



# THE NEED FOR EDUCATIONAL REFORM CONCERNING THE PATERNAL ROLE IN FASD PATHOGENESIS

KATHRYN HUH[1], RIYA DATTA[1], HOLLY ASTROM[1]

[1] BACHELOR OF HEALTH SCIENCES (HONOURS), CLASS OF 2022, MCMASTER UNIVERSITY

## ABSTRACT

Fetal alcohol spectrum disorders (FASD) is an umbrella term for a group of neurodevelopmental impairments caused by prenatal alcohol exposure.

FASD pathogenesis often implicates the mother, largely focused on maternal alcohol consumption prior to or during pregnancy. As such, most FASD interventions are geared towards the mother. However, an array of risk factors within the family environment, notably paternal alcohol consumption and attitudes toward maternal consumption during pregnancy, can impact FASD development in the offspring. This paper sheds light on the paternal role in FASD pathogenesis that is rarely discussed and promotes the importance of family-centred interventions. FASD is a preventable disorder: prophylactic measures such as increasing the information and educational resources to reach a larger population could greatly reduce the risk and incidence of FASD.

Fetal alcohol spectrum disorders (FASD) is an umbrella term for lifelong neurodevelopmental impairments due to prenatal alcohol exposure (PAE).

[1] The FASD spectrum includes: fetal alcohol syndrome, partial fetal alcohol syndrome, alcohol-related neurodevelopmental disorder, neurobehavioural disorder associated with PAE and alcohol-related birth defects.[1] Across all five disorders, PAE leads to brain damage resulting in mild to severe physical, cognitive and/or behavioural disabilities.[2-3] Though alcohol is the main teratogen, or the agent which interrupts typical embryonic and fetal development, other maternal risk factors may exacerbate symptoms of FASD.[2,4] These include poor nutrition, lower socioeconomic status, higher maternal age, smoking or other drug use, history of depression, and number

of previous pregnancies.[2]

Lesser-known risk factors include paternal alcohol consumption, which can lead to FASD-like phenotypes in offspring.[5] In this paper we will describe the etiology of FASD and then discuss the need for more comprehensive FASD educational programs and resources for youth of all genders.

Research indicates that early diagnosis and interventions can improve a child's cognitive development as well as prevent some secondary disabilities (e.g., attention-deficit hyperactivity disorder (ADHD), depression, anxiety, and other behavioural difficulties).[6] However, the variability of FASD presentation and lack of a specific biological marker to confirm the presence of most FASD complicate the diagnostic process.[7] Currently, diagnosis includes assessment of four health parameters: growth, facial features, brain development and functioning, and exposure to alcohol in utero.[8] The data obtained are compared to defined criteria for FASD, such as those set by the Canada FASD Research Network (CanFASD). (8) Due to the irreversible damage caused to the central nervous system, there is no cure for FASD. (6) Treatment modalities may include medications to manage symptoms, behaviour and education training, and education of caregivers.[6]

## MATERNAL ALCOHOL CONSUMPTION

The fetus is exposed to alcohol through the bloodstream. [2] PAE subsequently affects the developing organ systems and brain development, leading to the typical FASD traits.[2] However, the precise mechanism by which PAE exposure causes teratogenic effects is unknown.[4] Several hypotheses have been proposed to

understand FASD's pathogenesis, including alcohol altering the regulation of gene expression, disrupting cell signaling pathways, inducing cell damage/cell death, disrupting proteins involved in glucose metabolism, transport, and cell-to-cell interactions as well as impairing placental blood flow to the fetus, resulting in fetal hypoxia.[9] Certain fetal symptoms have been associated with alcohol consumption during specific trimesters of pregnancy. First-trimester PAE is associated with an increased probability of facial and brain abnormalities.[4] Second-trimester exposure increases the incidence of spontaneous miscarriages. Third-trimester exposure causes a decreased height, weight, and brain volume.[4] Due to ethical concerns, formal studies on PAE and brain development; most of the current knowledge comes from observational, retroactive case studies and neuroimaging.[4]

## PATERNAL ALCOHOL CONSUMPTION

Studies have reported cases of mothers giving birth to children with FASD despite not having consumed alcohol during their pregnancy, indicating that other factors influence PAE.[10] Heavy paternal alcohol consumption can have detrimental effects on pregnancy, birth, and infant outcomes, many of which resemble FASD phenotypes.[5] The role of paternal alcohol consumption in the onset of FASD is under-researched, though approximately 75% of children with FASD have fathers with heavy alcohol use.[5,11] While the exact impact of each parent continues to be investigated, fathers likely play a critical role in FASD prevention.

Alcohol-affected sperm can possess harmful toxins that degrade the genetic material of the fetus, potentially leading to developmental defects.[12] Further, being around a heavy alcohol-consuming partner can increase susceptibility to maternal alcohol consumption.[12] In observational studies where preconception paternal alcohol consumption was the main factor, offspring demonstrated a wide variety of developmental, cognitive, and behavioural limitations, not unlike those traditionally seen in FASD.[12] These included: ventricular septal defects, hormonal and nervous system abnormalities, low birth weight, decreased learning and language abilities, and temperament difficulties such as ADHD.[12]

## PROVISION OF FAMILY-CENTERED RESOURCES

Studies have shown that protective factors such as a loving, nurturing and stable home environment, as well as the absence of violence in the home, can reduce the symptoms of FASD.[2] A study by Olson et al suggests the potential efficacy of collaborative problem-solving and stress-management interventions for both caregivers and children as a way of promoting strong relationships and positive family functioning.

Studies have also identified that different family types demonstrate different needs, indicating that interventions should be tailored to provide for foster, adoptive, birth or other types of families.[17]

The overarching message of FASD awareness campaigns is that it is completely preventable; this has led to FASD stigma and fails to consider other pertinent risk factors. [13] Despite CanFASD's preventative education efforts over the past two decades, the incidence of FASD in Canadians has not decreased.[13] The Public Health Agency of Canada has synthesized a four-part prevention framework that highlights the complex continuum of FASD: broad-based awareness and health intervention, discussing alcohol use with women of childbearing age, providing care and treatment to women at highest risk, and postpartum support for mothers.[14] Though this multilevel initiative reflects evidence-based practices and considers the diverse needs of women, there are no opportunities for fathers to access similar education and support.[15]

Emerging research on paternal risk factors indicates the potential benefits of targeting educational programming at men of reproductive age and families as a whole. Research from CanFASD demonstrates that awareness campaigns encourage information seeking, help shift attitudes and beliefs and spread awareness about where to find support services.[16] Therefore implementing broad awareness campaigns in different locations, such as high schools, post-secondary institutions, and alcohol-serving institutions could drive information-seeking behaviour.

## CONCLUSION

FASD research and interventions are commonly centred around the mother. However, studies show that the partner plays an integral role in mitigating the risk of PAE. Shifting the target audience for information provision of FASD to families, men and women of reproductive age could help improve awareness of FASD and thus reduce its prevalence.

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