

Change of fluoride level in blood following ingestion of sodium fluoride tablet in hostel inmates of a private Dental College**Priyanka Yadav, Ashok Kumar Mohapatra, Mayank Agrawal, Ankita Jain, Deepika Singh¹**

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ABSTRACT:

Introduction: Fluoride is the most potent and effective known agent for the prevention of dental caries. The purpose of this study was to determine the amount of Fluoride in human blood.

Material and Method: 20 healthy, caries free hostel inmates with average age 22 yrs who volunteered and gave informed and verbal consent, were included in the study. Blood Samples were collected after the dinner for a baseline data and they were asked to swallow 1 mg of sodium fluoride tablet. Follow-up samples were collected at 6 hrs and 12 hrs interval. Sample thus collected sent for fluoride estimation by using ion electrode method. Statistical analysis was done using paired t test.

Result: 0.5816 ppm & 0.4112 ppm after 6 hrs and 12 hrs respectively.

Conclusion: It was observed that fluoride present after 6 hrs was higher than baseline and 12 hrs. Significantly increased and after 12 hrs decreased with time.

Keywords: Fluoride, Blood, Sodium Fluoride Tablet

INTRODUCTION:

Fluorine is the 13th most abundant element in earth's crust. Human beings are repeatedly exposed to fluoride through food, water and a variety of other products of daily use. Intake of too much fluoride causes dental and skeletal fluorosis. In India fluorosis is prevalent for the last six decades and the fluoride effect on human health has been clearly understood by now.¹

Ingestion of fluoride systematically during tooth development has been shown to reduce the incidence of dental caries.² In view of the fact that a variety of forms of fluorides have met broad acceptance for use in the avoidance of dental caries, the metabolism of fluoride is of substantial interest.³⁻⁵ The human organism is exposed to fluoride in a number of ways. Consumption of fluoride is accomplished through various foods; drinking water and fluoride containing products comprising

dentifrices, mouth rinses, tablets, drops, etc.⁶⁻⁸ Hard tissues are known to be the major sites of fluoride accumulation in the human body. Approximately 99% of the total body burden of fluoride is retained in bones and teeth, with the remainder distributed in highly-vascularised soft tissues.^{6,7} There are several fluids that may be used to determine the amount of fluoride in the various compartments of the body. Some of these are readily accessible and are useful for determining the current availability of fluoride. The values obtained are not a direct measure of fluoride accumulation of the body, but they are indicative of the burden because of incompletely defined relationship between fluoride concentration in bone and extracellular fluid. These fluids include urine, plasma and ductal saliva.⁹

Plasma is the biological fluid into which fluoride must pass for its distribution

elsewhere in the body as well as its elimination from the body. For these reasons, plasma is often referred to as the central compartment of the body.⁸ Factors that include fluoride intake from various sources may affect plasma fluoride levels.

The aim of this study is to determine the fluoride level in human blood and objective to determine the bioavailability of fluoride on human body.

MATERIAL AND METHODS

The study was carried out at a private dental college in Rajasthan. 20 healthy caries free hostel inmates with average age 22 years, staying in hostel, which volunteered and gave informed and verbal consent, were included in the study. The study protocol was approved by the Scientific and Ethical Committee of the institution.

Besides being otherwise healthy, the participants regularly consumed drinking water from the same city supply which has been previously shown to contain levels of fluoride. The participants consumed a regular hostel diet. Each participant was asked to abstain from drinking black tea and fluoridated water and eating high fluoride food. Participants were instructed to brush their teeth as usual, but refrain from using a dentifrice or oral rinse containing fluoride for 24 hours prior to baseline collections and until the study was complete and given same type of food and water during the study.

Blood Samples were collected after the dinner for a baseline data and they were asked to swallow 1 mg of sodium fluoride tablet. Follow-up samples were collected at 6 hrs and 12 hrs interval. 5 ml of blood samples were obtained and transferred into a

fluoride-free polyethylene tube. Samples were stored in a freezer at -20°C until fluoride measurement. To determine fluoride concentrations, equal volumes of TISAB buffer (Orion, U.S.A.) was added into the samples. All samples were homogenized using magnetic stirrers throughout the measurements. An ion-selective electrode (Mettler Toledo MA 235 pH/ion Analyzer) was used to measure the fluoride concentrations of the blood samples. Data so obtained were computed in SPSS software and subjected to statistical analysis using paired t-test and ANOVA.

Inclusion Criteria

1. College students who were staying in hostel since one year.
2. Boys/Girls students willing to participate and co-operative.

Exclusion Criteria

1. Students who are unwilling to participate and uncooperative.
2. Students who are ill or under medication.
3. Students not staying in hostel.

RESULTS

The mean fluoride concentration in baseline samples was 0.409±0.05211 PPM and after ingestion of tablet was 0.5816±0.136 and 0.4112±0.0542 PPM 6 hours and 12 hours respectively. (Table 1) All samples in the study demonstrated the highest mean fluoride levels in the blood samples collected after 6 hours. After 12 hours of ingestion of tablet, the fluoride concentration in whole saliva returned to baseline levels. Significant differences observed between the mean blood fluoride concentrations measured at baseline, 6 hrs and 12 hrs. (P= 0.001) (Table 2)

Table: 1 Comparison among Blood fluoride concentration before and after ingestion of Sodium Fluoride tablet

	N	Mean	Std Dev	't' Value	dF	'P' Value*
Baseline	20	0.409	0.05211	5.167	19	<0.001
6 Hours	20	0.5816	0.136			
Baseline	20	0.5816	0.136	0.127	19	0.901
12 Hours	20	0.4112	0.0542			
6 Hours	20	0.409	0.05211	5.317	19	<0.001
12 Hours	20	0.4112	0.0542			

Table: 2 Associations between the Blood Fluoride Concentration and Time Period (ANOVA)

	N	Mean	Std Dev	'F' Ratio	'P' Value*
Baseline	20	0.409	0.05211	23.926	<0.001
6 Hours	20	0.5816	0.136		
12 Hours	20	0.4112	0.0542		

DISCUSSION

Plasma is the biological fluid into which fluoride must pass for its distribution elsewhere in the body as well as its elimination from the body.

The plasma fluoride concentration displays an increase along with fluoride intake. This increase is, however, attenuated due to distribution to the interstitial and intracellular fluid uptake by calcified tissues and renal excretion.¹⁰ The literature contains a wide range (0.008-0.045 ppm) of reported normal plasma fluoride concentrations. More than 90 % of the ingested fluoride is absorbed from the gut.^{11,12} The diversity of values may have been due to the inclusion of fasting individuals as subjects in contrast to other studies employing non-fasting participants.¹² Certainly, other factors that include methodological variations as well as the fluoride levels of drinking-water consumed by subjects should have a strong impact on the reported values.¹² Li et al¹³ reported a mean plasma fluoride concentration of 0.106±0.076 ppm in 127 subjects. In their study, the subjects were selected from a region with the drinking water fluoride concentrations of 5.03 ppm. In the present study the mean plasma fluoride concentration was baseline samples was 0.409± 0.05211 PPM and after ingestion of tablet was 0.5816±0.136 and 0.4112±0.0542 PPM 6 hours and 12 hours respectively. It was observed that fluoride present after 6 hrs was higher than baseline and 12 hrs.

CONCLUSION

It was observed that fluoride present after 6 hrs was higher than baseline and 12 hrs. Significantly increased and after 12 hrs decreased with time.

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