



UNIVERSITI PUTRA MALAYSIA

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

DALEA BINTI ANUAR

**Ip
FPSK4 2022 26**

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

BY:

DALEA BINTI ANUAR

**Thesis submitted in fulfilment of the requirement for the degree of Bachelor of
Science in Environmental and Occupational Health with Honours from the Faculty
of Medicine and Health Sciences, Universiti Putra Malaysia**

ACKNOWLEDGEMENT

All praises belong to Allah Almighty, the One who is the Mightiest above all, ruler of all beneath and above the universe. Without His blessings, I would not have made it this far to finishing my bachelor degree in Environmental and Occupational Health. All parts of strength come from Him, and all weaknesses are leaned upon myself.

Greatest appreciation I bid to Dr Shaharuddin Mohd Sham, my supervisor for this research study. Thank you, Dr for all of the knowledge and guidance that you have shared with me throughout completing my studies. From learning Water Quality in classes to finishing a research study related to water in public health, I am grateful to have gained so much experience and knowledge in expanding my point of view in environmental health.

Also, not to forget my dearest parents who have brought me to where I am now. I am forever grateful to be blessed with supportive parents especially in lifting my spirit in finally obtaining my bachelor degree. A journey that is not all free without the company of challenges has taught me to count my blessings in appreciating the people who brought me to this world.

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

DALEA BINTI ANUAR

ABSTRACT

Introduction: Fluoride is an element that can be found naturally in Earth's crust. The exposure to fluoride is mostly contributed through ingestion in drinking water. Through the excessive or lack of exposure of fluoride, the health of a population can be impacted. The excessive exposure causes dental fluorosis, skeletal fluorosis, thyroid gland secretion problem, neural development problem, and insulin secretion problem. Meanwhile, the lack of exposure causes tooth decay and dental caries. Determining the knowledge and perception of fluoride among the Subang Jaya population was the objective to be achieved. **Methodology:** Respondents were distributed a questionnaire consisting three sections which were sociodemographic information, knowledge of fluoride, and perception of fluoride. The level of knowledge and perception is obtained by calculating the scores to each section and calculating the percentage of the scores, categorising respondents into different levels from Very Low to Very High. **Results:** Respondents obtained a significant association ($p < 0.05$) for the association between gender and knowledge level and between education level and knowledge level. Also, a significant association was shown between gender and perception level. **Conclusion:** Most of the population in Subang Jaya, Selangor had Medium level of both knowledge and perception of fluoride in drinking water. Further studies are recommended to include other factors affecting the knowledge and perception of fluoride in drinking water.

PENGETAHUAN DAN PERSEPSI FLUORIDA DALAM AIR MINUMAN DI KALANGAN POPULASI SUBANG JAYA, SELANGOR

DALEA BINTI ANUAR

ABSTRAK

Pendahuluan: Fluorida adalah elemen yang boleh dijumpai secara semula jadi di dalam kerak bumi. Pendedahan kepada fluorida kebanyakannya berlaku melalui minuman air. Pendedahan kepada fluorida secara berlebihan atau berkurangan boleh mengakibatkan kesan buruk kesihatan kepada populasi manusia. Penentuan pengetahuan dan persepsi fluoride dalam air minuman dalam penduduk Subang Jaya merupakan objektif kajian.

Kaedah: Para responden telah diedarkan soal selidik yang mempunyai tiga seksyen iaitu informasi sosiodemografik, pengetahuan tentang fluoride dalam air minuman dan persepsi tentang fluorida dalam air minuman. Tahap pengetahuan dan persepsi mengenai fluoride dalam air minuman ditentukan melalui pengiraan jumlah skor dan peratusan yang dianalisa kepada tahap-tahap berbeza bermula daripada Sangat Rendah sehingga Sangat Tinggi. **Keputusan:** Responden mempunyai persatuan yang signifikan antara

jantina dan tahap pengetahuan serta tahap pembelajaran dan tahap pengetahuan. Tambahan pula, persatuan antara jantina dan tahap persepsi juga mengeluarkan persatuan yang signifikan, **Kesimpulan:** Penduduk di Subang Jaya kebanyakannya mempunyai tahap Sederhana dalam pengetahuan dan persepsi tentang fluoride dalam air minuman. Kajian boleh dilakukan pada masa hadapan untuk mengenalpasti faktor lain yang memainkan peranan dalam menentukan pengetahuan dan persepsi tentang fluoride dalam air minuman.

TABLE OF CONTENTS

	Page
DECLARATION	i
SIGNATURE OF SUPERVISOR/INTERNAL EXAMINER	ii
ACKNOWLEDGEMENT	iii
ABSTRACT	iv
ABSTRAK	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1: INTRODUCTION	
1.0 INTRODUCTION	1
1.1 BACKGROUND STUDY	1
1.2 PROBLEM STATEMENT	3
1.3 STUDY JUSTIFICATON	6
1.4 RESEARCH QUESTIONS	8
1.5 RESEARCH OBJECTIVES	8
1.6 RESEARCH HYPOTHESES	9
1.7 CONCEPTUAL FRAMEWORK	11
1.8 VARIABLES DEFINITION	14
1.9 CONSLUSION	Error! Bookmark not defined.
CHAPTER 2: LITERATURE REVIEW	

2.0	INTRODUCTION	16
2.1	OVERVIEW OF FLUORIDE	16
2.2	NEGATIVE HEALTH EFFECTS OF FLUORIDE	19
2.3	HEALTH BENEFITS OF FLUORIDE	21
2.4	COMMUNITY WATER FLUORIDATION	23
2.6	CONCLUSION	25
CHAPTER 3: METHODOLOGY		
	MATERIAL AND METHODS	27
3.0	INTRODUCTION	27
3.1	BACKGROUND OF THE STUDY AREA	27
3.2	RESEARCH DESIGN	28
3.3	DURATION	29
3.4	STUDY POPULATION AND SAMPLING	29
3.5	METHODOLOGY AND INSTRUMENTS USED	32
3.6	STATISTICAL ANALYSIS	33
3.7	ETHICAL CONSIDERATION	35
3.8	CONCLUSION	36
CHAPTER 4: RESULTS		
4.1	THE SOCIODEMOGRAPHIC BACKGROUND OF THE POPULATION IN SUBANG JAYA, SELANGOR	36
4.2	KNOWLEDGE OF FLUORIDE IN DRINKING WATER	39
4.3	PERCEPTION OF FLUORIDE IN DRINKING WATER	44
4.4	ASSOCIATION BETWEEN SOCIODEMOGRAPHIC BACKGROUND AND KNOWLEDGE LEVEL OF FLUORIDE IN DRINKING WATER IN THE	

POPULATION OF SUBANG JAYA, SELANGOR	47
4.5 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC BACKGROUND AND FLUORIDE LEVEL OF FLUORIDE IN DRINKING WATER IN THE POPULATION OF SUBANG JAYA, SELANGOR	29
CHAPTER 5: DISCUSSION	
5.1 THE SOCIODEMOGRAPHIC BACKGROUND OF THE POPULATION IN SUBANG JAYA, SELANGOR	51
5.2 KNOWLEDGE OF FLUORIDE IN DRINKING WATER	51
5.3 PERCEPTION OF FLUORIDE IN DRINKING WATER	53
5.4 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC BACKGROUND AND KNOWLEDGE LEVEL AND PERCEPTION LEVEL OF FLUORIDE IN DRINKING WATER IN THE OPULATION OF SUBANG JAYA, SELANGOR	55
CHAPTER 6: CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH	58
REFERENCES	62
APPENDICES	69

LIST OF TABLES

	Page
Table 4.1 Sociodemographic data distribution	43
Table 4.2 Distribution of knowledge items in respondents	45
Table 4.3 Distribution of perception items in respondents	49
Table 4.4 Association between sociodemographic background and knowledge level	52
Table 4.5 Association between sociodemographic background and perception level	54

LIST OF FIGURES

	Page
Figure 1	11
Figure 2	12
Figure 3	27



CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

This chapter focuses on the background of study, problem statement, research questions, objectives and hypotheses, conceptual framework and definitions.

1.1 BACKGROUND STUDY

The main research problem related to this research of interest was fluoride in drinking water which was also considered a chemical hazard to public health. Fluoride is an element that can be found in the earth's crust through natural occurrence, and it can also be found in our drinking water originating from the placement of fluoride in the piped water system in most of the countries. It is found to be very soluble in water and is ubiquitous in the environment such as the air, soil, food, salts and dental products such as toothpaste. An extreme exposure towards fluoride may cause the health risks

such as dental fluorosis, skeletal fluorosis, thyroid function disruption, and neurological problem. Based on the Ministry of Health Malaysia (2010), the standard fluoride concentration in drinking water should be in the range of 0.4mg/L to 0.6mg/L as suggested by the National Standard for Drinking Water Quality (NSDWQ). Meanwhile, the standard set by the World Health Organization (WHO) is 1.5mg/L (Thackre et al., 2009).

The main sources of drinking water vary from tap water, bottled water, and mineral water. Usually, the Malaysian population choose tap water, bottled drinking water, and bottled mineral water as their main sources of drinking water. (Azrina Azlan et al., 2011). Drinking water is considered a major exposure to fluoride as humans consume water directly and daily from the piped or bottled water. Hence, making drinking water as the highest potential in causing health effects related to excessive fluoride exposure. Fluoride is beneficial for human health in trace amounts that can be found in either food, source of water and daily used products such as toothpaste. However, it can be toxic in excess and is linked to dental protection.

In order to assess the potential health risk posed by fluoride in drinking water, health risk assessment can be done such as identifying the hazard through the information on fluoride in drinking water from its sources.

After 30 years of implementation of fluoride in drinking water, the prevalence of dental caries and experience in Malaysia had been significantly reduced (Oral Health Division Ministry of Health Malaysia, 2006).

The exposure to fluoride is assessed whenever the route of exposure is through ingestion. United States Environmental Protection Agency (2010) states that water and water-based beverages count as the main sources of systemic ingestion. Also, approximately three quarter of the fluoride in diet among children and adults is through the water supply intake in United States. The fluoride that enters our bodies may be excreted in the form of urine and faeces or kept inside our bodies. A study found that the fluoride concentration of 75 to 90% that has been absorbed through the duodenum and stomach will be excreted through urine (Maha et al., 2015). Haftenberger et al., (2001) claimed that the fluoride that is not absorbed from the gastrointestinal tract will be eliminated through faeces because the maximum faecal elimination can go up to 10% of the ingested fluoride.

1.2 PROBLEM STATEMENT

Access to safe drinking water is a basic human right. However, it can

also lead to long-term health problems if the chemicals exceed the acceptable level. Fluorine is a chemical that is abundantly found in the environment (Fawell et al., 2006; Aldrees and Al-Manea, 2010). The United States Environmental Protection Agency claims that fluoride is categorized as one from the twelve pollutants that is listed as a priority in hazardous substances with United States Agency for Toxic Substances and Disease Registry (Faraji et al., 2014; Aghaei et al., 2015; Mahvi et al., 2006). Following the development of the water distribution system in all countries, fluoride is found to be dominant in the water system as it helps to maintain good teeth condition in consumers. However, little is known regarding the awareness of fluoride in drinking water among residents in Subang Jaya, Selangor.

Subang Jaya is located in an urban area whereby the water sources are mostly from the public water system. Past researches have mostly shown how fluoride is measured its concentration in drinking water in rural areas compared to urban areas. It is found that there should be more studies to be conducted in urban areas to gain more knowledge on the current health status and also fluoride concentration present in the drinking water. In urban areas, there is a constant run of water distribution which makes it more often for the community living in urban areas to consume the water directly connected from the pipe to

the water processor. This may increase the risk of health of the consumers as there is still no clear indication to whether the daily water consumption of these residents is in an appropriate amount of fluoride or in an excessive amount of fluoride.

Fluoride can impact a person through its advantages and disadvantages. Hence, this research aims to provide an insight on the current knowledge and perception of residents in Subang Jaya, Selangor about the exposure to fluoride in drinking or piped water as it may propose potential health risks towards the public health.

1.3 STUDY JUSTIFICATION

This research aimed to determine the knowledge and perception of fluoride in drinking water among residents in Subang Jaya, Selangor. The exposure to fluoride may vary from different sources ranging from food and beverages, products, and mostly from drinking water as people consume a large amount of water daily.

Additionally, there is a limited amount of research done on how fluoride may give impact on the health of the population in urban areas as they have the impression of the development of water system in urban areas are sufficient enough to control the fluoride exposure to the consumers. The water supply in urban areas especially in Selangor is 99% fluoridated, making the population of this urban area highly exposed to fluoride through the ingestion of drinking water. Also, the use of water is also included in cooking and also other fluoride-based products such as toothpaste which increases the likeliness of a person being risked of adverse health effects in the long run.

Moreover, there had not been any study conducted in Malaysia regarding assessing the knowledge and perception of fluoride in drinking water. The possibilities vary from a person to another in terms of their level of knowledge

and perception towards fluoride in drinking water. Therefore, in this study, we were able to identify the level of knowledge on fluoride in drinking water. Subang Jaya was chosen as the specific study location as no research regarding knowledge and perception of fluoride in drinking water has been done here before and the high-density population was beneficial to sample size calculation and generalising the research to the urban population.

Further studies can be done to determine whether the issue of fluoride is to be considered serious if the results of the water samples taken show that the concentration of fluoride exceeds or is less than the range provided by NSDWQ which is within 0.4 – 0.6 mg/L. WHO (n.d.) claims that a range of 0.9 to 1.2 mg/L of fluoride in drinking water can contribute to the mild dental fluorosis with the prevalence of 12-33% of the population. In order to avoid this from happening, it is important to know the exact range of fluoride concentration in water so people are aware of how fluoride can be consumed safely. The knowledge of fluoride among a population is important to assess whether the people are aware of what sources are fluoride from and how fluoride can affect a person's health in an excessive or lack of exposure to fluoride.

1.4 RESEARCH QUESTIONS

The study was based on the following research questions:

- What was the sociodemographic background of the residents of Subang Jaya, Selangor?
- What was the knowledge and perception of fluoride in drinking water among the population of Subang Jaya, Selangor?
- What was the association between sociodemographic background and level of knowledge among the population of Subang Jaya, Selangor?
- What was the association between sociodemographic background and level of perception among the population of Subang Jaya, Selangor?

1.5 RESEARCH OBJECTIVES

Generally, the aim of this proposed research was to assess the knowledge and perception of fluoride among the population of Subang Jaya, Selangor.

Specifically, the aims of this proposed research were:

1. To determine the sociodemographic background of the population in Subang

Jaya, Selangor.

2. To identify the knowledge level and perception level of fluoride in drinking water in the population of Subang Jaya, Selangor.
3. To assess the association between sociodemographic background and level of knowledge of fluoride in drinking water among the population of Subang Jaya, Selangor.
4. To observe the association between sociodemographic background and level of perception of fluoride in drinking water in the population of Subang Jaya, Selangor.

1.6 RESEARCH HYPOTHESES

The guide of this entire proposed study is based on below expectations:

- To determine the knowledge of fluoride in drinking water among the population of Subang Jaya, Selangor.

Hypothesis: There is low, moderate or high knowledge of fluoride in drinking water among the population of Subang Jaya, Selangor.

- To determine the perception of fluoride in drinking water among the population of Subang Jaya, Selangor.

Hypothesis: There is low, moderate or high knowledge of fluoride

in drinking water among the population of Subang Jaya, Selangor.

- To determine association between the knowledge and perception of fluoride among population in Subang Jaya, Selangor.

H_{null} = There is no association between the knowledge and perception of fluoride among the population in Subang Jaya, Selangor.

$H_{\text{alternative}}$ = There is an association between the knowledge and perception of fluoride among the population of Subang Jaya, Selangor.

- To determine the association between the knowledge level of fluoride in drinking water and sociodemographic background in population of Subang Jaya, Selangor.
- To determine the association between the perception level of fluoride in drinking water and sociodemographic background in population of Subang Jaya, Selangor.

1.7 CONCEPTUAL FRAMEWORK

Conceptual framework is a tool used to analyse the process of research and to get a better understanding of the whole view of research. Conceptual framework highlights the scope of study, independent and dependent variables, and the outcome of study.



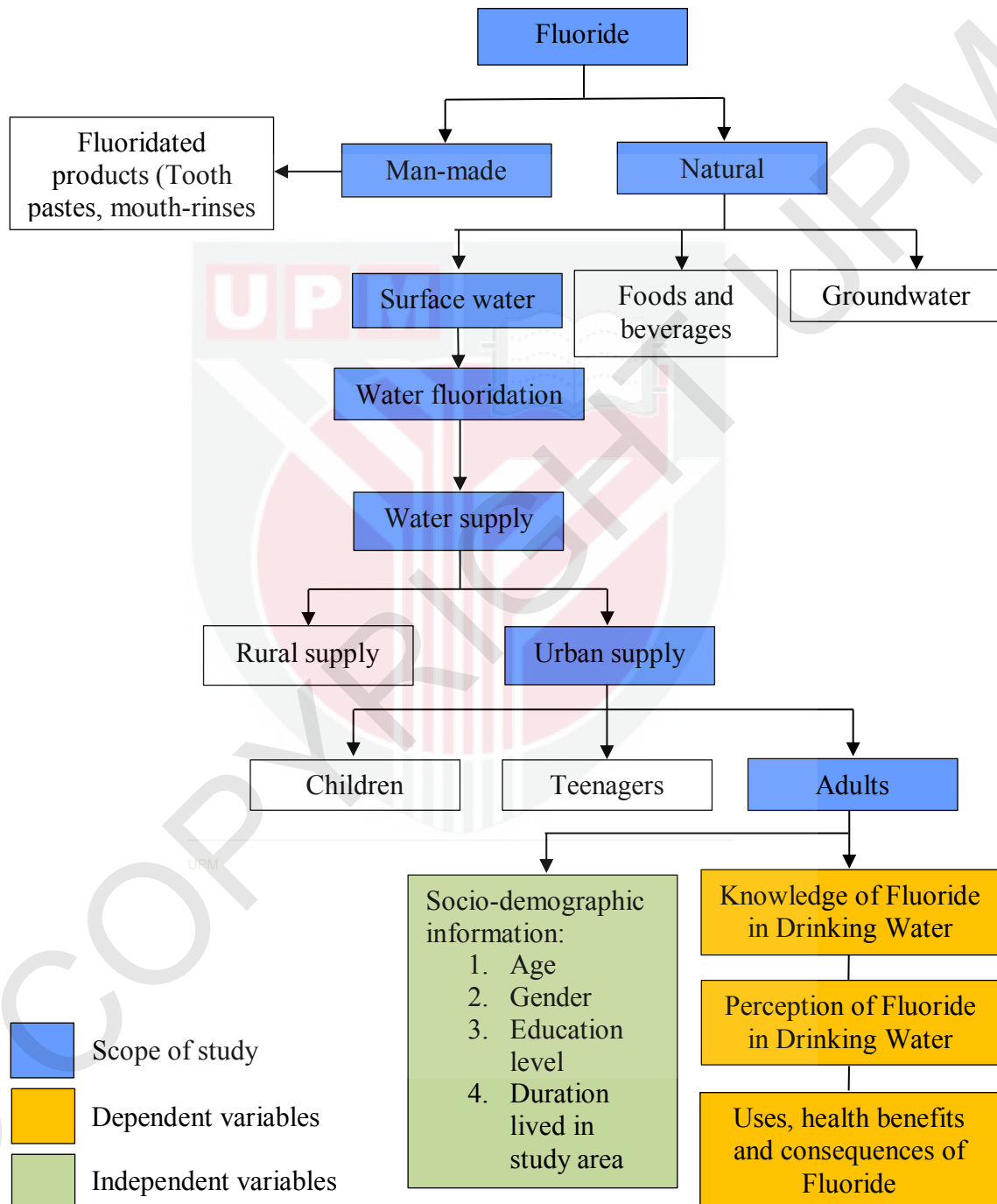


Figure 1: Conceptual framework

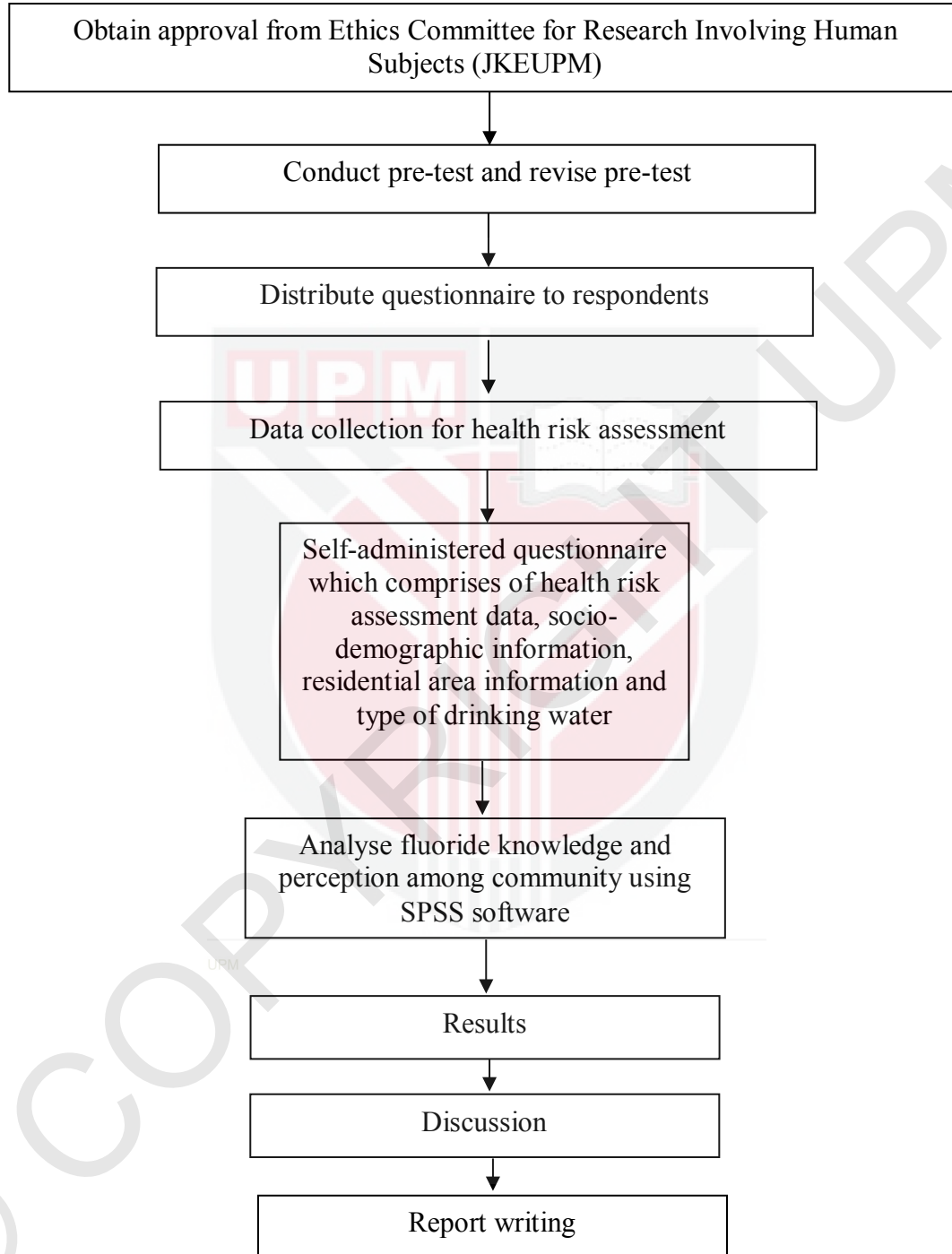


Figure 2: Research flowchart

1.8 VARIABLES DEFINITION

VARIABLES

Independent variable: Variable that can be changed or controlled by the researcher and assumed to directly affect dependent variables.

(Fluoride in drinking water)

Dependent variable: Variable that is tested or measured in a research and depends on independent variables. **(Knowledge and perception of fluoride in drinking water)**

FLUORIDE IN DRINKING WATER

Conceptual definition: Fluoride is a negatively charged fluorine atom (F⁻), also known as a fluorine anion that is a naturally occurring ion, found in certain mineral and salty deposits.

Operational definition: Drinking water was taken from tap water and collected using clean HDPE bottles and analysed by using SPADNS method on a direct reading spectrophotometer HACH Brand model DR1900.

KNOWLEDGE AND PERCEPTION

Conceptual definition: Knowledge is facts, information and skills

acquired through experience or education while perception is the way in something is regarded and understood.

Operational definition: Knowledge and perception are assessed through questionnaires where the score of respondents would determine the levels of knowledge and perception of fluoride in drinking water.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter focused on the literature review done by researcher to assess deeper on the topic of research. This section contains results from readings of other researchers' project to help researcher gain better understanding and validation on the project discussed. The discussed matters in literature review are the overview on fluoride, fluoride metabolism, the benefits of fluoride consumption, the limitations of fluoride consumption, and conclusion.

2.1 OVERVIEW OF FLUORIDE

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 (K. F. 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 as 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.

2.2 NEGATIVE HEALTH EFFECTS OF FLUORIDE

Fluoride is known to cause possible health effects due to prolonged exposure to an excessive concentration. Some of the possible health effects of fluoride include dental fluorosis, skeletal fluorosis, thyroid function disruption, and neurological problems.

Dental fluorosis is a result of hypo mineralization of tooth enamel caused by ingestion of excessive fluoride while the enamel is forming. Dental fluorosis can be observed through the change of colour in the teeth which looks like a brownish yellow stain that stays and does not disappear easily. Based on 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).

Additionally, skeletal health is also affected as recent studies suggested that the fluoride consumption of 1.5ppm concentration is highly associated with skeletal fluorosis cases. WHO (2018) claims that an exposure in the long term towards an excessive concentration of fluoride can cause skeletal fluorosis. As the level of fluoride in drinking water surpasses 10mg/L and above, there is a higher possibility of someone to develop crippling skeletal fluorosis. Toxic levels of fluoride have found to be weakening the bones instead of strengthening it and may cause a risk in hip and wrist fractures (Dey & Giri, 2016).

Neurological health is also affected as developing brain is highly at risk to the exposure of fluoride. A recent research showed that the exposure to fluoride does have a negative impact on the mental capability of children. Barberio et al. (2017) found no negative association with IQ or learning disorders from staying in areas with artificially fluoridated water. Meanwhile, a study conducted by Bashash et al. (2017) concluded that children residing in Mexico have a lower intelligence quotient (IQ) than the mothers who drank more fluoridated water during the period of pregnancy. In addition to this, excessive fluoride exposure specifically if fluoride is more than 1 mg/L will lead to toxicity to the neural system (Choi et. al., 2012, as cited in, Dey & Giri,

2016). The fluoride will give greater effects on learning and memory skills to developing brains if compared with matured brains. In another study, it showed that a high exposure level of fluoride will give negative impacts on children's learning development abilities (Shivaprakash et. al., 2011, as cited in Dey & Giri, 2016). The higher the fluoride intake, the lower the intelligence level among children which means, fluoride concentration is highly associated with the level of intelligence among growing children (Duan et al., 2018). A strong association between exposure to fluoride and low IQ was found and it was also noted that children who live in fluorosis prevalent areas have higher chances of developing a low IQ than those who live in normal areas.

2.3 HEALTH BENEFITS OF FLUORIDE

Dental caries is known to be the most common chronic disease to be experienced by children (Dey & Giri, 2016). To prevent the disease from happening, fluoride has been proven to the enamel which is a calcium-deficient, rich in carbonate hydroxyapatite. During its stable state, the Ca_2^+ , PO_4^{3-} , OH^- and F^- ion in the immediate vicinities of the crystals to maintain equilibrium with the surrounding fluid. Thus, the neutrality is maintained and helps to release calcium to protect the tooth.

Fluoride plays an important role as a micronutrient as it helps to develop the bones and teeth in a person. Ever since the late 1960s, the World

Health Organization (WHO) announced officially of how fluoride is important in ensuring better quality of oral health as it effectively reduces and prevents dental fluorosis. (Peterson & Ogawa, 2016). The exposure to fluoride in an optimal range is important especially for young children in order to prevent dental caries (Dey & Giri, 2016). Also, fluoride is crucial as an antimicrobial as it inhibits the growth of oral streptococci and lactobacilli (Balzar Ekenbäck et al., 2001, as cited in, Dey & Giri, 2016).

The neutral state of fluoride also makes it easier for fluoride to be found thus ensuring a lasting supply of fluoride in drinking water. Its cost is also low and effective in ensuring the drinking water is accessible and is safe to be consumed. Yousefi et al., (2018) claims that in average, 40% of tooth decay can be prevented by the standard level of fluoride in drinking water.

2.4 COMMUNITY WATER FLUORIDATION

In order to prevent dental caries within the population, community water fluoridation was promoted and implemented as the most easily accessed and affordable preventive measure in the community (Quiñonez & Locker, 2009). Recent studies have shown how the community have their own opinion in supporting or opposing the addition of fluoride in drinking water. This participant knowledge survey provides insight on what consumers know about fluoridation and their drinking water. The fluoride may be verily distributed in a drastic manner across the population due to the composition of soil and because the choice to fluoridate municipal waters is a local political decision. In 2000, fluoridation reached 66% in the United States population on public water supplies which is 162 million people.

Water fluoridation was initially introduced in Johor, Malaysia. Following then, more towns in the state have had their water supplies fluoridated. 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. In 2004, as the population may consume fluoride from other alternative sources, the Oral Health Division had recommended that the optimum level of fluoride be reviewed from 0.7 ppm to 0.5 ppm. National Drinking Water Quality Committee approved the level of fluoride and the standard accepted in 2005, the National Guidelines for Drinking Water Quality was 0.4-0.6 ppm effective. Towards the end of the year 2005, above 95 percent of the population received a piped water supply. Most states received a coverage of piped water supply of 95% to 99 % except Sabah (75.5%) and Kelantan (70%). Also, it is known that the main sources of drinking water among Malaysian citizens include tap water, bottled drinking water, and bottled mineral water (Azrina Azlan et al., 2011).

2.5 KNOWLEDGE AND PERCEPTION OF FLUORIDE

Knowledge and perception are a method used to assess the level of understanding of a community regarding an issue or opinion. Because of its

widespread impact on communities and ability to reduce oral health disparities among children, community awareness of preventive oral health-related interventions, such as water fluoridation, is a major public health goal. Public awareness of dental problems has been proven in studies to have a direct impact on public health outcomes such as water fluoridation. Hendaus et al., (2019) claimed that despite the fact that water fluoridation has been used to safeguard tooth health for decades, investigations have revealed that there is still a great deal of misunderstanding about its impact and purpose.

A considerable proportion of people are concerned about fluoridation, according to several research. Mork and Griffin (2015) undertook a research in the United States to look into the safety and benefits of community water fluoridation. About half of those polled strongly agreed or strongly agreed that community water fluoridation was safe, while 31.5% were indifferent and 13.2% opposed/strongly disagreed. Furthermore, nearly a third of the participants said community water fluoridation had no health benefits, while 57% said it had some benefits and 15.5% said it had a lot of benefits.

2.6 CONCLUSION

In this chapter, the researcher has explained related information from previous studies regarding the overview of fluoride, negative effects of

fluoride, benefits of fluoride, community water fluoridation, and knowledge and perception of fluoride.



CHAPTER 3

MATERIAL AND METHODS

3.0 INTRODUCTION

This chapter explains on the background of study area, research design, duration, study population and sampling, instruments used and variables.

3.1 BACKGROUND OF THE STUDY AREA

This research took place in Subang Jaya, Selangor in which the respondents were chosen randomly to participate in the questionnaire. 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 attainment, and knowledge levels. Residents of Subang Jaya, Selangor were eligible to participate in this study through answering the questionnaire.

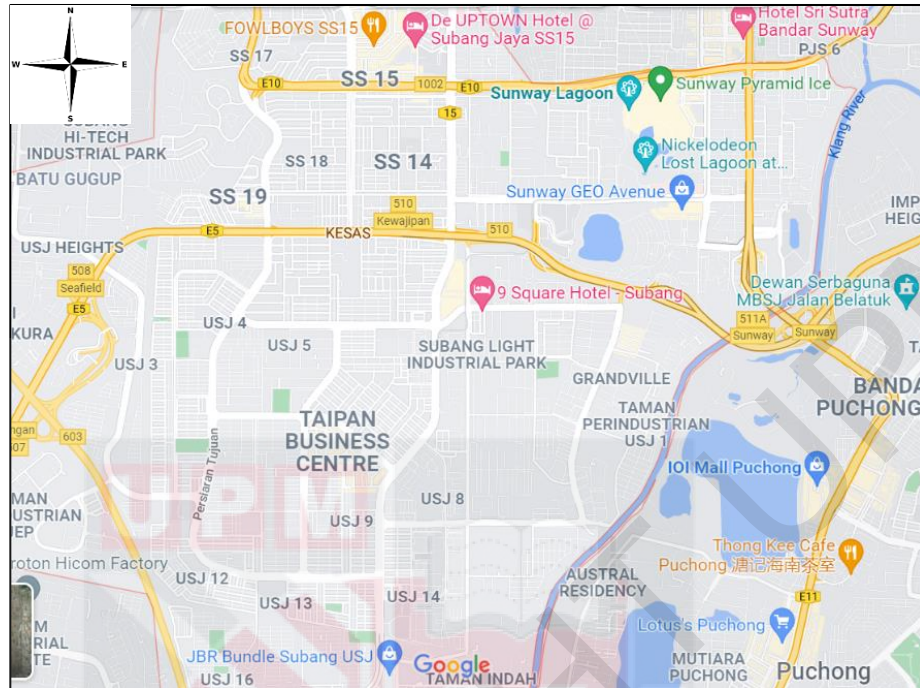


Figure 3: Map of Subang Jaya, Selangor

3.2 RESEARCH DESIGN

The research design planned was cross-sectional study design. Cross-sectional study involves observing and concluding the data of a research at one specific point in time. Cross-sectional studies are also known as descriptive studies that carry observational methods in this study. Through cross-sectional study design, the researcher aimed to find the knowledge and perception of the population towards fluoride to test out the hypothesis mentioned in Chapter

1.

3.3 DURATION

The duration of this proposed study was between July 2021 until January 2022.

3.4 STUDY POPULATION AND SAMPLING

- Study Population: Residents in Subang Jaya, Selangor.
- Sampling frame: Residents residing in USJ 1 to USJ 23 in Subang Jaya, Selangor. Subang Jaya consists neighbourhoods from SS12 to SS19, along with neighbourhoods from USJ 1 to USJ 23. Respondents will be freely chosen within the location of neighbourhood mentioned above.
- Sampling Method: Purposive Random Sampling method. The reason for this sampling method is chosen is because it is helpful in assessing different subgroups such as male/female, and also it enables researchers to obtain a sample population that represents the population well.

The study was conducted in a residential area in Subang Jaya, Selangor. Subang Jaya is known as a location of high density of people from various sociodemographic background. Hence, the research will be having respondents from Subang Jaya as specifically mentioned in the title of research.

In this research, the inclusion criteria were residents which of Subang Jaya, Selangor, and residents which were 18 years old and above. The reason for the inclusion criteria was due to adults may be more knowledgeable and are more exposed towards the knowledge and perception of fluoride in drinking water. Meanwhile, the exclusion criteria included disabled people, and children or residents below 18 years of age. All participants of this study were based on their voluntariness and they were asked to sign a consent form before answering any questions related to research.

Sample size calculation:

The sample size calculation was calculated using the specific objective which was to determine the perception of fluoride in drinking water in the population of Subang Jaya, Selangor.

Prevalence or one proportion sample size calculation was used to determine the sample size. Based on a previous pilot study, a cross-sectional questionnaire survey was conducted and results showed a response rate of 34.7% among a sample of 517 Australian adults as respondents. The study was about risk perception and water fluoridation support and opposition in Australia (Armfield & Akers, 2010).

Sample Size for Frequency in a Population

Population size(for finite population correction factor or fpc)(N): 517
Hypothesized % frequency of outcome factor in the population (p): 50% $\pm$ 5
Confidence limits as % of 100(absolute $\pm$ %)(d): 5%
Design effect (for cluster surveys- $DEFF$): 1

Sample Size(n) for Various Confidence Levels

ConfidenceLevel(%)	Sample Size
95%	221
80%	125
90%	178
97%	247
99%	291
99.9%	351
99.99%	386

Equation

Sample size $n = [DEFF * Np(1-p)] / [(d^2 / Z^2_{1-\alpha/2} * (N-1) + p*(1-p)]$

Figure 4: Sample size calculation from OpenEpi based on study by Armfield & Akers, (2010).

Based on the study by Armfield & Akers, (2010), finite sample size calculation was used.

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

Where:

n' = sample size with finite population correction

N = Population size

Z = Z statistic for a level of confidence

P = Expected prevalence of proportion (in proportion of one)

d = Precision (in proportion of one)

Based on the calculation done, the sample size was required to be 221 respondents with the confidence level of 95%.

3.5 METHODOLOGY AND INSTRUMENTS USED

The knowledge and perception of fluoride among the population of Subang Jaya was assessed through the methodology as follows:

3.5.1 QUESTIONNAIRE

Questionnaires were distributed through Google Form to the respondents. Upon receiving the questionnaires, respondents were required to fill in the form to gain information about their demographics and their exposure to fluoride. The questionnaire used was based on past studies conducted related to this research's objective which was to determine the knowledge and perception of fluoride in drinking water among the community.

- **Part A: The basic 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 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 list of references used to create the questionnaire is stated in Appendix A of Questionnaire.

While filling up the questionnaire, the researcher assisted the respondents in showing the informed consent, explaining the objective and benefits of this research to both parties and filling their personal information that was convinced to be kept as private and confidential upon their needs. Also, this questionnaire would only be participated by respondents who voluntarily wanted to participate in this study. The questionnaire was distributed through various social networking platforms which included WhatsApp, Instagram and Facebook to reach out to the public. Fortunately, through the power of sharing in social media, all respondents were able to be recruited based on the inclusive criteria.

3.6 STATISTICAL ANALYSIS

The data obtained was analysed using SPSS software. This part was

important as results were generated through different analysis that were used to analyse different specific objectives mentioned before.

3.6.1 DESCRIPTIVE ANALYSIS

Descriptive analysis is the description of set of data which functions to identify and explain the main characteristics of data in a research. This analysis can be used to find the mean, median, and mode as the central tendency. Also, the measures vary from the smallest to largest variables, skewness, standard deviation or variance. Descriptive analysis can benefit researchers by providing a valuable description of security for its comprehensive description of benefit behaviour in a population. The specific objectives which are included in this analysis are:

- To determine the knowledge of fluoride in drinking water in the population of Subang Jaya, Selangor.
- To determine the perception of fluoride in drinking water in the population of Subang Jaya, Selangor.

3.6.2 CHI SQUARE TEST/FISHER EXACT TEST

Chi Square was a non-parametric test used to determine the association between different categorical variables. The variables were measured from the

answers of respondents in the questionnaire and the total score divided by the total number of questions for each section (knowledge and perception) multiplied by 100% will determine the level of each variable (Very Low, Low, Medium, High, and Very High) based on the percentages obtained. The specific objectives used in this analysis were:

- To determine the association between sociodemographic background and knowledge level of fluoride in drinking water in the population of Subang Jaya, Selangor.
- To determine the association between sociodemographic background and perception level of fluoride in drinking water in the population of Subang Jaya, Selangor.

3.7 ETHICAL CONSIDERATION

Ethical consideration is important in any research. Hence, in order to conduct this research, the researcher must first get approval from the Research Committee of Universiti Putra Malaysia, JKEUPM and also the respondents who are willing to participate in this study. Also, all information of the participants will remain private and confidential throughout this study.

3.8 CONCLUSION

In this chapter, researcher has explained the background of study area, research design, duration of research, study population and sampling size calculation, instruments used and ethical consideration included in this study.



CHAPTER 4

RESULTS

Based on the specific objectives listed in Chapter 1 of Introduction under Section 1.5 of specific objectives, IBM SPSS software was used to analyse the data collected from the questionnaire.

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

Table 4.1 Sociodemographic data distribution

Sociodemographic variables		Frequency	Percentage (%)
Age	18-64 years old	215	95.1
	More than 64 years old	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

Table 4.1 displays the sociodemographic information of the population. For this objective, descriptive analysis was used to analyse the data to generate frequency and percentage of the sociodemographic information as follows:

1. Age
2. Gender
3. Education level
4. Duration lived in study area

4.1.1 Age

The respondents who participated in the questionnaire were mostly aged 18 to 64 years old with a total of 215 (95.1%) respondents. Meanwhile, respondents who were 64 years old and above recorded a total of 11 (4.9%) total participants.

4.1.2 Gender

For gender, the results showed that female respondents were the majority respondents recorded 139 (61.5%) female respondents. Meanwhile, male respondents recorded a

total of 87 respondents (39.5%).

4.1.3 Educational Level

The highest number of respondents recorded in the questionnaire are from tertiary level of education with a total of 196 (86.7%) respondents. The second highest number of respondents recorded was from a secondary level of education with a total of 29 (12.8%) respondents, followed by primary level of education with only one respondent (0.4%). No respondents had no formal education background reported in the study.

4.1.4 Duration lived in study area

Most of the respondents have stayed in Subang Jaya, Selangor for more than 10 years which totalled up to 168 (74.3%) respondents. 31 (13.7%) respondents stayed in the study area for 1 to 5 years. Next, 18 (8.0%) respondents stayed in the study area for 6 to 10 years and lastly 9 (4.0%) respondents stayed for less than a year in the study area.

4.2 THE KNOWLEDGE OF FLUORIDE IN DRINKING WATER IN THE POPULATION OF SUBANG JAYA, SELANGOR.

Table 4.2 Distribution of knowledge items in respondents (N=226)

Knowledge items	Correct n (%)
General knowledge	
Fluoride	
Know about fluoride	
1. Yes	169 (74.8%)
2. No/Not sure	57 (25.2%)
Heard or read about fluoride	
1. Yes	187 (82.8%)
2. No/Not sure	39 (17.2%)
Source of heard or read about fluoride before	
1. Print media	21 (9.3%)
2. Electronic media	59 (26.1%)
3. Educational institution	45 (20.0%)
4. Friends	33 (14.6%)
Know about addition of fluoride in drinking water	
1. Yes	120 (53.1%)
2. No/Not sure	106 (46.9%)

Know the purpose of adding fluoride in drinking water

- | | |
|----------------|-------------|
| 1. Yes | 122 (60.0%) |
| 2. No/Not sure | 104 (46.0%) |

Know the optimal level of adding fluoride in drinking water by NSDQW

- | | |
|----------------|-------------|
| 1. Yes | 25 (11.1%) |
| 2. No/Not sure | 201 (88.9%) |

Can the lack of fluoride exposure cause diseases?

- | | |
|----------------|-------------|
| 1. Yes | 103 (45.6%) |
| 2. No/Not sure | 123 (54.4%) |

Can excessive exposure to fluoride cause diseases?

- | | |
|----------------|-------------|
| 1. Yes | 155 (68.6%) |
| 2. No/Not sure | 71 (31.4%) |

Health effects caused by excessive fluoride exposure

- | | |
|-------------------------------|------------|
| 1. Dental fluorosis | 69 (30.5%) |
| 2. Skeletal fluorosis | 42 (18.6%) |
| 3. Insulin secretion problem | 12 (5.3%) |
| 4. Neural development problem | 19 (8.4%) |

- | | |
|------------------------------------|-----------|
| 5. Thyroid gland secretion problem | 21 (9.3%) |
| 6. Tooth decay | 8 (3.5%) |

Health effects caused by lack of fluoride exposure

- | | |
|-------------------------|------------|
| 1. Dental fluorosis | 56 (24.8%) |
| 2. Weak bones structure | 45 (20.0%) |
| 3. Tooth decay | 34 (15.0%) |
-

Referring to the table above, the knowledge level of residents in Subang Jaya, Selangor was divided into different categories such as Very Low which had 32 participants, Low which had 77 participants, Medium which had 79 participants, High which had 37 participants and lastly no participants scoring a Very High knowledge level.

The knowledge of fluoride in drinking water was assessed through the respondents answering 11 questions in the knowledge section of the questionnaire. For the first question, 169 (74.8%) respondents answered Yes to whether they know what fluoride is. For the second question, 187 (82.8%) respondents had heard or read about fluoride. For the third question, 21 (9.3%) respondents heard or read about fluoride through print media, 59 (26.1%) respondents through electronic media, 45 (20.0%) respondents through educational institution, and 32 (14.6%) respondents through friends. Also, for the fourth question, 120 (53.1%) respondents knew about the addition of fluoride in drinking water. For the fifth question, 122 (60.0%) respondents knew the purpose of adding fluoride in drinking water. For the sixth question, 291 (88.9%) respondents did not know the optimal level of adding fluoride in drinking water by National Standard Drinking Water Quality (NSDWQ). Moreover, 103 (45.6%) respondents answered yes to whether the lack of fluoride exposure can cause diseases and 155 (68.6%) respondents answered yes to whether the excessive of fluoride

exposure can cause diseases. For the health effects caused by excessive fluoride exposure, 69 (30.5%) respondents answered dental fluorosis, 42 (18.6%) respondents answered skeletal fluorosis, 12 (5.3%) respondents answered insulin secretion problem, 19 (8.4%) respondents answered neural development problem, 21 (9.3%) answered thyroid gland secretion problem, 8 (3.5%) respondents answered tooth decay.

4.3 THE PERCEPTION OF FLUORIDE IN DRINKING WATER IN THE POPULATION OF SUBANG JAYA, SELANGOR.

Table 4.3 Distribution of perception items of respondents

Perception items	Correct n (%)
Commonly used source of drinking water	
1. Tap water	16 (7.1%)
2. Store bought water	9 (4.0%)
3. Filtered water	201 (89.0%)
Reason for choice of drinking water	
1. Taste, smell, and colour of drinking water	198 (87.7%)
2. Saves money and time	75 (33.2%)
3. Guarantees the safety of water consumption	202 (89.4%)
Think the addition of fluoride in drinking water is safe	
1. Yes	98 (43.4%)
2. No/Not sure	128 (56.6%)
Think the addition of fluoride in drinking water supply is effective	
1. Yes	71 (31.4%)
2. No/Not sure	155 (68.6%)
Think the addition of fluoride in drinking	

water supply can prevent tooth decay

- | | |
|----------------|-------------|
| 1. Yes | 132 (58.4%) |
| 2. No/Not sure | 94 (41.6%) |

Support the addition of fluoride in
drinking water supply

- | | |
|----------------|-------------|
| 1. Yes | 129 (57.1%) |
| 2. No/Not sure | 97 (42.9%) |
-

Based on the table above, a summary of the total number of respondents submitting answers for perception items was shown. For this section, 201 (89.0%) respondents chose filtered water as their source of drinking water which is the majority of respondents' choice. 16 (7.1%) respondents chose tap water and 9 (4%) respondents chose bottled water as their source of drinking water. The main reason to why the respondents chose their source of drinking water is because it guaranteed their safety of water consumption 202 (89.4%), they prefer the taste, smell and colour of drinking water 198 (87.7%) and lastly to save money and time 75 (33.2%). Next, 98 (43.4%) respondents thought that the addition of fluoride in drinking water is safe, 71 (31.4%) respondents thought that the addition of fluoride in drinking water is effective, 132 (58.4%) respondents thought that the addition of fluoride in drinking water could prevent tooth decay, and lastly 129 (57.1%) respondents supported the addition of fluoride in drinking water.

4.4 ASSOCIATION BETWEEN SOCIODEMOGRAPHIC BACKGROUND AND KNOWLEDGE LEVEL OF FLUORIDE IN DRINKING WATER IN THE POPULATION OF SUBANG JAYA, SELANGOR.

Table 4.4 Association between sociodemographic background and knowledge level

Sociodemographic characteristics		Knowledge Level N = 226					Expected count, χ^2	p-value (p=0.05)
		Very Low	Low	Medium	High	Very High		
Age	18 to 64 years old	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	0.000*
	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	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)		

education							
Duration lived in study area	Less than a year	0 (0.0%)	8 (3.5%)	1 (0.4%)	0 (0%)	0 (0%)	
			13 (5.8%)	14 (4.4%)			
	1 to 5 years old	0 (0.0%)	2 (0.9%)	8 (3.5%)	3 (1.3%)	1 (0.4%)	0.08
	6 to 10 years	0 (0.0%)	54 (23.9%)	75 (33.2%)	5 (2.2%)	1 (0.4%)	0.085
	More than 10 years	31 (13.7%)			29 (12.8%)	0 (0.0%)	

**significant p-value*

In determining the association between sociodemographic background and knowledge level of Subang Jaya population, a significant association is showed with associating gender and knowledge level, and education level and knowledge level. Association between gender and knowledge level resulted in $p=0.000$ ($p<0.001$) meanwhile the association between education level and perception level resulted in $p=0.004$ ($p<0.05$).

4.5 THE ASSOCIATION BETWEEN SOCIODEMOGRAPHIC BACKGROUND AND PERCEPTION LEVEL OF FLUORIDE IN DRINKING WATER IN THE POPULATION OF SUBANG JAYA, SELANGOR.

Table 4.5 Association between sociodemographic background and perception level

Sociodemographic characteristics		Perception Level N = 226					Expected count, χ^2	p-value (p=0.05)
		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%)	0.77	0.001
	Female	2 (0.9%)	10 (4.4%)	51 (22.6%)	51 (22.6%)	27 (12.0%)		
Educational level	Primary	1 (0.4%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.06	0.098
	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%)		

Duration lived in study area	No formal education	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0.08	0.139
	Less than a year	0 (0%)	0 (0%)	9 (4.0%)	0 (0%)	0 (0%)		
	1 to 5 years old	0 (0%)	1 (0.4%)	10 (4.4%)	15 (6.6%)	5 (2.2%)		
	6 to 10 years	0 (0%)	1 (0.4%)	8 (3.5%)	9 (4.0%)	0 (0%)		
	More than 10 years	2 (0.9%)	12 (5.3%)	75 (33.2%)	56 (24.8%)	23 (10.2%)		

**significant p-value*

CHAPTER 5

DISCUSSION

5.1 SOCIODEMOGRAPHIC CHARACTERISTICS OF 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%).

5.2 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.

5.3 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 know the source guarantees 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 saves 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 guarantees 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.).

In addition, 137 (57.1%) of participants wanted fluoride to be provided through inexpensive and time-saving drinking water sources over other methods. Our findings are consistent with earlier research, which indicates that dentists have a limited understanding of fluorides' principal mechanism of action, which may lead to erroneous conclusions about its efficacy in various age groups (Bansal et al., 2012). One of the individuals in our study who had heard or read about fluoride from their dentist may

have received erroneous information regarding its effectiveness.

5.3 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. However, gender was not taken into account when associating knowledge and perception due to reasons that will be discussed below.

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. (Sharma et al., 2020) reported that a significant difference was found between the gender of male and female in their study. However, for association, it cannot be specifically be proven to how male and female can be associated with one another.

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. Contrary to a previous study by Wajahat et al., (2022), the researchers claimed that educational status and parental gender had no bearing on knowledge of silver diamine fluoride (SDF) treatment. A concerning finding of our

study was the lack of trust in the purity and safety of community tap water in a city where water is safe and the belief that bottled water is purer and safer than tap water. However, similar to the results of a significant association between knowledge and gender, it is not clear to how gender can be associated with perception. Hence, to further clarify on gender, further analytical test which is the Kruskal-Wallis test must be used to find the significant difference between male and female.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS FOR FUTURE STUDIES

In conclusion, most of the respondents from Subang Jaya has Medium level of knowledge of fluoride in drinking water with 79 (35.0%) respondents. In addition, they also have Medium level of perception of fluoride in drinking water with 102 (45.1%) respondents. Through this study too, we could observe the potential health effects from excessive exposure towards fluoride such as dental fluorosis, skeletal fluorosis, thyroid gland secretion problem, insulin secretion problem, and also neural development problem. Furthermore, the insufficient exposure towards fluoride may lead to dental caries and tooth decay.

The knowledge and perception of fluoride in drinking water among the community shall be improved to increase their awareness on the health benefits and consequences of fluoride exposure. For recommendations, the local government is urged to develop programmes to educate Malaysians about fluoride, which can be found not only in the toothpaste people use on a daily basis, but also in a variety of other places in the environment. Furthermore, the local government can develop successful collaboration initiatives with other agencies that focus on dental health to get better

results when delivering fluoride to the population. Although water fluoridation has been a part of Malaysia's drinking water supply since 1972, most Malaysians are still unaware of the presence of fluoride in their regular water use. As a result, local governments will boost fluoride-related programmes for Malaysians. For example, in Malaysia, fluoride instructional programmes are being implemented at the primary level, as well as fluoride education for parents to make them more aware of their children's fluoride intake. As a result, problems such as dental decay caused by a lack of fluoride exposure, as well as cases of excessive fluoride exposure, may be regulated and prevented in this country.

The limitations in this study were the small sample size that could not be generalised to a whole urban population. This is because there is currently a total of 1,321,672 population in Subang Jaya as compared to the sample size in this study which was only 226 respondents. Hence, a bigger sample size in other urban areas can contribute in generalising further about this study. Also, the limitations of this study include the lack of face to face interaction between researcher and respondents. This is due to the platform of the questionnaire distributed was only through online Google Form. Hence, respondents might feel hesitant to directly contact the researcher for further inquiries leading to inaccurate answers in the questionnaire. Also, not many studies were done regarding this topic in Malaysia hence researchers were only able to get references from international academic articles to support this study.

For recommendations, it is suggested that this study needs a face to face interaction and the respondents to this study be given clear instructions on how to complete the survey in order to avoid them from selecting responses at random without thoroughly reading the questions and to assist them in answering more attentively. Finally, instead of focusing solely on fluoride intake from drinking water, this type of study should incorporate fluoride from a variety of sources, such as foods, beverages, and oral healthcare products. As a result, we can calculate the baseline of fluoride knowledge and perception from a variety of sources. Also, a questionnaire that requires respondents to answer two times which are before and after watching and reading educational material regarding fluoride's uses, health benefits and consequences is recommended to be conducted. This will further enhance the understanding of respondents as they can learn about the topic and provide feedback after they have read or watched the materials given such as poster or a short video of fluoride.

REFERENCES

- 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>
- Armfield, J. M., & Akers, H. F. (2010). Risk perception and water fluoridation support and opposition in Australia. *Journal of Public Health Dentistry*, 70(1), 58–66. <https://doi.org/10.1111/j.1752-7325.2009.00144.x>
- Aldrees, A. M., & Al-Manea, S. M. (2010). *Fluoride content of bottled drinking waters available in Riyadh, Saudi Arabia*. ResearchGate; Elsevier. https://www.researchgate.net/publication/255987339_Fluoride_content_of_bottled_drinking_waters_available_in_Riyadh_Saudi_Arabia
- Assessment, U. E. N. C. for E. (n.d.). “IRIS Assessments | IRIS | US EPA.” Iris.epa.gov. https://iris.epa.gov/AtoZ/?list_type=alpha
- Azami-Aghdash, S., Ghojzadeh, 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>

Azrina Azlan, Hock Eng Khoo, Mohd Aizat Idris, & Muhammad Rizal Razman. (2012, June). *Consumption Patterns and Perception on Intake of Drinking Water in Klang Valley, Malaysia*. ResearchGate; Asian Network for Scientific Information. https://www.researchgate.net/publication/227349917_Consumption_Patterns_and_Perception_on_Intake_of_Drinking_Water_in_Klang_Valley_Malaysia

Barberio, A. M., Quinonez, C., Hosein, F. S., & McLaren, L. (2017). Fluoride exposure and reported learning disability diagnosis among Canadian children: Implications for community water fluoridation. *Canadian Journal of Public Health*, 108(3), 229–239.

Bashash, M., Thomas, D., Hu, H., Martinez-Mier, E. A., Sanchez, B. N., Basu, N., Peterson, K. E., Ettinger, A. S., Wright, R., Zhang, Z., Liu, Y., Schnaas, L., Mercado-García, A., Tellez-Rojo, M. M., & Hernandez-Avila, M. (2017). Prenatal fluoride exposure and cognitive outcomes in children at 4 and 6–12 years of age in Mexico. *Environmental Health Perspectives*, 125(9), 1–12.

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>

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

Dey, S., & Giri, B. (2016). Fluoride Fact on Human Health and Health Problems: A Review. *Medical & Clinical Reviews*, 02(01). <https://doi.org/10.21767/2471-299x.100001>

Duan, Q., Jiao, J., Chen, X., & Wang, X. (2018). Association between water

fluoride and the level of children's intelligence: a dose-response meta-analysis. *Public Health*, 154, 87–97.
<https://doi.org/10.1016/j.puhe.2017.08.013>

Fluoride in Drinking-water Background document for development of WHO Guidelines or Drinking-water Quality. (n.d.).
https://www.who.int/water_sanitation_health/dwq/chemicals/fluoride.pdf

Fluorosis. (2018). Who.int.
<https://www.who.int/teams/environment-climate-change-and-health/water-and-health/burden-of-disease/other-diseases-and-risks/fluorosis>

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>

Kanduti, D., Sterbenk, P., & Artnik. (2016). Fluoride: A Review of Use and

Effects on Health. *Materia Socio Medica*, 28(2), 133.
<https://doi.org/10.5455/msm.2016.28.133-137>

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/jfmpe.jfmpe_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>

Mork, N., & Griffin, S. (2015). Perceived safety and benefit of community water fluoridation: 2009 Health Styles survey. *Journal of Public Health Dentistry*, 75(4), 327–336. <https://doi.org/10.1111/jphd.12104>

Quiñonez, C. R., & Locker, D. (2009). Public Opinions on Community Water Fluoridation. *Canadian Journal of Public Health*, 100(2), 96–100.

<https://doi.org/10.1007/bf03405514>

Petersen, P., & Ogawa, H. (2016). Prevention of dental caries through the use of fluoride - the WHO approach. *Community Dental Health*, 33, 66–68.
https://doi.org/10.1922/CDH_Petersen03

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

Sharma, U., Verma, L., & Passi, S. (2020). Oral Health Knowledge, Attitude, and Practices among Postgraduate Students of Panjab University, Chandigarh: A Cross-sectional Study. *International Journal of Clinical Pediatric Dentistry*, 13(2), 113–118. <https://doi.org/10.5005/jp-journals-10005-1717>

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>

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>

Tahir, M. A., & Rasheed, H. (2013). Fluoride in the drinking water of Pakistan and the possible risk of crippling fluorosis. *Drinking Water Engineering and Science*, 6(1), 17–23.

Yousefi, M., Ghoochani, M., & Hossein Mahvi, A. (2018). Health risk assessment to fluoride in drinking water of rural residents living in the Poldasht city, Northwest of Iran. *Ecotoxicology and Environmental Safety*, 148, 426–430. <https://doi.org/10.1016/j.ecoenv.2017.10.057>

Wajahat, M., Abbas, B., Tariq, K., Imran, E., Aslam, S., & Khurshid, Z. (2022). Parental perception of silver diamine fluoride for the management of dental caries. *Journal of Taibah University Medical Sciences*. <https://doi.org/10.1016/j.jtumed.2021.11.010>

World Health Organization. (n.d.). Fluoride in Drinking-water Background document for development of WHO Guidelines for Drinking-water Quality. https://www.who.int/water_sanitation_health/dwq/chemicals/fluoride.pdf

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.

APPENDICES

APPENDIX A: QUESTIONNAIRE



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

**Pengetahuan dan Persepsi mengenai Fluorida di dalam Air Minuman dalam
Penduduk Subang Jaya, Selangor.**

QUESTIONNAIRE/SOAL SELIDIK

This set of questionnaires will be used as the instrument for obtaining information related to study matter from the respondents for the study purposes. The respondents need to answer all of the questions provided in the questionnaire below. The questionnaire consists of open-ended questions and has three sections. The three sections which are: **Section A: Socio-demographic Characteristics**, **Section B: Knowledge of Fluoride in Drinking Water** and **Section C: Perception of Fluoride in Drinking Water**.

Set soal selidik ini akan digunakan sebagai instrumen bagi memperoleh maklumat yang

berkaitan dengan kajian daripada para responden untuk tujuan kajian. Responden perlu menjawab ke semua soalan yang disediakan dalam soal selidik di bawah. Soal selidik ini mengandungi soalan terbuka dan mempunyai tiga bahagian. Tiga bahagian yang disediakan dalam soal selidik ini antaranya ialah: **Bahagian A: Ciri-ciri Sosio-demografi**, **Bahagian B: Pengetahuan mengenai Fluorida di dalam Air Minuman** dan **Bahagian C: Persepsi mengenai Fluorida di dalam Air Minuman**.

Introduction

Fluoride is an ionized form of the element fluorine that will be beneficial to teeth because it will help to prevent tooth decay. In Malaysia, fluoride is added to drinking water to prevent tooth decay among children and has been a main concern to public health. All public water supplies intended for human consumption are subjected to drinking water quality standards known as the National Standard Drinking Water Quality (NSDWQ). NSDWQ is a set of guidelines designed to help determine the proper raw water treatment that meets the drinking water quality standards for safe and potable water supply. Therefore, an optimum range for fluoride is 0.4mg/L - 0.6 mg/L to make sure the public did not receive lack or excess fluoride in drinking water that will lead to health risk such as dental fluorosis, skeletal fluorosis, insulin secretion problem, neural development problem, thyroid gland problem and tooth decay. 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 since it is a major consumption of fluoride through ingestion.

Pengenalan

Fluorida adalah bentuk terion dari unsur fluorin yang memberi manfaat kepada gigi kerana dapat membantu mencegah kerosakan gigi. Di Malaysia, fluorida ditambahkan ke bekalan air orang awam untuk mencegah kerosakan gigi terutama di kalangan kanak-kanak dan menjadi tumpuan utama kesihatan awam. Semua sumber bekalan air awam adalah tertakluk kepada standard kualiti air minuman yang dikenali sebagai Kualiti Air Minum Standard Nasional (NSDWQ). NSDWQ adalah satu garis panduan yang dirancang untuk membantu pengguna menentukan rawatan air yang betul dan memenuhi standard kualiti air bagi bekalan air yang selamat. Oleh itu, julat optimum yang ditetapkan oleh NSDWQ ialah 0.4mg/L - 0.6 mg/L untuk memastikan orang ramai tidak kekurangan atau berlebihan menggunakan fluorida dalam air minum yang akan menyebabkan risiko kesihatan seperti fluorosis gigi, fluorosis rangka, masalah rembesan insulin, masalah perkembangan saraf, masalah kelenjar tiroid dan kerosakan gigi. Pelbagai sumber pendedahan kepada fluorida seperti melalui makanan, air dan penggunaan ubat gigi yang berlebihan. Namun begitu, air minum menunjukkan keutamaan tertinggi kerana pendedahan fluorida kepada orang ramai melalui majoriti pengambilan fluorida melalui pencernaan.

Please tick (/) on the blank space provided.

Sila tandakan (/) pada ruangan kosong yang disediakan.

SECTION A: SOCIO-DEMOGRAPHIC CHARACTERISTICS

BAHAGIAN A: CIRI-CIRI SOSIO-DEMOGRAFI

1. Age/Umur:

☐ 18-64 years old / 18-64 tahun

☐ More than 64 years old / Lebih daripada 64 tahun

2. Gender/Jantina:

☐ Male / Lelaki

☐ Female / Wanita

3. Educational level/Tahap pembelajaran:

☐ Primary education / Pendidikan rendah

☐ Secondary education / Pendidikan menengah

☐ Tertiary education / Pendidikan tinggi

☐ Did not receive any formal education / Tidak menerima sebarang pendidikan formal

4. How long have you lived in the study area/Sudah berapa lama anda tinggal di kawasan penyelidikan?

☐ Less than a year / Kurang dari setahun

- ☐ 1-5 years / 1-5 tahun
- ☐ 6-10 years / 6-10 tahun
- ☐ More than 10 years / Lebih dari 10 tahun



SECTION B: KNOWLEDGE OF FLUORIDE IN DRINKING WATER

BAHAGIAN B: PENGETAHUAN MENGENAI FLUORIDA DI DALAM AIR MINUMAN

5. Do you know what fluoride is?/Adakah anda tahu apa itu fluorida?

- ☐ Yes / Ya
☐ No / Tidak
☐ Not sure / Tidak pasti

6. Have you heard or read about fluoride before?/Pernahkah anda mendengar atau membaca tentang fluorida sebelum ini?

- ☐ Yes / Ya
☐ No / Tidak
☐ Not sure / Tidak pasti

7. Where did you hear or read about fluoride? Please select all that apply./Di manakah anda mendengar atau membaca tentang fluorida? Sila tanda yang berkenaan.

- ☐ Print media / Media cetak
☐ Electronic media / Media elektronik
☐ Educational institution / Institusi pendidikan
☐ Friends / Rakan-rakan
☐ Others, please specify / Lain-lain, sila nyatakan:

☐ Not applicable / Tidak berkaitan

8. Do you know there is the addition of fluoride in your drinking water?/Adakah anda tahu terdapat penambahan fluorida di dalam air minuman anda?

- ☐ Yes / Ya
☐ No / Tidak
☐ Not sure / Tidak pasti

9. Do you know the purpose of the addition of fluoride in drinking water?/ Adakah anda tahu tujuan penambahan fluorida di dalam air minuman?

- ☐ Yes / Ya
☐ No / Tidak
☐ Not sure / Tidak pasti

10. What is/are the purpose(s) of the addition of fluoride in drinking water?/ Apakah tujuan penambahan fluorida di dalam air minuman?

- ☐ Prevent dental caries and preserve oral health / Mengelakkan daripada karies gigi dan mengekalkan kesihatan oral
☐ Strengthen bones / Menguatkan tulang
☐ Not sure / Tidak pasti

11. Do you know the optimal level of fluoride addition in drinking water that is implemented by the National Standard Drinking Water Quality (NSDWQ)?/ Adakah anda tahu tahap optimal penambahan fluorida di dalam air minuman yang dilaksanakan oleh Kualiti Air Minum Standard Nasional (NSDWQ)?

- ☐ Yes / Ya
☐ No / Tidak

☐ Not sure / Tidak pasti

12. Lack of fluoride exposure can cause diseases/ Kurang pendedahan kepada fluorida boleh menyebabkan penyakit.

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

13. Excessive exposure of fluoride can cause diseases/ Pendedahan fluorida yang berlebihan boleh menyebabkan penyakit.

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

14. What are the health effects that may be caused by excessive levels of fluoride in drinking water?/ Apakah kesan kesihatan yang disebabkan oleh pendedahan fluorida yang berlebihan di dalam air minuman?

☐ Dental fluorosis / Fluorosis gigi

☐ Skeletal fluorosis / Fluorosis tulang

☐ Insulin secretion problem / Masalah pada perembesan insulin

☐ Neural development problem / Masalah pada perkembangan pembelajaran

☐ Thyroid gland problem / Masalah pada kelenjar tiroid

☐ Tooth decay / Pereputan gigi

☐ Not sure / Tidak pasti

15. What are the health effects that may be caused by lack of fluoride exposure in drinking water? / Apakah kesan kesihatan yang disebabkan oleh kurang pendedahan fluorida di dalam air minuman?

☐ Dental fluorosis / Fluorosis gigi

☐ Weak bones structure / Struktur tulang yang lemah

☐ Tooth decay / Pereputan gigi

☐ Not sure / Tidak pasti

SECTION C: PERCEPTION OF FLUORIDE IN DRINKING WATER

BAHAGIAN C: PERSEPSI MENGENAI FLUORIDA DI DALAM AIR MINUMAN

16. What is your most commonly used source of drinking water? / Apakah sumber bekalan air minuman yang sering digunakan?

- ☐ Tap water from public drinking water supply / Air paip daripada sistem air minuman awam
- ☐ Store bought bottled water / Air botol yang dibeli
- ☐ Others, please specify:
-

17. State the reason for your choice of the drinking water source/ Nyatakan sebab pilihan sumber air minuman anda.

*You can choose more than one answer/ *Anda boleh memilih lebih daripada satu jawapan.

- ☐ The taste, smell and color of the drinking water / Rasa, bau dan warna air minuman
- ☐ Save money and time / Jimat kos dan masa
- ☐ To guarantee the safety of the drinking water consumption / Yakin dengan keselamatan air minuman
- ☐ Others, please specify / Lain-lain, sila nyatakan:
-

18 Do you think that the addition of fluoride to the public drinking water supply is safe? / Adakah anda berpendapat bahawa penambahan fluorida ke dalam bekalan air minuman awam adalah selamat?

- ☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

19. Do you think that the addition of fluoride to the public drinking water supply is effective? / Adakah anda berpendapat bahawa penambahan fluorida ke dalam bekalan air minuman awam adalah berkesan?

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

20. Do you think that the addition of fluoride to public drinking water supply can help prevent tooth decay? / Adakah anda berpendapat bahawa penambahan fluorida ke dalam bekalan air minuman awam dapat membantu mengelakkan pereputan gigi?

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

21. Do you think there are any health risks from adding fluoride in drinking water? / Adakah anda berpendapat bahawa terdapat risiko kesihatan daripada penambahan fluorida di dalam air minuman?

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti

22. Are you into the addition of fluoride in drinking water? / Adakah anda

menyokong penambahan fluorida di dalam air minuman?

☐ Yes / Ya

☐ No / Tidak

☐ Not sure / Tidak pasti



References:

- Department of Health Western Australia. (2011). Fluoridated drinking water. Government of Western Australia. Retrieved August 15, 2021, from https://www.healthywa.wa.gov.au/Articles/F_I/Fluoridated-drinking-water
- Sabti, M. Y., Al-Yahya, H., Al-Sumait, N., Akbar, A. A., & Qudeimat, M. A. (2019). Dental and medical practitioners' perception of community water fluoridation as a caries preventive measure. *European Archives of Paediatric Dentistry*, 20(1), 53–61. <https://doi.org/10.1007/s40368-018-0385-1>
- Quinonez, C. R., & Locker, D. (2009). Public opinions on community water fluoridation. *Canadian Journal of Public Health*, 100(2), 96–100.
- Whyman, R. A., Mahoney, E. K., & Borsting, T. (2016). Community water fluoridation: Attitudes and opinions from the New Zealand Oral Health Survey. *Australian and New Zealand Journal of Public Health*, 40(2), 186–192.
- Wilger, J., Jhu, B. S., Cutrufelli, R., Ars, B. S. U., Pehrsson, P., Ars, U., Patterson, K. Y., Ars, U., Holden, J., Ars, M. S. U., & March, F. (2004). Participant Knowledge of Fluoride in Drinking Water Based on a National

Survey, 65(87), 26008.



**APPENDIX B: FORM 2.4; RESPONDENT'S INFORMATION SHEET AND
INFORMED CONSENT FORM**



**JAWATANKUASA ETIKA
UNIVERSITI UNTUK
PENYELIDIKAN
MELIBATKAN MANUSIA
(JKEUPM) UNIVERSITI
PUTRA MALAYSIA, 43400
UPM SERDANG,
SELANGOR, MALAYSIA**

Please read the following information carefully and do not hesitate to discuss any questions you may have with the researcher.

**1. STUDY TITLE: KNOWLEDGE AND PERCEPTION OF
FLUORIDE IN DRINKING WATER IN THE POPULATION OF
SUBANG JAYA, SELANGOR.**

1. INTRODUCTION:

Fluoride in drinking water can contribute to both benefits and also the risk to human health. The daily exposure to fluoride through drinking water can be worrying if there is no sufficient and accurate information about what is the concentration of fluoride in the water itself. A potential health risk is detected if the measured concentration of fluoride level exceeds the National Standard for Drinking Water Quality (NSDWQ). Some of the potential health risks include dental fluorosis, skeletal fluorosis, thyroid function disruption, and

neurological problems. Subang Jaya is an urban area where the supply of water is continuous from the piped water system. Little information is known about the current status of fluoride in the drinking water distributed among the consumers. Hence, this study aims to determine the knowledge and perception of fluoride in the population of Subang Jaya, Selangor. To conduct this study, a questionnaire is distributed consisting of three sections that are all required to be answered by the respondents.

2. WHAT WILL YOU HAVE TO DO?

You are required to read and understand the respondent's information sheet and informed consent form. If you agree to participate in this study, you will need to sign the respondent's information sheet and informed consent form. Next, you may proceed to fill up the socio-demographic information that will be followed by the section of knowledge of fluoride in drinking water and lastly perception of fluoride in drinking water.

3. WHO SHOULD NOT PARTICIPATE IN THE STUDY?

People who are not a resident in Subang Jaya, Selangor.

4. WHAT WILL BE THE BENEFITS OF THE STUDY?

a. TO YOU AS THE SUBJECT?

This is a great opportunity to create awareness and prevent the excessive exposure to fluoride in drinking water to ensure a healthy life. Also, you are able to have a clearer overview on the fluoride concentration in water.

b. TO THE INVESTIGATOR?

We are able to collect data that can aid in future researches about fluoride in drinking water and how we can carry out plans that can contribute to the better wellbeing of the community.

5. WHAT ARE THE POSSIBLE RISKS?

No risks are involved throughout this research.

6. WILL THE INFORMATION THAT YOU PROVIDE AND YOUR IDENTITY REMAIN CONFIDENTIAL?

Yes, the information and identity of respondents will remain private and confidential.

7. WHO SHOULD YOU CONTACT IF YOU HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

You are welcome to call the researcher or the supervisor below to get additional input on this research.

Researcher:
Dalea Anuar
Contact number: 019-3013707
Email: daleaanuar@gmail.com

Supervisor:
Dr Shaharuddin Mohd Sham
Contact number: 012-3387305
Email: shaha@upm.edu.my

*Please initial here if you have read and understood the
contents of this page*_____

8. CONSENT

I Identity Card No

Address

..... hereby voluntarily agree
to take part in the research stated above

*(clinical /drug trial/video recording/ focus group/interview-based/
questionnaire-based).

I have been informed about the nature of the research in terms of methodology, possible adverse effects and complications (as written in the Respondent's Information Sheet). I understand that I have the right to withdraw from this research at any time without giving any reason whatsoever. I also understand that this study is confidential and all information provided with regard to my identity will remain private and confidential.

I* wish / do not wish to know the results related to my participation in the research

I agree/do not agree that the images/photos/video recordings/voice recordings related to me be used in any form of publication or presentation (if applicable)

* delete where necessary

Signature Signature

(Respondent)

(Witness)

Date : Name

.....

I/C No.

.....

.....

I confirm that I have explained to the respondent the nature and purpose of the above-mentioned research.

Date Signature

.....

(Researcher)



