

ORIGINAL ARTICLE

A Study on Estimation of Stature from Odontometric Parameters: Forensic Tool

Jahnavi Rongali¹, S. Sreedhar Reddy², K. Naresh³**HOW TO CITE THIS ARTICLE:**

Jahnavi Rongali, S. Sreedhar Reddy, K. Naresh. A Study on Estimation of Stature from Odontometric Parameters – Forensic Tool. Indian J Forensic Med Pathol. 2026; 19(2): 186-192.

ABSTRACT

Introduction: Anthropometry comprises various methods to estimate the dimensions of the human body. Identification of a severely decomposed or mutilated body is a big challenge to the forensic experts. Teeth are made of hard tissue which have higher durability and are relatively indestructible. Careful study of odontometric parameters will enable us in determining the stature of a person.

Methodology: The present study is an Institution based Cross-sectional study done on 100 subjects (50 males and 50 females). All the individuals were in the age group of 18-25 years with complete set of fully erupted healthy teeth of proper alignment. Mesiodistal width of right upper central incisors, inter-canine distance and height of an individual are measured.

Observations & Results: The results of the study showed that there is a significant association of mesiodistal width of right upper central incisor ($p < 0.05$) with the height of the individual but there is no association of intercanine width ($p > 0.05$) with the stature.

KEYWORDS

• Identification • Stature • Odontology

AUTHOR'S AFFILIATION:

¹3rd Phase – Part I MBBS, Department of Forensic Medicine & Toxicology, Alluri Sitaramaraju Academy of Medical Sciences, Eluru, Andhra Pradesh, India.

²Professor, Department of Forensic Medicine & Toxicology, Great Eastern Medical School, Ragolu, Srikakulam, Andhra Pradesh, India.

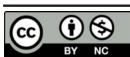
³Professor and Head, Department of Forensic Medicine & Toxicology, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India.

CORRESPONDING AUTHOR:

Naresh Karukutla, Professor and Head, Department of Forensic Medicine & Toxicology, NRI Institute of Medical Sciences, Visakhapatnam, Andhra Pradesh, India.

E-mail: drnaresh2704@gmail.com

➤ **Received:** 11-03-2026 ➤ **Accepted:** 15-05-2026



Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution NonCommercial 4.0 License (<http://www.creativecommons.org/licenses/by-nc/4.0/>) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed as specified on the Red Flower Publication and Open Access pages (<https://www.rfppl.co.in>)

INTRODUCTION

The United Nations Declaration of Human Rights states that every freeborn person has the right to be identified even after death.¹ Identification of a severely decomposed or mutilated body is a big challenge to the forensic experts.² Anthropometry comprises various methods to estimate the dimensions of the human body including skeletal remains which made it easy for identification of an individual even after the death of a person.

Height/stature is one of the useful anthropometric parameters for individual identification.³ Dimensional relationship between body segments and stature has been the focus of forensic research for many years.⁴ Correlation of stature to long bones, even fragmentary bones, are frequently reported among various populations.^{5,6} Studies reported that stature has a direct proportional relationship with cranial and facial bones, long bones, trunk, hand and footprints.¹ It becomes difficult for an individual to be identified when the body is disfigured or destroyed due to massive burns, accidents or disasters.

Teeth are made of hard tissue which have higher durability and are relatively indestructible.⁷ Teeth are chemically stable entities and are also resistant to fire. The tissue turnover time is also less which enhances its role as an odontometric parameter.² Dental identification is crucial for identification of victims in disasters. It is accurate, efficient, inexpensive, and accepted in the courts of law.⁸ Dental identification plays a crucial role in the identification of remains of the deceased when postmortem changes, traumatic injury, use of visual or fingerprint methods are invalid.⁹

So, teeth are used in identification of an individual in a severely destroyed body. Careful study of odontometric parameters will enable us in determining the stature of a person.

The present study helps to find out whether the right upper central incisor and intercanine distance can be used in estimating stature of an individual.

AIMS AND OBJECTIVES

Aim: The aim of this study is to find out the possibility of estimating the stature

of an individual based on odontometric measurements

Objectives

1. To measure mesiodistal width of upper right central incisors.
2. To measure intercanine distance.
3. To measure the actual height of an individual.
4. To investigate the possibility of estimating height from odontometric parameters

METHODOLOGY

This was an institutional based Cross-sectional study conducted on 100 (50 males and 50 females) Undergraduate Medical students of Alluri Sitaramaraju Academy of Medical Sciences (ASRAM), Eluru from September 2024 to December 2024. Individuals in the age group of 18-25 years with complete set of fully erupted healthy teeth which are in proper alignment were included in the study. Those with history of clinical presentation of missing tooth, dental caries, trauma, pathological disorders of teeth and gingiva, cleft palate, orthodontic surgeries, endocrine disorders and developmental disorders were excluded from the study.

After obtaining ethical clearance and informed consent from ASRAM institute and the participants respectively, the study has been conducted. In this study, odontometric parameters (mesiodistal width of upper right central incisor and intercanine distance) were measured using digital vernier calipers in a hygienic way. Three readings were measured in millimeters and an average was recorded. The individual height is recorded using a stadiometer. Individuals were made to stand erect across the stadiometer with their feet placed together touching the stadiometer. Back of head, shoulders, buttocks should touch the stadiometer and the measured height is recorded. The height from the odontometric parameters is compared with that of measured height.

OBSERVATIONS AND RESULTS

Observations and results obtained after the statistical analysis are tabulated which shows in detail information of objectives taken up for the study. The tables show minimum and

maximum values, mean, standard deviation (SD) shows standard error (SE), p-value and Pearson's correlation coefficient (R).

From the table 1 regression equation is obtained from the formula $y=A+Bx$

y =predicted height of an individual
 B =regression coefficient
 x =value of parameter used for calculating the stature
 A =constant of the parameter

Table 1: Descriptive statistics

Parameters	N	Maximum	Minimum	Mean	SD
Height	100	1860	1480	1672.20	103.88
Mesiodistal width	100	10.10	6.70	8.41	0.58
Intercanine distance	100	45.50	33.80	38.87	2.17

Table 2: Linear regression equation variables and p-value of mesiodistal width upper right central incisors

Parameter	Estimate	SE	t	p-value
Intercept	2098.27	146.85	14.29	1.06e-25
Mesiodistal width	-50.63	17.41	-2.91	0.0045

$y = 2098.27 - 50.63 \times (x)$

Height calculated = 2098.269 - 50.632 (mesiodistal width of upper central incisors)

Table 3: Correlation and Regression analysis of mesiodistal width of upper right central incisors

Parameter	R	R ²
Mesiodistal width	-0.28	0.08

mesiodistal width of right upper central incisor there will be decrease in the height of an individual and vice versa.

From the above table 3, R = -0.28 which implies that there is slight negative correlation of mesiodistal width with height of an individual i.e., if there is an increase in the

From Figure 1 and Table 4, $p < 0.0045$ which implies that there is high significant association between mesiodistal width and height of an individual.

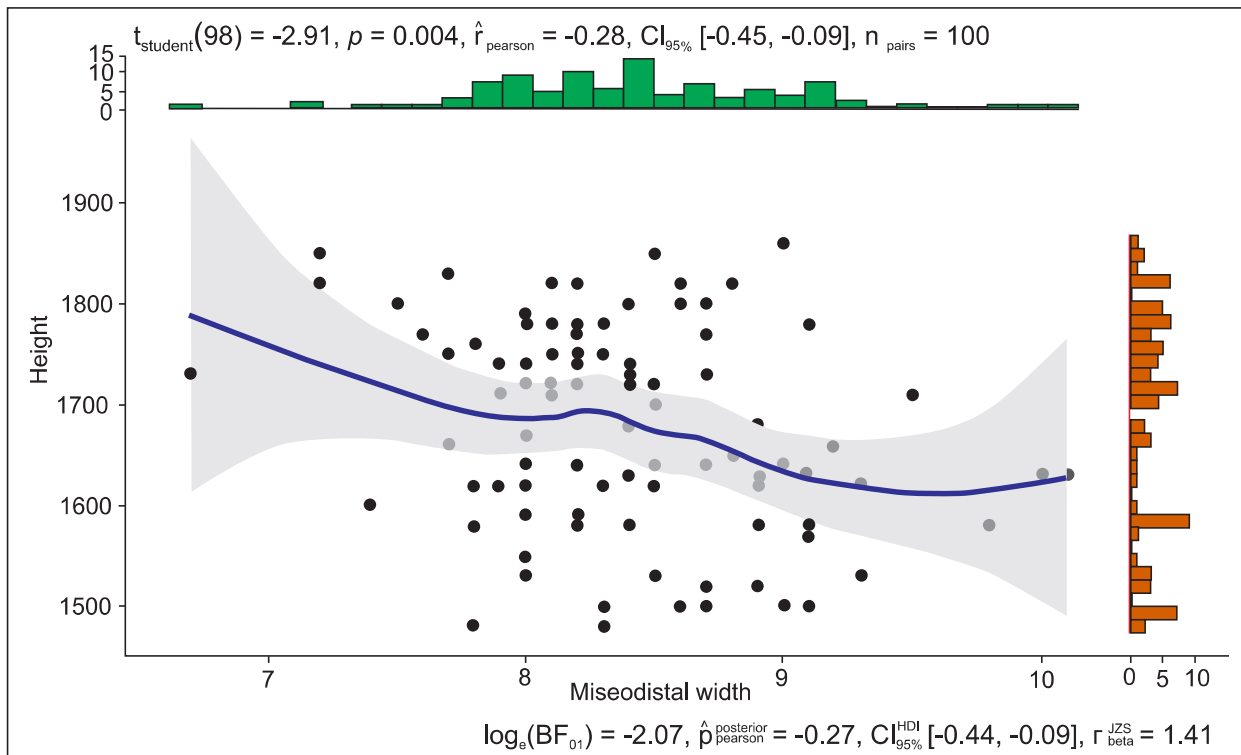


Figure 1: Height vs Mesiodistal width

Table 4: Correlation matrix

		Height	Mesiodistal width	Inter canine distance
Height	Pearson’s r	-	-	-
	p-value	-	-	-
Mesiodistal width	Pearson’s r	-0.28**	-	-
	p-value	0.0045	-	-
Inter canine distance	Pearson’s r	0.07	0.50***	-
	p-value	0.48544	1.36e-7	-

Note: *p<0.05,**p<0.01,***p<0.001

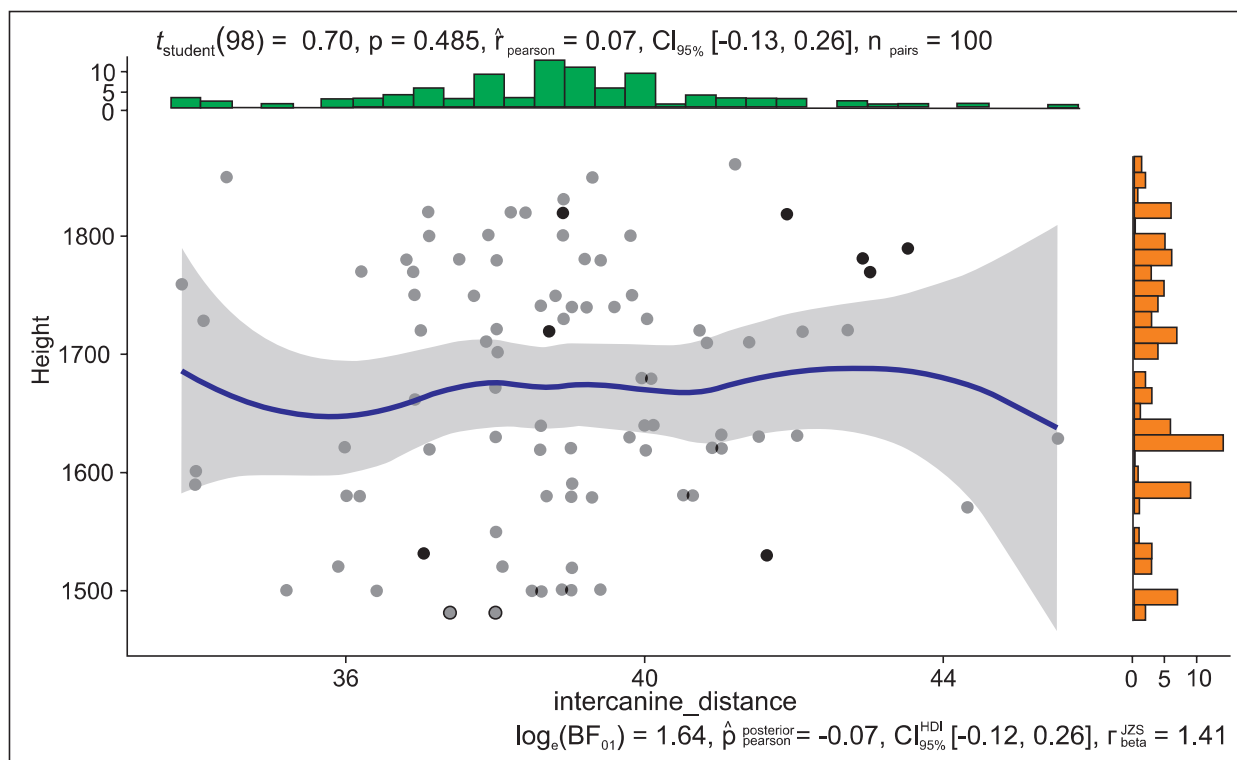


Figure 2: Height vs inter-canine distance

Table 4 and figure 2, $p < 0.485$ which implies that there is no significant association between intercanine distance and height of an individual

Table 5: Linear regression equation variables and p-value of intercanine distance

Parameter	Estimate	SE	t	p-value
Intercept	1540.66	188.14	8.19	1.00e-12
Inter canine distance	3.38	4.83	0.70	0.485

Table 5 shows Linear regression equation values for inter-canine distance in correlation with height

$$y = 1540.655 + 3.384(x)$$

$$\text{Predicted height} = 1540.655 + 3.38 \times \text{intercanine distance}$$

Table 6: Correlation and Regression analysis of intercanine distance

Parameter	R	R ²
Inter canine distance	0.37	0.14

From the above table 6, $R = 0.37$ which implies that there is slight positive correlation of

mesiodistal width with height of an individual i.e., if there is an increase in the intercanine distance there will be increase in the height of an individual and vice versa.

Table 7 Linear regression equation values obtained when both odontometric parameters are taken together in correlation with height of an individual.

Table 7: Linear regression equation variables and p-value for combined odontometric parameters

Parameters	Estimate	SE	t	p-value
Intercept	1786.54	187.03	9.55	1.24e-15
Mesiodistal width	-75.71	19.52	-3.8	1.91e-4
Inter canine distance	13.45	5.21	2.58	0.0114

Predicted height = 1786.54 - (75.71×mesiodistal width of right upper central incisor) + (13.45×intercanine distance)

Table 8: correlation and regression analysis of combined odontometric parameters

Parameters	R	R ²
Combined odontometric parameters	0.37	0.14

From Table 7 and 8, it suggests that there is a positive correlation and high significant association between combined odontometric parameters and height of an individual.

DISCUSSION

In this study, a sample population of 100 members (50 males and 50 females) of age ranging between 18-25 years are taken. Mesiodistal width of right upper central incisors, intercanine distance, height of an individual are measured. From the odontometric parameters height of the individual is predicted by linear regression equation. Later, statistical analysis are tabulated.

The study shows that there is a significant association of mesiodistal width of right upper central incisor ($p < 0.05$) with the height of the individual but there is no association of intercanine width ($p > 0.05$) with the stature. (From table 4 and figure 1, 2)

The above mentioned results explain that there is a negative correlation of mesiodistal width ($r = -0.28$) and a slight positive correlation of intercanine distance ($r = 0.07$) with the stature. (table 4 and figure 1,2).

When both the odontometric parameters i.e., mesiodistal width of right upper central incisor and intercanine distance are taken into consideration at the same time there showed a better correlation ($r = 0.37$) and high significant association ($p < 0.05$) with the height of the individual. (table 7, 8)

In a study by Yadav *et al*⁶ in 2016 on 361 Indian students, the findings showed that all odontometric parameters (right and left central

and lateral incisors, left canine, combined mesiodistal width) have positive correlation and were significantly associated ($p < 0.05$) with stature. Among these parameters the maxillary canines showed much significant association with stature.

Another study which was demonstrated by Khangura RK *et al*.⁵ on 100 subjects (50 males and 50 females) of age ranging between 20-30 years, from OPD of D.J. College of Dental Sciences and Research in Uttar Pradesh in 2015. They studied four parameters (intercanine distance, mesiodistal width of six permanent maxillary anterior teeth, arc length, interpremolar width) that were considered singly and then in various sets of combinations. The results showed that all the variables whether taken individually or in combinations showed positive correlation with stature. Intercanine width (p -value = 0.006), inter premolar width (p -value = 0.005) and combined odontometric parameters (p -value = 0.0074) were found to be statistically significant whereas mesiodistal width of anterior tooth measured individually (p -value > 0.05), arc length (p -value 0.1195) was found to have no significant association with stature.

In 2021, K Ramya *et al*.⁽²⁾ studied on reliability of different odontometric parameters in stature analysis on 100 patients considering mesiodistal width of anterior teeth, intercanine width, interpremolar width and maxillary arc length as their variables and found that the all the parameters showed positive correlation with stature. Combined mesiodistal width of the anterior teeth (p -value = 0.033) and the arc length (p -value = 0.009) were statistically significant in estimating the height of the individual whereas intercanine distance (p -value = 0.225) and interpremolar width (p -value = 0.069) were not significantly associated.

In study done by Gopinath T *et al*.¹⁰ in 2021 on 70 individuals in Chennai on the role of facial index and odontometric parameters, the results showed that, in both males and females there is much significant association (p value < 0.05) with the stature of the person when the odontometric parameters were considered together than considering the individual parameters.

Also, in a study by Jani Y *et al*.¹ on body height from tooth size in 2018, which studied odontometric parameters that includes

intercanine width, interpremolar width and combined mesiodistal width. The results showed out that the intercanine width is statistically significant with p value being 0.025 and has a positive correlation ($r=0.223$) while other parameters were also found to have positive correlation but did not show significant association in estimating stature (p-value >0.05).

The study conducted by Bharath Rao *et al.*¹¹ in 2019 on three Asian ethnicities found that there is positive correlation intercanine distance ($r=0.09$), interpremolar width ($r=0.13$) arc length ($r=0.29$) and negative correlation with mesiodistal crown dimension of the six permanent maxillary anterior teeth ($r=-0.02$). The results showed there is a significant association of the arc length with the stature with p-value 0.002 but there was no significant association of other parameters like intercanine width (p-value =0.328) and interpremolar width (p-value =0.172) and the mesiodistal crown width of 6 anterior maxillary teeth (p-value = 0.814) with the height of the individual.

According to study by Prabhu S *et al.*¹² in the year 2013 on 95 individuals comprising 47 females and 48 males showed that there is a low correlation of odontometric parameters with the stature ($r,-0.10$ to 0.33). There is no significant association between the variables taken in the study with p-value greater than 0.05.

A study by Shalini Kalia *et al.*³ in 2006 demonstrated that combined mesiodistal width of anterior maxillary teeth has significant association with the stature (p-value <0.05).

In 2021, K. Revathy *et al.*⁴ conducted a study on revealing stature from facial proportions from teeth on 1000 individuals in Kerala, showing that there is very low positive correlation of mesiodistal width of maxillary anterior teeth of females and negative correlation for males. The study showed significant association of combined mesiodistal width for females with p value <0.05 but for males the parameter was not significant with p value being 0.802.

In Saveetha Dental College in Chennai, a study was done on 60 dental students by Panigrahi C *et al.*⁷ which showed that there is no significant association of inter premolar width with the stature in both males and females.

Mohammad Zakir Hossain *et al.*¹³ did research

on 201 volunteers on South East Asians in the year 2016. Their study showed that the length and mesiodistal width of central incisors and canines showed positive correlation with stature ($r = 0.35 - 0.45$).

According to a study by Marroquin *et al.*¹⁴ in 2017 which shows the advantages of dental examination over bone analysis to estimate the age of individuals, it finds the pulp to tooth area ratio from upper canines and single rooted teeth, and pulp to tooth width-length ratio as a reliable technique.

From the conclusions of a study done by Atul *et al.*¹⁵ on 196 medical students aged 18 to 25 years from central India, it showed a significant correlation between stature and head length obtained from the regression equations separately for males and females. These findings show that head length can be used for stature estimation in forensic purposes.

Another study done by Kyllonen *et al.*⁽¹⁶⁾ developed a regression equation to estimate stature using the cranial measurements from the CT scans and the forensic data banks in the United states, the results suggested that cranial measurements can aid in stature estimation but the 95% confidence intervals produce stature ranges, limiting their reliability.

CONCLUSION

The study concludes that:

- Combined and individual odontometric parameters can be used to estimate the stature.
- However, more precise results are obtained when combined odontometric parameters are taken into consideration.

Hence, odontometric parameters are useful forensic tool in the identification of individual

Ethical considerations: This study was conducted after obtaining ethical clearance from “The Institutional Ethics Committee” of Alluri Sitaramaraju Academy of Medical Sciences, Eluru.

Source of funding: Dr. NTR University of Health Sciences, Andhra Pradesh

Conflict of interest: Nil

Acknowledgement: We take immense pleasure in expressing our deep sense of gratitude to Dr. NTR University of Health Sciences for encouragement in doing this study by funding.

REFERENCES

1. Jani Y., Parikh S., Dudhia B., Bhatia P., Patel P., Patel R. Body height from tooth size: A novel study on stature estimation by odontometric parameters. *Journal of Indian Academy of Oral Medicine and Radiology*. 2018 Jul 1; 30(3): 275-80.
2. Ramya K., Deshpande A., Deepika A.D., Rayudu G.S., Pendyala S.K., Kondreddy K. Reliability of odontometric parameters in stature analysis. *Journal of Oral and Maxillofacial Pathology*. 2021 Jan 1; 25(1): 189-92.
3. Kalia S., Shetty S.K., Patil K., Mahima V.G. Stature estimation using odontometry and skull anthropometry. *Indian Journal of dental research*. 2008 Apr 1; 19(2): 150-4.
4. Revathy K., Beena V.T, Cherian L.M., Rao A., Jose J., Banu M.D. Revealing Stature and Facial Proportions from Teeth: An Adjunct to Forensic Science. *Journal of Forensic Dental Sciences*. 2021 Jan 1; 13(1): 18-23.
5. Khangura R.K., Sircar K., Grewal D.S. Four odontometric parameters as a forensic tool in stature estimation. *Journal of forensic dental sciences*. 2015 May 1; 7(2): 132-6.
6. Yadav A.B., Yadav S.K., Kedia N.B., Singh A.K. An odontometric approach for estimation of stature in Indians: Cross-sectional analysis. *Journal of Clinical and Diagnostic Research: JCDR*. 2016 Mar; 10(3): ZC24.
7. Panigrahi C., Babu K.Y. Stature estimation using the odontometric measurements of the maxilla. *Journal of Advanced Pharmaceutical Technology & Research*. 2022 Nov 1; 13 (Suppl 1): S153-5.
8. Wood R.E., Gardner T. Forensic odontology in DVI-A path forward. *J Forensic Sci*. 2024 Sep; 69(5): 1620-1629. doi: 10.1111/1556-4029.15412. Epub 2023 Nov 6.
9. Jeddy N., Ravi S., Radhika T. Current trends in forensic odontology. *J Forensic Dent Sci*. 2017 Sep-Dec; 9(3): 115-119. doi: 10.4103/jfo.jfds_85_16. PMID: 29657486; PMCID: PMC5887632.
10. Gopinath T., Ganesh S., Subramani V.N. Role of Facial Index and Odontometric Parameters in the Establishment of Stature and Gender of Individuals. *J Pharm Bioallied Sci*. 2021 Nov; 13 (Suppl 2): S1068-S1073. doi: 10.4103/jpbs.jpbs_158_21. Epub 2021 Nov 10.
11. Rao K.B., Natarajan, M., Amalan, A. *et al*. Odontometric parameters as a forensic tool for stature estimation among three Asian ethnicities. *Egypt J Forensic Sci* 9, 60 (2019).
12. Prabhu S., Acharya A.B., Muddapur M.V. Are teeth useful in estimating stature? *J Forensic Leg Med*. 2013 Jul; 20(5): 460-4. doi: 10.1016/j.jflm.2013.02.004. Epub 2013 Feb 28.
13. Hossain M.Z., Munawar K.M., Rahim Z.H., Bakri M.M. Can stature be estimated from tooth crown dimensions? A study in a sample of South-East Asians. *Arch Oral Biol*. 2016 Apr; 64: 85-91. doi: 10.1016/j.archoralbio.2016.01.001. Epub 2016 Jan 11.
14. Marroquin T.Y., Karkhanis S., Kvaal S.I., Vasudavan S., Kruger E., Tennant M. Age estimation in adults by dental imaging assessment systematic review. *Forensic Sci Int*. 2017 Jun; 275: 203-211. doi: 10.1016/j.forsciint.2017.03.007. Epub 2017 Mar 27.
15. Atul S. Keche, Harsha A. Keche, Estimation of Stature by Head Length in Central India, *J Res Med Dent Sci*, 2022, 10(1): 425-428.
16. Kyllonen K.M., Simmons-Ehrhardt T., Monson K.L. Stature estimation using measurements of the cranium for populations in the United States. *Forensic Sci Int*. 2017 Dec; 281: 184.e1-184.e9. doi: 10.1016/j.forsciint.2017.10.011. Epub 2017 Oct 18.