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Anthropometric Measurements of Hvar Islanders and Changes in Secular Trend of Height – Evidence From the Village of Gdinj

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ABSTRACT

The aim of this study was to compare the data on height of Hvar islanders collected from two transversal studies (1978/1979 and during the 1994). The first field research covered a total of 935 inhabitants of the island (484 males and 451 females) aged between 20 and 72 years, from five villages of the western part (Dol, Vrbanj, Svirče, Vrisnik, Pitve) and four villages of the eastern part of the island of Hvar (Poljica, Zastražišće, Gdinj, Bogomolje). The second field research was carried out in 1994 that enrolled total of 189 participants (82 males and 107 females) from the villages Dol, Vrbanj, Svirče, Zastražišće, Gdinj and Bogomolje. Comparison of data on Hvar adults since these two periods demonstrated a secular increase in average height for females and males in all investigated villages except in the village of Gdinj. Negative secular trend in village of Gdinj was observed for both female and male inhabitants. Possible explanation for this trend could be the specific migratory patterns and traditional practice of endogamy.

Key words: *height, secular change, Gdinj, Island of Hvar*

Introduction

The populations of the Eastern Adriatic islands are determined by a range of distinct and turbulent migratory and historical events, specific demographic histories and geographic and reproductive isolation. The earliest evidence of human occupation of Adriatic islands has been dated to Upper Paleolithic and Neolithic period, by Illyrians, a heterogeneous group of 'tribes' who spoke an Indo-European language[1], and later Greeks and Romans. The first period in history that brought significant input to the gene pool of the extant islanders was probably between the 7th and 8th century AD in the time of the colonization by the Slavic tribes Croats that gradually replaced other groups, mostly between 7th till 8th centuries. In the whole of Dalmatia the period between the 15th and the 18th century was characterized by Turkish expansion into south-east Europe and the Balkan Peninsula. This caused great migrations of populations who fled from Turks on the mainland of the Balkan Peninsula, especially from Herzegovina, to the relatively close Adriatic islands throughout that period. Island of Hvar is especially suitable for bioanthropological studies due to its geographic configuration and the fact that the island is inhabited by groups differing in origin, morphological characteristics, way of life and some socio-cultural characteristics.

In this paper we are presenting the data on height measurements in several different Hvar villages, with special regards to the village of Gdinj, the only Hvar's settlement with negative secular trend in body height.

The village of Gdinj and its historical background

The village of Gdinj is situated between Bogomolje and Zastražišće on the eastern part of the island of Hvar, in history also known as Plame (Figure 1). This village is composed of few different hamlets such as Dugi Dolac, Visoka, Nova Crkva, Bonkovići, Stara Crkva, Vrvolići i Banovi Dvori.

According to archaeological findings (mostly Illyrian burial mounts found in the vicinity) the village of Gdinj was inhabited since the Illyrian period[2–5]. Greek and Roman populations did not leave any known traces on this part of the island[6]. The first data on the eastern part of

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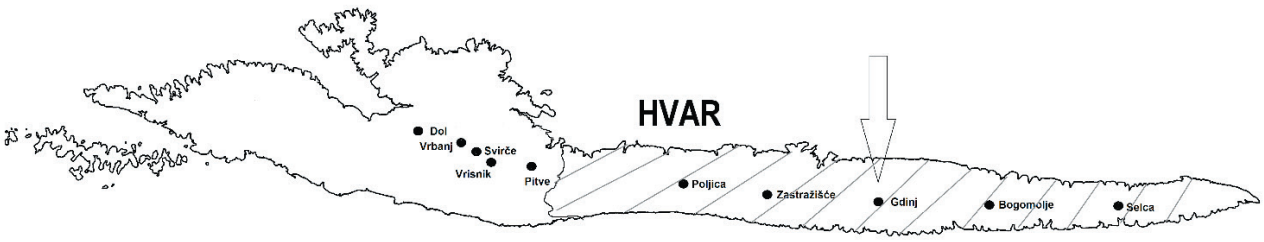

Fig. 1. The Island of Hvar with its settlements. Eastern part of the island of Hvar (Plame) according to the Statute of the Hvar Medieval commune (1331) is presented with the stipes, and position of Gdinj is marked with an arrow.

the island are found in the Statute of the Hvar Medieval commune dating to 1331, in which its administrative border was defined and where it was referred to as *Plame* for the first time. That rocky and less fertile islands area is described in the Statute as *terreni communis de Plame*, which means that it wasn't a private property, but a land of shepherds, for cattle breeding and logging[7] (Figure 1)

The period from the 15th to the 18th century is of particular importance for the island. Hvar was at the time continuously under Venetian rule. The overcrowding of the settlements surrounding the fertile Stari Grad Plain in the central part of the island caused the first wave of colonization and formation of settlements in the area of Plame. In the 15th century villages Zastražišće and Poljica were permanent settlements, while Gdinj and Bogomolje were mentioned as the toponyms in archival documents. The communal land register from 1407 first mentioned private estates in Plame and toponym Gdinj (*via publica, per quam itur ad Gdin / public road, by which we go to Gdin*). The first mentioned settlers were Petar Bavorović and his brothers, whom in 1453 the Commune of Hvar gave land for the house, yard and garden[8].

In the archival sources (land registers, official church visitations, parish registries) and censuses (1673 was the first census in island of Hvar) immigrants were mentioned in Gdinj with surnames, which were also found in settlements on the western part of the island (Jelsa, Vrbanj, Pitve). (Table 1).

According to the review of the surnames in Gdinj, it seems that most of the inhabitants moved here from old settlements in the western and middle part of the island, primarily from villages Pitve and Vrbanj. The Turkish invasion and occupation of the Balkan Peninsula caused large migrations of populations from the continental hinterlands (of Bosnia, Herzegovina, and Montenegro) towards the Makarska coastline and the nearby islands. The biggest imigrational wave was in the 17th century during Turkish wars, when new immigrants (*habitanti nuovi*) came from the mainland: coastal region and hinterland of Makarska, Bosnia and Herzegovina and Montenegro[8].

According to the research of Radovanović (1973)[9], recorded stories and oral history from Gdinj inhabitants as well as from some marital records, the village of Gdinj was inhabited 250 till 300 years ago by few families namely: Bonković from Bosnia, Visković and Ćurin from Herzego-

TABLE 1
VILLAGE OF GDINJ: SURNAMES FROM 15TH TO 20TH CENTURY (DATA FROM: KOVAČIĆ, 1996)

Century	Year	Village of Gdinj Surnames (surnames written in italics are present even nowadays)
15th	1425	Brešković (moved from Vrbanj)
		Dudorović (Budorović, Budrović – probably surname from Vrbanj)
		Brezić
		Godonja
		Čripojević,
		Slavogostić Vidoš and Ozorović Ivan (landlords)
	1453	Bavorović Petar and his brothers
16th	1518	Brešković
		Krstulović
		Dapković
	1595	Roljić
	1596	Bavorović
		Zaninović
		Bonković (also mentioned in nearby village of Zastražišće in 1518)
17th	1604	Soljanović or* Dapković
	1607	Lelevković
		Čepejković
	1614	Krstulović or* Antičević
		Rasković or* Krstulović
		Heladić
		Pićojević
		Cassio (landlord)
	1624	Krstulović also known as Mileta
	1632	Jerković
		Heljadić
		Lisica
		Krpeljko
		Ivanić, Paladinić and Zečić-Peporini (estates of nobility)
	1644	Rasković (nickname Planjar)
	1647	*Trbuhović*
		Miletić
		Jurić
		Lisičić

Century	Year	Village of Gdinj Surnames (surnames written in italics are present even nowadays)
	1670	Pladnjar or* Rasković
		Martić
		Huljić also known as Vrančić (surname from Pitve)
		Tarbušković (surname from Pitve)
		Ćurin
		Mišetić
		Visković also known as Heladić
		Vrvolić (*Viruolich/ Varoulich)*
		Heladić also known as Lizi(l)j
		Banović also known as Ban
		Jurić also known as Jurac
		Bonković also known as Kapotović
	1671	Heladić also known as Visković
	1672	Rasković also known as Martić
		Rasković also known as Lisica
	1667	Tatković (privileged resident)
	1673	Banović
		Bonković
		Ćurin
		Heladić
		Jurić
		Jurinić
		Lizilj
		Martić
		Martinčev
		Pladnjar
		Rasković
		Roljić
		Soljan
		Trbuhović
		Visković
		Vrvolić
18th	1702	Bogdanović
		Hajduković (today *Hajduk*)
		Šeputić
	1746	*Radovanović* (moved from village of Pitve, probably descendants of Radovan Radičić mentioned in 1641)
	1756	Jurasović, *Srzentić*
19th		Radić (moved from Jelsa)
		Milevčić (moved from Jelsa)
		Tomeić (moved from village of Vrbanj)
		Lušić (moved from village of Vrbanj)
20th	1925	Guglielmi (moved from Orebić, Pelješac Peninsula)

*The same family used surnames alternations during history. For example, current family Hajduk had four different surnames in the past 200 years: Krstulović - Rasković - Pla(d)njar - Hajduk(ović).

vinia, Popović, Srzentić and Banović from Montenego and Jurasović from the neighbouring island of Korčula. In later period a larger group of immigrants came to Hvar from the coastal settlement of Zaostrog on the mainland and settled at Gdinj and Bogomolje. The Republic of Venice gave special "Privileges of Paštrović" to the newcomers; which means that they were not bound to pay any taxes or to participate in public work and they were not taken to the galleys in return to perpetual military service. These privileges would be lost by marriage with natives, so this reproductive isolation maintained until the fall of the Venice in 1797[10–12]. According to data from parish registers of births, marriages and deaths in 18th century the endogamy in Gdinj was very high, and the largest number of marriage partners came to Gdinj from the nearest eastern villages Bogomolje, Zastražišće, Poljice and Sućuraj[13].

Beside frequent marriages between neighbours on the eastern part of the island and newcomers from the mainland, a significant input of marital partners in the 18th century also came to Gdinj from villages in the western part of the island: from Brusje, Pitve, Svirče, Vrbanj, Vrisnik, Jelsa, Grablje and Hvar[13]. They were mostly men who moved in with the wife's family, and they were known as *domazeti* (the son-in-law)[14]. This matrilocal migration pattern in the village of Gdinj serves as an evidence of the gene flow and genetic admixture of subpopulations from the 18th century.

Sample and Methods

The data were collected from two transversal studies (conducted in 1978/1979 and in 1994). The first field research was carried out by the workers of the Laboratory for Anthropology of the Institute for Medical Research and Occupational Health in Zagreb in consultation with the Department of Human Genetics, Newcastle. The data were collected by the same observer during fieldwork in April 1978 (western part of the island of Hvar) and in June 1979 (eastern part of the island of Hvar). This study covered a total of 935 inhabitants of the island (484 males and 451 females) aged between 20 and 72 years, from five villages of the western part (Dol, Vrbanj, Svirče, Vrisnik, Pitve) and four villages of the eastern part of the island of Hvar (Poljica, Zastražišće, Gdinj, Bogomolje). The second field research was carried out in 1994 and it enrolled total of 189 participants (82 males and 107 females) from the villages Dol, Vrbanj, Svirče, Zastražišće, Gdinj and Bogomolje. The data on body height of Hvar inhabitants were collected by using using standard anthropometric equipment (Seiber-Hegner, Switzerland) and according to the IBP recommended technique (1969) during both field researches on all subjects. The data are presented in Table 2. A simple t-test analysis was used to measure statistical significant differences in height for both sexes.

Results

According to the results of height from two transversal studies (conducted in 1978/1979 and in 1994), average height of inhabitants from the island of Hvar differed substantially between all studied settlements. We found statistically significant differences between female and man in all villages and in all two measuring points ($p<0.001$)

TABLE 2
DESCRIPTIVE DATA FOR CHANGES IN MEAN HEIGHT OF THE INHABITANTS OF ISLAND OF HVAR COLLECTED FROM TWO TRANSVERSAL STUDIES CONDUCTED 1978/1979 AND 1994

Field work 1978/79 Females	N	Height	Height SD	Field work 1978/79 Males	N	Height	Height SD
Dol	44	161,03	7,67	Dol	52	172,14	5,90
Vrbanj	55	162,55	8,09	Vrbanj	63	176,03	5,74
Svirče	75	163,11	6,55	Svirče	75	175,73	5,90
Vrisnik	44	162,02	5,80	Vrisnik	52	176,05	5,92
Pitve	26	166,10	3,77	Pitve	29	180,62	6,07
Poljica	34	161,56	6,56	Poljica	29	177,97	7,16
Zastražišće	58	164,64	4,91	Zastražišće	72	177,03	6,36
Gdinj	77	162,39	5,82	Gdinj	57	175,60	4,86
Bogomolje	38	159,58	7,31	Bogomolje	55	172,57	8,09
Field work 1994 Females	N	Height	Height SD	Field work 1994 Males	N	Height	Height SD
Dol	17	164,19	5,91	Dol	17	174,22	7,45
Vrbanj	28	164,48	5,66	Vrbanj	19	179,50	6,13
Svirče	18	164,04	6,71	Svirče	9	180,19	6,10
Zastražišće	15	162,17	5,07	Zastražišće	15	178,13	5,01
Gdinj	16	159,10	7,55	Gdinj	10	174,95	8,95
Bogomolje	13	163,54	5,70	Bogomolje	12	176,96	7,06

West part (1) – villages from 1 to 5; East part (2) – villages from 6 to 9

based on simple t-test analyses. The females were found to be continuously shorter than man. Particularly in 1978/1979 the shortest average height for female was found in the village of Bogomolje (159, 58; SD = 7,31) while the highest one was found in the village of Pitve (166,1; SD 3,77). There were no statistically significant differences between any two measuring points in females in all villages. For the women from Gdinj difference was not statistically significant, it was at the border of significance, t (df=91) =–1.951, p = 0.0542, (d= –3.290 cm). Adversely, the shortest average height for male population was found in the village of Dol (172, 14; SD = 5,90), while the highest one was found newly in the village of Pitve (180,62; SD = 6,07). The results confirm that the highest female and male inhabitants were found in the village of Pitve. In the second investigation conducted in 1994 we found the shortest female inhabitants in the village of Gdinj (159, 09; SD = 7,5) which represents 3,29 cm lower value of average height for female in Gdinj than in 1978/1979. The highest female inhabitants were found in the village of Vrbanj (164, 48; SD = 5, 66). The shortest average height for male was found in the village of Dol (174, 22; SD = 7,45) and Gdinj (174,95; SD = 8,95) while the highest was found in the village of Vrbanj (179,5; SD = 6,13) and Svirče (180,19; SD = 6,10). Statistically significant difference between two measuring points in males was found in Vrbanj t (df=80) = 2.274, p = 0.0256, (d= 3.470 cm) and Svirče t (df=82) = 2.136, p = 0.0357, (d= 4.460 cm). All other differences were not statistically significant, e.g. differences for Gdinj t (df=65) = –0.338, p = 0.7364, (d= –0.65 cm). Our findings demonstrate that in terms of height (Table 2), differences between investigated villages were observed. Comparison of data on island of Hvar adults since 1978/1979 and 1994 period demonstrated a secular increase in average height for females and males in all investigated villages except for the village of Gdinj. Negative secular trend in the village of Gdinj was observed for both female and male inhabitants (Table 2, Figures 2 and 3).

Discussion

This paper presents the results of changes in height of Gdinj inhabitants on the island of Hvar from two different periods, showing a negative secular trend. Findings also demonstrate that in terms of height differences between investigated villages were observed (Table 2). Comparison of data on island of Hvar adults since 1978/1979 and 1994 period demonstrated a secular increase in average height for females and males in all investigated villages except for the village of Gdinj. Negative secular trend in village of Gdinj was observed for both, female and male inhabitants (Figures 2 and 3). One possible explanation could be

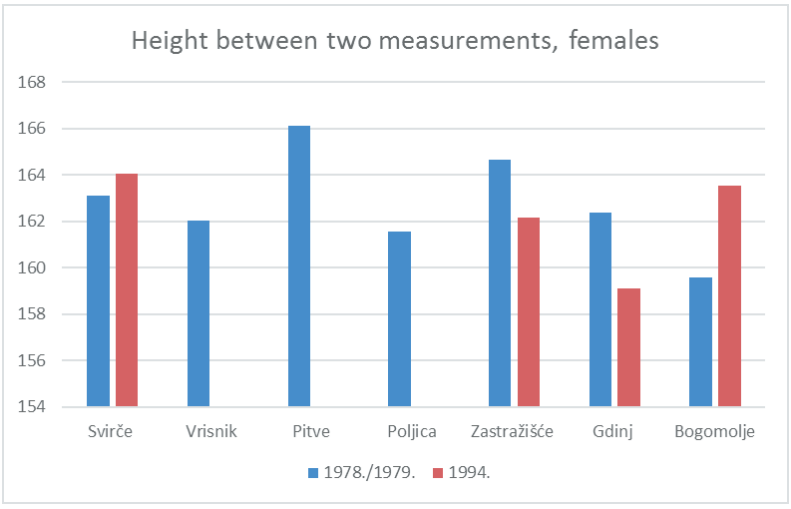

Figure 2. Height in females according to the two measurements (in 1978/19979 and in 1994) in different Hvar villages.

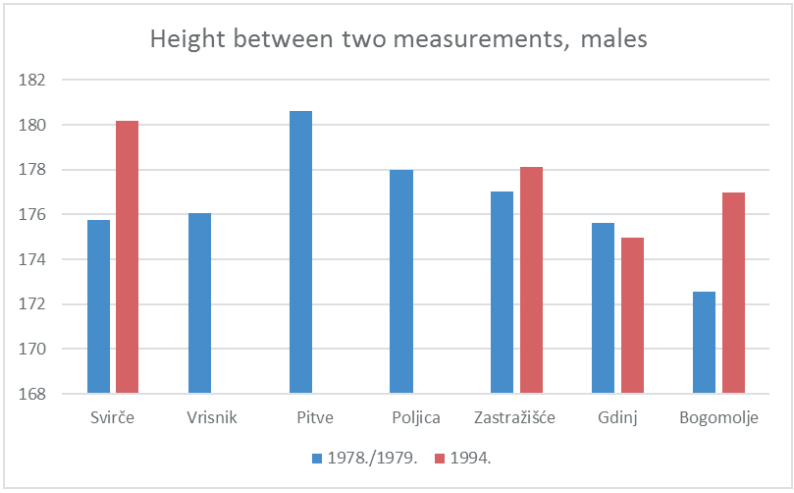

Figure 3. Height in males according to the two measurements (in 1978/1979 and in 1994) in different Hvar villages.

found in their ancestry and migration patterns. According to the one of the abovementioned theories of the immigration in Gdinj the first settlers came from old settlements in the western and middle part of the island, primarily from villages Pitve and Vrbanj, known for the highest males on the whole island of Hvar. In sociocultural research of islands stereotypes and inter-communal rivalries (campanilism), nicknames for certain families were formed on the basis of subjective traits for example, certain unusual physical characteristic. Islanders regularly mention the strong constitution of Pitovjani (people from Pitve), thus calling them *the Mules* after the beast of burden, with characteristics such as enormous strength and endurance. Almost all of interviewees claimed that people from Pitve are big and strong folks, describing them as giants. On the other hand, there is a stereotype about short and dark men from the village of Dol. The islanders from the town of Stari Grad and other nearest villages call them *Munita* (small coins) referring to their small stature[15–17]. Previous anthropological data on the average height of men on the island of Hvar showed that the men from Pitve really are the tallest with an average height of 180.6 cm and men from Dol are the smallest islanders with an average height of 172.14 cm[18,11]. Other migrational wave of new inhabitants came from Bosnia and Herzegovina and Montenegro. The unusual height of Montenegrin population has been recognised by European anthropologists for more than 100 years ago. According to data collected by Coon (1975)[19], Montenegrin males were on average 177 or 178 cm tall, taller than people from Herzegovina (175–176 cm), Bosnia (171–174 cm) and the coastal zone stretching from Istria to Dalmatia (166–171 cm). A study conducted by Pineau, Delamarche, & Božinović (2005)[20] contributed to an update of average body height among European populations. Although this study does not contain the exact data of the Montenegrin population, it represents the recent study related to the average body height of modern Montenegrins. Pineau et al's inves-

tigation[20] showed that, contrary to the general belief, the male population of the Dinaric Alps is on average, the tallest in the whole of Europe. The average height of 184.6 centimetres in 17-years old boys (with still unfinished growth), was higher than the average height of the Dutch of the Netherlands, presumably the highest population in Europe, with 184 centimetres on average. This finding showed that male population of the Dinaric Alps is on average the tallest in the Europe, as well as second tallest nation worldwide[21].

Even though the Hvar island population is continuously isolated as a whole, inter- and intra-island migrations and gene flow over many centuries brought new genetic variance in Gdinj. It is possible that their average height decreased with time. This unusual negative secular trend could have been even more pronounced in the latest decades of the 20th century when better roads were constructed and geographical and consequently sociocultural barriers were reduced. It could be concluded, that the first tall inhabitants of Gdinj were mixed with lower neighbours from local villages. We could presume that this negative trend of height lasted for a longer time (possible even for centuries), but it was observed in our research for the first time.

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ANTROPOMETRIJSKE ZNAČAJKE STANOVNIKA OTOKA HVARA I PROMJENE SEKULARNOG TRENDA MJERENE VISINE – PRIMJER NASELJA GDINJ

SAŽETAK

Glavni cilj ove studije bio je usporediti podatke o visini stanovnika naselja otoka Hvara prikupljene tijekom dviju transverzalnih studija. Prva studija provedena je na terenskom istraživanju 1978./1979. godine i obuhvatila je ukupno 935 stanovnika otoka Hvara (484 muškarca i 451 ženu), dobne skupine između 20 i 72 godina, porijeklom iz pet naselja zapadnog dijela otoka (Dol, Vrbanj, Svirče, Vrisnik, Pitve) i četiri naselja istočnog dijela otoka ((Poljica, Zastražišće, Gdinj, Bogomolje). Druga studija provedena je 1994. godine i obuhvatila je ukupno 189 ispitanika (82 muškaraca i 107 žena), porijeklom iz naselja Dol, Vrbanj, Svirče, Zastražišće, Gdinj i Bogomolje. Na temelju usporedbe podataka o visini ispitanika tijekom navedena dva razdoblja utvrđen je pozitivni sekularni trend i porast prosječne visine i kod žena i kod muškaraca u svim istraživanim naseljima s izuzetkom naselja Gdinj. U naselju Gdinj utvrđen je negativni sekularni trend mjerene visine i kod žena i kod muškaraca. Moguće objašnjenje uočenog trenda može biti povezano sa specifičnim migracijskim obrascem naseljavanja otoka Hvara, odnosno povijesnim i suvremenim kretanjima stanovništva, kao i tradicionalnom prakticiranju endogamije stanovnika otoka Hvara.