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MIDDLE PHALANGEAL HAIR DISTRIBUTION IN SERBIAN HIGH SCHOOL STUDENTS

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Abstract - The aim of this paper was to explore hairiness of the middle phalanges on both hands of Serbian high school students. The total sample comprised 425 pupils in the town of Niš of Serbian nationality, aged 15–19 years. Hairiness on the middle phalanges of second, third, fourth and fifth fingers was detected by inspection with a magnifying glass. The results showed that hairiness was more frequent on the fifth finger of boys. The investigation of the hairiness on the middle phalanges of both hands in the region of Niš may be, in comparison with anthropological investigations of other regions, important in the investigation of the genetic cause of the hairiness on the middle phalanges.

Keywords: mid-digital hair, hands, gender.

UDC 577.2

INTRODUCTION

Hairiness in humans has been attracting the attention of anthropologists for a long time. While all the mammals evolutionally close to humans have fur (hairy skin), humans are "naked monkeys". The reason for this loss of hair has not been fully elucidated. The phalanges of the hand also follow the evolutional hominid trend of progressive hair loss (Danforth, 1921). While man's ancestors had hair on all their fingers, studies on human subjects have shown that the distal phalanges have almost no hair; the proximal ones almost always have hair which can occasionally be present on the middle phalanx of the finger. Authors agree that the presence of middle phalangeal hair is genetically conditioned, but there has not been any agreement about the manner of transmission of this characteristic. Danforth explained the absence of hair by a simple autosomal-recessive mechanism, similar to Saldanha and Guinsberg (1961) and Bonne (1966).

Bernstein and Burks (1942) suggested a model by which hairiness was determined by at least 5 allelic genes (A_0, A_1, A_2, A_3, and A_4). Individuals without middle phalangeal hair (MPH) are the carriers of two recessive genes for individual alleles (OMIM number 157200). Studies conducted in the U.S.A. (Chopra, 1953) and data from Japan (Matsunaga, 1956) that parents without this characteristic had eight children with MPH suggested that there were exceptions to this rule, indicating that the hypothesis of heredity was not completely satisfactory and that further studies were necessary.

Many authors have been interested in the racial differences in MPH distribution and have studied Caucasians (Bernstein, 1949) in Great Britain (Brothwell and Mollenson, 1965), Brazil (Saldanha and Guinsburg, 1961), Canada (Ikoma, 1986), Spain (Luna, 1989), Yugoslavia (Boev i Vlahović, 1970), Republic of Macedonia (Dadić et al., 2008), Bosnia and Herzegovina (Hadžiselimović and Berberović, 1980; Ahmić et al., 2005; Hamidović and Terzić, 2009), Serbia (Čukuranović, 1989, 1992; Marinković and Cvjetičanin, 2007; Nešić et al., 2008); then the inhabitants of Eastern Europe and Asian countries: Turkish (Hatiboğlu, 1983), Indian (Dutta, 1963, 1965, 1966; Basu, 1967; Sinha et al., 1984; Sethuraman et al., 1982), Eskimo (Sewall,

1939), Tibetan (Tiwari and Bhasin, 1969), Japanese (Matsunaga, 1956), Malaysian (Dharap et al., 1995); as well as the African population in Nigeria (Singh, 1982; Mbajiorgu et al., 1996), Ethiopian (Bat-Miriam, 1962) and American (Setty, 1966). Analyses of the characteristic in various populations have demonstrated significant differences (Sethuraman et al., 1982). The frequency of individuals without MPH varied in the range 21.6–90% among the studied populations (Saldanha and Guinsberg, 1961). The characteristic was completely absent in Eskimos and the lowest values were found in Africa and highest among the white people. Though the variation range was very wide regarding the presence or absence of MPH in the various populations, the frequency distribution 4>3>5>2 was the same in all of them (Singh, 1982).

The age of the examinees influences MPH manifestation: up to the fourth year of age it is not apparent at all and only becomes conspicuous after the onset of puberty (Luna, 1989). Studies of different age groups (5–10; 11–15; 16–20; 21–25; 26–30; 31–35; >35) have confirmed the significance of the age effect in both genders. In these, the incidence peaks in the group with 10-15 years of age, and afterwards gradually drops, being the lowest in those >35 years (Mbajiorgu et al., 1996). A significant increase of MPH occurs in puberty in males, implicating the role of altered androgen levels in the phenomenon. Garn (1951) demonstrated that the frequency of MPH among castrated males was lower compared to the general population controls. However, although numerous authors consider as important the variations in male hormones regarding MPH, gender differences have not been found in all the studied populations (Vonna and Porcella, 1989; Agrawal, 1966; Luna, 1989; Saldanha and Guinsburg, 1961).

Finally, occupation may also have an impact on MPH as it can be responsible for the mechanical loss of hair which does not involve the follicles (Luna, 1989).

Our aim here was to present the distribution of MPH among Serbian high school students from Niš.

MATERIALS AND METHODS

Subjects

The distribution of MPH was determined in a randomized population sample of 425 students (150 male and 275 female examinees aged from 15 to 19 years, not related by kinship) of Serbian nationality, attending the "Bora Stanković" general high school.

Method

MPH observation was done in selected groups involving close inspection of the clean hands of the students, under adequate lighting, against a dark background, using a magnifying glass. The fingers with empty follicles and those with hair were both recorded as the fingers with hair. The observations were recorded in questionnaires, together with the personal data (name and surname; age; parental origin).

The phenotypes were determined through the observation of the presence or absence of hair or follicles on the phalanges of the second, third, fourth, and fifth fingers, i.e. the MPH finger combinations. In the cases of asymmetry, those who did not belong to the above phenotypes were classified according to the hair distribution on their more hairy hand. The results were statistically processed for the percentage of MPH incidence. The difference between the right and left hand phenotypes and gender differences were established by the t-test.

The phenotypes were classified using the Bernstein classification (1949) as:

0 – no hair on any of the middle phalanges;

3 – hair present on a middle phalanx;

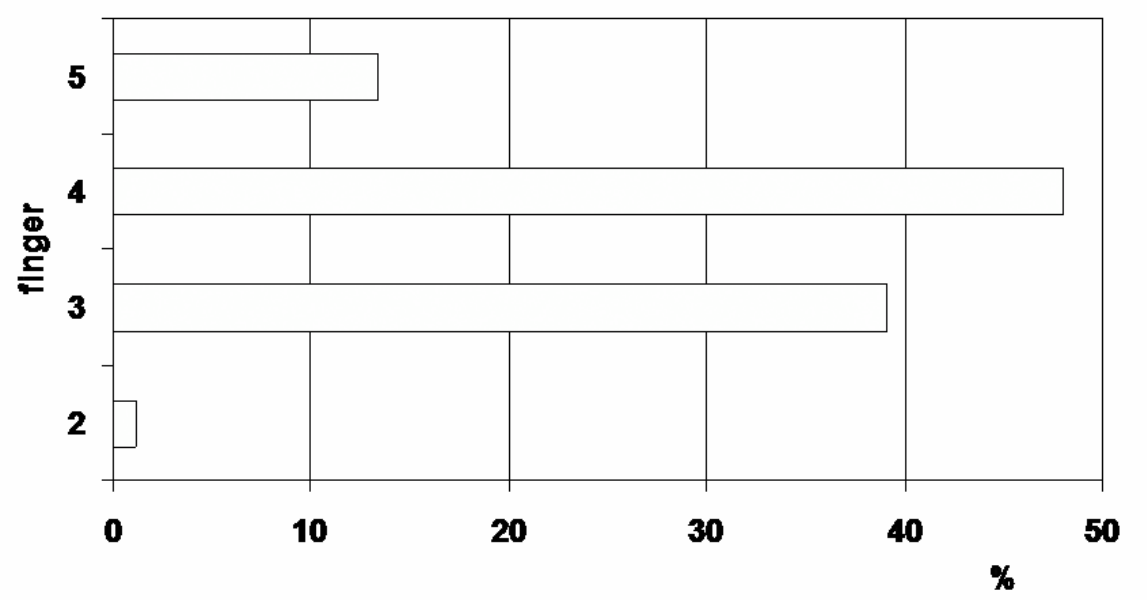
4 – hair present on the fourth finger;

45 – hair present on the fourth and fifth fingers;

34 – hair present on the middle and fourth fingers;

Table 1. Frequency and percentage of absence and presence of MPH on both the right and left hands of the subjects of Serbian nationality.

finger	left				right			
	Without hair		With hair		Without hair		With hair	
	N	%	N	%	N	%	N	%
2	415	97,6	10	2,4	415	97,6	10	2,4
3	236	55,53	189	44,47	243	57,2	182	42,8
4	199	46,82	226	53,18	197	46,4	228	53,6
5	348	81,88	77	18,12	363	85,4	62	14,6



Graph 1. Percentage of symmetric MPH of the fingers

345 – hair present on the middle, fourth, and fifth fingers;

234 – hair present on the forefinger, middle, and fourth fingers;

2345 – hair present on the middle phalanges of all four fingers.

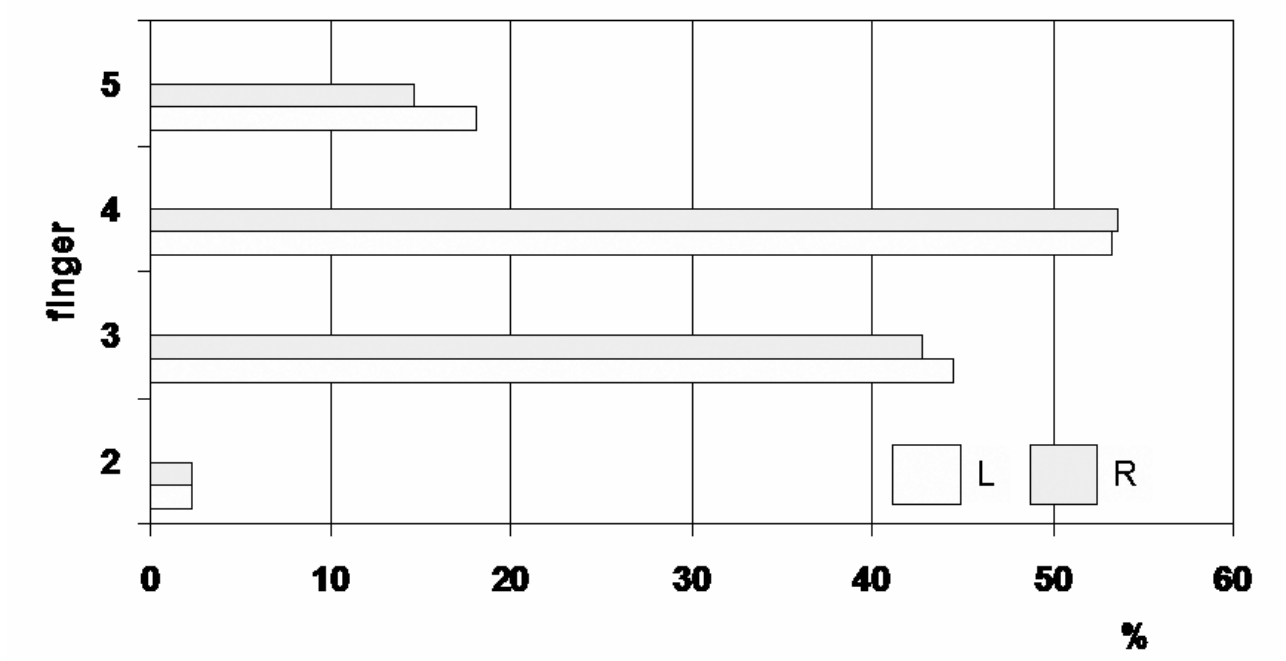
RESULTS

The percentage MPH frequency demonstrates the usual frequency pattern: 4>3>5>2.

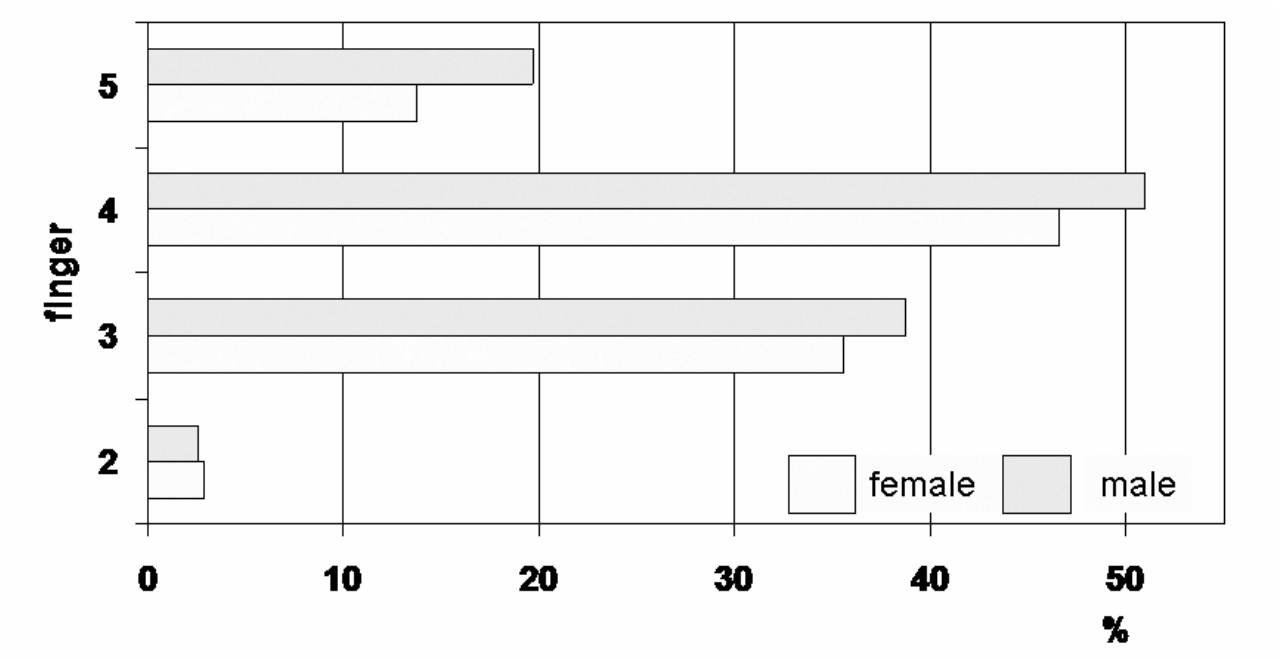
MPH was more common on the fifth finger of the left hand compared to the same finger of the right hand (t=3.029, (df=424), p=0.003).

The male gender had a higher frequency of MPH on the fifth finger (χ^2= 4.251 (df=1), p=0.039) of the left hand (Graph 4).

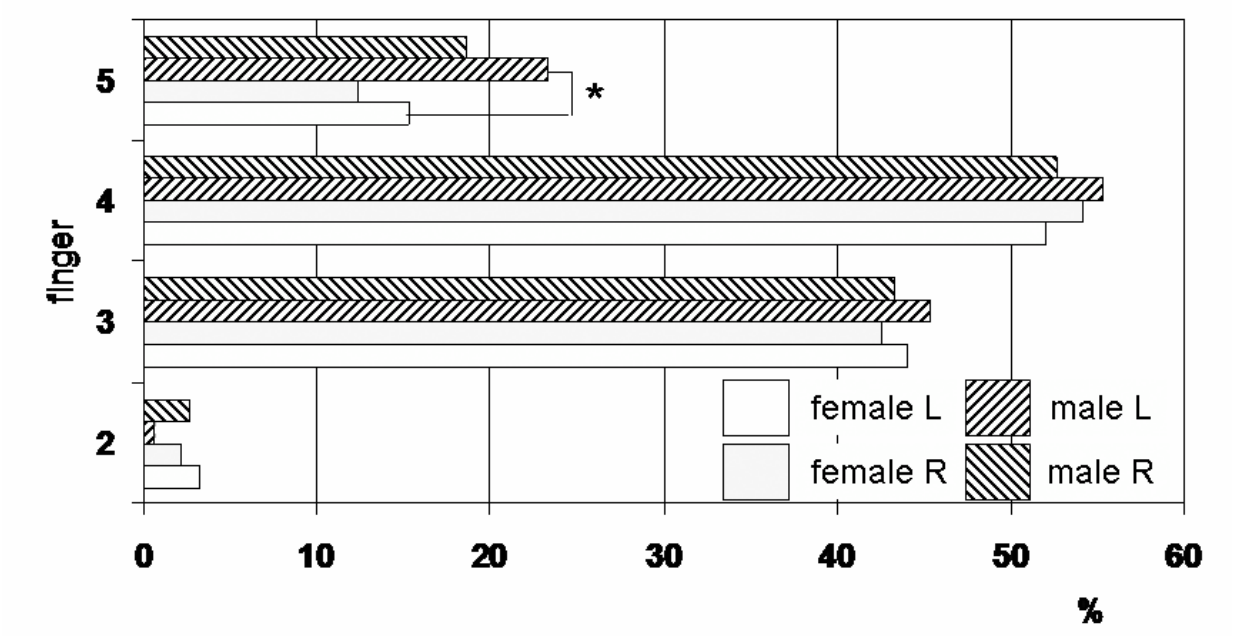
The study of symmetric hairiness by phenotypes (Graph 5) demonstrated that the Serbian population had a percentage frequency of phenotypes of 76.01%. Bilateral symmetric absence of hair was most commonly found (38.82 %), followed by the "34"



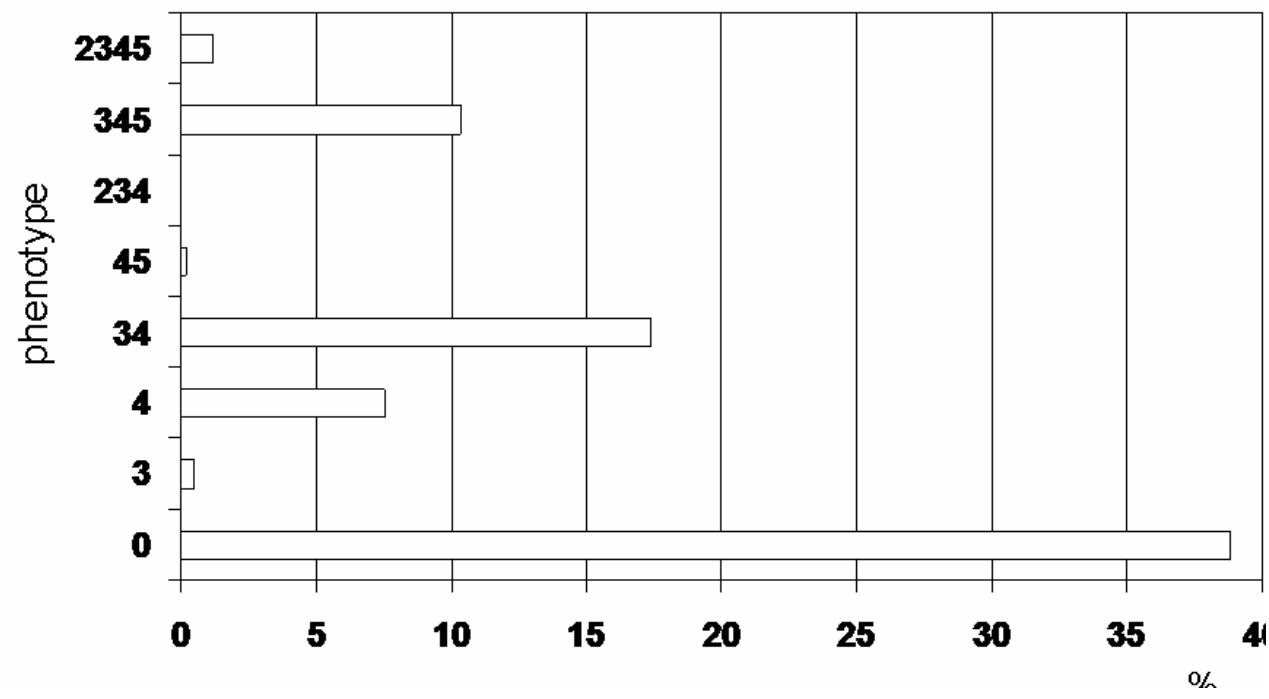
Graph 2. Percentage of left (L) and right (R) hand MPH



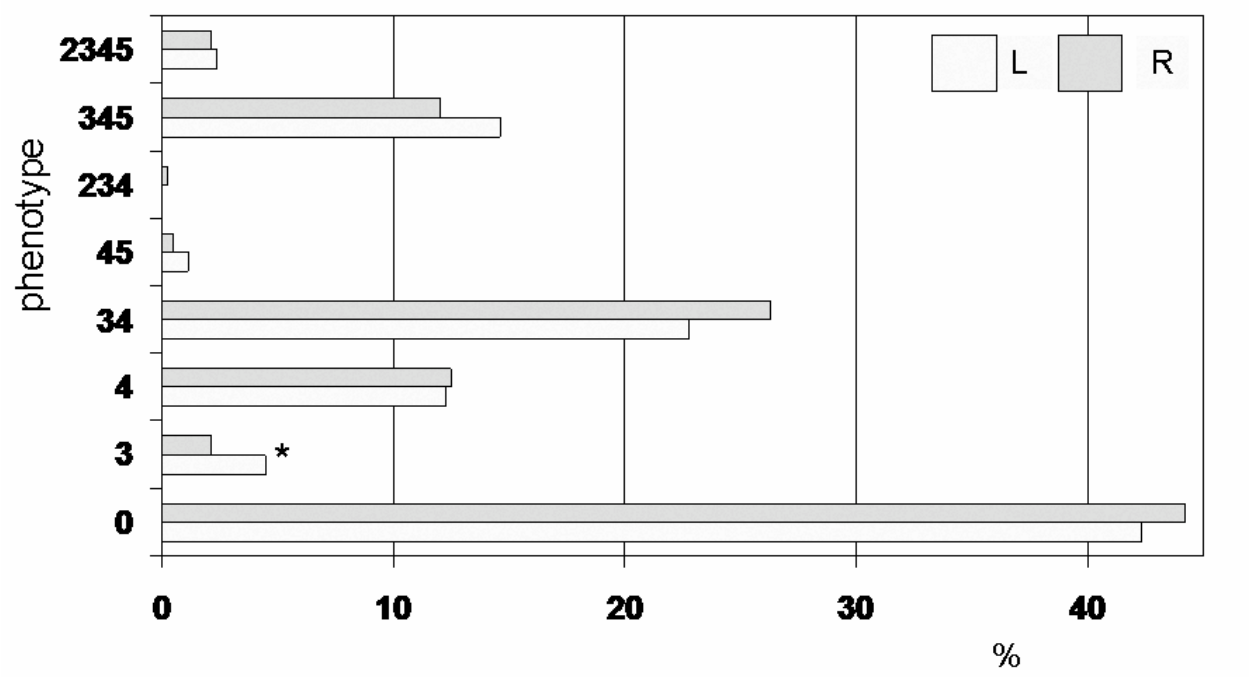
Graph 3. Percentage of symmetric MPH of the fingers in both male and female subjects.



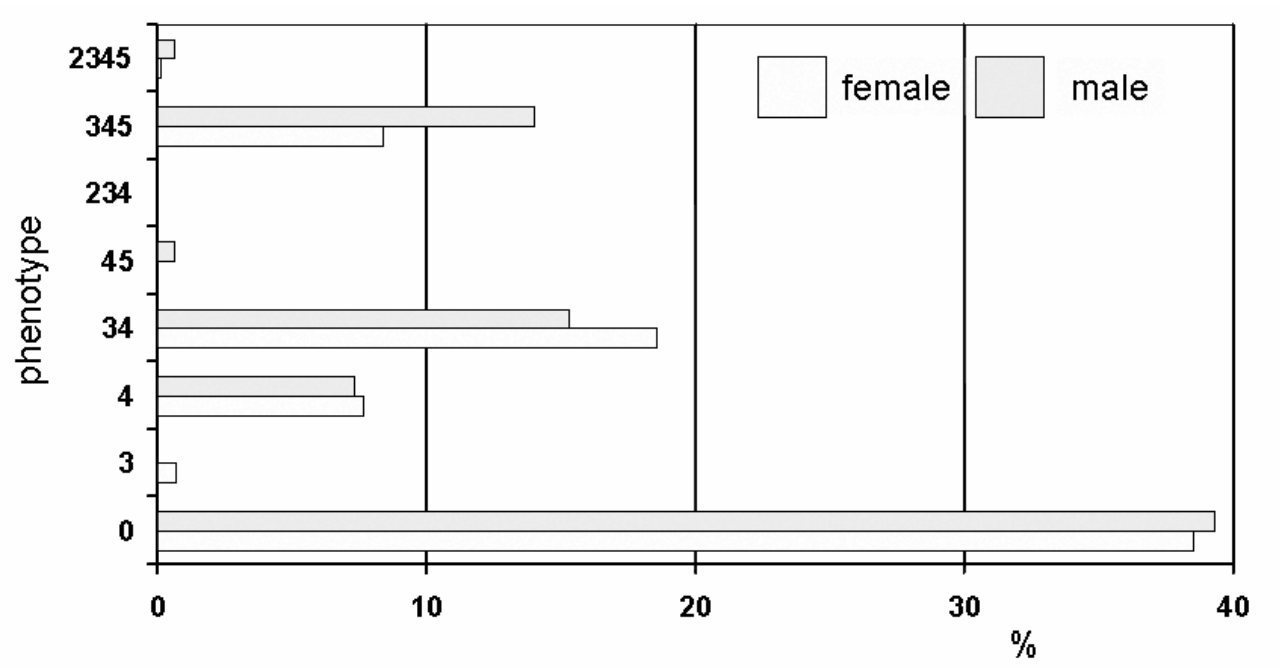
Graph 4. Percentage of MPH of the left (L) and right (R) hands in both male and female subjects and significance of the difference (* <0.05).



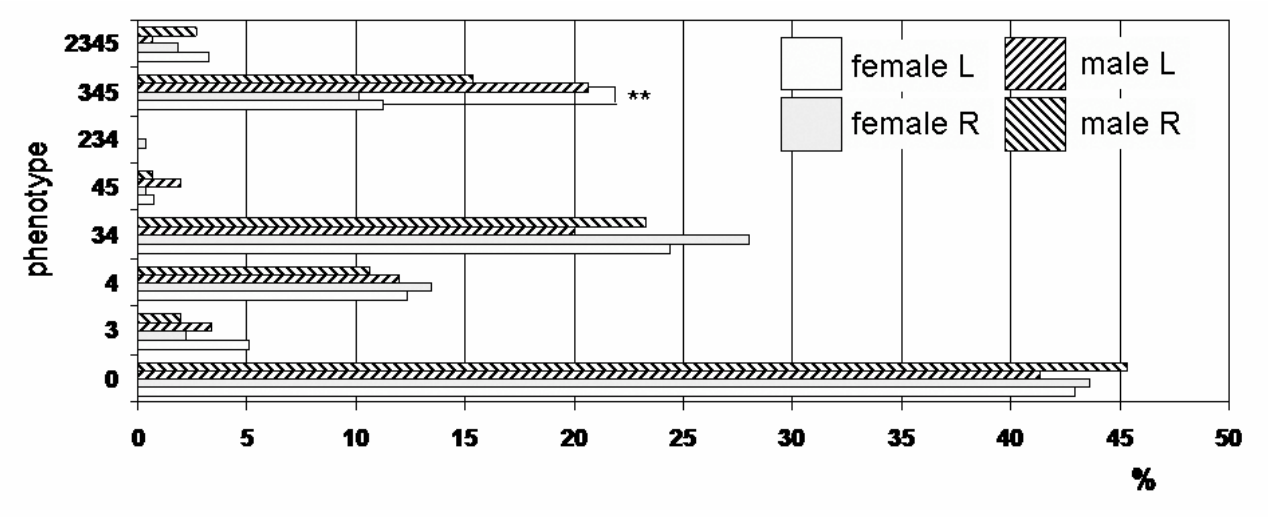
Graph 5. Percentage of symmetrical MPH by phenotype.



Graph 6. Percentage of the MPH phenotypes of the left (L) and right (R) hands and significance of the difference (* <0.05).



Graph 7. Percentage of symmetrical MPH by phenotype in both male and female subjects.



Graph 8. Percentage of MPH of the left (L) and right (R) hands by phenotype in both genders and significance of the differences (** p<0.01).

(17.41%), "345" (10.36%) and "4" (7.53%) phenotypes; the incidence of symmetrical phenotypes was as follows: 0>34>345>4>2345>3>45. A symmetrical presence of the "234" phenotype was not registered.

Applying the t-test, a statistically significant difference was found between the left and right hands for the isolated third finger hairiness (t=-2.049, df=424, p=0.041), with a higher frequency of MPH on the left hand. Associated third and fourth finger MPH (t=1.927, df=424, p=0.055) approached statistically significant values, with higher right hand frequencies.

The highest percentage difference of the phenotypes by gender was the more common (14%) symmetrical associated MPH of the third, fourth, and fifth fingers in males vs. females (8.36 %) (Graph 7).

Pearson's chi-square test demonstrated that there were no statistically significant differences for the MPH phenotypes of the right (χ^2=4.70 (df=7), p=0.697) and left hands (χ^2=11.557 (df=6), p=0.073) by the factor of gender (Graph 8). The male gender was found to have more common associated MPH of the third, fourth, and fifth fingers of the left hand (χ^2=6.874 (df=1), p=0.009).

DISCUSSION

Certain studies have demonstrated that sometimes populations of different origin and geographical location share the same frequency features. For instance, individuals of Irish origin have less expressed hairiness than other Northern Europeans, while the Italians have even less hairiness, especially if the hair is dark. The population of Sardinia has a markedly lower frequency of individuals with hair on the middle phalanx compared to the Mediterranean and other European populations (Vona and Porcella, 1989). Female members of the Murcia population from Spain demonstrate an extremely low frequency of MPH (Esteban and Fananas, 1992), while a comprehensive study of the southern Spanish population did not show any differences that were either bimanual- or gender-related (Luna, 1989). Our findings demonstrated an absence of hair on all middle phalanges (phenotype "0") of the right hand in 44.2% of Serbs. The presence of hair in Mongoloid peoples is rarer, which is further supported by the data on the incidence of MPH of 44.25% in men and markedly lower incidence of 31.39% in women from Tibet (Tiwari i Bhasin, 1969). Malayans, for instance, in whom MPH is present in 48% in men and 33% of women, are ethni-

cally similar to other Asian populations (Dharap et a., 1995). The tribes of Malaita (Hindley i Damon, 1973) have similar frequency of hair (at the age of 20 it is significantly higher in men – 58.3%, compared to women – 34.4%) as the peoples of the Caucasus (Setty, 1964), slightly higher than the people of Japan (Matsunaga, 1956) and significantly higher than that in Negroid populations and American Indians. Concerning gender differences, as with most of the studied populations, the percentage of individuals without MPH is higher in the female than in the male gender; the difference, however, is far from being significant. Such absence of any significant gender dysmorphism can be found in the papers by Saldanha (1961) and Agrawal (1966). The range of variability of MPH absence in men is from 16.5% in Netherlanders (the sample from Sao Paolo, Brazil; Saldanha, 1961) to 79.0% in Nigerians (Singh, 1982). The range of the values among other studied populations ranges from 26.4% for women from the Basque country (Boyd and Boyd, 1937) to 55.7% for women from Russia (Boyd and Boyd, 1937). Albanians from Skopje in Macedonia (Dadić et al., 2008), as well as Serbs from Niš, are close to the values found for other European populations.

The sequence of frequencies of MPH presence 4>3>5>2, found in almost all studied populations so far, was confirmed for both genders in this paper too. The sequence seems to be universal (Singh, 1982). In the Serbian population, the incidence of MPH was highest for the "34" combination – 26.4%. The presence of hair was not noted only on the forefinger phalanx in any of the subjects, which was characteristic for all other populations as well (Mbajiorgu, 1996).

Literature data suggest that there is an asymmetry in hair distribution between the left and right hands in both genders. Though the differences do not reach statistical significance, the frequency of asymmetry is not important for population studies (Saldanha and Guinsberg, 1961). Both hands can have symmetrical hair distribution, with the incidence of 74% (Bernstain and Burks, 1942) or 90% (Danforth, 1921). The percentage of 76.01% for symmetrical MPH presence in Serbs indicated an almost equal symmetrical presence of MPH phenotypes in these populations. Symmetrical incidence of MPH by phenotype is higher in men than in women (77.33% vs. 73.96%). Mbajiorgu thinks that hair on the fingers is symmetrically distributed, with minor deviations due to temporary shedding or intentional removal, leaving the follicles temporarily invisible (Mbajiorgu, 1996). Simultaneous symmetrical MPH presence on the third, fourth, and fifth fingers is significantly more common in the male compared to the female gender (14% vs. 8.36%).

The association of other genetic traits with mid-digital hair in various populations is an especially significant aspect of population genetic studies (Sewell, 1939, Singh and Goel, 1975). Moreover, familial clustering was also observed, similar to, for instance, Balkan endemic nephropathy (BEN), and a significant genetic impact on disease expression (Čukuranović, 1989, 1992). The nature of heredity of mono- and oligogene-controlled qualitative morphophysiological traits was assessed by way of an assessment of the proportion of homozygous recessive traits in a sample of 20 large families in Southern Serbia with BEN. Some significant differences were found in the median values of gene homozygousness of distribution type, as well as differences in the presence of certain individual combinations of the traits in BEN, among which was also a markedly higher frequency of absence of mid-digital hair (66% in 50 people affected by BEN, vs. 52% in 50 controls from Niš, Leskovac, and Aleksinac) (Čukuranović, 1989, 1992; Marinković and Cvjetičanin, 2007). The results of the study by Nešić et al. (2008) of the total frequency of hairiness of 61.7% for males and 61.2% for females demonstrated that in the studied sample of high school students in Niš a higher frequency of hairiness was found compared to the data obtained in a smaller, control group and BEN patients for all regions, but the results of the investigation were closer to the values obtained in the control group of subjects from the region of Niš (absence of hairiness in 37,5%, Čukuranović, 1992), and findings of other authors who studied the European populations.

More detailed information on the MPH distribution requires larger samples to be studied, analyses of the characteristic in subjects from different regions, and, finally, investigation of the trait together with other anthropologic and genetic characteristics. More valid conclusions would require the data to be collected on the trait in other populations which inhabit the territory of Serbia.

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