Vol 5, Issue 9, September 2025 www.ijesti.com E-ISSN: 2582-9734
International Journal of Engineering, Science, Technology and Innovation (IJESTI)

Evaluation of Dental Fluorosis Prevalence and Child Perceptions in the Context of Fluoride Levels

Pavan Kumar Namdeo [1], Dr. Neelu Jain [2]

[1, 2] Department of Chemistry, Mansarovar Global University, Sehore, M.P., India.

ABSTRACT

This research provides significant evidence that the correlation between dental fluorosis in children and the concentration of fluoride in drinking water is maintained by examining 140 children who are twelve years old. At appropriate concentrations, fluoride is helpful for preventing cavities; nevertheless, it becomes toxic when used in excess, particularly during the crucial periods of tooth formation. The results show that fluorosis, in moderate to severe forms, is more common in children whose drinking water has fluoride levels over 1.0 mg/L. The major factor that determines an individual's sensitivity is the fluoride content in their water, but environmental, social, and nutritional variables all play a role. Particularly in areas with naturally high concentrations, the findings stress the critical requirement of constantly monitoring and controlling fluoride levels in public water sources. Reducing the danger of fluorosis while keeping the caries-preventive effects of fluoride requires public health initiatives such as defluoridation techniques, parental education, and regular dental checkups. Protecting children's oral health, avoiding dental fluorosis, and ensuring fluoride continues to give its intended advantages without harmful consequences all depend on achieving an ideal balance in fluoride exposure. The long-term oral health results for the population may be significantly improved with this balanced approach.

Keywords: *Dental Fluorosis, Fluoride Levels, Prevalence, Child Perception, Enamel Defects.*

I. INTRODUCTION

Dental fluorosis occurs when a person consumes an excessive amount of fluoride during the formative years of their teeth, usually between the ages of one and eight, which disrupts the normal growth of their tooth enamel. Even while fluoride helps prevent tooth cavities, too much of it may cause hypomineralization, which shows up as discolored enamel, pitting, and surface abnormalities. Variations in environmental exposure, dietary habits, community fluoridation methods, and the quantity of fluoride in drinking water are the main factors that contribute to the vast regional variation in the prevalence of dental fluorosis. Naturally occurring fluoride levels often above the prescribed limits in many locations where groundwater is the main supply of drinking water, creating a major public health problem about fluorosis. Effective preventative and instructional methods for dental fluorosis must be based on a thorough understanding of the condition's prevalence as well as the perspectives of children who have been afflicted.

One of the main causes of fluorosis in developing nations is the presence of high levels of fluoride in groundwater. Millions of Indians live in areas prone to fluorosis, where the natural fluoride level could be higher than the 1.5 ppm advised by the WHO. People are more likely to develop dental fluorosis and, in extreme circumstances, skeletal fluorosis if they drink water from these sources for an extended period of time. The enamel of children's teeth is still forming, making them more susceptible to the harmful effects of fluoride since it easily penetrates the mineralizing structures of their teeth. This highlights the continued need of tracking children's early exposure to fluoride and determining its effects on dental health.

From little white spots to noticeable brown discoloration and even structural enamel loss, dental fluorosis may manifest in a wide range of ways. Moderate to severe fluorosis may have a profound impact on a child's psychological and social health, even if milder versions may go unrecognized or even be considered cosmetically acceptable. Interpersonal relationships, peer acceptability, and self-confidence are significantly impacted by the way a child's teeth seem while they are in school. People may avoid smiling or engaging in other oral activities because of shame, social isolation, or scarred or stained teeth. Consequently, the social and personal experiences of impacted children should be taken into account alongside the clinical severity.

Parents, educators, and doctors may have different views about dental fluorosis than children do. Young people may absorb the judgments of their classmates, experience anxiety about their teeth's look, or develop a sense of uniqueness as a result. As a result, children who have tooth discoloration as a result of fluorosis may feel shame, stigma, or misunderstanding in communities where the condition is misunderstood. In order to reduce psychological effect and improve oral health literacy, it is helpful to understand their perspectives in order to develop culturally relevant therapies. There are other potential sources of fluoride exposure than water.

Fluoridated toothpaste, nutritional supplements, processed foods, tea, and industrial pollutants are some of the other sources that add to the overall consumption. Thus, it is essential to include all potential sources of fluoride exposure when assessing the incidence of fluorosis. Because of the interplay between dietary status, water consumption, and weather circumstances that can lead to increased water consumption, the risk increases in places with high levels of natural fluoride. Thus, in order to prevent tooth decay, public health policies should weigh the advantages of fluoride against the dangers of excessive exposure.

Community health planners may benefit greatly from the epidemiological insights gained by analyzing the correlation between fluoride levels and the incidence of dental fluorosis. Finding vulnerable people, analyzing distribution patterns, and identifying high-risk zones are all aided by this kind of assessment. At the same time, beyond the clinical symptoms, a more complete picture of the situation may be shown by include children's perspectives and stories. Policies regarding water fluoridation, defluoridation methods, community awareness campaigns, and oral health initiatives in schools must be created with this dual emphasis.

Due to the complex nature of fluorosis, it is essential to conduct a thorough examination that includes psychological testing, clinical diagnosis, and fluoride concentration mapping. With this method, health officials may organize specific measures, such as alternatives to unsafe water supplies, community education, early screening, and cosmetic treatments for impacted children. Public health officials, dentists, environmental specialists, teachers, and members of the community must work together to combat dental fluorosis.

Impact of Fluoride on Child Oral Health

The effects of fluoride on children's dental health are multifaceted and consequential. Although it aids tooth preservation, dental fluorosis may occur if there is an excess of it. Because it aids in remineralization of enamel, halts demineralization, and slows down the development of bacteria that cause cavities, fluoride is believed to be essential for preventing dental caries when levels are appropriate. Various public health initiatives have been launched worldwide to support the oral health of children. Community water fluoridation, toothpaste with fluoride, and topical fluoride treatments are all examples of this.

Nevertheless, the beneficial benefits of fluoride are highly dependent on three factors: the amount of fluoride present, the frequency of exposure, and the age of your teeth. During the period when enamel is developing (often up to eight years old), dental fluorosis may occur when the body's fluoride levels are higher than recommended. This irreversible condition is characterized by changes in the appearance of enamel. Therefore,

it is critical to utilize fluoride effectively to maintain the balance between its protective and harmful effects on children's oral health, even if it remains an essential component of preventive dentistry.

Naturally occurring fluoride levels may exceed safe limits in many areas, especially in rural towns that rely on groundwater. In these situations, children are constantly exposed to fluoride via their water supply, food grown in soil that has been fluoridated, and common oral hygiene items. The normal process of enamel mineralization can be disrupted by this much exposure. Depending on the severity of fluorosis, enamel may develop pitting, dark brown stains, or barely visible white streaks. It is crucial that parents, schools, and physicians all be able to recognize the early signs of fluorosis. Understanding the effects of fluoride on children's oral health requires considering both its beneficial role in avoiding cavities and the potential harm that excessive fluoride exposure may cause to enamel. As more people become aware of the need of fluoride, it is crucial to educate families on how much fluoride their children should take and where to acquire it. This will help prevent dental cavities and fluorosis.

- **Health Effects**

The negative impacts of fluoride on children's health go much beyond the cosmetic alterations that may occur in their teeth. It is especially important for children, whose teeth are still developing and whose diets may contain plenty of sweet foods, to have enough fluoride levels since this promotes stronger and more decay-resistant enamel. Using fluoridated toothpaste or drinking water with the necessary amount of fluoride usually results in fewer cavities, less tooth discomfort, less infection risk, and better oral functionality for children. This has a beneficial impact on dietary consumption, language development, and overall health. Restorative procedures can be expensive and out of reach for underprivileged populations, but fluoride helps keep teeth structurally sound.

The first and most obvious sign of systemic fluoride toxicity occurs when fluoride consumption exceeds the prescribed limit, and this is known as dental fluorosis. Often seen as only a cosmetic issue, mild fluorosis manifests as little opaque white spots or streaks on enamel. However, dental structure can be severely compromised by mild to severe fluorosis, which causes enamel to become fragile, lose its integrity, discolor, and develop surface pitting. In contrast to fluoride's protective function, these abnormalities make teeth more vulnerable to dental caries. Teeth become more susceptible to wear and breakage when enamel becomes porous and weak in extreme instances.

Over time, consuming too much fluoride might have consequences for more than just your teeth. Skeletal fluorosis, brought on by the buildup of fluoride in bones, can lead to discomfort, stiffness, and decreased mobility. It is a disorder that is linked to chronic exposure to extremely high doses of fluoride. Joint pain or stiffness may be early symptoms of skeletal fluorosis in areas with high levels of fluoride exposure, albeit this condition is more common in adults. The possible effects of fluoride on neurodevelopment are also a topic of ongoing scientific controversy. The data is not conclusive and varies depending on the exposure source, measuring techniques, and concomitant environmental variables; nonetheless, several studies have connected high fluoride exposure during early life to mild cognitive consequences. However, these results highlight the need to keep an eye on fluoride levels and make sure that overexposure is caught early enough to avoid any long-term problems.

Therefore, fluoride has both positive and negative health impacts; it is useful at optimal amounts but toxic at excessive ones. Fluoride levels in water should be monitored regularly, parents should be instructed on how to properly use fluoridated toothpaste, and community outreach initiatives should be implemented. Obtaining the ideal dosage of fluoride for children's dental and general health requires health officials to weigh the benefits of prevention against any hazards.

- **Psychosocial Concerns Among Children**

The psychological and social health of children are profoundly affected by dental fluorosis, much more so than their physical health, especially in cases of moderate to severe disease. Any change in look, particularly on the exposed front teeth, can have major psychological effects, especially during childhood when self-esteem, social skills, and emotional resilience are still forming. Because fluorosis causes noticeable stains, discolouration, or pitting, children may feel embarrassed or self-conscious about their illness. Fearing their classmates' judgment, they may be reluctant to smile, engage in social contacts, or speak freely.

A child's self-image is greatly influenced by how their peers see them. Children of school age frequently experience bullying, discrimination, or comments regarding their teeth, which can cause them to isolate themselves, take less part in class activities, and be hesitant to speak up in group projects. Academic achievement and general school participation may be impacted by this emotional load. Children who have visible dental abnormalities are more likely to experience low self-esteem, anxiety, and social isolation, according to the research. If counseling, therapy, or supportive measures are not implemented, the psychological damage might continue throughout adolescence and adulthood.

In addition, children who have visible fluorosis typically have a worse oral health-related quality of life (OHRQoL). Individuals with social anxiety disorder may be reticent to smile for pictures, talk in front of groups, or meet new individuals. Their feeling of self and belonging might be impacted and their emotional development stunted by this self-imposed social constraint. Children may experience emotions of shame or inadequacy if they mistake fluorosis for a symptom of bad personal cleanliness. When children have trouble fitting in socially due to their teeth, it may be upsetting and frustrating for parents as well.

There are societal and familial dimensions to the psychological difficulties. Some families may feel powerless or even responsible for the disease if they are unaware of the hazards associated with fluoride. Children afflicted with fluorosis may still encounter prejudice in mixed-race communities, even though shared experiences help to lessen stigma in regions where the disease is common. A parent's mental health may suffer even more if they avoid therapy out of shame or guilt.

More than just therapeutic intervention is needed to tackle these psychological issues. Aesthetic correction procedures like microabrasion, bleaching, or veneers can help restore both appearance and confidence. Other options include counseling services, community education, and school-based awareness initiatives. It is equally important to promote inclusive educational environments and encourage healthy peer connections in order to help afflicted youngsters. Although medical management of dental fluorosis is important, the ultimate objective is for children to overcome the effects of excessive fluoride exposure by being emotionally, socially, and psychologically robust.

II. LITERATURE REVIEW

Arbab, Kanwal et al., (2022) Oral health difficulties, such as dental disorders, were associated with teen absences from class. Teens' Oral Health-related Quality of Life (OHRQoL) is negatively impacted by gingivitis and periodontal disease, but not by severe traumas. The purpose of this study was to examine the effects of dental fluorosis on the quality of life and everyday performance of children and adolescents (aged 11–14) in relation to the oral state. Between February 2021 and March 2022, researchers in Peshawar, Pakistan, examined the impact of DF on occupational health-related quality of life (OHRQoL) among students in the 11–14 age groups living in fluoridated areas. The study's participants were 240 school-aged youngsters from Peshawar, ranging in age from 11 to 14. In highly fluoridated regions, the

average CS OIDP score was 38.84. It also shows that students had the most difficulty with eating (3.14), and the most difficulty with socialising (7.87), on average. The results of this study should prompt dental professionals to investigate population trends at the county and municipal levels in order to better understand the causes of dental problems, the factors that put people at risk, and the best ways to treat and prevent them.

Balamurali, Nivaditha et al., (2020) Dental fluorosis is reportedly more common in Southern India. Dental fluorosis affected 87.7 percent of school-aged children in the Madurai district of Tamil Nadu. The current study's overarching goal is to learn how dental fluorosis affects the academic performance of school-aged youngsters (12–14 years old). Using the Thylstrup-Fejerskov index, 693 students from four separate schools were evaluated for the presence and severity of dental fluorosis. Examining students' knowledge of dental fluorosis, their attendance in class, their aesthetic impressions of the condition, and their friends' attitudes toward their teeth were all part of the evaluation process. To determine if dental fluorosis affected academic achievement, researchers used the nonparametric Mann-Whitney U and Kruskal-Wallis tests. There has to be more controlled research on whether dental fluorosis significantly impacts academic achievement. When it came to dental fluorosis, children were more concerned about brown stains than white opacities from an aesthetic standpoint.

Moimaz, Suzely et al., (2015) this study examined the perceived level of dental fluorosis by the children tested, as well as the prevalence of the condition in 12-year-olds and its correlation with varying amounts of fluoride in the public water supply. Clinical exams and a standardized tool to measure self-perception of fluorosis were utilized to determine the prevalence of fluorosis. The research criterion was the child's region of residence since birth in relation to the water supply source. A total of 496 kids were a part of the research. Fluorosis was quite common, with the mildest forms being the most common. Most of the kids had fluorosis to some extent, but most of them didn't even notice the spots, so it seems like it didn't change their lives too much.

Naidu GM et al., (2013) Among school-aged adolescents (15–year-olds), we want to determine the prevalence and self-perception of dental fluorosis. Resources and procedures: In the Prakasam area, 840 students, aged 15–18, from 12 different schools participated in a cross-sectional survey. Data about self-perception of dental fluorosis, dental behavior, source of water and food, socio-demographic characteristics, and informed consent was collected via interviews using a pretested questionnaire after parents or legal guardians had given their assent. To assess the Deans fluorosis index, an oral examination was conducted in natural light. We employed the chi-square test as our statistical tool. The results showed that dental fluorosis affected 82.04% of the people surveyed. Of them, only 42.3% were aware of the current circumstances. Among females, only 40.50 percent are aware of dental fluorosis, compared to 47.90 percent of boys. There is no statistically significant relationship between fluorosis score and gender (chisquare (8.796); p=0.117). The town of Kanigiri has a public health concern with dental fluorosis. Since Kanigiri town, one of the worst hit areas in our nation, did not participate in any studies. In order to decrease the morbidity linked to dental fluorosis in this region, it is essential that the water be defluoridated prior to distribution.

Praveen S. Jodalli et al., (2013) To determine if there is a correlation between 12–15 year olds' perceptions and worries about dental fluorosis and scores on the Tooth Surface Index of Fluorosis (TSIF). Analyzed using a cross-sectional design. From 696 youngsters who were tested for fluorosis, 316 were chosen, all between the ages of 12 and 15, and their levels of dental fluorosis varied. Researchers used the SPADNS spectrophotometric approach to quantify fluoride levels in drinking water ranging from 2.2 to 4.5 ppm in three communities located in rural Gadag, Karnataka, India. Under natural light, the labial surface of the

upper anterior teeth of children were examined for fluorosis using the TSIF 8-point scale. Participants' understanding, perspectives, and worries were gauged by a self-administered survey. Distributions of frequencies and Spearman's correlation coefficients were used to analyze the data. Perceptions of beauty and TSIF ratings. The kids knew that fluoride was in the water and that it may hurt them. The health consequences of fluoride were known to children. Additionally, they saw dental fluorosis as an issue with appearance.

Vento-Zahra, Ethel & Vassallo, Paula. (2011) The purpose of this research was to determine the frequency of dental fluorosis in students in Gozo (a Maltese island) between the ages of 5 and 12, as well as to raise awareness about the cosmetic changes that may occur in 12-year-olds as a result of dental fluorosis of the upper central incisors. The study's methods included testing all students who were either 5 or 12 years old on their most recent birthday, as long as they met the following criteria: they were born in Gozo, had six front teeth that were not decaying or repaired, and were present at school on the day of the exam with their parents' permission papers. Thylstrup-Fejerskov (TF) Index (1978) was used for the purpose of recording observations. The ability of twelve-year-olds to recognize markings on the upper central incisors was tested. In the end, only 8 children (or 1.8% of the total) had a TF Index score of 1 among the 5-year-olds. Of the 12 year olds surveyed, 48 (14.2%) had a TF score of 1 or above. Distinct values were observed by location when analyzing the mean TF scores ($P<0.005$). Out of the 48 kids, only three (6.25%) recognized the markings on their top incisors as being caused by fluorosis. When looking at 12-year-olds in 2006, there was no correlation between mean fluoride concentration (1994-2000) and TF scores by location. There is no immediate threat to public health from fluorosis in Gozo. The evaluated youngsters had no idea that modern dental fluorosis causes cosmetic alterations.

kudlure (K.M), Sudhir et al., (2009) Students in the Nalgonda area of Andhra Pradesh, whose ages range from thirteen to fifteen, had their dental fluorosis evaluated and their incisor fluorosis compared. An analytical cross-sectional investigation was carried out. Using stratified cluster sampling, we chose a random sample of 1000 students (ranging in age from 13 to 15) from four regions with varying concentrations of naturally occurring fluoride in the water supply. When measuring fluorosis, the TF index (TFI) was used. At each of the four fluoride concentrations, the prevalence of fluorosis (a TFI score of 1 or above) was 100%. Elevated fluoride levels in water were associated with an increase in both the frequency and intensity of the problem. Maxillary and mandibular incisor teeth did not differ significantly in terms of fluorosis prevalence or severity. Even in regions with ideal fluoride levels in the water, a high incidence of mild to moderate fluorosis is observed in the Nalgonda district.

III. RESEARCH METHODOLOGY

Study Design

The cross-sectional approach is adopted in this study.

Study Population

The research included 140 students, all of them were twelve years old and hail from rural parts of Jabalpur. Since the permanent incisors, which are crucial for fluorosis evaluation, are fully erupted by the age of twelve, this age group was selected in compliance with WHO recommendations.

Research Tool

Dental fluorosis was assessed using the Modified Dean's Index, a measure that is both generally acknowledged and approved by the World Health Organization (WHO) for this purpose.

Water Sample Classification

Fluoride content was determined by analyzing water samples taken from the homes and schools of the children. These measures were used to classify youngsters into two groups: those living in places with an excess of fluoride and those without.

Statistical Analysis

We used statistical analysis to look for correlations between water fluoride levels and dental fluorosis prevalence and severity. In order to look for correlations between the categorical variables, we used chi-square tests on the two-way frequency tables.

IV. DATA ANALYSIS AND INTERPRETATION

Table 1: Distribution of The Children According to Fluorosis Level

Criterion / Level	No Fluorosis			With Fluorosis			Total n (%)
	Normal n (%)	Questionable n (%)	Very mild n (%)	Mild n (%)	Moderate n (%)	Severe n (%)	
Children n (%)	20 (14.3)	14 (10.0)	24 (17.1)	60 (42.9)	17 (12.1)	5 (3.6)	140(100%)
	58 (41.4%)			82 (58.6%)			

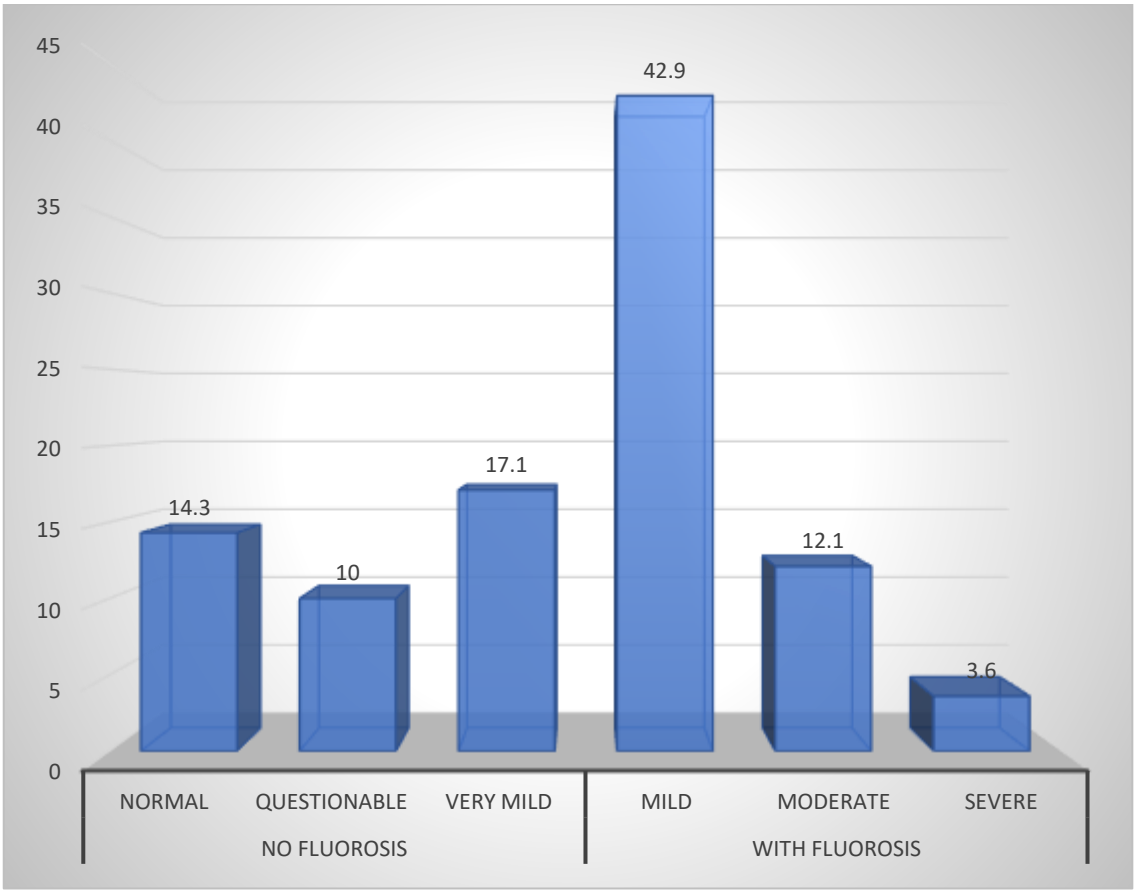

Figure 1: Distribution of The Children According to Fluorosis Level

Among the 140 children that were tested, the prevalence of dental fluorosis is displayed in Table 1. While 58 children (41.4%) showed no symptoms of fluorosis, 20 children (14.3%) were classified as "normal," and 14 children (10%) showed "questionable" alterations that do not conclusively indicate fluorosis. However, a greater number of 82 children (58.6% of the total) had fluorosis of varied degrees, indicating that the disease was rather common in this group of children. The most prevalent presentation of the afflicted children was early-stage fluorosis, with 42.9% of instances being categorized as moderate and 17.1% as very mild. Only 5.6% of the children showed signs of severe fluorosis, while 12.1% showed signs of mild fluorosis.

Table 2: Distribution of Children According to Area with and Without Excess Fluorine and Level of Fluorosis

	No Fluorosis		With Fluorosis			
Criterion / Level	**Normal n (%)**	**Questionable n (%)**	**Very mild n (%)**	**Mild n (%)**	**Moderate n (%)**	**Severe n (%)**
Fluoride excess (n = 58)	16 (27.6%)	3 (5.2%)	31 (53.4%)	6 (10.3%)	2 (3.4%)	0 (0.0%)
No fluoride excess (n = 82)	34 (41.5%)	5 (6.1%)	31 (37.8%)	11 (13.4%)	1 (1.2%)	0 (0.0%)
Total (n = 140)	50 (35.7%)	8 (5.7%)	62 (44.3%)	17 (12.1%)	3 (2.1%)	0 (0.0%)
Chi-square (χ^2)			4.811			
p-value			0.307			
Significance ($p < 0.05$)			Not Significant			

Table 2 shows the prevalence of dental fluorosis in children living in regions where the water supply is too fluoridated and in places where it is not. More over half of the 58 children living in locations with high levels of fluoride had some degree of fluorosis; the severity of the condition was rated as very mild in 53.4% of the cases, mild in 10.3%, and moderate in 3.4%. The percentage of children with perfectly healthy teeth was just 27.6%, while 5.2% had teeth that were considered dubious, suggesting possible early alterations. The distribution of the 82 children residing in regions free of excessive fluoride indicated a somewhat greater proportion of non-fluorosis cases: 41.5% were normal and 6.1% were doubtful. Though less severe, fluorosis was nevertheless evident in this group; 37.8% had very mild cases, 13.4% mild, and 1.2% moderate. After combining the two sets of data, the most common category in the sample was very mild fluorosis, which was observed in 44.3% of the children.

The lack of a statistically significant correlation between fluoride levels in the area and the severity of fluorosis is indicated by the chi-square test result ($\chi^2 = 4.811$) and associated p-value (0.307) at $p < 0.05$.

Table 3: Distribution of Children According to The Presence or Absence of Fluorosis, and Water with and Without Fluorine Excess in the Water Supply

Fluoride Concentration in Water Supply	Fluorosis Presence n (%)	Fluorosis Absence n (%)	Total n (%)
Fluoride excess	40 (68.3%)	18 (31.7%)	58 (100%)
No fluoride excess	43 (52.4%)	39 (47.6%)	82 (100%)
Total	83 (59.3%)	57 (40.7%)	140 (100%)
Chi-square (χ^2)		3.190	
p-value		0.074	
Significance ($p < 0.05$)		Not Significant	

Table 2 shows the prevalence of dental fluorosis in children living in regions where the water supply is too fluoridated and in places where it is not. More over half of the 58 children living in locations with high levels of fluoride had some degree of fluorosis; the severity of the condition was rated as very mild in 53.4% of the cases, mild in 10.3%, and moderate in 3.4%. The percentage of children with perfectly healthy teeth was just 27.6%, while 5.2% had teeth that were considered dubious, suggesting possible early alterations. The distribution of the 82 children residing in regions free of excessive fluoride indicated a somewhat greater proportion of non-fluorosis cases: 41.5% were normal and 6.1% were doubtful. Though less severe, fluorosis was nevertheless evident in this group; 37.8% had very mild cases, 13.4% mild, and 1.2% moderate. After combining the two sets of data, the most common category in the sample was very mild fluorosis, which was observed in 44.3% of the children.

The lack of a statistically significant correlation between fluoride levels in the area and the severity of fluorosis is indicated by the chi-square test result ($\chi^2 = 4.811$) and associated p-value (0.307) at $p < 0.05$.

V. CONCLUSION

Excess fluoride in drinking water was not substantially associated with the presence or severity of fluorosis, according to statistical testing, even though the disease was detected throughout a large portion of the population. Children from places with high fluoride levels had a slightly greater incidence of fluorosis, but the differences were not statistically significant. This shows that oral hygiene habits, dietary habits, and individual biological variation are other potential contributors to dental fluorosis, in addition to water fluoride. The research highlights the need of public education about the management of total fluoride exposure and the necessity for regular evaluation of fluoride levels in water sources. The results suggest that dental fluorosis is more complicated than previously thought and call for more study to identify and account for all potential causes.

REFERENCES

[1] K. Arbab, F. Fahimullah, B. Haider, H. Tahir, A. Khan, S. Khan, S. Bangash, and I. Ullah, "Evaluation of the effects of dental fluorosis (DF) on the oral health related life quality between 11–14 years school children in Peshawar, Khyber Pakhtoonkhwa," Int. J. Health Sci., vol. 2, no. 1, pp. 4486–4495, 2022.

[2] N. Balamurali, N. Thowbieck, S. Amreen, D. Chandrasekaran, K. Karthikeyan, and A. Sherwood, "Prevalence and perception of dental fluorosis among the school-going children and its impact on academic performance," Indian J. Dent. Sci., vol. 12, no. 1, pp. 1–10, 2020.

[3] S. Moimaz, O. Saliba, L. Marques, C. Garbin, and N. Saliba, "Dental fluorosis and its influence on children's life," Braz. Oral Res., vol. 29, no. 2, pp. 1–7, 2015.
[4] G. Naidu, S. Rahamthullah, R. Kopuri, Y. Kumar, S. Suman, and R. Balaga, "Prevalence and self-perception of dental fluorosis among 15-year-old school children in Prakasham district of South India," J. Int. Oral Health, vol. 5, pp. 67–71, 2013.
[5] P. S. Jodalli, A. V. Ankola, M. Hebbal, and M. Vikneshan, "Aesthetic perceptions regarding fluorosis by children from an area of endemic fluorosis in India," Community Dent. Health, vol. 30, no. 4, pp. 249–253, Dec. 2013.
[6] M. A. Harding and D. M. O'Mullane, "Water fluoridation and oral health," Acta Med. Acad., vol. 42, no. 2, pp. 131–139, Nov. 2013.
[7] M. A. Buzalaf, C. M. Moraes, K. P. Olympio, J. P. Pessan, L. T. Grizzo, T. L. Silva, et al., "Seven years of external control of fluoride levels in the public water supply in Bauru, São Paulo, Brazil," J. Appl. Oral Sci., vol. 21, no. 1, pp. 92–98, Jan.–Feb. 2013.
[8] N. Habbu, N. Joshi, M. Ramamoorthi, and V. Mabrukar, "Esthetic management of dental fluorosis," Int. J. Dental Clin., vol. 3, no. 2, pp. 80–81, 2011.
[9] E. V. Zahra and P. Vassallo, "Dental fluorosis among school children in Gozo, Malta," Oral Health Dent. Manag., vol. 10, no. 2, pp. 93–99, 2011.
[10] K. M. Sudhir, G. M. Prashant, V. V. Subba Reddy, U. Mohandas, and G. N. Chandu, "Prevalence and severity of dental fluorosis among 13- to 15-year-old school children of an area known for endemic fluorosis: Nalgonda district of Andhra Pradesh," J. Indian Soc. Pedod. Prev. Dent., vol. 27, no. 4, pp. 190–196, 2009.
[11] S. K. M. Kudlure, G. Prashant, V. Reddy, and U. Mohandas, "Prevalence and severity of dental fluorosis among 13- to 15-year-old school children of an area known for endemic fluorosis: Nalgonda district of Andhra Pradesh," J. Indian Soc. Pedod. Prev. Dent., vol. 27, no. 6, pp. 190–196, 2009.
[12] V. P. Tiano, S. A. S. Moimaz, O. Saliba, N. A. Saliba, and D. Sumida, "Fluoride intake from meals served in daycare centers in municipalities with different fluoride concentrations in the water supply," Oral Health Prev. Dent., vol. 7, no. 3, pp. 289–295, 2009.
[13] L. S. Castilho, E. F. Ferreira, and E. Perini, "Perceptions of adolescents and young people regarding endemic dental fluorosis in a rural area of Brazil: psychosocial suffering," Health Soc. Care Community, vol. 17, no. 6, pp. 557–565, Nov. 2009.
[14] S. V. Ramanaiah, M. S. Venkata, B. Rajkumar, and P. N. Sarma, "Monitoring of fluoride concentration in ground water of Prakasham district in India: Correlation with physicochemical parameters," J. Environ. Sci. Eng., vol. 48, no. 2, pp. 129–134, 2006.
[15] M. C. T. Can Güssu, P. C. Narvai, R. Castellanos Fernandez, and V. Djehizian, "Dental fluorosis in Brazil: a critical review," Cad. Saude Publica, vol. 18, no. 1, pp. 7–15, Jan.–Feb. 2002.
[16] M. G. Brandão, A. S. Peres, N. A. Saliba, and S. A. S. Moimaz, "Prevalence of dental fluorosis in school children from Marinópolis, São Paulo," Cad. Saude Publica, vol. 18, no. 3, pp. 877–881, May–Jun. 2002.
[17] S. Dahiya, A. Kaur, and N. Jain, "Prevalence of fluorosis among school children in rural area, district Bhiwani: A case study," Indian J. Environ. Health, vol. 42, pp. 192–195, 2000.
[18] W. J. Butler, V. Segreto, anREd E. Collins, "Prevalence of dental mottling in school-aged lifetime residents of 16 Texas communities," Am. J. Public Health, vol. 75, no. 12, pp. 1408–1412, 1985.