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Fetal Alcoholic Spectrum (FAS) Syndrome

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ABSTRACT

Fetal alcohol syndrome refers to a broad range of neurological symptoms linked to alcoholism during pregnancy. The increased organizational socio-economic status, alcohol intake during pregnancy, and internal drunkenness within women disturbingly raise challenges inside the Indian subcontinent. Therefore, doctors must be conscious of an illness and its phenotypic variants. Supportive care and abstinence throughout pregnancy are the sole options available in the absence of effective treatments that stop continued progression and occurrence in subsequent pregnancies. A typical appearance, short stature, low body weight, tiny head size, poor coordination, behavioral issues, learning challenges, and hearing and vision issues are some of the symptoms that can be present. People who are affected are more prone to struggle in areas of high risk, including school, the law system, alcohol, additional drugs, as well as other drugs of abuse.



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INTRODUCTION

A modest amount of alcohol was advised by doctors to help relieve Braxton hicks contractions or early pregnancy contractions that were causing the uterus to contract. Alcohol was frequently as a tocolytic, a technique to prevent premature labor, from the 1960s to the 1980s. The alcohol was often delivered intravenously in significant doses during the later stages of pregnancy. Women reported experiencing identical side effects to those associated with oral intake, such as intoxication, nausea,

vomiting, and possible alcohol poisoning, accompanied by hangovers after the alcohol was stopped [1]. The mother being more intoxicated would have been feasible otherwise since the alcohol administers intravenously, allowing the doctor to continue the treatment long after she had passed out. Such heavy drinking likely contributed to FASD [2]. British doctors petitioned the House of Commons in 1725 regarding the effects of drinking heavily while expecting. There were frequent results in children that were weak, sickly, and displeased, who must be, instead of a benefit as well as power, a charge to his country. There was an increase in 120 alcoholic female convicts with higher stillbirth rates than their sober female relatives and proposed alcohol use as the causal agent [3] even though later studies revealed that they probably definitely have FAS.

Recognition as a Syndrome

Two morphologists at the University of Washington Medical School in Seattle first coined fetal alcohol syndrome in 1973. Animal research, especially non-human monkey experiments conducted at the Uni-

iversity of Washington primate center by Dr. Sterling Clarren, had already established a teratogen nine years after Washington on finding [4]. The term "fetal alcohol spectrum disorder," or "FASD," was created to refer the both FAS and other disorders brought on by prenatal exposure to alcohol. The only manifestation of prenatal alcohol exposure recognized by the ICD-9 and the International Statistical Classification of Diseases but also Related Health Problems at this time is FAS.

In Fiction

In the 1932 novel *Brave New World* by Aldous Huxley, lower caste embryos are produced by alcohol transfusions to lessen intelligence and height, training them for easy, menial labor [Figure 1] [5].

Alcohol consumption by the mother during pregnancy results in fetal alcohol spectrum disorders. According to American surveys, 10% of expecting mothers drank alcohol in the prior month, while 20% to 30% did so at some point during their pregnancies. In a 2001 epidemiological survey, 3.6% of pregnant American women satisfied the criteria for such an alcohol use disorder [6]. Depending on the quantity, frequency, and stages of pregnancy during which alcohol is consumed, there is a risk of FASD. Smoking, a lousy diet, and the mother's advanced age are other risk factors. No timing or amount of alcohol consumption is safe during pregnancy. The person's signs and symptoms are used to make the diagnosis. Despite the condition's irreversible nature, treatment can help with outcomes [7]. By abstaining from alcohol while pregnant, mothers can avoid fetal alcohol spectrum diseases. Authorities on medicine advise women to abstain from alcohol entirely when attempting to conceive and while pregnant. FASD is thought to impact 1% and 5% of people in Western Europe and the United States. In the US, FAS is estimated to affect 0.19 to 9 out of every 1,000 live births. Some communities in South Africa have rates of as much as 9%.

Types

Various physical and neurological issues can arise from parental alcohol exposure, including FASDs. Fetal alcohol syndrome (FAS) is the most severe condition for those with specific birth abnormalities and neurodevelopmental disorders diagnostic diagnosis [8]. Some people only consider FAS a diagnosis because the evidence for the other categories is inconclusive.

Fetal Alcohol Syndrome (FAS)

People with alcohol-related physical and neurodevelopmental issues who have a history of parental alcohol exposure (known or strongly suspected);

impairments but do not fully match the FAS criteria are said to have partial fetal alcohol syndrome (PFAS). pFAS-subtypes:

Alcohol-related neurodevelopmental disorders (ARND)

Alcohol-related congenital disabilities (ARBD).

Alcohol-related congenital disabilities (ARBND)

A neurobehavioral disorder associated with prenatal alcohol exposure (ND-PAE). These illnesses, including spontaneous abortion and Sudden Infant Death Syndrome (SIDS), are considered within the spectrum of disorders connected to prenatal alcohol consumption [9].

Developmental Toxicity

Developmental Toxicology

If there is any reversible structural alteration that interferes with homeostasis, typical growth, differentiation, development, or behavior and brought on by an environmental insult (including drugs, alcohol, diet, toxic chemicals from the environment, and physical factors), this alteration may be harmful [Figure 2] [10].

It refers to the research of harmful effects on organism development brought on by contact with hazardous substances before conception, during the prenatal period, or after birth till puberty.

Teratogens are hazardous to the developing body starting at the embryonic stage. The type of drug, dose, duration and exposure period all affect how development toxicants behave.

Teratology, the earlier word for the study of predominantly structural congenital abnormalities, has been primarily suppressed by this one to allow for the inclusion of a broader range of genetic illnesses.

Radiation, infections, maternal metabolic disorders (such as alcoholism, diabetes, and folic acid deficiency), medicines (such as tetracyclines, numerous hormones, and thalidomide), as well as atmospheric chemicals are major causes of developmental toxicity. Exposure during the first trimester is considered the most significant risk for developmental damage [11].

The first 14 to 60 days, when the fetus's primary organs are growing, are the most dangerous for the fetus.

However, fetal exposure to toxicants can occur at any point throughout pregnancy, depending on the type of toxin and the degree of exposure.

Toxicant exposure during the second and third trimesters of pregnancy can result in low birth weight and poor fetal growth.

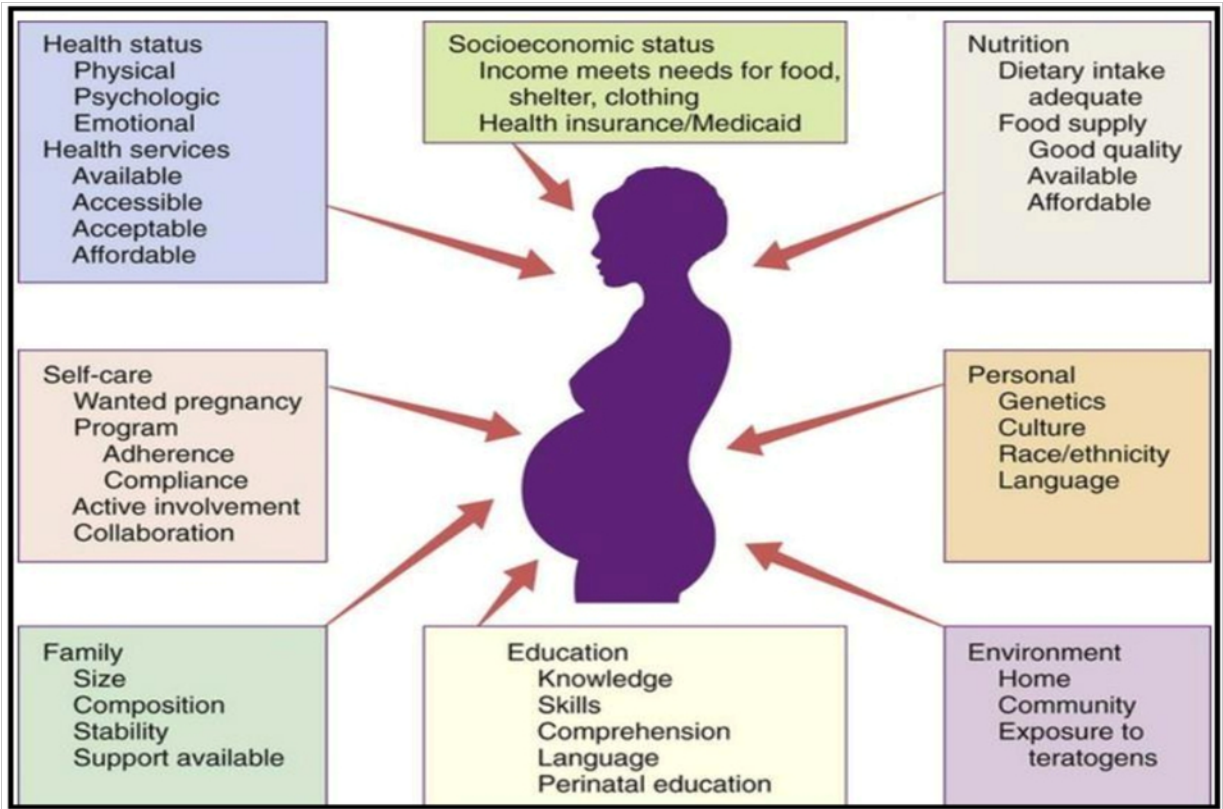


Figure 1: Socioeconomic Status

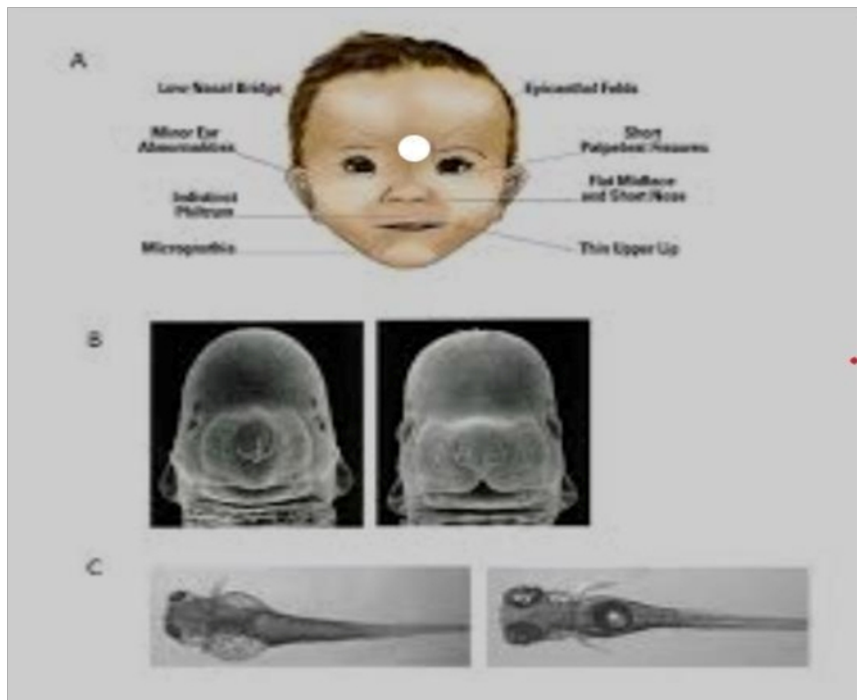


Figure 2: Structural Alteration of Homeostasis, Typical Growth, Differentiation

Toxicity Effects

Rather than altering the function of already created organs, developmental toxicity refers to changes in the developmental processes (organogenesis, morphogenesis). The toxicants' effects are influenced by dose, threshold, and duration. Toxicology's side effects are:

1. Minor structural deviations include those caused by retinoic acid compounds, anticonvulsants, and warfarin.
2. Significant structural deformities- e.g., DES (diethylstilbesterol), cigarette smoking
3. Growth Retardation: Polychlorinated biphenyls or alcohol, for example
4. Functional alternation- e.g., Retinoic Acid derivatives, Polychlorinated Biphenyls, Phenobarbital, lead.
5. Death: e.g., Rubella, ACE inhibitors [12].

Cause

A woman consuming wine while carrying a child can lead to fetal alcohol spectrum disorder. Alcohol can disrupt a kid's normal development by passing via the placenta to the unborn child. Alcohol is a teratogen (causes birth malformations), and there is no known safe level of alcohol use during pregnancy. There is also no known safe period during pregnancy for alcohol consumption. Small doses of alcohol might not even result in an odd appearance. Still, they can have lesser side effects, including a behavior problem and an increased risk of miscarriage if consumed while pregnant.

Mechanism

A human fetus appears to be at triple risk from maternal alcohol consumption:

1. Alcohol and harmful metabolites like acetaldehyde can enter the fetal compartment through the placenta. Concerning ethanol, the so-called placental barrier is almost nonexistent.
2. It appears that ethanol poisoning mainly affects the developing fetal neurological system. Latter interference with the synaptic network's integration, axonic outgrowth, neuronal migration, proliferation, differentiation, and fine-tuning. The growing central nervous system's numerous processes seem to be in jeopardy.
3. Because fetal tissues contain far lower levels of antioxidant enzymes like SOD, glutathione

transferase, and glutathione peroxidase than adult tissues, antioxidant protection is less efficient.

Furthermore, alcohol may affect fetal development by disrupting retinoic acid signaling. The primary metabolite of ethanol, acetaldehyde, can compete with retinaldehyde and stop it from oxidizing to retinoic acid [Figure 3] [13].

Diagnosis

Therefore, rather than relying on the mother's self-reporting, observation procedures of the child's physiology and behavior are used to determine the severity of FADS. Four FADS diagnostic tools developed in North America can now diagnose FAS and other FASD disorders [14]. The Guidelines for Referral and Diagnosis of "Fetal Alcohol Syndrome" from the Centers for Disease Control, which established the diagnosis of FAS in the United States but postponed addressing other FASD conditions: Canadian standards for FASD diagnosis, where it standardized the majority of variations between both the 10M as well as the University of Washington systems but also invented criteria for diagnosing FASD in Canada.

Fetal Alcohol Syndrome

For a FAS diagnosis, all of the following requirements must be satisfied:

1. Growth deficiency: parental or postnatal height or weight (or both) at or below the 10th percentile.
2. All three FAS face characteristics are present.
3. Clinically substantial anatomical, neurological, or functional disability caused by injury to the central nervous system.
4. Parental alcohol exposure: Confirmed or unknown parental alcohol exposure [15].

Differential Diagnosis

1. Aar Skog syndrome
2. William's syndrome
3. Noonan syndrome
4. Dubowitz syndrome
5. Brachman- DeLonge syndrome
6. Toluene syndrome
7. Fetal hydration syndrome
8. Maternal PKU fetal effects

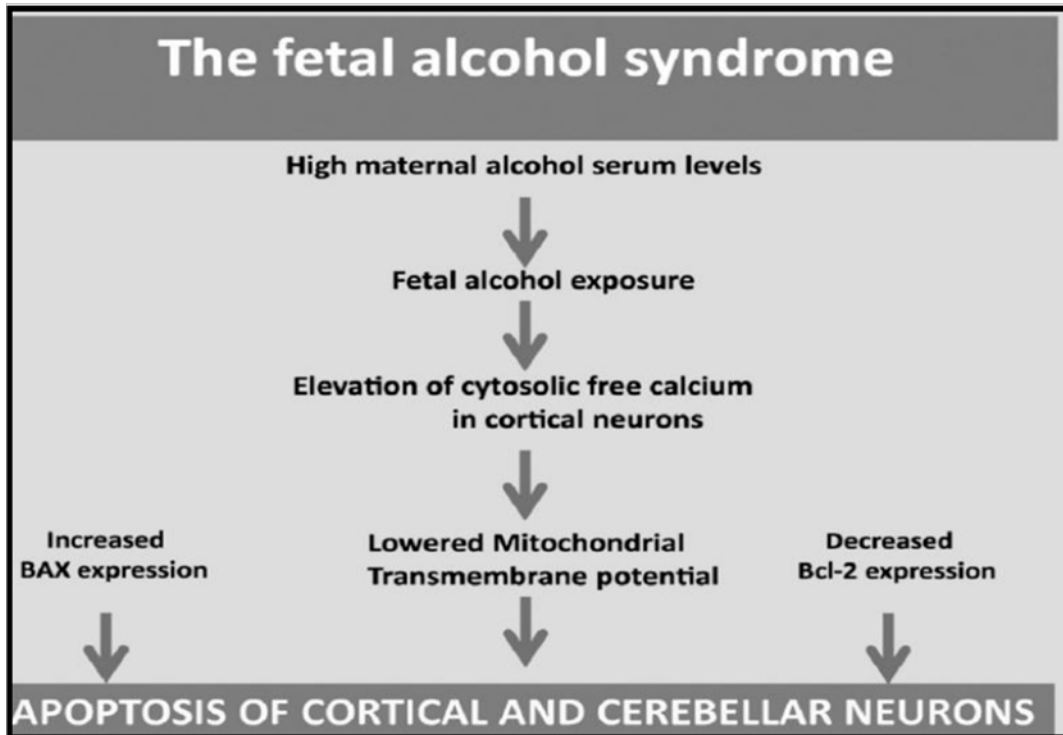


Figure 3: Apoptosis of Cortical and Cerebellar Neurons

Other conditions that have behavioral signs and may coexist with fetal alcohol spectrum disorder include [16]:

1. Disorder of attention deficit hyperactivity
2. Autism spectrum condition
3. Reactive relationship disorder
4. The fourth is an antisocial personality disorder
5. A problem with sensory processing
6. Bipolar illness
7. Depression

Due to the significant overlap between the behavioral abnormalities of ADHD and FASD, most FASD patients have frequently received the wrong diagnosis.

Signs and Symptoms

In addition, a newborn to an alcoholic mother habit may experience alcohol withdrawal after birth. Alcohol usage during pregnancy does not affect the mother’s capacity to breastfeed the baby [17].

1. Unusual facial characteristics include a ridgeless area between the top lip and nose.
2. Small head size

3. Poor memory
4. Hyperactive behavior
5. Low birth weight
6. Challenges at school (especially with math)
7. Speech and language
8. Poor judgment or logic
9. Difficulties with sleep and sucking as a baby
10. A visual or hearing issue

There are five types of FASD depending on the disorders:

1. First, fetal alcohol syndrome
2. Neurodevelopmental disorder linked to alcohol
3. Birth malformations brought on by alcohol
4. Static encephalopathy
5. Neurobehavioral Dysfunction Related to Maternal Alcohol Consumption.

Related Signs

1. Heart: A heart murmur that usually goes away by age one. Heart rhythm disorder, tetralogy of Fallot, Aortic coarctation, a ventricular septal abnormality, and atrial septal defect.

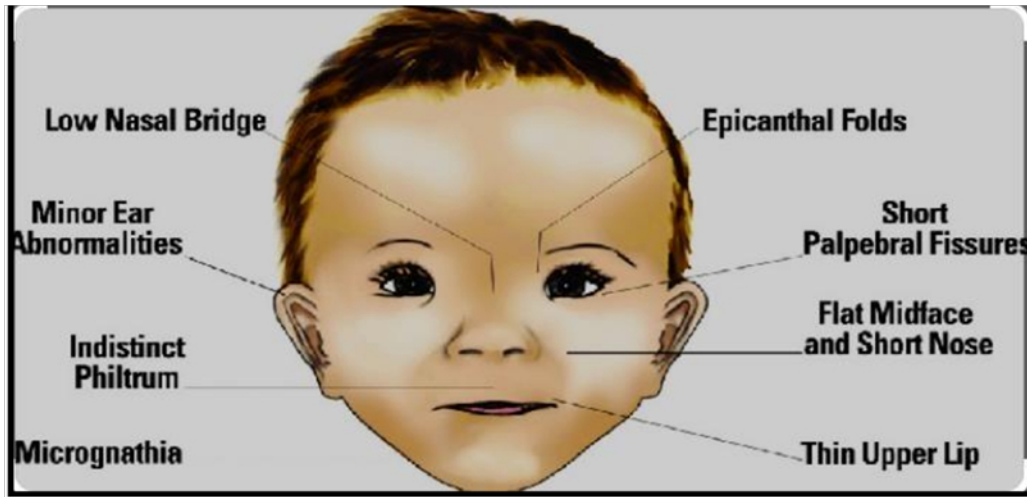


Figure 4: Diagrammatic Representation of Related Signs



Figure 5: No Alcohol During Pregnancy

2. Bones: Small fifth fingernails, small distal phalanges, changed palmar crease patterns, and joint anomalies such as aberrant location and function.
3. Kidneys: kidneys that are horseshoe-shaped, aplastic, dysplastic, or hypoplastic.
4. Eyes: Strabismus or hypoplasia of the optic nerve (which may cause light sensitivity, decreased visual acuity, or involuntary eye movements)
5. Occasionally occurring issues: Include hydrocephalus, webbed neck, ptosis of the eyelid, and microphthalmia [Figure 4].

Treatment

When a woman knows she is pregnant, she may stop drinking. However, during pregnancy, women

may have severe withdrawal symptoms from alcohol [18].

Medications

A nonselective opioid antagonist called naltrexone treats opioid use disorder and AUD. Although there is inadequate information to determine the exact risk to pregnant women, studies on animals reveal that naltrexone use during pregnancy increases the chance of early fetal loss. We don't yet know how long-term naltrexone use will affect the fetus.

Disulfiram stops relapses by preventing the metabolism of acetaldehyde, which is produced after drinking alcohol and causes headaches, nausea, and vomiting. According to specific research, using disulfiram in the first trimester increases the incidence of congenital problems like reduction deformities and cleft palate.

Furthermore, disulfiram's side effects may include hypertension, which is dangerous for pregnant

women and their fetuses.

According to American Psychiatric Association guidelines, medicines should only be used to treat acute alcohol withdrawal symptoms or other co-occurring problems in pregnant women with alcohol use disorder [19].

There are Three Approaches to the Treatment of FAS

At home: Children with FAS benefit from stable, loving environments at home that follow routines, have clear rules to obey, and offer rewards for good behavior [20].

Medication: FASD symptoms are specifically treated with medication, not the FAS itself. Antidepressants, stimulants, neuroleptics, and anti-anxiety meds are a few of the drugs used [21].

Counseling: Behavior and functional training, social skill development, and tutoring benefit children with FAS. Support groups and talk therapy benefit not only the FAS-affected children but also their parents and siblings [22].

Preventions

To prevent harm. Avoiding drinking during pregnancy is the only foolproof approach to prevent FAS. Even though a woman may not be aware that she is pregnant initially, a Surgeon General of the United States suggested that women refrain from consuming alcohol when expecting or planning a pregnancy in 1981 and again in 2005.

The "zero-tolerance" policy adopted by many nations regarding alcohol use during pregnancy has generated considerable debate. There is insufficient evidence to support FAS, and associating moderate drinking with the possibility of injury to the foetus may have detrimental social, legal, and health effects. Additionally, since the incidence and origin of this disease are frequently related to FASD, which is more prevalent and causes less harm than FAS, great care should be used when considering statistics on this condition [Figure 5] [23].

CONCLUSION

There are very few fetal alcohol spectrum disorder experts in the UK. Thus, obtaining specialist advice is restricted to the lucky few. As is the case for many, clinical service funding streams mean that for people with fetal alcohol spectrum disorders, it is not always possible to obtain what they need. Nonetheless, by recognizing the condition, obtaining sufficient early evidence and using resources locally available in collaboration with multi-professional colleagues can reap important rewards.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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