KNOWLEDGE AND PERCEPTION OF FLUORIDE IN DRINKING WATER AMONG THE POPULATION OF SUBANG JAYA, SELANGOR

Dalea Anuar[1], Shaharuddin Mohd Sham[1*]

[1]Department of Environmental and Occupational Health, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 UPM Serdang Selangor Malaysia

Corresponding author: Shaharuddin Mohd Sham; shaha@upm.edu.my; Department of Environmental and Occupational Health, Faculty of Medicine and Health Science, Universiti Putra Malaysia, 43400 UPM Serdang, Malaysia.

ABSTRACT

Objective: The objective of this study was to determine the level of knowledge and perception of fluoride in drinking water in the population of Subang Jaya, Selangor and to determine the association between knowledge and fluoride in drinking water and the sociodemographic characteristics of the Subang Jaya, Selangor.

Method: A pre-tested questionnaire that was prepared through compiling relevant questions from past related studies comprising the questionnaire of three different sections which are a) sociodemographic characteristics, b) knowledge of fluoride, and c) perception of fluoride.

Result: Most of the participants were aged 18 to 64 years old with 215 (95.1%) respondents, 139 (61.5%) female respondents, and 196 (86.7%) respondents obtained tertiary education. A significant association was found between knowledge and education level (x^2=0.00, P=0.004).

Conclusion: We discovered that most people are aware of the presence of fluoride in drinking water. However, not many are well aware of the benefits and consequences of health based on the fluoride intake. The study done was limited to drinking water as the only source of fluoride of a person. More factors of fluoride may be included in further studies.

Keywords: *Knowledge, Perception, Fluoride, Drinking Water, Subang Jaya*

1. Introduction

Fluoride is known as the product from the ionization of fluorine element that appears in white colour or possibly colourless. It possesses a bitter taste and does not have any odour to be present. Fluoride can be abundantly found in the Earth's crust such as rocks, soil, water bodies and foods (Colgate, 2021). The discovery of fluoride includes through the natural occurring water bodies such as the ocean and rivers. Water bodies with high concentrations of fluoride are associated with the remains of marine organisms that lived in the areas where they are found (Nair et al., 1984 as cited in Kitalika et al., 2018). Also, it is concentrated in tropical regions where the main source of water is wells and ground waters (Azami-Aghdash et al., 2013). A variety of sources of exposures to fluoride is through food, water and extreme usage of toothpaste. However, drinking water shows the highest prominence as the exposure to fluoride towards the public. Also, fluoride can be assessed through the practice or use of foodstuffs and also in the forms of medications such ass toothpastes, tea, tobacco, food, milk and meat (Srivastava, 2020). Fluorine is an important source of ensuring our bones are

strong and also for the prevention of any tooth decay. However, an excessive intake of fluorine can risk someone into developing health effects such as dental fluorosis, skeletal fluorosis, impact on intelligence, and disruption of thyroid gland function.

On the other hand, the production of synthetic fluoride is also possible. Fluoride encounters many different chemical products for daily use including aerosol propellants, pipe linings and refrigerants. Fluoride is consistently present in human's lives despite its concentration difference. The combination of fluoride intake from a variety of sources raises concern about its harmful effect on human health over a long period of time. Excessive exposure to fluoride might pose a higher risk primarily to the vulnerable population. Fluoride is one of the halides that is highly present in granitic terrains most probably causing adverse health effects when consumed over a long time as water supply (Adimalla and Venkatayogi, 2017). There are various sources of fluoride for people to consume but major sources for fluoride intake are from drinking water but others from food, tea, and toothpaste. Therefore, the fluoride in drinking water level has been lowered by the Wastewater Treatment Plant management since people nowadays can get fluoride easily from other sources and to prevent consumers from excess fluoride.

Fluoride became a concern as it could pose health effects to the people exposed excessively to it. The excessive exposure to fluoride can cause adverse health effects to humans such as dental fluorosis, skeletal fluorosis, insulin secretion problem, neural development problem, and thyroid gland problem. (Dey & Giri, 2018). In a study conducted by Zhuo et al., (2019), they wanted to determine an association of low-to-moderate exposure with relative mtDNA levels with the dental fluorosis cases in children. The results showed that there was a positive association between the low-to-moderate fluoride in water and fluoride in urinary concentrations and the prevalence of dental fluorosis. A dose response relationship between fluorosis and fluoride intake can be analysed with the hypothesis of increased fluoride intake will increase the prevalence and severity of fluorosis (Bhagavatula et al., 2015).

In 1974, the nationwide water fluoridation programme was implemented incrementally with the installation of fluoride feeders in water treatment plants of at least 0.5 million gallons per day (mgd) capacity (Oral Health Division Ministry of Health, Malaysia, 1995). To implement this programme, it involves active participation from both public and private agencies, that are the Ministry of Health (Oral Health Division, Engineering Division and Public Health Division), the Ministry of Energy, Water and Telecommunication, the Ministry of Science, Technology and Innovation (Chemistry Department), states authorities, public works department and private water authorities. The objective of this study was to determine the knowledge and perception of fluoride in drinking water and to associate sociodemographic characteristics with knowledge and perception of fluoride in drinking water in the population of Subang Jaya, Selangor.

2. Materials and Method

This research was a cross-sectional study conducted among the population of Subang Jaya, Selangor. 226 respondents were recruited through convenience sampling method.

2.1. Study location

Subang Jaya is a district in Selangor, Malaysia, with latitude and longitude of 3.0567° N and 101.5851° E. Subang Jaya was chosen as the study location because the community's huge population represented a diverse range of socioeconomic backgrounds, educational level, and knowledge levels.

2.2 Questionnaire

The questionnaire was distributed through Google Form to the respondents. Upon receiving the questionnaires, respondents are required to fill in the form to gain information about their demographics and their exposure to fluoride. The questionnaire being used is based on past studies conducted related to this research's objective which is to determine the knowledge and

perception of fluoride in drinking water among the community.

- Part A: The sociodemographic information about the respondents
- Part B: Knowledge of fluoride in drinking water
- Part C: Perception of fluoride in drinking water

The questionnaire was prepared through assembling and modifying questions from past studies which have used questionnaires as their tool of research. Different researches were assembled and prepared by implementing the important aspects of knowledge and perception of fluoride in drinking water. The questionnaire was distributed to different social networking platforms such as WhatsApp, Instagram and Facebook in order to reach out to residents of Subang Jaya, Selangor.

Closed-ended questions were included in the survey, and respondents were required to respond with "yes," "no," or "not sure" to the questions. Respondents' replies will be scored as 1 for accurate answers that are 'yes' answers, while they will be scored as 0 for incorrect answers, or 'no/not sure' answers. Previous research (Ab Razak et al., 2016); (Khan et al., 2014); and (Likert scale and yes/no computation of one score, 2012) have all employed this scoring approach to assess the level of knowledge and perception of fluoride in drinking water among the study population.

In order to ensure the questionnaire was reliable, the questionnaire was pre-tested before it was used to assess the knowledge and fluoride level among respondents in Subang Jaya, Selangor. The questionnaire was pre-tested among residents who do not live in the study area and it was done using the Statistical Analysis with Statistical Package for Social Sciences version 26.0 (SPSS 26.0). The Cronbach Alpha value obtained was 0.771 indicating that internal consistency was achieved. The sociodemographic characteristics and knowledge and perception level was achieved with descriptive statistics and the association between sociodemographic

characteristics was achieved using Fisher Exact Test.

2.3 Ethical consideration

The research received approval from the university's Ethics Committee of Research involving Human Subjects, Universiti Putra Malaysia.

3. Results

This study was able to recruit 226 participants. The results in Table 1 showed the sociodemographic characteristics of the Subang Jaya population. Table 2 and Table 3 showed the knowledge and perception respectively that was answered by the participants. Table 4 and Table 5 showed the association between knowledge and perception with sociodemographic characteristics.

3.1 The sociodemographic background of the population in Subang Jaya, Selangor.

The total participants in this study was 226 respondents. For age, the majority of respondents were from 12 to 64 years old with 215 (95.1%) respondents. For gender, majority was female with 139 (61.5) respondents. For education level, majority had tertiary education with 196 (86.7%) respondents (Table 1).

3.2. Knowledge and Perception of fluoride in drinking water

The knowledge of fluoride in drinking water was assessed through the respondents answering 11 questions in the knowledge section of the questionnaire. Meanwhile, for perception, respondents answered 6 questions from the questionnaire. The knowledge level of residents in Subang Jaya, Selangor is divided into different categories such as Very Low which has 32 (14.2%) participants, Low which has 77 (34.1%) participants, Medium which has 79 (35.0%) participants, High which has 37 (16.24%) participants and lastly 1 (0.4%) participant scoring a Very High knowledge level. Meanwhile, for perception level, 2 (0.9%) participants scored Very Low, 14 (6.2%) participants scored Low, 102 (45.1%) scored Medium, 80 (35.4%) scored High,

and lastly 28 (12.4%) participants scored Very High.

Sociodemographic variables		Frequency	Percentage (%)
Age	18-64	215	95.1
	> 64	11	4.9
Gender	Male	87	38.5
	Female	139	61.5
Education level			
Primary level		1	0.4
Secondary level		29	12.8
Tertiary level		196	86.7
No formal education		0	0.0
Duration lived in study area	Less than a year	9	4.0
	1 to 5 years	31	13.7
	6 to 10 years	18	8.0
	More than 10 years	168	74.3

Result shows 169 (74.8%) respondents knew about what fluoride is (Table 2). 187 (82.8%) respondents have heard or read about fluoride, 120 (53.1%) respondents knew about the purpose of adding fluoride in drinking water, 122 (60.0%) knew about the addition of fluoride in drinking water. However, majority of the respondents 201 (88.9%) did not know about the optimal level of adding fluoride in drinking water. 103 (45.6%) respondents claimed that they were not sure whether the lack of fluoride exposure can cause diseases, and 155 (68.6%) claimed that the excessive exposure to fluoride can cause diseases. Also, the respondents claimed the health effects due to excessive exposure to fluoride such dental fluorosis were 69 (30.5%) respondents, skeletal fluorosis 42 (18.6%), insulin secretion problem with 12 (5.3%), neural development problem with 19 (8.4%), thyroid gland problem with 21 (9.3%), tooth decay with 8 (3.5%) respondents.

For perception, the commonly used source of drinking water for the respondents were tap water with 16 (7.1%) respondents, store bought water with 9 (4.0%) respondents, and filtered water with 201 (89.0%) respondents. The reasons for their choice of drinking water were because of the taste, smell, and colour of drinking water with 198 (87.7%) respondents, to save money and time with 75 (33.2%) respondents, and to guarantee the safety of water consumption with 202 (89.54%). Next, 98 (43.4%) respondents thought that the addition of fluoride in drinking water was safe, and 71 (31.4%) respondents thought that the addition of fluoride in drinking water supply was effective. Moreover, 132 (58.4%) thought that the addition of fluoride in drinking water supply can prevent tooth decay, and lastly 129 (57.1%) respondents supported the addition of fluoride in drinking water supply (Table 3).

4. Discussion

4.1 Sociodemographic Characteristics of the Population in Subang Jaya, Selangor

The majority of the respondents in Subang Jaya, Selangor were from the age category of 18 to 64 years old, gender category of female, and education level category of tertiary education. The respondents from the age category of 18 to 64 years old were a total of 215 (95.1%) respondents meanwhile the respondents from the age category of 64 years old and above were 11 (4.9%) respondents. Based on data from the Department of Statistics Malaysia in 2021, the age group of 18-64 years old dominated 22.7 million (69.6%) of Malaysians, while the geriatric age group (above 64 years old) accounted for just 2.4 million (7.4%). Scherzer et al. (2010) conducted a study in rural Latino areas that found that Latina women with children were 65% more likely to participate than Latino men.

Table 2: Knowledge of fluoride in drinking water in the population of Subang Jaya, Selangor (N=226).

Knowledge items	Correct (Yes) n (%)
Know about fluoride	
Yes	169 (74.8%)
No/Not sure	57 (25.2%)
Heard or read about fluoride	187 (82.8%)
Yes	39 (17.2%)
No/Not sure	
Source information relate to fluoride	21 (9.3%)
Print media	59 (26.1%)
Electronic media	45 (20.0%)
Educational institution	33 (14.6%)
Friends	
Know about fluoride addition in drinking water	
Yes	120 (53.1%)
No/Not sure	106 (46.9%)
Know the purpose of fluoride in drinking water	
Yes	122 (60.0%)
No/Not sure	104 (46.0%)
Know the optimal level of fluoride in drinking water	
Yes	25 (11.1%)
No/Not sure	201 (88.9%)
Disease cause by lack of fluoride	103 (45.6%)
Yes	123 (54.4%)
No/Not sure	
Disease cause by excessive fluoride	
Yes	155 (68.6%)
No/Not sure	71 (31.4%)
Health effects caused by excessive fluoride	
Dental fluorosis	69 (30.5%)
Skeletal fluorosis	42 (18.6%)
Insulin secretion problem	12 (5.3%)
Neural development problem	19 (8.4%)
Thyroid gland secretion problem	21 (9.3%)
Tooth decay	8 (3.5%)
Health effects caused by lack of fluoride	
Dental fluorosis	56 (24.8%)
Weak bones structure	45 (20.0%)
Tooth decay	34 (15.0%)

Table 3: Perception of fluoride in drinking water in the population of Subang Jaya, Selangor (N=226)

Perception items	Correct n (%)
Commonly used source of drinking water	
Tap water	16 (7.1%)
Store bought water	9 (4.0%)
Filtered water	201 (89.0%)
Reason for choice of drinking water	
Taste, smell, and colour of drinking water	198 (87.7%)
Saves money and time	75 (33.2%)
Guarantees the safety of water consumption	202 (89.4%)
Think the addition of fluoride in drinking water is safe	
Yes	98 (43.4%)
No/Not sure	128 (56.6%)
Think the addition of fluoride in drinking water supply is effective	
Yes	71 (31.4%)
No/Not sure	155 (68.6%)
Think the addition of fluoride in drinking water supply can prevent tooth decay	
Yes	132 (58.4%)
No/Not sure	94 (41.6%)
Support the addition of fluoride in drinking water supply	
Yes	129 (57.1%)
No/Not sure	97 (42.9%)

Table 4: The association between sociodemographic background and knowledge level

Sociodemographic characteristics		Knowledge Level (N = 226)					X^2	p-value
		Very Low	Low	Medium	High	Very High		
Age	18 to 64	31 (13.7%)	71 (31.4%)	75 (33.2%)	37 (16.4%)	1 (0.4%)	0.05	0.376
	Above 64 years old	1 (0.4%)	6 (2.7%)	4 (1.7%)	0 (0%)	0 (0%)		
Gender	Male	13 (5.8%)	47 (21%)	21 (9.3%)	6 (2.7%)	0 (0%)	0.38	<0.001*
	Female	19 (8.4%)	30 (13.3%)	58 (25.7%)	31 (13.7%)	1 (0.4%)		
Educational level	Primary	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.00	0.004*
	Secondary	4 (1.7%)	17 (7.5%)	8 (3.5%)	0 (0%)	1 (0.4%)		
	Tertiary	27 (12.0%)	77 (34.1%)	71 (31.4%)	37 (16.4%)	1 (0.4%)		
	No formal education	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)		

significant p-value < 0.05

Table 5: Association between sociodemographic background and perception level

Sociodemographic characteristics		Perception Level N = 226					x^2	p-value
		Very Low	Low	Medium	High	Very High		
Age	18 to 64 years old	0 (0%)	14 (6.2%)	93 (41.2%)	78 (34.5%)	30 (13.3%)	0.68	0.144
	Above 64 years old	0 (0%)	0 (0%)	9 (4.0%)	2 (0.88%)	0 (0%)		
Gender	Male	0 (0%)	4 (1.7%)	51 (22.5%)	29 (12.8%)	3 (1.3%)	5.39	0.001*
	Female	2 (0.9%)	10 (4.4%)	51 (22.6%)	51 (22.6%)	27 (12.0%)		
Educational level								
	Primary	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)	0 (0%)	0.06	0.098
	Secondary	0 (0%)	1 (0.4%)	19 (8.4%)	9 (4.0%)	0 (0%)		
	Tertiary	0 (0%)	13 (5.8%)	83 (36.8%)	70 (31.0%)	30 (13.3%)		
	No formal education	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)		

significant p-value < 0.05

Furthermore, the findings of this study were consistent with those of Blumer et al. (2018), who found that the majority of respondents in Israel were 85% female and 15% male. Furthermore, the majority of them had more than 12 years of education, which is comparable to this study, which found that 63% of the respondents in this survey were enrolled in or had completed university education, compared to the remainder of the respondents' educational level groups.

4.2 The Knowledge of Fluoride in Drinking Water in The Population of Subang Jaya, Selangor

Based on the results obtained, it was found that the knowledge of fluoride in drinking water was the most achieved in the Medium level with 75 (33.2%) respondents in the 18 to 64 years old age category and the least achieved in the Very High level with only 1 (0.4%) respondent. In the Medium level of knowledge achieved, Female was recorded in higher count with 58 (25.7%) respondents and Male was recorded lesser than Female with 21 (9.3%) respondents. For knowledge, respondents recorded that electronic media 59 (26.1%) was the most used source of information or knowledge about fluoride.

According to Lowry et al. (2021), one-third of respondents (283/761 - 37%) had read or heard about fluoridation in the preceding 12 months via local newspapers, followed by dental practises, and a large minority thought their water supply was already fluoridated. Electronic media access to information has become quick, cheap, and simple to execute, according to Shearer & Mitchell (2021). Digital material can be read by electronic media devices such as a computer, smartphone, digital radio, and television. Presenting information on hypermedia websites via the worldwide Internet network is one of the most popular kinds of electronic media. As a result, the percentage of respondents who had heard or read about fluoride from electronic media sources is the greatest among all other sources of knowledge.

Furthermore, in 2013, 80% of the population received water fluoridation as a result of strong collaboration among stakeholders and an extensive network of piped water supplies, but in 2018, the coverage fell to 74.1 % due to the end

of water fluoridation in Pahang due to a lack of funding, weak legislation, the use of reverse osmosis water filtration systems, the difficulty of maintaining an optimal level of fluoride in the water, and a lack of local dairies (Faizah Abdul Karim et al., 2020). As a result, just a few participants in this study are aware of the purpose and addition of fluoride to drinking water. As a result, just a few participants in this study are aware of the function of fluoride in drinking water and the addition of fluoride to it.

4.3 The Perception of Fluoride in Drinking Water in The Population of Subang Jaya, Selangor

The most commonly used source of drinking water by the population in Subang Jaya was filtered water with 198 (87.7%) respondents, followed by tap water with 16 (7.1%) respondents and lastly store-bought water with 9 (4.0%) respondents. The reason of their choices of source of drinking water was mostly because they knew the source guaranteed the safety of water consumption with 202 (89.4%), they preferred the taste, smell and colour of drinking water with 198 (87.7%) respondents, and lastly they claimed that it saved money and time with 75 (33.2%) respondents. In a previous study, people in the rural Latino hamlet prefer bottled or commercially filtered water to municipal tap water since it is considerably cheaper and easier to obtain. This is partly due to the poor organoleptic properties of tap water (i.e., awful taste, hazy appearance, and disagreeable odour), which created and reinforced basic beliefs in the water supply's lack of safety (Scherzer et al., 2010). Hence, to correlate with this study, the respondents in Subang Jaya also agreed to how they prefer filtered water mostly as it guaranteed them the protection from uneasy taste and appearance of tap water that may be of concern for certain people.

Perceptions may result in different forms as people are exposed about fluoride through different mediums. Fluoride in drinking water may be perceived negatively if it is not shared of its benefits and dangers when exposed excessively or insufficiently. Hendaus et al., (2019) claimed that misreporting and unfounded concerns about water fluoridation are serious public health

concerns, because fluoridation is frequently based on the results of community consultations, or more directly, on a consensus. Furthermore, environmental aids, such as providing clean cold water in numerous places, such as schools and junior sporting clubs, are critical facilitators for encouraging people to drink tap water and, as a result, improving dental health (Hendaus et al., 2019).

4.4 The Association Between Knowledge and Perception of Fluoride in Drinking Water and the Sociodemographic Characteristics of Population in Subang Jaya, Selangor.

In this study, it was found that the only significant association was present when associating knowledge with gender and education level. Meanwhile, for perception of fluoride in drinking water, association was found between gender of population in Subang Jaya.

Gender was found to be significant of the association with knowledge as this is probably due to the differences in the total number of respondents between Male 87 (39.5%) and Female 139 (61.5%). Scherzer et al. (2010) reported a study that was conducted in the population of rural Latino communities that had majority participants from Latina women with children by 65% compared to Latina men's participants which was 35%. Furthermore, the significant outcome of this study is also parallel with the study that was conducted by Blumer et al. (2018) in Israel where the majority of the respondents were 85% female and 15% were male, hence producing significant association between the knowledge and gender variable. In the study, the researcher also mentioned most of the participants received more than 12 years of education level which is similar to this study that shows most of the respondents in this survey were in or graduated from tertiary education level by 86.7% among the rest of other respondents' educational level categories.

Education level showed a significant association with knowledge level. In this research, most of the respondents were from tertiary education followed by secondary education. Knowledge is an

important factor in determining one's actions. One of the levels of knowledge is application; when someone reaches this level, his or her knowledge will be used or applied in accordance with well-established principles (Efendi & Makhfduli, 2009).

Perception was found to be significant in association with the gender. The difference between male and female respondents is the number of respondents which majors in female respondents with 87 (38.5%) male respondents and 139 (61.5%) female respondents. Contrasting the previous studies, no correlation was found between the perception and gender.

The limitations to this study include that it was done only in a small sample in an urban location, which means it could not be generalised to the whole population which includes the rural population. Also, there might have been limited details to the questionnaire in how to assess the knowledge and perception of respondents regarding the fluoride in drinking water. Hence, further studies should be considered to have a wider view on the possible factors that could affect one's knowledge and perception on fluoride in drinking water and also other sources of fluoride such as dental products and food. In a previous study, Azlan et al. (2011) reported that before being distributed to the public for consumption, tap water was treated at a drinking water treatment plant to ensure that the parameters of the drinking water were within the allowed limit set by the Malaysian Drinking Water Standards established by the Ministry of Health (MOH). As a result, the drinking water may be consumed without treatment. However, due to out-of-date and corroded plumbing pipes, the water may be contaminated, causing the drinking water to lack the physical attributes (taste, smell, and colour) that it should have before reaching the consumers. As a result, Malaysians were willing to spend hundreds of ringgits to have a filtered water system installed in their homes to assure the safety of their drinking water (Mat Salleh, 2007).

5. Conclusion

In conclusion, the most achieved level in knowledge of fluoride in drinking water was categorized as Medium level and the perception of fluoride in drinking water was categorized as High level. Association was significant when comparing knowledge of fluoride with gender and education level whereas association was significant when comparing perception of fluoride with gender.

Acknowledgement

References

Ab Razak, N. H., Praveena, S. M., Aris, A. Z., & Hashim, Z. (2016). Quality of Kelantan drinking water and knowledge, attitude and practice among the population of Pasir Mas, Malaysia. *Public Health*, *131*, 103–111. https://doi.org/10.1016/J.PUHE.2015.11.006

Adimalla, N., & Venkatayogi, S. (2017). Mechanism of fluoride enrichment in groundwater of hard rock aquifers in Medak, Telangana State, South India. Environmental Earth Sciences, 76(1), 1–10. https://doi.org/10.1007/s12665-016-6362-2

Azami-Aghdash, S., Ghojazadeh, M., Pournaghi Azar, F., Naghavi-Behzad, M., Mahmoudi, M., & Jamali, Z. (2013). Fluoride concentration of drinking waters and prevalence of fluorosis in iran: a systematic review. Journal of Dental Research, Dental Clinics, Dental Prospects, 7(1), 1–7. https://doi.org/10.5681/joddd.2013.001

Bhagavatula, P., Levy, S. M., Broffitt, B., Weber-Gasparoni, K., & Warren, J. J. (2015). Timing of fluoride intake and dental fluorosis on late-erupting permanent teeth. Community Dentistry and Oral Epidemiology, 44(1), 32–45. https://doi.org/10.1111/cdoe.12187

Blumer, S., Tal Ratson, Peretz, B., & Dagon, N. (2017, September 22). *Parents' Attitude towards the Use of Fluorides and Fissure Sealants and its Effect on their Children's...* ResearchGate; unknown. https://www.researchgate.net/publication/319992570_Parents'_Attitude_towards_the_Use_of_Fluorides_and_Fissure_Sealants_and_its_Effect_on_their_Children's_Oral_Health

Colgate. (2021). *What is Fluoride?* Colgate.com. https://www.colgate.com/en-my/oral-health/fluoride/what-is-fluoride

Faizah Abdul Karim, Mohd, Y., & Nor. (2020). WATER FLUORIDATION AND ORAL HEALTH IN MALAYSIA: A REVIEW OF LITERATURE. Journal of Health and Translational Medicine, 23(2), 76–91. https://doi.org/10.22452/jummec.vol23no2.12

Kitalika, A. J., Machunda, R. L., Komakech, H. C., & Njau, K. N. (2018). Fluoride Variations in Rivers on the Slopes of Mount Meru in Tanzania. Journal of Chemistry, 2018, 1–18. https://doi.org/10.1155/2018/7140902

Hendaus, M., Siddiq, K., AlQadi, M., Siddiqui, F., Kunhiabdullah, S., & Alhammadi, A. (2019). Parental perception of fluoridated tap water. *Journal of Family Medicine and Primary Care*, *8*(4), 1440. https://doi.org/10.4103/jfmpc.jfmpc_192_18

Oral Health Division Ministry of Health, Malaysia (1995). *Implementation of Water Fluoridation Programme in Malaysia.* https://ohd.moh.gov.my/images/pdf/xtvtnsop/Implementation-of-Water-Fluoridation-Programme-in-Malaysia-2006.pdf

Sananda Dey, & Biplab Giri. (2016). Fluoride Fact on Human Health and Health Problems: A Review. ResearchGate; unknown. https://www.researchgate.net/publication/304040050_Fluoride_Fact_on_Human_Health_and_Health_Problems_A_Review/link/57645f2508aeb4b998007cd0/download

Scherzer, T., Barker, J. C., Pollick, H., & Weintraub, J. A. (2010). Water consumption beliefs and practices in a rural Latino community: implications for fluoridation. *Journal of Public Health Dentistry*, *70*(4), 337–343. https://doi.org/10.1111/j.1752-7325.2010.00193.x

Shearer, E., & Mitchell, A. (2021, January 12). *News Use Across Social Media Platforms in 2020*. Pew Research Center's Journalism Project; Pew Research Center's Journalism Project. https://www.pewresearch.org/journalism/2021/01/12/news-use-across-social-media-platforms-in-2020/

Srivastava, S., & Flora, S. J. S. (2020). Fluoride in Drinking Water and Skeletal Fluorosis: a Review of the Global Impact. Current Environmental Health Reports, 7(2), 140–146. https://doi.org/10.1007/s40572-020-00270-9

Zhou, G., Yang, L., Luo, C., Liu, H., Li, P., Cui, Y., Liu, L., Yu, X., Zeng, Q., Chen, J., Zhao, Q., Dong, L., Niu, Q., Zhang, S., & Wang, A. (2019). Low-to-moderate fluoride exposure, relative mitochondrial DNA levels, and dental fluorosis in Chinese children. Environment International, 127, 70–77