ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 5, Issue – 4, August - 2022, Page No. : 130 - 138

Estimation of stature from tooth by dental cast among North Indian Population

[1]Dr. Mohammad Abdurrahman Khan, Assistant Professor, Department of Forensic Medicine and Toxicology, Hind Institute of Medical Sciences, Barabanki.

[2]Sonam Verma, Research Scholar

[3]Dr. Manisha Verma, Senior Resident, Department of Periodontology, FODS, KGMU, Lucknow U.P.

[4]Dr. Anoop Kumar Verma, Professor and Head, Department of Forensic Medicine and Toxicology, KGMU, Lucknow U.P.

[5]Dr. Sangeeta Kumari, Associate Professor, Department of Forensic Medicine and Toxicology, KGMU, Lucknow U.P.

[6]Dr. Mousami Singh, Additional Professor, Department of Forensic Medicine and Toxicology, KGMU, Lucknow U.P.

Corresponding Author: Dr. Mohammad Abdurrahman Khan, Assistant Professor, Department of Forensic Medicine and Toxicology, Hind Institute of Medical Sciences, Barabanki, Lucknow.

Citation of this Article: Dr. Mohammad Abdurrahman Khan, Sonam Verma, Dr. Manisha Verma, Prof. Dr. Anoop Kumar Verma, Dr. Sangeeta Kumari, Dr. Mousami Singh, "Estimation of stature from tooth by dental cast among North Indian Population", IJDSIR- August - 2022, Vol. – 5, Issue - 4, P. No. 130 – 138.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Introduction: Body height or stature is one of the very important anthropometric parameters which is used to determine the physical identity of an individual. Estimation of stature is most commonly done from long bone.

Stature estimation from dimension of teeth is very useful in highly decomposed body, heavily mutilated with fragmentary remains like skull with some teeth or broken jaw having few teeth or destroyed in mass disaster, airplane crash, massive burn, massive road traffic or railways accident.

Aim: The aim of the study was to find out correlation of tooth dimension with stature.

Materials and Methods: The sample comprised of dentition from 100 individuals (50 males and 50 females), all young adults between 20 and 35 years of age. Impressions of the teeth were made using irreversible hydrocolloid (alginate) material and casts poured in dental stone. Buccolingual (BL) and Mesiodistal (MD) dimensions of all teeth, except third molars. Pearson correlation coefficients were used to determine the relationship of teeth parameters.

Results: Results of the study revealed that tooth dimension has significant correlation with stature with

correlation coefficient (r) value ranges from -0.316 to 0.422, p value less than 0.001. Among the tooth dimension lower right jaw Bucco canine parameter showed highest correlation

Conclusion: Odontometric measurement can be used for stature estimation in North Indian population.

Keywords: Stature, Tooth, Dimension, Odontometric, Measurement, Height, Anthropometric, Regression analysis, Correlation.

Introduction

Body height or stature is one of the very important anthropometric parameters which is used to determine the physical identity of an individual [1,2].

Stature estimation is an imperative tool for forensic examination specially in undisclosed, highly decomposed, mutilated and frag mentary human remains. Estimation of stature is most commonly done from long bone [3,4]. To create a biological profile, many methods are used in forensic identification of unknown person [5,8].

Among various method, stature estimation from remains of body is important aspect of identification of unknown in forensic medicine [6,13].

Researcher had conducted several studies for stature estimation from different parts of body like fingers, hand, limbs, foot, trunk, long bone, short bone, vertebral column, sternum length, face dimension, cephalic dimension and they got excellent corelation [14,15,16,17]. Difficulty arises when body is highly decomposed, heavily mutilated with fragmentary remains like skull with some teeth or broken jaw having few teeth or destroyed in mass disaster, airplane crash, massive burn, massive road traffic or railways accident [8,19,28].

Little research has conducted on to revaluate the Corelation of stature estimation from dimension of teeth [29,33]. Since teeth being decay resistant, conscientious analysis of teeth can accredit reliable estimation of stature of an individual specially when other determinants are fragmented or destroyed [34,36]. The aim of our study was to explore the correlation between stature and crown dimensions of teeth.

Material and Methods

Material required

1. Alginate
2. Dental stone
3. Maxillary Impression Trays
4. Mandibular Impression Trays
5. Rubber Bowl
6. Spatula

The alginate dental impression forms an imprint (i.e., a ‘negative’ mould) of those teeth and gums, which can then be used to make a cast or ‘positive’ model of the patient’s dentition.

Sample and tooth measurements

The sample comprised of dentition from 100 individuals (50 males and 50 females), all young adults between 20 and 35 years of age. Impressions of the teeth were taken using irreversible hydrocolloid (alginate) material and poured by dental stone (Fig 1).

Buccolingual (BL) and Mesiodistal (MD) dimensions of all teeth, except third molars, were measured on the casts using a digital caliper calibrated to 0.01 mm.

The MD dimension was defined as the greatest distance between contact points on the approximate surfaces of the tooth crown and was measured with the caliper beaks placed occlusally and aligned with the long axis of the tooth (Fig 2). In case, if teeth were rotated or misaligned, measurements were taken between points on the approximate surfaces of the crown where it was considered that contact with adjacent teeth would normally occur. The BL measurement was defined as the greatest distance between the labial/ buccal surface and

the lingual/ palatal surface of the tooth crown, measured with the calliper held at right angles to the MD dimension (Fig 3).

Fig 1: Image of Primary Diagnostic Cast.

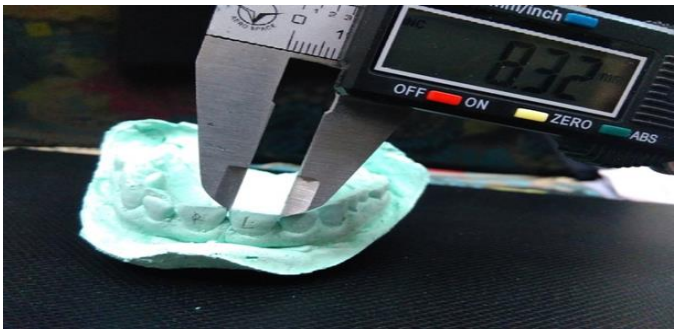


Fig 2: Measuring of mesiodistal dimension of teeth by the digital caliper.

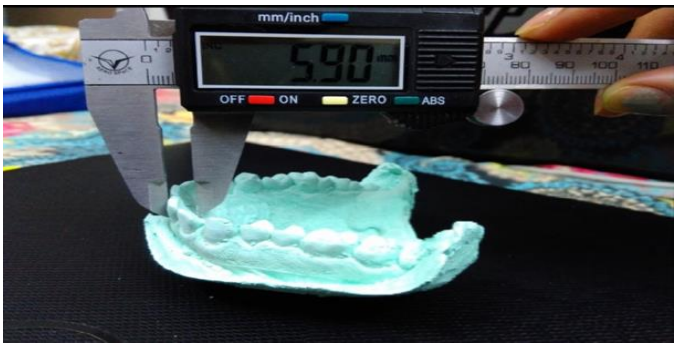


Fig 3: Measuring of buccolingual dimension of teeth by the digital caliper

Stature Measurement

Stature was measured as the vertical distance from the vertex to the floor. The measurement was obtained by making the subject stand erect and barefooted with the heels in close contact with each other and stature is measured by the use of measuring tape.

Result

Descriptive statistical analysis was performed using SPSS software. Data were summarized as Mean and SD. Pearson correlation coefficients were used to determine the relationship of all teeth parameters except 3rd molar (total 56 parameters) with height for all participant without gender specification. The findings of the present study revealed that 18 out of 56 odontometric parameters showed positive correlation with stature independent of gender with correlation coefficient (r) value ranges from -0.316 to 0.422. Among them lower right jaw, Bucco canine parameter showed highest correlation (Table 1).

Table 1: Pearson correlation coefficient (r) of parameters according to height.

Parameters	Mean	Std. Deviation	Pearson correlation coefficient (r)	P value
upper right jaw Bucco central inc	7.10	0.52	0.218	0.029*
upper right jaw Bucco lateral inc	6.54	0.88	-0.173	0.085
upper right jaw Bucco canine	7.89	0.66	0.316	0.001**
upper right jaw Bucco 1st pre molar	8.97	0.61	0.383	<0.001**
upper right jaw Bucco 2nd pre molar	9.08	0.66	0.277	0.005*
upper right jaw Bucco 1st molar	10.85	0.58	0.322	0.001**
upper right jaw Bucco 2nd molar	10.83	0.66	0.170	0.09
upper right jaw mesio central inc	8.14	0.66	-0.103	0.31

upper right jaw mesio lateral inc	6.05	0.54	0.231	0.021*
upper right jaw mesio canine	6.57	0.64	-0.067	0.508
upper right jaw mesio 1st pre molar	7.01	0.99	-0.316	0.001**
upper right jaw mesio 2nd pre molar	7.15	0.69	-0.052	0.607
upper right jaw mesio 1st molar	8.50	0.71	-0.044	0.667
upper right jaw mesio 2nd molar	8.25	0.78	-0.09	0.372
upper left jaw Bucco central inc	7.04	0.56	0.172	0.087
upper left jaw Bucco lateral inc	6.39	0.50	0.181	0.072
upper left jaw Bucco canine	7.87	0.72	0.225	0.025*
upper left jaw Bucco 1st pre molar	9.06	0.61	0.183	0.069
upper left jaw Bucco 2nd pre molar	9.11	0.56	0.135	0.18
upper left jaw Bucco 1st molar	10.85	0.51	0.245	0.014*
upper left jaw Bucco 2nd molar	12.35	11.55	-0.059	0.560
upper LEFT jaw mesio central inc	8.17	0.66	-0.096	0.340
upper LEFT jaw mesio lateral inc	6.21	0.54	0.159	0.114
upper LEFT jaw mesio canine	6.64	0.67	-0.038	0.709
upper LEFT jaw mesio 1st pre molar	6.94	0.08	-0.132	0.189
upper LEFT jaw mesio 2nd pre molar	7.21	0.68	-0.148	0.140
upper LEFT jaw mesio 1st molar	8.47	0.76	-0.019	0.848
upper LEFT jaw mesio 2nd molar	8.27	0.71	-0.083	0.41
LOWER right jaw Bucco central inc	5.73	0.49	0.275	0.006*
LOWER right jaw Bucco lateral inc	5.89	0.40	0.164	0.102
LOWER right jaw Bucco canine	7.16	0.86	0.422	<0.001**
LOWER right jaw Bucco 1st pre molar	7.67	0.59	0.208	0.038*
LOWER right jaw Bucco 2nd pre molar	8.27	0.49	0.171	0.088
LOWER right jaw Bucco 1st molar	10.10	1.38	-0.05	0.619
LOWER right jaw Bucco 2nd molar	10.04	0.47	0.348	<0.001**
LOWER right jaw mesio central inc	5.22	0.59	-0.068	0.504
LOWER right jaw mesio lateral inc	5.75	0.62	0.195	0.051
LOWER right jaw mesio canine	5.94	0.66	0.327	0.001**
LOWER right jaw mesio 1st pre molar	5.47	0.39	0.033	0.741
LOWER right jaw mesio 2nd pre molar	6.10	0.62	-0.167	0.097
LOWER right jaw mesio 1st molar	7.97	0.78	0.056	0.582
LOWER right jaw mesio 2nd molar	7.27	0.58	0.057	0.571
LOWER left jaw Bucco central inc	5.67	0.45	0.135	0.181
LOWER left jaw Bucco lateral inc	5.92	0.39	0.144	0.153
LOWER left jaw Bucco canine	7.21	0.73	0.407	<0.001**
LOWER left jaw Bucco 1st pre molar	7.73	0.59	0.197	0.05

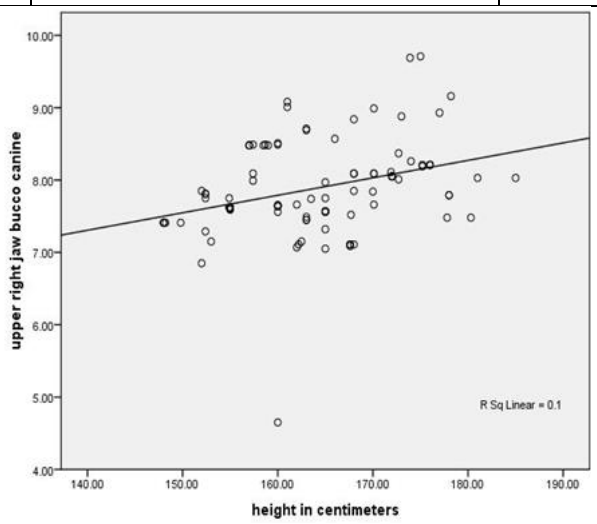
LOWER left jaw Bucco 2nd pre molar	8.32	0.65	0.044	0.665
LOWER left jaw Bucco 1st molar	10.37	0.48	0.214	0.033*
LOWER left jaw Bucco 2nd molar	10.02	1.00	0.133	0.187
LOWER LEFT jaw mesio central inc	5.13	0.34	0.171	0.089
LOWER LEFT jaw mesio lateral inc	5.65	0.44	0.266	0.008*
LOWER LEFT jaw mesio canine	5.90	0.63	0.222	0.026*
LOWER LEFT jaw mesio 1st pre molar	5.50	0.38	0.006	0.954
LOWER LEFT jaw mesio 2nd pre molar	6.16	0.61	-0.17	0.091
LOWER LEFT jaw mesio 1st molar	8.07	0.78	-0.074	0.463
LOWER LEFT jaw mesio 2nd molar	7.21	0.67	-0.045	0.655

For ** p value: teeth parameter name were directly associated with height and demonstrate a highly significant strong positive relation (r=? p=?).

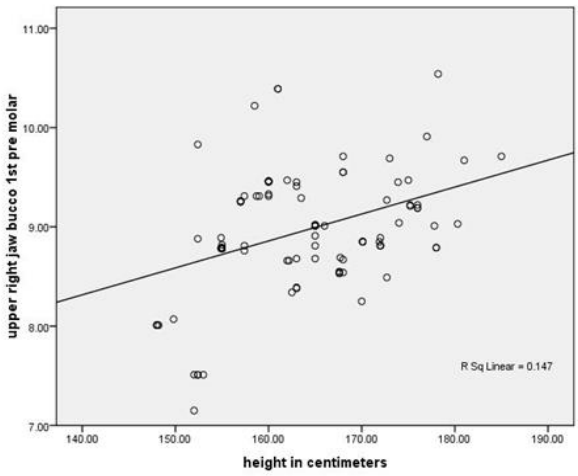
For * p value: teeth parameter name were directly associated with height and demonstrate a significant positive relation (r=? p=?).

For not significant: There was no obvious correlation between tooth parameter name and height.

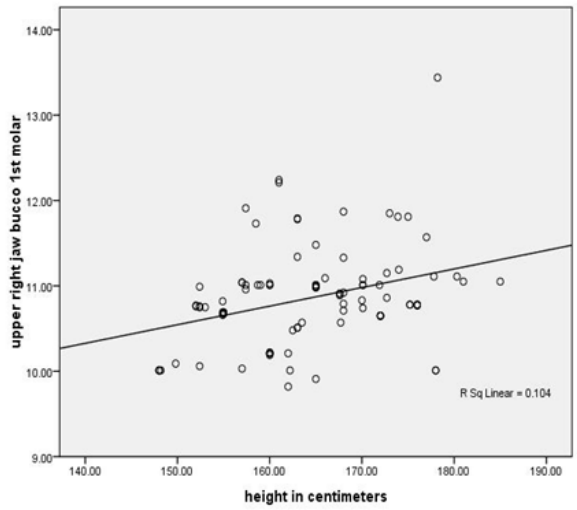
For + or – symbol: shows positive or negative relation. (Value of r).



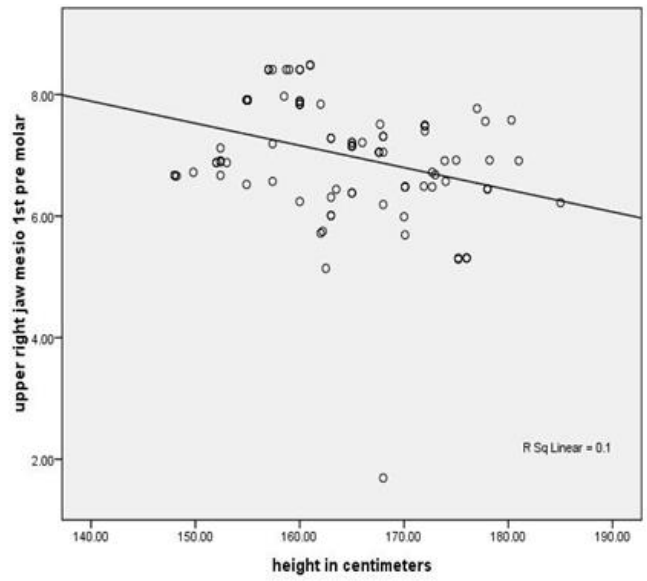
Graph 1:



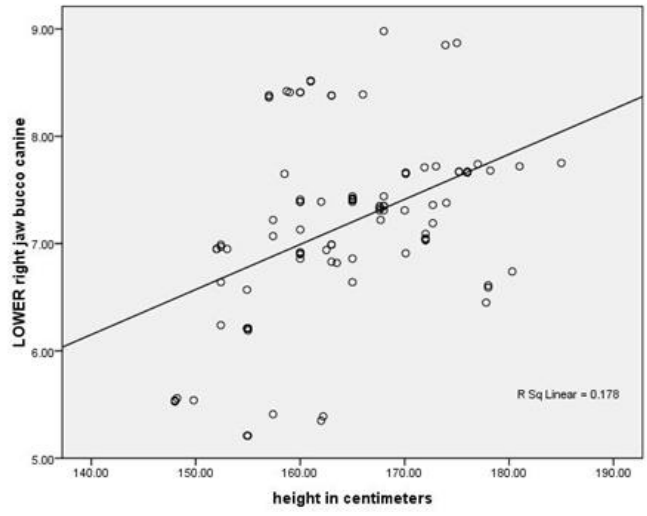
Graph 2:



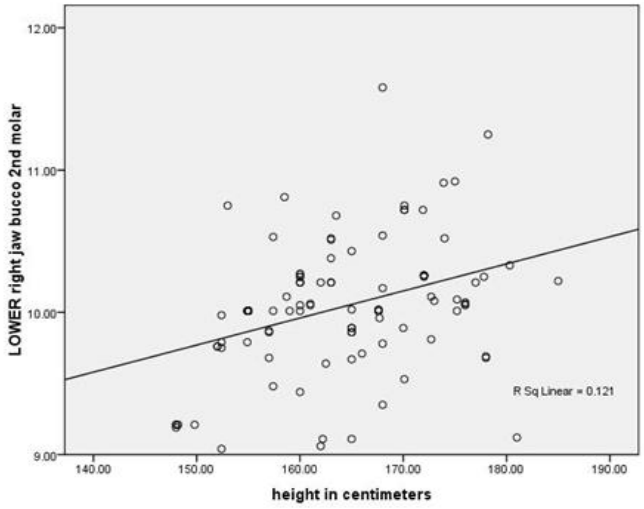
Graph 3:



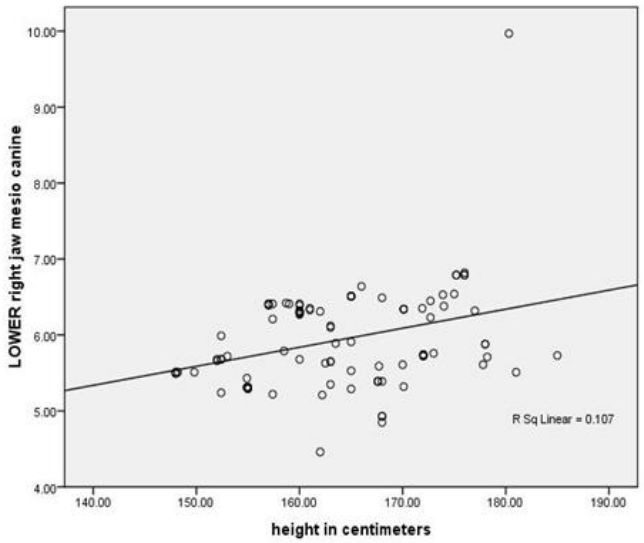
Graph 4:



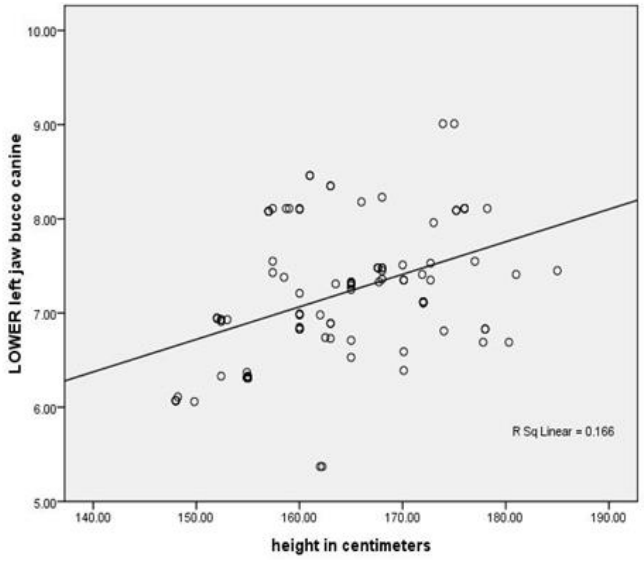
Graph 5:



Graph 6:



Graph 7:



Graph 8:

Discussion

This study correlate the Buccolingual (BL) and Mesiodistal (MD) dimensions of all teeth (except third molars) with stature. On measurement (table no.1) among upper right jaw Bucco central incisor, Bucco 2nd molar, mesiolateral incisor and mesio 1st premolar are directly associates with height and demonstrate significant positive relation while Bucco canine, Bucco 1st premolar and Bucco 1st molar are directly associated with height and have demonstrate highly significant strong positive relation. Among upper left jaw Bucco canine and Bucco 1st molar are directly associated with height and have significant positive relation. Among lower right jaw Bucco central incisor and Bucco 1st premolar directly associated with height and have significant positive relation while Bucco canine, Bucco 2nd molar and mesocanine are directly associated with height and have demonstrate highly significant strong positive relation. Among lower left jaw Bucco 1st molar, mesolateral incisor and mesocanine directly associated with height and have significant positive relation while mesocanine and Bucco canine are directly associated with height and have demonstrate highly significant strong positive relation.

Stature is immanent feature for medicolegal and physical anthropological investigations [37]. Researcher used various bone of different part of human skeleton for estimation of stature. However, when these bones are not available, measurements from body parts other than bone are used for stature estimation. Tooth dimension and skull are similar to other bone of the body and not only genetically determined but also influenced by dietary and environmental factors, so their estimation is exclusive for a particular race and geographical region [38,39].

The findings of the present study revealed that all odontometric measurement were not positively and significantly correlated with height in contrast to a study [40] who says that all odontometric measurement were positively and significantly correlated with stature. Another study on Caucasians revealed no correlation between tooth width and stature [41]. Study of Filip son and Goldson revealed no correlation between tooth width and stature in Sweden population [42]. Our study demonstrates that buccolingual dimension is more significantly correlated with height than mesiodistal dimension and among them upper right jaw teeth dimension is better than upper left jaw teeth and lower right jaw teeth are better than lower left jaw teeth for stature estimation. Our study also finds significant correlation between upper right Bucco central incisor (maxillary central incisor) and stature, which is contradicting to study done by Garn et al, who found no such correlation with maxillary central incisor [43] and similar to study done in African Americans having correlation of stature with maxillary central incisor tooth width [44].

Conclusion

Stature is one of the important determinants for establishing the identity in highly decomposed, mutilated, fragmentary human remains or skeleton remains. Present study showed that out 56 parameters, 18 having significant correlation with stature can be used for stature estimation specially when extremities are not available. Since these parameters are population specific so they may not applicable on all populations.

References

1. Kumar J, Lili Chandra. Estimation of stature using different facial measurements among the Kabui Naga of Imphal Valley, Manipur. Anthropologist. 2006; 8:1-3.

2. Jadav HR, Shah GV. Determination of personal height from the length of head in [5] Gujarat region. J Anat Soc India. 2004; 53:20-21.

3. Kalia S, Shetty SK, Patil K, Mahima VG. Stature estimation using Odontometry and skull an thropometry. Indian Journal of dental research. 2008; 19(2):150.

4. Menezes RG, Kanchan T, Kumar GP, Rao PJ, Lobo SW, Uysal S, Krishan K, Kalthur SG, Nagesh KR, Shettigar S. Stature estimation from the length of the sternum in South Indian males: a preliminary study. Journal of forensic and legal medicine. 2009; 16(8):441-443

5. Brickley M, McKinley JI. Guidelines to the Standards for Recording Human Remains. Highfield, Southampton, BABAO. 2004. http:// www. babao. org. uk/ Human remains FINAL. pdf. Accessed 22 April 2015 Is can MY. Forensic anthropology of sex and body size. Fo

6. rensic Sci Int 2005; 147:107-112.

7. Is can MY. Global forensic anthropology in the 21st century. Forensic Sci Int 2001; 117:1-6.

8. Cattaneo C. Forensic anthropology: developments of a classical discipline in the new millennium. Forensic Sci Int 2007; 165:185-193.

9. Sopher IM. The dentist, the forensic pathologist, and the identification of human remains. J Am Dent Assoc 1972; 85:1324-1329.

10. De Mendonca MC. Estimation of height from the length of long bones in a Portuguese adult population. Am J Phys Anthropol 2000; 112:39-48.

11. Mohanty NK. Prediction of height from percutaneous tibial length amongst Oriya population. Forensic Sci Int 1998; 98:137-141.

12. Holland TD. Estimation of adult stature from fragmentary tibias. J Forensic Sci 1992; 37:1223-1229.

13. Habib SR, Kamal NN. Stature estimation from hand and phalanges lengths of Egyptians. J Forensic Leg Med 2010; 17:156-160

14. Krishan K. Estimation of stature from cephalo-facial anthropometry in north Indian population. Forensic Science International. 2008; 181(1):52.

15. Agnihotri AK, Kachhwaha S, Goo goo lye K, AL lock A. Estimation of stature from cephalo-facial dimensions by regression analysis in Indo-Mauritian population. Journal of forensic and legal medicine. 2011; 18(4):167-172.

16. Waghmare VK, Gaikwad RB, Herekar NG. Estimation of the stature from the anthropometric measurement of hand length. The Internet Journal of Biological Anthropology. 2011; 4(2).

17. Shah T, Patel MN, Nath S, Bhise RS, Menon SK. Estimation of stature from cephalo-facial dimensions by regression analysis in Gujarati population. Journal of Indian Academy of Forensic Medicine. 2015; 37(3):253-257)

18. Hinchliffe J. Forensic odontology, part 2. Major disasters. Br Dent J 2011; 210:269-274

19. Sopher IM. The dentist, the forensic pathologist, and the identification of human remains. J Am Dent Assoc 1972; 85:1324-1329.

20. De Mendonca MC. Estimation of height from the length of long bones in a Portuguese adult population. Am J Phys Anthropol 2000; 112:39-48.

21. Mohanty NK. Prediction of height from percutaneous tibial length amongst Oriya population. Forensic Sci Int 1998; 98:137-141.

22. Holland TD. Estimation of adult stature from fragmentary tibias. J Forensic Sci 1992; 37:1223-1229.

23. Habib SR, Kamal NN. Stature estimation from hand and phalanges lengths of Egyptians. J Forensic Leg Med 2010; 17:156-160.

24. Lundy JK. The mathematical versus anatomical methods of stature estimate from long bones. Am J Forensic Med Pathol 1985; 6:73-76.

25. Jason DR, Taylor K. Estimation of stature from the length of the cervical, thoracic, and lumbar segments of the spine in American whites and blacks. J Forensic Sci 1995; 40:59-62.

26. Simmons T, Jantz RL, Bass WM. Stature estimation from fragmentary femora: a revision of the Steele method. J Forensic Sci 1990; 35:628-36.

27. Chiba M, Terazawa K. Estimation of stature from somatometry of skull. Forensic Sci Int 1998; 97:87-92.

28. In trona F, Jr., Di Vella G, Petra chi S. [Determination of height in life using multiple regression of skull parameters]. Boll Soc Ital Biol Sper 1993; 69:153-160.

29. Garn SM, Lewis AB, Kerewsky RS. The magnitude and implications of the relationship between tooth size and body size. Arch Oral Biol 1968; 13:129-131.

30. Henderson AM, Corruccini RS. Relationship between tooth size and body size in American Blacks. J Dent Res 1976;55(1):94-96.

31. Filip son R, Goldson L. Correlation between Tooth Width, Width of the Head, Length of the Head, and Stature. Acta Odontol Scand. 1963; 21:359-365.

32. Starrett JD, Oliver T, Robinson F, Fortson W, Knaak B, Russell CM. Width/length ratios of normal clinical crowns of the maxillary anterior dentition in man. J Clin Periodontol 1999; 26:153-157.

33. Prabhu S, Acharya AB, Madhapur MV. Are teeth useful in estimating stature? J Forensic Leg Med 2013;20(5):460-464.

34. Kalia S, Shetty SK, Patil K, Mahima VG. Stature estimation using Odontometry & 24] skull anthropometry. Indian J Dent Res. 2008; 19(2): 150-54.

35. Verze L. History of facial reconstruction. [25] Acta Biomed. 2009; 80: 5-12.

36. Patil KR, Mody RN. Determination of sex by discriminant function analysis & [26] stature by regression analysis: a lateral cephalometric study. Forensic Sci Int. 2005; 147(2-3): 175-80.

37. Krogman WM, Is can MY. The human skeleton in forensic medicine. 2 nd ed. Springfield, Illinois, U.S.A: Charles C. Thomas Pub Ltd.; 1986. p. 302-348.

38. William PL, Bannister LH, Berry MM, Collins P, Dyson M, Dusk JE, et al. Gray's Anatomy. 38th ed. ELBS/ Churchill Livistone; 1995. p. 607-10.

39. Bermudez De Castro JM, Nicolas ME. Posterior dental size reduction in hominids: the Atapuerca evidence. Am J Phys Anthropology. 1995; 96: 335-56.

40. Achla Bharti Yadav, Sumit Kumar Yadav, Neal Bharat Kedia, Abhinav Kumar Singh. An Odontometric Approach for Estimation of Stature in Indians: Cross-Sectional Analysis. Journal of Clinical and Diagnostic Research. 2016 Mar, Vol-10(3): ZC24-ZC26

41. Starrett JD, Oliver T, Robinson F, Fortson W, Knaak B, Russel CM. Width/length ratios of normal clinical crowns of the maxillary anterior dentition in man. J Clin Periodontol. 1999; 26:153-57.

42. Bermudez De Castro JM, Nicolas ME. Posterior dental size reduction in hominids: [30] the Atapuerca evidence. Am J Phys Anthropology. 1995; 96: 335-56

43. Garn SM, Lewis AB, Kerewsky RS. The magnitude and implications of the relationship between tooth size and body size. Arch Oral Biol. 1968; 13:129-31.

44. Henderson AM, Corruccini RS. Relationship between tooth size and body size in American Blacks. J Dent Res. 1976; 55:94-96.