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Original Research

To assess salivary nickel level in patients with fixed orthodontic treatment

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ABSTRACT

Background: Orthodontic appliances are highly biocompatible, although some side effects associated with the release of nickel ions have been documented. The present study was conducted to assess salivary nickel level in patients with fixed orthodontic treatment. **Materials & Methods:** The present study was conducted on 15 subjects undergoing fixed orthodontic treatment of both genders. From all the subjects fasting salivary samples were collected in cold polypropylene tube. The assessment of salivary nickel levels was done using atomic absorption spectrophotometer. **Results:** In group I, 8 males and 7 females were under fixed orthodontic treatment and group II had 9 males and 6 females. The mean nickel level in group I was 19.5 ng/ml and in group II was 13.2 ng/ml. The difference was significant (P< 0.05). **Conclusion: The** release of nickel from fixed orthodontic appliances can be harmful. Hence a check in required to avoid complications.

Key words: Fixed orthodontic appliances, Nickel, Salivary

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INTRODUCTION

Orthodontic appliances are highly biocompatible, although some side effects associated with the release of nickel ions have been documented.[1] Fixed orthodontic appliances including brackets and arches are commonly made of stainless steel and nickel–titanium (NiTi) alloys and, therefore, have corrosion potential in the oral environment. The amount of nickel as the main constituent of contemporary orthodontic appliances may vary from 8% in stainless steel to more than 50% in NiTi alloys. Stainless-steel alloys include 17% to 22% of chromium.[2]

Nickel (Ni) and chromium (Cr) containing alloys are present in great numbers in a wide variety of appliances, auxiliaries, and utilities used in orthodontics and thus become an integral part of almost every routine orthodontic intervention. The use of various combinations of metal alloys for prolonged durations in orthodontic patients warrants special consideration regarding their biocompatibility. The oral cavity is a complete corrosion cell, with many factors that enhance the biodegradation of orthodontic appliances.[3]

In one study it has been reported that, no cytotoxic effect was produced due to using of orthodontic arch wires contained up to 54% nickel. In the same study, the highest level of nickel released from orthodontic arch wires was much lower than that needed to cause cytotoxic effect in cell culture of human peripheral blood mononuclear cell.[4] Such results increase the use of wires containing high level of nickel in orthodontics. Although, nickel is one of the most used metals in the construction of the orthodontic appliance, it is reported that gingival enlargement has commonly occurred during orthodontic treatment.[5] The

present study was conducted to assess salivary nickel level in patients with fixed orthodontic treatment.

MATERIALS & METHODS

The present study was conducted in the department of Orthodontics. It comprised of 15 subjects undergoing fixed orthodontic treatment of both genders. Equal number of controls was also included in the study. The study was approved from institutional ethical committee. All participants were informed regarding the study and written consent was obtained.

Data related to participants such as name, age, gender etc. was recorded.

From all the subjects fasting salivary samples were collected in cold polypropylene tube. All the samples were sent to laboratory for further assessment. In the laboratory, the assessment of salivary nickel levels was done using atomic absorption spectrophotometer. Results were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of participants

Gender	Group I (Study)	Group II (Control)
Males	8	9
Females	7	6

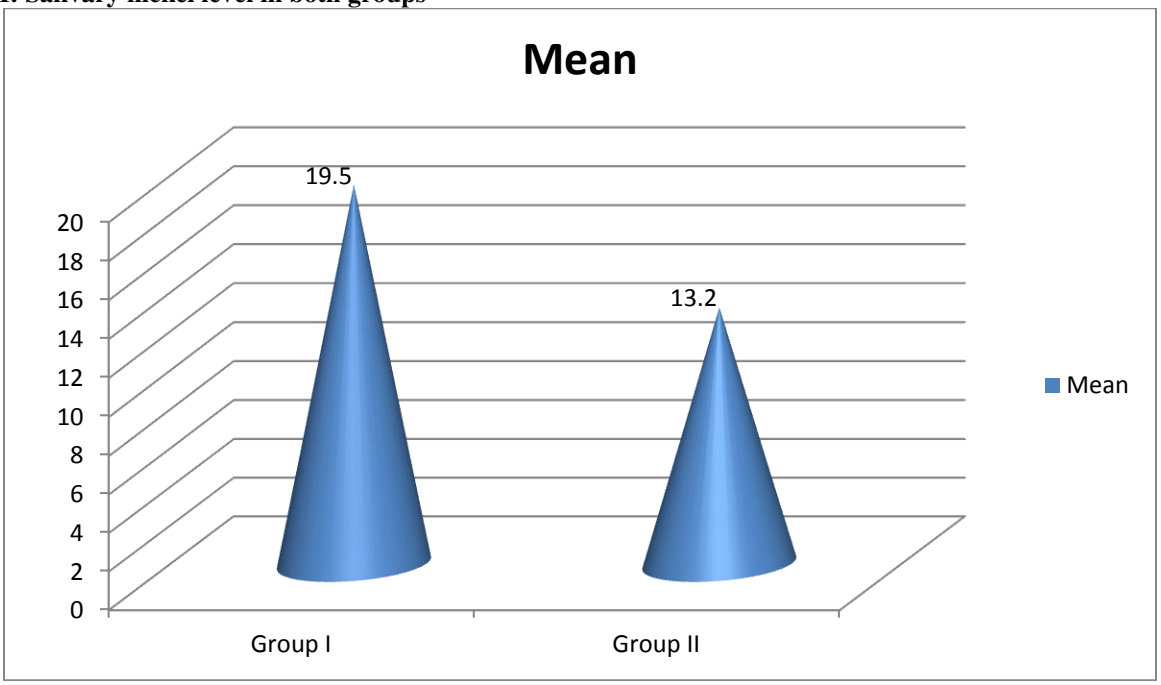
Table I shows that in group I, 8 males and 7 females were under fixed orthodontic treatment and group II had 9 males and 6 females.

Table II Salivary nickel level in both groups

Groups	Group I	Group II	P value
Mean value (ng/ml)	19.5	13.2	0.05

Table II, graph I shows that mean nickel level in group I was 19.5 ng/ml and in group II was 13.2 ng/ml. The difference was significant (P< 0.05).

Graph I: Salivary nickel level in both groups



DISCUSSION

Several studies have confirmed that nickel is a toxic and carcinogenic metal. It is known as a strong sensitizer and considered as a common cause of metal induced allergic contact dermatitis. In orthodontics, nickel containing alloys have involved in several application such as metallic brackets, arch wires, bands.[6,7]

Nickel and chromium ions released from fixed orthodontic appliances can serve as allergens or may have serious biological side effects. Moreover, they are cytotoxic, mutagenic, and carcinogenic in small quantities in the range of nanograms. Evaluation of the level of trace elements in patients using orthodontic appliances is a priority. Both nickel and chromium ions can cause hypersensitivity reactions in some people. In addition, nickel and chromium can cause dermatitis and asthma.[8]The present study was conducted to assess salivary nickel level in patients with fixed orthodontic treatment.

In this study, in group I, 8 males and 7 females were under fixed orthodontic treatment and group II had 9 males and 6 females. Increased prevalence of nickel hypersensitivity as well as the increased demand and availability of orthodontic treatment have attracted the attention of researchers towards the composition of alloys and their ion release potential during orthodontic treatment.[9] Orthodontic appliances (brackets and wires) exposed to the oral environment are affected by thermal alterations in the oral cavity and pH, constant presence of saliva, exposure to foods and drinks, mechanical loads applied to them, and abrasion. They are subjected to aging as such and may undergo dissolution or oxidation. The placement of archwires can cause an increase in salivary nickel and chromium levels and, therefore, nickel may be released from the wires as well as bands and brackets.[10]

We found that mean nickel level in group I was 19.5 ng/ml and in group II was 13.2 ng/ml. Raina et al[11] found that mean salivary nickel levels among the subjects of the study group was 18.9 ng/ml while mean salivary nickel levels among subjects of the control group was 8.9 ng/ml. Mean salivary nickel levels of the subjects of the study group was significantly higher than the subjects of the control group.

Aminiet al[12] conducted a study in which patients were divided into two groups and level of nickel was determined by atomic absorption spectrophotometry. Nickel concentration value (mg/L) in first group prior to starting treatment was 0.097± 0.071. An increase in level of nickel was followed by decrease 4 and 8 weeks after applying the arch wire (0.208± 0.112) and (0.077±0.056 mg/L) respectively. Nickel levels in saliva of the second group were showed minimal variation and ranged from 0.061± 0.044mg/L to 0.083±0.054 throughout period of study. It may be concluded that there could be a release of nickel from the appliances used in first group but it doesn't reach toxic level in saliva.

CONCLUSION

Authors concluded that the release of nickel from fixed orthodontic appliances can be harmful. Hence a check in required to avoid complications.

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