

Prevalence and Distribution of Incidental Findings in Panoramic Radiographs in the North Gujarat Population: A Prospective Study

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ABSTRACT

Background: Panoramic radiography is commonly used in dentistry and often reveals incidental findings unrelated to the patient's main complaint. These findings may have clinical significance and require careful interpretation. Aim of this study is to assess the prevalence of incidental findings in routine orthopantomographs (OPGs) and analyze their distribution by age and gender.

Materials and Methods: A cross-sectional study was conducted on 200 subjects aged 18–80 years undergoing digital panoramic radiography at Narsinhbhai Patel Dental College and Hospital, Visnagar. Images were evaluated using CS Imaging V8 software. Data were analyzed using SPSS version 20 with chi-square and frequency tests. A p-value < 0.05 was considered significant.

Results: Incidental findings appeared in 40% of radiographs. The most common dental anomaly was impacted teeth (38.04%), followed by root dilacerations (17.4%). Bony anomalies included elongated styloid processes (18.47%) and idiopathic osteosclerosis (15.21%). Soft tissue calcifications like tonsilloliths were found in 2.17% of cases. No significant gender-based differences were observed ($p > 0.05$).

Conclusion: Incidental findings are frequent in panoramic radiographs and are not significantly influenced by age or gender. Comprehensive evaluation of OPGs is essential for all patients, regardless of their presenting complaint.

Keywords: Dental anomalies, Incidental findings, Maxillofacial imaging, Orthopantomograph, Panoramic radiograph.

INTRODUCTION

Panoramic radiography is a frequently used imaging technique in dentistry. It offers a comprehensive view of both jaws, teeth, maxillary sinuses, nasal cavities, and temporomandibular joints. This technique facilitates the detection of pathologies, jaw lesions, and dental anomalies in the

maxillofacial area. Careful analysis of panoramic radiographs can occasionally reveal incidental findings beyond the initial reason for the patient's visit, some may require treatment to avert future issues.¹

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Radiographic incidental findings refer to hidden abnormalities that show no clinical signs or symptoms but are discovered unintentionally when radiographs are taken to investigate a patient's primary complaint. Typically, dentists prescribe radiographs when they believe the images will provide diagnostic information that will impact the treatment plan. Indications for radiologic examinations often stem from clinical signs, symptoms, or patient history.² The information from the clinical examination helps in selecting the appropriate radiograph and later aids in interpreting the results. Incidental findings in the jaws may include dental and/or intraosseous abnormalities, some of which can have serious consequences. Therefore, it is crucial to examine every aspect of each radiographic image systematically, rather than focusing on a specific region, as early detection of abnormalities can improve prognosis and potentially reduce mortality and morbidity rates.³

Common incidental findings include dental anomalies like impacted or supernumerary teeth, pathological conditions such as cysts and tumors, periodontal issues including bone loss and infections, and developmental anomalies in the dentition like gemination, dilaceration, taurodontism, dens invaginatus; anomalies in the maxillary sinuses and nasal septum. Other findings may involve bony findings like elongated styloid process, odontoma, Stafne bone cyst, idiopathic osteosclerosis; foreign objects, vascular anomalies, soft tissue calcifications like sialolith, calcified lymph nodes; sinus conditions like antrolith, joint abnormalities, and signs of systemic diseases affecting bone health. Detecting these findings may require further investigation or therapeutic intervention to prevent future complications and as there are no studies done in the North Gujarat population for this purpose so we have chosen to conduct this research.¹

MATERIAL AND METHOD

This prospective study was carried out over a four-month period, from June to September 2024, in the Department of Oral Medicine and Radiology at Narsinhbhai Patel Dental College and Hospital, Visnagar. A total of 200 subjects, ranging in age from 18 to 80 years, were included in the study. Ethical approval was obtained from the Institutional

Ethics Committee of Narsinhbhai Patel Dental College and Hospital, Visnagar (NPDCH/IEC/2024/174).

The inclusion criteria for this study require subjects between the ages of 18 and 80 years, encompassing both male and female participants. Subjects are eligible only if their OPG images are complete, clearly visible, and free from artefacts, with proper positioning and no errors that might obscure the view. Images that are distorted, blurred, or otherwise compromise the clarity and accuracy of radiographic assessment will be excluded from the study.

OPG scans were obtained using the CS 8100SC Digital Panoramic and Cephalometric System, which features a 0.5 mm focal spot, a maximum tube voltage of 60–90 kVp, tube current ranging from 2 to 15 mA, an exposure time between 15 and 30 seconds, a frequency of 140 kHz, and a total scanning time of 90 seconds. All images were assessed in panoramic view using the CS Imaging V3.8.7 software (Carestream Dental LLC, Atlanta, GA, USA).

Incidental findings like tooth-related anomalies such as Impacted teeth, Supernumerary tooth (impacted), Congenitally missing permanent tooth, Dilacerated root, Gemination, Taurodontism, etc were taken into consideration. Also, other bony findings like Elongated Styloid process, Stafne Bone Cyst, Condensing Osteitis, Idiopathic Osteosclerosis, Odontoma; soft tissue findings like Tonsillitis, Calcified vascular plaque, Sialolith, Calcified Lymph nodes were checked. Statistical analysis of the data was performed using SPSS software, version 26. The Chi-square test was employed to examine the association between different categorical variables. A significance level of $P < 0.05$ was established for all tests, with results considered statistically significant if the P value was below this threshold.

RESULTS

The study involved 200 individuals, comprising 112 males (56%) and 88 females (44%). The age distribution showed that the majority of participants were young adults. Among males, 41.96% were aged 18–30 and 22.33% were 31–40, while among females, 45.46% were 18–30 and 22.73% were 31–40. This indicates that over two-

thirds of both male and female participants were below 40 years of age, making the younger age group the most represented in the sample.

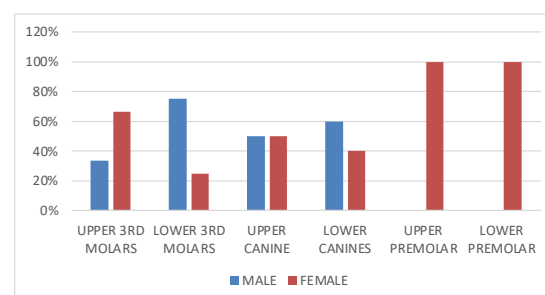
Incidental findings were present in 40% of the radiographs. Frequency distribution can be seen in Table I. Regarding radiographic findings, the most common dental anomaly was impacted teeth, seen in 35 individuals (38.04%). Dilaceration was present in 16 participants (17.4%), and supernumerary teeth in 4 individuals (4.34%). Rare anomalies included congenitally missing teeth and root resorption, each found in one subject (1.09%). Among bony findings, the elongated styloid process (Figure 1) was the most frequent, noted in 17 individuals (18.47%), followed by idiopathic osteosclerosis in 14 (15.21%). A Stafne bone cyst was found in one case (1.09%) (Figure 2). Soft tissue calcification in the form of Tonsilloliths (Figure 3) was observed in two individuals (2.17%), while other soft tissue and radiographic anomalies like calcified vascular plaques, periapical radiolucencies, and odontomes were not detected.

Table I: Frequency Distribution of Incidental Findings.

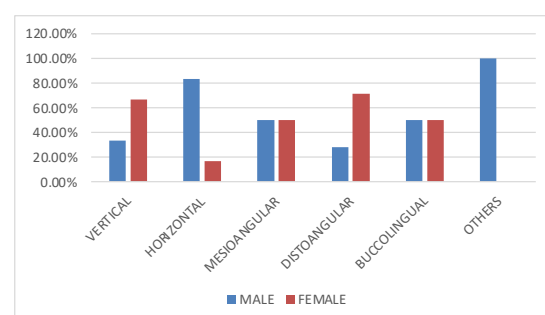
Findings		Number of subjects	%
Dental anomalies related	Impacted teeth	35	38.04
	Supernumerary teeth	4	4.21
	Congenitally missing	1	1.09
	Dilaceration	16	17.3
	Gemination	0	0
	Taurodontism	0	0
	Dens invaginatus	0	0
	Root tips embedded	0	0
	Hypercementosis	0	0
	Root resorption	1	1.09
Bony findings	Idiopathic osteosclerosis	14	15.21
	Elongated styloid process	17	18.47
	Stafne bone cyst	1	1.09
	Condensing osteitis	0	0
	Periapical cemento-osseous dysplasia	0	0
Radiolucent/radiopaque lesions	Periapical radiolucency	0	0
	Pericoronal radiolucency	1	1.09
	Residual like cyst	0	0
	Periapical radioopacity	1	1.09

Soft tissue calcification	Odontome	0	0
	Tonsillolith	2	2.17
	Calcified vascular plaque	0	0
	Sialolith	0	0
	Calcified lymph nodes	0	0
	Antrolith	0	0

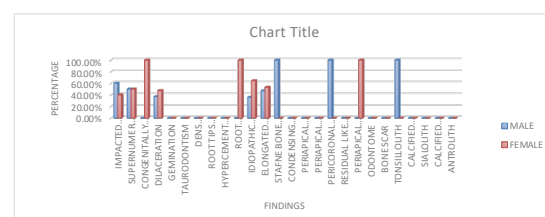
In terms of gender differences, upper third molar impactions were more frequent in females (66.66%), whereas lower third molar impactions were more common in males (75%). Horizontal impactions showed a significant gender difference, occurring in 83.34% of males versus 16.67% of females ($p = 0.0372$). Other types of impactions such as vertical, mesioangular, and distoangular did not show significant gender disparities. Distribution of impacted teeth according to gender is given in Graph I. Distribution of type of impaction within jaws according to gender is given in Graph II.



Graph I. Distribution of impacted teeth within jaws according to gender



Graph II. Distribution of type of impaction within jaws according to gender



Graph III: Gender wise distribution of incidental findings

Dental anomalies like dilaceration were slightly more frequent in females (47.37%) than males (36.84%), but without statistical significance. Similarly, bony and soft tissue anomalies showed no significant gender-based differences, reinforcing that most findings were evenly distributed across sexes in this population. No statistically significant differences were found between males and females for any category of incidental findings ($p > 0.05$). Similarly, the occurrence of findings was distributed across all age groups without significant correlation.



Figure 1 showing Elongated Styloid Process and Impacted Permanent Mandibular Right Canine



Figure 2: showing Stafne Bone Cyst below the mandibular canal on left side



Figure 3: Showing a Tonsillolith in the ramus of the mandible region posterior to the left mandibular third molar

DISCUSSION

Orthopantomographs (OPGs) are invaluable in routine dental diagnostics, offering a broad overview of the maxillofacial region. While typically used to assess dental issues, these panoramic radiographs frequently reveal incidental findings, which may have diagnostic or prognostic relevance despite being unrelated to the patient's chief complaint.

In this prospective study involving 200 participants (112 males and 88 females), 40% of OPGs revealed incidental findings. This prevalence is lower than the 85% reported by Imanimoghaddam et al. ⁴ but higher than the 34.5% and 38% observed by Narayan et al. ⁵ and Hlongwa et al. ⁶, respectively. A similar study by Shamshad et al. ⁷ reported incidental findings in 12.8% of 1045 OPGs evaluated, with a total of 29 distinct orofacial abnormalities identified, supporting our observation of the diversity of such findings.

The most common dental anomaly in our study was impacted teeth, noted in 17.5% of cases. This is consistent with the 23.13% reported by Shamshad et al. ⁷, who also identified mesioangular mandibular third molar impactions as the most prevalent subtype (64.5%). Our findings similarly showed mandibular third molar impactions as the most frequent, with horizontal and mesioangular angulations dominating.

Dilacerated roots were the second most common anomaly (8%), echoing the findings by Alhamid et al. ⁸, who also noted a high prevalence (34.5%) in their sample. Supernumerary teeth, congenitally missing teeth, and root resorption were among the rarest findings in both our study and those by Narayan et al. ⁵ and MacDonald et al. ⁹

Among bony findings, elongated styloid process was the most frequent (8.5%), closely mirroring rates from studies by Goyal et al. ¹⁰ and Jadu et al. ¹¹, which also highlighted this finding's prominence. In the PNU study by AlHarbi et al. ¹², elongated styloid processes were detected in 7.3% of cases, reinforcing its prevalence across diverse populations.

Idiopathic osteosclerosis was the second most common bony finding (7%). This aligns with findings from study by AlHarbi et al. ¹² (7.5%) and

falls within the broader prevalence range of 2.4%–38% reported across different populations. The mandibular predilection observed in our study also corresponds with literature, attributed to anatomical and vascular differences.

Stafne bone cysts were rare (0.5%), a finding consistent across studies by Ramesh et al.¹³ as well as Shamshad et al.⁷, suggesting its classification as a rare but notable anatomical variant.

Soft tissue calcifications, such as tonsilloliths, were detected in 2.17% of our sample—comparable to the 3% prevalence noted by MacDonald et al.⁹ and supported by the 1–3% range reported by other researchers. These findings underscore the importance of scrutinizing soft tissues during radiographic evaluations.

Other less frequent incidental findings in our study, including periapical radiolucencies and radiopacities, matched trends seen in the literature. Shamshad et al.⁷ recorded periapical radiolucent lesions in 19.4% of their sample, which slightly exceeds our observation but remains contextually relevant.

Our data revealed no statistically significant gender differences in the distribution of incidental findings ($p > 0.05$), consistent with findings from Vaseemuddin et al.¹⁴ and AlHarbi et al.¹², reinforcing the view that gender does not strongly influence the likelihood of incidental findings.

Age-wise, most participants were in the 18–40 age group, a demographic commonly reported to have higher rates of developmental anomalies and impacted teeth. AlHarbi et al.¹² also highlighted a strong age association with incidental findings, particularly idiopathic osteosclerosis and elongated styloid processes, which increased in frequency with age.

This collective body of evidence strongly supports the value of a systematic, comprehensive approach in interpreting panoramic radiographs. Incidental findings, while often asymptomatic, can alert clinicians to underlying or developing pathology, guiding timely intervention.

CONCLUSION

Panoramic radiographs serve as valuable diagnostic tools not only for assessing dental complaints but also for identifying incidental findings that may have clinical implications. This study highlights the significance of such findings in 40% of the examined cases. A thorough and systematic approach to image interpretation can aid in early diagnosis, improving patient outcomes. Dentists should remain vigilant for these unexpected findings, regardless of patient demographics.

Limitations of the Study:

- The study was conducted at a single institution, which may limit the generalizability of results.
- A relatively small sample size ($n=200$) restricts broader application.
- Only digital panoramic radiographs were considered; comparisons with other imaging modalities were not made.
- Follow-up assessments or confirmatory diagnostics for incidental findings were not included.

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