## Original research

# Rakosi Jarabak Analysis for the South Indian Population -A Cross-Sectional Study

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**ABSTRACT:**

**Background**: Rakosi jarabak analysis has been proved to be effective in predicting the facial growth pattern, morphological characters, reaction to various orthopedic approaches, and functional alterations. Most of these established cephalometric values are based on average values for the Caucasian population. Whereas cephalometric values vary among different populations and have shown variations among different ethnic groups, gender, and age. The objectives of this paper are to develop Rakosi Jarabak cephalometric norms for the South Indian population and compare the measures to values from other ethnic groups.

**Materials and Method:** Facad software was used to track the lateral cephalograms of 100 non-growing patients from the South Indian population who satisfied our inclusion criteria. Nineteen craniofacial parameters of Jarabak's analysis were measured.

**Result**: A comparison between the males and females of the South Indian population showed a significant difference between the three parameters. Comparison of the south Indian male, female values, and overall values with established norms of various ethnic populations showed significant differences among various parameters.

**Conclusion**: This study establishes the south Indian ethnic norms for Rakosi Jarabak analysis. The south Indian norms vary from caucasian norms showing significant ethnic .These differences need to be considered when analyzing the cephalogram . These values will help in customizing treatment plans based on ethnic norms.The study concludes that distivariationsnct sets of cephalometric norms should be developed for different ethnic groups in order to aid orthodontists and surgeons in optimising treatment plans based on local norms.

*Keywords: Cephalometry, Ethnic group, India, Caucasians, Ethnicity, South Indian, Indian population*

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**INTRODUCTION:**

Lateral cephalogram plays a vital role in clinical diagnosis and treatment planning as well as in growth studies that evaluate the development of skeletal and dental structures [1,2]. A Cephalometric analysis according to Thomas Rakosi is based on elements chosen with great care over years of experience. Various Cephalometric analyses have been used to evaluate facial forms, skeletal relations of the jaws in various malocclusions [3,4].

Cephalometric norms can be defined as the ideal cephalometric values for a particular group of population with the same age group, gender, and race [9]. For many years orthodontists have focused on establishing the cephalometric norms and any deviation from the prescribed values is considered abnormal. Most of these established cephalometric values are based on average values for the caucasian population [10–12]. Whereas cephalometric values vary among different populations and have shown variations among different ethnic groups, gender, and age [13–16]. As a consequence, it is necessary to adjust the normal values, which are based on actual measurements obtained from population-based studies on various ethnic groups. India is diverse and a multiethnic country with more than a thousand ethnic groups [17,18]. The established criteria for the Caucasian population do not apply to the Indian population due to structural variances, dietary habits, socioeconomic condition, cultural background, genetic, and environmental variables that impact growth and development.. There are only a limited number of studies on cephalometric analyses establishing norms for the South Indian population [19–24].

Bjork created a face diagram utilizing angular and linear measurements to estimate the pattern of facial prognathism[5,6]. Jarabak cephalometric analysis was based on Bjork's work to determine the mandibular growth rotations [7]. Jarabak cephalometric analysis uses the cranial base (Sella-Nasion plane) as the reference plane to compare the sagittal, vertical, and intermaxillary relationships to determine various morphological characteristics, facial growth patterns, and skeletal patterns [6]. The analysis predicts the direction of mandibular growth from a facial polygon. This analysis has been proved to be effective in predicting the facial growth pattern, morphological characters, reaction to various orthopedic approaches, and functional alterations [6]. This analysis aids in the selection and design of orthopedic devices, assessing the therapeutic effects, and identifying proclivity towards orthopedic modification [8].

The objectives of this paper is to develop Rakosi Jarabak cephalometric norms for the South Indian population and compare the measures to values from other ethnic groups.

**MATERIALS AND METHOD:**

In this cross-sectional study, South Indian adults visiting a private dental college between the age group of 18-30 years were selected. Ethical committee approval was obtained from the institutional ethical review board. Sample size calculation was done using the Jarabak ratio as the primary outcome and was carried out using G*Power software V 3.1 from the means and standard deviations of the two-class I samples (65.7 +/- 3.9 %; 68.5 +/- 3.5 %) from the study by Esra Jassim (2009)[3]. Keeping the alpha error at 0.01, power at 0.95, and an allocation ratio of 1 for a two-sided t-test, resulted in a sample size of 47 subjects per group. Intraoral examination was performed by an experienced orthodontist to check for the presence of any malocclusion. A total sample size of 100 subjects (50 females and 50 males) was selected for the study. Subjects with a complete set of permanent dentitions (not including third molars), ideal to mild class I malocclusion, and having no history of previous orthodontic treatment were included in the study. Subjects having clinical asymmetry or any other skeletal and dental deformity were excluded from the study sample. Lateral

cephalograms were obtained from the subjects who fulfilled the inclusion criteria and consented to participation in the study. The lateral cephalogram of all the selected patients was taken with the Orthophos XG 3D(Dentsply Sirona, UK) machine at 72 kVp, 15 mA, and an exposure time of 9.4 s. All Lateral cephalometric images taken were obtained in digital (jpeg) format. The lateral cephalograms were traced digitally using the Facad software version 3.1 (Ilexis AB, Linköping, Sweden). Various landmarks for Rakosi Jarabak analysis was performed, and angular measurements were analyzed (Figure 1)[25]. All the cephalograms were traced by a single examiner who was well trained in using the software. All the cephalometric values were entered into an excel sheet.

Twenty percent of the sample size was used for the pilot study. Lateral cephalograms of ten subjects from each gender were selected randomly using random.org, an online true random number service, and retraced one week after carrying out the original measurements for estimating the intra-examiner error. Another expert examiner performed the lateral cephalometric analysis on the selected 20 cephalograms. The reliability coefficient was calculated using the formula: 1-$(Se^2 \div St^2)$, where $Se^2$ is the variance due to random error and $St^2$ is the total variance of the measurements. The measurements showed a high correlation, with values ranging from 0.99 to 0.97. All statistical analyses were performed with a 95% confidence level using IBM SPSS software version 23 (IBM, New York, United States). Descriptive Statistics was performed to obtain mean, and standard deviation (S.D). Independent samples t-test was performed for the comparison of the various parameters between genders. Comparison of South Indian means values to test for statistically significant differences between various ethnic populations including Caucasians, Brazilians, Iraqis. Saudi, Pakistani, Nepali, and Bangladeshi based on sex and overall average values were done using an independent t-test[3,8,26–31]. The level of significance was set at 5%.

**RESULT:**

A total of Nineteen cephalometric parameters (Saddle angle, Articular angle, gonial angle upper and lower, the sum of angle, SNA, SNB, ANB, SNPog, Basal plane angle, Palatal - occlusal plane angle, Occlusal-Mandibular plane angle, Inclination angle, SN-Mandibular plane angle, Y-axis, P: A Facial ratio, Angulation of upper incisor-SN plane, Angulation of upper incisor to -Palatal plane, Angulation of lower incisor -Mandibular plane, Incisor position upper incisor- N-Pog, Incisor position lower incisor N pog, Interincisal angle) were assessed with rakosi analysis among 50 South Indian males and 50 South Indian females. Among the parameters assessed eighteen were angular and one was a proportion. The mean and standard deviation of the overall South Indian population, South Indian male and female population along with the p values obtained from comparison of male and female mean values are presented in Table 1. The Jarabak values of males and females from various ethnic groups and their comparison with the South Indian population are mentioned in Tables 2 and 3 respectively. The Jarabak values for the overall South Indian population and their comparison with various other ethnic populations are presented in Table 4. Inter operator reliability test showed high inter-operator reliability, with values ranging from 0.99 to 0.97.

**Table 1: Comparison of various Jarabak standard values between Gender**

| PARAMETERS MEASURED | SOUTH INDIAN FEMALE AVERAGE | SOUTH INDIAN MALE AVERAGE | P-VALUE |
|---|---|---|---|
| Saddle angle | $125.46^0 \pm 4.6^0$ | $121.8^0 \pm 5.9^0$ | 0.538 |
| Articular angle | $140.9^0 \pm 7.3^0$ | $145.6^0 \pm 7.7^0$ | 0.984 |
| Gonial angle | $123.8^0 \pm 7^0$ | $119.9^0 \pm 7^0$ | 0.394 |
| Gonial upper | $52.29^0 \pm 4.5^0$ | $51.1^0 \pm 4.1^0$ | 0.27 |
| Gonial lower | $71.5^0 \pm 5.4^0$ | $70^0 \pm 5.2^0$ | 0.707 |
| Sum angle | $390.6^0 \pm 7.2^0$ | $388.6^0 \pm 6.3^0$ | 0.725 |
| SNA | $82.5^0 \pm 3.7^0$ | $82.55^0 \pm 4.1^0$ | 0.786 |
| SNB | $80^0 \pm 3.4^0$ | $80.5^0 \pm 4.1^0$ | 0.683 |
| ANB | $2.50 \pm 1.40$ | $2.050 \pm 10$ | 0.647 |
| SNPog | $80.7^0 \pm 3.7^0$ | $81.6^0 \pm 4.1^0$ | 0.922 |
| Basal plane angle | $24^0 \pm 5.8^0$ | $24^0 \pm 6^0$ | 0.719 |
| Palatal -Occlusal plane angle | $6.99^0 \pm 3.6^0$ | $6.49^0 \pm 3.1^0$ | 0.906 |
| Occlusal-Mandibular plane angle | $17.05^0 \pm 5.1^0$ | $17.5^0 \pm 5.9^0$ | 0.118 |
| Inclination angle | $87.25^0 \pm 3.2^0$ | $88.48^0 \pm 3.1^0$ | 0.946 |

| | | | |
|---|---|---|---|
| SN-Mandibular plane angle | $30.^0 \pm 7^0$ | $28.6^0 \pm 6.3^0$ | 0.77 |
| Y axis | $65.9^0 \pm 4.5^0$ | $64.6^0 \pm 4^0$ | 0.515 |
| P:A Facial ratio | $68.5 \pm 6.3$ | $69.5 \pm 5.4$ | 0.724 |
| Angulation of upper incisor-SN plane | $118.4^0 \pm 5^0$ | $115.2^0 \pm 1^0$ | 0.002 |
| Angulation of upper incisor to - Palatal plane | $55.35^0 \pm 5^0$ | $60.15^0 \pm 9.5^0$ | 0.071 |
| Angulation of lower incisor - Mandibular plane | $105.8^0 \pm 7.1^0$ | $101.75^0 \pm 7.1^0$ | 0.97 |
| Incisor position upper incisor- N-Pog | $8.6 \pm 3.4$mm | $7.6 \pm 3.3$mm | 0.06 |
| Incisor position lower incisor N pog | $10.3 \pm 5$mm | $5.4 \pm 4.3$mm | 0.17 |
| Interincisal angle | $106^0 \pm 14.3^0$ | $114.3^0 \pm 14.3^0$ | 0.015 |

**TABLE 2:The Jarabak values of males from various ethnic groups and their comparison with the South Indian population.**

| SOUTH INDIAN MALE | MEAN | S.D | t | p-value | |
|---|---|---|---|---|---|
| GONIAL ANGLE | | | | | |
| SOUTH INDIAN MALE | 121.80 | ±5.90 | | | |
| BRAZIL MALE | 121.56 | ±6.91 | 0.1251 | 0.9008 | |
| IRAQ MALE | 122.80 | ±4.80 | 0.8264 | 0.4111 | |

| PAKISTAN MALE | 126.48 | ±2.18 | 4.9703 | 0.0000 | ** |
|---|---|---|---|---|---|
| SAUDI MALE | 125.81 | ±5.21 | 3.1968 | 0.0020 | ** |
| ARTICULAR ANGLE | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 145.60 | ±7.70 | | | |
| BRAZIL MALE | 148.00 | ±8.21 | 1.0329 | 0.3055 | |
| IRAQ MALE | 143.73 | ±5.63 | 1.2459 | 0.2165 | |
| PAKISTAN MALE | 137.84 | ±2.95 | 6.2639 | 0.0000 | ** |
| SAUDI MALE | 140.90 | ±8.01 | 2.6064 | 0.0109 | ** |
| GONIAL ANGLE | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 119.90 | ±7.00 | | | |
| BRAZIL MALE | 122.19 | ±4.17 | 1.4376 | 0.1554 | |
| IRAQ MALE | 123.93 | ±5.80 | 1.4504 | 0.1510 | |
| PAKISTAN MALE | 128.48 | ±3.02 | 1.1606 | 0.2496 | |
| SAUDI MALE | 127.28 | ±6.57 | 1.5415 | 0.1272 | |
| UPPER GONIAL ANGLE | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 51.10 | ±4.10 | | | |
| BRAZIL MALE | 50.63 | ±4.15 | 1.1885 | 0.2390 | |
| IRAQ MALE | 50.33 | ±4.19 | 0.9608 | 0.3396 | |

| PAKISTAN MALE | 52.08 | ±1.03 | 0.6158 | 0.5399 | |
| SAUDI MALE | 52.17 | ±4.57 | 1.0061 | 0.3174 | |
| LOWER GONIAL ANGLE | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 70.00 | ±5.20 | | | |
| BRAZIL MALE | 71.56 | ±4.82 | 1.4117 | 0.1629 | |
| IRAQ MALE | 73.53 | ±4.10 | 1.0493 | 0.2973 | |
| PAKISTAN MALE | 74.00 | ±3.60 | 1.0300 | 0.3064 | |
| SAUDI MALE | 75.10 | ±4.01 | 1.0295 | 0.3064 | |
| SUM OF ANGLES | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 388.60 | ±6.30 | | | |
| BRAZIL MALE | 391.75 | ±6.02 | 1.8011 | 0.0764 | |
| IRAQ MALE | 390.47 | ±4.50 | 1.5384 | 0.1280 | |
| PAKISTAN MALE | 392.12 | ±2.38 | 3.4827 | 0.0008 | ** |
| SAUDI MALE | 393.99 | ±3.77 | 4.8111 | 0.0000 | ** |
| JARABAK RATIO | | | | | |
| MALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MALE | 69.50 | ±5.4 | | | |
| BRAZIL MALE | 66.83 | ±5.11 | 1.7939 | 0.0775 | |
| IRAQ MALE | 68.57 | ±3.59 | 0.9201 | 0.3603 | |

| PAKISTAN MALE | 63.88 | ±0.6 | 7.2699 | 0.0000 | ** |
|---|---|---|---|---|---|
| SAUDI MALE | 65.04 | ±3.7 | 4.4067 | 0.0000 | ** |

**TABLE 3:The Jarabak values of females from various ethinic groups and their comparison with the South Indian female population.**

| SADDLE ANGLE | | | | | |
|---|---|---|---|---|---|
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 125.46 | ±4.60 | | | |
| BRAZIL FEMALE | 124.38 | ±6.34 | 0.6541 | 0.5152 | |
| IRAQ FEMALE | 126.20 | ±5.78 | 0.7307 | 0.4669 | |
| PAKISTAN FEMALE | 126.92 | ±3.20 | 1.6859 | 0.0961 | |
| SAUDI FEMALE | 125.73 | ±4.99 | 0.3177 | 0.7515 | |
| ARTICULAR ANGLE | | | | | |
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 140.90 | ±7.30 | | | |
| BRAZIL FEMALE | 144.88 | ±8.49 | 1.8766 | 0.0648 | |
| IRAQ FEMALE | 143.35 | ±6.17 | 1.7242 | 0.0882 | |
| PAKISTAN FEMALE | 136.24 | ±5.62 | 3.0526 | 0.0032 | ** |
| SAUDI FEMALE | 142.90 | ±7.67 | 1.1618 | 0.2488 | |

| GONIAL ANGLE | | | | | |
|---|---|---|---|---|---|
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 123.80 | ±7.00 | | | |
| BRAZIL FEMALE | 122.06 | ±5.40 | 1.1306 | 0.2621 | |
| IRAQ FEMALE | 123.33 | ±4.55 | 0.3879 | 0.6990 | |
| PAKISTAN FEMALE | 127.76 | ±3.15 | 3.3719 | 0.0012 | ** |
| SAUDI FEMALE | 126.17 | ±8.15 | 1.3399 | 0.1841 | |
| UPPER GONIAL ANGLE | | | | | |
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 52.29 | ±4.50 | | | |
| BRAZIL FEMALE | 50.31 | ±5.31 | 1.4977 | 0.1388 | |
| IRAQ FEMALE | 50.58 | ±3.30 | 2.0829 | 0.0402 | ** |
| PAKISTAN FEMALE | 52.82 | ±1.63 | 0.7408 | 0.4612 | |
| SAUDI FEMALE | 51.11 | ±4.50 | 1.1502 | 0.2535 | |
| LOWER GONIAL ANGLE | | | | | |
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 71.50 | ±5.40 | | | |
| BRAZIL FEMALE | 71.75 | ±3.57 | 0.2292 | 0.8194 | |

| | | | | | |
|---|---|---|---|---|---|
| IRAQ FEMALE | 72.70 | ±3.98 | 1.2117 | 0.2289 | |
| PAKISTAN FEMALE | 73.28 | ±3.60 | 1.6953 | 0.0943 | |
| SAUDI FEMALE | 75.32 | ±5.49 | 3.0636 | 0.0030 | ** |
| SUM OF ANGLES | | | | | |
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 390.60 | ±7.20 | | | |
| BRAZIL FEMALE | 391.31 | ±4.81 | 0.4855 | 0.6288 | |
| IRAQ FEMALE | 392.88 | ±4.70 | 1.8038 | 0.0747 | |
| PAKISTAN FEMALE | 390.18 | ±5.51 | 0.2774 | 0.7823 | |
| SAUDI FEMALE | 394.79 | ±5.58 | 2.9317 | 0.0044 | ** |
| JARABAK RATIO | | | | | |
| FEMALE | MEAN | S.D | t | p- value | |
| SOUTH INDIAN FEMALE | 68.50 | ±6.30 | | | |
| BRAZIL FEMALE | 66.11 | ±3.03 | 2.1541 | 0.0347 | ** |
| IRAQ FEMALE | 65.80 | ±3.92 | 2.4911 | 0.0146 | ** |
| PAKISTAN FEMALE | 63.70 | ±1.96 | 4.9307 | 0.0000 | ** |
| SAUDI FEMALE | 64.28 | ±4.24 | 3.5986 | 0.0006 | ** |

**TABLE 4: The Jarabak values for the overall South Indian population and their comparison with various other ethnic populations.**

| SADDLE ANGLE | | | | | |
|---|---|---|---|---|---|
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MEAN | 123.50 | ±5.60 | | | |
| IRAQ MEAN | 124.74 | ±5.60 | 1.4232 | 0.1565 | |
| BANGLADESH MEAN | 122.29 | ±1.13 | 2.1180 | 0.0354 | ** |
| NEPAL MEAN | 125.28 | ±5.97 | 2.2188 | 0.0276 | ** |
| ARTICULAR ANGLE | | | | | |
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MEAN | 143.46 | ±7.80 | | | |
| IRAQ MEAN | 143.51 | ±5.91 | 0.0513 | 0.9591 | |
| BANGLADESH MEAN | 138.80 | ±2.24 | 5.7423 | 0.0000 | ** |
| NEPAL MEAN | 141.20 | ±6.14 | 2.3096 | 0.0219 | ** |
| GONIAL ANGLE | | | | | |
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MEAN | 121.78 | ±7.50 | | | |

| IRAQ MEAN | 123.59 | ±5.10 | 1.8676 | 0.0636 | |
| BANGLADESH MEAN | 124.62 | ±2.90 | 3.5318 | 0.0005 | ** |
| NEPAL MEAN | 124.31 | ±6.59 | 2.5760 | 0.0107 | ** |
| UPPER GONIAL ANGLE | | | | | |
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN  MEAN | 51.60 | ±4.10 | | | |
| IRAQ MEAN | 50.47 | ±3.68 | 1.8762 | 0.0624 | |
| NEPAL MEAN | 52.30 | ±3.65 | 1.2966 | 0.1962 | |
| LOWER GONIAL ANGLE | | | | | |
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MEAN | 70.00 | ±5.20 | | | |
| IRAQ MEAN | 73.06 | ±4.03 | 4.3119 | 0.0000 | |
| NEPAL MEAN | 72.29 | ±5.28 | 3.1499 | 0.0019 | ** |
| SUM OF ANGLES | | | | | |
| OVERALL | MEAN | S.D | t | p- value | |
| SOUTH INDIAN MEAN | 388.60 | ±6.30 | | | |

| IRAQ MEAN | 391.84 | ±4.74 | 3.8274 | 0.0002 | |
| NEPAL MEAN | 390.80 | ±7.04 | 2.3794 | 0.0183 | ** |
| JARABAK RATIO | | | | | |
| OVERALL | MEAN | S.D | t | p-value | |
| SOUTH INDIAN MEAN | 69.00 | ±5.80 | | | |
| IRAQ MEAN | 66.99 | ±4.00 | 2.6770 | 0.0082 | |
| NEPAL MEAN | 67.07 | ±6.37 | 2.2871 | 0.0232 | ** |

## DISCUSSION:

In this cross-sectional study, the Rakosi Jarabak norms for South Indian populations were determined. The results of this study provide norms for Jarabak's analysis in the South Indian population that are significantly different from those of other races such as Caucasians, Saudis, and Brazilians. Amongst the genders, we found a significant difference between south Indian males and females concerning upper incisor to SN plane value and interincisal angle, suggesting that south Indian females have more proclined upper incisor than males.

## Skeletal parameters:

On comparing parameters amongst the different populations, the Saddle angle of the South Indian population was found to be similar to that of the Caucasians and Iraqis, indicating that the glenoid fossa in all three populations was located in similar positions. However, we found that these values were significantly higher than those found in the Bangladeshi population indicating an anteriorly positioned glenoid fossa and significantly lower than those found in the Nepali populations, indicating a more posteriorly positioned glenoid fossa. The Pakistani and Saudi male populations had more anteriorly located glenoid fossa than the South Indian male population. However, no such difference was observed in the female values of all the population. The Articular angle of the South Indian population was similar to that of the Caucasians and Iraqis . Bangladeshi and Nepalese populations, on the other hand, had a more retrognathic mandible. In comparison to the Bangladeshi and Nepalese populations, the upper and lower gonial angles, seen in the South Indian population suggested a horizontal growth pattern . Gonial angles in South Indian females were found to be significantly lower than the Pakistani population, whereas the South Indian male values did not show any deviations . The sum of the posterior angles also suggested a horizontal growth pattern. In comparison to Iraqi, and Nepali populations, the Jarabak ratio of South Indians, suggested a relatively greater posterior facial height and a horizontal growth pattern[27,29].

The south Indian population's Palatal - Occlusal plane angle showed a lower value and the occlusal to a mandibular plane angle showed a higher value. But both the values compensated for each other and resulted in a basal plane angle close to the Caucasian value. The mean Inclination Angle obtained for the South Indian population was similar to the Caucasian value[25].

**Dental parameters:**

In comparison to Caucasians and North Indian population, the angle of the upper incisor to SN plane and the angle of the upper incisor to the palatal plane indicated that the upper incisors are more proclined in the South Indian population [25,32]. Females in the South Indian population had greater upper incisor procalination than males. The lower incisor to mandibular plane angle shows a more proclined lower incisors in the south Indian population[25].

Even though Bangladesh, Nepal, Pakistan are neighboring countries of India, yet, our study had found differences in their facial morphology as seen in their cephalometric values. This further emphasizes the need for more cephalometric norms based on ethnic populations. To our knowledge, this is the first study that has both established South Indian Rakosi Jarabak norms and compared them with the Caucasian and various other ethnic populations. Also, most of the studies were done using convenient sampling. We had not considered linear measurements in our study to avoid possible magnification errors.

**LIMITATIONS AND FUTURE RECOMMENDATIONS:**

India is a land of unity amongst diversity with multiple ethnic origins residing within the country. In the future, a pan-Indian study with a multicentric study design will be the need of the hour to evaluate the current results with a broader perspective giving us better insight into the facial morphological variations among various populations.

**CONCLUSION:**

This study establishes the south Indian ethnic norms for Rakosi Jarabak analysis. The south Indian norms vary from caucasian norms showing significant ethnic. These differences need to be considered when analyzing the cephalogram . These values will help in customizing treatment plans based on ethnic norms. The study concludes that different sets of cephalometric norms should be developed for different ethnic groups in order to aid orthodontists and surgeons in optimising treatment plans based on local norms

**CONFLICT OF INTEREST:**

There are no conflicts of interest.

**GRANT SUPPORT AND FINANCIAL DISCLOSURE:**

None

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