

# Maturational Profiles and Migration in the Female Adolescent Population of Madrid: Is There a Need for a New Perspective?

Raquel Fernández-del Olmo, Javier Anuncibay and Consuelo Prado

Department of Biology. Faculty of Science. University Autónoma of Madrid, Madrid, Spain

## ABSTRACT

*The aim of this study is to assess anthropometric changes and menstrual cycle characteristics during the maturation process of an adolescent female sample in Madrid, Spain. The new demographic context of Madrid, with a 33.9% of girls coming from Central and South America, makes this study relevant in terms of new epidemiological situations that could possibly develop. The sample consists of 284 girls, ages 9 to 16 years, measured and interviewed in four school centres of Madrid. Results show that menarche is slightly earlier in the Spanish girls, but there are no other important differences regarding the characteristics of their menses. However, the Spanish girls have a significantly higher intake of menarcheal pain related drugs. The anthropometric changes accompanying menarche are greater in the immigrants, especially in terms of trunk fatness, leading to an »overweight« characterisation of this sub-sample. These maturational profiles show the need for educational programs, especially focussed on the foreign adolescent population, to cope with health risks related to overweight.*

**Key words:** menarche, menses characteristics, body composition, immigrants

## Introduction

Migration has changed the demographic profile of Spain in recent years. Even though the total percentage of immigrant population in Spain is not as great as in other European countries, the net migratory flow is by far the highest of the European Community<sup>1</sup>. The economic factor is the main motive for migration. A high level of unemployment in the countries of origin is one of the most important factors influencing the decision to emigrate<sup>2</sup>, even though the immigrants often end up with employment in the lower socioeconomic categories of the host nation<sup>3</sup>.

This recent increase in immigrant population of Spain offers the opportunity to study the microadaptive transition. It is acknowledged within the field of Human Biology that environmental changes can lead to an imbalance of homeostasis. This may be due to the acquisition of unhealthy food habits<sup>4–6</sup>, the change in social context, and other factors. These may result in the increase of epidemiological risk factors of the foreign population<sup>7</sup>. In this sense, the adolescent population is especially vulnerable, for puberty is a dynamic period in terms of physical and

physiological change<sup>8,9</sup>. The main events of the growth and maturational process at adolescence could be summarized as follows:

1. A marked acceleration in the increase of most body dimensions, with some differences by sex<sup>10,11</sup>. The more rapid body growth includes a trend towards a rise in weight<sup>8</sup>, as well as an overall increase in body size.
2. Changes in body composition and body proportions, due to differences in the timing and intensity of growth among the different body dimensions and components. These are a remarkable sexual dimorphism in this process<sup>12,13</sup>.
3. Sexual maturation is accelerated, with both the development of the gonads and the sexual secondary characteristics going through a series of well known stages of maturation<sup>14</sup>.

Within this maturation process, menarche (the onset of menstrual cycles), is one of the most objective indicators of reproductive development. Menarche is known to

be very sensitive to the environmental context<sup>15–17</sup> and it is a reliable indicator of a population's well being<sup>18</sup>. Energy balance is one of the important factors influencing the timing of menarche<sup>19</sup>. Fat accumulation prior to menarche is one of the main variables that influences sexual maturation. Once menstruation commences there is a period of adolescent sterility, which is characterized by irregular and frequently anovulatory cycles<sup>14</sup>. Many behavioural factors influence the length of this period<sup>20</sup>.

The objective of this study is to examine possible differences in the maturation process of both Spanish and immigrant girls in a sample of female students in Madrid. Anthropometric changes and some characteristics of the menses were the variables of interest.

### Material and Methods

This paper is based on a sample of 284 girls, ages 9 to 16 years old, measured and interviewed during 2004–2006 in 4 school centres of several districts of Madrid. Girls from immigrant families comprise 33.9% of the sample. The immigrants come from Central and South America. This sample is representative of the demographic changes happening in Spain due to the migratory flows that have taken place lately<sup>21</sup>.

Children and their parents or guardians were properly informed about the subject of the study, and the written consent from the later was compulsory for inclusion in the survey<sup>22</sup>. The anthropometric measures, taken according to the guidelines of the IBP protocol<sup>23</sup>, consist of height, weight, skinfolds (bicipital, tricipital, subscapular and suprailliac) and waist and hip circumferences. The Body Mass Index (BMI), body fat percentage, and waist/hip ratio were also calculated. With regard to reproductive maturation variables, the following data were collected: menarcheal status (premenarcheal, postmenarcheal), age at menarche, intensity of the bleeding (light, moderate, heavy), ovulatory cycle regularity (regular cycles, irregular cycles), menstrual pain (yes or no) and pain medication taken (none, without medical supervision, medically prescribed).

All these data were statistically analysed using parametric and non-parametric tests. Percentages, means, and standard deviations were obtained. A multiple correspondence analysis was employed to search for relationships between the variables.

### Results

The median age at menarche, estimated using the status quo procedure, is 12.46 years for the Spanish girls and 12.57 years for the immigrants.

In Table 1 we present some of the anthropometric changes of Spanish and immigrant girls, classified with regard to the presence or absence of menses. Except for the body fat percentage in the Spanish girls, all the somatic variables show significant changes with respect to menarcheal status. BMI increases in both the Spanish and the immigrants, but more remarkably in the foreign subgroup. Prior to menarche there were no differences between the sub-groups in BMI.

The increase in body fat percentage is much more intense in the immigrant girls, leading to a significant difference between the pre- and post-menarcheal girls in this sub-group. In any case, there is no difference between the Spanish and immigrant girls in body fat percent, either pre- or postmenarche. In contrast with the variation of these anthropometrics, the waist/hip index change with menarche is significant in both the Spanish and the immigrants, but non-significant difference exist between the two groups both in pre- and post-menarcheal girls.

The increase in body fat assessed in the immigrants goes along with a significant fat accumulation at subscapular, tricipital and suprailliac skinfold sites (Table 2). Again, no differences were found in the Spanish sub-sample. Premenarcheal Spanish girls show higher bicipital and tricipital skinfold values (Bi:  $U=1119.0$ ;  $p=0.025$ ; Tri:  $U=1099.5$ ;  $p=0.005$ ) than immigrant girls. Post-menarcheal girls, however, are different only at subscapular site, but in this case the immigrants have the larger skinfold thickness ( $U=1342.0$ ;  $p=0.014$ ).

**TABLE 1**  
SOMATIC VARIATION REGARDING MENARCHEAL STATUS

	Spanish			Immigrants		
	X (SD)	$\chi^2$	Sig.	X (SD)	$\chi^2$	Sig.
BMI						
Pre-menarcheal	19.9 (3.4)	10.540	0.001	19.9 (3.3)	13.759	0.0001
Post- menarcheal	21.8 (4.1)			22.8 (3.4)		
Body fat percentage						
Pre-menarcheal	28.1 (4.6)	0.437	0.509	27.5 (3.8)	7.165	0.009
Post- menarcheal	28.6 (4.9)			29.9 (4.4)		
Waist/Hip ratio						
Pre-menarcheal	0.81 (0.1)	29.534	0.0001	0.83 (0.1)	13.855	0.0001
Post- menarcheal	0.76 (0.1)			0.77 (0.1)		

**TABLE 2**  
SKINFOLDS' VARIATION REGARDING MENARCHEAL STATUS

Skinfolds	Spanish			Immigrants		
	X (SD)	U	Sig.	X (SD)	U	Sig.
Biceps	10.2 (4.1)	2827	0.105	8.5 (2.3)	801	0.471
Pre-menarcheal	9.6 (4.4)			9.7 (3.8)		
Post- menarcheal						
Triceps	15.0 (5.2)	3121	0.519	12.3 (3.8)	531.5	0.002
Pre-menarcheal	15.7 (5.6)			15.5 (4.7)		
Post- menarcheal						
Subscapular	11.8 (6.6)	2968	0.249	11.5 (4.7)	626	0.022
Pre-menarcheal	12.3 (6.4)			14.0 (5.3)		
Post- menarcheal						
Suprailiac	12.8 (7.4)	2843.5	0.117	13.7 (7.0)	650.5	0.039
Pre-menarcheal	14.6 (8.0)			17.1 (8.0)		
Post- menarcheal						

**TABLE 3**  
MENSTRUAL CYCLE CHARACTERISTICS REGARDING MIGRATION

	Menstrual cycle regularity (%)				Intensity of the bleeding (%)				
	Regular	Irregular	F	Sig.	Light	Moderate	Heavy	F	Sig.
Spanish	56.4	43.6	0.223	0.637	15.4	64.1	20.5	0.380	0.827
Immigrants	61.1	38.9			11.1	66.7	22.2		

**TABLE 4**  
MENSTRUAL PAIN AND USE OF RELATED MEDICATION

	Menstrual pain (%)				Medication (%)				
	Yes	No	F	Sig.	No	Without medical supervision	Prescribed	F	Sig.
Spanish	50.0	50.0	0.077	0.782	66.3	22.5	11.3	6.720	0.035
Immigrants	52.8	47.2			88.9	5.6	5.6		

In Table 3 and 4 we present the characteristics of the menstrual cycles in terms of regularity, intensity of the bleeding, and menstrual pain. Because some of the medication used in the relief of this pain consists of non steroid anti-inflammatories, which can present important adverse effects such as gastric ulcers, the use of these drugs as controlled by a medical professional has been also studied (Table 4).

Regularity of the cycles tends to be greater in the immigrant girls, even though the percentage of irregularity is high in both sub-populations. Regardless of their origin, most of these girls' menses come along with moderate bleeding, but a slightly higher proportion of the foreign girls report heavy bleeding.

Menstrual pain, also known as dysmenorrhoea, is reported by more than 50% for both sub-samples. Despite

these reports, a low number of girls use drugs to alleviate menstrual pains. Although there is no significant difference between sub-samples in the percentage of girls who suffer from dysmenorrhoea, there is a significantly higher consumption of pain medication among the Spanish girls, both for medications which are prescribed and for drugs without medical supervision.

In order to get a deeper insight into the multivariate association of the measurements, a multiple correspondence analysis was carried out (Fig. 1). For this procedure, the menstrual cycle characteristics and the origin of the girls were included, along with the BMI, as it stands for an adequate indicator of the nutritional status<sup>24,25</sup>. The analysis may be interpreted to indicate that there are two different maturational profiles. The Spanish are associated with normal weight or underweight

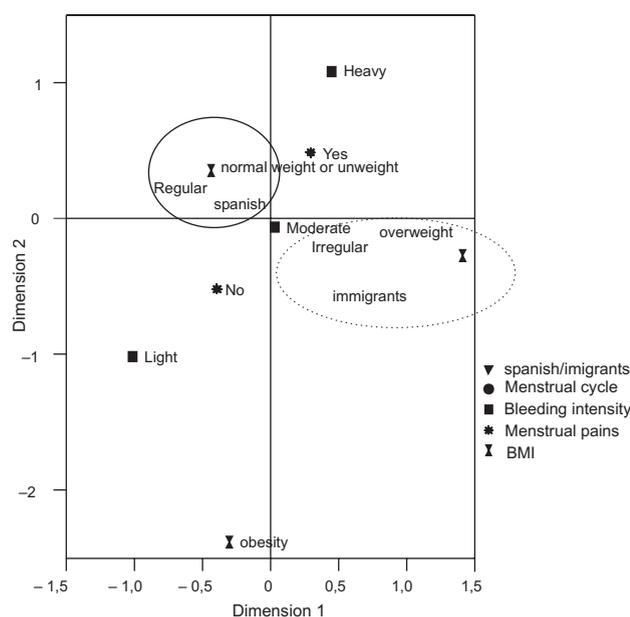


Fig. 1. Multiple correspondence analysis for migratory status, BMI and characteristics of the menses.

status, along with cycle regularity. In contrast the immigrant girls are associated with overweight and irregular cycles.

## Discussion

Migration is a process that has numerous implications, affecting socio-economic status, behaviour, and health, which can make immigrant populations vulnerable<sup>26,27</sup>. Moreover, their mental health status is going to be related to their cross-cultural experiences, overall human acceptance, and tolerance<sup>28</sup>. Immigrants in their new settings may keep their habits and cultural identity as long as possible, but tend to acquire characteristics of the receiving population, including the aspects of physical growth and the disease profile<sup>29</sup>. Adolescence is a stage of great sensitivity to environmental conditions because of the number of events taking place, including the development of the adult personality.

## REFERENCES

1. EUROSTAT Population in Europe 2005: first results. 16 (2006). —
2. EUROSTAT. Push and pull factors of international migration. A comparative report. Why do people migrate?. *Statistics in focus*. 3 (2001). —
3. CACHON L, Migraciones. 14 (2003) 219. —
4. ROVILLE-SAUSSE F, *Biom Hum et Anthropol*. 21 (3–4) (2003) 155. —
5. ACEVEDO P, Las mujeres inmigrantes del Magreb y América Latina en la Comunidad de Madrid: características sociales y sanitarias, [MS Thesis], [in Spain], (University Autónoma of Madrid, Madrid, 2004). —
6. ŠKREBLIN S, SUJOL-DŽIĆ A, *Coll Anthropol*, 27 (2003) 469. —
7. MARRODAN MD, Inmigrantes entre nosotros. Dinámica migratoria de poblaciones iberoamericanas, asiáticas y africanas hacia España. Implicaciones biodemográficas y epidemiológicas. In: *Las migraciones: su repercusión en la sociedad y en la biología de las poblaciones humanas*. (Ediciones Universidad Autónoma Madrid, Spain, 1994). —
8. PRADO C, La pubertad: un periodo de crisis.

The anthropometric changes that are observed in these Spanish and immigrant students have already been described as »normal« within the maturation process<sup>30–33</sup>. We show here, however, that the somatic changes at menarche of the immigrant sample are, generally, greater than those of the Spanish sample.

The reason for this pattern differentiation could be that the control of the maturational process has dissimilar biological characteristics in each sub-sample. In addition, the stress of migration may be a factor, as stress can lead to a greater fat accumulation<sup>34</sup>. After menarche, trunk fat accumulation seems to be more remarkable in the immigrant girls, a pattern which is important due to its close relationship with metabolic and cardiovascular diseases<sup>35,36</sup>.

As seen in this study, to be an immigrant girl is associated with overweight, supporting the idea that migration can somehow be interpreted as health risk factor<sup>37</sup>. Irregularity in ovulatory patterns is also defining character. This irregularity is frequent during this maturation transition, but could also indicate another underlying situation, such the polycystic ovulatory syndrome.

The prevalence of dysmenorrhoea in this sample is similar to that reported in another study focused on an adolescent population<sup>38</sup>. It is interesting that despite the similar percentages of dysmenorrhoea between Spanish and immigrant girls, a medical treatment for the pain is more common in the Spanish. This could be interpreted as the reflection of a different perception of these women regarding their menses, so that for the immigrants the pain is accepted as part of the process and not as a health problem.

All these findings suggest that there is a need for educational programs especially focussed on the foreign adolescent population, so that health problems and risk situations can be prevented.

## Acknowledgements

The authors wish to thank Professor Barry Bogin for reading the manuscript and for his valuable contribution and language revision.

- In: REBATO E, SUSANNE C, CHIARELLI B (Eds), *Antropología Biológica* (Verbo Divino, Spain, 2005). —
9. BODSZÁR EB, Variability of changes in puberty. In: BODSZÁR EB, SUSANNE C, PROKOPEC M (Eds), *Puberty: Variability of changes and Complexity Factors* (Eötvös Loránd University, Budapest, 2000). —
10. HARRISON G, TANNER J, PILBEAM D, BAKER P, *Human Biology* 3rd ed. (Cambridge University Press, New York, 1993). —
11. SUSANNE C, REBATO E, CHIARELLI B, *Anthropologie Biologique*, (De Boeck Université, Bruxelles, 2003). —
12. BODSZÁR EB, *Human Biol Budapest* 22, (1991). —
13. ULJASZEK S, JOHNSTON F, PREECE M, *Cambridge Encyclopaedia of Human Growth and Development*, (Cambridge University Press, New York, 1998). —
14. TANNER J.M, *Growth and adolescence*, 2ed (Blackwell, Oxford, 1962). —
15. BODSZÁR EB, *Humanbiol Budapest*, 3 (1975) 174. —
16. DANKER-HOPPE H, *Yearbook of Physical Anthropology*, 29 (1986)

81. — 17. BOGIN B, Patterns of human growth, (Cambridge University Press, Cambridge, 1999). — 18. ARGANANI L, TOSELLI S, GUALDI-RUSSO E, Coll Anthropol, 28 (2004) 885. — 19. ROSETA L, Reproducción humana: una adaptación fisiológica al modo de vida y al ambiente. In: REBATO E, SUSANNE C, BRUNETTO C, (Eds), La Antropología Biológica, (Verbo Divino, Spain, 2005). — 20. CLAVEL-CHAPELON F, GROUP E3N-EPIC, Human Reproduction, 17.1 (2002) 228. — 21. INE. Instituto Nacional de Estadística, España en cifras 2006, Available from: [http://www.ine.es/prodyser/pubweb/esp/esp/06.htm](http://www.ine.es/prodyser/pubweb/esp/esp/esp/06.htm), accessed August, 2006. — 22. World Medical Association, Helsinki declaration: Ethical Principles for Medical Research Involving Human Subjects (2000), Available from: [www.wma.net/s/policy/b3.htm](http://www.wma.net/s/policy/b3.htm). — 23. WEINER SJ, LOWREY J, Human Biology: a guide to field methods (Blackwell Scientific Publication, Oxford, 1981). — 24. DEURENBERG P, WESTSTRATE JA, SEIDELL JC, Br J Nutr, 65 (1991) 105. — 25. HIMES JH, DIETZ WH, Am J Clin Nutr, 59 (1994) 307. — 26. BRUNNER E, B M J, 314 (1997) 1472. — 27. GONZALEZ M, SANZ B, SCHUMACHER R, TORRES AM, Una aproximación a la identificación de la situación socio-sanitaria de la población inmigrante del Área Sanitaria 6 de la Comunidad de Madrid, OFRIM, Sup Diciembre (1997) 75. — 28. SUJOLDŽIĆ A, DE LUCIA A, BUCHEGGER R, TERZIĆ R, BEHLULI I, BAJRAMI Z, Coll anthropol, 27 (2003) 431. — 29. MUL D, OOSTDIJK W, DROP S, Horm Res, 57 (2002) 1. — 30. CAMERON N, GRODON-LARSEN P, WRCHTOA EM, Am J Phys Anthropol, 93 (1994) 307. — 31. BIRO FM, LUCKY AW, SIM-BARTL LA, BARTON BA, DANIELS SR, STRIEGEL-MOORE R, KRONSBURG SS, MORRISON JA, J Pediatr, 142(6)(2003) 643. — 32. VITALLE MS, TOMIOKA CY, JULIANO Y, AMANCIO OM, Rev Assoc Med Bras, 49(4) (2003) 429. — 33. PRADO C, FERNÁNDEZ-DEL OLMO R, ANUNCIBAY J, Biom Hum Anthropol, 23 (3–4) (2005) 193. — 34. Sociedad Española para el estudio de la obesidad, Med Clin 115 (2000) 587. — 35. EUROPEAN ARTERIOSCLEROSIS SOCIETY (EAS), Nutr Metab Cardiovas Dis, 2(3) (1992) 113. — 36. VÁZQUEZ C, Endocrinol Nutr, 50 (6) (2003), 198. — 37. CAÑADA JL, COLL V, DÍAZ M, HERNÁNDEZ E, MARTÍNEZ A, OCHOA J, SOLSONA L, VÁZQUEZ J, La atención al inmigrante: Del aluvión a la solución razonable. Documentos SEMFYC 17. Sociedad Española de Medicina Familiar y Comunitaria (2002), Available from: <http://www.semfy.es>. — 38. STRINIĆ T, BUKOVIĆ D, OAVELIĆ L, FAJDIĆ J, HEMAN I, STIPIĆ I, PALADA I, HIRŠ I, Coll Anthropol, 27 (2003) 707.

R. F. del Olmo

Universidad Autónoma de Madrid, 2 Darwin Street, Cantoblanco (Madrid), Spain  
e-mail: raquelfernandezo@hotmail.com

## PROFILI SAZRIJEVANJA I MIGRACIJE U ŽENSKOJ ADOLESCENTNOJ POPULACIJI U MADRIDU: POSTOJI LI POTREBA ZA NOVIM STAJALIŠTIMA?

### SAŽETAK

Svrha ove studije je procijeniti antropometrijske promjene te karakteristike menstrualnog ciklusa tijekom procesa sazrijevanja adolescentica u Madridu, Španjolska. Novi demografski sadržaj Madrida, sa 33,9 % djevojaka iz srednje i južne Amerike, čini ovu studiju važnu u smislu novih epidemioloških situacija koje se mogu razviti. Uzorak sadrži 284 djevojke u dobi od 9 do 16 godina, mjerenih i intervjuiranih u četiri školska centra u Madridu. Rezultati pokazuju da se menstruacija javlja nešto ranije kod španjolskih djevojaka, ali nema drugih značajnih razlika koje se odnose na karakteristike njihovih menstruacija. No, španjolske djevojke imaju značajno viši unos lijekova protiv menstrualnih bolova. Antropometrijske promjene vezane uz menstruaciju veće su kod imigranata, osobito u slučaju debljine trupa, koje vodi karakterizaciji pretilosti tog sub-uzorka. Ovi profili sazrijevanja pokazuju potrebu za edukacijskim programima, osobito usmjerenim na stranu adolescentsku populaciju, kako bi se lakše izašlo na kraj sa rizicima vezanim uz pretilost.