



Tooth Morphometry of Bengali Population: A Forensic Anthropological Studies

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Abstract

Dental morphometry, which focuses on the shape and form of teeth, has been a key tool for identifying individuals for centuries. In forensic odontology, teeth can offer vital information when other identification methods are not available. This study investigates the potential of dental morphometry for identifying individuals within the Bengali population. By examining specific dental traits, including tooth size, shape, and unique features, we aim to create a database that reflects the dental variations unique to this group. This database could be instrumental in forensic investigations, cases of missing persons, anthropological studies, identifying victims of mass disasters and comparison to other population India and Abroad. The patients visiting the outpatient department of Kusum Devi Sunderlal Dugar Jain Dental College & Hospital demographically for Bengali natives. Impression of maxillary arche was taken with the help of alginate impression material, cast were made out of that impression and the mesio-distal length of each tooth, inter-canine distance (I.C.D), palatal depth (P.D) were recorded with a help of Digital Vernier caliper. The result of the present study gave us information about the morphological characteristic of teeth in a Bengali population. The average tooth morphology, inter-canine distance, palatal depth of females are smaller than that of males. In both the population ovoid arch type is highest (males- 45.45%) (females- 52.17%) followed by tapered arch type (males 39.39%) (females 30.43%) least is Square arch type (males 15.16%) (females 17.39%). Cusp of Carabelli is seen in Bengali population (5.36%). Supernumerary canine is also seen (3.57%). Forensic odontology plays important role in gender determination of individual where bodies are mutilated beyond recognition. Gender determination is a crucial step for medico legal cases. Teeth are excellent material because they are extremely durable in cases of fire and bacterial decomposition. Although our study has revealed significant results, further studies with larger sample size and more statistical techniques may contribute in human identification.

Keywords: Mesio-distal length of tooth, Inter-canine distance (I.C.D), Palatal depth (P.D).

Introduction

Teeth morphometry is a scientific technique that involves measuring various aspects of teeth, such as their size shape and position. This information can be used to identify individuals, particulars in forensic studies. Canine tooth dimorphism in sex identity one of the key points¹. Tooth crown dimensions are the accurate predictors of sex². While teeth morphometry can be applied to population worldwide for sex prediction³, certain characteristic might be more relevant in the Bengali population due to genetic and environmental factors -Specific tooth size and shape, Bite pattern and Anthropological factors⁴.

Aim and objectives: The aim of this study is Gender determination male or female from this tooth morphometry study. The objectives of this study as follows: Estimation of Specific tooth size and shape, Determination average inter-canine distance, palatal depth etc. Specific characters like supernumerary tooth or Cusp of Carabelli etc.

IEC and informed consent: Institutional ethical committee clearance done from our hospital ethical committee and duly signed by the subjects who are enlisted for the study. The Informed Consent written in English, Hindi and Vernacular language with simple & lucid sentences.

Materials and Methods

All the patients visiting the outpatient department of our Dental College and Hospital were screened demographically for Bengali natives.

Exclusion criteria: i. Multiple missing teeth in upper arches. ii. Patient having crown bridge prosthesis. iii. Heavy stained teeth or severe attrition present. iv. Patient suffering from any systemic or terminal disease should not include into the study.

Inclusion criteria: i. Must be from Bengali native population, ii. The patients having 18-65 years of age. iii. No missing teeth or attrition present. iv. No such terminal diseases.

Data related to age gender were recorded. Standard intraoral examination was done and impression of maxillary arches were taken with the help of alginate impression material; cast were made out of that impression. The Mesio-Distal length of each tooth (MD), Inter-canine Distance (ICD), Palatal Depth (PD) were recorded with a help of digital Vernier caliper.

Materials: Rubber bowl, Plaster spatulas, Impression trays, Impression paste, drape, mask, gloves, water resources respectively, magnifying glass, digital Vernier calipers and the die-stone models etc.

Table-1: Male, Average Mesio-Distal Length (mm).

Tooth number	Average Mesio-distal length (mm)	Tooth number	Average Mesio-distal length (mm)
11	8.65	21	8.69
12	6.83	22	6.80
13	7.83	23	7.80
14	6.87	24	6.99
15	6.29	25	6.45
16	9.90	26	9.79
17	9.50	27	9.70

Table-2: Female, Average Mesio-Distal Length (mm).

Tooth number	Average Mesio-distal length (mm)	Tooth number	Average Mesio-distal length (mm)
11	8.60	21	8.53
12	6.68	22	6.77
13	7.69	23	7.57
14	6.82	24	6.89
15	6.35	25	6.32
16	9.63	26	9.60
17	9.13	27	9.27

Table- 3: Arch Shape in Bengali Population.

Arch shape	Males	Females
Ovoid	15 (45.45%)	12 (52.17%)
Tapered	13 (39.39%)	7 (30.43%)
Square	5 (15.16%)	4 (17.39%)

Table-4: Inter-Canine Distance (mm) and Palatal Depth (mm).

Gender	Inter canine distance (mm)	Palatal depth (mm)
Males	35.91	27.91
Females	34.29	25.98

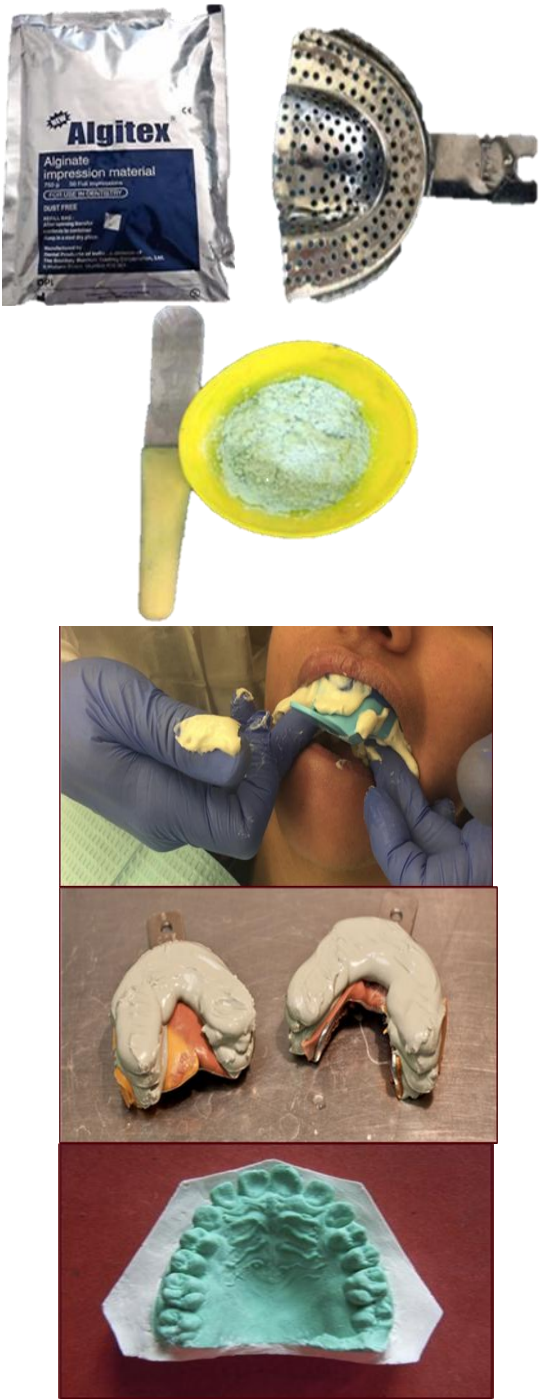


Figure-1: Materials to be used.



Figure-2: Armamentariums.

Results and Discussion

All the data of each tooth were recorded and tabulated in Microsoft excel. Total 56 patients were examined out of which 33 were male and 23 were females. Males and females were recorded separately. Average of every individual tooth were recorded. Average inter-canine distance was recorded. Average palate height re also recorded. Arch shape of individuals was also recorded. All this data were recorded in Bengali population. Third molar was not included in the study Special features like cusp of Carabelli; supernumerary teeth were observed.

Discussion: Forensic odontology plays important role in gender determination of individual where bodies are mutilated beyond recognition. Gender determination and personal identification is a crucial step for medico legal cases and Disaster Victim Identification (DVI)⁵. Teeth are excellent material because they are extremely durable in cases of fire and bacterial decomposition⁶. The study on occlusal morphology done on Gujrati population on 100 cases in 2015 by Dholia et al. shows significant results⁷. Inter-canine Width (ICW), Inter-premolar Width (IPW), Arch Length (AL) and Combined Width (CW) of six maxillary anterior teeth, to determine percentage of sexual dimorphism⁸. Mesiodistal (MD) and Buccolingual (BL) dimensions of all the teeth of permanent dentition to find new parameters to differentiate between male and female teeth⁹. The gender dimorphism percentages for the right and left MD width of maxillary canines were 3.5% and 3%, respectively, whilst for maxillary ICD it was found to be 3.14%¹⁰. Standard morphometric parameters of the maxillary central incisor,

canine, premolar and molar mesiodistal width (MDW), the buccolingual width (BLW), the crown length (CL) and the cervical angle (CA) were charted and consistence with sexual dimorphism¹¹. Males have larger teeth than females and buccolingual dimension is a better gender predictor than mesiodistal dimension. Maxillary canine is found to be more significant in Udaipur population for sexual dimorphism¹². One study shows of estimation of stature using head circumference among the Bengali adolescents (11-17 years)¹³ but no other study in Bengali population by tooth morphometry sex determination should be done.

The sample size in our study was 56 with 33 males 23 females. The sample consists of students of our institute and patients of our institute. These people are from our state WEST BENGAL since the aim and Objective of the study was “Forensic Identification of Bengali Population”.

Although our study has revealed significant results, further studies with larger sample size and more statistical techniques may contribute in human identification.

Conclusion

The result of the present study gave us information about the morphological characteristic of teeth in a Bengali population. The average tooth morphology, Inter-canine Distance, palatal depth of females are smaller than that of males in both the population ovoid arch type is highest (males 45.45%) (females 52.17%) followed by tapered arch type (males 39.39%) (females 30.43%) least is Square arch type (males 15.16%) (females 17.39%), Cusp of Carabelli is seen in Bengali population (5.36%), Supernumerary canine is also seen (3.57%).

References

1. Sherfudhin H, Abdullah MA and Khan N. (1996). A cross-sectional study of canine dimorphism in establishing sex identity: Comparison of two statistical methods. *J Oral Rehabil.*, 23, 627–631.
2. Acharya AB and Mainali S. (2008). Sex discrimination potential of buccolingual and mesiodistal tooth dimensions. *J Forensic Sci.*, 53(4), 790–792.
3. Acharya AB, Angadi PV, Prabhu S and Nagnur S. (2011). Validity of the mandibular canine index (MCI) in sex prediction: Reassessment in an Indian sample. *Forensic Sci Int.*, 204(1-3), 207.e1–207.e4.
4. Brook AH, Griffin RC, Townsend G, Levisianos Y, Russell J and Smith RN (2009). Variability and patterning in permanent tooth size of four human ethnic groups. *Arch Oral Biol.*, 54, 79–85.
5. Pittayapat P, Reinilde J, De Valck E, Vandermeulen D, Willems G. (2012). Forensic odontology in the disaster victim identification process. *J Forensic Odontostomatol.*, 30(1), 1–12.

Table-5: Master Sheet Females.

Name	Age years	Tooth Number and mesiodistal dimension (mm)														I.C.D (mm)	P.D (mm)	Arch shape	Special features
		17	16	15	14	13	12	11	21	22	23	24	25	26	27				
Shrestha Raha	21	9.16	10.09	6.06	6.77	7.56	5.75	9.02	8.6	5.44	7.59	6.21	6.49	10.28	9.53	33.71	31.23	Square	
Akanksha Konar	22	8.86	8.96	7.09	6.12	8.36	6.77	8.69	8.69	7.23	8.02	6.53	6.37	9.45	9.43	36.46	28.84	Ovoid	
Anushka Das	22	9.17	10.43	7.49	7.64	7.76	7.3	7.92	7.6	7.21	7.44	7.35	7.13	10.59	9.13	36.09	29.03	Ovoid	
Sneha Mondal	23	8.68	9.45	5.95	7.36	7.78	7.16	8.73	8.59	7.74	7.69	7.41	5.98	9.16	8.8	30.14	31.63	Square	
Anwesha Sanyamath	23	8.58	9.18	6.81	6.49	7.55	6.73	7.87	8.15	6.86	7.6	7.06	6.86	9.88	9.22	31.18	24.04	Ovoid	3cusp type 16
Aheli Rudra	22	9.57	9.93	6.61	7.67	8.93	7.91	9.62	9.69	7.56	8.72	7.39	6.74	9.29	9.98	37.64	29.29	Tapered	
Arnabi Chatterjee	21	9.13	9.85	5.61	7.07	7.87	7.52	8.78	9.21	7.85	8.31	7.6	6.24	9.61	9.47	37.73	21.44	Tapered	
Alivia Paramanik	22	8.48	9.11	6.19	6.57	6.97 / 7.03	6.45	8.51	8.46	6.7	6.98	6.42	5.66	9.17	8.96	34.58 / 25.68	21.92	Ovoid	supernu merary canine irt 13
Anusmita Parui	19	-	10.33	6.63	6.6	7.83	7.82	10.3	9.44	7.62	8.24	7.3	6.04	9.78	-	34.95	24.6	Ovoid	
Sidrah Noor	22	8.89	10.23	6.35	6.52	8.2	6.75	8.85	8.89	7.16	8.08	6.82	6.34	10.07	9.34	35.73	23.97	Ovoid	
Debika Mondal	21	9.47	9.78	5.75	6.67	7.04	5.97	8.72	8.53	6.18	6.83	6.6	6.17	9.55	9.29	35.51	26.72	Ovoid	cusp of caramel li 16
Snehanita Mondal	22	10.22	9.94	6.32	6.88	8.03	7.73	8.9	9.02	7.66	7.87	7.02	6.58	10.03	10.4	35.63	24.59	Tapered	
Torsa Roy	21	9.69	9.87	6.01	6.66	7.75	6.64	8.72	8.99	6.94	7.61	7.12	6.25	10.26	9.68	34.5	25.67	Ovoid	
Tiyasa Khanra	20	8.32	9.37	7.17	6.7	7.57	6.64	8.86	8.57	6.64	7.92	7.13	6.68	9.66	8.17	32.76	23.11	Ovoid	
Ankita Bhanja	22	8.81	9.52	6.78	7.03	7.25	6.72	8.53	8.93	6.76	6.88	6.86	6.42	9.65	9.39	33.44	26.55	Ovoid	
Rhiddhi Sarkar	21	9.96	9.47	6.54	7.51	7.7	6.77	8.47	8.28	6.63	8.07	6.83	6.37	9.84	9.78	35.63	27.29	Tapered	
Ritwika Basu	21	9.85	8.78	6.89	7.72	8.02	6.75	9.24	9.32	6.47	7.69	8.09	7.38	9.82	10.1 4	35.26	25.27	Tapered	
Prerana Basu	22	9.41	9.9	6.24	6.31	7.5	6.87	8.3	8.03	7.03	7.2	6.45	6.05	9.94	9.26	34.59	26.07	Tapered	
Sharidiya Dasgupta	21	8.5	9.67	6.18	6.91	7.7	5.82	8.02	7.68	6.07	7.64	6.63	5.9	8.44	8.9	32.29	28.39	Square	
Shalini Saha	20	9.04	9.43	6.58	6.51	7	5.19	8.01	7.83	5.65	6.57	6.72	6.37	9.33	8.89	32.38	23.65	Square	
Ankita Ghosh	21	9.46	9.9	6.19	6.69	6.52 / 7.88	6.58	7.91	8.04	5.99	7.92	6.68	6.45	9.72	9.34	35.05 / 27.01	24.8	Ovoid	supernu merary canine irt 13
Sebali Das	33	8.64	9.33	5.02	6.22	7.11	5.52	7.69	7.49	5.89	6.87	5.95	5.23	8.4	9	33.18	26.11	Ovoid	
Jayanti Das	36	8.51	9.04	5.63	6.31	7.07	6.26	8.17	8.2	6.48	6.31	6.3	5.65	8.77	7.81	31.35	23.26	Tapered	
Maximum		10.22	10.43	7.49	7.72	8.93	7.91	10.3	9.9	7.85	0.72	8.09	7.38	10.59	10.4	37.73	31.63		
Minimum		8.32	8.78	5.02	6.12	7	5.19	7.69	7.49	5.44	6.31	5.95	5.23	8.4	7.81	30.14	21.44		
Average		9.13	9.63	6.35	6.82	7.69	6.68	8.6	8.53	6.77	7.57	6.89	6.32	9.6	9.27	34.29	25.98		

Table-6: Master Sheet Males.

Name	Age (years)	Tooth Number and mesiodistal dimension (mm)														I.C.D (mm)	P.D (mm)	Arch shape	Special features
		17	16	15	14	13	12	11	21	22	23	24	25	26	27				
Arkaprabha Koley	21	10.14	10.78	6.18	6.17	6.81	7.01	9.09	8.89	6.73	7.07	6.57	6.47	8.78		36.59	28.56	Ovoid	
Agnik Ghosh	21	9.31	10.21	6.18	6.37	8.08	6.51	7.97	8.1	6.43	8.03	6.73	6.65	9.73		36.06	27.98	Ovoid	
Sumalya Bhattacharaya	22	8.98	9.05	6.05	6.87	7.98	7.09	8.41	8.89	7.2	7.5	6.9	6.24	8.81	9.21	35.8	32.52	Ovoid	
Debayan Chakraborty	22	8.77	9.01	6.72	6.48	7.74	5.89	8.8	8.54	6.55	7.55	7.09	6.63	9.23	9.52	35.66	28.08	Tapered	
Sagnik Choudhary	22	8.96	9.52	6.28	6.61	7.48	6.74	8.01	8.07	6.53	7.47	6.51	6.65	9.6	9.54	35.32	26.74	Ovoid	
Archak Biswas	21	9.7	9.14	6.56	6.89	7.74	7.06	8.28	8.25	7.12	7.82	6.66	6.36	9.21	9.63	32.98	27.44	Tapered	
Dibakar Ghosh	25	9.02	9.06	6.68	6.79	8.43	7.21	9.27	9.53	7.37	8.17	7.72	6.39	9.58	9.37	37.17	31.22	Ovoid	cusps of carabelli 16, 26
Krishna Manna	35	9.23	10.63	6.46	6.32	7.45	7.07	9	8.28	7.13	7.48	7.03	6.24	10.58	10.18	34.77	18.49	Ovoid	cusps of carabelli 16, 26
Soumik Giri	23	11.43	8.85	6.97	7.65	8.14	7.57	9.84	9.44	7.48	8.69	7.37	7.61	10.07	11.03	37.1	30.25	Square	
Pratim Chatterjee	23	10.4	10.9	7.24	7.76	8.93	8.22	9.86	10.55	8.35	8.63	8.33	7.37	10.71	10.63	38.95	29.42	Tapered	
Amlan Mondal	21	10.09	9.72	6.39	6.55	7.89	6.23	7.88	7.48	5.9	7.89	6.53	6.3	9.93	10.32	36.77	25.45	Tapered	
Souvik Dey	22	10.56	9.67	6.88	7.11	8.62	7.27	8.5	8.37	7.24	8.33	7.6	7.11	9.98	10.47	38.29	25.48	Ovoid	
Surgata Samanta	21	10.02	10.66	7.43	7.15	8.05	7.78	9.34	9.24	7.15	8.03	7.24	7.09	11.2	9.75	34.52	29.06	Square	
Parthapratim Mandal	23	10.16	9.5	6.51	6.8	8.37	7.25	8.7	8.52	7.47	8.08	7.64	7.23	9.34	10.49	37.85	27.9	Square	
Nilanjan Chatterjee	22	9.37	10.08	5.97	6	7.63	6.22	7.8	8.06	6.18	7.53	7.23	6.35	9.52	-	34.13	27.78	Tapered	
Krishna Gorai	21	8.47	11.05	6.58	7.17	8.02	6.79	9.02	9.22	6.68	8.18	7.01	6.72	10.85	9.92	35.63	32.36	Ovoid	
Anil Chatterjee	29	8.06	10.68	5.13	6.49	7.09	6.36	8.84	9.18	6.38	7.16	6.43	5.45	9.96	9.07	32.83	26.13	Tapered	
Prabaha Das	21	8.41	10.09	6.03	6.65	7.32	6.8	8.31	8.53	6.58	7.69	6.15	5.61	9.69	9.12	36.23	27.53	Tapered	
Antarik Das	19	10.34	9.9	6.74	7.66	8.16	7.14	8.98	9.38	6.72	8.15	7.43	7.66	10.06	10.14	35	30.36	Square	
Abhishek Basu	20	8.98	10.85	4.9	6.58	7.48	6.97	9.09	8.8	6.62	8.51	6.39	5.59	9.53	8.9	37.33	27.67	Ovoid	
Shorno Roy	22	10.66	10.74	6.89	7.81	8.59	6.46	8.3	8.7	6.28	8.39	7.91	7.63	10.91	10.21	36.46	29.45	Ovoid	
Anagh chattopadhyaya	22	8.75	9.85	5.91	6.56	7.47	6.77	8.96	9.33	6.03	7.19	6.39	5.81	9.54	8.78	33.47	29.89	Ovoid	
Sushruta Dutta	22	9.77	10.12	6.05	7.08	7.87	6.06	8.71	8.69	7.11	8.01	7.25	6.87	9.96	10.38	36.62	28.6	Ovoid	
Sumit Karmakar	22	9.89	9.35	6.69	7.02	7.6	7.85	9.54	9.01	7.68	7.31	7.46	6.16	9.14	10.12	38.36	31.33	Tapered	
Anik Gupta	21	9.66	10.39	6.32	7.04	8.47	6.49	8.21	8.04	6.11	8.24	7.13	6.71	10.29	10.53	43.31	29.47	Ovoid	
Adhiraj Chakraborty	20	8.97	9.1	5.19	6.28	6.92	5.54	7.07	6.58	5.31	6.67	6.21	5.07	9.24	9.18	31.24	24.6	Ovoid	
Subhrojoti Chakraborty	21	10.31	9.81	5.87	6.75	7.79	6.63	8.5	8.48	6.97	7.65	6.59	6.31	9.67	9.44	33.49	25.42	Square	
Shubrata Chakraborty	41	8.93	9.82	6.01	7.14	8.09	7.64	8.93	9.37	7.67	7.88	7.5	6.62	10.01	9.29	35.94	25.54	Tapered	
Diganto Chandra	22	10.16	9.61	5.41	7.03	8.35	6.59	9.07	8.86	6.73	8.06	7.29	6.05	9.18	-	36	27.78	Tapered	
Nilanjan Patra	23	8.94	9.17	6.6	6.69	7.2	6.25	7.84	7.6	5.83	7.31	6.21	5.88	8.87	8.73	34.35	28.39	Tapered	
Ankit Sanayal	25	8.91	9.64	6.16	7.06	7.72	7.02	7.96	8.09	7.21	7.76	6.87	6.45	9.46	9.38	34.68	27.03	Tapered	
Sayak Chakraborty	23	8.72	9.73	6.54	7.37	7.8	6.39	8.07	8.88	6.77	8.03	7.06	6.46	9.56	8.84	35.35	28.07	Ovoid	
Somnath Naskar	28	-	10.09	5.99	6.77	7.25	6.44	9.23	9.7	6.78	7.03	6.31	5.55	11.01	9.27	36.81	24.91	Tapered	
Maximum		11.43	11.05	7.43	7.81	9.93	8.22	9.86	10.55	8.35	8.69	8.33	7.66	11.2	11.03	43.31	32.52		
Minimum		8.06	8.85	4.9	6	6.81	5.54	7.07	6.58	5.31	6.67	6.15	5.07	8.78	8.73	31.24	18.49		
Average		9.5	9.9	6.29	6.87	7.83	6.83	8.65	8.69	6.8	7.8	6.99	6.45	9.79	9.7	35.91	27.91		

6. Salazar AM, Huerta PA, Coliboro V, Castro AF and Barbaro A. (2025). Evaluation of DNA in human teeth—ante-mortem and post-mortem factors affecting degradation and preservation: A literature review. *Genes (Basel)*, 16(4), 364.
7. Dholia B and Manjunatha BS. (2015). Occlusal morphology of permanent mandibular first and second molars in Gujarati population. *J Forensic Dent Sci.*, 7(2), 137–141.
8. Singh Grewal D, Khangura RK, Sircar K, Tyagi KK, Kaur G and David S. (2017). Morphometric analysis of odontometric parameters for gender determination. *J Clin Diagn Res.*, 11(8), ZC09–ZC13.
9. Litha H, Girish C, Sanjay MJK and Savita (2017). Gender determination by odontometric method. *J Forensic Dent Sci.*, 9, 44–45.
10. Almugla YM, Madiraju GS, Mohan R and Abraham S (2023). Gender dimorphism in maxillary permanent canine odontometrics based on a three-dimensional digital method and discriminant function analysis in the Saudi population. *Appl Sci.*, 13(16), 9326.
11. Banerjee A, Kamath VV, Satelur K, Rajkumar K and Sundaram L. (2016). Sexual dimorphism in tooth morphometrics: An evaluation of the parameters. *J Forensic Dent Sci.*, 8(1), 22–27.
12. Metgud R, Surbhi Naik S and Patel S (2015). Odontometric: A useful method for gender determination in Udaipur population identity panel. *J Forensic Investig*, 3(2).
13. Debnath M and Khatun A (2015). Stature estimation from head circumference among Bengali adolescents of Darjeeling District, West Bengal, India. *Res J Forensic Sci.*, 13(1), 11–16.