

# Facial indicator in the determination of maxillary central incisor length in Nepalese population – A clinical study



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## ABSTRACT

**Background:** The maxillary anterior teeth are important in achieving pleasing facial and dental esthetics. Among those, the central incisor has a key role in determining the esthetic as they are the most dominant and visible teeth during smile. Determining the proper size of these teeth is important but difficult in the absence of pre extraction records in edentulous condition.

**Aims and Objectives:** This study was conducted to find a suitable guide in determining the length of the central incisor by correlating it with some independent facial structure like nose length in a small population of Chitwan district. **Materials and Methods:** The distance from the bridge of the nose to the base was compared to the length of the maxillary central incisor in 321 patients of both sexes between the age groups of 20–35 years. The actual length of the maxillary incisor was measured and also calculated by regression analysis to determine some fixed ratio. The calculated value by this ratio was compared to the actual measured value to find if the difference was significant. **Results:** The difference between the calculated distances and the actual measured distance was found to be 0.340 in males and 0.266 in females, which was statistically significant ( $P < 0.001$ ). **Conclusion:** The distance from the bridge of the nose to base of the nose may be used as a reference to estimate the length of the central incisor in the Nepalese population, although sample included subjects from the central Chitwan District of Nepal.

**Key words:** Maxillary central incisor length; Regression analysis; Nose length; Facial indicator

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## INTRODUCTION

Facial esthetics is one of the primary goals of prosthetic rehabilitation of the patients. It is not concentrated on the teeth or jaws separately, but involves dental and maxillofacial portions. The size, form, and color of the teeth must be in harmony with the surrounding oral and facial structures to achieve a successful dental restoration.<sup>1,2</sup> The maxillary central incisors play a significant role in the smile and each anterior tooth portrays a different aspect of a person. The selection of maxillary anterior artificial teeth as a component of hard tissue becomes the prime concern when prosthesis is fabricated as the teeth are the visible component, while the patients performs various functions such as speech and smile.

Frush and Fisher, in 1955, gave the concept of dentogenesis, in which tooth selection was done based on patients age, sex, and personality.<sup>3</sup> Apart from selecting proper form and color of the teeth, selecting the proper anterior teeth size becomes difficult in the absence of any pre-extraction records.

Actual tooth size and morphology are addressed in the literature, but inconsistent information is presented. When no pre-extraction records are available, one should depend on the anatomic measurement to find appropriate size of the teeth. Anatomical landmarks such as shape of the nose, intercanine distance (ICD), inner canthal width, interpupillary distance (IPD), and interalar distance have been used as the guide for determining the width of maxillary anterior teeth.<sup>4-8</sup>

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The width of the teeth is considered by some to be more critical than the length;<sup>9,10</sup> however, studies have found some specific ratio of width: length for an esthetic smile.<sup>11-13</sup>

Although the length is primarily dependent on the available interocclusal space, sometimes restoring to the full space available becomes unesthetic as the dental and facial height will not be in harmony. Various studies have suggested reference guides toward estimation of the width of central incisors, but no suitable guides to ascertain the length of the incisor.

With this objective, the present study is attempted to arrive at a correct proportion for determining as far as possible the correct length of the maxillary central incisor with the help of certain vertical facial measurements (i.e., bridge of the nose to base of the nose) and see if any relation exists between them.

### Aims and objectives

This study was conducted to find a suitable guide in determining the length of the central incisor by correlating it with some independent facial structure like nose length in a small population of Chitwan district.

## MATERIALS AND METHODS

A prospective cross-sectional study was carried out from October 2021 to March 2022 after receiving the ethical clearance from the College of Medical Sciences, Bharatpur-10, Chitwan. The study was carried on 321 subjects which included undergraduate BDS students, hospital staffs, and nursing and health assistants students. Subjects between the age of 20 and 35 years with class I occlusion, non attrited teeth with no anterior restoration and absence of crowding, interdental spacing, or recession were selected for the study. Subjects having prosthetic replacement such as crowns, malformed tooth, pathological migration, and traumatic occlusion of anterior teeth were excluded from the study. Informed consent was taken from the head of the departments and the college before recording the data.

Digital Vernier caliper was used to measure the length of the nose and the maxillary central incisor height maxillary incisor height – measured (MIH-M). To measure the length of nose, distance between the bridges of the nose to the base of the nose length (NL) was considered. The patient was seated comfortably in the dental chair in an upright position looking straight forward. With the help of the metallic scale kept between the inner canthi of both the eyes in the area of the bridge of the nose, a center point was marked with the help of indelible marker. Another point was marked at the center of the base of the nose in a

relaxed position. The distance between them was measured using the caliper.

The right maxillary central incisor height was measure from the gingival zenith/cementoenamel junction to the incisal edge MIH-M. To avoid bias, care was taken to measure accurately by repeating the readings 3 times and the average was recorded for all measurements. Correlation between these two measurements was studied to find whether regression analysis could be applied to find the dependent variable. Here, NL was taken as the independent variable and maxillary central incisor height as the dependent variable. This calculated value (MIH-C) was compared with hypothetical ratio 1:5 of the incisor height to the NL (MIH-R) to see if the ratio of 1:5 can be applied to determine the incisor height in case of known NL. The paired sample t-test was carried out to find if the calculated values by two methods was statistically significant.

All the data were entered and statistical analysis was done by SPSS V13 software.

## RESULTS

Out of 321 samples, 154 were male and 167 were female. The mean distance between the bridges of the nose to the base of the nose (NL) in males was 48.04 mm±2.54 and females was 46.74 mm±2.91. The actual height of the maxillary central incisors measured by the caliper showed the mean values of 9.26 mm±0.683 in males and 9.08 mm±0.766 in females (Table 1).

Correlation study was done between the NL and the incisor length which showed positive correlation with values 0.507 in males and 0.510 in females (Table 2).

The calculated height of the maxillary centrals by regression analysis (MIH-C) was found to be 9.241±0.343 in males and 9.0651 ± 0.393 in females. Similarly, the height of those teeth calculated as 1/5<sup>th</sup> of the measured NL (1/5 NL) indicated as MIH-R was 9.609±0.509 in males and 9.384±0.582 in females (Table 3).

The difference between the calculated distance and the actual measured distance was found to be 0.340 in males

**Table 1: Distance from the bridge of the nose to the base (NL= Nose length) and actual measured height of the central incisor (MIH-M= maxillary incisor height - measured)**

Sex	Number	Variables	Min	Max	Mean	SD
Male	154	NL	41.20	56.02	48.045	2.546
		MIH-M	7.76	11.27	9.268	0.683
Female	167	NL	40.21	54.73	46.74	2.911
		MIH-M	6.97	11.69	9.082	0.766

**Table 2: Regression results for predicting incisor length using NL as the independent variable in males and females**

Sex	Constant (c)	m=slope ( $\beta$ )	P-value	R=Correlation (Y)	R <sup>2</sup>
Male	2.734	0.136	<0.003	0.507	0.257
Female	2.802	0.134	<0.001	0.510	0.260

**Table 3: Calculated maxillary central incisor height using regression analysis (MIH-C) and using 1/5<sup>th</sup> ratio of tooth to nose length (MIH-R)**

Sex	Dependent variables	Min	Max	Mean	SD
Male	MIH-C	8.32	10.32	9.241	0.343
	MIH-R	8.24	11.20	9.609	0.509
Female	MIH-C	8.18	10.14	9.065	0.393
	MIH-R	8.04	10.95	9.348	0.582

and 0.266 in females, which was statistically significant ( $P<0.001$ ).

## DISCUSSION

Selection of proper anterior teeth size is one of the primary needs of prosthodontics rehabilitation as during esthetic restoration dental and facial structures harmony should be evaluated for a pleasing dental and facial esthetics. French A, in 1951, conducted a study on selection and arrangement of anterior teeth in dentures and concluded that teeth should be arranged according to the face.<sup>14</sup> The relationship between the anterior tooth size and the various facial structures such as interalar width, bizygomatic width, and intercanthal distance have been studied in the past and derived a proper ratio of tooth width to the facial structures which help in complete denture fabrication.<sup>15-19</sup> In a study by Gomes et al., the results showed a significant correlation between all facial elements and the combined mesiodistal width of the six teeth, when observed from the frontal aspect. The ICD, IPD, and ICM showed the highest probability of being correlated to the mesiodistal width of the teeth ( $P=0.000$ ).<sup>20</sup>

During restoration of missing anterior teeth, central incisors play a significant role as maxillary central incisors are the most dominant teeth in the smile and commonly the most visible one during smile.<sup>21</sup> Various studies found the tooth width to height ratio during esthetic smile analysis which suggested that length of the incisor being equally important during the treatment.<sup>13,22-23</sup> Hence, the present study was carried out to determine the relation between the central incisor length and other facial measurements like the NL in the absence of pre extraction records in the subset of the Nepalese population.

Other similar studies were carried out to determine the length of the central incisor in relation to the facial height

by Pound who suggested that the distance from the hairline to the lower edge of the bone of the chin divided by 16 provides the length of the maxillary incisors.<sup>24,25</sup>

Study by Radia et al., about the relationship between the maxillary central incisor and facial proportion found that the maxillary central incisor length was associated with total facial length in the ratio of 1:18.<sup>26</sup>

In cases of patients with loss of vertical height, determining the total facial length might be difficult. Hence, this study attempts to study the relation of the NL to the incisor length.

Our study showed gender variation in relation to the NL and the central incisor length with males having greater values than the females as in other studies.<sup>13,27,28</sup>

The mean length of central incisor was 9.17 (0.732) mm, which was found to be shorter than that found in the Europeans and caucasian populations.<sup>29</sup>

The recorded data showed a positive correlation between the NL and the central incisor length with correlation coefficient of 0.507 in males and 0.510 in females. This was similar to study by Wisam Al-Hathol who studied the association between facial length and central incisor length in Saudi population and the result showed significant correlation between the two with correlation coefficient of 0.156 ( $P=0.007$ ).

As the recorded data showed positive correlation, the regression analysis was used to find the value of the dependent variable, that is, the tooth length using NL as the independent variable (MIH-C). Thus, obtained value for the tooth length and actual measured length of the nose was compared which gave a ratio of 5:1.

Using this ratio, the tooth length was calculated (MIH-R) which gave the values of  $9.609\pm 0.509$  in males and  $9.384\pm 0.582$  in females. The difference between this calculated length and the actual measured length was 0.340 in males and 0.266 in females. Paired sample t-test applied to compare this difference was found to be statistically significant ( $P<0.001$ ).

As this difference was very slight, our study proposed that ratio 1:5 could be applied to find the length of the central

incisor teeth in absence of pre-extraction records taking bridge of the nose to base of the nose as a reference which was similar to study by Shetty et al.<sup>30</sup>

Our study was limited to the population from one district only which does not cover diverse ethnicity and races of people and further studies covering the whole population could be done to substantiate the presumption.

In spite of this, the suggested ratio of 1:5 gave consistent results for both male and females individual in this study.

### Limitations of the study

This ratio may serve as a guide in the esthetic enhancement of the maxillary anterior dentition, however subjective norms of the individual should also be given priority. These are the small cross sectional studies and further studies on a larger population are suggested to further authenticate these results.

## CONCLUSION

In the absence of any pre-extraction records, reference to the existing facial structures could be taken to determine the length of the central incisor as in earlier published studies<sup>15-18,24,25</sup> who suggested methods based on the relationship between the anterior teeth and certain facial measurements. As preliminary guide in determining the size of maxillary central incisor certain ratio of the bridge of the nose to the base of the nose and the incisor length may be taken, in which this study was proposed to be 5:1.

Mean length of the central incisor was found to be 9.26 mm in males and 9.08 mm in females and mean NL was found to be 48.04 mm in males and 46.74 mm in females. Individually, measured value for the NL and tooth length showed a positive correlation ( $r=0.507$  in males and  $0.501$  in females). A ratio of 1:5 was proposed to be the most acceptable to determine the length of the incisor in case of known value of the NL.

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**Author's Contribution:**

**SS-** Concept and design of the study; prepared first draft of manuscript; interpreted the results; reviewed the literature; and manuscript preparation;  
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