skin fold covering the inner corner of the eye, while the delay of nasal growth to length contributes to directing the nostrils' opening towards the front and down [5].

Another, also a characteristic change, concerns philtrum located between the nose and the upper lip. Correctly there is a vertical, middle-lying furrow bounded by two vertical ridges made of leather. At the point of contact with the lip of the labium, there are small notches that cause the lip to form a Cupid arc. In turn, in people affected by the Fetal Alcohol Syndrome, the philtrum is elongated and at the same time smooth. It does not have skin combs, and the upper lip of the lips forms a gentle arch [5,14,17]. Another important feature that makes up the child's FAS face phenotype is the thin upper lip [2,8,14,17].

It should be noted that the differences in the facial structure including the smoothing of the philtrum, thin upper lip and shortened eyelid gaps, indicate the strongest recognition of FAS, regardless of ethnicity and gender. They are so-called screening criteria, which are characterized by 100% sensitivity and specificity of 89.4% [8]. For the quantitative assessment of the upper lip thickness and the smoothing degree of the Astley and Clarren sump gutters, they have developed corresponding reference images covering a scale of 1 to 5 points. Result 4 or 5, indicates the occurrence of pathology [8]. The small periphery of the face - microcephaly, is not a feature that defines the characteristics of the phenotype, but is a feature of the central nervous system [18].

Brain injuries occurring in children with FAS / FASD

The characteristic facial phenotype does not occur among all children who were exposed to harmful effects of alcohol in their intrauterine life. In turn, alcohol in each of them has a destructive effect on the brain tissue, resulting in the presence of changes in its structures. This is particularly reflected in the presence of abnormalities in the frontal lobes, corpus callosum, subcortical nuclei or cerebellum, as they show considerable sensitivity to

alcohol. The result is irreversible disturbances in the child's functioning [17,21]. For this reason, neuroimaging methods gain more and more importance for the accurate and accurate diagnosis of FAS [21]. The changes taking place in the brain in children affected by FASD are referred to as static encephalopathy: they are persistent - they do not undergo treatment and static - they do not deepen or retract [5].

The most commonly reported brain damage in the literature are:

- the cerebellum region: the area in which neurons are created at the latest during fetal life. Exposure of the fetus to alcohol in the third trimester of pregnancy results in a permanent reduction in the number of nerve cells and glial cells in this region (decreased volume and surface of the cerebellum [5, 18],
- reduce the volume of the frontal lobes compared to healthy children.
- reduce the total size of the brain. Children with FAS have an average of 13% smaller brain than healthy children of the same age. This is the result of reducing the gray matter of the brain and white matter [5],
- reduction of the corpus callosum (the element connecting the two hemispheres, responsible for the smooth flow of information between them) [5, 18],
- reducing the size of the hippocampus conditioning the creation of memories and enabling memorization and the almond body responsible for the creation and regulation of emotions [5],
- reduction of subcortical nuclei [5,17,18],
- additionally, as a result of brain damage, problems with sensation of pain, hypersensitivity to touch, hypotonia and / or hypertonia appear [5].

Properly targeted and individualized therapy enables the greatest possible use of the possibilities inherent in the child and prevents the appearance of secondary symptoms [5].

Changes in the skeletal system

The most important changes in the skeletal system, occurring as a result of exposure to alcohol in intrauterine life, in addition to the most frequently mentioned growth inhibition, include:

- cynodactyl (the arcuate of the fifth finger) and shortening of the fifth finger in hands and feet),
- hypoplastic nails
- scoliosis,
- Klipp - Feil syndrome - flattening or anastomosis of two (or more) cervical vertebrae in the form of a block,
- dust or funnel-shaped chest,
- changed construction of joints,
- radial-elbow adhesions limiting the range of movement in the elbows [5].

FAS diagnosis

The complete medical and psychological documentation is an indispensable tool for making accurate diagnosis. Another very important stage enabling recognition are evaluations assessing the level of functioning of the senses [7]. Full and comprehensive neurodevelopmental examination consists of:

- an interview covering the period of pregnancy and childbirth, full history of the disease,
- general medical examination,
- child developmental interview,
- assessment of the characteristic face phenotype,
- psychological examination, which consists of texts defining opportunities and developmental losses,
- examination of motor functions and adaptive abilities,
- study of speech advancement, assessment of reasoning and communication [7].

Over the past three decades, several diagnostic criteria have been formulated, among others, by Clarren and Smith, as well as the Group of Researchers on the Fetal Alcohol Syndrome at the Alcoholism Society, a team working at the Institute of Medicine (Institute of Medicine, IOM) [12]. The 4-Digit Diagnostic Code was presented by researchers from the Washington State FAS Diagnostic and Prevention Network in 1997. It is a diagnostic method used to comprehensively diagnose the spectrum of developmental disorders associated with prenatal alcohol exposure. It is more accurate and more reproducible than the previous scales [12].It contains 4 levels related to four key characteristics of FAS:

1. delay of growth,
2. presence of characteristic dysmorphic features,
3. damage to the central nervous system,
4. prenatal alcohol exposure [12].

At each level, the intensity of expression of features is assessed using a four-level Likert scale (1 point means the total absence of FAS features, and 4 points "classic"). In 2004, the scale was updated. It is widely used in the Washington State FAS Diagnostic & Prevention Network [12].

Psychological tests

In order to diagnose FAS (FASD), and thus to determine the neuropsychological and social problems of ill children, many psychological tests are used.

The WISC-R test (Wechsler Intelligence Scale) is the most commonly used and until recently the only test. It is used to examine the general IQ (IQ) and to determine the current cognitive functioning. It also allows the diagnosis of individual talents and intellectual abilities as well as negligence or spheres of cognitive functioning at a low level. In total, it gives the opportunity to determine the areas in which the child's development should be stimulated. It consists of the scale of verbal abilities and the scale of performance abilities. Each of them is built of subscales. For example, the verbal scales build elements: messages, repeating numbers, dictionary, arithmetic, understanding and similarities [22].

Summary

In Poland, alcohol consumption increased from 3 liters of pure alcohol per capita in 1950, to 9.3 liters of alcohol per capita in 2007 [23]. The age of alcohol initiation is also steadily decreasing (currently it is between 12 and 15 years of age), and the number of unplanned pregnancies among teenagers is increasing [23].

At the same time, there is a noticeable increase in the interest in various fields and scientific disciplines of the physical, mental and social condition of children from families with an alcohol-related problem. The interest of the society in the influence of alcohol on the occurrence of various pathologies in offspring is also growing. Alcohol and drugs, X-rays, is a

teratogenic factor playing an important role in the pathogenesis of fetal developmental disorders, and then - a newborn and a child in the future [23].

Excessive regular drinking of alcohol disrupts the functioning of the kidneys and weakens their filtering qualities, maintaining an optimal balance of fluids and proteins in the body, dehydrating and de-salting the body, exacerbates kidney diseases. Very frequent Proteinuria. The filtration ability of the glomeruli of the kidneys, the glomerular filtration rate is disturbed, the tender renal cells are destroyed, and renal dystrophy, glomerulonephritis and renal hydronephrosis gradually develop [24-52].

Responsibility for the occurrence of FAS lies entirely with the mother of a sick child, because it can be completely prevented from occurring by stopping drinking alcohol (total abandonment even of the smallest glass of wine) while pregnant [16]. According to the public, there is still a belief that a "glass" of wine will not hurt, and on the Internet, you can still find recommendations and information to promote the consumption of small amounts of alcohol by pregnant women.

Another very important fact is the frequency of birth of children with FAS. They are born relatively often; in Poland, 1-3 children are born with FAS per 1,000 births [12], while the incidence rate of Down Syndrome is 1 in 660/800 births [3]. The indicator applies only to children who have been diagnosed, however, the nomenclature emphasizes the problem of incorrectly diagnosed ADHD or Asperger syndromes or the diagnosis of Fetal Alcohol Syndrome among adolescents, which is very late.

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