Implementation of Anthropometric Measurements in Anterior Teeth Selection in Two Ethnic Groups: An In Vivo Study

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Aim: The aim of this study was to evaluate whether there is any consistent relationship between interalar distance and six maxillary anterior teeth in two ethnic groups. Materials and Methods: Two hundred subjects (Assamese 100 and Nyishi 100) of different age and sex ranging from 18 to 33 years were identified for this study. The distance between two widest points marked on the alae of nose was measured by means of sliding digital caliper. Statistical analysis of variance was the testing method to determine whether the nasal width and intercanine distance were different in various racial groups. Results: The mean nasal width dimension in Assamese group was 36.38 mm (range 28.55–50.00 mm). The mean nasal width dimension in Nyishi group was 35.73 mm (range 31.34–41.90 mm). For the nasal width, no significant difference was observed between two races. For the canine cusp tip to cusp tip distance, the mean value of Assamese subjects was 43.63 mm (range 39.02–50.02 mm), whereas the Nyishi presented 41.77 mm (range 36.69–47.05 mm). Conclusion: For the two racial groups studied, the measurements of the interalar width showed a weak correlation with the canine to canine distance, not sufficiently high to be used as a predictive factor. It suggests to select wider artificial teeth. Practitioners can use ethnic norms as guides, not absolute values.

Keywords: Anterior teeth selection, ethnic groups, nasal index, racial norms

INTRODUCTION

In complete denture prosthodontics, selection of anterior teeth of appropriate size is one of the most difficult and confusing aspects, as it is the prime factor for esthetics. Of the many anthropometric methods, one is the “Nasal Index” method. In this method, lines are dropped from the widest part of alae on both sides to the labial surface of maxillary occlusal rim. This position suggests the tip of artificial canine.[1]

Various studies performed earlier to determine relationship between nasal width and maxillary anterior artificial teeth width for racial populations have shown no significant relation between the two measurements.[2-5] Many of the studies were conducted in the Caucasian population and findings were used for other ethnic groups. Johnson[6] criticized that the prosthodontics literature studied only the Caucasian race with very few note about other races. However, no such studies have been conducted in North East Indian population to determine whether nasal width can be a guide for selection of artificial anterior teeth. This study was undertaken in Nyshi and Assamese populations.

The main objectives of this study were to determine whether nasal width can be used as a guide to select proper width of maxillary anterior teeth and to evaluate whether there is any relationship of nasal width and

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canine to canine distance of two ethnic groups. So, the null hypothesis tested were that for the population of the subjects measured there would be no relation between nasal width and maxillary canine to canine distance and nasal index cannot be taken as a guide to select denture teeth in the tested ethnic groups.

MATERIALS AND METHODS
Two hundred subjects (Assamese 100 and Nyishi 100) of various sex and age (18–33 years) were selected for this study. The inclusion criteria of the study were subjects having natural maxillary teeth with no orthodontic treatment or extraction; good alignment of canine and incisors with no spacing, drifting, or attrition with more than one third of incisal edge; who have no congenital or surgical defects; and who have no gingival inflammation or hypertrophy. The exclusion criteria of the study were subjects with partial denture prostheses, artificial crowns on the maxillary canines, with systemic diseases, infectious diseases, and allergic to study materials. Informed consent was taken from all subjects and approval was obtained from Institute Ethics Committee.

The two widest points were located on the alae of nose with view to record maximum width between the two landmarks [Figure 1]. The inner edges of the arms of the sliding digital caliper were coated with skin marking color and placed at the highest contour of each ala in horizontal and vertical directions. The points obtained on the alae at intersection of lines were used for making the interalar measurement. A sliding digital caliper is used to measure the distance between the two widest points, without applying pressure and measurement recorded in millimeters. The average value of interalar width was computed and recorded. The impressions of maxillary arches of the subjects were made with irreversible hydrocolloid material and immediately poured in type III dental stone to obtain the study models.

The tips of the maxillary canine teeth were located by marking two lines on the labial and lingual surfaces denoting the labial and lingual ridges. The point where these two lines met incisally indicated the tip of canine tooth. The maxillary canine tips were located on both sides of the arch. Dental floss was used to measure the circumferential arc distance between the cusp tip of both the canine at the greatest facial curvature superio-inferiorly on the study cast [Figure 2]. It was marked with graphite pencil and then measured with help of sliding digital caliper. Straight-line measurement was made from left to right canine cusp tip. The actual canine cusp tip was the intersection of the line joining the incisal edges and labiolingual long axes. The measurements of intercanine distances were recorded thrice. The average was computed and recorded. The same person carried out all measurements and recorded all information.

Statistical analysis
For statistical evaluation and computation, the mean, standard deviation, and standard error of each ethnic group were calculated. Analysis of variance was used to evaluate whether the nasal width and canine to canine distance were different in relation to ethnicity. For mean comparison, \( t \) test \((P < .05)\) was used. The Pearson coefficient was used to evaluate relationship between the canine to canine distance and the nasal width in the two racial groups studied.
RESULTS

The mean values of the nasal width and canine cusp tip distance of two ethnic groups and the results of t test are tabulated in Table 1. Pearson correlation analysis between the nasal width and inter-canine distance in the two races has shown no significance. It is not good enough to be used as a predictive factor. The coefficients (r) obtained are presented in Table 2. Selection error information to use nasal width for selection of six anterior teeth width is shown in Table 3.

DISCUSSION

Without any pre-extraction dental record and without established studied racial norms of the population, selection of anterior maxillary teeth for edentulous population will be difficult. Zarb[7] stated, with respect to interalar width, that “this is not sufficiently reliable for use as the means for the final selection.” Lee[8] stated that interalar distance is the same as distance between canine tips each measured in a straight line. But in this study interalar distance and canine tip distance showed a difference in both the two races. Ahn et al.[9] study showed the most reliable relationship between the intercanine distance and interalar width (inter canine distance was 37.88 ± 2.15 mm and inter alar width was 37.85 ± 2.29 mm).

In this study, there is no statistical significant difference of nasal width in both races. This may be due to admixture of the two races as they are living side by side since long past. But within the racial group, there is significant difference between measurement values of the nasal width and intercanine distance, which is not in agreement with Lee statement.

Another study by Fabiana and Sergio[10] stated that the correlation between the canine to canine distance and interalar width was not high enough to be used as a predictive factor. Nasal width alone should not be used to determine the combined width of maxillary anterior teeth. Anatomical facial references, such as bizygomatic width, corners of the mouth, and interpupillary distance also can be helpful.[11]

Keng[12] has stated that men have greater nose width and slightly greater canine to canine distance compared to women. However, there was no demonstrable correlation between nasal width and canine to canine distance. Latta et al.[13] stated that there was correlation between mouth width, interalar width, bizygomatic width, or interpupillary distance for the population as a whole, or when it was divided into race, sex, or group. They suggested the use of more than one facial measurement to estimate the combined width of the maxillary anterior teeth. In a study of Yeong and Huggare,[14] the results reflect gender differences in both angular and linear cephalometric craniofacial measurements. Rostamkhany et al.[15] studied the ratio of mean central and lateral incisor lengths to mean vertical dimension of occlusion. They concluded that by use of measurements in this we can determine the length and width of study and other methods anterior teeth. Study of Zlatarić et al.[16] suggests that the use of facial measurements for the selection of artificial denture teeth is generally inaccurate, which is in agreement with this study.

Jiraporn[17] conducted a study and concluded that maxillary intercanine width (middle to middle) and interalar width were not different in men but a little bigger in women. Goncalves et al.[18] concluded in their study that the individual tooth width can be determined if the combined width of the maxillary anterior teeth is obtained by using a flexible millimeter ruler.

CONCLUSION

The following conclusions were drawn from the results of this study:

| Table 1: The mean values of the nasal width and intercanine distance (cusp tips) of two racial groups and the results of t test |
|---------------------------------------------------------------|
| | Nasal width (mm) | Intercanine distance (cusp tip) (mm) | Statistical significance |
| Assamese subjects | 36.38 ± 3.22 | 43.63 ± 2.52 | Significant |
| Nyishi subjects | 35.73 ± 2.73 | 41.77 ± 2.28 | Significant |
| Statistical significance | Not significant | Not significant |

| Table 2: Correlation coefficient (r) of both groups |
|--------------------------------------------------|
| Racial group | Coefficient (r) |
| Assamese | 0.096 |
| Nyishi | 0.216 |

| Table 3: Selection error due to use of the nasal width for the selection of the six interior teeth width |
|---------------------------------------------------------------|
| Information | Assamese | Nyishi |
| Error statistics (mm) | 12.03 | 11.31 |
| Largest error for wider teeth | 6.19 | 3.98 |
| Largest error for narrower teeth | 8.57 | 8.61 |
| Mean | 1.25 | 1.47 |

SD = standard deviation
1. For the two ethnic groups studied, interalar width showed a weak correlation with the canine to canine distance, not enough useful as a predictive factor.
2. When natural teeth width and denture teeth width derived from interalar width compared, inaccuracy of nasal width method is clearly shown for the two ethnic groups. Also nasal width method suggests for wider artificial teeth.
3. Racial norms can only be used as guides for anterior teeth selection. They cannot be used as absolute values. The prosthesis must correlate with an individual not with a norm.
4. The use of more than one facial measurement in the selection of maxillary complete denture anterior artificial teeth is suggested.

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Conflicts of interest
There are no conflicts of interest.

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