Ministry of Health Malaysia
Oral Health Programme

GUIDELINES FOR WATER FLUORIDATION PROGRAMME IN MALAYSIA

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ABBREVIATION

DDO / PPD	District Dental Officer / *Pegawai Pergigian Daerah*
DPHS	Dental Public Health Specialist / *Pakar Pergigian Kesihatan Awam*
FEO	Fluoride Enamel Opacities
HIC	Health Informatics Centre, MOH
JAKIM	*Jabatan Agama Islam Malaysia*
KMAM	*Unit Kawalan Mutu Air Minum*
MAV	Maximum Acceptable Value
MOH	Ministry of Health
MOSTI	Ministry of Science, Technology & Innovation
NHMRC	Australian National Health and Medical Research Council
NOHPS	Malaysia National Oral Health Strategic Plan
OHD	Oral Health Division
OHP	Oral Health Programme, MOH
ppm	part per million
RP	Reticulation Point
SPAN	*Suruhanjaya Perkhidmatan Air Negara* / National Water Services Commision
TPKN (G)	*Timbalan Pengarah Kesihatan Negeri (Pergigian)* / State Deputy Director of Health (Oral Health)
WHO	World Health Organisation
WSIA	Water Service Industry Act
WTP	Water Treatment Plant

1. INTRODUCTION

Water fluoridation of public water supplies is the controlled addition of a fluoride compound to a public water supply to achieve a concentration optimal for dental caries prevention[1]. The purpose in water fluoridation is to achieve mass prevention in reducing and controlling dental caries in large population.

Water fluoridation is a safe and effective public health intervention for caries prevention and has been named one of the ten most important public health measures of the 20th century[2,3]. The World Health Organisation (WHO)[4] supports and recommends that community water fluoridation (CWF) should be introduced and maintained wherever it is socially acceptable and feasible.

The safety and beneficial of water fluoridation are well documented in various scientific and public documents[5] and have all concluded that water fluoridation is a safe and effective way to prevent dental caries and promote good oral health[6]. The addition of fluoride compound shall comply with criteria governing the provision of a safe water supply.

There has been a significant improvement of caries status of Malaysians over the past 50 years[7]. Water fluoridation has been considered as one of the contributing factors to the improved oral health status of schoolchildren and young adults in Malaysia. Therefore, Malaysia National Oral Health Strategic Plans (NOHSP) 2022-2030 has reemphasis on continuing water fluoridation programme by improving water fluoridation coverage in the population as one of the population-based strategies to enhance prevention and control of dental caries[8].

The first guideline on the implementation of water fluoridation was published in 2006. Since then, there has been many changes seen in public water supply development and improvement in implementation of the fluoridation program. The public water supply has become an industry with

[1] US Department of Health and Human Services. Oral Health in America: A Report of the Surgeon. US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, Rockville Maryland, 2000.
[2] Centers for Disease Control and Prevention (CDC). Ten Great Public Health Achievements -- United States, 1900-1999 MMWR April 02, 1999 / 48(12);241-243.
[3] Centers for Disease Control and Prevention (CDC). Achievements in public health, 1900--1999: fluoridation of drinking water to prevent dental caries. MMWR 1999;48:933--40.
[4] World Health Organization. Fluoride and oral health. Report of a WHO Expert Committee on Oral Health Status and Fluoride Use. Technical Report Series No 846. Geneva: World Health Organisation. 1994.
[5] McDonagh MS *et al*. A Systematic Review of Public Water Fluoridation.
University of York, York: NHS Centre for Reviews and Dissemination; 2000.
[6] US Department of Health and Human Services, "Statement on the Evidence Supporting the Safety and Effectiveness of Water Fluoridation," US Department of Health and Human Services, Rockville, Marlyland, 2018.
[7] Ministry of Health Malaysia.National Health and Morbidity Survey: National Oral Health Survey of School Children 2017 (Volume 2: Oral Health Status of 12-years old Schoolchildren). Institute of Public Health, National Institute of Health (NIH) Ministry of Health Malaysia; 2017
[8] The National Oral Health Strategic Plan 2022-2030; Oral Health Program, Ministry of Health Malaysia; Online access via https://ohd.moh.gov.my/images/pdf/publication/Snap%20Shot%20NOHSP%202022_2030_FINAL_Edaran%202.0.pdf; 2022

the expansion of private water supply providers. However, in some places water supply is provided by the government agency. To ensure quality and safety water supply, the National Water Services Commision or *Suruhanjaya Perkhidmatan Air Negara* (SPAN) was established in 2006 as a national regulatory body for the water and sewerage industry for Peninsular Malaysia and the Federal Territory of Labuan. SPAN and state water regulatory entities (Sabah and Sarawak) play a vital role in water fluoridation particulary to ensure the water supply agencies comply with the standard of safe drinking water.

In term of water fluoridation implementation, some substantial changes were made by Oral Health Programme, Ministry of Health (OHP) to adapt with the current needs which were identified through series of meeting at state and national level. An addendum was introduced in 2015 to emphasize on source of funding and expenditure along with the technical procedures of fluoride level monitoring at water treatment plants and reticulation points. In addition, current evidences of dental fluorosis and its association with fluoridation were established. Therefore, this justifies the needs to revise the existing guideline.

1.1 History of Water Fluoridation

The history of use of fluoride in dentistry started at Colorado Spring in 1900s when Dr. Frederick McKay, a young dentist who arrived there in 1901 discovered the Colorado stains among the local people[9]. The stains were described as minute white flecks or yellow or brown spots or areas, scattered irregularly or streaked over the surface of a tooth, or it may be a condition where the entire tooth surface is of a dead paper-white like the colour of porcelain[10]. McKay also observed that mottled enamel was not susceptible to dental caries than normal enamel. Later, he discovered that the occurrence of stains was localised in define geographical area and associated with those received water supply from one source. Samples of water from other areas reported of similar stains were analysed and high concentration of fluorine in water was discovered.

In 1931, Dr H. Trendley Dean, dental officer from US Department of Public Health was assigned full time research on Colorado Spring stains. He expanded McKay`s work to find the extend and geographical distribution of mottled enamel in the United States. He found that severity of mottled enamel increased with increasing concentration of fluoride in the drinking water and in area which fluoride concentration was less than 1.0 part per million (ppm) the stains cases were not significant.

[9] Murray et al. The Prevention of Oral Disease. Oxford University Press. Oxford.2003
[10] McKay F.S. An Investigation of mottle teeth (III). Dental Cosmos 58,781-92 Michigan 1916

Dean`s and colleagues also discovered the inverse relationship between caries experience and fluoride content.

First community water fluoridation began in January 1945 at Grand Rapids in Michigan. After the sixth year (1951), it was found that the caries experience among 6 years old children were 2 times less compared to control city, Muskegon. Both cities have similar caries experience prior to 1945. Since then, many studies of effectiveness of water fluoridation have been documented in scientific literature for over 70 years. Through the various evidence of effectiveness of water fluoridation, it has been expanded to other countries in the world.

1.2 Water Fluoridation in Malaysia

Water fluoridation was first introduced in Malaysia in 1957 in Tebrau & Gunung Pulai Water Treatment Plant in the state of Johor. This plant served the Johor Bahru District. Fluoridation of public water supplies in other towns commenced from 1965[11].

State government of Johor has appointed a committee to study and recommend prospect of expansion of water fluoridation to the whole state. Dr. Abdul Rahman Awang, a Dental Public Health Officer of Johor and his team had been assigned to conduct epidemiological study to compare caries status pre and post fluoridation and between Johor Bahru and other non-fluoridated towns[12]. The caries status of children aged 7, 9 and 11 years-old were examined. Results of the survey showed that dental caries experience of children in Johor Bahru (fluoridated area) was lower than children in any other four sampled towns (non-fluoridated area). Based on this finding, state government of Johor has agreed to expand water fluoridation to the whole state by stages[12].

Meanwhile in Sarawak, water fluoridation was first introduced in Simanggang water treatment plant in November 1961 at Simanggang (Sri Aman). It was later expanded to Serian in Mac 1962. A total of 15 water treatment plants was involved in water fluoridation in the year 1976.

In 1969, The Committee on Fluoridation of Public Water Supplies in West Malaysia was appointed by the Honourable Minister of Health Malaysia to study and report on the feasibility of introducing the fluoridation of public water supplies as public health measure in all states in West Malaysia. The committee was chaired by Dato Dr. Ibrahim Haji Yassin, who was then the Director of Dental Services and comprised of representatives from relevant agencies such as Medical Services,

[11] Dental Division, MOH. Report of The Committee Appointed to Inquire into and Report Upon the Fluoridation of Public Water Supplies in West Malaysia. Ministry of Health Malaysia. Kuala Lumpur. 1971
[12] Ishak AR, Jaafar N, Jalalluddin RL, Fluorida dan Kesihatan Pergigian. Penerbitan Universiti Malaya.1988

Public Work Department, Chemistry Department, Public Health Engineering, Senior Nutrition and five Dental Public Health Officers, a Dental Officer and one Secretary. The committee strongly recommended that fluoridation of public water supplies be instituted in West Malaysia as soon as possible at optimum level of 0.7 ppm fluoride be maintained in the reticulation system[11]. Based on this recommendation, in 1972 the Cabinet of Federal Government approved the addition of fluoride to the public water supplies as a primary prevention measure to prevent dental caries[13].

Following this, the nationwide water fluoridation programme was implemented incrementally since 1974. The OHP is responsible for monitoring the water fluoridation programme to ensure it is safe and effective in reducing dental caries.

In early implementation, the recommendation optimum level was 0.7 ppm based on the volume of water intake in our climate[9]. However, the level was reviewed by OHP since 2005 to 0.5 ppm after considering the findings from the study on Fluoride Exposure and Fluorosis among Schoolchildren in Malaysia[14,15]. This is mainly due to consumption of alternatives sources of fluoride in the population. The recommended accepted optimum level of fluoride lies between 0.4 to 0.6 ppm due to difficulty in obtaining the exact reading of 0.5 ppm.

2. LITERATURE REVIEW

2.1 Fluoride and Oral Health

Widespread use of fluoride has been a major factor in the decline in the prevalence and severity of dental caries in economically developed countries[16]. The use of fluoride in promoting oral health involves a balance between protection against dental caries and risk of dental fluorosis. Benefits of fluoride conferred through dental caries prevention far outweigh the risk of enamel opacities occurrence[17].

There are various fluoride delivery methods, e.g. water/salt/milk fluoridation, fluoride supplements, fluoride toothpastes, fluoride mouth rinses and topically applied fluoride gels/varnishes. Unlike

[13] Oral Health Program, MOH. Milestone in Dentistry. Oral Health Program, Ministry of Health Malaysia, Putrajaya, 2020.
[14] Tan BS. Fluorosis and fluoride exposure among Malaysian schoolchildren. Thesis in fulfillment of the requirement for the degree of Doctor of Philosophy, 2003. Department of Community Dentistry, University of Malaya, 2003
[15] Oral Health Division, MOH. Fluoride Enamel Opacities in 16 year0old School Children. Oral Health Division, Ministry of Health Malaysia, 2001.
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[17] FDI World Dental Federation. Policy Statement, Promoting Oral Health through Water Fluoridation. September 2014, Delhi, India, Available from: https://www.fdiworlddental.org

other fluoride caries preventive modalities, the great advantages of water fluoridation are that it is relatively inexpensive, effective, eminently safe, equitable (entire population benefits), required no cooperative effort or direct action, benefits continue for life time if consumption continues, reduces cost of dental treatment and does not depend on professional services[18]. However, there are political, geographical and technical reasons that make water fluoridation unavailable to all[19].

2.1.1 Fluoride and Caries Prevention

Despite great improvements in the oral health of the population globally, the problem of caries persists particularly among poor and disadvantaged groups in both developed and developing countries[20]. Dental caries can result in loss of tooth structure, pain, acute infections and eventually may lead to tooth loss. It affects mastication, appearance, general well-being and causes loss of working and school hours as well as impacts on quality of life. According to The World Oral Health Report 2003, dental caries continues to cause an important public health problem in most developed countries, where it affects 60-90% of schoolchildren and most adults[21].

Dental caries is a preventable disease affecting people of all ages. It can be controlled by the common action of communities, professionals and individuals aimed at reducing the impact of sugar consumption and emphasising the beneficial impact of fluorides[19].

Research related to the beneficial effects of fluoride began in the early 1900's. Since the fluoridation trials in Grand Rapids in 1945, water fluoridation has been an effective way of public health measures in preventing dental caries. The existing body of scientific evidence strongly suggests that water fluoridation is beneficial at reducing prevalence and severity of dental caries[22,23;24,25,26].

[18] Horowitz HS. Decision-making for national programs of community fluoride use. Community Dent Oral Epidemiol. 2000 Oct;28(5):321-9.
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[22] National Health Service Centre for Review and Dissemination (CRD). A systematic review of public water fluoridation (CRD Report No, 18), York, UK, National Health Service Centre for Review and Dissemination, University of York. 2000. Available at http://www.york.ac.uk/inst/crd/fluorid.htm.
[23] Truman BI, Gooch BF, Sulemana I, Gift HC, Horowitz AM, Evans CA, Griffin SO, Carande-Kulis VG; Task Force on Community Preventive Services. Reviews of evidence on interventions to prevent dental caries, oral and pharyngeal cancers, and sports-related craniofacial injuries. Am J Prev Med. 2002 Jul;23(1 Suppl):21-54. Review.
[24] American Dental Association and Centers for Disease Control and Prevention. Water Fluoridation. 2006. Available from: https://www.cdc.gov/fluoridation/pdf/natures_way.pdf Accessed on 26 September 2020.
[25] NHMRC. A systematic review of efficacy and safety of fluoridation. National Health and Medical Research Council. Australian Government. 2007.
[26] Iheozor-Ejiofor Z, Worthington H, Walsh T, O'Malley L, Clarkson J, Macey R, Alam R, Tugwell P, Welch V, Glenny A-M. Water fluoridation for the prevention of dental caries. Cochrane Database Syst Rev. 2015:Issue 6. Art. No.: CD010856.DOI: 010810.011002/14651858.CD14010856.pub14651852.

There are a few recent reviews of studies on water fluoridation[20,21,23,24]. The York Review, the earliest systematic review of extensive available studies on water fluoridation worldwide was conducted by National Health Services Centre for Review and Dissemination at the University of York[20,27].

In terms of reduction in percentage of caries free children, the York Review indicates a mean difference of 14.6% in the proportion of caries free children in fluoridated and non-fluoridated areas. Truman et al. (2002) concluded that water fluoridation reduces dental caries by 30% to 50% of what could be expected for people not consuming fluoridated water[21]. In addition, stopping water fluoridation may lead to the median 17.9% increase in caries, in situations in which alternative sources of fluoride are inadequate[21]. The Australian National Health and Medical Research Council's (NHMRC) review suggested that the introduction of water fluoridation is strongly associated with an increase in the percentage of caries-free children, resulted in a mean difference of 15.4% in the percentage of caries-free children; 14.3% after adjusted for confounding factors[23]. The Cochrane Review by Iheozor-Ejiofor et al. (2015) indicates there were 15% increase in the caries free children in deciduous dentition and 14% in permanent dentition[24].

Water fluoridation has contributed to the reduction in dental caries severity, measured as the mean difference in the change in decayed, missing, and filled primary/permanent teeth (dmft/DMFT) score, the York Review suggested the median of mean change in (dmft/DMFT) was 2.25 teeth[20]. The NHMRC's review suggested that introduction of water fluoridation is strongly associated with an improvement in dmft/DMFT scores, i.e. a mean difference of 2.61 after adjusted for confounding factors[23]. Cochrane Review showed introduction of water fluoridation results in a 35% reduction in caries severity in deciduous dentition, with a mean different of 1.81 dmft and a 26% reduction in permanent dentition, a mean difference of 1.16 DMFT[24].

The York Review estimated from the studies reviewed that a median of six people need to receive fluoridated water for one extra person to be caries-free. A beneficial effect of water fluoridation was still evident despite the assumed exposure to non-water fluoride in the population studied[20].

From the systematic reviews of water fluoridation, majority of the studies on benefits of fluoridation focus on the effect on children dental health. However, adults also benefit from fluoride[14]. Griffin et al. (2007) reported that fluoride prevents caries among adults of all ages[28]. They showed that

[27] Medical Research Council (MRC). Medical Research Council Working Group Report: Water fluoridation and health, London, Medical Research Council. 2002. Available at: http://www.mrc.ac.uk/pdf-publications-water_fluoridation_report.pdf
[28] Griffin SO, Regnier E, Griffin PM, Huntley V. Effectiveness of fluoride in preventing caries in adults. J Dent Res. 2007 May;86(5):410-5.

among studies published after/during 1980, any fluoride (self- and professionally applied or water fluoridation) annually averted 0.29 (95% CI: 0.16-0.42) carious coronal and 0.2 (95% CI: 0.08-0.37) root surfaces. The prevented fraction for water fluoridation was 27% (95% CI: 19%-34%). Parnell et al. (2009) concluded from their review of three systematic reviews and three guidelines that water fluoridation is effective at reducing caries in children and adults[29].

In Malaysia, the first series of fluoridation studies in Johor State showed that there was a 60% reduction of severity in dental caries in the permanent dentition and a 29% reduction in the deciduous dentition[30]. Overall, fluoridation has brought about 44% reductions in dental caries.

In the past 50 years, survey data have shown incremental improvement in oral health status of Malaysian schoolchildren[31,32,33,34,35,36,37]. The mean DMFT of 12-year-old schoolchildren has improved from 3.7 in 1970 to 0.78 in 2017[34]. The prevalence has declined from 83.0% in 1970 to 33.3% in 2017[34]. This has been attributed to the combined effect of water fluoridation, approved by the Malaysian Cabinet Committee in 1972[38], and the comprehensive Incremental Dental Care Programme of the Ministry of Health started in the 1980s[39] in collaboration with the Ministry of Education, Malaysia. A study by Norlida et al. (2005) reported that following water fluoridation cessation in Kelantan (1995) and Terengganu (1999), both states had caries levels that were two to three-folds higher than for the fluoridated state of Johor among 11-12-year-olds[40]. Noting that the use of fluoride toothpaste is widespread in Malaysia, this study also serves to indicate that water fluoridation imparts additional cumulative benefit for caries control as seen in Johor.

Despite the improvement in the national data on dental caries for younger Malaysians, inequalities persist by age groups, location and states[31,32,33,34]. There seems to be association between caries

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[30] Dental Division, Ministry of Health Malaysia: Report on the Fluoridation Projects in the State of Johore Malaysia 1964-1976. 1978. Johor Bahru.
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[32] Dental Division, Ministry of Health Malaysia. Dental epidemiological survey of school children in Peninsular Malaysia. Kuala Lumpur: Government Printers, 1988
[33] Oral Health Division, Ministry of Health Malaysia. National oral health survey of school children 1997 (NOHSS '97), 1998
[34] Oral Health Division. National Oral Health Survey of School Children 2007 (NOHSS 2007): 6-Year-Olds. Ministry of Health Malaysia; 2009.
[35] Oral Health Division. National Oral Health Survey of School Children 2007 (NOHSS 2007): 12-Year-Olds. Ministry of Health Malaysia; 2010.
[36] Oral Health Division. National Oral Health Survey of School Children 2007 (NOHSS 2007): 16-Year-Olds. Ministry of Health Malaysia; 2010.
[37] Oral Health Division, Ministry of Health Malaysia. National Health and Morbidity Survey 2017. National Oral Health Survey of Schoolchildren 2017 (NHMS 2017: NOHSS 2017). Vol. II: Oral Health Status of 12-year-old Schoolchildren, September 2017.
[38] Ministry of Health Malaysia. File No. 164/811/72 dated 18 April 1972
[39] Oral Health Division, Ministry of Health Malaysia. Milestones in Dentistry in Malaysia, April 2009
[40] Norlida A, Wan MN, Khairiyah AM, Natifah CS, Mahrusah J, Azizah Y, Rosli I. Effects of cessation of fluoridation in Kelantan and Terengganu on caries experiences of 11- to 12-year-olds. Paper presented at the National QA Convention 2005 held at Summit Hotel, Subang Jaya, Selangor on 14-15 November 2005. Also abstract: *Malaysian J Public Health Med 2005*;**5**(Suppl 4):10 (Oral)

experience and status of water fluoridation programmes. Caries experience was higher among schoolchildren in Kelantan, Terengganu, Sabah and Sarawak[34].

Survey data on enamel opacities of 16-year-old schoolchildren in Malaysia showed there were large differences in the caries experience of children between fluoridated and non-fluoridated areas[41,42]. In 2001, mean DMFT score was 1.3 in fluoridated areas compared to 4.2 in non-fluoridated areas[38]. In 2013, survey showed the prevalence of dental caries in fluoridated areas was 41.0%, significantly lower that non-fluoridated areas (78.3%)[39]. The mean score of DMFT was about four times higher in non-fluoridated areas (3.66) compared to fluoridated areas (1.03)[39].

2.1.2 Fluoride and Dental Fluorosis

Adding fluoride to drinking water may result in discolouration of enamel or dental fluorosis. Dental fluorosis is a hypomineralisation of tooth enamel or dentin produced by the chronic ingestion of above-optimum amounts of fluoride when teeth are developing. The degree of dental fluorosis relates to the timing, duration and amount of fluoride exposure and appearance on teeth can range from hardly noticeable whitish striations to unsightly staining which may compromise teeth cosmetically[43]. Enamel defects similar to dental fluorosis are associated with other conditions, such as malnutrition, premature birth, low birth weight, hyperglycaemia, rickets, neonatal tetany, celiac disease and asthma[44]. Minor forms of dental fluorosis are aesthetically acceptable and reported to have no impact on the oral health related quality of life[45].

Numerous studies have been conducted across the world to determine the prevalence of dental fluorosis. Direct comparison of the data is not appropriate as various indices have been used for measuring the prevalence of dental fluorosis. In Malaysia, the prevalence of dental fluorosis among 9- and 12-year-olds varied from 5.5% to 35.7% depending on the areas residing, fluoridated or non-fluoridated areas[46]. These findings were higher than those reported in Australia (11.3%)[47]. But the findings are comparable to those reported in the USA (33.4% - 40.6%)[48], Hong Kong[49] and Singapore[50] in the 1980s and 1990s. While for the developmental defects of enamel (DDE),

[41] Oral Health Division, Ministry of Health Malaysia. Fluoride enamel opacities in 16-year-old school children, June 2001
[42] Oral Health Division, Ministry of Health Malaysia. Fluoride enamel opacities in 16-year-old school children, 2016.
[43] Horowitz HS. Fluoride and enamel defects. *Adv Dent Res 1989*;**3**:143-6
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[50] Lo GL, Bagramian RA. Prevalence of Dental Fluorosis in Children in Singapore. Community Dent Oral Epidemiol 1996: 24(1);25-27.

majority of reported cases in Malaysia[51], Sweden[52], Australia[53], New Zealand[54] and India[55] ranged from 32% to 58% in permanent dentition. Fluoride Enamel Opacities (FEO) in 16-year-old schoolchildren 2013 showed the overall prevalence of FEO was 44.2; significantly higher in fluoridated areas (82.4%) than non-fluoridated areas (33.8%)[39].

2.2 Safety of Water Fluoridation

York Review concluded that the evidence of a beneficial reduction in caries should be considered with the increased prevalence of dental fluorosis. There was no clear evidence of other potential adverse effects[20]. The Australian NHMRC[23] review supported the conclusions of previous research in asserting that there was no evidence to substantiate a link between fluoridation and adverse health outcomes such as cancer[56] or an increased risk of bone fracture[57]. Parnell et al. (2009) revealed that with the exception of dental fluorosis, no association between adverse effects and water fluoridation has been established[27].

2.3 Cost of Water Fluoridation

A number of studies were conducted to assess cost and cost effectiveness of water fluoridation programme. A systematic review by Ran et al. (2016) concluded that the economic benefit of community water fluoridation exceeds the intervention costs[58]. It was estimated that the cost for a community to fluoridate its water ranged from USD0.11 to USD24.38 per capita per year, while per capita per year benefits ranged from USD5.49 to USD93.19[55]. In Malaysia, a study in Johor estimated that the per capita cost of fluoride compound for fluoridating community water supply at the recommended level of 0.7ppm was RM0.18 per year from 1992 to 1996[59]. In South Africa, it was estimated per capita cost per year was USD0.36[60].

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[57] Cury JA, Ricomini-Filho AP, Berti FLP, Tabchoury CPM. Systemic Effects (Risks) of Water Fluoridation. *Brazilian Dental Journal* 2019:30(5);421-428.
[58] Ran T, Chattopadhyay S. Economic Evaluation of Community Water Fluoridation: A Community Guide Systematic Review. *Am J Prev Med* 2016:50(6);790-796.
[59] Loh KH. Cost estimation study of water fluoridation programme in Johor. A compendium of Abstracts 2004. Oral Health Division, Ministry of Health Malaysia. 2005.
[60] Kroon J, van Wyk PJ. A model to determine the economic viability of water fluoridation. J Public Health Dent. 2012 Fall;72(4):327-33.

In Colorado United States, O'Connell and colleagues estimated community water fluoridation programmes were associated with annual savings of USD60.78 per person[61]. In Australia, Campain and colleagues estimated average cost savings/person, using Australian dollars at the 2005 level, ranged from USD56.41 in 1970s to USD17.75 in 1990s; estimated average cost savings/person was USD249.45 in 1970s to USD69.86 in 1990s if complex method was employed[62]. Kroon et al. (2005) estimated that cost effectiveness of CWF programme was USD11.41 in South Africa[57].

2.4 The Optimal Concentrations of Fluoride

The optimal concentrations of fluoride in community drinking water were determined based on the balance between achieving maximum protection against caries and to minimise the occurrence of dental fluorosis[23,63]. The optimal concentration of fluoride varies according to climatic conditions with the range 0.5-1.0 mg/L being recommended[61]. WHO recommends that volume of water consumed and intake from other sources should be considered when setting national standards[61]. In the USA, the U.S. Public Health Service has recommended that community drinking water contain 0.7 to 1.2 mg/L (ppm) of fluoride since 1962[64]. The recommended level has been revised to 0.7 mg/L in 2015[65]. The recommended level in Hong Kong and Singapore is 0.5 ppm[66].

In the UK, the regulatory limit for fluoride in the public water supply is 1.5 mg/L[67]. The Maximum Acceptable Value (MAV) of fluoride in drinking water in New Zealand is 1.5 ppm[68]. While for Australia, the design of the fluoridation plant must at no time allow the fluoride concentration in the drinking water supply to exceed the health guideline value of 1.5 mg/L[69].

In Malaysia, the recommended optimum level of fluoride in public drinking water in year 1972 was 0.7 ppm based on the volume of water intake in local climate, with 1.0 ppm as the upper limit for safety. Due to concerned about the exposure to multiple fluoride sources and findings from the

[61] O'Connell JM, Brunson D, Anselmo T, Sullivan PW. Costs and savings associated with community water fluoridation programs in Colorado. Prev Chronic Dis. 2005 Nov;2 Spec no:A06.
[62] Campain AC, Mariño RJ, Wright FA, Harrison D, Bailey DL, Morgan MV. The impact of changing dental needs on cost savings from fluoridation. Aust Dent J. 2010 Mar;55(1):37-44.
[63] World Health Organisation Expert Committee on Oral Health Status and Fluoride Use. Fluorides and oral health. WHO Technical Report Series No. 846. World Health Organisation, Geneva. 1994.
[64] United States. Public Health Service. Public health service drinking water standards. US Government Printing Office; 1962.
[65] U.S. Department of Health and Human Services. Public Health Service Recommendation for Fluoride Concentration in Drinking Water for Prevention of Dental Caries. 2015. Available from: https://www.federalregister.gov/documents/2015/05/01/2015-10201/public-health-service-recommendation-for-fluoride-concentration-in-drinking-water-for-prevention-of (accessed on 30.9.2020).
[66] Petersen PE, Baez RJ, Lennon MA. 2012. Community-oriented administration of fluoride for the prevention of dental caries: a summary of the current situation in Asia. Adv Dent Res. 24(1):5–10.
[67] Drinking Water Inspectorate. Code of Practice in Technical Aspects of Fluoridation of Water Supplies 2016 London: Drinking Water Inspectorate; 2016.
[68] Ministry of Health. Drinking-Water Standards for New Zealand 2005 (Revised 2008) Wellington: Ministry of Health.
[69] National Health and Medical Research Council 2016, Australian Drinking Water Guidelines, NHMRC, Canberra.

fluoride enamel opacities studies among 16 year-old schoolchildren[70] and fluoride exposure and fluorosis among schoolchildren in Malaysia[71], the recommended fluoride level in public water in Malaysia had been adjusted from 0.7-0.9ppm before 1998 to 0.5-0.7ppm in 1998[72] and further down to 0.4-0.6ppm in 2005[73].

2.5 Population Coverage

Population coverage in countries implementing water fluoridation is as shown in **Table 1**.

Table 1: Countries with water fluoridation schemes covering populations of 1 million or more

Country	Adjusted fluoride Population covered (millions)	Population covered (%)
Argentina	3.1	8.0
Australia	17.6	79
Brazil	73.2	38.0
Brunei	0.3	92.0
Canada	14.2	42.0
Chile	11.0	64.0
Guatemala	1.8	13.0
Hong Kong	6.9	100.0
Ireland	3.2	73.0
Israel	5.2	69.0
South Korea	2.8	6
Malaysia	23.4	76.8 in 2022[74]*
New Zealand	2.3	53.0
Singapore	5.8	100.0
Spain	4.2	10.0
UK	5.7	9
USA	185	60
Vietnam	3.5	4

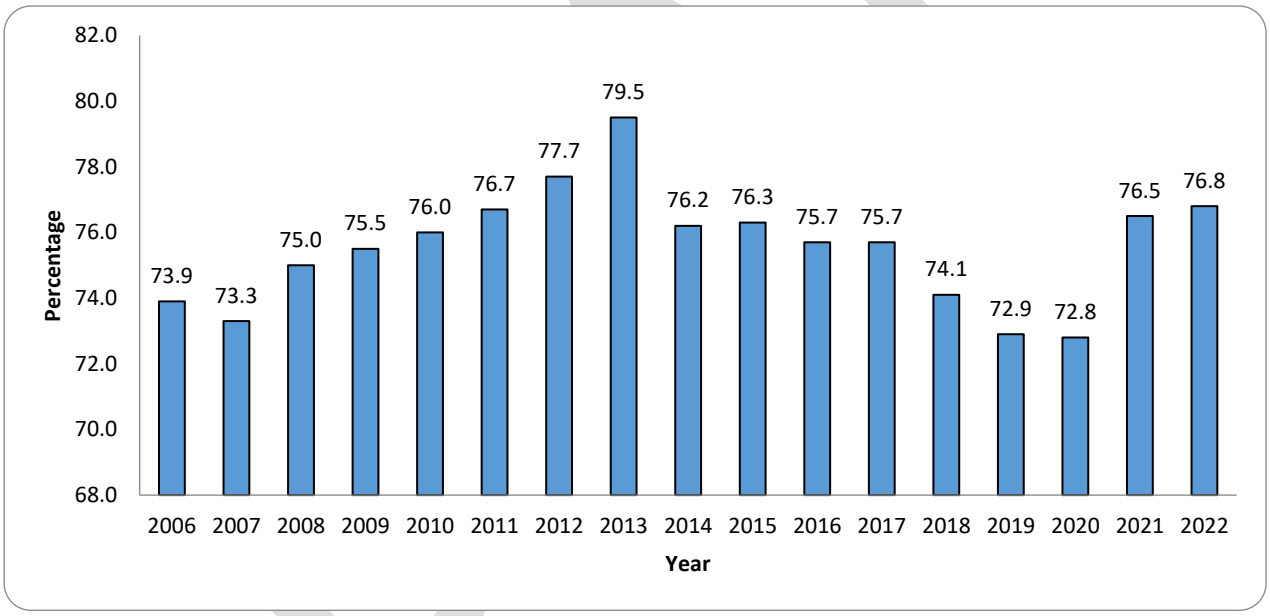
Source: O'Mullane et al., 2016[75] and as stated*

[70] Oral Health Division, Ministry of Health Malaysia. Fluoride enamel opacities in 16-year-old school children, June 2001
[71] Tan BS. Fluorosis and fluoride exposure among Malaysian schoolchildren. Thesis in fulfilment of the requirement for the degree of Doctor of Philosophy, Department of Community Dentistry, University of Malaya, 2003.
[72] Annual Report Oral Health Division 1998.
[73] Letter from Engineering Division, Ministry of Health Malaysia. File No. (32) KKM-153(5/191). Dated 22 December 2005. Notification on Change of Fluoride Level in Drinking Water.
[74] Oral Health Programme, Ministry of Health Malaysia. Annual Report 2022
[75] O'Mullane DM, Baez RJ, Jones S, Lennon MA, Petersen PE, Rugg-Gunn AJ, Whelton H and Whitford GM. Fluoride and Oral Health. Community Dental Health, 33(2), 69-99, 2016

a. Population Coverage in Malaysia

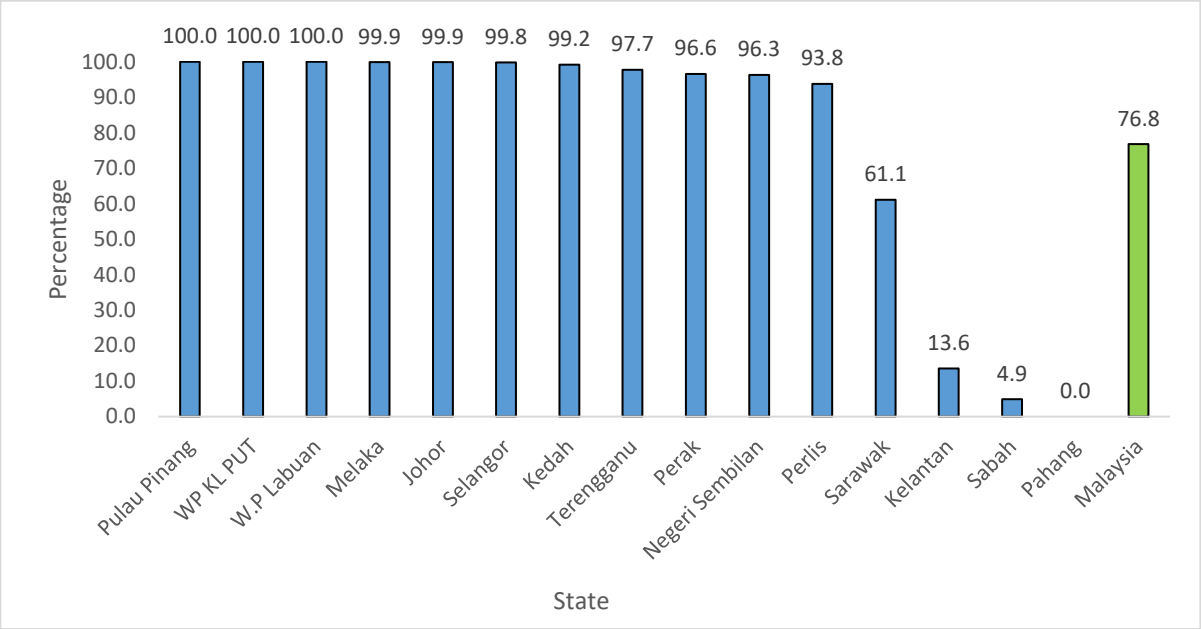
In the year 2010, about 95% of the population receiving piped water supply[76]. Most states had a good coverage of 98% to 100% except Sarawak (93.3%), Sabah (79.0%) and Kelantan (57.0%). In 2022, 76.8% of the population benefitted from fluoridation of public water supplies. **Figure 1** showed the trend of population coverage for water fluoridation from 2006-2022[74]. The percentage of population which received fluoridated public water supplies have increased from 73.3% in 2007 to 79.5% in 2013. However, the extent of fluoridation in individual states varied considerably. In most states more than 90% of the population received fluoridated water except for Pahang, Sabah, Kelantan and Sarawak. In Sarawak, about 61.1% of the population received fluoridated water in 2022. Approximately 13.6% of the population in Kelantan received fluoridated water. While in Sabah and Pahang, the percentages were 4.9% and 0.0%, respectively (**Figure 2**).

Figure 1: Population coverage for water fluoridation programme, 2006-2022



[76]SPAN. Water Statistics 2010. Population Served 2009-2010. Available from: http://www.span.gov.my/index.php?option=com_content&view=article&id=291&Itemid=363&lang=en. Accessed on 24 Nov 2011.

Figure 2: Population receiving fluoridated water by state, 2022



There have been many hurdles in the implementation of the water fluoridation programme in a few states, namely Kelantan, Sabah and Pahang. The implementation of the programmes has been subjected to changes in state governments.

The cessation of water fluoridation programmes in Sabah, Kelantan and Terengganu took place in 1988, 1995 and 2000, respectively[77]. With the efforts of OHP and OHD, the programmes were reinstituted in year 1996 in Sabah, 2006[78] in Kelantan and 2008[79] in Terengganu. However, in 2010, Sabah State Cabinet had agreed on expansion of water fluoridation, as the coverage in 2009 was only 4.5%[80].

b. Multi-sectoral Collaboration

Implementation of this programme requires active involvement and effective collaboration of both public and private agencies as listed in **Table 2**.

[77] Ministry of Health Malaysia. Annual Report 2004.
[78] Oral Health Division, Ministry of Health. Annual Report 2006. 2007.
[79] Oral Health Division, Ministry of Health. Annual Report 2008. 2009.
[80] Oral Health Division, Ministry of Health Malaysia. Annual Report 2012. 2013.

Table 2 : Multi-sectoral Collaboration with Various Agencies Involvement

Agencies	Responsibility
Federal Government	Policy and standards for water industries.
State Government (Sabah and Sarawak)	Policy and standards for water industries. Monitoring and evaluation.
SPAN	Coverage, supply and access to water supply. Monitoring operators' compliance with stipulated standards, contractual obligations and relevant laws and guidelines.
Engineering Services Division, Ministry of Health (MOH)	Surveillance of standards, inclusion of standards in National Guideline of Drinking Water Quality, Safe Drinking Water Act (Regulation).
Department of Chemistry, Ministry of Science, Technology and Innovation (MOSTI)	Testing of fluoride level in water samples.
OHP	Policy, standards, safety and effectiveness of water fluoridation programme. Monitoring and evaluation.
Unit Kawalan Mutu Air Minum, State Health Department	Monitoring the drinking water quality in accordance to National Standard for Drinking Water Quality Guideline
Private Water Agencies	Implementation of water fluoridation and maintaining the optimum level.

Inter and intra collaboration with all relevant agencies such as:

- SPAN was established under the *Suruhanjaya Perkhidmatan Air Negara* Act 2006 [Act 654]. SPAN regulates the water supply industries under the Water Services Industry Act 2006 (WSIA) which came into force on 1 January 2008. It applies only to Peninsular Malaysia and Federal Territory of Labuan. SPAN is responsible to ensure water fluoridation programme is carried out and regulating the quality standards and technical compliance such as conducting audit and taking action towards non-compliance.
- State Water Monitoring Entities are responsible for the regulating and monitoring roles for Sabah and Sarawak where the water supply remains under the responsibility of their state government i.e. under the purview of Ministry of Public Utilities and Ministry of Infrastructure Development in Sarawak and Sabah respectively.

- The Engineering Division, Ministry of Health Malaysia through Kawalan Mutu Air Minuman (KMAM) is responsible to set and ensure compliance to the standard of fluoride in the National Guidelines of Drinking Water Quality. KMAM in this division is the national monitoring agency for quality of drinking water in Malaysia (National Drinking Water Standard). This unit ensures safe drinking water for the Malaysian population.
- The Public Health Programme Ministry of Health is responsible for monitoring the quality of the drinking water.
- The State KMAM is responsible for monitoring the drinking water quality in accordance to National Standard for Drinking Water Quality Guideline.
- The District KMAM is responsible for collecting water for fluoride level testing from water treatment plants, service reservoir outlet and reticulation sampling points. Water samples collected as scheduled by the Assistant Environment Health Officer will be sent for fluoride level testing by the Department of Chemistry Malaysia, MOSTI.
- The Department of Chemistry is responsible for the analysis and reporting on the level of fluoride in water samples to KMAM, SPAN and water authorities.
- The water authorities are responsible to ensure implementation of the fluoridation program is in compliance with health and safety standards, including handling and storage of fluoride compound. They are also responsible to install and maintain fluoride feeders as well as the use of appropriate fluoride test equipment to monitor fluoride levels. The water authorities must ensure an adequate supply of fluoride compound, monitor and maintain fluoride levels at water treatment plants within standard at all times.

2.6 Quality of Fluoride Compound Used for Fluoridation Programme

The chemical used for water fluoridation are specifically manufactured to high quality standards. In the UK, the standards must be listed as the approved substances by the Drinking Water Inspectorate and meet Department of Environment purity specifications[81]. In the USA, the fluoride compounds used must meet the safety standards established by American Water Works Association (AWWA) and National Sanitation Foundation International/American National Standard Institute (NSF/ANSI) 60 Standards for Drinking Water Additives[82].

The quality of fluoride compound used in water fluoridation programme in Malaysia is regulated by SPAN. The compounds used need to meet the following requirements:

[81] British Fluoridation Society. Fluoride Compound Used in the UK for Fluoridation of Public Water Supplies, Available at: https://bfsweb.org/fluoride-compounds/. 2020.
[82] National Sanitation Foundation International Standard/American National Standard. NSF/ANSI 60 – 2016: Drinking Water Treatment Chemicals – Health Effects. 2016.

a. Malaysian Standard

i. Sodium Silicofluoride: MS 1724:2004 – Sodium Silicofluoride for Use in Potable Water Supply (Specification)[83]

ii. Sodium Fluoride: MS 1573:2003 – Specification for Sodium Fluoride Used for Potable Water Supply[84]

b. Halal Certification

All fluoride compounds use for fluoridating water supplies required Halal Certification issued by *Jabatan Agama Islam Malaysia* (JAKIM) or any Islamic authorities, which are recognised by JAKIM.

2.7 Water Treatment Plants (WTP)

All water treatment plants were run by the government until the introduction of the National Privatisation Policy in the 1980's which included water treatment plants. In 2022, there was a total of 500 WTP and about 60.2% of the water treatment plants with fluoride feeders were privatised (**Table 3 and 4**). Funding of the fluoridation programme for all government operated water treatment plants was given to the MOH and channeled at the state level to the water department for implementation of the fluoridation programme. For privatised water treatment plants, all costs of the fluoridation programme are borne by the company.

[83] Standards Development Malaysian Institute of Chemistry. MS 1724:2004 Sodium Silicofluoride for Use in Potable Water Supply – Specification. 2004.
[84] Standards Development Malaysian Institute of Chemistry. MS 1573:2003 Specification for Sodium Fluoride Used for Potable Water Supply. 2003.

Table 3: Water Treatment Plants with Active Fluoride Feeders by States, 2022

States	No. of water treatment plant			Water treatment plant with fluoride feeder		Water treatment plant with active fluoride feeder		Fluoride Compound	
	Total	Public/ Board	Private	No.	%	No.	%	Sodium Silico-fluoride	Sodium Fluoride
Perlis	3	0	3	3	100	3	100	3	0
Kedah	36	0	36	34	94.4	34	100	34	0
Penang	8	0	8	8	100	8	100	8	0
Perak	45	40	5	44	97.8	43	97.7	14	30
Selangor	31	0	31	31	100	31	100	29	2
FT KL & P	3	0	3	3	100	3	100	3	0
N. Sembilan	21	0	21	19	90.5	19	100	7	14
Melaka	10	10	0	10	100	10	100	10	0
Johor	47	0	47	47	100	47	100	47	0
Pahang	72	0	72	49	68.1	0	0	0	0
Terengganu	12	0	12	12	100	12	100	0	12
Kelantan	37	0	37	3	8.1	2	66.7	3	0
Sabah	84	70	14	13	15.5	13	100	13	0
FT Labuan	5	4	1	4	80	3	75	1	0
Sarawak	86	71	11	40	46.5	40	100	40	0
Malaysia	**500**	**195**	**301**	**320**	**64.0**	**317**	**99.1**	**212**	**58**

Source: Oral Health Programme, 2022

Table 4: Water Treatment Plants with Fluoride Feeders, by States and Types of Management, 2022

State	No. of Water Treatment Plants	Number of Treatment Plants with Fluoride Feeders			
		Total	Government	Board	Private
Perlis	3	3	0	0	3
Kedah	36	36	0	0	36

State	No. of Water Treatment Plants	Number of Treatment Plants with Fluoride Feeders			
		Total	Government	Board	Private
Penang	8	8	0	0	8
Perak	45	44	0	39	5
Selangor	31	31	0	0	31
FT KL&P	3	3	0	0	3
N. Sembilan	21	19	0	0	19
Melaka	10	10	0	0	10
Johor	47	47	0	0	47
Pahang	72	49	0	0	49
Terengganu	12	12	0	0	12
Kelantan	37	3	0	0	3
Sabah	84	13	13	0	0
FT Labuan	5	4	3	0	1
Sarawak	86	40	26	10	4
Malaysia	500	322	42	49	231

Source: Oral Health Programme, 2022

3. OBJECTIVES

3.1 General Objective

To ensure implementation of water fluoridation as a public health measure to prevent and control dental caries in the community.

3.2 Specific Objectives

a. To guide oral health personnel in planning, implementation, monitoring and evaluation of water fluoridation programme.
b. To ensure an optimal fluoride level is maintained in the water supply.
c. To increase coverage of population receiving fluoridated water.

4. STRATEGIES

The OHP plays a lead role in determining the appropriate level of fluoride in drinking water to ensure that it is safe and effective in reducing dental caries. The standard level for fluoride in drinking water is incorporated into the National Guidelines for Drinking Water Quality document[85] for implementation of water fluoridation programme in the country. All water treatment plant management shall comply to the standard. Any changes in the recommended level will need approval of the National Guidelines for Drinking Water Quality Technical Committee.

In this endeavor, all the State OHD must identify the suitable approach to ensure the success in water fluoridation programme based on the following strategies:

4.1 Strengthening Advocation and Collaboration with All Relevant Agencies

a. Advocation to stakeholders

OHP / Timbalan Pengarah Kesihatan Negeri (Pergigian) (TPKN(G) / District Dental Officer (DDO) shall play vital role in continous advocation to all relevance stakeholders pertaining implementation of water fluoridation of public water supply. Approach to relevant agencies based on their responsibilities in water fluoridation.

Table 5 : Resposibilities by Agencies on Water Fluoridation

AGENCY		ACTION
1	National Water Services Commission (SPAN)	Attend regular meetings to discuss findings of fluoride levels at WTP and corrective actions to resolve and prevent outliers.
2	State Water Monitoring Entities	Ministry of Public Utilities and Ministry of Infrastructure Development are responsible to monitor the water supply in Sabah and Sarawak.
3	Engineering Services Division, Ministry of Health	Continuous monitoring to ensure safe drinking water for the Malaysian population.
4	*Unit Kawalan Mutu Air Minum (KMAM)*, State Health Department	Responsible for monitoring the quality of the drinking water by collecting water samples from sampling points.

[85] Ministry of Health Malaysia. National Standards of Drinking Water Quality Revised 2000. Second Version, Engineering Services Division, Ministry of Health Malaysia 2004.

AGENCY		ACTION
5	Water Treatment Plant Management	Maintain fluoride levels within standards at all times, at water treatment plants and at identified reticulation sampling points.
6	The Department of Chemistry	Analyse water samples from WTP and reticulation points (RP) periodically.

b. Maintain and enhance platform of collaboration with all agencies and stake holders such as;

- discussion of performance and issue in water fluoridation programme should be discussed regulary in periodical meeting conducated at state or federal level involving relevant agencies
- ad-hoc meeting (if necessary) to discuss and address important matters

4.2 Fortifying Installation of Fluoride Feeders at Water Treatment Plants

Fluoride feeder must be installed at all new WTP and existing WTP without fluoride feeder. The TPKN (G) shall discuss and convince the water treatment authority on installation of fluoride feeder at suitable water treatment plants. Thus, it is important for TPKN (G) to find out on projects of new WTP in the state and to ensure that water fluoridation is conducted. However, water authorities will have the option to decide on the location, type of fluoride feeders and fluoride compound used. They are also responsible on the operation and maintenance of fluoride feeders.

4.3 Community Empowerment Through Effective Promotional Activities

Knowledge and awareness are important to ensure that public understands the benefit of water fluoridation. Therefore, promotion on water fluoridation should be rigorous and reach all level of the population. Strategies on the promotional activities are as follows;

- awareness to the public on the benefits of water fluoridation should be included in oral health promotion activities,
- collaboration with non-government agencies,
- enlist Ikon Gigi (IGG) to share information on water fluoridation to the public,
- using influencer for wider dissemination of information, and
- utilizing various social media platforms such as Facebook, Instagram etc. to create awareness on water fluoridation.

4.4 Enhancing Capacity Building on the Water Fluoridation Programme

a. Dental officers should be updated continually on all aspects of water fluoridation through seminars and courses to enable them to be a resource person on fluoridation.
b. All relevant MOH and WTP operators involved in handling water fluoridation should be continually trained to create awareness and update knowledge through various avenues such as meetings, discussions, seminars, continuous education programmes, conferences and workshops. The personnel, especially the operators involved in the operation and maintenance of fluoride dosing equipment, should receive specific training on fluoridation issues such as:
    - optimal level of fluoride in drinking water,
    - handling of fluoridation chemicals,
    - potential hazard and toxicity of fluoride chemicals,
    - reporting requirements of dosing records, and
    - remedial/corrective actions in achieving optimum fluoride level in drinking water.
c. Training records of personnel shall be maintained.

4.5 Conducting Evidence Based Research

Research activities associated with water fluoridation should be explored continually to discover new information, which can further strengthen the programme. For example:

- natural fluoride level in drinking water
- natural fluoride in tube well
- economic evaluation of water fluoridation in caries prevention
- fluoride enamel opacities study in population

5. MONITORING AND EVALUATION

This programme is multi-sectoral with active involvement of both public and private agencies. Among others are the OHP, the Engineering Services Division and the State Health Department, SPAN and water authorities.

5.1 Monitoring of fluoride level

Monitoring of water fluoridation programme is carried out at district, state and national levels. The main purpose of this monitoring are:

a. to ensure conformance to the optimal levels (PGF 201 & WFP 1/2022)
b. to report on population receiving fluoridated water (WFP 2/2022)

The State OHD will monitor the performance of fluoridation programme by reviewing their districts' report / findings. DDO will monitor fluoride levels both at the water treatment plant and at reticulation sampling points in the district using appropriate fluoride test equipment **(Appendix 1).** Any non-conformity of fluoride level should be reported to WTP management for immediate corrective action. Procedures on monitoring, recording and reporting are as below:

a. Sample Collection (Refer **Table 5**)
    - Dental Public Health Specialist (DPHS) / DDO shall prepare list of WTP with at least one representative reticulation points (RP) identified by KMAM in each district for sample collection.
    - Water sample shall always be collected from the same reticulation point.
    - Prepare a schedule to collect water samples. Ensure that sample can be forwarded to the clinic for analysis within 24 hours of sampling.

Table 5 : Schedule for sample collection

Type of WTP	Frequency of fluoride testing at RP	Frequency of fluoride testing at WTP
• WTP with functional Fluoride Feeder (FF)	At least once in fortnight	At least once a month
• WTP with non-functional FF ≥ 3 months (declared by water treatment agencies)	Every 3 months	-
• WTP without FF	Every 3 months (to monitor natural fluoride. Record shall be kept in district / state level only)	-

b. Reporting of Results
    - At clinic level, monitoring of fluoride levels shall use WFP 1/2022, Weekly Record for Fluoride Level Testing in Public Water Supplies Sample at Water Treatment Plant (WTP) and Reticulation Points (RP).
    - If there is any outlier in the weekly reading, related districts have to retake water sample and repeat testing at the water treatment plant. Corrective action to rectify the non-conformity must be executed.
    - Report on the fluoridation programme to be carried out as stated in Appendix 2 and 3 (PGF 201, WFP 1/2022 – WFP 4/2022). Refer **Table 6** for summary on levels of reporting.

- All reports shall be utilised to evaluate performance and to plan for ongoing improvements in the water fluoridation programme.
- Reports from WTP without FF shall be kept at district / state coordinator's level only.

Table 6 : A Summary on levels of Reporting

No.	Frequency	Format Used	Appendix	Originator	Receiver
1.	Weekly	WFP 1/2022	3	Oral Health Personnel / District / State Coordinator	*Kept at clinic level
2.	Monthly	PGF 201 Pind.1/2022	2		DDO / TPKN (G) / OHP / HIC
3.	Yearly	WFP 2/2022	3		TPKN (G) / OHP
4.	Yearly	WFP 3/2022	3	District / State Coordinator	TPKN (G) / OHP
5.	Yearly	WFP 4/2022	3	District / State Coordinator	TPKN (G) / OHP

c. Surveillance / Remedial Action Procedures

- Upon receiving non-conformance reports, the DPHS / DDO shall inform the water authorities of the non-conformities as soon as possible.

d. Corrective Action

- In case of non-conformity to optimum fluoride level in drinking water, recommended actions to be taken are listed in the **Table 7** below. The recommendations are based on Engineering Services Division, MOH guidelines.
- Any non-conformance readings should be followed up with the water treatment authorities on the measures taken until the problem resolved.
- If the readings are not within optimal level (<0.4ppm or >0.6ppm but ≤ 1.0ppm) for 3 consecutive periods with no valid reasons by the water authorities, TPKN (G) shall report the non compliance to SPAN (occurrence of non compliance is within 1.5 – 2 months)

Table 7 : Non-Conformity Reporting Recommendations

Fluoride level (ppm)	Recommendations
<0.4 or > 0.6 but ≤1.0	1. Repeat sample testing 2. If result still shows <0.4 or > 0.6 but ≤1, inform WTP management within **3 working days.**

Fluoride level (ppm)	Recommendations
> 1.0	1. Repeat sample testing 2. If result still shows >1.0, inform WTP management **immediately.**

e. Record Keeping

The maintenance of accurate and complete records, including corrective and preventive actions taken, shall be an integral part of the surveillance of fluoride level in drinking water.

Visit to water treatment plants is necessary to ensure good collaboration and implementation of water fluoridation programme. Periodical visit to WTP should be carried out by TPKN (G) / DPHS / DDO / State Coordinator at least once a year using *Senarai Semak Lawatan* (**Appendix 4**).

5.2 Evaluation of Water Fluoridation Programme

Evaluation of the programme needs to be carried out at district, state and national levels to ensure safety and effectiveness of the programme through:

a. Service data
b. Health System Research
c. National Epidemiological Survey

6 CONCLUSION

Several factors contribute to the success of the water fluoridation programme in Malaysia. Among others are political commitment, collaboration and cooperation between various parties involved and more importantly the continual, extensive upgrading of the piped public water supply infrastructure. Continuous efforts to monitor and evaluate the program are essential to ensure its cost effectiveness, quality, safety and benefits, which will contribute towards improving the oral health and enhancing the quality of life of the population.

Appendix 1 (ENG)

SAMPLING PROCEDURES FOR FLUORIDE LEVEL TEST IN WATER SUPPLY AT WATER TREATMENT PLANT (WTP) AND RETICULATION POINT (RP)

RESPONSIBILITY	ACTION
Dental Surgeon Assistant/any appointed staff	**1.0 Preparation** 1.1 Use glass or plastic bottle. The use of plastic bottle A/B as in Appendix 1a is recommended. 1.2 Label the sampling bottle as below: a. Name of reticulation point b. Date taken c. Time taken
Dental Surgeon Assistant/any appointed Staff	**2.0 Water sampling at WTP / RP** 2.1 Wash tap for water sampling to remove dirt 2.2 Leave tap running for 2-5 minutes to remove sediments from water line 2.3 Rinse bottle at least twice with the sampled water. 2.4 Water is filled into bottle slowly to avoid turbulence and air bubbles 2.4.1 About 100ml water sample is required for analysis 2.4.2 Ensure water taken does not touch the outer sides of samples container. Bottles should not be recycled. 2.5 Close lid tightly. 2.5.1 The sample bottle shall be sealed and remain so until they are opened for analysis in the clinic. 2.5.2 All sampling bottles from one station is placed in the same plastic bags before placing them all in a container with temperature less than ≤6°C for transportation
Dental Surgeon Assistant/any appointed Staff	**3.0 Analysis Procedure** 3.1 Use Pocket Colorimeter to measure fluoride level in drinking water utilising colorimetric or spectrophotometric method (*SPANDS, sodium 2*-(*p-sulfophenyl azo*)-l, 8-dihydroxy-3, 6-naphthalene disulfonate) 3.1.1 The use of test kits shall adhere to manufacturer's instruction.

RESPONSIBILITY	ACTION
	3.1.2 Accuracy check shall be conducted monthly using Standard Solutions Methods. Use fluoride standard solution 1.0 mg/L for accuracy check. 3.1.3 Standardization of test kits shall be conducted when needed in each state/zone. 3.2 Analyse sample at room temperature as soon as possible; within 72 hours after sample collection. 3.2.1 Samples may be stored for 7 days at 4°C or below. However, samples must be tested at room temperature. 3.2.2 If sample is kept for more than 72 hours, discard it and collect a new sample. 3.2.3 Conduct test for water sample and "blank" sample under same conditions at the same time.
Dental Sister/Dental Surgeon Assistant/any appointed Staff	**4.0 Reporting of results** 4.1 Records fluoride level readings at all WTP and RP in PGF 201 and WFP 1/2022. 4.3 The personnel shall complete and submit the **Appendix 2 and 3** to the person in-charge for verification. 4.4 DPHS/DDO shall check analysis procedures and results regularly.

* When using different testing equipment, please follow the instructions from the supplier

Appendix 1 (BM)

ARAHAN KERJA UJIAN PARAS FLUORIDA DI DALAM SAMPEL BEKALAN AIR DI LOJI RAWATAN AIR DAN DI LOKASI RETIKULASI

TANGGUNGJAWAB	TINDAKAN
Pembantu Pembedahan Pergigian/Anggota yang dikenalpasti	**1.0 Persediaan Awal** 1.1 Gunakan botol plastik atau kaca. Penggunaan botol plastik A/B seperti di Lampiran 1a adalah dicadangkan. 1.2 Labelkan botol pensampelan seperti di bawah: a. Nama pusat retikulasi b. Tarikh diambil c. Masa diambil
Pembantu Pembedahan Pergigian/Anggota yang dikenalpasti	**2.0 Pensampelan Air Di Loji Rawatan Air / Pusat Retikulasi** 2.1 Cuci paip air untuk membersihkan dari kekotoran 2.2 Biarkan air paip mengalir selama 2-5 minit untuk membuangkan segala mendapan dari aliran air. 2.3 Bilas botol sekurang-kurangnya dua (2) kali menggunakan air sampel tersebut. 2.4 Isi air pada kadar perlahan ke dalam botol untuk mengelakkan pergolakan air dan gelembung udara. 2.4.1 Sebanyak 100ml sampel air diperlukan untuk analisa 2.4.2 Pastikan air yang diisi tidak bersentuh dengan bahagian luar botol. Botol sampel tidak boleh digunakan semula. 2.5 Tutup penutup botol dengan ketat 2.5.1 Botol sampel perlu d*iseal* dan hanya dibuka bila sampai ke klinik untuk analisa. 2.5.2 Semua botol sampel dari satu stesen dimasukkan ke dalam beg plastic yang sama sebelum dimasukkan dalam bekas bersuhu kurang dari ≤6°C untuk pengangkutan ke klinik.
Pembantu Pembedahan Pergigian/Anggota yang dikenalpasti	**3.0 Prosedur Analisa** 3.1 Gunakan Pocket Colorimeter yang menggunakan colorimetric atau spectrophotometric method (*SPANDS, sodium 2-*(*p-sulfophenyl azo*)-l, 8-dihydroxy-3, 6-naphthalene disulfonate) untuk mengukur paras fluorida dalam air minuman

TANGGUNGJAWAB	TINDAKAN
	3.1.1 Penggunaan kit ujian perlu mengikut arahan dari pihak pembekal. 3.1.2 Pemeriksaan ketepatan perlu dibuat setiap bulan menggunakan Kaedah *Standard Solutions*. Gunakan larutan Fluorida piawai 1.0 mg/L untuk semakan ketepatan. 3.1.3 Kalibrasi alat ujian perlu dibuat jika perlu di setiap negeri/zon. 3.2 Analisa sampel dalam suhu bilik secepat yang mungkin; atau sekurang-kurangnya 72 jam selepas pengambilan sampel. 3.2.1 Sampel boleh disimpan selama 7 hari pada suhu 4°C or kurang. Walaubagaimanapun sampel mesti diuji pada suhu bilik. 3.2.2 Sampel perlu dibuang jika disimpan lebih dari 72 jam. Pengambilan sampel baharu perlu dilakukan. 3.2.3 Lakukan ujian untuk sampel air dan "*blank*" sampel di bawah keadaan yang sama.
Pembantu Pembedahan Pergigian/ Jururawat Pergigian /Ketua Jururawat Pergigian/Anggota yang dikenalpasti	**4.0 Pelaporan Keputusan** 4.1 Rekod paras fluorida di semua LRA dan PR dengan menggunakan PGF 201 and WFP 1/2022. 4.3 Anggota terlibat perlu melengkapkan dan menyerahkan Appendix 2 dan 3 kepada pegawai yang bertanggungjawab untuk pengesahan. 4.4 Pakar Pergigian Kesihatan Awam / Pegawai Pergigian Daerah perlu memeriksa prosedur analisa dan keputusan analisa secara berkala.

*Sekiranya menggunakan peralatan pengujian yang berlainan, sila patuhi arahan dari pembekal

Appendix 1a

Examples of Water Containers

Contoh Bekas Untuk Sampel Air

*Note : Container A/B will be used by dental personnel

Nota : Anggota pergigian akan menggunakan bekas A/B

Appendix 2 (ENG)

PGF 201 Pind.1/2022

MINISTRY OF HEALTH MALAYSIA
HEALTH INFORMATION MANAGEMENT SYSTEM

General guidelines on monthly monitoring of fluoride level in public water supply and the status of fluoride feeder for clinic / district

1. Objective

The aim of this report is to provide monthly feedback on the condition of fluoride feeders by keeping checks on its breakdown frequency. In addition, the report helps to monitor the level of fluoride in public water supply and water treatment plants to ensure that it is at its optimum level (0.4-0.6 ppm) for the effectiveness in the prevention of dental caries.

2. Preparation and submission of reports

The monthly report shall be prepared by the Oral Health Personnel / District / State Coordinator by using the form PGF 201 Pind.1/2022. It has to be compiled at state level and sent to OHP monthly through the TPKN (G).

Appendix 2 (BM)

PGF 201 Pind.1/2022

KEMENTERIAN KESIHATAN MALAYSIA
SISTEM MAKLUMAT KESIHATAN

Garis panduan am laporan bulanan paras fluorida bekalan air awam dan status *fluoride feeder* di klinik / daerah

1. Objektif

Matlamat laporan ini adalah untuk memberikan maklum balas bulanan tentang keadaan *fluoride feeder* dengan mengekalkan semakan kekerapan kerosakannya. Di samping itu, laporan ini akan membantu memantau tahap fluorida dalam bekalan air awam dan loji rawatan air berada pada tahap optimum (0.4-0.6ppm) untuk memastikan keberkesanan dalam pencegahan karies gigi.

2. Penyediaan dan penghantaran laporan

Laporan bulanan hendaklah disediakan oleh anggota pergigian / penyelaras daerah / negeri dengan menggunakan borang PGF 201 Pind.1/2022. Ia perlu dikumpul di peringkat negeri dan dihantar bulanan ke Program Kesihatan Pergigian (PKP) melalui dan dengan pengesahan TPKN (G).

PGF 201 Pind. 1/2022

HEALTH INFORMATION SYSTEM
MINISTRY OF HEALTH

MONTHLY REPORT OF FLUORIDE LEVELS AT WATER TREATMENT PLANTS (WTP) AND RETICULATION POINTS (RP) FOR WATER FLUORIDATION PROGRAMME
MONTH……..YEAR…….

STATE:

DISTRICT	NUMBER OF WTP	NUMBER OF WTP WITH FLUORIDE FEEDER*	NUMBER OF READINGS		NUMBERS OF CONFORMING READING AT 0.4 - 0.6 PPM		% OF CONFORMING READING AT 0.4 - 0.6 PPM		NUMBERS OF NON-CONFORMING READING (<0.4 PPM)		% NON-CONFORMING READING AT <0.4 PPM		NUMBERS OF NON-CONFORMING READING (>0.6 PPM)		% NON-CONFORMING READING AT >0.6 PPM	
			WTP	RP	WTP	RP	WTP	RP	WTP	RP	WTP	RP	WTP	RP	WTP	RP
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JUMLAH																

Nota :
- WTP : Water Treatment Plant (WTP)
- RP : Reticulation Point
- *Information can be obtained from the state water company.

PGF 201 Pind. 1/2022

SISTEM MAKLUMAT KESIHATAN
KEMENTERIAN KESIHATAN MALAYSIA

LAPORAN BULANAN PARAS FLUORIDA DI LOJI RAWATAN AIR (LRA) DAN PUSAT RETIKULASI BAGI PROGRAM PEMFLUORIDAAN BEKALAN AIR AWAM
BAGI BULAN……..TAHUN…….

NEGERI:

DAERAH	BILANGAN LRA	BILANGAN LRA ADA *FLUORIDE FEEDER**	BILANGAN BACAAN		BILANGAN BACAAN MENEPATI STANDARD (0.4 - 0.6 ppm)		% BACAAN MENEPATI STANDARD (0.4 - 0.6 ppm)		BILANGAN BACAAN TIDAK MENEPATI STANDARD (<0.4 ppm)		% BACAAN TIDAK MENEPATI STANDARD (<0.4 ppm)		BILANGAN BACAAN TIDAK MENEPATI STANDARD (>0.6 ppm)		% BACAAN TIDAK MENEPATI STANDARD (>0.6 ppm)	
			L	R	L	R	L	R	L	R	L	R	L	R	L	R
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JUMLAH																

Nota :
- L : Loji Rawatan Air (LRA)
- R : Pusat Retikulasi
- *Maklumat perlu diperolehi daripada syarikat air negeri.

Recording Instruction for the Monthly Monitoring of Fluoride Level in Public Water Supply and the Status of Fluoride Feeder (PGF 201 Pind.1/2022)

Column No.	Information	General Instructions
	Month	Record the month when the report was prepared.
	Year	Record the year when the report was prepared.
	State	Record the name of state from where the report was prepared.
1	District	Record the name of district from where the report was prepared. (District name according to DOSM).
2	Number of WTP	Record number of water treatment plant (WTP).
3	Number of WTP with fluoride feeder	Record number of water treatment plant (WTP) with fluoride feeder.
Number of readings		
4	Water treatment plant (WTP)	The total number of water sample readings at the WTP in the relevant district for the particular month.
5	Reticulation point (RP)	The total number of water sample readings at the RP in the relevant district for the particular month.
Numbers of conforming reading at 0.4 – 0.6 ppm		
6	Water treatment plant (WTP)	Total number of readings of water sample at the WTP that conformed to the recommended standard 0.4-0.6 ppm for the particular month
7	Reticulation point (RP)	Total number of readings of water sample at the RP that conformed to the recommended standard 0.4-0.6 ppm for the particular month
Percentage (%) of Conforming Reading at 0.4 - 0.6 ppm		
8	Water treatment plant (WTP)	Record the percentage of readings of water sample at the WTP conforming to the

Column No.	Information	General Instructions
		recommended standard 0.4-0.6 ppm for the particular month (total readings of water sample at the WTP conforming to the recommended standard 0.4-0.6 ppm divided by all the total readings of water sample at the WTP. (column 6 / column 4)
9	Reticulation point (RP)	Record the percentage of readings of water sample at the RP conforming to the recommended standard 0.4-0.6 ppm for the particular month (total readings of water sample at the RP conforming to the recommended standard 0.4-0.6 ppm divided by all the total readings of water sample at the RP. (column 7 / column 5)
Numbers of non-conforming reading (<0.4 ppm)		
10	Water treatment plant (WTP)	Record the total readings of water sample less than 0.4 ppm at the WTP for the particular month
11	Reticulation point (RP)	Record the total readings of water sample less than 0.4 ppm at the RP for the particular month
Percentage (%) of non-conforming reading at <0.4 ppm		
12	Water treatment plant (WTP)	Percentage of readings of water sample less than 0.4 ppm at the WTP for the particular month (total readings of water sample less than 0.4 ppm at the WTP divided by all the total reading of water sample at the WTP) (column 10 / column 4).
13	Reticulation point (RP)	Percentage of readings of water sample at the RP less than 0.4 ppm for the particular month (total readings of water sample less than 0.4 ppm at the RP divided by all the

Column No.	Information	General Instructions
		total reading of water sample at the RP) (column 11 / column 5).
Numbers of non-conforming reading (>0.6 ppm)		
14	Water treatment plant (WTP)	Record the total readings of water sample more than 0.6 ppm at the WTP for the particular month
15	Reticulation point (RP)	Record the total readings of water sample more than 0.6 ppm at the RP for the particular month
Percentage (%) of non-conforming reading at >0.6 ppm		
16	Water treatment plant (WTP)	Percentage of readings of water sample more than 0.6 ppm at the WTP for the particular month (total readings of water sample less than 0.6 ppm divided by all the total readings of water sample at the WTP) (column 14 / column 4).
17	Reticulation point (RP)	Percentage of readings of water sample more than 0.6 ppm at the RP for the particular month (total readings of water sample less than 0.6 ppm divided by all the total readings of water sample at the RP) (column 15 / column 5).

Arahan Perekodan bagi Pemantauan Bulanan Paras Fluorida Bekalan Air Awam dan Status *Fluoride Feeder* (PGF 201 Pind.1/2022)

Kolum No.	Maklumat	Arahan Am
	Bulan	Bulan semasa laporan disediakan.
	Tahun	Tahun semasa laporan disediakan.
	Negeri	Nama negeri bagi klinik/fasiliti yang menyediakan laporan.
1	Daerah	Nama daerah berdasarkan Jabatan Perangkaan Malaysia.
2	Bilangan LRA	Bilangan loji rawatan air yang terdapat di daerah berkenaan.
3	Bilangan LRA Ada *Fluoride Feeder*	Bilangan loji rawatan air yang mempunyai *fluoride feeder* di daerah berkenaan. Maklumat ini perlu diperolehi daripada syarikat air negeri.
Bilangan Bacaan		
4	Loji Rawatan Air (L)	Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan bagi bulan tersebut.
5	Pusat Retikulasi (R)	Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan bagi bulan tersebut.
Bilangan Bacaan Menepati Standard (0.4 – 0.6 ppm)		
6	Loji Rawatan Air (L)	Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang menepati standard yang disyorkan (0.4 – 0.6 ppm) bagi bulan tersebut.
7	Pusat Retikulasi (R)	Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang menepati

Kolum No.	Maklumat	Arahan Am
		standard yang disyorkan (0.4 – 0.6 ppm) bagi bulan tersebut.
% Bacaan Menepati Standard (0.4 – 0.6 ppm)		
8	Loji Rawatan Air (L)	Peratus bacaan sampel air di loji rawatan air di daerah yang berkenaan yang menepati standard yang disyorkan (0.4 – 0.6 ppm) bagi bulan tersebut. Cara pengiraan – Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang menepati standard yang disyorkan (0.4 – 0.6 ppm) dibahagi dengan jumlah bacaan semua sampel air di loji rawatan air di daerah yang berkenaan bagi bulan tersebut (kolum 6 / kolum 4).
9	Pusat Retikulasi (R)	Peratus bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang menepati standard yang disyorkan (0.4 – 0.6 ppm) bagi bulan tersebut. Cara pengiraan – Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang menepati standard yang disyorkan (0.4 – 0.6 ppm) dibahagi dengan jumlah bacaan semua sampel air di pusat retikulasi di daerah yang berkenaan bagi bulan tersebut (kolum 7 / kolum 5).
Bilangan Bacaan Tidak Menepati Standard (<0.4 ppm)		
10	Loji Rawatan Air (L)	Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang kurang daripada 0.4 ppm bagi bulan tersebut.
11	Pusat Retikulasi (R)	Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang kurang daripada 0.4 ppm bagi bulan tersebut.

Kolum No.	Maklumat	Arahan Am
% Bacaan Tidak Menepati Standard (<0.4 ppm)		
12	Loji Rawatan Air (L)	Peratus bacaan sampel air di loji rawatan air di daerah yang berkenaan yang kurang daripada 0.4 ppm bagi bulan tersebut. Cara pengiraan – Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang kurang daripada 0.4 ppm dibahagi dengan jumlah bacaan semua sampel air di loji rawatan air di daerah yang berkenaan bagi bulan tersebut (kolum 10 / kolum 4).
13	Pusat Retikulasi (R)	Peratus bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang kurang daripada 0.4 ppm bagi bulan tersebut. Cara pengiraan – Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang yang kurang daripada 0.4 ppm dibahagi dengan jumlah bacaan semua sampel air di pusat retikulasi di daerah yang berkenaan bagi bulan tersebut (kolum 11 / kolum 5).
Bilangan Bacaan Tidak Menepati Standard (>0.6 ppm)		
14	Loji Rawatan Air (L)	Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang lebih daripada 0.6 ppm bagi bulan tersebut.
15	Pusat Retikulasi (R)	Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang lebih daripada 0.6 ppm bagi bulan tersebut.
% Bacaan Tidak Menepati Standard (>0.6 ppm)		
16	Loji Rawatan Air (L)	Peratus bacaan sampel air di loji rawatan air di daerah yang berkenaan yang lebih daripada 0.6 ppm bagi bulan tersebut.

Kolum No.	Maklumat	Arahan Am
		Cara pengiraan – Jumlah bacaan sampel air di loji rawatan air di daerah yang berkenaan yang lebih daripada 0.6 ppm dibahagi dengan jumlah bacaan semua sampel air di loji rawatan air di daerah yang berkenaan bagi bulan tersebut (kolum 14 / kolum 4).
17	Pusat Retikulasi (R)	Peratus bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang lebih daripada 0.6 ppm bagi bulan tersebut. Cara pengiraan – Jumlah bacaan sampel air di pusat retikulasi di daerah yang berkenaan yang lebih daripada 0.6 ppm dibahagi dengan jumlah bacaan semua sampel air di pusat retikulasi di daerah yang berkenaan bagi bulan tersebut (kolum 15 / kolum 5).

Appendix 3 (ENG)

Reporting Format of Water Fluoridation Programme

1. All information pertaining to the programme shall be recorded using WFP 1-4/2022. Records of WFP 1/2022 will be kept in clinic level, meanwhile for WFP 2-4/2022 shall be reported to district / state and OHP yearly.

2. All reports shall not become an end in itself, but should be a means to evaluate performance and to plan for improvements in water fluoridation programme.

Appendix 3 (BM)

Format Pelaporan Program Pemfluoridaan Bekalan Air Awam

1. Semua maklumat yang berkaitan dengan program hendaklah dilaporkan menggunakan WFP 1-4/2022. Laporan WFP 1/2022 akan disimpan di peringkat klinik, manakala bagi laporan WFP 2-4/2022 hendaklah dilaporkan di peringkat daerah / negeri dan Program Kesihatan Pergigian, KKM setiap tahun.

2. Semua laporan harus menjadi kaedah untuk menilai prestasi dan merancang penambahbaikan dalam program pemfluoridaan bekalan air awam.

Weekly Record for Fluoride Level Testing in Public Water Supplies Sample at Water Treatment Plant (WTP) and Reticulation Points (RP)

Clinic : _____

Month : _____

Year _____

No	Name of WTP	Readings (ppm)										Remarks
		1st Week		2nd Week		3rd Week		4th Week		5th Week		
		WTP	RP	WTP	RP	WTP	RP	WTP	RP	WTP	RP	
1	2	3	4	5	6	7	8	9	10	11	12	13

Note :

a. WTP : Water Treatment Plant

b. RP : Reticulation Point

Prepared by:

Name :
Position :
Date :

Checked by:

Name :
Position :
Date :

Rekod Mingguan Pengujian Paras Fluorida di dalam Sampel Bekalan Air Awam di Loji Rawatan Air (LRA) dan Sistem Retikulasi

Klinik : _____
Bulan : _____
Tahun : _____

Bil	Nama LRA	Bacaan (ppm)										Catatan
		Minggu 1		Minggu 2		Minggu 3		Minggu 4		Minggu 5		
		L	R	L	R	L	R	L	R	L	R	
1	2	3	4	5	6	7	8	9	10	11	12	13

Catatan :
a. L : Loji Rawatan Air
b. R : Pusat Retikulasi

Disediakan oleh:

Nama :
Jawatan :
Tarikh :

Disemak oleh:

Nama :
Jawatan :
Tarikh :

DATA COLLECTION FORMAT FOR INFORMATION ON WATER TREATMENT PLANTS AT DISTRICT/STATE LEVEL

Year : _____

District / State : _____

General information								Fluoridation Status							Remarks
District	No.	Name of WTP	WTP Capacity		WTP Management			No Fluoride Feeder	Yes						
			Plant Capacity(mld)	Output Capacity(mld)	Public Water Authorities (PWA)		Name of Water Supply Company		Year of Implementation	Fluoride Feeder		Type of Fluoride Compound			
					Yes	No				Wet Feeder	Dry Feeder	Sodium Silicofluoride	Sodium Fluoride	Others	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

District / State	Estimation of population(D)	Estimation of population receiving fluoridated water supply (N1)	Percentage of Coverage population receiving fluoridated water (N1/D)	Estimation of population receiving pipe water supply (N2)	Percentage of population receiving pipe water supply (N2/D)

Prepared by:

Name :
Position :
Date :

Checked by:

Name :
Position :
Date :

Recording Instruction for Information on Water Treatment Plants at District / State Level (WFP2/2022)

Column No.	Item	Information General Instructions
1	District	State the district
2	No.	Record the entry beginning with number 1
3	Name of WTP	State the WTP Name
WTP Capacity		
4	Plant capacity (mld)	State the plant capacity in million litre per day (mld)
5	Output capacity (mld)	State the output plant capacity in million litre per day (mld)
WTP Management		
Public Water Authorities		
6	Yes	Indicate (/) if water treatment plant is managed by Public Water Authorities
7	No	Indicate (/) if water treatment plant is managed by Private Water Company
8	Name of water supply company	State the name of Water Supply Company
Fluoridation status		
9	No Fluoride Feeder	Indicate (/) if water treatment plant is without fluoride feeder
10	Year of implementation	State year where fluoridation started
Fluoride feeder		
11	Wet Feeder	Indicate (/) if fluoride feeder is wet feeder
12	Dry Feeder	Indicate (/) if fluoride feeder is dry feeder
Type of fluoride compound		
13	Sodium silicofluoride	Indicate (/) if the type of fluoride compound used is Sodium Silicofluoride
14	Sodium fluoride	Indicate (/) if the type of fluoride compound used is Sodium Fluoride
15	Others	Indicate (/) if there is other type of fluoride compound used other than Sodium Silicofluoride and Sodium Fluoride
16	Remarks	Notes any relevant issues

FORMAT LAPORAN MAKLUMAT LOJI RAWATAN AIR DI PERINGKAT DAERAH / NEGERI

Tahun : _____

Daerah / Negeri : _____

Maklumat Am								Status Pemfluoridaan								Catatan
Daerah	Bil.	Nama Loji Rawatan Air	Kapasiti Loji		Pengurusan Loji			Tiada *Fluoride Feeder*	Ada *Fluoride Feeder*							
					Pihak Berkuasa Bekalan Air Awam		Nama Syarikat Air		Tahun Pelaksanaan	*Fluoride Feeder*		Jenis Bahan Fluorida				
			Kapasiti Loji(mld)	Kapasiti Output (mld)	Ya	Tidak				*Wet Feeder*	*Dry Feeder*	Sodium Silicofluoride	Sodium Fluoride	Lain-lain		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		16

Daerah / Negeri	Anggaran populasi (D)	Anggaran populasi menerima bekalan air berfluorida (N1)	Peratus populasi menerima bekalan air berfluorida (N1/D)	Anggaran populasi menerima bekalan air paip (N2)	Peratus populasi menerima bekalan air paip (N2/D)

Disediakan oleh:

Nama :
Jawatan :
Tarikh :

Disemak oleh:

Nama :
Jawatan :
Tarikh :

Arahan Perekodan bagi Laporan Maklumat Loji Rawatan Air di peringkat Daerah / Negeri (WFP 2/2022)

Kolum	Perkara	Arahan Am Maklumat
1	Daerah	Nyatakan daerah
2	Bil.	Kemasukan bermula dengan nombor 1
3	Nama Loji Rawatan Air	Nyatakan nama loji rawatan air
Kapasiti Loji		
4	Kapasiti Loji	Nyatakan kapasiti loji million litre per day (mld)
5	kapasiti Output	Nyatakan kapasiti output loji million litre per day (mld)
Pengurusan Loji		
Pihak Berkuasa Bekalan Air Awam		
6	Ya	Tandakan (/) jika loji rawatan air diuruskan oleh Pihak Berkuasa Bekalan Air Awam
7	Tidak	Tandakan (/) jika loji rawatan air diuruskan oleh Syarikat Air Swasta
8	Nama Syarikat Air	Nyatakan nama syarikat air
Status Pemfluoridaan		
9	Tiada Fluoride Feeder	Tandakan (/) jika loji rawatan air tidak dilengkapi *fluoride feeder*
10	Tahun Pelaksanaan	Nyatakan tahun pelaksanaan program pemfluoridaan
Fluoride Feeder		
11	*Wet Feeder*	Tandakan (/) jika *fluoride feeder* ialah *wet feeder*
12	*Dry Feeder*	Tandakan (/) jika *fluoride feeder* ialah *dry feeder*
Jenis Bahan Fluorida		
13	Sodium silicofluoride	Tandakan (/) jika jenis bahan fluorida yang digunakan ialah Sodium Silicofluoride
14	Sodium fluoride	Tandakan (/) jika jenis bahan fluorida yang digunakan ialah Sodium Fluoride
15	Lain-lain	Tandakan (/) jika bahan fluorida yang digunakan adalah selain Sodium Silicofluoride dan Sodium Fluoride
16	Catatan	Catatan jika ada isu yang relevan

DATA COLLECTION FORMAT FOR TRAINING OF PERSONNEL ON WATER FLUORIDATION PROGRAMME AT DISTRICT / STATE LEVEL

Year : _____
State : _____

District	No.	Name of Training	Category (Number of participants)						Total number of participants	Remarks
			Dental Officer	Dental Technologist	Dental Therapist	Dental Surgery Assistant	Others	Notes (Specify category for others)		
Total										

Prepared by:

Name :
Position :
Date :

Checked by:

Name :
Position :
Date :

FORMAT PENGUMPULAN DATA UNTUK LATIHAN BAGI PROGRAM PEMFLUORIDAAN BEKALAN AIR AWAM DI DAERAH / NEGERI

Tahun : _____
Negeri : _____

Daerah	Bil.	Nama Latihan	Kategori (Jumlah Peserta)						Jumlah Peserta	Catatan
			Pegawai Pergigian	Juruteknologi Pergigian	Juruterapi Pergigian	Pembantu Pembedahan Pergigian	Lain-lain	Catatan (Nyatakan jawatan bagi lain-lain)		
Jumlah										

Disediakan oleh:

Nama :
Jawatan :
Tarikh :

Disemak oleh:

Nama :
Jawatan :
Tarikh :

DATA COLLECTION FORMAT FOR INTERCOLLABORATION WITH OTHER AGENCIES

Year : _____
State : _____

District	Date	Name of activity	Category *			Agency Involved*							Organizer	Remarks
			Discussion/ Visit	Meeting	Others	District Health Office	Water Treatment Plant Authority	Suruhanjaya Perkhidmatan Air Negara (SPAN)	Chemistry Department	State Health Department	Others	Notes (Specify agency for others)		
1	2	3	4	5	6	7	8	9	10	11	12		13	14
Total														

* Please (/) in appropriate column

Prepared by:

Name :
Position :
Date :

Checked by:

Name :
Position :
Date :

FORMAT PENGUMPULAN DATA UNTUK KOLABORASI DENGAN AGENSI LAIN

Tahun : _____
Negeri : _____

Daerah	Tarikh	Nama Aktiviti	*Kategori			*Agensi yang terlibat							Anjuran	Catatan
			Perbincangan / Lawatan	Mesyuarat	Lain-lain	Pejabat Kesihatan Daerah	Pengurusan Loji Rawatan Air	Suruhanjaya Perkhidmatan Air Negara (SPAN)	Jabatan Kimia	Jabatan Kesihatan Negeri	Lain-lain	Catatan (Nyatakan agensi bagi lain-lain)		
1	2	3	4	5	6	7	8	9	10	11	12		13	14
Jumlah														

* Sila (/) di ruangan yang sesuai

Disediakan oleh:

Nama :
Jawatan :
Tarikh :

Disemak oleh:

Nama :
Jawatan :
Tarikh :

Appendix 4 (ENG)

CHECKLIST OF VISIT TO WATER TREATMENT PLANT (WTP) WITH FLUORIDE FEEDER (FF)

* For Private WTP - visit will be done if there is any problem

For Government WTP – at least once a year

STATE : _____
DISTRICT : _____
NAME OF WTP : _____
NAME OF OFFICER AT WTP : _____
POST : _____
NAME OF VISITING OFFICER : _____
POST : _____
DATE OF VISIT : _____
WTP MANAGEMENT : ☐ **PUBLIC**
☐ **PRIVATE**

No	Items	Observation		Remarks
1	**FLUORIDE FEEDER**			
1.1	**Number of Fluoride Feeder:**			
1.2	**Status of Fluoride Feeder**	**Fluoride Feeder 1**	**Fluoride Feeder 2**	
	Functional	**Yes** ☐ **No** ☐ **Specify** **Number of days (non-functioning FF):** _____ **Reasons of non-functioning:**	**Yes** ☐ **No** ☐ **Specify** **Number of days (non-functioning FF):** _____ **Reasons of non-functioning:**	

No	Items	Observation		Remarks
		_____	_____	
2	**FLUORIDE COMPOUND MATERIAL**			
2.1	**Stock**	**Yes** ☐ **Total**_____**kg** **Enough for supplies** _____ **month/months** **No** ☐ **Reasons:** _____		
2.2	**Expiry date**	**Yes** ☐ **Specify:** _____ **No** ☐		
2.3	**Storage**	**Good** ☐ **Needs Improvement** ☐ **Specify suggestion:** _____ _____ _____		
3	**MONITORING FLUORIDE LEVELS**			
3.1	**Percentage of compliance to recommended optimum level (0.4-0.6 ppm) for the last 3 months** **Achievement 1: ……%** **Achievement 2: ……%** **Achievement 3: ……%**			

No	Items	Observation	Remarks
3.2	**Problems with Compliance of fluoride levels**		
3.3	**Preventive and Correction action to compliance of fluoride levels**		
3.4	**Follow-up action to fluoride levels compliance**		

_____ _____

Name & Signature of Officer **Name & Signature of WTP's supervisor**

Appendix 4 (BM)

SENARAI SEMAK LAWATAN KE LOJI RAWATAN AIR (LRA) YANG ADA *FLUORIDE FEEDER*

* Bagi LRA Swasta – lawatan dibuat jika ada masalah

Bagi LRA Kerajaan – sekurang-kurangnya sekali satu tahun

NEGERI : _____

DAERAH : _____

NAMA LRA : _____

NAMA PEGAWAI DI LRA : _____

JAWATAN : _____

NAMA TPKNG / PPGKA / PPD / PN : _____

JAWATAN : _____

TARIKH LAWATAN : _____

PENGURUSAN LOJI : ☐ **KERAJAAN**
☐ **SWASTA**

Bil.	**Perkara**	**Pemerhatian**		**Catatan**
1	***FLUORIDE FEEDER***			
1.1	**Bilangan *Fluoride Feeder* :**			
1.2	**Status *Fluoride Feeder***	***Fluoride Feeder* 1**	***Fluoride Feeder* 2**	
	Berfungsi	**Ya** ☐ **Tidak** ☐ **Nyatakan** **Bilangan hari tidak berfungsi: _____** **Sebab tidak berfungsi:**	**Ya** ☐ **Tidak** ☐ **Nyatakan** **Bilangan hari tidak berfungsi: _____** **Sebab tidak berfungsi:**	

Bil.	Perkara	Pemerhatian		Catatan
		_____	_____	
2	**BAHAN KOMPAUN FLUORIDA**			
2.1	**Stok**	**Ada** ☐ **Jumlah**_____**kg** **Cukup untuk bekalan** ___ **bulan** **Tiada** ☐ **Sebab:**_____		
2.2	**Tarikh luput**	**Ada** ☐ **Nyatakan:**_____ **Tiada** ☐		
2.3	**Penyimpanan**	**Baik** ☐ **Perlu Penambahbaikan** ☐ **Nyatakan Cadangan:** _____ _____ _____		
3	**PEMANTAUAN PARAS FLUORIDA**			
3.1	**Peratus pematuhan kepada paras optimum yang disyorkan (0.4-0.6 ppm) bagi 3 bulan yang terakhir** **Pencapaian 1 : ……..%** **Pencapaian 2 : ……..%** **Pencapaian 3 : ……..%**			

Bil.	Perkara	Pemerhatian	Catatan
3.2	**Masalah pematuhan paras fluorida**		
3.3	**Tindakan Pencegahan dan Pembetulan pematuhan paras fluorida**		
3.4	**Tindakan Susulan pematuhan paras fluorida**		

_____ _____

Nama & tanda tangan pegawai yang melawat **Nama & tanda tangan Penyelia Loji**