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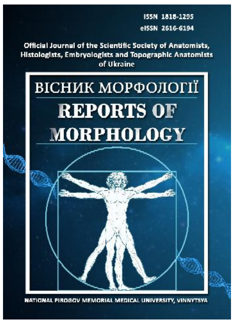


# Regression models of teleradiographic parameters according to the Jarabak method in young men and young women with orthognathic occlusion

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*Obtaining orthognathic occlusion in a patient as a result of treatment is a key goal of any orthodontist. However, the thorny path that both the patient and the doctor must go through involves painstaking work, which primarily begins with planning and choosing a method of orthodontic treatment, predicting and modeling its results. However, the latter is possible only if previously conducted research to determine the normative indicators for a population. The aim of the study was to construct and analyze regression models of teleradiographic parameters according to the Jarabak method in Ukrainian young men and young women with orthognathic occlusion. 49 young men and 76 young women with orthognathic occlusion underwent cephalometric analysis of lateral radiographs according to the modification of the method Jarabak J. R. - Roth-Jarabak, performed using the software OnyxCeph³™. All parameters according to the Jarabak method were divided into three groups: the first group included metric characteristics of the skull, which are used as baseline indicators; to the second group - dental-jaw in which the skeleton has already been formed and which surgical methods can change the length, width, angles and positions of the upper and lower jaws; to the third group - indicators that characterize the position of each individual tooth relative to each other, cranial structures and the profile of the soft tissues of the face. Construction of regression models of teleradiographic indicators by the Jarabak method was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis. When modeling teleradiographic parameters according to the Jarabak method, which were included in the second group, depending on the indicators of the first group in young men with orthognathic occlusion, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.589 to 0.950) were constructed. The constructed equations most often include the value of the angle N-S-Ar and the distances Ar-Go and N-S. In young women with orthognathic occlusion, 6 reliable regression models of the second group were constructed depending on the indicators of the first group ($R^2$= from 0.609 to 0.971). The constructed equations most often include the value of the distances Ar-Go, S-Ar, N-S and the angle N-S-Ar. When modeling teleradiographic indicators included in the third group, depending on the indicators of the first and second groups in young men, 5 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.658 to 0.751) were constructed. The constructed equations most often include the values of the angles N-A-Pog, N-Go-Gn, S-N-B and A-N-B. In young women with orthognathic occlusion, 6 reliable regression models of the third group were constructed depending on the indicators of the first and second groups ($R^2$= from 0.509 to 0.772). The constructed regression equations most often include the value of the angles N-A-Pog, A-N-B, S-Ar-Go, S-N-A and the ratio Go_Me:N-S. The obtained models will allow orthodontists to automatically calculate the required cephalometric parameters.*

**Keywords:** *regression analysis, teleradiography, cephalometric analysis according to the Jarabak method, Ukrainian young men and young women with orthognathic occlusion.*

## Introduction

Physiologically correct, or as it is called in dentistry - orthognathic occlusion, promotes the proper functioning and development of the dental system in general and other systems indirectly, namely: promotes the formation and maintenance of oral hygiene, quality machining of food for the digestive system, uniform load on the teeth and joints, the proper functioning of nasal breathing, the formation of a harmonious and proportionate face, the creation of an aesthetically pleasing smile, which in turn ensures the proper psycho-emotional development of person.

And although congenital orthognathic occlusion is quite common, occlusal pathology and other orthodontic diseases occur in almost all populations, different segments of the population with varying frequency. Studies conducted in Northern Finland have revealed at least one bite pathology in 39.5% of subjects. The most common pathologies were lateral occlusion (17.9%), deep occlusion (11.7%) and cross-occlusion (9.7%) [13].

In order to perform orthodontic treatment is primarily its planning with the use of clinical and instrumental examination [10, 19]. One of the key places at this stage is the cephalometric analysis of lateral teleradiograms [6].

However, to ensure the best results of orthodontic intervention, it is necessary to take into account the fact that the normative indicators established for a particular type of cephalometric analysis were created for a certain population, according to the country and region of the author. That is, for their full implementation it is necessary to conduct research on the normative indicators of the local population, taking into account their nationality [8], regional affiliation [11, 20], sex, age and type of face [16], etc.

Thus, it is necessary to perform extensive and painstaking work in the form of clinical trials, taking into account as many factors as possible for better adaptation of cephalometric analysis techniques for the needs of Ukrainian orthodontics.

***The aim*** of the study was to construct and analyze regression models of teleradiographic parameters according to the Jarabak method in Ukrainian young men and young women with orthognathic occlusion.

## Materials and methods

Teleradiography in the mode of cephalometric examination was performed using a dental cone-beam tomograph Veraviewepocs 3D Morita (Japan) for 49 young men (aged 17 to 21 years) and 76 young women (aged 16 to 20 years) who had a physiological bite as close as possible to orthognathic (further orthognathic) which is defined on 11 points by Bushan M. G., etc. [5]. Cephalometric analysis modified by the method Jarabak J. R. [12] - Roth-Jarabak was performed using OnyxCeph³™ software, 3DPro version, Image Instruments GmbH, Germany (software license № URSQ-1799).

Cephalometric points were determined according to the recommendations of Phulari B. S. [18] and Doroshenko S. I. and Kulginsky E. A. [9].

Cephalometric parameters according to the method of Jarabak in this study were divided into three groups according to Dmitriev M. O. [7]. The first group includes metric characteristics of the skull, which are used as basic indicators in the methods of cephalometric analysis; to the second group - dental-jaw in which the skeleton has already been formed and which surgical methods can change the length, width, angles and positions of the upper and lower jaws; to the third group - indicators that actually characterize the position of each individual tooth relative to each other, cranial structures and the profile of the soft tissues of the face.

Cephalometric measurements by the method of Jarabak included the determination of the following parameters [22, 23]:

*the first group* - the distance **Ar-Go**, characterizes the length of the branch of the mandible (mm); distance **S-Ar**, characterizes the location of the temporomandibular joint relative to the Turkish saddle (mm); distance **N-S**, characterizes the length of the anterior base of the skull (mm); angle **N-S-Ar**, characterizes the position of the temporomandibular joint (°); the ratio of **S-Ar:Ar-Go**, allows you to assess the degree of development of the branch of the mandible relative to its body (%);

**the second group** - the distance **Go_Me**, characterizes the length of the body of the mandible (mm); **N-Go** distance, characterizes the height of the bony base of the face, and the actual distance of the chin from the point N in the vertical plane (mm); distance **S-Gn**, characterizes the length of the face determined by the axis Y, and the actual distance of the chin from the Turkish saddle (mm); the distance **S-Go**, which characterizes the posterior height of the face, and the actual distance of the angle of the lower jaw from the Turkish saddle, also determines the degree of development of the branch of the lower jaw mainly in the vertical plane (mm); distance **N-Me**, characterizes the anterior height of the face (mm); angle **S-Ar-Go**, characterizes the position of the temporomandibular joint and the branch of the mandible (°); angle **Ar-Go-Gn** (gonial angle), characterizes the value of the angle of the mandible (°); **Sum** indicator, characterizes the direction of development (vertical when increasing and horizontal when decreasing) of the lower jaw (°); the angle **N-Go-Ar**, characterizes the angle of inclination of the branch of the mandible to the line N-tGo (°); angle **N-Go-Gn**, characterizes the angle of the mandible to the line N-tGo (°); angle **S-N-A**, characterizes the position of the upper jaw in the sagittal plane (°); angle **S-N-B**, characterizes the position of the lower jaw in the sagittal plane (°); angle **A-N-B**, characterizes the inter-jaw ratio in the sagittal plane (°); angle **SN-GoGn**, characterizes the inclination of the body of the mandible to the anterior base of the skull (°); angle **N-S-Gn**, characterizes the direction of the axis of development of the mandible (°); angle **S-N-Pog**, characterizes the position of the lower jaw, namely the bony chin in the sagittal plane (°); angle **N-A-Pog** (angle of facial convexity), characterizes the convexity of the bony profile of the face (°); the ratio of **Go_Me:N-S**, allows to estimate the degree of development of the lower jaw relative to the anterior base of the skull (%); the ratio **S-Go:N-Me**, characterizes the ratio between the front and rear heights of the face (%);

*the third group* - the distance **Li-NsPog'**, characterizes the position of the lower lip relative to the "Aesthetic line" - the line Ns-Pog` (mm); distance **Ls-NsPog'**, characterizes the position of the upper lip relative to the "Aesthetic line" - the line Ns-Pog` (mm); distance **1lo-NPog**, characterizes the anterior-posterior position of the lower medial incisor (mm); distance **1up-NPog**, characterizes the anterior-posterior position of the upper medial incisor (mm); angle **II** (inter-incisor angle), characterizes the angular ratio of the medial incisors of the upper and lower jaws (°); angle **Mand1-GoMe**, characterizes the inclination of the lower medial incisor to the mandibular plane (°); angle **Max1-SN**, characterizes the inclination of the upper medial incisor to the anterior base of the skull (°); angle **OcP-GoGn**, characterizes the inclination of the closing plane to the mandibular plane (°).

It should be noted that, unlike the original Jarabak analysis, the Roth-Jarabak analysis does not use a specific A-point which is placed 2 mm in front of the apex of the median maxillary incisor, but uses the more common Downs A-point.

Construction of regression models of teleradiographic indicators by the Jarabak method was performed in the licensed package "Statistica 6.0" using step-by-step regression analysis.

## Results

Models of teleradiographic indicators by the Jarabak method with a coefficient of determination ($R^2$) greater than 0.5, which are included in the second group depending on the indicators of the first group have the form of the following linear equations:

***Sum*** *(young men)* = 411.8 - 0.930 x Ar-Go + 0.374 x N-S-Ar - 0.341 x N-S ($R^2$=0.645; $F_{(3.45)}$=27.27; p<0.0000; Error of estimate =3.971);

***S-N-B*** *(young men)* = 97.23 + 0.461 x Ar-Go - 0.325 x N-S-Ar ($R^2$=0.607; $F_{(2.46)}$=35.51; p<0.0000; Error of estimate =2.163);

***SN-GoGn*** *(young men)* = 51.84 - 0.930 x Ar-Go + 0.374 x N-S-Ar - 0.341 x N-S ($R^2$=0.645; $F_{(3.45)}$=27.27; p<0.0000; Error of estimate =3.971);

***N-Go*** *(young men)* = -42.89 + 0.940 x Ar-Go + 0.382 x S-Ar:Ar-Go + 0.347 x N-S-Ar + 0.626 x N-S ($R^2$=0.642; $F_{(4.44)}$=19.73; p<0.0000; Error of estimate=3.546);

***N-S-Gn*** *(young men)* = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2$=0.589; $F_{(3.45)}$=21.50; p<0.0000; Error of estimate=2.785);

***S-Go*** *(young men)* = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2$=0.950; $F_{(3.45)}$=286.2; p<0.0000; Error of estimate=1.244);

***S-Go:N-Me*** *(young men)* = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2$=0.725; $F_{(3.45)}$=39.59; p<0.0000; Error of estimate=3.051);

***S-N-Pog*** *(young men)* = 74.37 - 0.408 x N-S - 0.427 x Ar-Go + 0.331 x N-S-Ar ($R^2$=0.612; $F_{(2.46)}$=36.29; p<0.0000; Error of estimate=2.244);

***Go_Me*** *(young women)* = -12.12 + 0.575 x N-S + 0.303 x Ar-Go + 0.454 x S-Ar + 0.114 x N-S-Ar ($R^2$=0.662; $F_{(4.71)}$=34.71; p<0.0000; Error of estimate=3.569);

***N-Go*** *(young women)* = -57.84 + 0.818 x N-S + 1.205 x Ar-Go + 0.403 x S-Ar:Ar-Go + 0.242 x N-S-Ar ($R^2$=0.866; $F_{(4.71)}$=114.7; p<0.0000; Error of estimate=3.305);

***S-Gn*** *(young women)* = 40.43 + 0.856 x N-S + 1.631 x S-Ar - 0.423 x S-Ar:Ar-Go ($R^2$=0.808; $F_{(3.72)}$=100.7; p<0.0000; Error of estimate=4.068);

***S-Go*** *(young women)* = 21.28 + 0.993 x Ar-Go + 0.893 x S-Ar - 0.171 x N-S-Ar ($R^2$=0.971; $F_{(3.72)}$=812.1; p<0.0000; Error of estimate=1.204);

***N-Me*** *(young women)* = -12.12 + 0.575 x N-S + 0.303 x Ar-Go + 0.454 x S-Ar + 0.114 x N-S-Ar ($R^2$=0.652; $F_{(4.71)}$=33.25; p<0.0000; Error of estimate=5.008);

***S-Go:N-Me*** *(young women)* = 21.28 + 0.993 x Ar-Go + 0.893 x S-Ar - 0.171 x N-S-Ar ($R^2$=0.609; $F_{(4.71)}$=27.68; p<0.0000; Error of estimate=2.955);

where, $F_{(!.!!)}$=!!.!! - critical (!.!!) and obtained (!!.!!) value of Fisher's criterion; p - the level of reliability of the model; Std. Error of estimate - standard estimation error.

Models of teleradiographic indicators by the method of Jarabak with a coefficient of determination greater than 0.5, which are included in the third group depending on the indicators of the first and second groups have the form of the following linear equations:

***OcP-GoGn*** *(young men)* = -37.73 + 0.508 x N-Go-Gn + 1.333 x S-N-Pog - 0.863 x S-N-B - 0.331 x S-Go:N-Me ($R^2$=0.658; $F_{(4.44)}$=21.14; p<0.0000; Error of estimate=2.451);

***Max1-SN*** *(young men)* = -1.072 + 1.571 x S-N-B - 0.155 x S-Ar-Go ($R^2$=0.683; $F_{(2.46)}$=49.65; p<0.0000; Error of estimate=3.864);

***Mand1-GoMe*** *(young men)* = 151.2 - 0.996 x N-Go-Gn + 0.831 x N-A-Pog + 0.359 x S-Go - 0.229 x Go_Me ($R^2$=0.751; $F_{(4.44)}$=33.17; p<0.0000; Error of estimate=3.817);

***1up-NPog*** *(young men)* = -8.488 + 0.766 x N-A-Pog - 0.874 x A-N-B + 0.173 x S-N-B ($R^2$=0.712; $F_{(3.45)}$=37.10; p<0.0000; Error of estimate=1.572);

***1lo-NPog*** *(young men)* = 2.736 + 0.711 x N-A-Pog - 0.831 x A-N-B ($R^2$=0.714; $F_{(2.46)}$=57.48; p<0.0000; Error of estimate=1.461);

***OcP-GoGn*** *(young women)* = -88.36 + 0.678 x N-Go-Gn + 0.420 x N-Go-Ar - 0.091 x N-A-Pog + 0.150 x S-Ar-Go + 0.120 x Go_Me:N-S ($R^2$=0.606; $F_{(5.70)}$=21.57; p<0.0000; Error of estimate=2.545);

***Max1-SN*** *(young women)* = -4.292 + 3.132 x S-N-B - 2.036 x S-N-A + 0.138 x S-Ar:Ar-Go + 0.543 x N-A-Pog + 0.137 x Go_Me:N-S ($R^2$=0.574; $F_{(5.70)}$=18.83; p<0.0000; Error of estimate=4.208);

***Mand1-GoMe*** *(young women)* = 229.0 + 1.305 x N-A-Pog - 1.247 x S-N-A - 1.161 x SN-GoGn ($R^2$=0.623; $F_{(3.72)}$=39.58; p<0.0000; Error of estimate=4.290);

***1up-NPog*** *(young women)* = 4.921 + 0.987 x N-A-Pog - 1.550 x A-N-B + 0.107 x Go_Me - 0.127 x Ar-Go ($R^2$=0.731; $F_{(4.71)}$=48.18; p<0.0000; Error of estimate=1.463);

***1Io-NPog** (young women)* = -1.585 + 0.947 x N-A-Pog - 1.510 x A-N-B + 0.036 x S-Ar-Go ($R^2$=0.772; $F_{(3.72)}$=62.39; p<0.0000; Error of estimate=1.426);

***Ls-NsPog'** (young women)* = 14.61 + 0.692 x N-A-Pog - 1.170 x A-N-B - 0.100 x N-S-Ar - 0.057 x N-Me ($R^2$=0.509; $F_{(4.71)}$=18.39; p<0.0000; Error of estimate=1.750).

## Discussion

When modeling teleradiographic parameters according to the Jarabak method, included in the *second group*, depending on the indicators of the *first group* in *young men* with orthognathic occlusion, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.589 to 0.950) were constructed. The constructed regression equations most often include the value of the angle N-S-Ar (33.33%) and the distances Ar-Go and N-S (29.12% each). In young men, the coefficients of determination of the regression equations of the angles S-Ar-Go, Ar-Go-Gn, N-Go-Ar, N-Go-Gn, S-N-A and N-A-Pog, the distances Go_Me, S-Gn and N-Me and the ratio Go_Me:N-S according to the Jarabak method, depending on the teleradiographic characteristics of the basal cranial structures were from 0.05 to 0.48 and therefore the constructed models had no practical significance; and the regression equation of the value of the angle A-N-B was not constructed at all.

When modeling teleradiographic indicators according to the Jarabak method, which were included in the *second group*, depending on the indicators of the *first group* in *young women* with orthognathic occlusion, 6 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.609 to 0.971) were constructed. The constructed regression equations most often include the value of the distances Ar-Go, S-Ar and the angle N-S-Ar (23.81% each) and the distance N-S (19.05%). In young women, the coefficients of determination of the regression equations of the magnitude of the angles S-Ar-Go, Ar-Go-Gn, Sum, N-Go-Ar, N-Go-Gn, S-N-A, S-N-B, SN-GoGn, N-S-Gn and S-N-Pog and the ratio of Go_Me:N-S by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures was from 0.10 to 0.45 and therefore the constructed models had no practical significance; and the regression equations of the magnitude of the angles A-N-B and N-A-Pog were not constructed at all.

When modeling teleradiographic parameters according to the Jarabak method, which were included in the *third group*, depending on the indicators of the *first* and *second groups* in *young men* with orthognathic occlusion, 5 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= 0.658 to 0.751) were constructed. The constructed regression equations most often include the value of the angle N-A-Pog (20.00%) and the angles N-Go-Gn, S-N-B and A-N-B (13.3 3% each). In young men, the coefficients of determination of the regression equations of the angle II and the distances Ls-NsPog' and Li-NsPog' by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures and upper and lower jaws were from 0.30 to 0.35 and therefore the models are not had practical significance.

When modeling teleradiographic parameters according to the Jarabak method, which were included in the *third group*, depending on the indicators of the *first* and *second groups* in *young women* with orthognathic occlusion, 6 out of 8 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.509 to 0.772) were constructed. The constructed regression equations most often include the value of the angle N-A-Pog (25.00%), the angle A-N-B (12.50%) and the angles S-Ar-Go, S-N-A and the ratio Go_Me:N-S (8.33% each). In young women, the coefficients of determination of regression equations of the angle II and the distance Li-NsPog' by the method of Jarabak depending on the teleradiographic characteristics of the basal cranial structures and upper and lower jaws were 0.22 and 0.50 and therefore the models were not practical.

A study in Iraq found that the local population was dominated by individuals with average cephalic indices of 79.45 and 74.34 in men and women, respectively (ie mesocephalus). When compared with data from Saudi Arabia, it was found that Iraqis have a smaller average facial proportion and less common data with the norms according to the Jarabak method (55.38% and 63.5% respectively) [1].

A survey of the population of Nepal with occlusion of class I occlusion revealed a hyperdivergent growth pattern in 10.57% of subjects, normodivergent in 18.26% and hypodivergent in 71.15% of people. The average ratio of Jarabak for individuals with hyperdivergent growth was 58.65±1.94, for normodivergent growth 63.98±0.85 and hypodivergent was 69.98±4.13. The greatest correlation was found between AFH and PFH in individuals with hyperdivergent and normodivergent growth types (r=0.821 and r=0.978, respectively) [2].

A survey of 58 residents of Hazaribakh (India) revealed the following distribution by type of growth: hyperdivergent - 10.3%, normodivergent - 17.2%, hypodivergent - 72.4%. Manifestations of sexual dimorphism were revealed - the average values of all linear measurements were higher in men. The strongest correlations were observed between the posterior height of the face and the gonial angle, the lower gonial angle and the angle of the mandibular plane [14].

Examination of persons with class II occlusion pathology revealed the following specific changes in cephalometric parameters: decrease in the length of the mandible, decrease in the lower anterior height of the face, decrease in the value of the gonial angle and increase in the value of the incisal angle [3].

The following features of odontometric indicators have been identified in Javanese with class III occlusion pathology: the angle Go1 has lower values than normal, the angle Go2, on the contrary, has higher values than normal. The general gonial angle at such persons is within norm. The authors of the study did not find a difference in the values of the gonial angle between men and women (p=0.939 and p=0.861, respectively). A negative correlation of PFH with Go2 (p=0.018) and a positive correlation of the position of the mandibular branch and Go1 (p=0.003) were established [4].

In individuals with class III and I occlusion pathology, 14 indicators were identified that can be used to construct reliable regression models, including indicators: Holdaway and AFH ratios, Ao-Bo and 1u-NPog distances, and SNB, SND, FMA, IMPA, MeGoOcP, Mand 1-MeGo, NSAr, ArGoMe, NGoMe and SNPog angles [24].

Mangla R. and co-authors [15] in the cephalometric examination of 110 teleradiograms of men and women aged 18-25 years found features of the parameters of the mandible in different types of faces. A significant relationship has been established between the vertical pattern of the mandible and the significant height, depth and symphysis ratio, decreasing height and width of the mandibular branch, decreasing its depth, increasing the gonial angle, and decreasing the mandibular arch angle.

When evaluating the relationships between cephalometric indicators and facial indicators, a significant inverse correlation was found between FMA and Jarabak index (r= -0.6, p<0.05) [17].

The thickness of the masticatory muscles correlates with the cephalometric parameters of the face. In persons with a low value of the angle of the face, the thickness of the masticatory muscles is higher than in persons with a normal and high angle of the face, both during the contraction of the masticatory muscles and during their relaxation (p<0.001). There was also a positive correlation between masticatory muscle thickness and Jarabak ratio and mandibular branch thickness, and a negative correlation with LAFH, FMA, MMPA and gonial angle [21].

The work on the construction and analysis of regression models of teleradiographic indicators by the method of Jarabak for adolescents with orthognathic occlusion, taking into account sex and ethnicity is another positive step towards the introduction of new scientific achievements in the active practice of Ukrainian orthodontists.

## Conclusions

1. When modeling teleradiographic indicators included in the second group according to the Jarabak method, depending on the indicators of the first group, 8 out of 19 possible reliable regression models with a coefficient of determination greater than 0.5 ($R^2$= from 0.589 to 0.950) were constructed for young men, and for young women - 6 models ($R^2$= from 0.609 to 0.971). When modeling teleradiographic indicators included in the third group, depending on the indicators of the first and second groups, 5 out of 8 possible models were built for young men ($R^2$= from 0.658 to 0.751), and for young women - 6 models ($R^2$= from 0.509 to 0.772).

2. When modeling the indicators of the second group, depending on the indicators of the first group in young men, the constructed equations most often include the value of the angle N-S-Ar (33.33%) and the distances Ar-Go and N-S (29.12% each), and in young women - the value of the distances Ar-Go, S-Ar and the angle N-S-Ar (23.81% each) and the distance N-S (19.05%). When modeling the indicators of the third group, depending on the indicators of the first and second groups in young men, the constructed equations most often include the value of the angle N-A-Pog (20.00%) and the angles N-Go-Gn, S-N-B and A-N-B (13.33% each), and in young women - the value of the angle N-A-Pog (25.00%), the angle A-N-B (12.50%) and the angles S-Ar-Go, S-N-A and the ratio Go_Me:N-S (8.33% each).

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## РЕГРЕСІЙНІ МОДЕЛІ ТЕЛЕРЕНТГЕНОГРАФІЧНИХ ПОКАЗНИКІВ ЗА МЕТОДОМ JARABAK В ЮНАКІВ І ДІВЧАТ З ОРТОГНАТИЧНИМ ПРИКУСОМ

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*Отримання в результаті лікування ортогнатичного прикусу у пацієнта є ключовою ціллю роботи будь якого лікаря ортодонта. Проте тернистий шлях, що його мають пройти сумісно як пацієнт, так і лікар, передбачає проведення кропіткої роботи, яка в першу чергу починається з планування і вибору методу ортодонтичного лікування, передбачення та моделювання його результатів. Проте, проведення останнього можливе лише за умови попередньо проведених досліджень для визначення нормативних показників для тієї, чи іншої популяції населення. Мета дослідження - в українських юнаків і дівчат з ортогнатичним прикусом побудувати та провести аналіз регресійних моделей телерентгенографічних показників за методом Jarabak. 49 юнакам і 76 дівчатам із ортогнатичним прикусом проведено цефалометричний аналіз бокових телерентгенограм за модифікацією методики J.R. Jarabak - Roth-Jarabak, виконаний за допомогою програмного забезпечення OnyxCeph³™. Усі параметри за методикою Jarabak були розділені на три групи: до першої групи увійшли метричні характеристики черепа, які використовують як базові показники; до другої групи - зубо-щелепні, в яких кістковий скелет вже сформувався і яким хірургічними методами можна змінювати довжину, ширину, кути та положення верхньої і нижньої щелеп; до третьої групи - показники які характеризують положення кожного окремого зуба відносно один одного, черепних структур та профілю м'яких тканин обличчя. Побудова регресійних моделей телерентгенографічних показників за методом Jarabak проведена в ліцензійному пакеті "Statistica 6.0" за допомогою покрокового регресійного аналізу. При моделюванні телерентгенографічних показників за методикою Jarabak, що увійшли до другої групи, в залежності від показників першої групи в юнаків із ортогнатичним прикусом побудовані 8 із 19 можливих достовірних регресійних моделей з коефіцієнтом детермінації більшим 0,5 ($R^2$ = від 0,589 до 0,950). До побудованих рівнянь найбільш часто входять величина кута N-S-Ar та відстаней Ar-Go і N-S. У дівчат із ортогнатичним прикусом побудовані 6 достовірних регресійних моделей показників другої групи в залежності від показників першої групи ($R^2$ = від 0,609 до 0,971). До побудованих рівнянь найбільш часто входять величина відстаней Ar-Go, S-Ar, N-S і кута N-S-Ar. При моделюванні телерентгенографічних показників, що увійшли до третьої групи в залежності від показників першої та другої груп в юнаків побудовані 5 із 8 можливих достовірних регресійних* *моделей з коефіцієнтом детермінації більшим 0,5 ($R^2$ = від 0,658 до 0,751). До побудованих рівнянь найбільш часто входять величина кутів N-A-Pog, N-Go-Gn, S-N-B і A-N-B. У дівчат із ортогнатичним прикусом побудовані 6 достовірних регресійних моделей показників третьої групи в залежності від показників першої та другої груп ($R^2$ = від 0,509 до 0,772). До побудованих регресіних рівнянь найбільш часто входять величина кутів N-A-Pog, A-N-B, S-Ar-Go, S-N-A і співвідношення Go_Me:N-S. Отримані моделі дозволять лікарям-ортодонтам автоматично вираховувати необхідні цефалометричні показники.*

**Ключові слова:** *регресійний аналіз, телерентгенографія, цефалометричний аналіз за методом Jarabak, українські юнаки та дівчата з ортогнатичним прикусом.*