

INCIDENCE AND DISTRIBUTION OF CORONAL PULP STONES FOUND IN POSTERIOR TEETH OF PATIENTS SEEKING DENTAL TREATMENT IN A TEACHING HOSPITAL OF LAHORE

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(Received, 29th May 2024, Revised 10th September 2024, Published 25th September 2024)

Abstract: Pulp stones are calcifications within the dental pulp, often discovered incidentally during routine radiographs. Their size and shape vary, which can complicate dental procedures. Understanding the prevalence and distribution of pulp stones across different demographic groups is critical for enhancing dental care strategies. **Objective:** This study aimed to determine the prevalence of pulp stones and assess their distribution across various age and gender groups in patients attending the Dental Hospital at Lahore Medical and Dental College (LMDC), Lahore. **Methods:** A cross-sectional study was conducted over 12 months, from October 2020 to October 2021, at the LMDC Dental Hospital. Data from 600 patients were reviewed, and a sample of 400 patients meeting the inclusion criteria was selected. Two experienced examiners independently evaluated radiographs for the presence of pulp stones. Statistical analysis was conducted using SPSS version 26. Descriptive statistics were employed to summarize the data, and chi-square tests were used to evaluate associations between pulp stone presence and demographic variables. Statistical significance was set at p -value < 0.005 . **Results:** The prevalence of pulp stones was 93.3% among the 400 patients, with an average age of 37.74 years. The highest prevalence was observed in the 31-50 age group (42.25%). Males exhibited a slightly higher prevalence (54.5%) than females (38.75%). Significant associations ($p < 0.005$) were found between age and the presence of pulp stones in several tooth types. However, gender differences were statistically insignificant, except for the left mandibular second molar. **Conclusion:** This study demonstrates a high prevalence of pulp stones, with significant associations between age and their occurrence in various tooth types. Gender differences were minimal, except in specific cases. These findings highlight the need to consider demographic factors in dental care and suggest further research to explore the broader health implications of pulp stones.

Keywords: Dental Pulp Stones, Prevalence, Demographics, Radiographic Assessment, Endodontics, Systemic Health

Introduction

Dental pulp stones, calcified structures within the pulp chamber of teeth, are often discovered incidentally during routine dental radiographs. These calcifications exhibit considerable variability in size and shape, ranging from small nodules to larger, more complex masses that can wholly or partially obstruct the pulp chamber. (1). Despite their typically asymptomatic nature, pulp stones can pose challenges in dental procedures, particularly in endodontics, where they can hinder access to root canals and complicate treatment outcomes. (2).

The prevalence of pulp stones varies across different populations and age groups. Studies have reported prevalence rates ranging widely, influenced by factors such as age and the presence of dental pathologies like caries and restorations. (3-6). Older individuals tend to exhibit higher incidences of pulp stones, likely due to cumulative dental insults over time and age-related changes in pulp tissue. (7). Understanding these demographic trends is crucial for anticipating clinical challenges and tailoring treatment strategies accordingly.

The pathogenesis of pulp stone formation is complex and not fully elucidated. Histologically, pulp stones are classified into true denticles, which contain dentin-like tubular structures, and false denticles, which are more amorphous. (1, 8). True denticles are thought to form through dystrophic calcification within existing dentinal tubules, possibly in response to chronic irritation or trauma to the dental pulp. (1). Factors such as genetic predisposition and systemic conditions like metabolic disorders have also been implicated in their development. Associations have been suggested with conditions like cardiovascular diseases, diabetes mellitus, and renal disorders, although the exact mechanisms remain speculative (9-11).

Diagnostic imaging plays a pivotal role in identifying and assessing pulp stones. Conventional radiographic techniques, such as periapical and bitewing radiographs, are routinely used to visualize pulp calcifications in clinical settings. These methods provide essential information about the size, location, and number of pulp stones, guiding treatment planning and prognosis in endodontics. More advanced imaging modalities, such as cone-beam computed

[Citation: Syed, U.Z.S., Khan, S.R., Khan, U.J., Divi, S., Rajesh., Waraich, K.T., Avinash. (2024). Incidence and distribution of coronal pulp stones found in posterior teeth of patients seeking dental treatment in a teaching hospital of Lahore. *Biol. Clin. Sci. Res. J.*, 2024: 1077. doi: <https://doi.org/10.54112/bcsrj.v2024i1.1077>]

tomography (CBCT), offer three-dimensional views of dental structures, enhancing spatial resolution and accuracy in assessing pulp anatomy and stone localization (12, 13). Clinically, pulp stones may occasionally lead to symptoms such as pulpal pain if they impinge on nerve fibers or obstruct root canals. Their management during endodontic procedures requires careful consideration to ensure thorough root canal cleaning and shaping, often necessitating additional steps to remove or manage obstructing stones effectively (12, 14).

Beyond their local impact on dental health, some studies have linked pulp stones to systemic diseases. (9-11, 15, 16). Radiographic examination for pulp stones has thus served as a potential screening tool for assessing systemic health risks, underscoring the interconnectedness of oral and systemic health outcomes. This study aimed to determine the prevalence and distribution of pulp stones in the permanent molars and premolars of an adult population using periapical radiographs and to explore the associations with demographic variables such as age and gender.

Methodology

A descriptive cross-sectional study was conducted over 12 months, from October 2020 to October 2021, at the Dental Hospital, Lahore Medical and Dental College (LMDC), Lahore. The primary objective was to determine the prevalence and distribution of pulp stones in posterior teeth. Data were reviewed from 600 patients who visited the hospital for routine checkups during this period, sourced from the radiology department records.

The inclusion criteria for the study were the presence of a well-defined radiopaque mass (pulpal stone) in at least one tooth, including only posterior teeth with pulpal rocks, and the condition of the teeth being sound or minimally carious. Exclusion criteria included patients under 18 years of age, radiographs taken at incorrect angulation or improperly exposed, poor-quality radiographs, primary teeth, or fractured or grossly carious posterior teeth. Based on these criteria, a sample of 400 patients was selected. The study protocol received approval from the Institutional Review Board (IRB) of LMDC, and informed consent was obtained from all participants before their inclusion in the study.

Orthopantomogram (OPG)/panoramic radiographs (Vatech Co., Králové-Březhrad, Czech Republic) were used to identify pulp stones in posterior teeth (Fig 1). Two experienced examiners independently interpreted the radiographs. Each posterior tooth was evaluated twice to identify well-defined radiopaque bodies in the pulp chambers. The posterior teeth were also examined to assess their clinical condition for study inclusion. Any tooth not initially presenting with a well-defined radiopaque mass was reexamined twice before being included, based on a consensus between the examiners.

Statistical analyses were performed using SPSS software version 26. Descriptive statistics were employed to calculate the prevalence of pulp stones, expressed as a percentage of the total number of teeth examined. Means and standard deviations were computed for continuous variables, while frequencies and percentages were calculated for categorical variables. Chi-square tests were conducted to assess the association between the presence of pulp stones and demographic variables. A p-value of less than 0.05 was considered statistically significant.

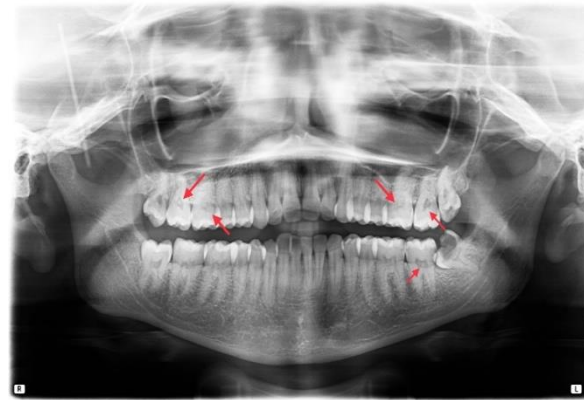


Figure 1: OPG showing pulp stones in posterior teeth

Results

The study encompassed data from 400 patients, revealing a mean age of 37.74 (SD = 13.186). Age distribution showed that 34% of patients were ≤30 years old, 45% fell within the 31-50 years age group, and 21% were ≥51 years old. Gender distribution indicated that 58% of patients were male and 42% were female. Regarding pulp stone prevalence, the study identified these radiopaque masses in 93.3% of patients. Additionally, systemic diseases were present in 41.5% (166 patients) of the study population, with 58.5% (234 patients) having no systemic diseases (Table 1).

Table 1: Demographics of study population

Characteristics	Frequency	Percent
Age		
≤30 years	136	34.0
31-50 years	180	45.0
≥51 years	84	21.0
Gender		
Male	232	58.0
Female	168	42.0
Pulp Stone		
Present	373	93.3
Absent	27	6.8
Systemic Disease		
Present	166	41.5
Absent	234	58.5

The study revealed varying prevalence rates of pulp stones across different age groups and genders (Table 2). Among patients, those aged 31-50 years exhibited the highest prevalence of pulp stones (42.25%), followed by patients aged ≤30 years (31.75%) and those ≥51 years (19.25%). Gender-wise, males were more prevalent (54.5%) than females (38.75%). Regarding systemic diseases, 38.5% (154 patients) of patients with such conditions had pulp stones, while 54.75% (219 patients) without systemic diseases exhibited pulp stones.

Table 2: Prevalence of pulp stones across different age groups and genders

Characteristics	Pulp Stone	
	Present N (%)	Absent N (%)
Age		

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≤30 years	127 (31.75)	9 (2.25)
31-50 years	169 (42.25)	11 (2.75)
≥51 years	77 (19.25)	7 (1.75)
Gender		
Male	218 (54.5)	14 (3.5)
Female	155 (38.75)	13 (3.25)
Systemic Disease		
Present	154 (38.5)	12 (3)
Absent	219 (54.75)	15 (3.75)

The study analyzed the presence of pulp stones across different age groups and genders in various posterior teeth

(Table 3). Significant associations ($p < 0.05$) were observed between age groups and the presence of pulp stones in several teeth types. Specifically, significant results were found in teeth such as the right max. 2nd premolar ($p = 0.017$), suitable max. 1st molar ($p = <0.001$), right max. 2nd molar ($p = 0.003$), left max. 1st molar ($p = 0.027$), left max. 2nd molar ($p = 0.015$), left man. 1st molar ($p = 0.047$), and left man. 2nd molar ($p = 0.050$). However, with the exception of the left man 2nd Molar ($p = 0.029$), the study did not find statistically significant differences between genders for the examined teeth types.

Table 3: Associations between age groups and the presence of pulp stones

Pulp Stone	Age				Gender		
	≤30 years	31-50 years	≥51 years	p-value	Male	Female	p-value
Right, Max. 1st Premolar							
Present	56	54	32	0.098	82	60	1.000
Absent	80	126	52		150	108	
Right, Max. 2nd Premolar							
Present	51	46	34	0.017	72	59	0.391
Absent	85	134	50		160	109	
Right, Max. 1st Molar							
Present	89	61	53	0.000	117	86	9.19
Absent	47	119	31		115	82	
Right, Max. 2nd Molar							
Present	63	51	35	0.003	85	64	0.834
Absent	73	129	49		147	104	
Left Max. 1st Premolar							
Present	45	56	26	0.922	73	54	0.914
Absent	91	124	58		159	114	
Left Max. 2nd Premolar							
Present	51	57	35	0.250	75	68	0.113
Absent	85	123	49		157	100	
Left Max. 1st Molar							
Present	84	87	52	0.027	123	100	0.221
Absent	52	93	32		109	68	
Left Max. 2nd Molar							
Present	55	53	39	0.015	79	68	0.208
Absent	81	127	45		153	100	
Left Man. 1st Premolar							
Present	45	65	30	0.856	86	54	0.340
Absent	91	115	54		146	114	
Left Man. 2nd Premolar							
Present	47	70	30	0.724	87	60	0.753
Absent	89	110	54		145	108	
Left Man. 1st Molar							
Present	49	44	30	0.047	70	53	0.826
Absent	87	136	54		162	115	
Left Man. 2nd Molar							
Present	39	46	34	0.050	61	58	0.078
Absent	97	134	50		171	110	
Right Man. 1st Premolar							
Present	48	68	27	0.674	85	58	0.674
Absent	88	112	57		147	110	
Right Man. 2nd Premolar							
Present	47	57	29	0.828	81	52	0.452
Absent	89	123	55		151	116	
Right Man. 1st Molar							
Present	78	100	52	0.619	132	98	0.838
Absent	58	80	32		100	70	

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Right Man. 2 nd Molar							
Present	47	47	31	0.118	62	63	0.029
Absent	89	133	53		170	105	

Discussion

Pulp stones, calcified structures found within the pulp chamber of teeth, pose significant challenges in endodontic treatment due to their potential to obstruct root canal pathways. Understanding the prevalence and distribution of pulp stones, as well as their associations with demographic factors such as age and gender, is crucial for optimizing diagnostic and therapeutic strategies in dental care. The findings revealed a high prevalence of pulp stones (93.3%) among the studied population, with significant associations between the presence of pulp stones and demographic factors.

The overall prevalence of pulp stones observed in our study is considerably higher than in previous research conducted in various regions. For instance, recent studies have reported lower prevalence rates: Indrapriyadharshini *et al.* (17) Found a prevalence of 54%, Chen *et al.* (18) reported 74.8%, Ivanauskaitė *et al.* (19) We observed 58.8%, and Naidu *et al.* (20) They documented 63.6%. These discrepancies in prevalence rates could be due to differences in study populations, diagnostic criteria, and the radiographic techniques employed.

Gender differences in the prevalence of pulp stones have been debated in the literature. Our study found a higher prevalence of pulp stones in males (54.5%) compared to females (38.75%). This contrasts with the findings of Ertas *et al.* (21) And Qureshi *et al.* (22). However, similar to our results, several studies (17, 18) observed a higher prevalence of pulp stones in males. The variability in gender-related findings across different studies suggests that further research is needed to elucidate the influence of gender on pulp stone formation.

Regarding age distribution, our results indicated that older individuals exhibited higher incidences of pulp stones, which aligns with the findings of several previous studies. For instance, the study by Chen *et al.* (18), Indrapriyadharshini *et al.* (17) and Colak *et al.* (23) demonstrated an increasing prevalence of pulp stones with advancing age, supporting the notion that cumulative dental insults and age-related changes in pulp tissue contribute to their formation. Contrastingly, Ravichandran *et al.* (24) and Naidu *et al.* (20) They reported higher prevalence rates in younger age groups.

Advanced imaging techniques, such as CBCT, have been advocated for superior accuracy in detecting pulp stones compared to conventional radiographs. Our study utilized orthopantomograms, which, while effective, may not provide the same level of detail as CBCT. The clinical implications of our findings are significant for dental practitioners, particularly in the field of endodontics. The high prevalence of pulp stones necessitates careful radiographic examination and consideration during endodontic treatment planning. Obstructive pulp stones can complicate root canal procedures, requiring additional techniques for their removal or management to ensure successful treatment outcomes.

Conclusion

Our study provides data regarding pulp stones' prevalence and distribution, highlighting significant associations with age. The findings emphasize the importance of comprehensive radiographic evaluation in detecting pulp stones and inform dental practitioners of the potential challenges these calcifications pose in endodontic procedures. Future research should explore their potential systemic associations and employ advanced imaging techniques to enhance diagnostic accuracy.

Declarations

Data Availability statement

All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned.

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Data entry and Data analysis, drafting article.

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