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ORIGINAL ARTICLE

Cranial Base Morphology Across Skeletal Class I, II, and III Malocclusions: A Cephalometric Study in Bangladeshi Adults

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ABSTRACT

Background: *The cranial base plays a pivotal role in craniofacial growth and development, potentially influencing sagittal jaw relationships. Understanding the association between cranial base angle and skeletal malocclusion is essential for accurate orthodontic diagnosis and treatment planning.* ***Objective:*** *To evaluate the relationship between cranial base angle and sagittal skeletal malocclusion among orthodontic patients.* ***Methods & Materials:*** *This analytic cross-sectional study was conducted at the Department of Orthodontics, BSMMU, Dhaka, from February 2019 to March 2020. A total of 90 untreated orthodontic patients (18-25 years) were divided into three groups (Class I, II, III; n=30 each) based on the ANB angle. Lateral cephalogrph were traced for SNA, SNB, ANB, N-S-Ba angle, S-N, S-Ba, and N-Ba lengths. Data were analyzed using ANOVA and Pearson correlation.* ***Results:*** *The mean cranial base angle (N-S-Ba) was significantly different among groups (Class I: 127.93±2.07°, Class II: 132.40±3.70°, Class III: 123.67±3.60°; p<0.001). Significant negative correlations were observed between cranial base angle and SNA (r=-0.630 to -0.691) and SNB (r=-0.677 to -0.751) across all groups. ANB angle showed a positive correlation with cranial base angle in the total sample (r=+0.754, p<0.001).* ***Conclusion:*** *Cranial base angle demonstrates a significant association with sagittal skeletal malocclusion, with Class II showing the largest and Class III the smallest angles. The cranial base angle may serve as a valuable diagnostic parameter in predicting sagittal jaw relationships.*

Keywords: *Cephalometry, Cranial base, Malocclusion, Orthodontics, Sagittal skeletal pattern*

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INTRODUCTION

The cranial base serves as the structural foundation of the craniofacial complex, playing a pivotal role in determining the spatial relationship between the maxilla and mandible [1]. Its growth trajectory, which is largely completed by early childhood, exerts a profound influence on the subsequent development of the facial skeleton and the eventual sagittal jaw relationship [2]. The maxilla articulates with the anterior cranial base, while the mandible is functionally and developmentally related to the posterior cranial base, making the morphology of this region a critical determinant of anteroposterior jaw discrepancies [3]. Consequently, variations in cranial base angulation and length have been implicated in the etiology of sagittal skeletal malocclusions [4]. Sagittal skeletal malocclusions, classified as Class I, II, or III based on the ANB angle, represent a spectrum of anteroposterior jaw disharmonies with significant functional and esthetic implications [5]. Class II malocclusion is characterized by a retrognathic mandible or prognathic maxilla, while Class III malocclusion typically presents with a prognathic mandible or retrognathic maxilla [6]. The establishment of an accurate diagnosis and effective treatment plan hinges upon a comprehensive understanding of the underlying skeletal morphology, including the often-overlooked contribution of the cranial base [7]. Traditional cephalometric analyses, while invaluable, have sometimes treated the cranial base as a stable reference plane, potentially underestimating its role as a variable in malocclusion etiology [8]. The relationship between cranial base angle and sagittal skeletal pattern has been the subject of considerable research, yet findings remain inconclusive and sometimes contradictory [9]. Some studies have reported a significant association between a more obtuse cranial base angle and Class II malocclusion, and a more acute angle with Class III malocclusion [10]. This is supported by the observation that an obtuse cranial base angle tends to displace the mandible more distally, contributing to a Class II tendency, whereas a more acute angle is associated with a more anterior mandibular position and a Class III tendency [11]. However, other investigations have found no significant differences in cranial base angles among different skeletal classes, suggesting that cranial base flexure may not be a primary etiological factor in all populations [12]. Such discrepancies may be attributed to variations in study populations, methodologies, and the specific cephalometric landmarks and angles measured (e.g., N-S-Ba vs. N-S-Ar) [13]. Despite the abundance of literature, a consensus on the predictive value of the cranial base angle for sagittal skeletal patterns remains elusive. Furthermore, regional and ethnic variations in craniofacial morphology

necessitate population-specific investigations [14]. Given the limited data on the South Asian population, particularly from Bangladesh, this study was undertaken to evaluate the relationship between the cranial base angle (N-S-Ba) and sagittal skeletal malocclusion among orthodontic patients. We hypothesized that the cranial base angle would exhibit a significant association with different sagittal skeletal patterns, with Class II malocclusion demonstrating a more obtuse angle and Class III a more acute angle compared to Class I.

METHODS & MATERIALS

This analytic cross-sectional study was conducted at the Department of Orthodontics, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from February 2019 to March 2020. A total of 90 untreated orthodontic patients aged 18 to 25 years were enrolled using purposive sampling. The sample size was calculated using the formula $N=[(Z\alpha+Z\beta)/C]^2+3$ [15], with a final sample of 30 participants per group to account for potential dropouts.

Inclusion criteria: Patients with permanent dentition, aged 18 to 25 years, with pretreatment lateral cephalograph were included. Participants were classified based on the ANB angle: Class I (2-4°), Class II (>4°), and Class III (<2°). Both male and female patients were included.

Exclusion criteria: Patients with craniofacial disorders, facial asymmetries, previous orthodontic treatment, history of maxillofacial trauma, congenital deformities (e.g., cleft lip and palate), distorted cephalograph, or those with respiratory obstruction affecting head posture were excluded.

Study procedure: Lateral cephalograph were obtained using a cephalometric X-ray machine with 165-cm film-to-tube distance and rigid head fixation. Subjects were positioned with the sagittal plane perpendicular to the X-ray path, Frankfort plane parallel to the horizontal, teeth in centric occlusion, and lips relaxed. Cephalograph were traced on acetate sheets using 2H pencils. SNA, SNB, ANB, N-S-Ba angle, S-N, S-Ba, and N-Ba lengths were measured. Methodological tracing error was assessed using Dahlberg's formula [16] on 20 randomly selected cephalographs, with errors ranging from 0.35° to 0.64° for angular and 0.32 mm to 0.48 mm for linear measurements, considered insignificant.

Data analysis: Data were analyzed using SPSS version 26.0. Normality was assessed using the Kolmogorov-Smirnov test. Descriptive statistics (mean, standard deviation) were calculated. One-way ANOVA compared cranial base characteristics among groups. Pearson correlation assessed relationships between cranial base angle and sagittal parameters. An unpaired t-test compared male and female measurements. A chi-square test evaluated gender distribution. Significance was set at $p<0.05$.

RESULT

A total of 90 untreated orthodontic patients aged 18 to 25 years were enrolled in this analytic cross-sectional study. Patients were divided into three groups based on ANB angle: Class I (n=30), Class II (n=30), and Class III (n=30). Normality testing using the Kolmogorov-Smirnov test confirmed that all variables were normally distributed ($p>0.05$). The demographic characteristics of the study population are presented in *Table I*. The mean age was 20.47±1.83 years in Class I, 20.17±1.86 years in Class II, and 19.87±1.70 years in Class III, with no significant difference among groups (p=0.437). The majority of patients were female across all groups (60.0% in Class I, 53.3% in Class II, and 56.7% in Class III), with no significant association between sex and malocclusion type (p=0.873).

Table I: Demographic Characteristics of the Study Population

Variables	Class I (n=30)	Class II (n=30)	Class III (n=30)	p-value
Age (years), Mean ±SD	20.47±1.83	20.17±1.86	19.87±1.70	0.437ns
Sex, n (%)				
Male	12 (40.0)	14 (46.7)	13 (43.3)	0.873ns
Female	18 (60.0)	16 (53.3)	17 (56.7)	

Data were expressed as mean ±SD or frequency (percentage). ANOVA and Chi-square test were performed. ns=not significant.

Comparison of mean SNA, SNB, and ANB angles among the three groups is presented in *Table II*. The mean SNB angle was 80.80±2.87° in Class I, 78.43±4.63° in Class II, and 86.53±5.49° in Class III ($p<0.001$). The mean ANB angle was 2.93±0.78° in Class I, 6.60±1.59° in Class II, and -4.10±2.63° in Class III ($p<0.001$). Significant differences were observed in SNB and ANB angles among the three groups, while SNA angle showed no significant difference (p=0.063).

Table II: Comparison of Mean SNA, SNB, and ANB Angles Among Skeletal Class I, Class II, and Class III Malocclusion

Variables	Class I (Mean ±SD)	Class II (Mean ±SD)	Class III (Mean ±SD)	p-value
SNA angle (°)	83.73±2.90	84.87±3.98	82.43±4.73	0.063
SNB angle (°)	80.80±2.87	78.43±4.63	86.53±5.49	<0.001*
ANB angle (°)	2.93±0.78	6.60±1.59	-4.10±2.63	<0.001*

*Data were expressed as mean ±SD. ANOVA test was performed. *Significant.*

Comparison of cranial base parameters among the three groups is presented in *Table III*. The mean cranial base angle (N-S-Ba) was 127.93±2.07° in Class I, 132.40±3.70° in Class II, and 123.67±3.60° in Class III ($p<0.001$). The mean S-N length was 74.37±3.49 mm in Class I, 76.57±3.94 mm in Class II, and 73.03±3.02 mm in Class III ($p<0.001$). The mean N-Ba length was 118.47±5.82 mm in Class I, 121.97±5.46 mm in Class II, and 112.74±6.66 mm in Class III ($p<0.001$). No significant difference was observed in S-Ba length among the three groups (p=0.103).

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Table II: Comparison of Cranial Base Parameters Among Skeletal Class I, Class II, and Class III Malocclusion

Variables	Class I (Mean ±SD)	Class II (Mean ±SD)	Class III (Mean ±SD)	p-value
N-S-Ba angle (°)	127.93±2.07	132.40±3.70	123.67±3.60	<0.001*
S-N length (mm)	74.37±3.49	76.57±3.94	73.03±3.02	<0.001*
S-Ba length (mm)	50.30±4.84	51.83±4.01	49.53±3.65	0.103
N-Ba length (mm)	118.47±5.82	121.97±5.46	112.74±6.66	<0.001*

*Data were expressed as mean ±SD. ANOVA test was performed. *Significant.*

Correlation analysis between cranial base angle (N-S-Ba angle) and SNA, SNB, and ANB angles is presented in *Table IV*. The cranial base angle showed a significant negative correlation with SNA angle in Class I (r=-0.630, p<0.001), Class II (r=-0.691, p<0.001), and Class III (r=-0.464, p=0.010). Similarly, significant negative correlations were observed between cranial base angle and SNB angle in Class I (r=-0.677, p<0.001), Class II (r=-0.751, p<0.001), Class III (r=-0.480, p=0.007), and the total sample (r=-0.766, p<0.001). The ANB angle showed a significant positive correlation with cranial base angle in Class II (r=+0.568, p=0.001) and the total sample (r=+0.754, p<0.001).

Table IV: Correlation (r) of Cranial Base Angle (N-S-Ba) with SNA, SNB, and ANB Angles

Variables	Class I (n=30)		Class II (n=30)		Class III (n=30)		Total (n=90)	
	r	p	r	p	r	p	r	p
SNA	-0.63	<0.001*	-0.691	<0.001*	-0.464	0.010*	-0.184	0.082
SNB	-0.677	<0.001*	-0.751	<0.001*	-0.48	0.007*	-0.766	<0.001*
ANB	0.146	0.442	0.568	0.001*	0.167	0.377	0.754	<0.001*

*Pearson correlation test was performed. *Significant.*

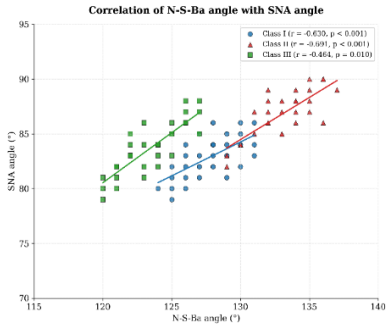


Figure 1: Scatter plot showing correlation of N-S-Ba angle with SNA angle in different malocclusion groups

Figure 1 shows the negative correlation between cranial base angle (N-S-Ba) and SNA angle across all three malocclusion groups. The scatter plots demonstrate that as the cranial base angle increases, SNA angle tends to decrease, with the strongest negative correlation observed in Class II malocclusion (r=-0.691).

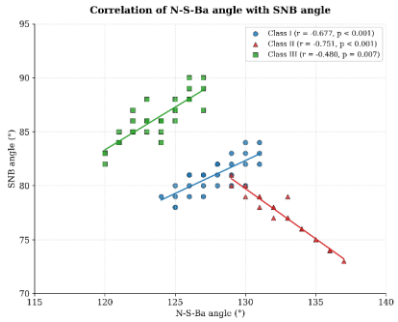


Figure 2: Scatter plot showing correlation of N-S-Ba angle with SNB angle in different malocclusion groups

Figure 2 illustrates the negative correlation between cranial base angle (N-S-Ba) and SNB angle across all three malocclusion groups. The scatter plots reveal that as the cranial base angle increases, SNB angle tends to decrease, with the strongest negative correlation observed in the total sample (r=-0.766).

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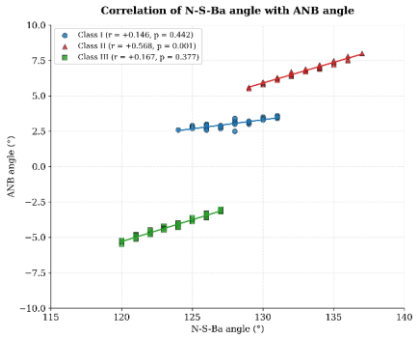


Figure 3: Scatter plot showing correlation of N-S-Ba angle with ANB angle in different malocclusion groups

Figure 3 demonstrates the positive correlation between cranial base angle (N-S-Ba) and ANB angle, particularly evident in Class II malocclusion (r=+0.568) and the total sample (r=+0.754). As the cranial base angle increases, the ANB angle tends to increase, reflecting a greater anteroposterior discrepancy.

DISCUSSION

The present study was undertaken to evaluate the relationship between cranial base angle (N-S-Ba) and sagittal skeletal malocclusion among orthodontic patients. Our findings demonstrate that the cranial base angle exhibits significant differences among Class I, II, and III malocclusions, with Class II showing the most obtuse angle and Class III the most acute angle. These results support the hypothesis that cranial base morphology plays a meaningful role in the development of anteroposterior jaw relationships and may serve as a valuable diagnostic parameter in orthodontic assessment. The most notable finding of this study was the significant difference in mean N-S-Ba angle among the three skeletal classes (127.93±2.07° in Class I, 132.40±3.70° in Class II, and 123.67±3.60° in Class III; p<0.001). Class II malocclusion demonstrated the largest cranial base angle, while Class III exhibited the smallest. This pattern is consistent with the established concept that an obtuse cranial base angle tends to displace the mandible more posteriorly, contributing to a Class II tendency, whereas a more acute angle is associated with a more anterior mandibular position and Class III tendency [5]. A recent study from Nepal also reported that the saddle angle was significantly larger in Class II compared with Class I and Class III skeletal patterns (P < 0.05), with a mean difference of 3.22° and 4.45°, respectively [14]. Similarly, an Iraqi population-based study found that the mean saddle angle was smaller in the skeletal Class III group and larger in the skeletal Class II group for both genders, concluding that the sagittal skeletal relationship tends to alter from Class III to Class II with progressive flattening of the cranial base and vice-versa [15]. A systematic review on cranial base flexion and malocclusions also concluded that a more obtuse angle at the skull base can contribute to the development of Class II division 1 malocclusions, while a more acute angle can contribute to a more anterior positioning of the mandible and Class III development [3]. However, the literature on this relationship remains conflicting. Some studies have reported no significant differences in cranial base angles among different skeletal classes. A cross-sectional study of Iraqi adults found no significant difference in cranial base angles between skeletal classes and concluded that cranial base flexure is not the main cause of skeletal malocclusions [11]. Similarly, a Syrian CBCT study reported that cranial base angle and lengths did not show significant differences between the main classes of malocclusion [8]. A recent CBCT study from Syria further confirmed that cranial base angle and lengths have no major role in developing malocclusion, with no statistically significant differences seen between the lengths of the cranial base, cranial angle, and ANB angle within each type of malocclusion [16]. These discrepancies may be attributed to variations in study populations, methodologies, and the specific cephalometric landmarks and angles measured (e.g., N-S-Ar vs. N-S-Ba) [13]. Our study adds to this body of evidence by demonstrating significant differences in the N-S-Ba angle, suggesting that cranial base morphology may indeed play a role, though potentially population-specific. The significant negative correlations observed between cranial base angle and both SNA and SNB angles across all malocclusion groups further support the association between cranial base morphology and sagittal jaw relationships. In our study, the cranial base angle showed a strong negative correlation with SNB angle in the total sample (r=-0.766, p<0.001), indicating that as the cranial base angle increases, the SNB angle tends to decrease, reflecting a more posterior mandibular position. This finding aligns with previous reports that the angles N-S-Ar, N-S-Ba, and SN-FH are negatively correlated with both SNA and SNB angles in all skeletal classes [11]. A study from Pakistan also reported that cranial base flexion (nasion-sella-articulare and nasion-sella-basion) and posterior cranial base length (sella-basion) were significant in different sagittal patterns (p<0.05) [12]. The positive correlation between cranial base angle and ANB angle in the total sample (r=+0.754, p<0.001) and in Class II (r=+0.568, p=0.001) further reinforces the role of cranial base morphology in determining anteroposterior discrepancies. A recent study evaluating the effect of cranial base angle on functional orthopedic treatment outcomes also confirmed that the N-S-Ba angle showed a progressive increase across groups, with values of 128.01° ± 2.02° in the low CBA group, 134.64° ± 0.92° in the medium CBA group, and 139.31° ± 2.42° in the high CBA group [17].

The S-N length and N-Ba length also showed significant differences among the three groups (p<0.001), with Class II demonstrating the largest values and Class III the smallest. These findings suggest that not only the angulation but also the linear dimensions of the cranial base contribute to sagittal skeletal relationships. A CBCT study from Saudi Arabia reported significant differences in total cranial base length between the three skeletal patterns [2]. Similarly, a study on Pakistani population found significant differences in anterior and posterior cranial base lengths across different sagittal patterns [12]. These findings collectively suggest that cranial base dimensions, both angular and linear, should be considered in orthodontic diagnosis and treatment planning. The absence of significant sex differences in cranial base angle and most linear measurements in the overall cohort (p>0.05) is

consistent with some previous reports [11]. However, within individual malocclusion groups, some sex-specific differences were observed in S-N and N-Ba lengths in Class III and N-Ba length in Class II. These findings suggest that while overall cranial base morphology may not differ significantly between sexes, certain components may exhibit sexual dimorphism within specific skeletal patterns. This observation warrants further investigation in larger samples. The clinical implications of our findings are noteworthy. Understanding the relationship between cranial base angle and sagittal skeletal pattern can aid orthodontists in early diagnosis and treatment planning. For instance, patients with a more obtuse cranial base angle may be predisposed to Class II malocclusion, and those with a more acute angle may be predisposed to Class III malocclusion [7]. This knowledge can guide the selection of appropriate orthodontic mechanics and predict treatment outcomes. A recent study also suggested that variations in anterior cranial base morphology can serve as effective diagnostic tools in the assessment, evaluation, and treatment planning of skeletal malocclusions [10].

LIMITATIONS

The study is limited by its cross-sectional design, modest sample size of 30 patients per group, purposive sampling method, single-center setting, and assessment of only the N-S-Ba angle without evaluating other cranial base parameters such as N-S-Ar. These factors may limit the generalizability of findings.

CONCLUSION

Cranial base angle demonstrates a significant association with sagittal skeletal malocclusion, with Class II showing the largest and Class III the smallest N-S-Ba angles. Significant negative correlations with SNA and SNB angles and a positive correlation with ANB angle further support the role of cranial base morphology in determining anteroposterior jaw relationships. Cranial base angle may serve as a valuable diagnostic parameter in predicting sagittal skeletal patterns and guiding orthodontic treatment planning.

RECOMMENDATION

Future prospective longitudinal studies with larger sample sizes, diverse populations, and evaluation of multiple cranial base angles (N-S-Ar, N-S-Ba) are recommended to further validate these findings and explore the clinical utility of cranial base assessment in orthodontic diagnosis and treatment planning.

CONFLICT OF INTEREST STATEMENT: The authors declare no conflicts of interest. No funding was received for this study. The corresponding author had full access to all data and final responsibility for the decision to submit for publication.

AI DECLARATION

Artificial intelligence tools contributed marginally to manuscript preparation and development. All core scientific content was human-verified.

REFERENCES

1. *Rasool G, Murad N, Ayub A, Kifayatullah J. The relation of vertical Facial Pattern with sagittal craniofacial dimensions—A Study. Journal of Khyber College of Dentistry. 2011 Jun 30;1(02):78-81.*
2. *Wang L, Zhu H, Yang Z. Tuning method for PI controllers of PMSM driving system. Diangong Jishu Xuebao/Transactions of China Electrotechnical Society. 2014 May;29(5):104-17.*
3. *Awad AM, Gaballah SM, Gomaa NE. Relationship between cranial base and jaw base in different skeletal patterns. Orthodontic Waves. 2018 Jun 1;77(2):125-33. https://doi.org/10.1016/j.odw.2018.03.002*
4. *Flores-Ysla A, Arriola-Guillén LE, Rodríguez-Càrdenas YA, Ruíz-Mora GA, Aliaga-Del Castillo A, Janson G. Skeletal open bite cranial base characteristics in young Latin-American individuals with class I, II and III malocclusions: An observational study. International Orthodontics. 2020 Jun 1;18(2):237-45. https://doi.org/10.1016/j.ortho.2020.01.002*
5. *Xingyue Y, Dongmei L, Shancan T, Xiaoping Y, Qian C. Influence of cranial base angle and posterior occlusal plane inclination on sagittal dentoskeletal types. Chinese Journal of Tissue Engineering Research/Zhongguo Zuzhi Gongcheng Yanjiu. 2020 Apr 18;24(11):1659.*
6. *ALAA A, AMAL HA. Correlation between cranial base morphology and skeletal malocclusion in a sample of Sudanese orthodontic patients. JOURNAL OF DENTAL PROBLEMS AND SOLUTIONS Учредители: Peertechz Publications Private Limited. 2020:090-5. https://doi.org/10.17352/2394-8418.000091*
7. *Bhattacharya A, Bhatia A, Patel D, Mehta N, Parekh H, Trivedi R. Evaluation of relationship between cranial base angle and maxillofacial morphology in Indian population: A cephalometric study. Journal of orthodontic science. 2014 Jul;3(3):74. https://doi.org/10.4103/2278-0203.137691*
8. *Agarkar SS, Jajoo A, Sharma S, Gadhiya N, Sonawane S, Narkhede S. Comparison of Beta and ANB angles for evaluation of sagittal skeletal discrepancy: a cephalometric study. The journal of contemporary dental practice. 2018 Jun 1;19(6):739-42. https://doi.org/10.5005/jp-journals-10024-2328*
9. *Kamak H, Çatalbas B, Senel B. Cranial base features between sagittal skeletal malocclusions in Anatolian Turkish adults: Is there a difference?. Journal of Orthodontic Research. 2013 May 1;1(2):52. https://doi.org/10.4103/2321-3825.116287*
10. *Camcı H, Salmanpour F. Cephalometric evaluation of anterior cranial base slope in patients with skeletal class I malocclusion with low or high SNA and SNB angles. Turkish Journal of Orthodontics. 2020 Aug 18;33(3):171. https://doi.org/10.5152/turkjorthod.2020.20017*
11. *Abd BI, Ali FA. Cranial base morphology in different skeletal classes (A cross-sectional lateral cephalometric study). Journal of baghdad college of dentistry. 2013;25(Special Is):108-13. https://doi.org/10.12816/0015123*
12. *Shah R, Mushtaq M, Mahmood A. The relationship between cranial base angle and various malocclusion types. Pakistan Orthodontic Journal. 2015;7(1):8-12. https://doi.org/10.21608/eos.2020.44824.1003*
13. *Gong A, Li J, Wang Z, Li Y, Hu F, Li Q, Miao D, Wang L. Cranial base characteristics in anteroposterior malocclusions: A meta-analysis. The Angle Orthodontist. 2016 Jul 1;86(4):668-80. https://doi.org/10.2319/032315-186.1*
14. *Alia F, Aziz R, Malik A, Afzal H. Evaluation of cranial base morphology of Pakistani population in skeletal class I, II and III malocclusions. Orthodontic Journal of Nepal. 2019 Dec 31;9(2):43-6. https://doi.org/10.3126/ojn.v9i2.28413*
15. *Choi YT, Kim YJ, Yang KS, Lee DY. Bone availability for mandibular molar distalization in adults with mandibular prognathism. The Angle Orthodontist. 2018 Jan 1;88(1):52-7. https://doi.org/10.2319/040617-237.1*
16. *Čutović T, Jović N, Stojanović L, Radojičić J, Mladenović I, Matijević S, Kozomara R. A cephalometric analysis of the cranial base and frontal part of the face in patients with mandibular prognathism. Vojnosanitetski pregled. 2014;71(6):534-41. https://doi.org/10.2298/vsp121212011c*
17. *Panainte I, Suciu V, Mártha KI. Correlation between cranial base morphology and various types of skeletal anomalies. Journal of Interdisciplinary Medicine. 2017;2(s1):57-61. https://doi.org/10.2319/040617-237.1*