

# Sex differences of odontometrical indexes crowns of molars

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**Abstract:** Modern reconstructive methods of dentistry (stopping, restoration, and prosthetics with different types of orthopedic constructions) require detailed examination of the anatomical structure of the teeth crowns, especially examination of the knowledge about the relief of masticatory surface. That is why, we conducted a detailed examination of the features of odontoglyphics of molars, according to the sex and determination of odontometrical teeth indices of the citizens of Ternopil region. To achieve the goals, we use the following research methods, such as odontological, odontometrical, and statistical. According to the odontometrical indices of the sizes of the crowns of the molars, women's processes of reduction are reflected more than men's. Sex differences of the crown sizes are specially defined on the second upper and second lower molars. In the result of the conducted researches, it was found and theoretically confirmed racial identity of Ternopil and Ternopil region citizens, and it was given the characteristics of the differences of odontometrical indices of molar crowns of males and females. The lore of these characteristics plays a great role in the clinic of prosthetic dentistry.

**Keywords:** odontometry, sex differences, odontometrical indexes, crowns module, odontoglyphics drawing

## Background

Sex differences in human teeth is becoming a very important concern, especially in modeling and restoring process such as restorative dentistry, teeth lost their anatomical forms. Modern reconstructive dentistry requires a high level of knowledge about the anatomical structure of the teeth crowns. Molars are the most complex structure of all dental systems and have a high degree of differentiation surfaces. According to the theory of Dahlberg, the first molars are called key teeth, where the signs of the formation of specific class features of the teeth crowns are determined [1]. In modern literature, there are no data about examination of odontology and odontological indexes of this group of teeth, depending on the sex. As the level of morbidity of caries and the frequency of its complications are very high, the result of such researches will acquire a high value in the clinic of restorative dentistry during the modeling and

restoration of teeth. Considering that the researches carried out in Ternopil region have not analyzed it, examining the sex dimorphism of odontometrical and odontological characteristics of molars is very realistic and has a high theoretical and practical sense.

## Objectives

Identification of the differences in types of odontoglyphics drawing of molars' masticatory surface of both male and female, respectively.

## Materials and Methods

The following research methods were used: odontological, odontometrical, and statistical.

Odontoglyphical research of chewing surfaces of molars crowns of the upper and lower jaws was conducted in the

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general dental examination of a selected group of citizens from Ternopil. A total of 250 people (125 men and 125 women), citizens of Ternopil region in the age group of 18–25 years, were examined.

Oral cavity of the study participants were examined with the help of dental mirror, probe, and forceps. The type of the molars masticatory surface odontoglyphics drawing was fixed in the research protocol for men's and women's separately.

To perform odontometrical researches, the diagnostical impressions were taken from the upper and lower jaws with the help of standard impression tray and alginate impression material ("Tropicalgin" brand Zhermack, Badia Polesine, Italy). After the impressions were taken, the diagnostical models from super plaster were casted (Convertin Hart, type IV brand Spofa-Dental, Jicin, Czech Republic). The main parameters of molars were measured: mesio-distal and vestibulo-lingual sizes of crowns and heights of clinical crowns for men and women were recorded separately on these plaster models (Fig. 1).

These measurements were made according to the method proposed by Zubov [2] with the help of a 0.02-mm precision calliper. Mesio-distal size of the crowns was measured between the most protruding points of contact surfaces, while the calliper's legs were kept strictly parallel to the median vertical of the tooth. Vestibulo-lingual size of the crowns was measured perpendicular to mesio-distal size between the most protruding points of vestibular and lingual surfaces.

To characterize the total weight of the crown, the following indexes were processed:

Crown's module. It is calculated as half of the sum of mesio-distal and vestibular-lingual sizes of the crown:  $m_{cor} = (VL_{cor} + MD_{cor})/2$ .

The massive of the crown. It is the product of mesio-distal and vestibular-lingual sizes of the crown:  $Rb = VL_{cor} \times MD_{cor}$ . This index evidences that the degree of reduction of the molars, which occurs in different ethnic group according to Zubov, is connected with their phenotype.

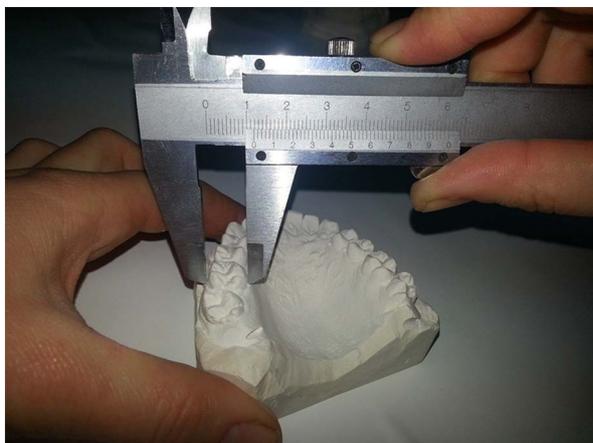


Fig. 1. Measuring the size of molars crowns

The middle module of the molars' series. It is calculated as a sum of the modules of the molars' crowns in a quadrant divided by the number of teeth:  $m_{cor}M(1-3) = m_{cor}M1 + m_{cor}M2 + m_{cor}M3/3$ . This indicator is a characteristic of the absolute size of the teeth in the jaw.

Statistical processing of digital data was performed using the software Excel (Microsoft, USA) and Statistica 6.0 (Stafsoft, USA).

For statistical analysis of the data, the methods used were as follows:

- (1) Analysis of the variational series – calculating the arithmetic mean and average error ( $M + m$ ).
- (2) Assess the reliability of the results difference obtained in the two groups by the method of the Student's  $t$ -test.

## Results

According to the literature [3–6], two types of molars odontoglyphics drawing are defined on the masticatory surface of molars: igrek (Y) and plus (+). Type of the pattern reflects mutual disposition of the major bumps in the center of the crown. Y-pattern stated in the case, where the eocone and diacone are contacted. +-Pattern means dotted contact between all the four main bumps in the center of the crown. The pattern of crown's masticatory surface in combination with the number of bumps is considered as the main morphological characteristics of molars [7–9]. According to the theory of Dalberg, the quantity of bumps on the masticatory surface of the molars is determined with the help of morphogenetic field of molarization [1]. The concept of the morphogenetic field includes complex relationships of cellular enamel elements, dentin and pulp, which are defined as the general morphological characteristics of the teeth as well as the individual features of one class (class specific). In the middle of the class, there are areas, where the morphogenetic field has the most powerful action and morphological sign is most distinct. According to Dalberg, the first molars of upper and lower jaws have the most powerful field of molarization, and they are the key teeth. In the second and third molars, the field of molarization is less significant, that is, manifested in a decrease of the number of cusps and their height.

The result of the researches showed that the molars of citizens in Ternopil region are characterized by the presence of Y-five, Y-four, Y-three, +-five, and +-four types of odontoglyphics drawing. Moreover, it is found that upper jaw molars are characterized by the permanent presence of Y pattern: the first and the second molars are characterized by Y-four type and third molar is characterized by Y-three type, regardless of sex (Fig. 2).

In 45% of examined people, we found the presence of Carabelli's tubercle with the different levels of expression

of the first upper molar. Moreover, this feature is typical for both men and women (*Fig. 3*).

The first molars of the lower jaw are characterized with the presence of Y-five type of odontoglyphics drawing, and this is observed in both women's and men's teeth.

In the second molars, the presence of +-four and +-five pattern of masticatory surface were observed. Here, we can see the sex differences. The men are characterized



**Fig. 2.** | Y-four type of odontoglyphics drawing of the first upper jaw molar



**Fig. 3.** | The Carabelli's tubercle on the first upper jaw molar



**Fig. 4.** | The second molar of the lower jaw (men)



**Fig. 5.** | The second molar of the lower jaw (women)

**Table I** | Statistical indexes of module of the men's upper molars crowns

	$M_1 \pm m_1$	$M_2 \pm m_2$	$t$	$p$	$M_3 \pm m_3$	$t_1$	$p_1$	$t_2$	$p_2$
Right side	10.88 ± 0.11	10.27 ± 0.07	4.68	<0.05	8.77 ± 0.27	7.24	<0.05	5.38	<0.05
Left side	10.91 ± 0.14	10.11 ± 0.13	4.19	<0.05	8.80 ± 0.23	7.84	<0.05	4.96	<0.05

Difference between  $M_1 \pm m_1$  and  $M_2 \pm m_2$  is determined by the indexes  $t$  and  $p$ .

Difference between  $M_1 \pm m_1$  and  $M_3 \pm m_3$  is determined by the indexes  $t_1$  and  $p_1$ .

Difference between  $M_2 \pm m_2$  and  $M_3 \pm m_3$  is determined by the indexes  $t_2$  and  $p_2$ .  $M_1$  – first molar,  $M_2$  – second molar, and  $M_3$  – third molar

**Table II** | Statistical indexes of module of the women's upper molars crowns

	$M_1 \pm m_1$	$M_2 \pm m_2$	$t$	$p$	$M_3 \pm m_3$	$t_1$	$p_1$	$t_2$	$p_2$
Right side	10.25 ± 0.15	9.94 ± 0.14	1.51	>0.05	8.97 ± 0.10	7.10	<0.05	5.64	<0.05
Left side	10.30 ± 0.17	9.94 ± 0.14	1.63	>0.05	8.99 ± 0.14	5.95	<0.05	4.80	<0.05

Difference between  $M_1 \pm m_1$  and  $M_2 \pm m_2$  is determined by the indexes  $t$  and  $p$ .

Difference between  $M_1 \pm m_1$  and  $M_3 \pm m_3$  is determined by the indexes  $t_1$  and  $p_1$ .

Difference between  $M_2 \pm m_2$  and  $M_3 \pm m_3$  is determined by the indexes  $t_2$  and  $p_2$ .  $M_1$  – first molar,  $M_2$  – second molar, and  $M_3$  – third molar

with the presence of +five, and for women, it was +four pattern of the second molar's masticatory surface. This fact shows that the process of reduction is expressed strongly at women's molars due to the disappearance of a fifth tubercle and decrease in the size of the crown (Figs 4 and 5).

To differentiate molars depending on sex, the indexes of the reduction of the second upper jaw molar represent valuable information. Reduced types of crowns of the second upper jaw molars, where the hypocone is very small or not available at all, are mostly found in women. We can make conclusion about the degree of the reduction depending on the sex by analyzing the percentage ratio of the first and second molar's crowns modules (Tables I and II).

Thus, after analyzing the results, it can be argued that the indicators module crowns of the men molars increase over women.

## Conclusion

To summarize, the following conclusions are made:

- (1) According to the odontometrical indexes of the size of the molar crowns, processes of reduction are more reflected in women's molars.
- (2) Sex differences of the crown sizes are especially defined on the second upper and lower jaw molars.
- (3) The citizens of Ternopil and Ternopil region are related to the South Europeoid ethnic group.

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