

Original Research Article

Assessment of knowledge, attitude and practice towards fluorides and fluorosis among rural people in fluoride endemic region of Kondagaon, Central India

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ABSTRACT

Background: Fluoride has advantages but acts as a toxin if consumed in excess. It interferes with the normal process of enamel as well as bone formation leading to an increased risk of dental and skeletal fluorosis. This study was aimed to assess the knowledge, attitude and practices related to fluoride and fluorosis among the residents of fluoride endemic villages of Kondagaon, Central India.

Methods: The study was carried out among 600 individuals aged 5 years and above. Each village was considered as a cluster. The number of participants from each village was determined based on proportionate sampling following which households in each village were selected based on systematic random sampling.

Results: Among the participants one-fourth of the total participants (26%) had heard the term fluorosis, less than one-fourth (23.3%) responded that fluorosis is preventable, while more than three-fourths (77.7%) had no knowledge about fluoride prevention and mitigation programs of government. Also, the attitude of more than two-third of the individuals (70.3%) is negative towards the fluorosis control program.

Conclusions: The knowledge, attitude and practices of the study were found to be very low. This suggests that more efforts have to be made at the grass-root level for creating awareness.

Keywords: Knowledge, Attitude, Practices, Fluorides, Fluorosis

INTRODUCTION

Fluoride a naturally existing content in water and is an important trace element required by the human body. But, if consumed in concentrations in excess of the optimum level, it acts as a toxin.^{1,2} It interferes with the normal process of enamel as well as bone formation and it leads to increased risk of dental and skeletal fluorosis.³

In India, fluorosis has been found to be endemic in 20 out of 35 states and union territories.⁴ Around 25 million of the Indian population are affected with fluorosis and 66 million are at risk of it.⁵ In Chhattisgarh, out of the 27 districts, fluoride content in water is beyond permissible limit in nearly 17 districts.⁶ Among these districts, Kondagaon district in the Bastar division of southern Chhattisgarh is a fluoride endemic area. So, the present

study was carried out to assess the knowledge, attitude and practices related to fluoride and fluorosis among the residents of fluoride endemic villages of the district. It is very important to know the knowledge and practices of the communities as it will help in its mitigation and prevention. The results of the study would help us to form coordinated and targeted prevention mechanisms.⁷ Despite the programmes to take care of fluoride related health issues in India, fluorosis is still under-diagnosed and under treated among the population across all ages especially in rural areas. Individuals with mild fluorosis usually remain unnoticed. Healthcare related to fluorosis has not yet been perceived as a priority public health problem in our country. Also, though the research on fluorosis and fluorides has increased in recent years globally, but that is not the case in India. So, the present study was carried out in one such district of Kondagaon in the Bastar division of southern Chhattisgarh. The aim of the study was to assess the knowledge, attitude and practices related to fluoride and fluorosis among the individuals aged 5 years and above residing in fluoride endemic villages.

METHODS

A community-based cross-sectional analytical study was conducted during May 2021 and June 2021 among the residents of fluoride endemic villages of Kondagaon district, Chhattisgarh.

Inclusion criteria

Individuals aged 5 years and above residing in the fluoride endemic rural areas were included in the study.

Exclusion criteria

Individuals unable to understand the questions

Sample population and sampling technique

All individuals aged 5 years and above residing in the fluoride endemic rural areas of Kondagaon district, Chhattisgarh were included in the study. Assuming the prevalence of fluorosis in individuals aged more than 5 years and above as 23.1%, absolute precision of 5 and, alpha error of 5% and design effect of 2.0 the calculated sample size was 546 using OpenEpi software (v3.01).⁸ By assuming 10 percent non-response rate, the calculated sample size will be 600. Hence 600 individuals were approached for the study. At the first step, the fluoride endemic villages from all the five blocks of the district were enumerated. (Table 1) From the enumerated list, based on the number of household in each village, the sampling interval of the household was decided based on Systematic random sampling. Each village was considered as a cluster. From each of the selected household, one eligible participant was selected by simple random sampling technique to eliminate design effect.

Table 1: List of fluoride endemic villages with total number of households.

| Block | Village | Total household | Sampling interval |
|------------------|---------------|-----------------|-------------------|
| Kondagaon | Bakhra | 241 | 16 |
| | Kukadgarkapal | 211 | 14 |
| | Kokodi | 593 | 40 |
| | Bhagdewa | 290 | 19 |
| | Badebhirawand | 216 | 14 |
| | Kamela | 304 | 20 |
| | Pusawand | 227 | 15 |
| | Malgaon | 841 | 56 |
| | Ghodagaon | 679 | 45 |
| | Karanji | 314 | 21 |
| Makadi | Joba | 590 | 39 |
| | Tamarawand | 332 | 22 |
| | Makadi | 889 | 59 |
| | Binjoli | 296 | 20 |
| | Chinari | 196 | 13 |
| | Anantpur | 534 | 36 |
| | Badghordsoda | 246 | 16 |
| | Bawai | 436 | 29 |
| | Deorwal | 196 | 13 |
| | Odargaon | 213 | 14 |
| | Ondari | 246 | 16 |
| | Heerapur | 445 | 30 |
| | Belondi | 202 | 13 |
| | Otenda | 428 | 29 |
| Mageda | 430 | 29 | |

Continued.

| Block | Village | Total household | Sampling interval |
|-------------|--------------|-----------------|-------------------|
| Keshkal | Aadanbeda | 86 | 6 |
| | Bawnimaari | 45 | 3 |
| | Uparchandeli | 37 | 2 |
| | Randha | 55 | 4 |
| | Honhed | 62 | 4 |
| Baderaj-pur | Dhamanpuri | 234 | 16 |
| | Harvel | 334 | 22 |
| | Kibda | 192 | 13 |
| | Pharasdihi | 134 | 9 |
| | Aamaguhan | 231 | 15 |
| | Rogadihi | 87 | 6 |
| | Kongera | 196 | 13 |
| | Baijenpuri | 252 | 17 |
| | Kopenkonhadi | 69 | 5 |
| | Korohobadi | 270 | 18 |

Study procedure

After getting permission, from the office of the Chief Medical and Health Officer, Kondagaon, Chhattisgarh, individuals aged above 5 years and above residing in fluoride endemic rural areas of Kondagaon, Chhattisgarh were approached. This study was conducted as a part of National Program for Control and Prevention of Fluorosis (NPPCF), so no ethical permission was required. After obtaining the consent, one responsible adult member from a household was interviewed to collect relevant information. If the house was found locked, then those houses were visited on consecutive days. If the house was found to be locked even after more than two visits, then those households were considered unavailable for the study and next house was included.

Firstly, a list of all eligible participants was obtained from the enumeration register of the health and wellness centers (HWCs) or sub-health centers (SHCs). Then a village map was obtained from the HWCs or SHCs and all the streets were numbered. After that, houses of all the participants in each street were marked and listed. On each day spot map was drawn for easy locating of houses and identifying its status of data collection. Collection status was marked with a different symbol for easy identification. All the eligible participants in each locality of the selected villages were listed. Then by Systematic Random sampling, the houses of the individuals in each para/locality were selected based on the sampling interval. In case there were more than one eligible participants present in a house, then only one was selected by Simple Random sampling technique to eliminate design effect. If a particular house was locked even after two attempts and those who didn't give consent for the study, they were considered as non-respondents. The participants were approached at their residence. The

purpose of the study was explained to them and they were assured of their confidentiality. After getting consent from the participants, information was gathered by using a structured questionnaire having closed ended questions.

Considering the literacy rate among the participants to be low and some lacking formal education, so for all the questionnaires, the investigator asked the questions and noted the responses. If they were not available at home during the first visit, one more attempt was made to collect the data. The participant who was not reached after two attempts were considered as non-respondent and were excluded from the study. All the questions were converted and validated into local language (Hindi) and was then converted back to English to ensure validity. Information recorded in the questionnaire was entered in Microsoft excel 2016. Analysis was done using SPSS version 25. Variables like age groups, gender, education, occupation, family type and source of drinking water, was summarized as proportions. Variables on knowledge, attitude and practices were summarized as proportions.

RESULTS

A total of 600 individuals participated in the study. The socio-demographic characteristics of study participants have been summarized in Table 2. Summarization of assessment of Knowledge regarding fluoride and fluorosis among study participants is shown in Table 3. Similarly, summarization of assessment of attitude regarding fluoride and fluorosis among study participants is shown in Table 4 and lastly summarization of assessment of practices regarding fluoride and fluorosis among study participants is shown in Table 5.

Table 2: Socio-demographic characteristics of study participants (n=600).

| Variables | Frequency (%) | |
|-------------------|---------------------|------------|
| Age group (years) | <18 | 39 (6.5) |
| | 19-30 | 205 (34.2) |
| | 31-59 | 347 (57.8) |
| | >60 | 9 (1.5) |
| Gender | Male | 326 (54.3) |
| | Female | 274 (45.7) |
| Education | No formal education | 104 (17.3) |
| | Primary | 69 (11.5) |
| | Secondary | 172 (28.7) |
| | High school | 196 (32.7) |
| | Graduate | 59 (9.8) |
| Family type | Nuclear | 492 (82) |
| | Joint | 108 (18) |
| Occupation | Unemployed | 91 (15.2) |
| | Employed | 70 (11.7) |
| | Farmer | 297 (49.5) |
| | Homemaker | 142 (23.6) |
| Source of water | Borewell | 248 (41.6) |
| | Handpump | 352 (58.4) |

Table 3: Assessment of knowledge regarding fluoride and fluorosis among study participants (n=600).

| Variables | Frequency (%) | |
|---|--------------------------|------------|
| Have you ever heard of fluorosis? | Yes | 156 (26) |
| | No | 444 (74) |
| Does water causes skeletal or dental defect? | Yes | 146 (24.3) |
| | No | 26 (4.3) |
| | Do not know | 428 (71.4) |
| Can fluorosis be prevented? | Yes | 140 (23.3) |
| | No | 28 (4.7) |
| | Do not know | 432 (72) |
| What is your source of information regarding fluorosis? | Mass media | 18 (3) |
| | Government health center | 53 (8.8) |
| | Health worker | 227 (37.8) |
| | Friends/neighbor | 87 (14.5) |
| | Community meetings | 69 (11.5) |
| | Others | 146 (24.4) |
| Knowledge about harmful effects of fluorosis | Dental | 63 (10.5) |
| | Skeletal | 79 (13.2) |
| | Soft tissue/Systematic | 39 (6.5) |
| | Do not know | 419 (69.8) |
| Do you know your drinking water has fluoride? | Yes | 146 (24.3) |
| | No | 454 (75.7) |
| Do you know about fluoride prevention programs from government? | Yes | 134 (22.3) |
| | No | 466 (77.7) |
| Do you know cause of fluorosis | Yes | 202 (33.7) |
| | Do not know | 398 (66.3) |

Table 4: Assessment of attitude regarding fluoride and fluorosis among study participants (n=600).

| Variables | Frequency (%) | |
|--|---------------|------------|
| Is fluorosis a serious health problem? | Yes | 225 (37.5) |
| | No | 54 (9.0) |
| | Do not know | 321 (53.5) |

Continued.

| Variables | Frequency (%) |
|--|--------------------------------------|
| Would you use medicated tooth paste/gels if provided? | Yes 345 (57.5) |
| | No 255 (42.5) |
| Is your attitude towards fluoride control program positive? | Yes 178 (29.7) |
| | No 422 (70.3) |
| Deciding factor to seek care for fluorosis? | Cost 27 (4.5) |
| | Distance of HWC 55 (9.2) |
| | Time availability 198 (33) |
| | Do not know 320 (53.3) |
| Best method to prevent fluorosis? | Use of medicated toothpaste 32 (5.3) |
| | Water management 64 (10.7) |
| | Awareness generation 223 (37.2) |
| | Do not know 281 (46.8) |

Table 5: Assessment of practice regarding fluoride and fluorosis among study participants (n=600).

| Variables | Frequency (%) |
|--|---|
| Whom do you contact if you see you or your family member has teeth whitening or skeletal defects for fluorosis treatment? | Doctor 187 (31.2) |
| | MLHP 42 (7.0) |
| | ASHA 329 (54.8) |
| | Do nothing 42 (7.0) |
| What protective measures you use against fluorosis? | Consume tamarind/ guava 90 (15) |
| | Use medicated tooth paste/gel 88 (14.7) |
| | Do nothing 422 (70.3) |
| If you see any dental or skeletal defect in you or family member developing, how quickly you go for consultation? | One week 555 (92.5) |
| | One month 23 (3.8) |
| | More than one month 8 (1.3) |
| | Do not go 14 (2.3) |

DISCUSSION

For planning any public health intervention, assessment of KAP is a very good step. This is of greater importance when we consider disease like fluorosis in which awareness about its cause and spread involves greater participation from various stakeholders. It also holds great importance in a state like Chhattisgarh which has many fluoride endemic states. It has to be noted that adequate amount of exposure to fluoride is important as the advantages of lower levels of fluoride exposure is outweighed by adverse effects at higher level.

Knowledge about fluorides and fluorosis

In our study, one-fourth of the total participants (26%) had heard the term fluorosis. Also, almost one-fourth of the total individuals (24.3%) knew that water causes some skeletal or dental defect. Of total, less than one-fourth (23.3%) responded that fluorosis is preventable. These results are in accordance with a study conducted by Nanjundan et al in South India.⁹ Contrast to our results, in a study by Rustagi et al no participants had any knowledge regarding fluorosis.¹⁰ Almost half of the individuals (46.2%) received information about fluorosis from health care workers and government health centers.

This illustrates the importance of public health facilities and importance of imparting knowledge regarding fluorosis to healthcare workers. Contrast to this, a study by Duguma et al found friends and internet to be a major source of information about fluorosis.¹¹ We found more than three-fourths (75.7%) had no knowledge whether drinking water contains fluoride or not. This results are in accordance with a study conducted by Sajjan et al in South India.¹ Also it was found that more than two third of the participants (69.8%) had no knowledge about harmful effects of fluorosis. Of total, more than three-fourths (77.7%) had no knowledge about fluoride prevention and mitigation programs of government. This is similar to finding of the study conducted by Nanjundan et al in South India.⁹

Attitude towards fluorides and fluorosis

More than half of the individuals (53.5%), do not know that fluorosis is a major health problem while attitude of more than two third of the individuals (70.3%) is negative towards the fluorosis control program. This result is consistent with a study conducted by Pahuja et al in North India.^{12,13} This suggests that efforts have to be made in order to bring about a change in the attitude among the people regarding fluorosis. More than two-fifth of the

individuals (42.5%) are not willing to use tooth paste even if they are provided. This suggests that oral health promotion needs to be carried out in rural areas which is consistent with a case study presented by Bahal et al in rural area.¹⁴ Of total, almost half of the individuals (46.8%) did not know the best method to prevent fluorosis while more than one-third (37.2%) responded that awareness generation is the best method to prevent fluorosis.

This is in accordance with the findings of a review article by Khairnar et al in which increasing awareness generation among the community about the adverse health impacts of excessive fluorides is the best way of combating fluorosis.¹⁵ However, our results also suggests that effort has to be made to sensitize the community about fluorosis prevention methods. One third of the individuals (33%) responded that availability of time is a factor which hinders them from seeking treatment while more than half of them (53.3%) were not able to tell a distinguished factor which stopped them from seeking treatment. This result is in contrast to a study carried out by Indu et al according to which medical costs is the hindering factor which stops people from seeking treatment.¹⁶ Since our results suggest availability of time is the hindering factor in seeking treatment, so if the treatment services are made available at the nearest public health facility everyone can seek treatment.

Practices towards fluorides and fluorosis

If there is any whitening of teeth or any skeletal defect, more than half of the individuals (54.8%) consult ASHA workers and nearly one third (31.2%) take the consultation of a doctor. Also, almost all of the individuals (92.5%) seek treatment within the first week of the appearance of symptoms.

This suggests the importance of well-trained primary health care team with adequate knowledge on fluorosis. The importance of primary health care team in fluorosis prevention has been illustrated in a media article by Singh in West Bengal.¹⁷

More than two third of total (70.3) do not take any preventive measure against fluorosis. So in this regard efforts have to be made in order to improve the preventive practices among the people residing in endemic areas.

Strength and limitations

Inclusion of all individuals five years and above, use of probability sampling technique at the community level are the main strengths of this study. There was very less scope for selection bias. Considering the low literacy rate among the participants, the interviewer explained some of the questions in local language (Hindi). This helped the participants answering all the questions. Only one participant was selected from each household. Also, since

each village was considered as a cluster, adequate sample size was taken with design effect of 2. Estimation of fluoride levels of drinking water in all the villages would have given an added dimension to the study. Also, assessment of fluorosis of the study participants would have helped in knowing the current burden of fluorosis.

CONCLUSION

The knowledge, attitude and practices of the study participants towards fluorides and fluorosis was found to be very low. This suggests that more efforts has to be made at the grass-root level for creating awareness. Apart from this, routine screening has to be done also especially at the schools and HWC-SHCs along with specialized camps in remote areas. Adequate knowledge should be imparted to the Primary health care team so that they can identify the problems at the earliest. Frequent testing of water has to be done so that immediate action can be taken in those areas which have higher fluoride content in water.

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