

Comparative cephalometric study of Class II division 1 malocclusion between Lithuanian and Jordanian females

Baher Adli Bader, Arunas Vasiliauskas, Ahmad Salim Qadri

SUMMARY

The Class II malocclusions have a strong hereditary component as etiologic factor, both in families and in ethnic and racial groups. The purpose of this study to compare skeletal and dentoalveolar morphology in Class II division I malocclusion of Lithuanian and Jordanian females. The sample consisted of 60 standardized lateral cephalograms (30 Jordanian – 30 Lithuanian). The mean age of the subjects was 14.8 ± 1.11 years. Criteria for cephalometric comparison were 5 linear and 10 angular cephalometric variables. Repeating landmark identification tested reproducibility of the measurements. Unpaired t-test was performed to assess the difference of malocclusion between both groups. Results considered to be statistically significant when $p \leq 0.05$.

Results showed that Lithuanian females had reduced vertical skeletal relationship in their Class II division 1 malocclusion, while Jordanian females characterized by increased vertical relationship. Dentoalveolar measurements showed a significant proclination of the mandibular incisors in Jordanian females compared with Lithuanians.

Key words: Class II division I malocclusion; Cephalometrics.

INTRODUCTION

The Class II malocclusions have a strong hereditary component as etiologic factor, both in families and in ethnic and racial groups. The ethnic aspect is an important characteristic in the morphologic variation of malocclusions [1], but not all ethnic groups should be considered the same. Researches showed higher prevalence of Class II malocclusion in Lithuanian population 27% [2], while in Jordanian population were 18.8% [3]. The Class II division 1 malocclusion is the most frequent in particular clinics, caused, in most times, by a retrognathic mandible, but opinions of orthodontic researchers are controversial about characteristics of Class II malocclusion [4-6]. It has been written in many orthodontic literatures about the components of Class II malocclusion; some investigators have reported in their studies the presence of retrognathic mandible, excessive

vertical development of the lower face and neutral lower incisor position [4, 7], other investigators showed decreased vertical development of the lower face [8-11], and greater dental protrusion especially of mandibular incisors [12]. Numerous researches have considered the components of Class II malocclusion, with most focusing on patients in the adolescent or adult age. These studies have shown that the term Class II malocclusion is not a single diagnostic entity but rather can result from numerous combinations of skeletal and dentoalveolar components [13]. The purpose of the present study was to compare Class II division 1 between two ethnic groups, and to find the components of Class II division 1 malocclusion.

MATERIALS AND METHODS

The study sample consisted of 60 females (30 Lithuanian and 30 Jordanian lateral cephalograms). Both groups were randomly selected with Class II division 1 from the Clinic of Orthodontics, Kaunas University of Medicine, Kaunas, Lithuania and Qadri Dental Centre, Amman, Jordan. The criteria for inclusion into this study were the existence of:

- Skeletal Class II division 1, ANB angle range (4° - 6°).

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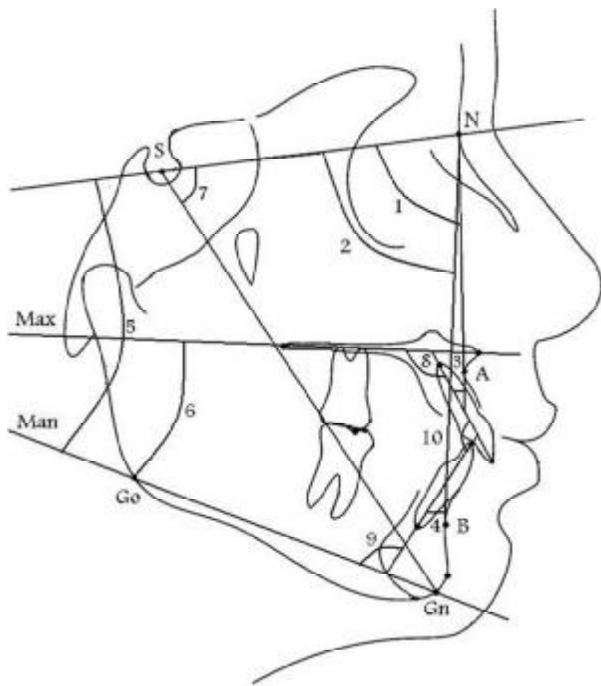


Fig. 1. Angular cephalometric measurements: 1 – SNA; 2 – SNB; 3 – NA-U1; 4 – NB-L1; 5 – Sn-ML; 6 – Max-Man; 7 – Y-Axis; 8 – Max-U1; 9 – Man-L1; 10 – U1-L1

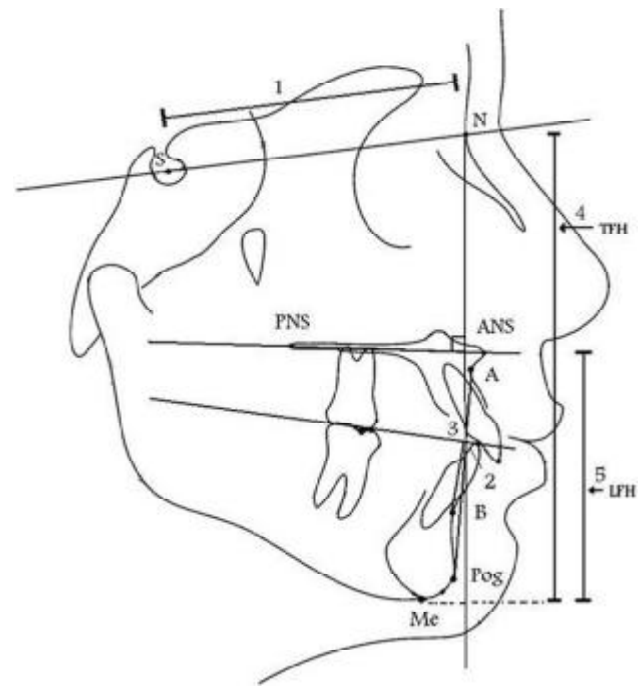


Fig. 2. Linear cephalometric measurements: 1 – Sn Length; 2 – A-Pog With Lower incisor; 3 – Wit's; 4 – Total Facial Height; 5 – Lower Facial Height

- Proclination of maxillary incisors with an overjet ranged (4-6 mm).
- Fully erupted permanent dentition.
- Young adolescents, after growth spurt.

With no previous orthodontic treatment recorded. Cephalometric lateral skull radiographs were taken as follows: each subject stood with the head in a natural position with teeth held in centric

occlusion under standard conditions. The head was fixed by fitting the ear rods of the cephalostat in the external auditory meatus. Cephalometric radiographs were digitized, traced, and analyzed using Dolphin Imaging 10.1 software (2007 Dolphin Imaging & Management Solutions). Cephalometric analysis comprised of the 15 variables (10 angular and 5 linear measurements):

- Anteroposterior position of the maxilla relative to anterior cranial base: SNA.
- Anteroposterior position of the mandible relative to anterior cranial base: SNB.
- Difference between SNA and SNB: ANB.
- Position of maxillary incisors relative to the maxilla: NA-U1.
- Position of mandibular incisors relative to the mandible: NB-L1.
- Upper incisor to lower incisor: U1-L1.
- Cranial base to mandibular plane: SN/ML.
- Maxillary plane angle to mandibular plane: Max/Man.
- Maxillary incisor angle to maxillary plane: U1/Max.
- Mandibular incisor angle to mandibular plane: L1/Man.
- Cranial base to S-Gn: y-Axis.
- Anterior cranial base length: Sn Length.
- Lower incisor to A-Pog: L1/A-Pog.
- Wit's appraisal: Wit's.

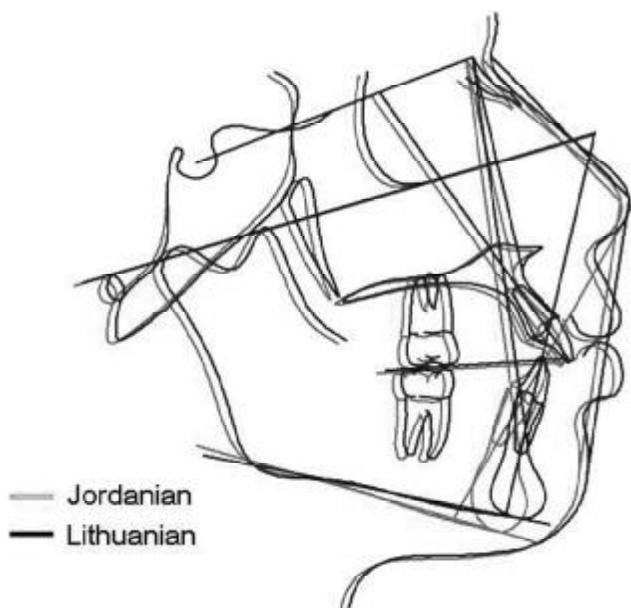


Fig. 3. Cephalometric superimposition representing mean of skeletal and dentoalveolar components

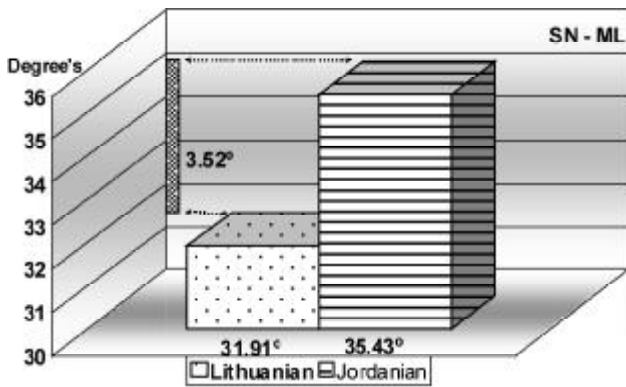


Fig. 4. Comparison of SN-ML mean between Lithuanian and Jordanian females

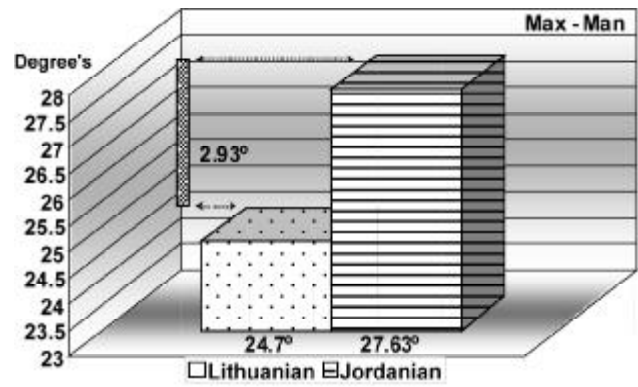


Fig. 5. Comparison of Max-Man mean between Lithuanian and Jordanian females

- Nasion (N) to Menton (Me): Total Facial Height.
- Anterior nasal spine (ANS) to Menton (Me): Lower Facial Height. The anatomic landmarks of measurements used in cephalometric analysis are presented in Figure 1 and Figure 2.

Method error

Sixty radiographs were traced by single practitioner, within two weeks interval from the first measurement. The reliability of the method was tested by other four practitioners. The error of method was calculated using the formula:

$$ME = \sqrt{\frac{\sum (d_1 - d_2)^2}{2(n-1)}}$$

Where $\pm 2SD$ are the limits within which 95% of the differences between the repeated measurements are expected to lie; d_1 – first measurement; d_2 – second measurement; n – number of patients.

The errors of linear measurements did not exceed $\pm 1.1mm$, differences between the repeated angular

measurements ranged between ± 1.5 and ± 1.9 degrees. These errors were deemed to have insignificant effect on reliability of the results. The variables with higher linear and angular measurement errors (Wit's, L1/Man) were considered to be not reliable.

Statistical analysis

All statistical calculations were performed with Microsoft Office Excel 2003 and the Statistical Package for the Social Sciences for Windows (SPSS 8.0). Mean and standard deviation (SD) of cephalometric parameters used for the data description. Unpaired student *t*-test was performed to assess the difference of malocclusion between both groups, Scheffe's test. $p < 0.05$ was considered statistically significant difference.

RESULTS

Dental and skeletal cephalometric comparison between Lithuanian and Jordanian Class II Division 1 females shown in Table and Figure 3, and results will be summarized as follows:

Table. Statistical comparison between Lithuanian and Jordanian females with Class II division 1 malocclusion

No	Variables	Lithuanian n=30		Jordanian n=30		Mean Differences	t	p
		Mean	SD	Mean	SD			
1	SNA	82.3	3.18	82.15	3.15	0.15	0.183	n.s
2	SNB	77.3	2.96	77.15	3.14	0.15	0.190	n.s
3	ANB	5.08	0.81	4.86	0.94	0.22	0.953	n.s
4	NA – U1	22.31	6.42	23.56	6.74	1.25	0.735	n.s
5	NB – L1	26	5.36	29.85	6.20	3.85	2.57	0.013
6	U1 – L1	129.41	8.85	125.06	10.27	4.35	1.76	0.084
7	SN – ML	31.91	4.38	35.43	4.71	3.52	2.99	0.0041
8	Max – Man	24.7	5.17	27.63	4.65	2.93	2.31	0.025
9	Max – U1	110.11	5.84	112.33	7.34	2.22	1.29	n.s
10	Man – L1	95.71	8.74	97.2	6.47	1.49	0.747	n.s
11	y-Axis	69.05	3.44	70.65	3.48	1.6	1.79	0.079
12	A-Pog	1.01	2.28	3.05	2.56	2.04	3.24	0.0020
13	Wit's	2.9	2.04	0.9	2.10	2	3.73	0.0004
14	Sn	71.33	2.63	73.5	5.02	2.17	2.09	0.041
15	LFH – TFH	54.58	2.12	55.04	2.71	0.46	0.727	n.s

n.s indicates nonsignificant

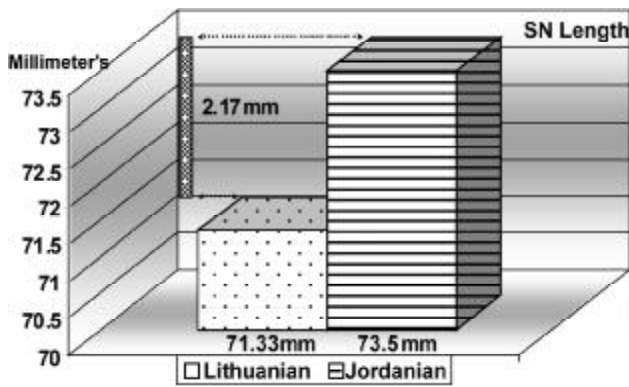


Fig. 6. Comparison of SN-length mean between Lithuanian and Jordanian females

Skeletal Components

Four variables were used to assess vertical skeletal relationship – three angular (SN-ML, Max-Man, y-Axis) and one linear (LFH-TFH). Jordanian group showed increased facial height compared with Lithuanian group – $3.52^{\circ} \pm 1.63$ for SN-ML $p < 0.05$ (Figure 4), Mandibular plane to Maxillary plane (Max-Man) also was $2.93^{\circ} \pm 1.76$ larger in Jordanian group $p < 0.05$ (Figure 5), the other measurements (Y-axis, LFH-TFH) were about similar. Anterior cranial base length was determined by one variable (SN Length) (Figure 6), SN length was 2 mm longer in Jordanian group compared with Lithuanian.

Dental Components

The position of maxillary incisors was determined by two angular variables (NA-U1) and (Max-U1). Both groups showed a slight proclination in the upper incisor position, no significant difference was observed between the two groups. For mandibular incisors position determination, angular (NB-L1) and linear (A-pog-L1) variables were used (Figures 7, 8). The Jordanian mandibular incisors were significantly more proclined $p < 0.05$, the NB-L1 showed $3.85^{\circ} \pm 2.17$ higher in Jordanian group and $2.04 \text{ mm} \pm 0.9$

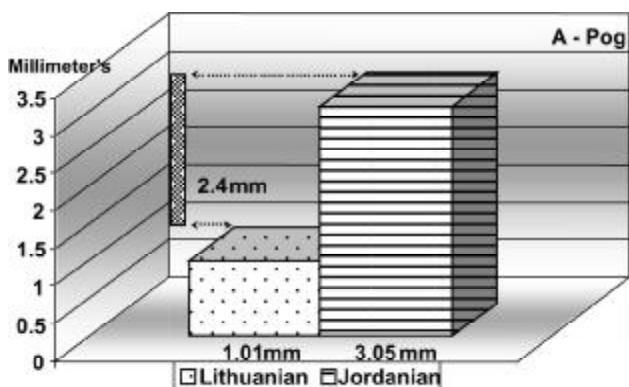


Fig. 8. Comparison of A-pog with lower incisors mean between Lithuanian and Jordanian females

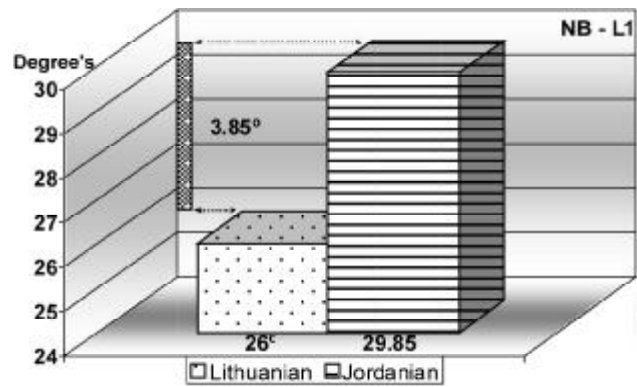


Fig. 7. Comparison of NB-L1 mean between Lithuanian and Jordanian females

for A-pog-L1, both groups showed a proclination in the lower incisors and was registered in 80% of class II division 1 cases.

DISCUSSION

Class II malocclusion has been estimated in numerous studies [7, 9, 14, 15], these results were controversial about characteristic of class II malocclusion. Class II malocclusions may result from numerous combinations of skeletal and dental components; Rothstein [6] reported that maxillary protrusion is the component of class II malocclusion, McNamara [4] stated in his study that mandibular retrusion is the component of class II malocclusion. The present study showed statistically significant difference between both groups in skeletal and dentoalveolar measurements, as the criteria for selection of the lateral cephalograms was specific for ANB angle, the anteroposterior skeletal relationship of the maxilla and mandible relative to the cranial base were similar. Cephalometric measurements and their interpretation depend on the selected method of analysis. During ANB angle evaluation attention is not paid to influence of vertical ratio of maxilla-mandible, and to influence of their absolute values to sagittal ratio. For instance, in case of increasing height of the lower third of the face and in case of the same size of mandible, point B will be in a more distal position. It is important to determine the dentoalveolar position relative to their bases in Class II division I malocclusion. Studies have usually associated protrusion of the upper incisor position relative to the maxilla. Riedel [16] noted that the maxillary incisor position in his Class II division 1 sample was twice as far anterior to the facial plane as that in patients having normal occlusion. Hitchcock [17] also reported maxillary incisor protrusion relative to A-Pog. Hamdan [18] reported a significant protrusion in upper incisor position in Jor-

danian population. The upper incisor position was evaluated by the NA-U1 and Max-U1 in the present study. Upper incisor proclination was present in 67% of the subjects in Jordanian group, while incisor retroclination was seen in few cases. This finding is in consonance with the results of other investigators [1, 15-17]. Two angular measurements of mandibular dental position relatively to the skeletal mandible were used in this study – NB-L1 and Man-L1. More than 70% of Class II division 1 cases showed proclination of the lower incisors according our data. However, it should be kept in mind that major cases with mandibular incisor protrusion correlated with retrognathic mandible because of dentoalveolar compensation of skeletal discrepancy [4, 19]. These findings are in agreement with other studies [1, 15], and conflict with the results of McNamara, in which he stated that the lower incisor position were generally well positioned [4]. Šidlauskas [8] showed a decreased facial height in his study on Lithuanian Class II division 1 malocclusion, and that supports our findings on Lithuanian females. Similar results were found in other Class II division 1 studies [9-11]. In comparison with Jordanian sample, which showed an increase in vertical height, and the results were similar to Henry [7], Hunter [11], McNamara [4], whose concluded in their studies that; excessive vertical development of the

lower face is a frequent characteristic of class II division 1 malocclusion. It is of utmost importance that the phenotype of the patient with Class II division 1 malocclusion be characterized thoroughly as possible, because this is closely related with further treatment planning. Treatment protocols with functional appliances for growing patients proved effectiveness in dentoalveolar and skeletal correction of post normal buccal segments [20]. The components of Class II division 1 malocclusion should be considered for every patient individually.

CONCLUSIONS

1- Lithuanian Class II division 1 females had reduced vertical skeletal relationship, while Jordanian females had increased vertical relationship in their class II division 1 malocclusion. 2- The dentoalveolar comparisons indicated that the Jordanian group had more protrusion of the lower incisors compared with Lithuanians.

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