**Journal of Neonatal Surgery**
***ISSN(Online): 2226-0439***
***Vol.14 , Issue 33s (2025)***
*https://www.jneonatalsurg.com*

OPEN ACCESS

# Evaluation of soft-tissue calcifications and their prevalence in the orofacial region using digital panoramic radiography: A retrospective study

**Dr. Shubha Sharma [1], Dr.Christopher Vinay Shinde [2]*, Dr.Hina Handa[3], Dr. Palak Dawrani[4]**

[1]PG resident Department of Oral Medicine and Radiology People's Dental Academy, People's University Bhopal, MP
Email ID- sharmashubha654321@gmail.com

[2]Associate Professor Department of Oral Medicine & Radiology Peoples University Bhopal MP

[3]Professor Department of Oral Medicine & Radiology Peoples University Bhopal MP

[4]PG resident Department of Oral Medicine and Radiology Peoples Dental Academy Peoples University Bhopal MP

Cite this paper as: Dr. Shubha Sharma , Dr.Christopher Vinay Shinde , Dr.Hina Handa, Dr. Palak Dawrani (2025) Evaluation of soft-tissue calcifications and their prevalence in the orofacial region using digital panoramic radiography: A retrospective study Journal of Neonatal Surgery, 15, (33s) 587-593

## ABSTRACT

Soft-tissue calcifications of the orofacial region are commonly detected as incidental findings on panoramic radiographs. Although many are asymptomatic, certain calcifications may indicate underlying local pathology or systemic disease, highlighting the importance of their recognition during routine dental imaging. The present study aimed to assess the prevalence, anatomical distribution, and radiographic characteristics of soft-tissue calcifications in the orofacial region using digital panoramic radiographs and to evaluate their association with demographic variables. This retrospective, observational radiographic study was conducted at the Department of Oral Medicine and Radiology, People's Dental Academy, Bhopal. A total of 800 digital panoramic radiographs of patients aged 18–60 years were evaluated for the presence of soft-tissue calcifications, which were classified according to type, anatomical location, laterality, number, and size using an eight-box classification system. Data were analyzed using SPSS version 30.0, applying descriptive statistics, Chi-square test, independent samples t-test, and one-way ANOVA, with statistical significance set at $p < 0.05$. Calcified stylohyoid ligament was the most prevalent finding (30.5%), followed by sialoliths (19.5%) and carotid artery calcifications (14%). Significant associations were observed between calcification characteristics and age, laterality, number, and size ($p < 0.001$), with unilateral and single calcifications predominating. Digital panoramic radiography is an effective screening modality for detecting a wide spectrum of orofacial soft-tissue calcifications, enabling early diagnosis and timely medical referral...

**Keywords:** Soft-tissue calcification; Panoramic radiography; Orofacial region; Stylohyoid ligament; Sialolith; Tonsillolith; Phlebolith

## INTRODUCTION

Calcification refers to the deposition of calcium salts within body tissues and may occur as a normal physiological process or as a pathological condition.(1) While calcium deposition is normally restricted to bones and teeth, abnormal deposition within soft tissues is termed heterotopic calcification.(2) Based on etiology, these calcifications are classified as dystrophic, idiopathic, or metastatic.(3) Soft-tissue calcifications in the orofacial region are often detected incidentally on panoramic radiographs and may represent benign findings or indicators of underlying local or systemic disease.(5) Accurate radiographic identification is therefore essential for appropriate diagnosis and clinical management.

## MATERIALS AND METHODS

This retrospective study was conducted in the Department of Oral Medicine and Radiology, People's Dental Academy, Bhopal. Digital panoramic radiographs archived in the departmental records were retrospectively retrieved, evaluated, and analysed. Data collection period was between March 2024 and December 2025 to assess the presence of soft-tissue calcifications in the dentomaxillofacial region. A total of 800 panoramic radiographs of patients of both genders, aged 18–60 years, were included in the study.

Only panoramic images of good diagnostic quality showing undiagnosed soft tissue calcifications were included in the study. Radiographs with poor image quality, positioning or imaging errors, overlapping of anatomical structures, inadequate field coverage not extending from the styloid process superiorly to the hyoid bone inferiorly, or unclear diagnostic features were excluded.

Digital panoramic radiographs served as the dependent variable, while independent variables included demographic factors such as gender and geographic variation, as well as the location, size, and site of calcifications. All radiographs were acquired using a Planmeca Proline XC digital panoramic unit and analysed using Planmeca Romexis software version 2.9.2.R on a Windows-compatible system.

Statistical evaluation revealed a highly significant association between age and the type, laterality, number, and size of calcifications ($p < 0.001$), with increasing age showing a greater tendency toward bilateral and multiple calcifications. Gender showed a statistically significant association with the type of calcification; however, no significant association was observed between gender and laterality or number of calcifications. Overall, digital panoramic radiography proved effective in detecting a wide spectrum of soft-tissue calcifications with distinct demographic and anatomical distribution patterns.

## RESULTS

A total of 800 digital panoramic radiographs were evaluated in the present study to assess the prevalence and characteristics of soft-tissue calcifications. The age distribution revealed that the majority of participants belonged to the 36–45-year age group (44%), followed by the 46–60-year age group (38%), indicating a higher occurrence of calcifications among middle-aged and older individuals. Subjects aged 26–35 years constituted 14% of the sample, while the youngest age group of 18–25 years represented only 4% of the study population. A statistically significant association was observed between age groups and the type of calcification identified on radiographic examination (**Table 1**- Association between Age Groups and Type of Calcification on Radiographic Examination (n=800)).

With respect to gender distribution, females accounted for 51% of the total sample, whereas males constituted 49%, reflecting a nearly equal representation of both genders **(Figure 2-** Gender distribution of the study participants (n = 800)). Analysis of calcification types revealed that calcified stylohyoid ligament was the most frequently observed entity, accounting for 30.5% of all cases. This was followed by sialoliths (19.5%) and carotid artery calcifications (14%). Tonsilloliths constituted 11% of the findings, while phleboliths and calcified lymph nodes each accounted for 8% of cases. Antroliths (5%) and rhinoliths (4%) were the least commonly detected calcifications. The overall distribution of soft-tissue calcifications according to type is illustrated in (**Figure 1-** Distribution of soft-tissue calcifications based on type (n = 800).

Anatomical site analysis demonstrated that the submandibular region was the most commonly affected location (36.5%), followed by the styloid region (20%) and the cervical lymph node region (15.5%). Regarding laterality, unilateral calcifications were more prevalent (72%) compared to bilateral involvement (28%). In terms of number, single calcifications predominated (65.5%), while multiple calcifications were observed in 34.5% of cases.

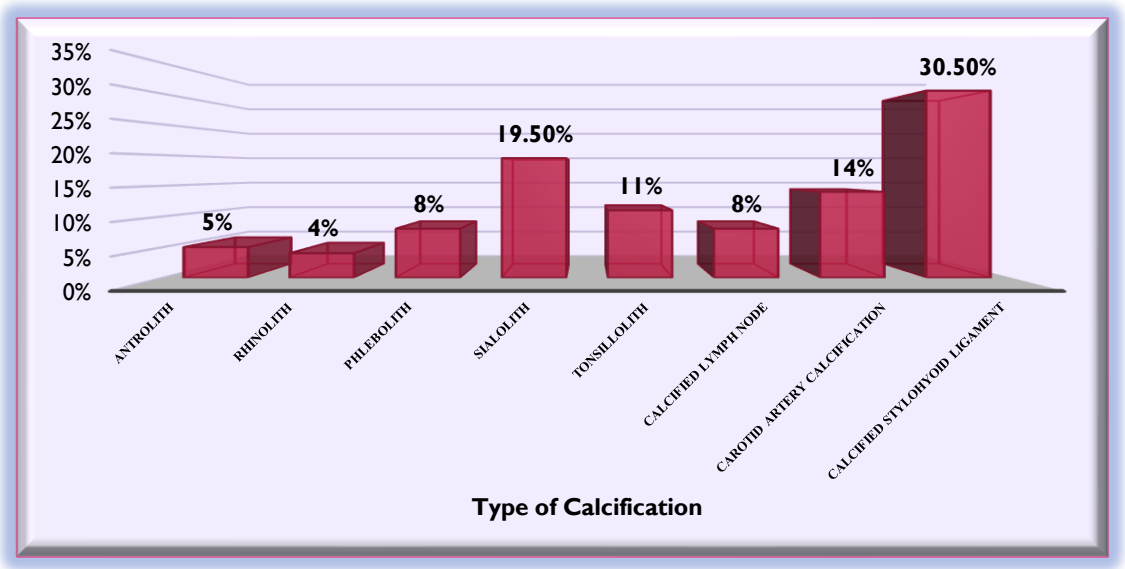


**FIGURE1- Distribution of soft-tissue calcifications based on type (n = 800)**

**TABLE 1- Association between Age Groups and Type of Calcification on Radiographic Examination (n=800)**

**p-value= 0.001* ($\chi^2$- 1211.4) *Statistically significant**

| Age group (years) | Antrolith n (%) | Rhinolith n (%) | Phlebolith n (%) | Sialolith n (%) | Tonsillolith n (%) | Lymph node n (%) | CAC n (%) | Stylohyoid n (%) | Total n (%) |
|---|---|---|---|---|---|---|---|---|---|
| 18–25 | 0 (0.0) | 32 (100.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) | 32 (4.0) |
| 26–35 | 12 (10.7) | 0 (0.0) | 8 (7.1) | 36 (32.1) | 0 (0.0) | 0 (0.0) | 4 (3.6) | 52 (46.4) | 112 (14.0) |
| 36–45 | 16 (4.5) | 0 (0.0) | 56 (15.9) | 84 (23.9) | 16 (4.5) | 20 (5.7) | 0 (0.0) | 160 (45.5) | 352 (44.0) |
| 46–60 | 12 (3.9) | 0 (0.0) | 0 (0.0) | 36 (11.8) | 72 (23.7) | 44 (14.5) | 108 (35.5) | 32 (10.5) | 304 (38.0) |
| Total | 40 (5.0) | 32 (4.0) | 64 (8.0) | 156 (19.5) | 88 (11.0) | 64 (8.0) | 112 (14.0) | 244 (30.5) | 800 (100.0) |

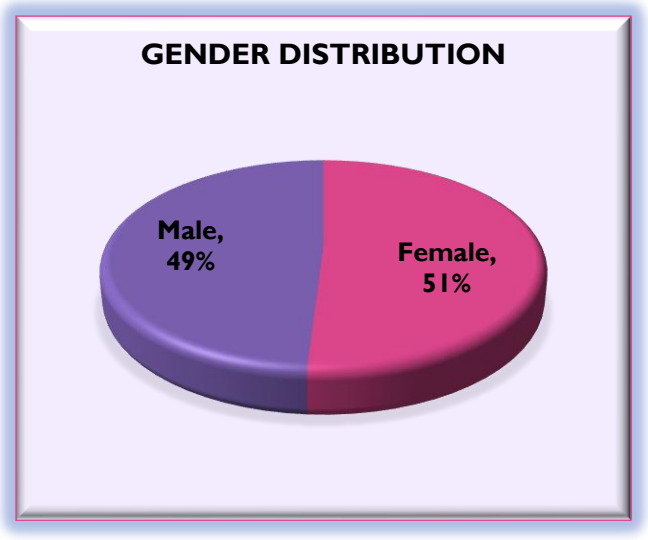


**FIGURE 2- Gender distribution of the study participants (n = 800)**

## DISCUSSION

The present study evaluated the prevalence, distribution, and radiographic characteristics of soft-tissue calcifications detected on digital panoramic radiographs. The analysis of 800 panoramic images allowed a comprehensive assessment of

calcification patterns in relation to age, gender, anatomical location, number, and size. Similar large-scale radiographic evaluations have been conducted by Cuttino et al., Monsour et al., Garay et al., Vengalath et al., Safabakhsh et al., and Preethy et al., emphasizing the role of panoramic radiography in epidemiological assessment of soft-tissue calcifications. [1,2,3,4,5,6] The findings of the present study further reinforce the relevance of panoramic radiography as a routine diagnostic and screening tool in dental practice.

A slight female predominance (51%) was observed in the present study, although both sexes were nearly equally represented. Comparable female predominance has been reported by Monsour et al., Garay et al., Vengalath et al., Safabakhsh et al., and Preethy et al., who attributed this trend to hormonal influences, metabolic differences, or greater healthcare utilization by females. [2, 3, 4, 5, 6] However, some authors such as Icoz and Akgunlu reported a male predominance, suggesting that gender distribution may vary across populations and study designs. [8]

The overall prevalence of soft-tissue calcifications observed in the present study was higher than that reported in earlier literature, where prevalence rates have ranged from as low as 1.34% reported by Cuttino et al. to as high as 43% reported by Maia et al. [1, 9] This wide variation across studies may be attributed to differences in sample size, radiographic techniques, diagnostic criteria, and inclusion or exclusion of specific calcification types. Studies by Garay et al., Vengalath et al., Safabakhsh et al., and Preethy et al. have similarly emphasized that meticulous radiographic evaluation and use of digital imaging significantly increase detection rates. [3, 4, 5, 6] The higher prevalence in the present study may also be explained by the inclusion of calcified stylohyoid ligament, which several earlier studies excluded by classifying it as an ossification rather than a calcification, thereby underestimating overall prevalence. [12]

A clear age-related trend was observed, with the highest prevalence of calcifications noted in the 36–45-year and 46–60-year age groups. This finding is consistent with studies by Garay et al., Vengalath et al., Ramadurai and Umamaheswari, Icoz and Akgunlu, and Maia et al., all of whom reported an increased frequency of calcifications with advancing age. [3, 4, 7, 9] Age-related degenerative changes, chronic inflammation, cumulative metabolic influences, and vascular alterations have been proposed as contributing factors. The gradual deposition of calcium salts over time likely explains the increased number, size, and complexity of calcifications in older individuals.

Calcified stylohyoid ligament was the most prevalent calcification (30.5%) in the present study. Previous studies have reported a wide prevalence range from 0.6% to 53.3%, reflecting variability in diagnostic criteria and inclusion protocols. [11, 12] The high prevalence observed in the present study may be attributed to consistent inclusion of stylohyoid ligament calcification and standardized radiographic assessment. Its identification is clinically relevant due to its association with Eagle's syndrome when symptomatic.

Sialoliths were the second most common calcification, predominantly involving the submandibular region. Similar findings have been reported by Preethy et al and Icoz and Akgunlu, who also observed male predominance, unilateral occurrence, and higher frequency in older age groups. [6, 8] The anatomical and physiological characteristics of the submandibular gland—alkaline saliva, high mucin content, and an antigravity duct course—have been widely accepted as predisposing factors.

Carotid artery calcifications were more frequently detected in older individuals, a finding consistent with studies by Monsour et al. and Safabakhsh et al., who highlighted their significance as markers of atherosclerosis and potential cerebrovascular risk. [2, 5] Tonsilloliths, phleboliths, calcified lymph nodes, antroliths, and rhinoliths showed lower prevalence, similar to observations in previous radiographic studies, and are commonly associated with chronic inflammation, vascular malformations, or long-standing infections. [11, 14]

Overall, unilateral and single calcifications predominated in the present study, while bilateral and multiple calcifications increased with advancing age. Comparable trends have been documented by Garay et al., Vengalath et al., and Maia et al., suggesting progressive deposition and severity over time.[3, 4, 9] These findings further emphasize the diagnostic, preventive, and screening value of panoramic radiography in the early detection of clinically significant soft-tissue calcifications, facilitating timely referral and appropriate patient management.

**Figures 3 & 4:** Represent panoramic radiographs demonstrating various soft-tissue calcifications. Figure 3 depicts a sialolith involving the right submandibular gland. Figure 4 demonstrates bilaterally calcified, thickened, and elongated stylohyoid ligaments.

FIGURE 3- Panoramic radiograph showing a sialolith (submandibular gland) on right side

FIURE 4- Panoramic radiograph showing calcified thickened and elongated stylohyoid ligamemt bilaterally

## CONCLUSION

The present study confirms that panoramic radiography is an effective and reliable modality for detecting and evaluating soft-tissue calcifications in the head and neck region. Calcified stylohyoid ligament was the most frequently observed entity, followed by sialoliths and tonsilloliths. An increasing prevalence with advancing age was evident, with variable gender distribution among different calcification types. Most calcifications were unilateral and solitary, except for stylohyoid ligament calcifications, which frequently showed bilateral involvement. Incidental identification of clinically significant entities, particularly carotid artery calcifications, highlights the role of panoramic radiographs as an important screening tool beyond routine dental diagnosis. **TABLE 4- Distribution of Demographic Variables and Characteristics of Soft-Tissue Calcifications (n = 800)**

**TABLE 4-Distribution of Demographic Variables and Characteristics of Soft-Tissue Calcifications (n = 800)**

| Parameter | Category | Count | Percentage (%) |
|---|---|---|---|
| **Age Group (years)** | **18–25** | 32 | 4.0 |
| | **26–35** | 112 | 14.0 |
| | **36–45** | 352 | 44.0 |
| | **46–60** | 304 | 38.0 |
| **Gender** | **Female** | 408 | 51.0 |
| | **Male** | 392 | 49.0 |

| | | | |
|---|---|---|---|
| **Type of Calcification** | **Calcified Stylohyoid Ligament** | 244 | 30.5 |
| | **Sialolith** | 156 | 19.5 |
| | **Carotid Artery Calcification** | 112 | 14.0 |
| | **Tonsillolith** | 88 | 11.0 |
| | **Phlebolith** | 64 | 8.0 |
| | **Calcified Lymph Node** | 64 | 8.0 |
| | **Antrolith** | 40 | 5.0 |
| | **Rhinolith** | 32 | 4.0 |
| **Laterality** | **Unilateral** | 576 | 72.0 |
| | **Bilateral** | 224 | 28.0 |
| **Number of Calcifications** | **Single** | 524 | 65.5 |
| | **Multiple** | 276 | 34.5 |

**Limitation of the Study**

The present study was retrospective in nature and based solely on radiographic evaluation. Clinical correlation, biochemical investigations, and histopathological confirmation were not performed, which may limit definitive diagnosis of certain calcifications. Additionally, as the study was conducted at a single institution, the possibility of selection bias cannot be completely excluded.

**Acknowledgments**

The authors would like to express their sincere gratitude to the Department of Oral Medicine and Radiology, People's Dental Academy, Bhopal, for providing the necessary facilities, radiographic records, and institutional support required for the completion of this study. We are thankful to the faculty members and technical staff of the department for their assistance in data collection and radiographic evaluation. The authors also acknowledge the support of the administrative staff for facilitating access to patient records and maintaining the radiographic database. No external financial or material support was received for this study.

**Conflict of Interest**

The authors declare that there is no conflict of interest that could be perceived as influencing the impartiality or integrity of the research reported.

**Funding**

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## REFERENCES

[1] Cuttino CL, Pogozelski DS, Richards GR, Tiecke RW. Panoramic radiographic survey of dentists' interpretation of findings. J Am Dent Assoc. 1969; 79(5):1179–82.

[2] Monsour PA, Young WG. Variability of the styloid process and stylohyoid ligament in panoramic radiographs. Oral Surg Oral Med Oral Pathol. 1986; 61(5):522–6.

[3] Garay I, Netto HD, Olate S. Soft tissue calcifications in the mandibular angle area observed by means of panoramic radiography. Int J Clin Exp Med. 2014; 7(1):51–6.

[4] Vengalath J, Puttabuddi IH, Rajkumar B, Shivakumar GC. Prevalence of soft tissue calcifications on digital panoramic radiographs: a retrospective study. J Indian Acad Oral Med Radiol. 2014; 26:385–9.

[5] Safabakhsh M, Johari M, Bijani A, Haghanifar S. Prevalence of soft tissue calcifications on panoramic radiographs in northern Iran. J Babol Univ Med Sci. 2018; 20(6):41–5.

[6] Preethy M, Elangovan S, Lakshmi SJ, Kumar S. Incidental findings of soft tissue radiopacities on digital

panoramic radiographs: a cross-sectional study. J Indian Acad Oral Med Radiol. 2022; 34:193–7.

[7] Ramadurai I, Umamaheswari TN. Prevalence of oral and maxillofacial calcifications in dental panoramic radiography: a retrospective study. IP Int J Maxillofac Imaging. 2018; 4(3):82–6.

[8] Icoz D, Akgunlu F. Prevalence of detected soft tissue calcifications on digital panoramic radiographs. SRM Journal of Research in Dental Sciences. 2019 Jan 1; 10(1):21-5.

[9] Maia PR, Tomaz AF, Maia EF, Lima KC, Oliveira PT. Prevalence of soft tissue calcifications in panoramic radiographs of the maxillofacial region of older adults. Gerodontology. 2022 Sep; 39(3):266-72.

[10] Hays JB, Gibilisco JA, Juergens JL. Calcification of vessels in the cheek of patients with arteriosclerosis. Oral Surg Oral Med Oral Pathol. 1966; 21(3):299–302.

[11] White SC, Pharoah MJ. Soft tissue calcifications and ossifications. In: White SC, Pharoah MJ, editors. Oral radiology: principles and interpretation. 5th ed. St. Louis: Mosby; 2004. p. 526–79.

[12] Cornell RW, Jensen JL, Tyber JB, Rhyne RR. Mineralization of the stylohyoid ligament complex: a radiographic incidence study. Oral Surg Oral Med Oral Pathol. 1979; 48(4):286–91.

[13] Langlais RP, Miles DA, Van Dis ML. Elongated and mineralized stylohyoid ligament complex: a proposed classification and report of a case of Eagle's syndrome. Oral Surg Oral Med Oral Pathol. 1988; 61(5):527–32.

[14] Scolozzi P, Laurent F, Lombardi T, Richter M. Intraoral venous malformation presenting with multiple phleboliths. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003; 96(2):197–200..