Fetal Alcohol Spectrum Disorder (FASD)

Background

Alcohol use during pregnancy can have a significant impact on the health of the unborn child. It is estimated that more than 10,000 children are born in Germany each year with impairments attributable to maternal alcohol use during pregnancy[11]. This results in lifelong physical and mental impairments as well as behavioral problems in the children.

The impairments are summarized under the umbrella term FASD (fetal alcohol spectrum disorder); the most severe form is the fetal alcohol syndrome (FAS) (Fig. 1)[17]. Unlike other birth defects, FASD is completely preventable by consistent abstinence from alcohol during pregnancy.

Causes

Alcohol passes from maternal bloodstream through the placenta and into the organism of the unborn child[3]. Alcohol is metabolized much more slowly in the fetus than in the mother's body because its metabolic system is not yet developed and alcohol is also absorbed from the amniotic fluid[2]. This has a wide range of effects on the immature fetus[6,14,16]. Alcohol and its toxic and carcinogenic metabolite acetaldehyde interfere with cell division and affect the development of the organs, especially the brain[4].

Impairment of the child depends on the amount and timing of maternal alcohol use during pregnancy[13]. Although binge

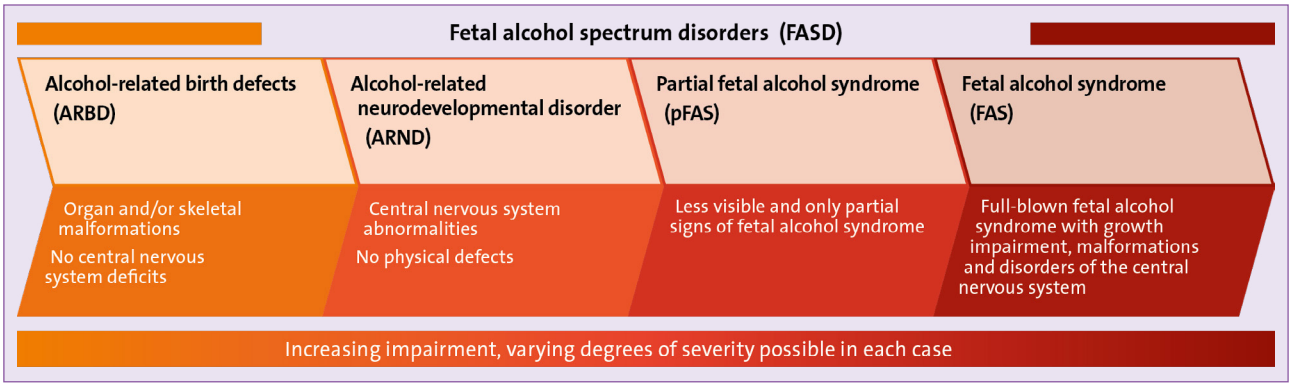

Figure 1: Gradations of fetal alcohol spectrum disorders. Source: Deutsches Krebsforschungszentrum 2022[5]. Illustration: German Cancer Research Center, Cancer Prevention Unit, 2023

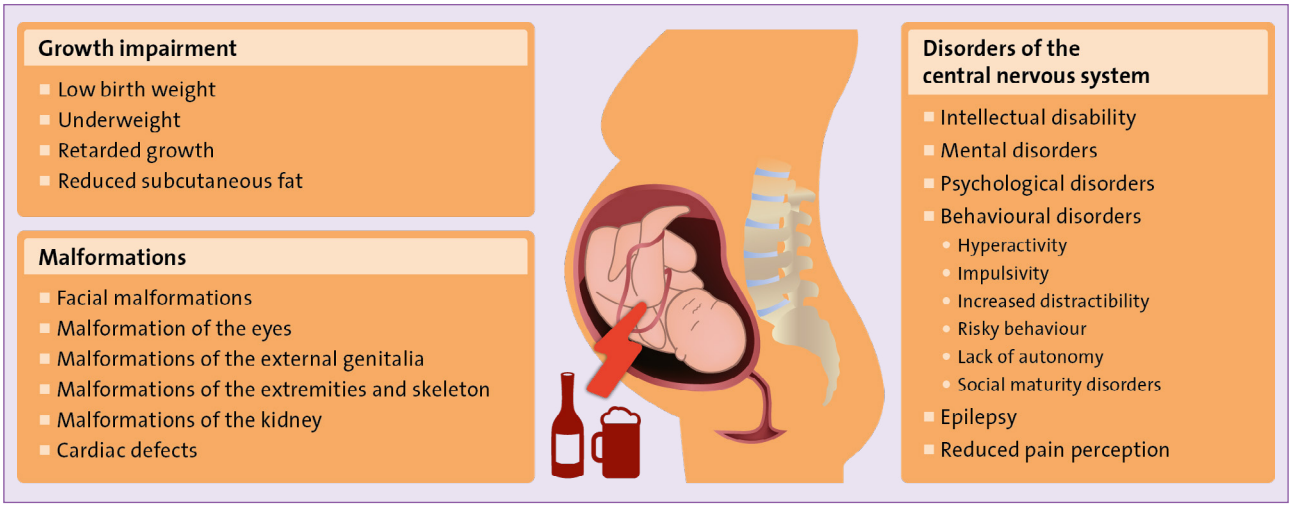

Figure 2: Effects of alcohol use during pregnancy on the fetus and long-term consequences for physical and mental development. Source: Deutsches Krebsforschungszentrum 2022[5]. Illustration: German Cancer Research Center, Cancer Prevention Unit, 2023

drinking during pregnancy bears the greatest risk of serious health effects for the unborn child, there is no known safe amount of alcohol use during pregnancy. Any alcohol consumption, even in small amounts, at any time during pregnancy can cause irreversible health problems and lead to FASD[13].

Therefore, for pregnant women applies: No alcohol! Any amount of alcohol is harmful – at any stage of pregnancy.

Symptoms

Children may show a variety of symptoms that, taken together, are typical for FASD (Fig. 2).[12,14,18,19]

The full clinical picture is relatively rare. For example, the typical facial features (small palpebral fissures, smooth philtrum, thin upper lip) occur in only 20 to 30 per cent of cases[5]. Maternal alcohol use can affect the development of the fetus's brain and change its structure. This can lead to disorders in the child's mental development[13,14,16]. These permanent changes to the brain are far more common than visible physical changes and are often recognized late. There are also changes to genes (epigenetic changes) that last a lifetime and can be passed on to future generations[1,8,10].

In addition to the direct effects of alcohol on the fetus, there may be several co-morbidities such as attention deficit hyperactivity disorder (ADHD), addiction and depression[15].

There is no cure for FASD. Diagnosis at the earliest possible stage and individualized therapy, such as physiotherapy, speech therapy or occupational therapy, can reduce the incidence of health effects and provide support for those affected[7,13]. The impairment and behavioral problems have a serious impact on patients' lives (Fig. 3). In many cases, people suffering from FASD require lifelong support from family members and support services, including health care, social care and special education. FASD affects both the person affected and their family[9,14].

Conclusion

FASD is one ofthe most common congenital diseases, but could be prevented to 100 per cent. It is caused by maternal alcohol use during pregnancy. FASD is an umbrella term for congenital malformations, developmental and growth disorders, mental and physical impairment and behavioral problems of varying severity. The effects are irreversible, incurable and last a lifetime. Abstinence from alcohol throughout pregnancy is the only and 100 per cent effective preventive measure.

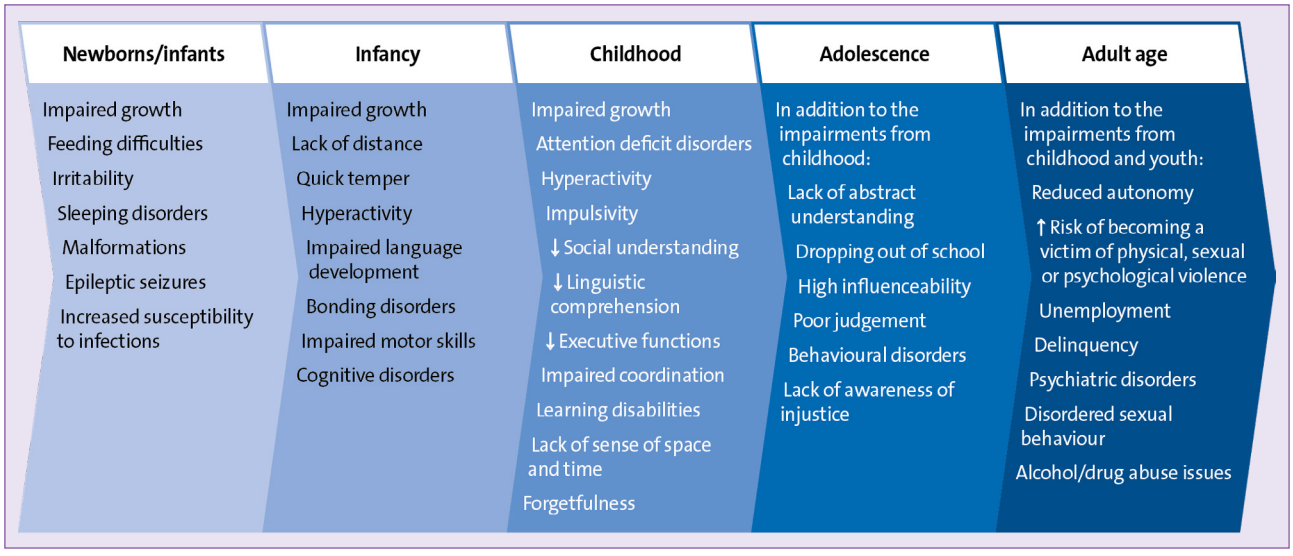

Figure 3: Symptoms of fetal alcohol syndrome in the various stages of life. Source: Deutsches Krebsforschungszentrum 2022[5]. Illustration: German Cancer Research Center, Cancer Prevention Unit, 2023

Imprint

Authors: Dipl.-Biol. Andy Hartard, Dr. Katrin Schaller

Layout, illustration, typesetting: Dipl.-Biol. Sarah Kahnert

Suggested citation: German Cancer Research Center (2023) Fetal Alcohol Spectrum Disorder (FASD). Facts on Alcohol, Heidelberg

Responsible for the content:
Dr. Katrin Schaller
German Cancer Research Center (DKFZ)
Cancer Prevention Unit and
WHO Collaborating Centre for Tobacco Control
Im Neuenheimer Feld 280
D-69120 Heidelberg
Phone: +49 (0)6221 42 30 07 | E-Mail: who-cc@dkfz.de

Translated from German with the assistance of DeepL.

This publication is available online at:
https://www.dkfz.de/en/krebspraevention/Downloads/1_Books-Reports-Brochures-Factsheets.html.

References

1 Basavarajappa BS (2023) Epigenetics in fetal alcohol spectrum disorder. Prog Mol Biol Transl Sci 197: 211–239

2 Burd L, Blair J & Dropps K (2012) Prenatal alcohol exposure, blood alcohol concentrations and alcohol elimination rates for the mother, fetus and newborn. J Perinatol 32: 652–659

3 Burd L, Roberts D, Olson M & Odendaal H (2007) Ethanol and the placenta: A review. J Matern Fetal Neonatal Med 20: 361–375

4 Caputo C, Wood E & Jabbour L (2016) Impact of fetal alcohol exposure on body systems: A systematic review. Birth Defects Res C Embryo Today 108: 174–180

5 Deutsches Krebsforschungszentrum (2022) Alkoholatlas Deutschland 2022. Pabst Science Publishers, Lengerich

6 Ehrhart F, Roozen S, Verbeek J, Koek G, Kok G, van Kranen H, Evelo CT & Curfs LMG (2019) Review and gap analysis: Molecular pathways leading to fetal alcohol spectrum disorders. Mol Psychiatry 24: 10–17

7 FASD Deutschland e.V. (2020) Lebenslang durch Alkohol. FASD Deutschland e.V., Lingen

8 Gutherz OR, Deyssenroth M, Li Q, Hao K, Jacobson JL, Chen J, Jacobson SW & Carter RC (2022) Potential roles of imprinted genes in the teratogenic effects of alcohol on the placenta, somatic growth, and the developing brain. Exp Neurol 347: 113919

9 Ilchena C, Slayen C, Rennie S, Cheung K, Gaulke T & Theule J (2023) Parenting stress and FASD: A scoping review. Res Dev Disabil 137: 104498

10 Kaminen-Ahola N (2020) Fetal alcohol spectrum disorders: Genetic and epigenetic mechanisms. Prenat Diagn 40: 1185–1192

11 Kraus L, Seitz NN, Shield KD, Gmel G & Rehm J (2019) Quantifying harms to others due to alcohol consumption in Germany: A register-based study. BMC Med 17: 59

12 Landgraf MN & Heinen F (2016) S3-Leitlinie: Diagnose der Fetalen Alkoholspektrumstörungen FASD. Langfassung, AWMF-Registernr: 022-025 (in Überarbeitung)

13 Popova S, Charness ME, Burd L, Crawford A, Hoyme HE, Mukherjee RAS, Riley EP & Elliott EJ (2023) Fetal alcohol spectrum disorders. Nat Rev Dis Primers 9: 11

14 Popova S, Dozet D, Shield K, Rehm J & Burd L (2021) Alcohol's Impact on the Fetus. Nutrients 13: 3452

15 Popova S, Lange S, Shield K, Mihic A, Chudley AE, Mukherjee RAS, Bekmuradov D & Rehm J (2016) Comorbidity of fetal alcohol spectrum disorder: a systematic review and meta-analysis. Lancet 387: 978–987

16 Preedy VR (2019) Neuroscience of alcohol: Mechanisms and treatment. Academic Press

17 Spohr H-L (2016) Das Fetale Alkoholsyndrom: Im Kindes- und Erwachsenenalter. De Gruyter, Berlin, Boston

18 Tsang TW, Finlay-Jones A, Perry K, Grigg JR, Popova S, Cheung MMY, Bower C, Tam P, Jamieson RV & Elliott EJ (2023) Eye abnormalities in children with fetal alcohol spectrum disorders: A systematic review. Ophthalmic Epidemiol 30: 340–351

19 Zhang S, Wang L, Yang T, Chen L, Zhao L, Wang T, Chen L, Ye Z, Zheng Z & Qin J (2020) Parental alcohol consumption and the risk of congenital heart diseases in offspring: An updated systematic review and meta-analysis. Eur J Prev Cardiol 27: 410–421