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## Knowledge and Public Perception of Dental Fluorosis in Children Living in Palestine

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### Abstract

Rare knowledge of dental fluorosis increases the risk of having it. Knowledge and public perception towards dental fluorosis is important factor in public health interventions and were not studied before in Palestine or Arabic countries.

**Objective:** To study the knowledge and the public perception of dental fluorosis among Palestinian children (aged 12-18 years old) and their mothers.

**Methods:** A cross-sectional study recruited stratified cluster random sample of 350 children aged 12-18 years and their mothers. Data of knowledge and public perception of dental fluorosis was collected through interview questionnaires with children and their mothers. Ethical approvals followed the guidelines of the Helsinki Declaration.

**Results:** Most children (99.4%) and all mothers did not know what dental fluorosis is and had not received information about it. The majority (99.7%) did not know dental fluorosis's causes or prevention. Concerning the public perception of dental fluorosis, 87.7% of the children and 88.6% of mothers did not have a problem with fluorosed teeth colour.

Although all respondents felt that others with fluorosed teeth did not have good appearance, 96.9% of children did not hide their smile. Most of the mothers (99.7%) thought that the government should find an immediate solution for this problem.

**Conclusions:** Lack of knowledge about dental fluorosis increases the risk of having dental fluorosis in Palestine and Arabic countries. This suggests the importance of developing immediate preventive intervention for dental fluorosis. Suffering from unrest political circumstances and having high prevalence of dental fluorosis for decades could diminish the negative impact of having coloured teeth on children's perception and personality.

**Keywords:** Dental fluorosis; Palestine; Public perception

### Introduction

Dental fluorosis is an enamel defect caused by excessive fluoride intake during the period of enamel formation, leading to incomplete crystal growth and increased porosity [1,2].

Dental fluorosis is the first visible sign indicating that much fluoride has poisoned the whole body. Beside the health hazards there are other adverse effects of dental fluorosis such as high costs of other medical and dental problems and the effect on the victims and their loss of time.

Rare knowledge of the causes of dental fluorosis may be considered one of associated risk factors which increase dental fluorosis problem because it will be reflected on people practice and attitude. Different studies have found very low knowledge on risk factors of dental fluorosis and its disadvantages [3,4]. Regarding public perception, previous studies showed that more than half the children who have dental fluorosis were avoiding smiling and not accepting their appearance [5]. In addition, parents felt worried and embarrassed when their children who had dental fluorosis [6].

In Gaza Strip, the Palestinian children have suffered from high prevalence of dental fluorosis (60 - 78%) for decades and many risk factors were found associated with severe dental fluorosis [7,8]. The fluoride concentration in groundwater wells was measured up to 4.4 ppm fluoride in southern governorates of Gaza Strip [7].

Dental fluorosis has negative effect on children appearance. In addition, it negatively affects the public perception which will be reflected on the public manner with people who suffer from this

problem generally and children especially. There are no information assess Palestinians' awareness about the risk of having excessive fluoride, the methods that minimize and prevent this problem and the public perception of dental fluorosis.

### Study objectives

1. To examine the knowledge of dental fluorosis and its causes among the Palestinian children and their mothers,
2. To study the public perception of dental fluorosis in children and their mothers in Gaza Strip in Palestine

### Materials and Methods

A published cross sectional study recruited 350 children in the preparatory and secondary school age (12-18 years old) in all Gaza Governorates in Palestine, as illustrated in Figure 1. Fathers of children were 48.6% unemployed and 67.7% of the families were under the poverty line. Average fluoride concentration in 57.1% of municipal

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wells of drinking water was more than 1 ppm. The highest fluoride concentration in municipal wells of drinking water was 4.29 ppm and it was found in the Gaza City. Children have high prevalence of dental fluorosis (78%). Depending on the Thyllstrup-Fejerskov Index (TFI) of dental fluorosis, among those who had dental fluorosis, there were 63.4% in the group of 1-4 TFI score while 14.6% in the group of 5-8 TFI score [8].

The researcher divided the sample-with consideration of population size in each Governorates-as following: 50 subjects from North Gaza, 100 subjects from Gaza City, 50 subjects from Midzone, 100 subjects from Khan-Younis and 50 subjects from Rafah. Details of sampling size and process are described in the above mentioned reference.

Data of knowledge and public perception had been collected using closed and open-ended questionnaire. The questionnaires had been written in Arabic language because it is the mothers' tongue language. Knowledge and public perception were assessed through questionnaire

(Tables 1-4). The researcher interviewed and directed the questions to children and their mothers.

The study questionnaire was revised and validated by experts in psychological, public health, dentistry, and dental public health specialties. Then the questionnaire was piloted among 10 children with their mothers from different areas in all Gaza governorates. The pilot sample was excluded from the study.

All ethical concepts were considered, respect for people and respect for truth, anonymity and confidentiality were maintained. The researcher followed the guidelines of Helsinki Declaration and secured the informed consent from the children and their mothers. Administrative approval was obtained from Palestinian Ministry of Health and United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA).

The researcher used Statistical Package of Social Sciences SPSS for data coding, entry and analysis. The study results are presented in frequency tables.

## Discussion

### The major findings

The Knowledge of the children and mothers about dental fluorosis in Gaza strip is illustrated in Table 1. Most of children and all mothers do not know what dental fluorosis is and have not received any information about dental fluorosis in Gaza strip. Just two children know what dental fluorosis is and have received information about it through school health education program. Furthermore, they do not know causes and how to prevent dental fluorosis or minimizing its severity. Just 2.3% of mothers and no child know advantages of fluoride in drinking water, and no one knows disadvantages of fluoride in drinking-water. Those who prefer fluoride existence in drinking water are 52.6% of children and 59.1% of mothers. It can be postulated that, those people do not counter the fluoride existence in drinking water because they do not have any information about the disadvantages of high fluoride concentration in drinking water and excessive fluoride intake.

On other hand, 89.7% of children and 80.3% of mothers are not interested in quality (contents) of toothpaste and 80.6% of children and 80.3% of mothers, who interest in quality (contents) of toothpaste, know if the toothpaste has fluoride or not.

Table 2 illustrates the public perception of dental fluorosis in Gaza Strip. All respondents feel that others with stained teeth (fluorosed) do not have good appearance. The majority of mothers think that stained

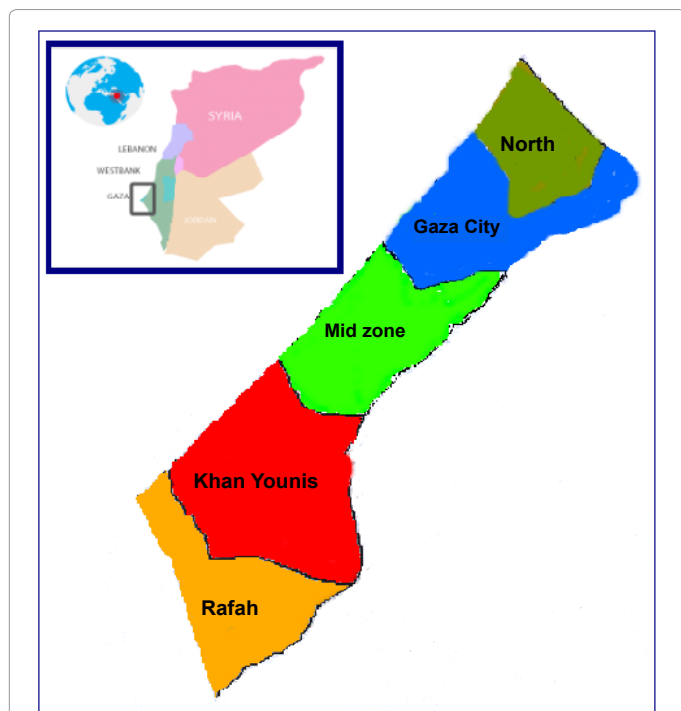


Figure 1: Map illustrates the five governorates in Gaza Strip in Palestine.

Variable	Yes		Yes	
	Children % (No.)	Mothers % (No.)	Children % (No.)	Mothers % (No.)
I know, what Dental Fluorosis is.	0.6 (2)	0.0 (0)	99.4(348)	100.0 (350)
I have received information about Dental Fluorosis in Gaza strip	0.6 (2)	0.0 (0)	99.4 (348)	100.0 (350)
I know the causes of Dental Fluorosis	0.3 (1)	0.0 (0)	99.7 (349)	100.0 (350)
I know what to do to prevent Dental Fluorosis or minimize its severity	0.3 (1)	0.0 (0)	99.7 (349)	100.0 (350)
I know what advantages of fluoride in drinking-water are.	0.0 (0)	2.3 (8)	100.0 (350)	97.7 (342)
I know what disadvantages of fluoride in drinking-water are.	0.0 (0)	0.0 (0)	100.0 (350)	100.0 (350)
I prefer fluoride existence in drinking water	52.6 (184)	59.1 (207)	47.4 (166)	40.9 (143)
I interest in quality(contents) of toothpaste	10.3 (36)	19.7 (69)	89.7 (314)	80.3 (281)
I know, whether toothpaste has fluoride or not (who responded Yes at previous item)	80.6 (29)	88.4 (61)	19.4 (7)	11.6 (8)

Table 1: The knowledge about DF of 350 children and their mothers in Gaza Strip-Palestine.

teeth (dental fluorosis) affects aesthetic appearance and personality. Children who do not hide their smile comprise 96.9% of the sample of study. All respondents interest with child aesthetic appearance so that all concern with child teeth. The majority (99.7%) of participated mothers think that the government can find immediate solution for this problem and they are ready to participate in solving the problem.

Table 3 shows that the respondents' perception about children with white teeth appearance that these children are more desirable as friends and more intelligence, furthermore, 98.6% of children agree with this idea and 95.4% of mothers agree as well, 98.3% of children and 95.4% of mothers found that they are more kind, and 98.9% of children and

96% of mothers see that they have better looking. The participants who believe that people with dental fluorosis (stained teeth) have lack social skills are 100% of children and 97.1% of mothers, 98.6% of children and 95.4% of mothers believe that they are less intelligent and 98.9% of children and 97.1% of mothers expect that they suffer of poor social adjustment. However, Table 4 shows that mothers participated in study are 89.7% satisfied with the colour of their children teeth, 98.9% do not feel guilty about their children teeth colour and 99.4% have not sought treatment for their children teeth colour.

To achieve acceptable appearance, this study found that most of mothers (92%) have not sought treatment for dental fluorosis because

Variable	Yes		Yes	
	Children % (No.)	Mothers % (No.)	Children % (No.)	Mothers % (No.)
Child has a problem with his/her teeth color	12.3 (43)	11.4 (40)	87.7 (307)	88.6 (310)
Child accepts his/her teeth appearance	86.3 (302)	87.4 (306)	13.7 (48)	12.6 (44)
The child does not accept his/her teeth appearance because of teeth color	87.5 (42)	86.4 (38)	12.5 (6)	13.6 (6)
Child desires to treat his/her teeth to have better appearance	13.4 (47)	12.6 (44)	86.6 (303)	87.4 (306)
The opinion about others with stained teeth (fluorosed(	0.0 (0)	2.3 (8)	100.0 (350)	97.7 (342)
Not good appearance	100.0 (350)	100.0 (350)	0.0 (0)	0.0 (0)
I think that stained teeth (Dental Fluorosis) affect aesthetic appearance and personality	99.7 (349)	99.4 (348)	0.3 (1)	0.6 (2)
Child hides her/his smile	3.1 (11)	3.1 (11)	96.9 (339)	96.9 (339)
The interest with child aesthetic appearance	100.0 (350)	100.0 (350)	0.0 (0)	0.0 (0)
I think that the government can find immediate solution for this problem	-	99.7 (349)	-	0.3 (1)
I am ready to participate in solving the problem	-	99.7 (349)	-	0.3 (1)

Table 2: Public perception for Dental Fluorosis of 350 children and their mothers in Gaza Strip – Palestine.

Variable	Child		Mother		
	Count	%	Count	%	
The concern with child teeth					
yes	350	100.0	350	100.0	
Total	350	100.0	350	100.0	
I think children with white teeth appearance is more					
Desirable as friends	yes	345	98.6	334	95.4
	no	5	1.4	16	4.6
	Total	350	100.0	350	100.0
Intelligence	yes	345	98.6	334	95.4
	no	5	1.4	16	4.6
	Total	350	100.0	350	100.0
Kind	yes	344	98.3	334	95.4
	no	6	1.7	16	4.6
	Total	350	100.0	350	100.0
Have better looking	yes	346	98.9	333	96.0
	no	4	1.1	14	4.0
	Total	350	100.0	347	100.0
I believe people with Dental Fluorosis (stained teeth) have					
Lack social skills	yes	349	100.0	340	97.1
	no	0	0	10	2.9
	Total	349	100.0	350	100.0
Lower intelligence	yes	345	98.6	334	95.4
	no	5	1.4	16	4.6
	Total	350	100.0	350	100.0
Poor social adjustment	yes	346	98.9	340	97.1
	no	4	1.1	10	2.9
	Total	350	100.0	350	100.0

Table 3: Public Perception for Dental Fluorosis of 350 children and their mothers in Gaza Strip – Palestine (continue).

Variable	Mother answer	Count	%
I am satisfied with the colour of my child teeth	yes	314	89.7
	no	36	10.3
	Total	350	100.0
I feel guilty about my child teeth colour	yes	4	1.1
	no	346	98.9
	Total	350	100.0
I have sought treatment for my child teeth colour	yes	2	.6
	no	348	99.4
	Total	350	100.0

**Table 4:** Perception of 350 mothers for Dental Fluorosis of their children in Gaza Strip-Palestine.

their children could cope with their appearance. The rest mothers have not sought treatment because of bad economic status (7%) and expensive treatment (1%).

### Knowledge around dental fluorosis

In general, studies investigating the knowledge of dental fluorosis are rare. In present study, there is lack in knowledge of the mother and child around dental fluorosis, this could lead to increase the risk of exposure to dental fluorosis. Levallois et al. found that knowledge of advantages and disadvantages of fluoride was rare in communities with fluoridated or non-fluoridated water supply in Quebec City region, and he warned of its reflect on people's practice and attitude [4].

The mothers and children in the current study are not interested in quality (contents) of toothpaste, this may increase the risk of more exposure to fluoride and to severe dental fluorosis. Whereas, in Northern Cape Province of South Africa, people living in areas receiving drinking water with fluoride concentration more than 1.7 ppm fluoride were more interested and aware on dental fluorosis [9]. Kukleva et al. illustrated that dentist who have more knowledge in dental fluorosis are more concerned with the changes in dental fluorosis colour compared with non-specialists people [10]. In the Montreal West Island territory, Vale and Kandelman emphasized on the role of dentists in improving people knowledge in fluoride's risks and benefits and preventing dental fluorosis [3].

### Public perception towards dental fluorosis

This study illustrated a negative public perception for dental fluorosis in Gaza Strip. All respondents feel that others with fluorosed teeth do not have good appearance. Majority of children and mothers think that dental fluorosis affect aesthetic appearance and personality.

Many studies have been conducted to investigate the perception of dental fluorosis around the world, and the results of most of them were in consistence with the study in Gaza Strip. The children, parents and dentists acceptability of people appearance decreased when dental fluorosis of their teeth increased [11-13].

A study in Tanzania found that children with dental fluorosis could suffer from social and psychological problems [14] and others declared that children's personality will be adversely affected [9,15].

This study found that most Children (96.9%) do not hide their smile. This may be attributed to the fact that the high prevalence of dental fluorosis, makes people less embarrassed of having discolored teeth as this could be common appearance in Gaza Strip. In contrary, other studies found that Irish patients with dental fluorosis were embarrassed and not smiling [16], and more than half the Colombian

children who have dental fluorosis are avoiding smiling and not accepting their appearance [5].

In the current study, the respondents' perception around children with white teeth appearance is that they are more desirable as friends and more intelligence. Furthermore, most of children and mothers agree with this idea. Nearly all children and mothers found that they are more kind and have better looking. All participants believe that people with dental fluorosis have lake social skills, less intelligent and suffer of poor social adjustment. Different studies have supported these results [15,17,18] and illustrated the negative impact of dental fluorosis on children's oral health-related quality of life [19].

In Gaza Strip, most of the children and mothers do not accept teeth appearance, because of teeth color. Similarly, Lalumandier and Rozier found that the worst aesthetic aspects of tooth surface was the only factor associated with parent satisfaction [20].

In present study, all people were concern with dental fluorosis, while, a review in York found that 12.5% of people exposed to water fluoridation (1,250 people in every 10,000) were concerned with dental fluorosis [21]. Similarly in England where mild dental fluorosis was acceptable [22].

Despite the negative perception of dental fluorosis in the Gaza Strip, the current study showed that 89.7% were satisfied with the colour of their children's teeth, and the majority did not feel guilty about their children's teeth colour and had not sought treatment for their children's teeth colour. While parents in Iceland, Ireland and England felt worried and embarrassed when their children suffering of dental fluorosis [6]. This could be a result of increased awareness of dental fluorosis and low experience of severe of dental fluorosis in these areas.

It could be concluded that rare knowledge of children and mothers around risk factors of dental fluorosis could increase the exposure to higher fluoride intake. In addition, Harrison's review in 2005 demonstrated that excessive intake of fluoride may causes other bad health-effects such as bone cancer, Down's syndrome, and renal failure [23]. Thus preventive health intervention should be developed to increase awareness and prevent dental fluorosis in future generations. Because the prevalence of dental fluorosis in Gaza Strip is high and it has common effect, the people accepting their children's appearance with dental fluorosis. Consequently, dental fluorosis's negative effect on children personality is low. Furthermore, living in areas suffering from unrest political and economic situation for decades could reduce the negative public perception and negative impact of having coloured teeth on children personality. However, mother interested to participate in any prevention programme to prevent this issue in future generations.

The study recommends establishing a national plan to solve dental fluorosis problem by encouraging Media and all providers of health service to illustrate the magnitude of dental fluorosis problem in Gaza strip and building health education program aiming to improve the Palestinians knowledge around dental fluorosis and how to minimize it.

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