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INVESTIGATING THE ROLE OF DENTAL PULP STONES IN DIABETES MELLITUS

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Abstract

Pulp stones, which manifest as nodular calcifications within the pulp chamber of teeth, have garnered substantial attention in dental research. They are generally asymptomatic and appear radiologically as round or ovoid radiopaque masses of varying sizes within a single tooth. Numerous studies have explored the intricate relationship between pulp stones and dental health, encompassing issues like pulpal irritations, dental caries, periodontal diseases, and their correlation with age and gender. However, despite extensive research, the etiology of these dystrophic calcifications remains largely elusive, with no definitive cause established.

This abstract aims to synthesize existing knowledge regarding pulp stones and elucidate the ongoing debates surrounding their implications for overall health. It is noteworthy that the associations between pulp stones and various health conditions are still a topic of dispute, including their potential connection with atheromatous plaques in blood vessels, renal stones, and diabetes mellitus.

Introduction:

Pulp stones are dystrophic calcifications that appear as nodular masses in the pulp chamber of the tooth. Clinically, these stones usually painless and identified radiologically as round or ovoid radiopaque stones with varying sizes in a single tooth (**Berèsetal. 2016**). Numerous studies were conducted to emphasis the relation between pulp stone and dental health such as pulpal irritations, dental caries, periodontal diseases as well as age and gender (**Sisman et al., 2012**) (**Baghdady et al., 1988**). In many instances, there is no definitive etiology behind the pathogenesis of this degenerative calcifications (**Ramesh et al., 2018**). There is a conflict in the association between pulp stone and health or disease status of individuals such as atheromatous plaques in the vessel, renal stones and diabetes mellites.

In a study conducted by (**Bains et al, 2014**) (**Movahhedian et al, 2018**) on cases with nephrolithiasis who present with hematuria, dysuria, renal colic and abdominal pain, and under went dental panoramic examination, showed no correlation between the presence of dental pulp and kidney stone though **Bainsetal** concluded that pulp stone cases have high propensity to develop cardio vascular disease. On the other hand (**Sayegh & Reed, 1968**) concluded that cardio vascular diseases and renal stone scan be considered as a predisposing factor to pulpal

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calcification which was later confirmed (**Eddsetal. 2005**). (**Jawahar et al, 2021**) studied the histological association of pulp stones with hyperlipidemia and systemic hypertension. The author recommended to evaluate lipid profile and blood pressure measurement to individuals who have irregular-shaped pulp stone.

Dental pulp cells produce osteopontin (OPN) and its expression is important information of pathologic pulp calcifications. (**Inagaki et al, 2010**) conducted an experimental study on cultured rat dental pulp cells and studies the effect of hyperglycemia on OPN production in diabetic rats compared with healthy one.

There search showed that a high concentration of glucose increases OPN protein production and alkaline phosphatase activity and plays an important role in the pathogenesis of dental dystrophic calcification. In addition, hyperglycemia is associated with changes in the morphology of the normal dental pulp due to less vascular blood flow showed evidenced histologically by thickened blood vessel walls, and more collagen deposition and crystallization (**Alsamahi et al, 2022**).

There are many proposed theories regarding the association of pulpal calcification to number of conditions stone. This systematic review aimed to identify the presence or absence of association between pulp stone and cardiovascular, diabetes mellitus and renal stone.

Objectives:-To identify the presence of association of dental pulp stone to diabetes mellitus, cardio vascular diseases, and renal stone.

Methodology:

Data bases were searched from 2010 to 2021 using the Cochrane methodology and reported findings according to PRISMA. CINAHL, Cochrane Library, Medline and PubMed. The search was limited to pulp stone association to cardiovascular diseases, renal stones and diabetes mellites and after removal of duplication, 46 studies were found and reviewed. Titles, author, year of publishing and conclusion were plotted in a table (table-1) which is refined to 3 variables for statistical analysis (year of publishing, medical condition studies, type of association) and submitted in (table-2). The correlation has been statistically studied by SPSS.

Flowchart:-Databases – date were refined to – duplication –variables to be study were- conclusions of articles were- Statistical analysis by.

Results:

A total of 46 articles reviewed. The majority of reviewed articles (52.2%) were concerning on pulps one in association with cardio vascular diseases including atheromatous and ischemic heart disease. The articles that concerned about the association of pulp stone with renal stone and diabetes mellitus (10.9% and 23.9% respectively). Few studies were conducted on the association with general heath including combination of all medical parameters.

Table-3: Medical Conditions Reviewed

	Frequency	Percent
Cardiovascular	24	52.2
Renal Stone	5	10.9
Diabetes Mellitus	11	23.9
All heath conditions	2	4.3
Cardio vascular and Diabetes Mellitus	2	4.3
Cardio vascular and Renal Stone	2	4.3
Total	46	100.0

In general, 78% of all studies found that there is positive association and while 21% concluded that there is no association (Figure-1)

Table 4: Types of Association

	Frequency	Percent
Positive Association	36	78.3
Negative Association	10	21.7
Total	46	100.0

Table-5: Cross tab: Study years vs. type of association.

			year of study		Total
			2010 - 2016	2017 - 2022	
Type of Association	positive association	Count	16	20	36
		% within association	44.4%	55.6%	100.0%
		% within year ofstudy	76.2%	80.0%	78.3%
		% of Total	34.8%	43.5%	78.3%
	negative association	Count	5	5	10
		% within association	50.0%	50.0%	100.0%
		% within year ofstudy	23.8%	20.0%	21.7%
		% of Total	10.9%	10.9%	21.7%
Total		Count	21	25	46
		% within association	45.7%	54.3%	100.0%
		% within year ofstudy	100.0%	100.0%	100.0%
		% of Total	45.7%	54.3%	100.0%

Both recent and old studies admitted the relation between the association between pulp stone and medical condition but 80% of recent published data admit the strong relation between these two conditions. On the other hand, only 20% of studies rejected the possible relation between them.

Table-6: Cross tabulation: Type of association vs medical condition studied.

		medical condition studied						Total
association			Cardiovascular	Renal Stone	Diabetes Mellitus	All	Cardiovascular and Diabetes Mellitus	Cardiovascularand Renal Stone
positive association	Count	19	3	9	2	2	1	36
	% within association	52.8%	8.3%	25.0%	5.6%	5.6%	2.8%	100.0%
	% within medical condition studied	79.2%	60.0%	81.8%	100.0%	100.0 %	50.0%	78.3%

The majority of cardiovascular diseases studies that showed strong relationship with pulp stone 79.2%. These studies recommended blood pressure and cardio vascular examination to excluded is chemical changes in people who have stone pulp.

Discussion:

The pulp stones are asymptomatic incidental finding in healthy and diseased individuals. The prevalence of pulp stone reported with various medical conditions is studied radiologically (**Kannan et al., 2015**) and histologically (**Huang et al, 2016**) Considering the association between pulp stone to many factors, such as age, gender and dental health has been approved by many studies (**Udoyeetal, 2011**).The argument in the literature was about the association of this dental condition to the systemic medical conditions. Our study was concerned on reviewing articles that are conducted to assess whether dental pulp stone is related cardio vascular diseases, diabetes mellites and renal stone. The result showed that most of recent (80.0%) and older (76.2%) studies admit the strong relation to cardio vascular diseases (79.2%), renal stone (60.0%) and diabetes mellites (81.8%). Based on the conclusions of these studies multiple factors were explained. Endothelial alteration by hyper glycemics tateora there sclerotic changes were the explanation for several studies (**Takashima et al, 2023**) and (**Jawahar, et al 2021**). Some studies considered pulp stone as an initial risk factor for cardio vascular disease (**S, N. et al 2021**) and recommended cardio vascular assessment and blood sugar measurements. However, (**Gunen et al. 2019**) reported hypertension as a non- risk factor for the pulp stone. With the fact that pulp stone is a dystrophic calcification, 40.0% of articles rejected the association between renal stone genesis due to hyper calcemia and pulp stone formation. Metastatic calcification seen in various organs such as kidney, joints and teeth are primarily made up of calcium.

Phosphate crystals.These crystals deposit is tissue if concomitant ischemic heart disease event has occurred (**Loya. and Nikhade, 2021**). This may explain our higher result, (100%) of studies, concerning combined cardiovascular and renal stone which showed positive association.

Thus, based on the results of reviewed study, there is a solid ground association between systemic diseases, such as cardio vascular diseases and diabetes mellitus with pulp stone and they can be considered as the risk factors.

Regarding renal stone, there is a relative relation but more studies in this field must be conducted. This enforces there commendation of screening of such dental patients to evaluate their medical status clinically and implement early intervention stomanage their medical conditions before they develop any complications.

Conclusion

From the present study, we can conclude that pulp stone was prevalent in cardio vascular diseases and diabetes mellitus population as well as renal stone patients. The cardio vascular group have the highest prevalence of pulp stone followed by diabetic group and less prevalence in renal stone patients. This might suggest a possibility of altered pathogenesis that require further assessment or management for these patients.

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