









**Table 4: Means, SD, and SE for the developmental stages of maxillary canine, age by developmental stages of maxillary canine, and chronological age; also shows comparison between chronological age and age by developmental stages of maxillary right canine**

Subgroup	No.	DS of maxillary canine			Age assessed by dev. stage of maxillary canine			Chronological age			Comparison between chronological age and age by stage of maxillary canine	
		Mean	SD	SE	Mean	SD	SE	Mean	SD	SE	NKT value	"P" value
Group I: Males												
A <sub>1</sub>	15	8.44	0.35	0.09	11.20	0.68	0.17	10.47	0.29	0.07	2.15	<0.05
B <sub>1</sub>	15	9.12	0.17	0.04	11.80	0.41	0.11	11.56	0.20	0.05	2.76	<0.05
C <sub>1</sub>	15	9.36	0.29	0.08	12.40	0.74	0.19	12.45	0.26	0.07	NS	<0.05
Group II: Females												
A <sub>2</sub>	15	8.61	0.35	0.09	9.20	0.56	0.12	9.41	0.22	0.06	2.09	<0.05
B <sub>2</sub>	15	9.26	0.27	0.07	10.27	0.46	0.12	10.46	0.28	0.07	2.17	<0.05
C <sub>2</sub>	15	9.67	0.23	0.06	11.60	0.74	0.13	11.52	0.30	0.08	NS	<0.05

A value of  $P < 0.05$  was considered statistically significant.  $P > 0.05$ , not significant, SD: Standard deviation, SE: Standard Error, DS: Development stage

**Table 5: Means, SD, and SE for developmental stage of mandibular right canine, age by mandibular right canine, and chronological age; also shows comparison between chronological age and age by developmental stage of mandibular right canine**

Subgroup	No.	DS of mandibular canine			Age by dev. stage of mandibular canine			Chronological age			Comparison between chronological age and age by stage of mandibular canine	
		Mean	SD	SE	Mean	SD	SE	Mean	SD	SE	NKT value	"P" value
Group I: Males												
a <sub>1</sub>	15	8.69	0.36	0.09	11.20	0.68	0.17	10.47	0.29	0.07	2.15	<0.05
b <sub>1</sub>	15	9.40	0.25	0.07	11.60	0.51	0.13	11.56	0.20	0.05	0.46	<0.05
c <sub>1</sub>	15	9.57	0.26	0.07	12.13	0.74	0.19	12.45	0.26	0.07	NS	<0.05
Group II: Females												
a <sub>2</sub>	15	8.79	0.31	0.08	9.20	0.56	0.12	9.41	0.22	0.06	2.09	<0.05
b <sub>2</sub>	15	9.28	0.14	0.04	10.27	0.46	0.12	10.46	0.28	0.07	2.17	<0.05
c <sub>2</sub>	15	9.88	0.15	0.04	11.60	0.57	0.13	11.52	0.30	0.08	NS	<0.05

A value of  $P < 0.05$  was considered statistically significant.  $P > 0.05$ , not significant, SD: Standard deviation, SE: Standard Error, DS: Development stage

As per this study, canine calcification stage 9 was related to capping of the third middle phalanx and appearance of the adductor sesamoid of the thumb. Hence, maxillary and mandibular canine calcification stage 9 (10-11 years for girls and 12-13 years for boys) confirmed the attainment of peak height velocity (PHV).

Stage 9 of the maxillary and mandibular canines, i.e., the walls of the root canal are parallel and its apical end is still partially open, coincides with the PHV; calcification between stages 8 and 9 could be used to identify the early stage of pubertal growth spurt. As these stages could be assessed on IOPA, this could prove more economical and convenient as the armamentarium required is much simpler and even the radiation dose is less. The information on the development of teeth is important not only for reasons of diagnosis and treatment but also for more detailed purposes of research. Calcification of teeth may, in this way, be used as a criterion of dental age in a patient as it provides an index of physiologic maturity of permanent dentition.

Many investigators have studied the development of the dentition by applying different techniques for observation. This study has adopted Nolla's technique due to its applicability and accuracy.<sup>[13-15]</sup>

It can be inferred that dental age can be used reliably for assessing dental maturity, but insignificant difference was observed between chronological age and maxillary and mandibular canine calcification stages for all subgroups. This confirmed the reliability and validity of canine calcification stages to be used as a dental maturity indicator. This also eliminated the use of additional radiographic exposure (hand-wrist radiograph) of patients in orthodontic practice, because canine is recorded on IOPA radiograph.

In this study, females were ahead in dental maturation than males in all the age groups. This is supported by the reports of Hagg and Taranger,<sup>[16]</sup> Castellanous et al.,<sup>[17]</sup> Koshy and Tandon,<sup>[18]</sup> Prabhakar et al.,<sup>[19]</sup> Hunter,<sup>[20]</sup> Fishman,<sup>[21]</sup> and Hafez.<sup>[22]</sup>

Results of the present study show insignificant difference

in dental development between males and females. The study results were supported by Nolla.<sup>[7]</sup>

The technique has the advantages of being simple, using low patient radiation dose, and exhibiting high degree of clarity of the radiographs. The equipment required is available in most dental clinics. Hence, Nolla's method for dental age estimation is reliable on Lucknow population.

To conclude, it could be stated that assessment of maturation is of utmost importance in certain orthodontic protocols such as for myofunctional therapy, before starting with rapid maxillary expansion, and for timing of ortho-surgical procedures (surgery for mandibular setback should be carried out only after mandibular growth has completed). As the chronological age cannot show accurate status of individual's so we can use canine calcification stages on periapical radiographs which are easier and cheaper to procure than hand wrist X-rays. To further validate the results of this study, it should be carried out on a larger sample size and in varied age groups.

## CONCLUSION

1. Females are ahead in dental maturation than males
2. There was insignificant difference between dental age and chronological age
3. Canine calcification stages could also be used as a dental maturity indicator.

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