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Magnesium Levels as Marker of Chronic Periodontitis in Hypertension & Diabetes

Dr Geeta Metage[1] & Dr Bhagyashree M Patil[2]
[1]Post Graduate student, Department of Periodontics, Al-Badar Rural Dental College & Hospital, Gulbarga.
[2] Assistant Professor, Department of Oral Medicine & Radiology, Al-Badar Rural Dental College & Hospital, Gulbarga.

Abstract: *Chronic periodontitis is an infectious disease resulting in inflammation within the supporting tissues of the teeth, progressive attachment loss, and bone loss and is characterized by periodontal pocket formation and/or recession of the gingival. Magnesium may also play an important role in preventing periodontal disease as it has unique ability to reduce inflammation caused by bacterial toxins. Individuals with hypertension & Diabetes mellitus has lower serum Mg levels than those without hypertension & Diabetes. Previous studies estimated magnesium levels in systemic conditions only. Thus the aim of this study was to assess salivary & serum magnesium levels in healthy subjects, periodontitis, hypertension & diabetes subject.*

Introduction:

Periodontitis is a multifactorial disease caused by gram negative anerobic bacteria, along with systemic & environmental factors. Periodontitis affected subjects have increased intraoral mineralization capacity as their saliva may contain many factors which may favour mineralization.

Saliva acts as a major determinant of oral environment & serve as an easily available diagnostic & monitoring method. However, the study of salivary functions has been challenging because of the high physiological variability of this fluid when compared to other body fluids such as plasma.

Many researchers found that patients with hypertension are at a higher risk for periodontitis. Systemic risk factors like hypertension influence the progression of periodontitis which is attributed to the variation & concentration of plasma micronutrients. Individuals with hypertension has lower serum Mg levels than those without hypertension.

Magnesium may also play an important role in preventing periodontal disease as it has unique ability to reduce inflammation caused by bacterial toxins. Thus reduced magnesium concentrations are associated with enhanced inflammatory response to bacterial challenge.

In hypertensive patients, inadequate levels of magnesium results in the ability for muscles to relax. Adequate amounts of magnesium have a stimulating effect upon the parasympathetic nervous system inhibiting the sympathetic 'fight or flight' stress response. Magnesium deficiency results in vasoconstriction & muscle tension. Magnesium is a powerful vasodilator & very effective calcium channel blockers.

In Diabetes mellitus(DM) patients, individuals with DM have lower serum Mg levels than those without DM. Insulin is a major hormone involved in the regulation of Mg metabolism. Mg is necessary for the synthesis of compounds with energy rich bonds of any type & the reconstitution of these compounds from the products of their own degradation is accomplished by phosphorylation coupled to oxidation/reduction reaction. Periodontitis affected subjects have increased intraoral mineralization capacity as their saliva may contain many factors which may favour mineralization. Magnesium may play an important role in preventing periodontal disease by reducing inflammation caused by bacterial toxins. Previous studies estimated magnesium levels in systemic conditions only. Thus the aim of this study was to assess salivary & serum magnesium levels in healthy subjects, periodontitis, hypertension & diabetes subject.

Materials & methods:

Study population consisted of 40subjects which were selected from the department of periodontology, Al Badar Rural dental college & hospital. All the participants were informed in detail about the study & informed consent was obtained. 10 subjects in each group between the age group 18-55years which was further divided

into four groups healthy, periodontitis, hypertension & diabetic.
Group 1: 10subjects healthy group (no gingivitis & chronic periodontitis),
Group2: periodontitis group10 subjects (tooth with probing pocket depth >5mm),
Group3: hypertensive with chronic periodontitis group 10subjects (patients were diagnosed as hypertension & were on medication),
Group4: diabetes with chronic periodontitis group 10subjects (patients were diagnosed as diabetic & were on medication).

Inclusion criteria: chronic periodontitis having more than one tooth with probing pocket depth >5mm, patients with hypertension & were on medication.
Exclusion criteria: subjects who has received any periodontal treatment during past 6months, subjects with less than 20 natural teeth, pregnant & lactating women, smokers.

Collection of saliva: prior to the collection of saliva, subjects were asked to rinse their mouth with water & then unstimulated whole saliva was then collected by making subjects sit in the upright position with head slightly inclined. Unstimulated saliva was collected in sterile container & sent for analysis of magnesium levels.

Collection of blood: An elastic band was wrapped around the subject's upper arm to stop the flow of blood, which made the veins below the band larger so it was easier to insert the needle into the veins. Cleaned needle was inserted into the vein, band was removed from the arm when enough blood was collected. Placed the gauze pad or cotton ball over the needle site as the needle was removed.

Statistical analysis:

The mean salivary & serum magnesium levels were statistically analyzed using one way of analysis of variance. Intergroup comparison was done using tukeys honesty significance difference test less than 0.05 was considered as statistically significant.

Results:

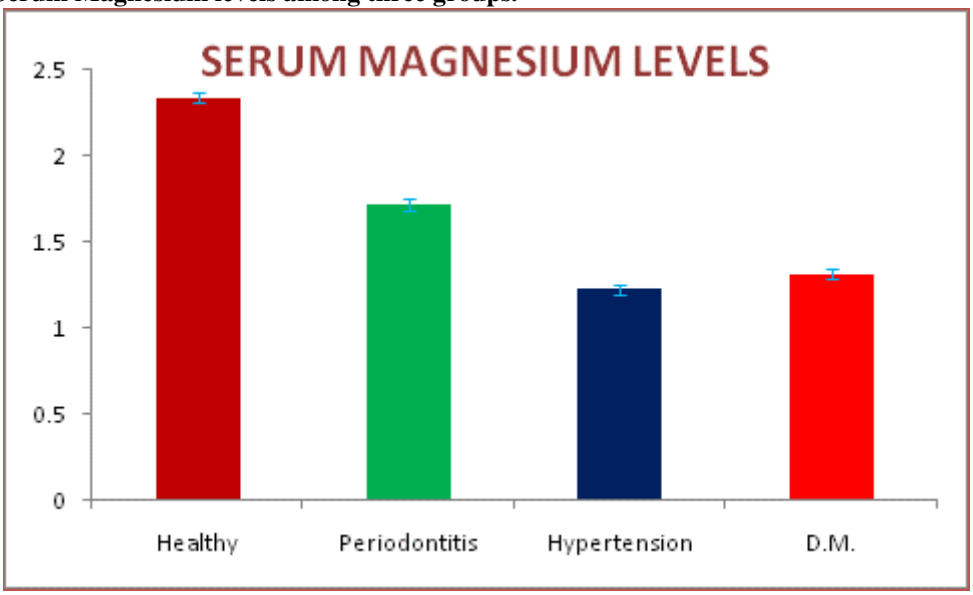
A statistically significant difference in the mean value of salivary magnesium levels were noted between healthy, periodontits, hypertension & type2DM (P<0.001).

Multiple comparisons and mean differences for serum magnesium levels among three groups was statistically significant as shown in table 1, graph 1. Serum magnesium levels were found to be less in hypertension and type2DM group than compared to periodontitis group.

Table 1:Serum Magnesium levels among three groups.

	HEALTHY			PERIODONTITIS			HYPERTENSION			D.M.		
	MEAN	SD	SE	MEAN	SD	SE	MEAN	SD	SE	MEAN	SD	SE
SERUM MAGNESIUM	2.337	0.194	0.064	1.715	0.076	0.025	1.225	0.02	0.006	1.31	0.09	0.03

Graph 1: **Serum Magnesium levels among three groups.**

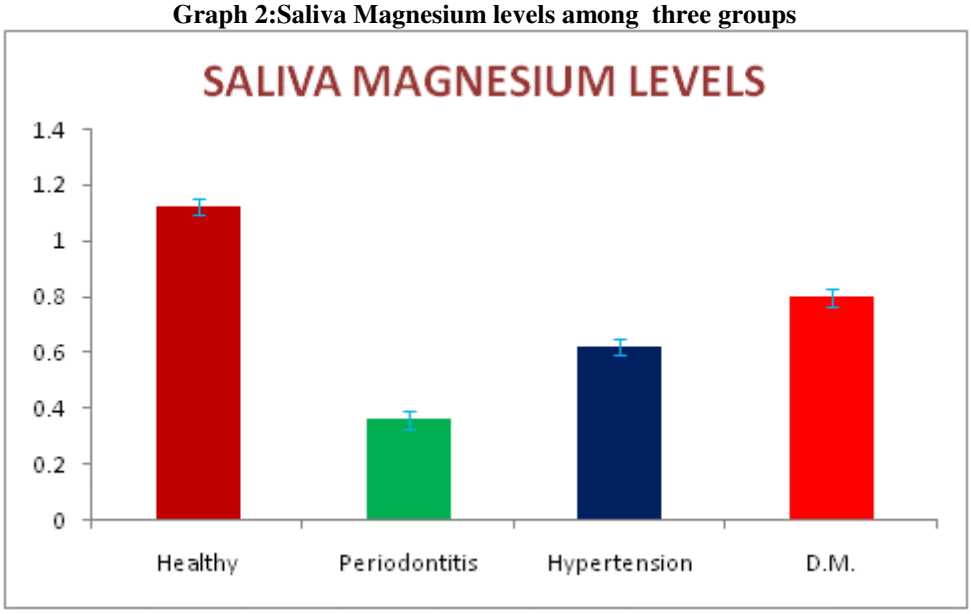


Multiple comparisons & mean differences for salivary magnesium levels among three groups was statistically significant. Salivary magnesium levels were less in group 2 than compared to group3 & group4 as shown in table 2,graph 2.

Table 2:Saliva Magnesium levels among three groups

	HEALTHY			PERIODONTITIS			HYPERTENSION			D.M.		
	MEAN	SD	SE	MEAN	SD	SE	MEAN	SD	SE	MEAN	SD	SE
SALIVA MAGNESIUM	1.124	0.106	0.035	0.361	0.100	0.033	0.622	0.137	0.045	0.798	0.142	0.047

Graph 2:Saliva Magnesium levels among three groups



Discussion:

This study was done to assess salivary & serum magnesium levels in healthy subjects, periodontitis, hypertension & type 2 DM subjects. Magnesium plays an important role in preventing periodontal disease as it has unique ability to reduce inflammation, Mg-SOD reduced inflammatory destruction of periodontal tissue in a rat model study. This may support in the present study that suggests Mg is associated with periodontitis even though it did not demonstrate the effect of Mg itself.

Another study also found that participants with periodontal disease had lower levels of Mg & SOD in saliva compared to the participants without periodontal disease. Type2 DM with periodontitis can alter serum Mg & lipid profile status. According to walter et al diabetic patients commonly have depletion of Mg probably due to its urinary loss that accompany glycouria, it has been reported by paolisso & barbagallo that the less availability of intracellular Mg results in decreased tyrosine kinase activity & its supplementation could recovers insulin sensitivity. Mg competes with sodium for binding site on vascular smooth muscles cell, increases prostaglandin that binds to potassium in a cooperative manner induce the endothelial dependent vasodilation, improves endothelial dysfunction in hypertensive and diabetic patients, decreases intracellular calcium & sodium and reduces prostaglandin. Study done by Devandra p et al in 50 hyperstenive subjects & 50 healthy subjects for serum magnesium levels and found that there was increase serum magnesium levels in hypertensive groups.

Resmeck et al found serum magnesium in hypertension group were higher. Garcia Zozaya et al studied 60 hypertensive patients for magnesium levels & found an inverse correlation between Mg excretion & blood pressure. Findings from the present study suggests that serum Mg levels were lower in hypertension & type2DM than compared to periodontitis where as salivary magnesium levels were low in periodontitis group than compared to hypertension & type2DM group.

Conclusion:

From the present study it can be concluded that subject with periodontitis, hypertension & type2DM showed decreased levels of Mg which suggest that Mg levels may be considered as a risk factor for periodontitis, hypertension & type2DM. Further it should be carried out in a larger sample size.

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