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Assessment of Dental Caries Among 12-15 Year Old School Children In Low Fluoride Areas of Hebri Panchayat, Karkala Taluk, Udupi District, Karnataka State, India

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Abstract: *The countries like India, China etc., are facing a rapid growth in their population coupled with an increase in prevailing dental caries and other oral diseases. The public health care systems already under severe strain can ill afford to treat the vast majority of the population in need of dental care. In such a difficult scenario, fluoride can be a boon for countries like India, in providing a cost effective alternative to expensive dental care. Some selected villages in India, have drinking water supply from the schemes of mini water supplies or accelerated rural water supply from tap water or tube wells. In the present scheme, bore wells as the primary source of supply of water into a storage tank which are constructed at one or more centrally located places of the villages and water is supplied through taps provided at tanks. But other villages had NRWS schemes where water is distributed through a network of pipes and tapes regarded as village having tape water to the consumers. The water samples collected from the entire gram panchayats in Karkala were brought to water quality analysis. Open well and Bore well water samples were taken separately from each gram panchayats. The epidemiological study was performed to assess the 12 to 15 year old school going children of Hebri gram panchayat, Karkala taluk in Karnataka for the prevalence of dental caries among them.*

Keywords: *Fluoride, Dental Caries, Groundwater, Dental public health*

1. Introduction

1.1. General

Ground water in the coastal part of Udupi is having low concentration of Fluoride [15]. Fluoride concentration in drinking water has a physiological significance for humans and some animals. Drinking of low fluoride water and/or consumption of low fluoride diets resulted in dental caries among the children. The low concentration may be due to very rapid fresh water exchange, especially during rainy season with the result, the normal processes of concentration through evaporation or evapotranspiration are not effective in raising the fluoride level in ground water.

The first and foremost breakthrough with respect to the protective role of fluoride in drinking water and what followed by thereafter was the detailed and comprehensive dental surveys, performed by Dean and his fellow associates in USA [12]. In 1938, with all the necessary proof and documentations Dean became the first person to report that presence of 1ppm of fluoride in potable water would give maximum cariostatic effect with no deleterious side effects on health [4].

Similar studies have established the relationship between domestic water and dental caries [1],[2],[3],[5],[6],[7],[8],[9],[10],[11],[13],[14].

1.2. Objectives

Main objective of the present work is to assess the dental caries in the school going children living in an area having low fluoride groundwater.

1.3. Study Area

The selected study area here is Karkala which is located on the geographical co-ordinates of 13°12'0" North (Longitude) and 74°59'0" East (latitude) in the coastal zone of Udupi District. Figure 1 shows the different panchayats in Karkala taluk.

The major rock types in the area include gneisses, granites, dolerites, lateritics. Laterites and lateritic soils of varying thickness are found predominantly in the study area. The aquifers in the region occur in weathered and fractured crystalline rocks. The Groundwater appears under water table conditions in laterites and in alluvium and is tapped mostly by open wells. The Groundwater is in confined/semi-confined conditions in fractured gneiss and granite and is exploited by tube wells.

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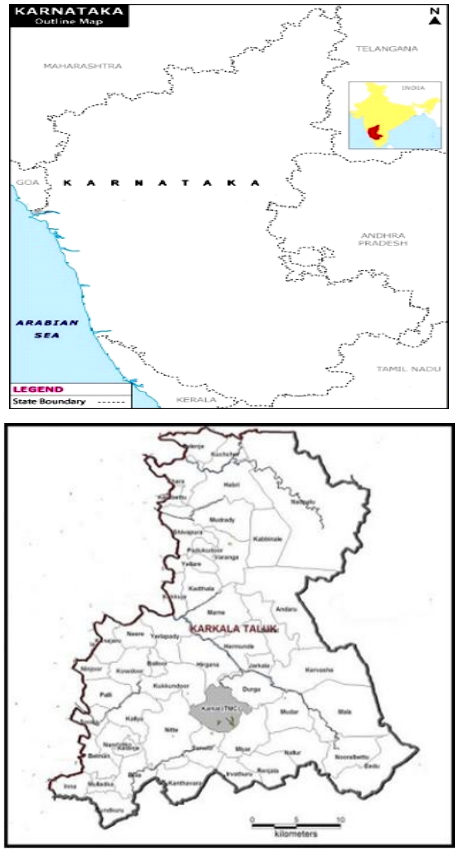

Figure 1: *Outline map of Karnataka state and Karkala Taluk map showing all the gram panchayats (*Source: www.mapsofindia.com*)*

2. Methodology

The Ground water samples were collected from 64 wells (32 open wells and 32 borewells) during pre-monsoon period of the year 2016. Using the standard analytical methods mentioned in the parts of APHA, 2012 and IS: 10500, 2012, the chemical parameters such as Fluoride, pH, Calcium, Chloride and Magnesium were determined and the results were shown in the Table 1.

- Determination of fluoride [16].
- Determination of pH [17]
- Determination of Calcium [18]
- Determination of Magnesium [19]
- Determination of Chloride [20]

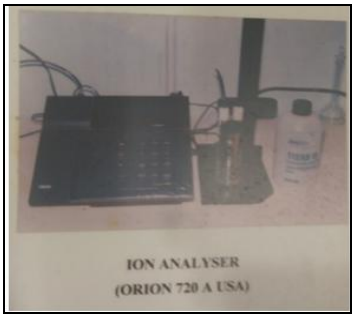

Figure 2: *Ion analyser for Fluoride determination*

Table 1: *Statistical details of physio-chemical parameters in groundwater samples of study area*

Parameter	Well type	Maximum	Minimum	Average	Acceptable Limit
Fluoride	BW	0.41 mg/L	0.07 mg/L	0.19 mg/L	1 mg/L
	OW	0.27 mg/L	0.07 mg/L	0.144 mg/L	
pH	BW	7.33	6.53	7.01	6.5 to 8.5
	OW	7.45	6.58	6.99	
Calcium	BW	23.76 mg/L	5 mg/L	13.91 mg/L	75 mg/L
	OW	26.11 mg/L	2.87 mg/L	14.28 mg/L	
Magnesium	BW	4.54 mg/L	0.94 mg/L	2.71 mg/L	30 mg/L
	OW	4.12 mg/L	0.81 mg/L	2.48 mg/L	
Chloride	BW	39.04 mg/L	13.56 mg/L	26.49 mg/L	250 mg/L
	OW	41.23 mg/L	13.47 mg/L	24.76 mg/L	

Note: OW means Open well and BW means Borewell. Also the acceptable limits are referred from IS: 10500, 2012 [21].

To assess the extent of dental caries in 12-15 age grouped 117 children of SR school, Hebri gram panchayat, Karkala were selected. Information such as Age, Gender, frequency of teeth brushing, eating habits (whether non-vegetarian or vegetarian), material used for brushing (toothpaste or tooth powder), DMFT (D stands for Decayed, M stands for Missing, F stands for Filled and T stands for Teeth) score were collected from the school children. The DMFT score is an important criterion since it is directly related to the dental caries. More is the DMFT score higher is the dental caries in the population.

3. Results and Discussion

The epidemiological study such as prevalence of dental caries and Distribution of DMFT component value according to Age and Sex was assessed to know the prevalence of dental caries. Also food habits, frequency of cleaning teeth and percentage of DMFT value among different age groups were also calculated. The data collected was analysed and the results were shown in the Table 2, 3, 4 and 5. Representation of the percentage of students belongs to the different age group and sex had been represented in the Figure 2.

Table 2. *Prevalence of Dental Caries according to Age and Sex*

Age in years	Sex	Students Examined	Affected	%
15	M	19	11	57.90
	F	15	11	73.33
14	M	17	9	52.94
	F	13	7	53.85
13	M	14	8	57.14
	F	10	7	70
12	M	18	12	66.67
	F	11	9	81.81
Total		117	74	63.24 %

Table 3. *Distribution of DMFT component value according to Age and Sex*

Age in years	Sex	No. of subjects	Decayed teeth	Missing teeth	Filled teeth	Total DMFT
15	M	19	31	11	9	51
	F	15	28	7	12	47
14	M	17	13	8	6	27
	F	13	16	7	5	28
13	M	14	19	5	10	34
	F	10	10	5	4	19
12	M	18	22	10	13	45
	F	11	14	7	5	26
Total		***117***	***153***	***60***	***64***	***277***

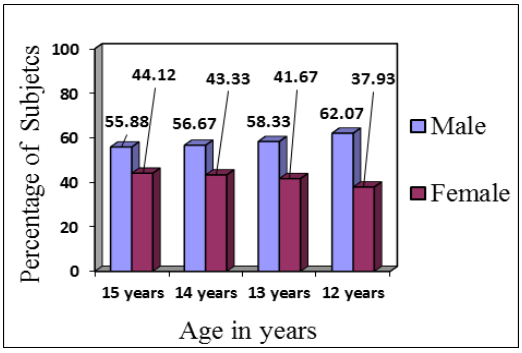

Figure 2. *Age and Sex-wise distribution of subjects*

Table 4. *Oral Hygiene practice followed among the study population according to Age and Sex*

Age in years	Sex	Frequency of Cleaning Teeth Students Examined	Once	Twice
15	M	19	16	3
	F	15	10	5
14	M	17	14	3
	F	13	9	4
13	M	14	11	3
	F	10	8	2
12	M	18	14	4
	F	11	8	3
Total		117	90	27

Table 5. *Caries experience of study population according to Diet*

Age in years	Sex	Vegetarians No.	Affected	Caries Free	Mixed No.	Affected	Caries free
15	M	2	2	0	17	9	8
	F	0	-	-	15	11	4
14	M	2	1	1	15	8	7
	F	3	2	1	10	5	5
13	M	1	1	0	13	7	6
	F	3	3	0	7	4	3
12	M	4	2	2	14	10	4
	F	2	1	1	9	8	1
Total		17	12	5	100	62	38

4. Conclusions

The result of the water quality analysis is clear that the Karkala taluk is a low fluoride region. The range of the fluoride obtained in the region of the range 0.05 to 0.45 mg/L. All the other parameters which affect fluoride were also well within the range of the IS: 10500, 2012.

The present epidemiological study was conducted to assess the prevalence of dental caries and treatment needs among 12 to 15 years old school going children of Hebri. The study population consisted of 117 school going children. The examination for dental caries was made according to the Dentation status and treatment needs described by WHO [22]. The examination was carried out by the investigator in natural light. Using simple random sampling method.

- The prevalence of dental caries found to be slightly higher among the vegetarian diet group as compared to mixed diet group.
- The caries prevalence was low in those students who brushed their teeth twice daily when compared to those children who brushed their teeth once daily.
- The prevalence of dental caries among the study population was 61.54%. It was observed that the caries prevalence of 12 years old age group was slightly higher as compared to 15 year old age group. This shows that as age advances caries decreases.
- Among 12, 13 and 15 years old children examined, the males have recorded higher DMFT value as compared to females. But in 14 years old children, the females have recorded slightly higher DMFT value of 28 as compared 27 in males.

In the end we justify that we selected the 12-15 year age group because this group of children are more affected by dental caries and for their teeth development some amount of fluoride is needed.

Regarding the food pumpkin, tea leaves have more fluoride content in them. Also locally available food with fluoride source has to be consumed giving emphasis to the climatic condition and geography.

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