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Determining the Correlation Between Maxillary Anterior Teeth Size with Bitragion Width, Wrist Width, Interpupillary Width, Nasal Height in Indian Population and Using These Anthropometric Measurement as A Guide For Selecting Maxillary Anterior Dimensions

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Abstract

Background: The vast number of combinations such as face form and size, Sex, Personality, and Age factor are utilized for determining the anterior tooth dimension. Whenever possible, it is advisable to record the form and shape of the natural teeth before extracting them. However, several anatomic entities and anthropometric measurements are used as a guide to select anterior teeth dimensions, but which is the most reliable indicator to determine the maxillary anterior teeth dimensions remains unclear. The study aimed to determine the correlation between maxillary anterior teeth size (Right Maxillary central incisor Length, Right Maxillary central incisor Width, Intercanine distance) with Bitragion width (BW), wrist width (WW), interpupillary width (IPW), Nasal height (NH) in Indian population. **Material & Methods:** Measurements of intraoral and extraoral landmarks made using Digital vernier caliper & Measuring tape in 173 subjects with an age range from 19 to 87 years were randomly selected fulfilling the inclusion and exclusion criteria. **Results:** The present study found that statistically significant difference (0.001) and strong correlation between Right maxillary central incisor length & width, and Intercanine distance with wrist width, nasal height & interpupillary distance, whereas, it is not significant between Right central incisor length & width, and Intercanine distance with Bitragion width. **Conclusion:** The results suggested that a high degree of correlation was seen between Wrist width, interpupillary width, nasal height, and maxillary anterior teeth dimensions. Hence, these anthropometric measurements can also be used for determining the maxillary anterior dimension in edentulous patients.

Keywords:- Bitragion width, Wrist width, Nasal height, Interpupillary width, Central incisor length, Central incisor width, Intercanine distance, Anthropometric measurements.

INTRODUCTION

Loss of teeth, the anterior region, in particular, leads to degradation of one's physical appearance and esthetic qualities which can create an inferiority complex with all its consequences, often resulting in psychological trauma.[1,2]

Teeth were selected in the ivory age mainly by dimensional measurements with very little importance given to the facial form and other dimensions of the physical structures. The thought of an esthetic selection of teeth in dental specialty was first employed by an artist named Madame Schimmelpeinik in 1815.[3]

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The first theory ever introduced for artificial teeth selection was the temperamental theory (1884), in which the patients were divided into sanguinic, lymphatic, neurotic, and biliar types depending on their temperament. The temperamental theory has considerable importance in dentistry because it was the primary theory on the selection of artificial teeth.[4]

Cigrande in 1913 proposed that the outline of the fingernail of the patient can be used to select the shape & dimension of the central incisor.[3] Subsequently, Leon Williams (1914), suggested that a correlation was between the upside-down facial shape & the shape of the upper central incisors, i.e., Theory of harmony/Geometric theory.[5] Winkler suggested that teeth selection should be predicated upon three main points. The points are Psychological, Biological-Physiological & the Biomechanical point of view. The psychological point of view is based upon the appearance of the face and esthetics. Biomechanical point of view is evolved from the mechanical limitations in the placement of anterior teeth. The Biological & physiological point of view is based upon the harmony of facial musculature & physiological limit with teeth arrangement.[3]

Lowery and Nelson (1922) proposed that a close relationship existed between face, tooth, and hard palate form/ tooth arm form.[6] Sears in 1941 proposed the Anthropometric- Cephalic index concept. This concept stated that the width of the maxillary central incisors can be estimated by the transverse circumference of the head divided by 13. This can also be evaluated by dividing the bizygomatic width by 3.3.[7]

Frush and Fischer (1956) presented the dentogenic theory of esthetics which is formulated on sex, personality & age factor (SPA) which every patient should possess. This theory was the biggest addition to William's comprehension of aesthetics, i.e., it harmonized tooth selection with patient's gender, personality, and age as they offer subjective unity, and are helpful to reconstruct dynamic unity. To keep holding on to this theory, several authors proposed a so-called "one, two, three guide". One is the central upper incisor, which represents age, two is the lateral upper incisor, which represents gender attributes and three is the upper canine, which represents personality features (powerful, determined, strong or delicate, soft and plain).[8,9,10]

Defining the ideal dimension is a difficult task considering the vast variety & individuality of features. Earlier mathematical theorems like the "Golden ratio" were applied to identify anterior teeth dimensions & the first doctor to apply this formula was Lombardi. Later Preston's (1993) measurements confirm the unsustainability of this formula.[11]

The patient's morphological & constitutional type should be respected when considering the harmony of shapes and sizes of every artificial tooth. The use of anthropometric parameters brings an analogous outcome of the width and length of anterior teeth in complete dentures comparable to the original natural teeth. Hence, delicate assessment and analysis of data obtained from our country's population help us to provide more predictable guidelines to measure the accurate dimension of missing anterior teeth.

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Anthropometry refers to the measurements of the physical body dimensions for the aim of understanding human physical variation as it plays a significant role in cosmetic surgery, prosthetics & various other data collection. Many preceding studies & works of literature used anthropometric measurements such as Bizygomatic width (BZW), Head circumference, Interalar width, Interpupillary distance (IPD), Intercommisural distance (ICMD), Interalar width (IAW), Inner canthal distance (ICD), the width of the upper lip philtrum (PHULW).

H Pound put forward an idea of using Bizygomatic width, i.e., one to one-half inches rearwards of the lateral corner of the eyes, thereby he came up with a simple equation that width of the central incisor is equal to the Bizygomatic width divided by 16. The length of the face is measured by measuring the distance from the hairline to the lower edge of the bone of the chin with the face at rest. Length of the central incisor is the length of the face divided by 6.[12]

Regardless of former efforts to assess the choice of anterior teeth, up to now no universally accepted anatomical measure had been found to accurately assist artificial tooth selection.[13]

Therefore, this clinical study was done to determine if a relationship exists between anthropometric measurements such as, Bitragion width, wrist width, interpupillary width, Nasal height, and maxillary anterior teeth dimensions such as maxillary central incisor length, maxillary central incisor width, and Intercanine distance that could assist dental practitioners in selecting esthetically appropriate maxillary anterior teeth in the absence of pre-extraction records.

MATERIAL AND METHODS

A total of 173 dentulous patients irrespective of gender were selected at random for this observational study between the age group of 19 years – 87 years from the outpatient reporting to the Department of prosthodontics in Adhiparasakthi dental college and Hospital, Melmaruvathur, Tamilnadu, India.

Inclusion criteria

1. Subjects with permanent dentitions which are morphologically normal
2. No artificial crowns or proximal restorations are placed on maxillary anteriors
3. No gingival inflammation or hypertrophy in the upper anterior region
4. No severe attrition is present in upper anteriors.

Subjects who had a trauma of the face and hand and other congenital facial malformations & who underwent plastic or reconstructive surgery of the face and hand are excluded from the study.

Informed consent for the participation in this study & for their photography was obtained from the patients. Approval for the study was obtained from Institutional Ethics Review Board on April 5, 2021(IRB Number: 2021/IRB - APR-PROSTHO 25/APDCH). The study was conducted from April 2021 to October 2021.

The subjects were comfortably seated on a chair in a relaxed state in an upright position. The following intraoral and other anatomical landmarks were measured using Digital vernier caliper 300mm (12") providing precise

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measurement with an accuracy of 0.01mm and Measuring tape [Figure 8].

1. Interpupillary width (IPW) was measured from mid pupil to mid pupil [Figure 1].
2. Wrist width (WW) was measured from the distance between outer borders of radial and ulnar styloid processes [Figure 2].
3. Nasal height (NH) was measured from nasion to subnasale [Figure 3].
4. Bitragion width (BW) was measured from straight line distance (through the nasal arc) between the right & left tragion landmark on the cartilaginous flaps in front of each ear hole. [Figure 4]
5. **Length of maxillary right central incisor (RCIL):** For uniformity, maxillary right centrals are measured from cementoenamel junction to the incisal edge in all subjects [Figure 5].
6. **Width of the maxillary right central incisor (RCIW):** Using the pointed beaks of the caliper which is placed at the widest mesiodistal dimension of the tooth, the width of the incisor is calculated. [Figure 6]
7. **Intercanine distance (ICD):** Measured from cusp tip of right maxillary canine to cusp tip of left maxillary canine (straight line distance). [Figure 7]

All measurements were measured using a digital vernier caliper in millimeters and without the application of pressure.

Figure 1: Measurement of interpupillary width (IPW)

Figure 2: Measurement of wrist width (WW)

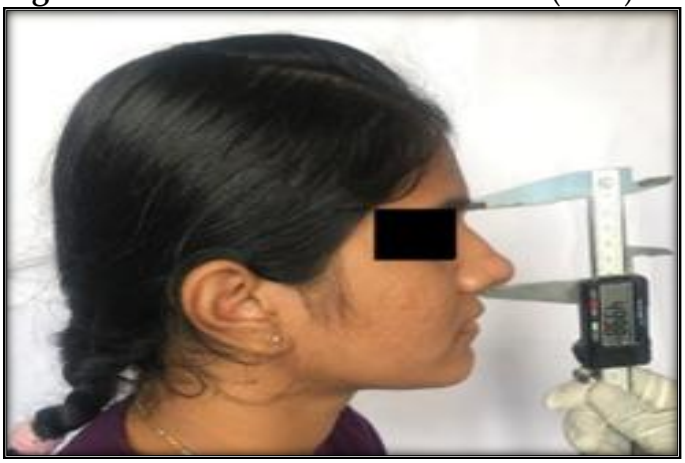

Figure 3: Measurement of Nasal height (NH)

Figure 4: Measurement of Bitragion width (BW)

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Figure 5: Measurement of length of right central incisor (RCIL)

Figure 6: Measurement of mesio-distal width of right central incisor (RCIW)

Figure 7: Measurement of Intercanine distance (ICD)

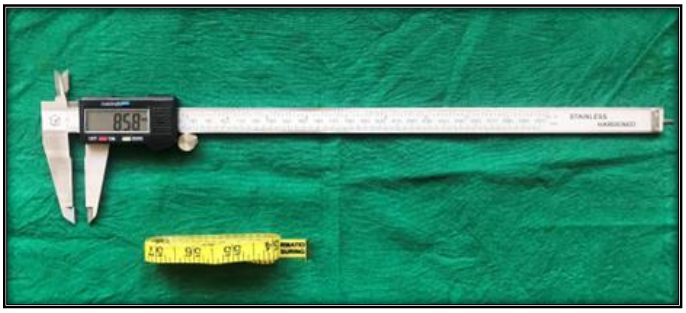

Figure 8: Distances measured using Digital vernier calliper and measuring tape

Statistical methods

Collected data were entered into Microsoft Excel software (MS office 2019) and converted into IBM SPSS Version 23.0(Windows) for statistical analysis. Descriptive statistics were calculated with mean & standard deviation and tabular presentation was done.

The method of statistical analysis used is Multiple regression analysis and Pearson's correlation coefficient to determine the correlation between Bitragion width, Wrist width, Interpupillary width, Nasal height &

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Right maxillary central incisor length, Right central incisor width, and Intercanine distance. P-value <0.05 was considered significant.

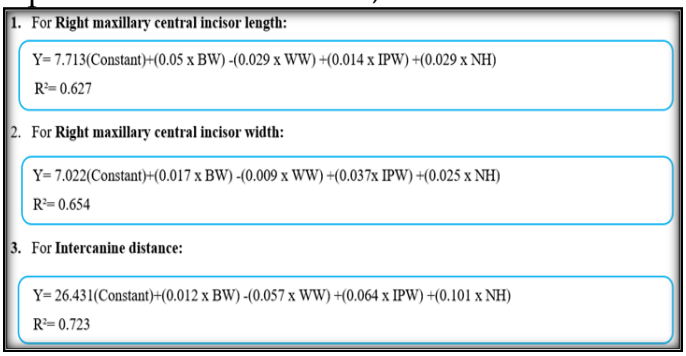
RESULTS

The mean values of Bitragion width, Wrist width, Interpupillary width, Nasal height, Right maxillary central incisor length, Right central incisor width, and Intercanine distance and Standard deviation for the above measurements were statistically analyzed and presented in [Table 1].

Pearson's correlation coefficient between Bitragion width, Wrist width, Interpupillary width, Nasal height and Right maxillary central incisor length, Right central incisor width, and Intercanine distance analyzed at 0.01 level (2-tailed) & 0.05 level (2-tailed) and presented in [Table 2].

- Significant at 0.05 level (P-VALUE= 0.046) but weak correlation (0.152) between Right central incisor length & wrist width was found in the total population
- Not statistically significant (P VALUE= 0.876) & zero correlation (0.012) found between Bitragion width & Right central incisor length
- Not statistically significant (P VALUE= 0.183) & weak correlation (0.102) found between Interpupillary width & Right central incisor length
- Not statistically significant (P VALUE= 0.065) & weak correlation (0.140) found between Nasal height & Right central incisor length
- Significant at 0.05 level (P-VALUE= 0.020) but weak correlation (0.177) between Right central incisor width & wrist width was found in the total population
- Highly Significant at 0.01 level (P-VALUE= 0.005) but weak correlation (0.212) between Right central incisor width & Interpupillary width was found in the total population
- Significant at 0.05 level (P-VALUE= 0.014) but weak correlation (0.186) between Right central incisor width & Nasal height was found in the total population
- Not statistically significant (P VALUE= 0.519) & negative correlation (-0.049) found between Bitragion width & Right central incisor width
- Statistically significant (P VALUE= 0.024) at 0.05 level but weak correlation (0.172) found between wrist width & Intercanine distance
- Statistically significant (P VALUE= 0.037) at 0.05 level but weak correlation (0.159) found between Interpupillary distance & Intercanine distance
- Highly significant (P VALUE= 0.007) at 0.01 level but weak correlation (0.206) found between Nasal height & Intercanine distance
- Not Statistically significant (P VALUE= 0.678) & No/Zero correlation (0.032) found between Bitragion width & Intercanine distance

The model of regression was hypothesized & an equation was obtained i.e.,



where Y= dependent variable (Right central incisor length, Right central incisor width,

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Intercanine distance) and the predictors are Bitragion width, Wrist width, Interpupillary width & Nasal height and presented in [Table 3-5]

Table 1: Descriptive statistics of BW, WW, IPW, NH, RCIL, RCIW, and ICD.

Descriptive Statistics			
	Mean	**Standard Deviation**	**N**
Bitragion width	271.717	15.5206	173
Wrist width	49.8397	4.69907	173
Interpupillary width	51.4138	3.77856	173
Nasal height	42.9354	4.23143	173
Right maxillary central incisor length	9.8538	1.18864	173
Right maxillary central incisor width	8.4643	.74660	173
Inetrcanine distance	33.5787	2.63397	173

Table 2: Pearson's correlation matrix for BW, WW, IPW, NH, RCIL, RCIW, and ICD.

		Bitragion width	**Wrist width**	**Interpupil-lary width**	**Nasal height**	**Right maxillary central incisor length**	**Right maxillary central incisor width**	**Inetrcanine distance**
Bitragion width	Pearson Correlation	1	.262**	.350**	.280**	.012	-.049	.032
	Sig. (2-tailed)		.000	.000	.000	.876	.519	.678
	N	173	173	173	173	173	173	173
Wrist width	Pearson Correlation	.262**	1	.381**	.330**	.152*	.177*	.172*
	Sig. (2-tailed)	.000		.000	.000	.046	.020	.024
	N	173	173	173	173	173	173	173
Interpupillary width	Pearson Correlation	.350**	.381**	1	.325**	.102	.212**	.159*
	Sig. (2-tailed)	.000	.000		.000	.183	.005	.037
	N	173	173	173	173	173	173	173
Nasal height	Pearson Correlation	.280**	.330**	.325**	1	.140	.186*	.206**
	Sig. (2-tailed)	.000	.000	.000		.065	.014	.007
	N	173	173	173	173	173	173	173
Right maxillary central incisor length	Pearson Correlation	.012	.152*	.102	.140	1	.180*	.340**
	Sig. (2-tailed)	.876	.046	.183	.065		.018	.000
	N	173	173	173	173	173	173	173
Right maxillary central incisor width	Pearson Correlation	-.049	.177*	.212**	.186*	.180*	1	.332**
	Sig. (2-tailed)	.519	.020	.005	.014	.018		.000
	N	173	173	173	173	173	173	173
Inetrcanine distance	Pearson Correlation	.032	.172*	.159*	.206**	.340**	.332**	1
	Sig. (2-tailed)	.678	.024	.037	.007	.000	.000	
	N	173	173	173	173	173	173	173

Note: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 3: Regression analysis:

Variables Entered/Removeda				
Model	**Variables Entered**		**Variables Removed**	**Method**
1	Nasal Height, Bitragion Width, Wrist Width, Interpupillary Widthb			Enter
Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**

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1		.790a	.627	.613	1.18069			
ANOVAa								
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**		
1	Regression	28.814	4	7.204	5.167	0.001	**	
	Residual	234.197	168	1.394				
	Total	263.011	172					
Coefficientsa								
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**		
		B	**Std. Error**	**Beta**				
1	(Constant)	7.713	1.787		4.315	.000		
	Bitragion width	-.005	.006	-.064	-.772	.441		
	Wrist width	.029	.021	.116	2.372	.016	*	
	Interpupillary width	.014	.027	.046	.526	.599		
	Nasal height	.029	.023	.105	1.258	.210		

a. Dependent variable: RCIL
b. Predictors: (Constant), NH, BW, WW, IPW.

Table 4: Regression analysis.

Variables Entered/Removeda							
Model	**Variables Entered**			**Variables Removed**		**Method**	
1	Nasal Height, Bitragion Width, Wrist Width, Interpupillary Widthb					Enter	
Model Summary							
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**			
1	.807a	.654	.626	.71898			
ANOVAa							
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	
1	Regression	9.029	4	2.257	4.367	.002b	**
	Residual	86.844	168	.517			
	Total	95.874	172				

Coefficientsa							
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	
		B	**Std. Error**	**Beta**			
1	(Constant)	7.022	1.088		6.452	.000	
	Bitragion width	-.017	.013	-.106	-1.293	.198	
	Wrist width	.009	.004	.183	2.279	.024	*
	Interpupillary width	.037	.017	.189	2.253	.026	*
	Nasal height	.025	.014	.141	2.391	.018	*

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a. Dependent variable: RCIW
b. Predictors: (Constant), NH, BW, WW, IPW.

Table 5: Regression analysis

Variables Entered/Removeda			
Model	**Variables Entered**	**Variables Removed**	**Method**
1	Nasal Height, Bitragion Width, Wrist Width, Interpupillary Widthb		Enter

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.852a	.723	.704	2.57937

ANOVAa							
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	
1	Regression	95.580	4	23.895	3.592	0.009	**
	Residual	1117.726	168	6.653			
	Total	1213.306	172				

Coefficientsa							
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	
		B	**Std. Error**	**Beta**			
1	(Constant)	26.431	3.905		6.769	2.07147E-10	
	Bitragion width	-.012	.014	-.073	-.892	.374	
	Wrist width	.057	.047	.102	2.218	.015	*
	Interpupillary width	.064	.060	.092	2.153	.019	*
	Nasal height	.101	.051	.163	2.158	.020	*

a. Dependent variable: ICD
b. Predictors: (Constant), NH, BW, WW, IPW.

The present study found that by applying model regression analysis there was a statistically significant difference (P VALUE=0.016) in Right maxillary central incisor length & wrist width; statistically significant difference between Right central incisor width & wrist width (P VALUE=0.024) & Interpupillary width (P VALUE= 0.026) & Nasal height (P VALUE=0.018); and statistically significant difference between Intercanine distance & wrist width (P VALUE=0.015) &Interpupillary distance (P VALUE=0.019) & Nasal height (P VALUE= 0.020) were found in the total population.

DISCUSSION

From the ancient period itself, the human body had been measured for several aspects, particularly for understanding the morphological pattern of an individual. Anthropometry is that the science handling the systematic measurement of the human individuals particularly dimensions of body calculations. The measurement concept is

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rooted in its interaction with several factors like the basic nutrition of the individual, psychological conditions, and infections. This anthropometric approach has numerous applications in various fields of medicine, such as in the field of preventive medicine for predicting the risk factors of Diabetes, Cardiovascular ailments, Cancers, and other various chronic diseases. And also, in the Siddha system of medicine, where they measure the various anatomical locations of vital energy points and its clinical applications were known as "Varma Maruthuvam".[14]

In the field of dentistry, especially in Prosthodontics, it is used for the selection and replacement of the anterior teeth. Because in the absence of pre-extraction records, various anthropometric parameters such as intra-oral anatomic landmarks, extra-oral anatomical landmarks, geometric & mathematical measurements have been proposed as aids for effective artificial teeth selection.

Kenneth Edward Reckelhoff (2015) used anthropometric measurement of the wrist in his study on Ultrasound evaluation of the normal ulnar nerve in Guyton's tunnel syndrome or "Cyclist's Palsy".[15] In another study by Mohamed H. Imam (2019) took wrist width measurement for identifying individuals with increased risk of carpal tunnel syndrome (CTS)/ Compression of the median nerve. In a few other studies, the Wrist width anthropometric parameter serves as an important tool and is utilized for assessing entrapment neuropathies, screening children at risk of obesity-related morbidities & cardiometabolic morbidities such as hypertension.[16]

Hyekyung Seo (2016) utilized Bitragion-pronasale arc & subnasale arc & other facial anthropometric dimensions to characterize facial dimensions of Korean children for designing a properly fitted respirator.[17] Other studies also used Bitragion width, Bitragion chin arc, Bitragion submandibular arc measurements during a head scan for designing headgear and helmets.[18]

Bitragion width – subnasale arc measured in the present study showed a mean of 271.717mm & a standard deviation of 15.52mm. This is in accordance with the findings established by the ISO Technical specification guide for anthropometrics, which showed a mean value of 277.5mm & a standard deviation of 13.1mm. Hence, we found that Bitragion width – subnasale arc was a reliable parameter in the determination of maxillary anterior teeth dimensions.[19]

In this study, the Interpupillary distance showed a mean of 51.41 and a standard deviation of 3.77mm. This is in accordance with the findings established by the ISO Technical specification guide for anthropometrics which showed a mean value of 61.9mm and a standard deviation of 3.5mm. This present study revealed that Interpupillary width can also be used for determining the maxillary anterior teeth dimensions. However, no comparative data for Nasal height and wrist dimensions was available.[19]

Interpupillary width is chosen as they are important components to an individual's facial esthetics, easily measured, have high interexaminer reliability and adult eye dimensions are established early & maintained throughout adult life (As the adult

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interpupillary distance was reached by the fourth year). In addition to that, no differences related to race or age have been shown in the literature.

In spite of this certainty, a weak correlation (r=0.15) was found between IPD and maxillary anterior teeth dimension, hence the authors do not support its use in anterior teeth selection, which is not consistent with our present study.

Ashish Rathnachand Jain et al, found in their study that Interpupillary width was strongly positively correlated with combined width of maxillary anterior teeth (CMA) (r=0.983) & right maxillary central incisor width (RMCIW) (r=0.959) which is similar to the present study, which shows significant (0.019) & strong correlation (r=0.852) between Intercanine distance (ICD) and Interpupillary distance at 0.05 level by applying model regression analysis.[20]

This study is also in agreement with a study done by H.M.AL-EL-Sheikh et al, where they found a significant correlation between Interpupillary width & maxillary anterior teeth width (r= 0.2134; p value=<0.01) by applying Pearson's correlation analysis.[21]

Ashish R. Jain et al used IPW as an anthropometric parameter in determining the width of the maxillary anterior. Different groups of Populations taken for this study were Indians, Mongloids, Aryans, Kurdish, Caucasians, Brazilian & Saudi and they revealed that the Indian population showed the highest correlation than other population groups mainly Indian males (r=0.809) followed by Indian females (r=0.726). The reason may be due to the male physique dominance over the female irrespective of the age group.[22]

The human nose has an esthetic feature in the facial region that differs in anatomy & morphology among racial groups & shows most characteristic differences during the analysis of ethical & racial differences. So far, no correlation study considered Nasal length as an anthropometric parameter for determining the anterior teeth dimensions.[23]

Various literature reviews depicted that many anthropometric measurements & measuring devices have been described & used by professionals over the years for the purpose of identifying the correct dimension of maxillary anteriors but none of them is fully accepted or considered completely correct. To overcome this state, this investigation was undertaken to find simple yet feasible anthropometric measurements to identify the relationship between maxillary anterior dimensions such as central incisor length, central incisor width, and Intercanine distance & Bitragion width, Wrist width, Interpupillary width, and Nasal height. Similar studies have not been mentioned about the anthropometric parameters like Bitragion width, Wrist width in the earlier dental literature. Hence, they can be considered as a novel parameter to utilize in the selection of correct anterior teeth in edentulous patients.

Limitations

This study has several limitations, which are the definitive conclusions and simplified equations to determine the anterior teeth size can be obtained if more samples of varied racial groups were included, consequently the R^2 value in model regression analysis can be increased &

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thereby precise outcome can be obtained. A few more variables and other measuring tools can be added to verify the collected data & their reliability in determining the correlation between anthropometric measurements & anterior teeth dimensions.

CONCLUSIONS

Though various anthropometric parameters have been discussed & proposed as an aid for effective artificial tooth selection, it can be inferred from the present study that Bitragion width, Wrist width, Interpupillary width, Nasal height can also be used as a guide in determining the anterior tooth form in the absence of pre-extraction records and also to provide a prosthesis that defies detection.

REFERENCES

1. Gomes VL, Gonçalves LC, do Prado CJ, Junior IL, de Lima Lucas B. Correlation between facial measurements and the mesiodistal width of the maxillary anterior teeth. J Esthet Restor Dent. 2006;18(4):196-205. doi: 10.1111/j.1708-8240.2006.00019_1.x.
2. Strajnić L, Vuletić I, Vucinić P. The significance of biometric parameters in determining anterior teeth width. Vojnosanit Pregl. 2013;70(7):653-9. doi: 10.2298/vsp1307653s.
3. Suhasini SJ, Suresh V. Comparing the anthropometric measurements as a tool for anterior teeth selection. Indian J Public Health Res Dev. 2020;11(5):131-135
4. White JW. Temperamental theory in relation to the teeth. Dental cosmos. 1884;26:113-120
5. Williams JL. A new classification of human tooth with special reference to a new system of artificial teeth. Dental cosmos. 1914;56 :627-636
6. Lowery PC. Art & esthetics as applied to prosthetics. Dental cosmos. 1921;63:1223-1226
7. Kern BE. Anthropometric parameters of tooth selection. J Prosthet Dent. 1967;17:431
8. Frush JP, Fisher RD. How dentogenic restorations interpret the personality factor. J Prosthet Dent. 1956;6:441-449
9. Shah M, Verma AK, Chaturvedi S. A comparative study to evaluate the vertical position of maxillary central incisor and canine in relation to incisive papilla line. J Forensic Dent Sci. 2014;6(2):92-6. doi: 10.4103/0975-1475.132534.
10. Frush JP, Fisher RD. The age factor in dentogenics. J Prosthet Dent. 1957;7:5-12
11. Preston JD. The Golden proportion revisited. J Esthet Restor Dent.1993;5:247-251
12. Pound E. Lost fine arts in the fallacy of ridges. J Prosthet Dent. 1954;4:6-16
13. Ellakwa A, McNamara K, Sandhu J, James K, Arora A, Klineberg I, et al. Quantifying the selection of maxillary anterior teeth using intraoral and extraoral anatomical landmarks. J Contemp Dent Pract. 2011;12(6):414-21. doi: 10.5005/jp-journals-10024-1069.
14. Vinayak S, Gayathri R, Wilson E, Rajkumar S, Kanakavalli K. Interpreting wrist circummetric signs of traditional siddha medicine (TSM) with standard anthropometric variables for quality data analysis. J Global Biosci. 2019;8(3):6051-6061
15. Prasetyo M, Rahardja RR, Yanuar A, Prihartono J, Setiawan SI. Ultrasonography evaluation of the normal ulnar nerve in adult: Comparison of the cross-sectional area at elbow extension and flexion. Eur J Radiol Open. 2021;8:100331. doi: 10.1016/j.ejro.2021.100331.
16. Boz C, Ozmenoglu M, Altunayoglu V, Velioglu S, Alioglu Z. Individual risk factors for carpal tunnel syndrome: an evaluation of body mass index, wrist index and hand anthropometric measurements. Clin Neurol Neurosurg. 2004;106(4):294-9. doi: 10.1016/j.clineuro.2004.01.002.
17. Kim H, Han DH, Roh YM, Kim K, Park YG. Facial anthropometric dimensions of Koreans and their associations with fit of quarter-mask respirators. Ind Health. 2003;41(1):8-18. doi: 10.2486/indhealth.41.8.

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Page no- 184-196 | Section- Research Article (Dentistry)

18. Park BD, Corner BD, Hudson JA, Whitestone J, Mullenger CR, Reed MP. A three-dimensional parametric adult head model with representation of scalp shape variability under hair. Appl Ergon. 2021;90:103239. doi: 10.1016/j.apergo.2020.103239.
19. Liu Y, Xi P, Joseph M, Zhuang Z, Shu C, Jiang L, et al. Variations in Head-and-Face Shape of Chinese Civilian Workers. Ann Occup Hyg. 2015;59(7):932-44. doi: 10.1093/annhyg/mev026.
20. Jain AR, Nallaswamy D, Ariga P. Determination of correlation of width of maxillary anterior teeth with extraoral factor(Interpupillary width) in Indian population. J Clin Diagnostic Res. 2019;13(7):ZC10-ZC17
21. al-el-Sheikh HM, al-Athel MS. The relationship of interalar width, interpupillary width and maxillary anterior teeth width in Saudi population. Odontostomatol Trop. 1998 Dec;21(84):7-10.
22. Jain AR, Nallaswamy D, Ariga P, Ganapathy DM. Determination of correlation of width of maxillary anterior teeth using Extraoral & Intraoral factors in Indian population. A systematic Review. Review Article. World J Dent. 2018;9(1):68-75
23. Ray SK, Saha K, Kumar A, Banjare S. Anthropometric study of Nasal index among the population of western Uttar Pradesh region. Int J Sci Study. 2016;4(2):65-70.

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