Original article

UPDCJ OPEN ACCESS

Cephalometric Norms of Bangladeshi Young Children Based on McNamara's Analysis

Khawla Binta Harun KHN[1]*, Hossan MT[2], Akter T[3], Tanni FT[4], Hasssan GS[5], Sajedeen M[6]

AFFILIATION:

1. **Khanum Huzzatun Nahar Khawla Binta Harun**
   Lecturer, Department of Orthodontics,
   Dhaka Dental College and Hospital, Dhaka, Bangladesh.
   Email: dr.khawla80@gmail.com
2. **Mohammad Tofazzal Hossan**
   Maxillofacial Surgeon, Bangladesh Armed Forces, Dhaka, Bangladesh.
   Emial: majtofazzal@gmail.com
3. **Tanjila Akter**
   Department of Orthodontics, Faculty of Dentistry,
   Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.
   Email: tamannatanjil@gmail.com
4. **Faria Tabassum Tanni**
   Department of Orthodontics, Faculty of Dentistry,
   Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.
   Email: fariatabu@yahoo.com
5. **Gazi Shamim Hasssan**
   Professor and Chairman, Department of Orthodontics,
   Faculty of dentistry, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.
   Email: drgazishamim@yahoo.com
6. **Mahmood Sajedeen**
   Associate Professor, Department of Orthodontics, Faculty of Dentistry,
   Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh.
   Email: drmasa@yahoo.com

Article info.

Received: 11 July 2021
Accepted: 03 September 2021

Volume: Vol-12, Issue-1, April 2022

DOI: https://doi.org/10.3329/updcj.v12i1.59154

Publisher: Update Dental College, Dhaka, Bangladesh
Web: www.updatedentalcollege.edu.bd
E-mail: updcj@hotmail.com

Scan QR code to see the latest issue

*** Corresponding Author**
Khanum Huzzatun Nahar Khawla Binta Harun
Lecturer, Department of Orthodontics,
Dhaka Dental College and Hospital, Dhaka, Bangladesh
Email: dr.khawla80@gmail.com

ABSTRACT:

Objective: To evaluate the cephalometric norms of Bangladeshi young children using McNamara's analysis.

Methods: It was a descriptive cross-sectional study carried out in the Department of Orthodontics, BSMMU among the dental patients visiting Dental OPD of BSMMU. The test sample was 40 Cephalometric radiographs of patients of which 20 were boys (group I) and 20 were girls (group II). The study respondents were of Bangladeshi origin, aged between 11 and 18 years at the time of cephalometric radiograph taken. A randomized sampling technique was followed to collect samples.

Results: The mean cephalometric values of McNamara variables were measured and compared with the Caucasian children and Bangladeshi adults. The p values of all variables for Group I (boys) and Group II (girls) were more than 0.05 which was not significant. So it was interpreted that there was no significant difference in the values of McNamara variables between Bangladeshi boys and girls. But in comparison to Caucasian children the p-value of all the variables was significant (<0.05) except Pogonion to Nasion perpendicular. This result suggested that the McNamara variables for Bangladeshi children were significantly different from Caucasian children.

Conclusion: The values observed by this study can be used in Bangladeshi children irrespective of gender because there is no statistically significant gender difference. It was also observed that the maxilla of the Bangladeshi children was slightly protrusive but the mandible was retrusive than the Caucasian children and both upper and lower incisors were found proclined.

KEY WORDS : Cephalometric Norms, McNamara's Analysis

INTRODUCTION:

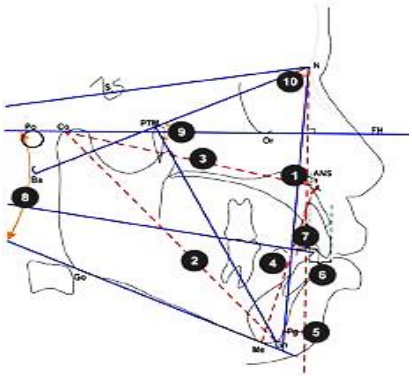
A cephalometric radiograph is an essential tool in orthodontics to assist research workers and orthodontic clinicians in diagnosis and treatment planning. Since its introduction by Broadbent[1] and Hofrath[2] in the United States and Germany, respectively, radiographic cephalometry has become one of the most important tools of clinical and research orthodontics[3]. In a contemporary comprehensive textbook on cephalometry, a list of the most well-known and popular cephalometric analyses included no fewer than 23 analyses introduced between 1946 and 1985[4]. One of the more recent additions is the McNamara analysis[5]. Orthodontic patients nowadays range from juveniles to senior citizens and come from various ethnic groups, a wide range of representative norms would be ideal. Bangladeshi population was found to have distinct craniofacial features as compared with other populations and due to ethnic variation. In principle, McNamara's analysis combines the anterior reference plane (a plane perpendicular to the Frankfurt horizontal through the nasion) described by Burstone et al and a description of the length of the jaws and their relationship as given by Harvold[6]. This specific innovative cephalometric analysis was introduced because ''a need had arisen for a method of cephalometric analysis that is sensitive not only to the position of teeth within a given bone, but also to the relationship of jaw elements and cranial base structures one to another"[5]. Considering the ethnic facial features of the patients thereby play a critical role in setting objectives for successful orthodontic treatment.

Therefore, each different population would be best treated according to its individual's characteristics in order to achieve an esthetically pleasing face.[7] This study has therefore established Cephalometric norms for Bangladeshi young children based on McNamara analysis which will provide the orthodontist and orthognathic surgeons a guideline in diagnosis, treatment planning and assessing the treatment outcomes.

METHODS:

It was a descriptive cross-sectional study carried out in the department of Orthodontics, BSMMU among the dental patients visiting Dental OPD of BSMMU. The test sample were 40 Cephalometric radiographs of patients in which 20 were boys (group I) and 20 were girls (group II), those were selected using predetermined inclusion and exclusion criteria. The study respondents were Bangladeshi origin, aged between 11 and 18 years at the time of cephalometric radiograph taken, patients with class-I occlusion, no previous history of orthodontic and prosthodontic treatment, patient with well aligned upper and lower dental arch with minimum incisors irregularities, lateral Cephalogram of the patient with normal overjet not exceeding 3 mm and normal overbite, lateral cephalogram of the patient with spacing/crowding of not more than 3 mm, no congenital abnormalities or trauma to face. Consent was obtained from each patient as well as guardian. Lateral cephalometric radiographs were taken in natural head position with the eyes straight ahead, the teeth in centric occlusion and lips in relaxed contact. Randomized sampling technique was followed to collect samples. The Sapiro-Wilk test was done to check the data normality, mean with standard deviation and median were measured for all variables, Non parametric (Mann-Whitney U) test was done for the comparison of the cephalometric values of the group I (boys) and group II (girls), Wilcoxon signed rank test was done to compare the Bangladeshi children with Caucasian children. The level of significance for the analysis was set at $p<0.05$.

Figure 1: Cephalometric landmarks of McNamara variables



Source:http://dx.doi.org/10.17159/2519-0105/2019/v74no2a6

Figure 1 showing Cephalometric landmarks of McNamara variables. 1) Distance from Point A to nasion perpendicular line, 2) Distance from condylion to gnathion, 3) Distance from condylion to Point A, 4) Distance from anterior nasal spine to menton, 5) Distance from point pogonion to the nasion perpendicular, 6) Distance from labial surface of upper incisor to Point A vertical, 7) Distance from tip of lower incisor to A-Pogonion line, 8) Angle between FH plane and Go-Me line, 9) Angle formed by intersection of N-Ba and PTM-Gn lines, 10) Angle formed by intersection of SN and NA lines.

RESULT:

Age Distribution:

Figure 2: Showing age distribution by using bar diagram.

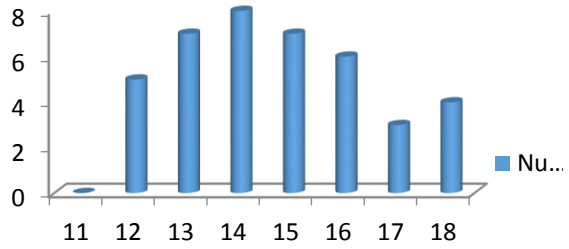


Fig 2: Bar chart of age distribution

Total Bangladeshi young children included in this study were 40 (N). The age range was 11-18 years. Among the participants the highest number was from the 14 years age group which was 8 and the lowest participants were from 11 years age group which was 0 in number.

Sex distribution:

Figure 3: Showing sex distribution of the participants.

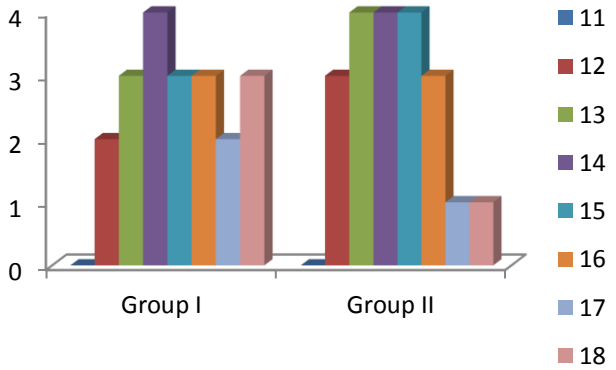


Fig 3: Bar chart of sex distribution

Table 1. Statistical analysis of Cephalometric values of McNamara variables of Group I (Bangladeshi boys)

Variables	N	Mean	Median	Std. Deviation
Patient's age	20	15.00	15.00	1.947
Nasion perpendicular to Point A	20	.4230	.6100	.48051
SNA angle	20	81.55	81.50	1.234
Effective Mandibular length	20	123.20	123.50	8.186
Effective midfacial length	20	95.70	98.00	4.330
Maxillomandibular differential	20	26.95	25.00	4.883
Lower anterior Facial Height	20	68.45	68.50	5.652
Mandibular Plane Angle	20	24.45	24.50	1.605
Facial Axis angle	20	3.45	3.00	.510
Pogonion to Nasion perpendicular	20	-4.85	-5.00	2.159
Upper incisor to point A vertical	20	5.10	5.00	.641
Lower incisor to A-PO line	20	3.55	4.00	.510

Table 2. Statistical analysis of Cephalometric values of McNamara variables of Group II (Bangladeshi girls)

Variables	**N**	**Mean**	**Median**	**Std. Deviation**
Patient's age	20	14.35	14.00	1.694
Nasion perpendicular to Point A	20	.1885	.2600	.19356
SNA angle	20	82.20	82.00	.834
Effective Mandibular length	20	119.45	118.00	6.236
Effective midfacial length	20	93.20	92.50	3.254
Maxillomandibular differential	20	26.75	26.00	3.768
Lower anterior Facial Height	20	65.20	63.50	4.873
Mandibular Plane Angle	20	24.95	25.00	1.395
Facial Axis angle	20	3.50	3.50	.513
Pogonion to Nasion perpendicular	20	-5.30	-6.00	1.809
Upper incisor to point A vertical	20	4.75	5.00	.639
Lower incisor to A-PO line	20	3.40	3.00	.503

A non-parametric test (Mann-Whitney U) was conducted to compare the Cephalometric values of Group I (boys) and Group II (girls) of the participants. The p values of all variables were more than 0.05 except effective midfacial length and lower anterior facial height. This result indicated that the Cephalometric values of McNamara's variables were not significant among Group I (boys) and Group II (girls). So it can be interpreted that there are no significant difference of the values of McNamara variables in between Bangladeshi boys and girls.

DISCUSSION

This study was designed to establish Cephalometric norms of McNamara Variables in Bangladeshi young children between 11 - 18 years of age.

Nasion perpendicular to point A (NP_A) (mm):

This value indicates the antero-posterior position of the maxilla relative to nasion perpendicular.

The study revealed that the value of NP-A for group I children was slightly higher than the group II children but there was no statistical significant difference between two groups. According to McNamara[5] this value changes per year minimally; from mixed dentition to adult it changes from 0 to 1 mm. In Tamil children[8] where age range was 11-12 years (N=60), the NP_A value was less than the Bangladeshi children which suggested that the maxilla of Bangladeshi children was more protrusive than Tamil children. But the South Indian children[9] showed more protrusive maxilla than Bangladeshi children.

SNA angle:

The mean value of SNA angle was measured for 47 boys and 43 girls in Caucasian children (mean age 12 years) and value was recorded for boys 80.26˚± 2.72˚, for girls 80.87˚±3.49°[5]. These values were less than Bangladeshi children that indicated protrusive maxilla of Bangladeshi children than Caucasion children. John W. et al.[10] measured SNA angle for 200 boys and 205 girls of Chinese children (mean age 12 years) which were close to the values of Bangladeshi children.

Effective mandibular length:

Effective mandibular length is used to indicate a small or large mandible. This study revealed that Bangladeshi boys have larger mandible than the girls. In Caucasian boys (age 14 years) this value was 120.60±4.30 mm, for girls (age 14 years) 118.90±5.00 mm[5]. This result revealed that the effective mandibular length of Caucasian children were less than Bangladeshi children. It was also less in Chinese[10], North and South Indian[9] Children.

Effective mid facial length:

It is the length of the maxilla relative to cranial base; greater value indicates the longer maxilla and less value indicates shorter maxilla. In this study it was larger in Bangladeshi boys than the girls. The Caucasian children[5] had the value close to the Bangladeshi children. In South Indian (Bunts) children this value was 89.58 ± 3.60 mm and in North Indian (Brahmins) it was 85.36 ± 3.98 mm[9] which were less than the value of Bangladeshi children. In Chinese children[10] this value revealed that the maxilla of Chinese children were shorter than Bangladeshi children.

Maxillomandibular differential:

This measurement is emphasizing the geometric relationship of the jaws and should not be related to the age of the children. This value showed no significant difference between Bangladeshi boys and girls. Maxillomandibular differential of the Caucasian[5] and the Chinese[10] children were close to the values of Bangladeshi children. But this value of South (Bunts) and North Indian children[9] were less than Bangladeshi children.

Lower anterior facial height:

It represents the length of the lower anterior face. This value was measured more in Bangladeshi boys than the Bangladeshi girls. This value was found in Caucasian boys and girls 66.8±3.9 mm and 65.6±4.9 mm[5] respectively. The p value was 0.474 (>0.05) which was not significant. In Chinese boys and girls this value was also close to the Bangladeshi children. This value in South and North Indian (Brahmins) children were less than Bangladeshi children which suggested that Bangladeshi children has long face than South and North Indian children.

Mandibular plane angle:

The Mandibular plane angle refers the steepness of the mandibular plane when compared to the cranial base by Frankfort plane and it refers forward and downward growth of jaws. Higher values indicate a vertical growth pattern and lower values indicate horizontal growth pattern. There was no significant difference of mandibular plane angle between Bangladeshi boys and girls. This value of Caucasian children[5] was found close to the value of Bangladeshi children. But it was more in South Indian (Bunts) and North Indian (Brahmins) children[9] than the value of Bangladeshi children. Chinese children[10] also had higher value than the value of Bangladeshi children which revealed that the vertical growth of Chinese children was more than Bangladeshi children.

Facial axis angle:

This value expresses the ratio of facial height to depth thus indicating the direction of growth of chin.this angle averages about 90±3.5. If the value is acute, indicative of horizontal growth pattern and if the value is obtuse, indicative of vertical growth pattern. According to McNamara ideal facial axis angle is 90^0 and it should not increase with age. This angle for Bangladeshi adult male was 3.28˚, female 3.00˚ and for all participants 3.14 ˚± 0.61˚.[7] There was no significant difference of facial axis angle in Bangladeshi adult and children.

Pogonion to Nasion perpendicular:

It determines the anterior or posterior positioning of mandible to the cranial base. In the current study there was little difference between Bangladeshi boys and girls which was not significant. This value was found significant (p=0.043) in Caucasian[5] children in comparison to Bangladeshi children and suggested that the pogonion was anteriorly positioned in Bangladeshi children. This value was more negative for Chinese boys[10] than Bangladeshi boys but the value for Chinese girls was close to the Bangladeshi girls. In case of South Indian (Bunts) and North Indian (Brahmins)[9] children chin position was more posterior than the Bangladeshi children.

Upper incisor to point A vertical:

It represents the relationship of upper incisor to maxilla. The values of upper incisor to point A vertical in Bangladeshi boys and girls were not significant. This value was found in Caucasian boys and girls 3.8±1.4 mm and 4.2±1.5 mm respectively.[5] The p value was significant with Bangladeshi children. So the Bangladeshi children have proclined incisors than Caucasian children. In Chinese boys and girls[10] this value was recorded more than the value of Bangladeshi children that revealed more proclined upper incisors in Chinese children. The South Indian children had more proclined incisor than Bangladeshi children whereas North Indian Children are same as Bangladeshi children.

Lower incisor to A-Po line:

This line indicates the proclination and retroclination of lower incisor. According to the current study the lower incisors to A-Po line had no difference in between Bangladeshi boys and girls. But the lower incisors of Caucasian children[5] were more retroclined than Bangladeshi children. This study found that the lower incisors of Chinese children[10] were more proclined than the Bangladeshi children. In south Indian (Bunts) children this value was found 3.94±1.77 mm and in north Indian children it was 3.81 ± 1.71 mm[9]. Both the values are close to the values of Bangladeshi children.

CONCLUSION

The cephalometric values of McNamara variables in Bangladeshi children were measured in this study. The comparative study suggested that the values for boys and girls were not significant but with the adult the values were markedly significant. These values can be used in Bangladeshi children irrespective of gender, because there is no statistically significant gender difference. It was also observed that the maxilla of the Bangladeshi children was slightly protrusive but mandible was retrusive than the caucasian children and both upper and lower incisors were proclined.

REFERENCES:

1. Broadbent, B.H. 1931,'A new x-ray technique and its application to orthodontia', Angle Orthod, vol. 1, pp, 45-60.
2. Hofrath, H. 1931,'Die Bedeutung der roentgenfern der kieferanomalien',Fortschrorthodont, vol. 1, pp. 232-248. https://doi.org/10.1007/BF02002578
3. Athanasiou, A. 1997, Orthodontic Cephalometry, Mosby-Wolfe, London, England.
4. Bosch, C., Athanasiou, A.1997, 'Landmarks, variables and norms of various numerical cephalometric analyses-cephalometric morphologic and growth data references'.
5. McNamara, J.A. 1984, 'A method of cephalometric evaluation', Am J Orthod, vol. 86, pp. 449-469. https://doi.org/10.1016/S0002-9416(84)90352-X
6. Harvold EP. The activator in interceptive orthodontics. CV Mosby company; 1974, pp. 37-56.
7. Alam MK, Basri R, Purmal K, Sikder MA, Saifuddin M, Iida J. 2013, 'Cephalometric norm study in a Bangladeshi population using McNamara analysis. Int Med J. 2013;20(1):84-86.

8. Ravikumar, D. 2018, 'Evaluation of McNamara's analysis in South Indian (Tamil Nadu) children between 8-12 years of age using lateral cephalograms', Journal of Oral Biology and Craniofacial Research, https://doi.org/10.1016/j.jobcr.2018.06.001
PMid:31211035 PMCid:PMC6562225

9. Bhat, M. Sudha, P. Tandon, S. 'Cephalometric norms for bunt and brahmin children of Dhakshina Kanada based on Mcnamara analysis.' J Indian Soc Pedo Prev Dent. 2001;19(2):41-51.

10. Wu, J. Urban, H. Barkr, AM. 2007, 'Chinese norms of McNamara's cephalometric analysis', Angle Orthod, 77(1), 12-20. https://doi.org/10.2319/021606-62R.1
PMid:17029538

How to Cite

Khawla Binta Harun KHN, Hossan MT, Akter T, Tanni FT, Hasssan GS, Sajedeen M. Cephalometric Norms of Bangladeshi Young Children Based on McNamara's Analysis. Update Dent. Coll. j [Internet]. [cited 2022 Apr. 14];12(1):22-26.
Available from:
https://www.banglajol.info/index.php/UpDCJ/article/view/59154