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EFFECT OF FLUORIDE IN DOWN SYNDROME BIRTHS

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Abstract: It has been suggested that the fluoridation of drinking water and the prevalence of Down syndrome are positively correlated. Young women are believed to exhibit this link the most. Many researchers worked and found out that there is some relation between Down syndrome births and fluoridation. Hence, the data on congenital abnormalities were examined from various resources. According to some studies, the problem was with water sources as these were found to be fluoridated and, in some cities, these had inadequate fluoride levels. In cities with fluoridated water supplies and those without, the prevalence of Down syndrome was comparable. Furthermore, some studies suggested that there was no evidence for a relationship particular to maternal age. The objective of this review is to look at the data supporting a link between Down's syndrome and water fluoride levels.

Keywords: Down syndrome; Fluoride; Maternal age; Meiosis; Non disjunction.

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INTRODUCTION

Mongolism, trisomy 21, trisomy G, and other words are also used to refer to Down syndrome. The first account of a youngster with what appeared to be Down syndrome was given by Esquirol in 1838. Eight years later, Seguin wrote about a patient who appeared to have characteristics of the defect that would subsequently be referred to as Down syndrome (Desai, 1997). Down syndrome is a readily identifiable congenital, autosomal (non-sex chromosomal) defect that affects 1 in 600 to 1 in 1000 live births and is characterized by global growth inadequacy and mental deficiency. The extra chromosome 21, present in approximately 95% of Down syndrome patients, results in a chromosomal count of 47 instead of the normal 46. Other chromosomal abnormalities, such as translocation (3%) and mosaicism (2%) or partial trisomy, account for the remaining 5 % (Desai, 1997). The cause of Down syndrome is the non-disjunction of chromosome 21 which occurs most frequently in the oocyte and can happen at two different times: either before the first meiosis is complete or right before ovulation in about 90% of cases (Whiting *et al*., 2001). Some have said that fluoridation of drinking water as one of the greatest public health success stories of the century, while others have decried it as an intrusion on personal freedom. There is no longer any debate as to how effective fluoride is at preventing dental cavities, yet it has frequently been questioned whether drinking water with 1 ppm fluoride for an extended period of time is safe. An important societal concern is whether ingesting fluoride increases the development of Down syndrome (Needleman *et al*., 1974). Rapaport is credited with making the initial claim that there is a connection between the

prevalence of Down syndrome (DS) and the amount of fluoride in drinking water (Erickson, 1980). The dearth of data illustrates how challenging it is to determine with any level of accuracy how common Down syndrome is in a given geographic location. Rapaport's findings, in which the prevalence rate of down syndrome at birth was less than half of surveys with meticulous case ascertainment, have been heavily criticized for them under ascertainment of cases (Needleman *et al*., 1974).

ASSOCIATION OF FLUORIDE AND DOWN SYNDROME BIRTH

Various studies have suggested that environment plays an integral part in causing chromosomal anomalies. As mentioned above, trisomy of chromosome 21 or Down syndrome births happen because of chromosomal non disjunction, but still some factors lead to an extra chromosome. Even if they are debatable, the epidemiological evidence supporting the link between the birth of people with Down syndrome and environmental contamination is also surprisingly strong. An increased incidence of Down syndrome births is known to follow several pollution incidents in a contaminated area. For instance, according to one study in the America, reports from the 1950s raised the possibility that fluoridating water supplies would increase the number of babies born with Down syndrome (Olagunju *et al*., 2021).

The newborn prevalence rates of DS for Massachusetts citizens consuming fluoridated and non-fluoridated water were examined. Nearly every child with DS born alive in Massachusetts during the 17-year period 1950-1966 was included in the observations. It was discovered that both fluoride-related newborns and suitable comparison groups had a rate of 1.5 cases per 1000 births. There were no differences in the incidence of maternal age-specific DS between fluoridated and non-fluoridated areas, according to an analysis of data from 51 American cities. There were no differences in the incidence of maternal age-specific DS between fluoridated and non-fluoridated areas, according to an analysis of data from 51 American cities (Olagunju *et al.,* 2021). Additionally, in a very intriguing study, James et al. (1999) reported the first evidence of a potential link between single nucleotide polymorphisms (SNPs) in genes involved in the folate metabolic pathway and the mother's chance of giving birth to a child with Down syndrome (DS) (Coppedè, 2016). Furthermore, other studies claimed that communities with fluoridated water supplies have generally higher incidences of Down syndrome are unfounded. The idea that there might be a maternal age specific effect is also not supported by most of the research. In the recent data, it is discovered that the fluoridated areas had higher rates among young mother and lower rates among older mothers (Erickson, 1980).

FLUORIDE TOXICITY

Among all studies of Down syndrome, there has been one on fluoride toxicity. Fluoride has been introduced to drinking water in many nations since the 1940s in an effort to lower dental caries. Fluoride's advantages and disadvantages continue to be among the most frequently discussed subjects in the area of public health today. In recent years, there have been more scientific publications and news reports about the potential negative health impacts of fluoride. Some of these reports strongly advise against consuming any fluoride; especially while pregnant (Guth *et al*., 2020). The reason for this was to protect pregnant women from the fluoride aftereffects. There is always a high risk that fluoride consumption will result in brain problems. In one of the studies by Green *et al.* (2019) children's IQs are displayed in scatter graphs of maternal urinary fluoride concentration versus IQ. In this instance, male children exhibit a decline in IQ with rising maternal urinary fluoride concentrations, whereas female children exhibit an unremarkable rise. In addition, it should be noted that, compared to the mean difference of about 5 between boys and girls, the impact of fluoride on boys' IQ (an increase from the 10th to the 90th percentile of maternal urinary fluoride

concentration) is relatively small, at 3.14 (Green *et al.,* 2019).

CONCLUSION

Given that Down syndrome is caused by a chromosomal non-disjunction and that the first meiotic division starts in the uterus, it is reasonable for the disorder to be linked to an improper development. Studies conducted in the early and middle 1950s concluded that it is a possibility of women getting exposed while carrying the child, leaving aside the potentially serious issues brought on by migration. Moreover, there is evidence that maternal age has a significant impact on the prevalence of Down's syndrome. Maternal exposure to other sources of fluoride, such as fluoridated toothpaste, mouthwashes, and fluoride tablets, may also have an impact on the relationship between the level of fluoride in the water and the likelihood that a child would develop Down's syndrome. On contrary, according to research needs, more investigation is necessary for a thorough assessment of association of fluoride during Down syndrome births. Human exposure to fluoride has been studied in the past, but it is advised to systematically analyze the fluoride content of foods, beverages, and water for human consumption using a standardized methodology to enable more accurate assessments of total fluoride intake and of fluoride intake from different sources. Furthermore, a comprehensive evaluation of exposure could benefit from the validation of biomarkers for both actual and chronic fluoride intake

REFERENCES

Coppedè F. (2016). Risk factors for Down syndrome. *Archives of Toxicology*, *90*(12):2917-2929.

Desai S.S. (1997). Down syndrome: a review of the literature. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *84*(3):279-285.

Deps T.D., Angelo G.L., Martins C.C., Paiva S.M., Pordeus, I.A., Borges-Oliveira A.C. (2015). Association between dental caries and Down syndrome: a systematic review and meta-analysis. *PLoS One*, *10*(6):1-11.

Erickson J.D. (1980). Down syndrome, water fluoridation and maternal age. *Teratology*, *21*(2):177-180.

Guth S., Hüser S., Roth A., Degen G., Diel P., Edlund K., Hengstler J.G. (2020). Toxicity of fluoride: critical evaluation of evidence for human developmental neurotoxicity in epidemiological studies, animal experiments and in vitro analyses. *Archives of Toxicology*, 94(5):1375-1415.

Green R., Lanphear B., Hornung R., Flora D., Martinez-Mier, E.A., Neufeld R., Till C. (2019). Association between maternal fluoride exposure during pregnancy and IQ scores in offspring in Canada. *JAMA Pediatrics*, *173*(10):940-948.

Kaminsky L.S., Mahoney, M.C., Leach J., Melius J., Jo Miller M. (1990). Fluoride: benefits and risks of exposure. *Critical Reviews in Oral Biology & Medicine*, *1*(4):261-281.

Needleman H.L., Pueschel S.M., Rothman K.J. (1974). Fluoridation and the occurrence of Down's syndrome. *New England Journal of Medicin*e, 291(16):821-823.

Olagunju A.R.A., Masud M.A. (2021). From the Genesis of Down Syndrome: What we know and what we still need to know. *Clin Psychiatry*, 7(1:77):1-5.

Takahashi K. (1998). Fluoride-linked Down syndrome births and their estimated occurrence due to water fluoridation. *Fluoride*, *31*(2):61-73.

Whiting P., McDonagh M., Kleijnen J. (2001). Association of Down's syndrome and water fluoride level: a systematic review of the evidence. *BMC Public Health*, *1*(1):1-8.

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