

Serum Total Cholesterol Level in Fluorotic Individuals in a Fluoride Endemic Zone

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ABSTRACT

Introduction: Fluorosis is a major worldwide problem, including in India affecting both human and animal life, in which different systems in the body can be involved. The aim of the study was to evaluate the relationship between serum fluoride level and the serum total cholesterol level to predict any defect in lipid metabolism in population residing in the fluoride endemic area.

Material and Methods: This cross-sectional observational study has been performed in Simlapal block, one of the fluoride endemic zones of Bankura district for evaluating the effect of fluorosis on the serum total cholesterol level on 80 subject selected by using simple random sampling. After collecting the blood samples from both groups, serum fluoride was measured by Ion-Meter and serum total cholesterol level was measured by auto-analyzer and then the data were compared.

Results: The serum fluoride was found to have a statistically insignificant relationship with serum total cholesterol in the study group. The serum level of fluoride was higher in the study group compared to the comparison group while serum total cholesterol level was lower in the former than the later.

Conclusion: There is no statistical relationship between serum fluoride level and serum total cholesterol level in fluorotic individuals.

Keywords: Serum fluoride, total cholesterol.

INTRODUCTION

Fluorine is the most abundant element in nature. In the human body bones and teeth contain about 96% of the fluoride. For the normal mineralization of bones and dental enamel fluoride is very much necessary. The recommended level of fluoride in drinking water in India is 0.5 to 0.8 mg/l.¹ Endemic fluorosis is prevalent in India since 1937.² Fluorosis is an important public health problem throughout the world as well as India as a result of high fluoride concentration in groundwater³ and because a large number of Indian rely on groundwater for drinking purposes which at many places is rich in fluoride.⁴ World Health Organization (WHO) has fix the upper limit of fluoride concentration in drinking water at 1.5 mg/L⁵, where as the Bureau of Indian Standards, has decrease 1.0 mg/L as the maximum permissible limit of fluoride.⁶ Dental, skeletal and non-skeletal fluorosis is associated with the prolonged ingestion of fluoride in drinking water in excess of the daily requirement. Conversely, dental caries is associated with the inadequate intake of fluoride in drinking water.⁷ In Bankura district of West Bengal 17 blocks out of 22 blocks are fluoride endemic zones, resulting in consumption of high levels of fluorides in drinking water with its health related hazardous effects namely dental and skeletal and non-skeletal fluorosis symptomatic cases.¹ The underlying hard rocks is the source of this high fluoride concentration in water of Bankura district.⁸ There are so many confusing data regarding fluoride toxicity

and lipid metabolism. Saralakumari et al showed that a an increase in serum cholesterol in rats supplemented with fluoride in drinking water for sixty days⁹ but Chinoy et al showed no changes in serum cholesterol of rats^{10,11} and mice¹² exposed to sodium fluoride for 30 days.

The aim of the study was to evaluate the relationship between serum fluoride level and the serum total cholesterol level to predict any defect in lipid metabolism in population residing in the fluoride endemic area.

MATERIAL AND METHODS

The present cross-sectional observational study was performed in Simlapal block of Bankura district. The tests were carried out at department of Biochemistry, B.S. Medical College, Bankura (District fluorosis detection laboratory).

Study subject: 80 subjects were selected by simple random sampling among them 49 were male and 31 were female. In that block, the endemic fluorosis was diagnosed according to the clinical diagnosis criteria, as per Wang et al.¹³ The criteria for study are (1) people residing in the endemic fluorosis region since birth, (2) having mottled tooth enamel which indicates dental fluorosis, (3) consuming water with fluoride levels above 1.2 mg/L (normal 1 mg/L), and (4) a urine fluoride level greater than 1.5 mg/L. Subjects residing in the same area without having above mentioned signs and symptoms were labeled as control. We have chosen the subjects from age 20 to age 65 years.

The exclusion criteria

1. History of any malignant condition,
2. History of any acute or chronic infection,
3. History of any chronic illness such as chronic kidney disease etc,
4. Pregnant women.
5. Severely malnourished individuals.
6. Known history of existing cardiovascular diseases etc.

With the help of a detailed questionnaire, history and physical examination the case and the control subjects were screened. Subjects belonging to both groups were physically examined and detailed information was collected with the help of a predesigned and pretested questionnaire. Both cases and controls gave the Informed consent. Institutional ethical committee had approved the study design.

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Sr. No	Parameter	Fluorotic subject (n=42) (Mean± SD)	Control (n=38) (Mean± SD)	P Value	Significance
1	Serum fluoride (mg/l)	0.2561±0.0093	0.0321±0.0071	0.001	Significant
2	Serum total cholesterol (mg/dL)	146.02±6.77	150.87±6.32	0.338	Insignificant

Table-1: Serum levels of total cholesterol and fluoride in Cases and controls

Parameter	Group	Correlation coefficient (r)	Significance (p value)
Serum fluoride Vs Total cholesterol	Study	0.115	0.467*

*Correlation is insignificant (2-tailed).

Table-2: Relationship between the serum parameters among study group

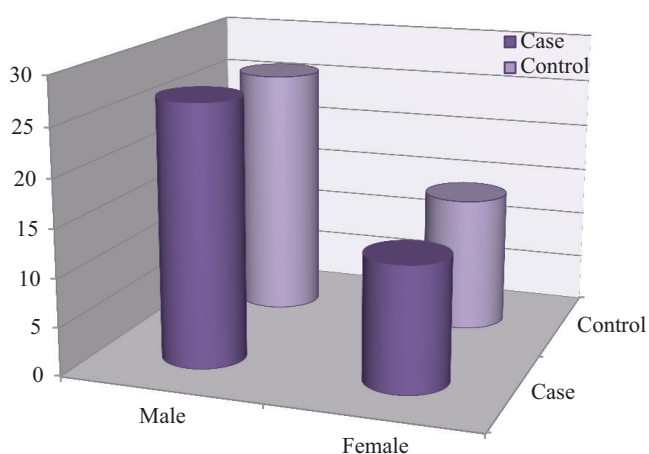


Figure-1: Distribution of case and control according to gender

Study Period: This study was carried out during the period from May 2016 to September 2016.

Laboratory investigations: The blood samples were collected from the 40 cases and 40 controls and serum was separated by performing centrifugation. Then serum fluoride level was measured by Ion Meter and serum total cholesterol level was measured by auto-analyzer.

STATISTICAL ANALYSIS

The data were put in MS excel and then they were analyzed by different statistical methods. Data were displayed by different charts and tables. Unpaired 't' test, Spearman correlation coefficient (r) etc. were used to find out whether any relationship between variables exist or not.

RESULT

Out of 80 participants 31 were female and rest were male (Figure-1).

The average age of the participants was 41.26±9.08 (mean ± SD) years with a range of 45 years. The study group have higher average serum fluoride levels compared to that of the comparison group but slightly lower serum cholesterol level than the comparison group and the difference was statistically insignificant (Table-1).

So the serum fluoride have no statistically significant relationship with serum total cholesterol among the study subjects (Table-2).

DISCUSSION

India is one of the fluorosis affected country, with huge number of population sufferings from it. Fluorosis is also a major health problem in many parts of the world. W.H.O. reported that concentrations of fluoride present in ground water are high in

India and China.¹⁴ Normal serum level is less than 200 mg/dL¹⁵ and the normal upper limit of fluoride in serum is 0.02 mg/l.¹⁶ In the present study, the study group was found to have higher average serum fluoride levels compared to that of the comparison group but slightly lower serum cholesterol level than the comparison group and the difference was statistically insignificant. There was also no statistical correlation between the serum fluoride level and serum total cholesterol level in the study populations. The findings of our study was similar to study done by Chinoy et al which reported that showed no changes in serum cholesterol and various reproductive tissues of rats^{10,11} and mice¹² exposed to sodium fluoride for 30 days and also a study conducted by Michael M et al which showed that normal levels of serum cholesterol. These findings exclude the occurrence of hypo or hypercholesterolemia among fluorotic individuals. In the other hand, Saralakumari et al showed that an increase in serum cholesterol in rats supplemented with fluoride in drinking water for sixty days.⁹ In some human studies which showed that hypercholesterolemia is a consistent finding in fluorosis.¹⁷⁻¹⁹ Cholesterol is an antioxidant²⁰ and its derivatives such as glucocorticoids, testosterone, progesterone, and estrogen can act as free radical scavengers.²¹ Hence, it is possible for high cholesterol level for preventing fluoride induced oxidative stress and the resultant damage.

CONCLUSION

Our study suggested that there is no statistical relationship between serum fluoride level and serum total cholesterol level in fluorotic individuals. So, more studies should be conducted for establishing the association between fluorosis and serum total cholesterol level in human being.

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