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## Length of residence and risk of eating disorders in immigrant adolescents living in Madrid; the AFINOS study

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### Abstract

**Objectives:** This study was designed to compare the risk of having an eating disorder (ED) among immigrant and native adolescents living in Madrid and to determine the possible influence of length of residence (LOR) on the risk of the immigrants.

**Methods:** A cross-sectional survey was conducted from november 2007 to february 2008 in a representative sample of adolescents aged 13 to 17 years (n = 2,077, 1,052 girls) living in the Madrid region. Data were collected using the Spanish version of the SCOFF Eating Disorders Questionnaire. Further factors considered were country of birth, LOR and several biological, socio-demographic, lifestyle and health-related variables.

**Results:** According to the three logistic regression models constructed, female immigrant adolescents on the whole showed a greater ED risk (OR = 1.95; 95% CI 1.29-2.95; p = 0.001) than native adolescents. Moreover, the likelihood of ED was higher among female immigrants living in Spain for <6 years than for Spanish native females (OR = 2.44; 95% CI 1.42-4.18; p = 0.001), while no significant differences were found when female natives were compared with female immigrants living in this country for ≥ 6 years. Similarly, no differences were observed in the ED risk recorded for male native and immigrant adolescents, both as a whole and by length of residence in Spain.

**Conclusions:** The immigrant status and the length of Spanish residence are relevant factors in regard to the ED risk in adolescents living in Madrid.

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Key words: Immigration. Eating disorders. Length of residence. Acculturation. Spain.

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### TIEMPO DE RESIDENCIA Y RIESGO DE TRASTORNOS DE CONDUCTA ALIMENTARIA EN ADOLESCENTES INMIGRANTES RESIDENTES EN MADRID; ESTUDIO AFINOS

#### Resumen

**Objetivos:** Este estudio fue diseñado para comparar el riesgo de trastornos de conducta alimentaria (TCA) entre adolescentes nativos e inmigrantes residentes en Madrid, así como para determinar la posible influencia del tiempo de residencia en el riesgo de los inmigrantes.

**Métodos:** Se llevó a cabo un estudio transversal durante el periodo comprendido entre noviembre 2007 y febrero 2008 sobre una muestra representativa de adolescentes residentes en Madrid, con edades de entre 13 y 17 años (n = 2.077, 1.052 mujeres). Los datos se recogieron usando la versión española del cuestionario SCOFF para la detección de trastornos alimentarios. Otros factores considerados fueron el país de nacimiento, el tiempo de residencia y diversas variables biológicas, socio-demográficas, relativas a estilo de vida y la salud.

**Resultados:** Según los tres modelos de regresión logística construidos, las mujeres adolescentes inmigrantes en conjunto mostraron un mayor riesgo de TCA (OR = 1,95; 95% CI 1,29-2,95; p = 0,001) que las nativas. Además, la probabilidad de sufrir TCA fue mayor entre las adolescentes inmigrantes con una residencia en España < 6 años que en las nativas (OR = 2,44; 95% CI 1,42-4,18; p = 0,001), mientras que no se encontraron diferencias entre las adolescentes nativas y las inmigrantes con un tiempo de residencia ≥ 6 años. No se observaron diferencias en el riesgo de TCA entre los adolescentes varones nativos y los inmigrantes, tanto en conjunto como según tiempo de residencia.

**Conclusiones:** La condición de inmigrante y el tiempo de residencia son factores relevantes a la hora de considerar el riesgo de TCA en adolescentes residentes en Madrid.

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Palabras clave: Inmigración. Trastornos alimentarios. Tiempo de residencia. Aculturación. España.

## Introduction

Eating disorders (ED) are a growing concern linked to a wide range of gastrointestinal, neurological and endocrine conditions<sup>1</sup>. In immigrant populations, the appearance of ED has also been related to socio-cultural factors such as ethnicity and acculturation<sup>2,3</sup>.

Acculturation is the multi-component process whereby immigrant populations change their original lifestyle to adopt behaviors and habits of the dominant culture<sup>4</sup>. Length of residence can be understood as an indirect measure of acculturation<sup>5</sup>, as confirmed in another study<sup>6</sup>.

Unlike the situation in other countries, immigration is a very recent phenomenon in Spain, which has substantially increased in some areas. For instance, in the Madrid region, the immigrant population grew from 2.3% in 1998 to 16.7% in 2010<sup>7</sup>.

Only a few studies have examined differences in the frequency or risk of ED between native and immigrant populations, and most have focused on female subjects. For this reason, in contextualizing this study, we have also considered those studies comparing the presence of ED among different ethnic groups as well as those carried out in adult populations. In one such study, increased bulimic behavior was observed in Greek adolescents of both sexes living in Greece compared with Greek migrants to Germany in the 1980s, yet no significant difference in this behavior was detected two decades later<sup>8</sup>. In contrast, numerous studies have addressed ethnic differences related to ED. For instance, among female adolescents, several studies have established that, certain ethnic groups are more vulnerable to ED<sup>2,3,9</sup>. However, the results of two further studies indicate that young adult Asian and Caucasian women are equally susceptible to ED<sup>10,11</sup>.

Further research efforts have addressed the issue of acculturation according to language proficiency and use, using indirect measures of this variable such as LOR or generation, but also using different acculturation scales based on cultural orientation and self-identification<sup>5</sup>. In effect, positive relationship was detected in adult women between the likelihood of suffering ED and acculturation<sup>12</sup> and this relationship was also observed for certain ED in both men and women<sup>13</sup>. In another study, a longer length of residence in young women was related to a higher rate of weight-related concerns and behaviors (weight dissatisfaction, binge eating or dieting)<sup>6</sup>. Similarly, a greater identification with the western culture has been associated with a greater likelihood of disordered eating behavior in children of both sexes<sup>14</sup>, yet the opposite was also observed in that less acculturated female adolescents were found to be more vulnerable to ED<sup>3</sup>. However, in adult women, no differences have been observed between acculturation and eating behavior<sup>15</sup>, or between acculturation and ED symptoms<sup>16</sup>.

Given the lack of Spanish studies examining this issue, the aim of our study was: 1) to establish diffe-

rences in ED risk between male and female immigrant and Spanish adolescents living in Madrid, and 2) to assess the effect of LOR, as an indirect measure of acculturation, on the ED risk.

## Methods

### *Study design and participants*

The participants for this study were recruited from the AFINOS (*La Actividad Física como Agente Preventivo del Desarrollo de Sobrepeso, Obesidad, Alergias, Infecciones y Factores de Riesgo Cardiovascular en Adolescentes*-Physical Activity as a Preventive Agent for the Development of Overweight, Obesity, Infections, Allergies and Cardiovascular Risk Factors in Adolescents) study. The rationale and methods of the AFINOS study have been described in detail elsewhere<sup>17</sup>. Briefly, it is a cross-sectional survey conducted in 2007-2008 designed to obtain data on lifestyle and health indicators through a questionnaire administered to a representative sample of adolescents ( $N \sim 2,000$ ) aged 13 to 17 years from the Madrid region. Data were collected at randomly selected secondary schools (grades 8<sup>th</sup> to 11<sup>th</sup>). The final sample comprised 2,077 subjects (1,052 girls), around 15% ( $n = 335$ ; 186 girls) of whom were born in a foreign country [263 in a Latin American country (South and Central America) and 72 in a European country, mostly (around 85%) of Eastern Europe]. This figure of 15% is in line with the estimated pattern for the immigrant population of Madrid (around 16%) based on data from the National Institute of Statistics for 2010<sup>7</sup>. The countries of origin also coincide with the two largest immigrant groups (Europeans and Latin-Americans) living in the Madrid region according to the National Survey of Immigrants 2007<sup>18</sup>. Of the 335 immigrants enrolled, only 318 provided LOR data for our analysis of the influence of this variable on the ED risk. The study protocol was approved by the Review Board of the *Puerta de Hierro* Hospital (Madrid, Spain) and the Bioethics Committee of the Spanish National Research Council (CSIC, Madrid, Spain). All parents or guardians and adolescents gave their written informed consent for participation.

### *Dependent variables*

All the variables used in this study were collected by questionnaire. The dependent variable, having a risk of ED, was estimated according to the Spanish version of the SCOFF Eating Disorders Questionnaire<sup>19</sup>. This is a screening tool originally designed for routine use to detect individuals considered to be at risk for ED and consists of five questions designed to assess deliberate vomiting, inability to control eating, weight loss, body image distortion and the impact of food on life. Two or

more positive answers to the questions were taken to indicate being at risk of disordered eating behavior<sup>20</sup>.

### *Independent variables*

The independent variables in this study were immigrant status and LOR in Spain. For the analysis of LOR, two categories were defined for girls and boys separately: adolescents who had lived in Spain for fewer than 6 years ( $n = 182$ ) and those who had spent 6 years or more in this country ( $n = 136$ ), which is the only measure of acculturation available in the AFINOS study. Given that LOR has not been well defined in studies performed on immigrant adolescents, we selected a cut-off value that would divide our subjects into two similar-sized groups. The cut-off of 6 years used also seems reasonable for the average age of the adolescents ( $14.7-9+1.2$  years).

### *Co-variables*

Some variables were considered co-variables in the analysis. These were: age, as a biological variable with a proven effect on ED<sup>21</sup>, socio-demographic variables that were available for all subjects such as family structure (two categories, both parents living at home, one or neither parent living at home) and large family (defined as  $\geq 3$  children by the Spanish government), also previously related to ED<sup>22</sup>; type of school (state versus private) and area of residence (Madrid center/suburbs versus rural areas). These last two variables have been related to socioeconomic status<sup>23,24</sup>, which has been considered in another study examining ED<sup>21</sup>. It should be noted that we lacked information on socioeconomic status (SES) for most of the AFINOS study sample owing to a low response rate of parents to the questionnaire.

Also included as co-variables were factors related to lifestyle: smoking (daily or occasionally) or non smoking (subjects who had never smoked or had given up smoking); daily consumption of fruit (at least one piece per day); dieting (currently on a restrictive diet to lose weight) and physical activity (active or non-active according to the PACE Program recommendation for adolescents of at least 60 min of moderate to vigorous exercise five days or more per week)<sup>25</sup>, given that several lifestyle factors have been considered as risk factors for ED<sup>26</sup>.

Finally, we considered the following health-related variables: the presence of overweight or obese (estimated as the self-reported body mass index or weight/height squared ( $\text{kg}/\text{m}^2$ ) using the BMI age- and gender-specific cut-offs proposed by Cole et al.)<sup>27</sup>, self-reported medical diagnosis of depression and self-reported school performance (poor/adequate, good or very good), which has also been linked to health behaviors, due to the confirmed relationship between health condition and ED<sup>13,26</sup>.

### *Data analysis*

The characteristics of the sample and output results of the study are provided as frequencies (percentages). Data for the male and female immigrant and native adolescents were compared by the Chi-squared test. Significance was two-sided ( $p < 0.05$ ).

The relationship between ED risk and LOR was assessed by binary logistic regression using three different regression models for boys and girls separately, with the Spanish subjects as the reference group (calculating odds ratios and 95% confidence intervals). In the first model, we adjusted for age as a biological variable, in the second model we adjusted also for socio-demographic and lifestyle variables and in the third model we added the health state variables. These three models were used to evaluate the potential impacts as confounders of all co-variables on the relationship between LOR and ED risk. All statistical tests were performed using the SPSS package (v 15.0) for Windows XP.

### **Results**

The characteristics of the male/female native and immigrant adolescents, overall and by LOR, are provided in table I. Risk prevalence for ED in the Spanish native and immigrant adolescent populations by sex are provided in figure 1. The female immigrant adolescents showed a higher prevalence than the female Spanish ( $P < 0.001$ ). Significant differences also emerged in ED risk when we compared female native and immigrant females with a LOR  $< 6$  years ( $P < 0.001$ ) yet these differences were no longer significant for female adolescents in the group LOR  $\geq 6$  years ( $P = 0.173$ ). No significant differences were observed when comparing male natives with male immigrants as a whole, or in the groups LOR  $< 6$  years ( $P = 0.460$ ) and LOR  $\geq 6$  years ( $P = 0.893$ ).

The logistic regression models constructed are shown in table II. Using the native female adolescents as the reference group, the ED risk adjusted for age was greater in immigrants (Model 1) (OR = 1.84; 95%CI 1.32-2.57;  $p = 0.002$ ). After adjusting also for socio-demographic and lifestyle variables (Model 2) the ED risk of the female immigrants was slightly higher (OR = 2.01; 95%CI 1.36-2.98;  $p < 0.001$ ). When factors related to health state were added as co-variables (Model 3), the ED risk was also higher among the female immigrant adolescents (OR = 1.95; 95%CI 1.29-2.95;  $p = 0.001$ ).

When the female natives (reference group) were compared with the female immigrants according to LOR, those whose LOR was  $< 6$  years showed a higher ED risk according to the three models (OR = 2.29; 95%CI 1.49-3.50;  $p < 0.001$ , OR = 2.40; 95%CI 1.44-3.99;  $p = 0.001$ , OR = 2.44; 95%CI 1.42-4.18;  $p = 0.001$ , respectively), however these differences in the

**Table I**  
 Characteristics of the Spanish native and immigrant adolescents examined, overall and by length of residence in the Madrid region, Spain. Sample comprised of 2,077 subjects aged 13-17 years

	Spanish	Immigrants	P*	Immigrants		
				Length of residence		P*
				< 6 years	≥ 6 years	
<b>Girls</b>						
n	866	186		101	77	
Age [mean, (SD)]	14.7 (1.2)	14.9 (1.2)	0.113	14.8 (1.2)	15.1 (1.2)	0.088
Age 13-14 years (%)	41.9	43.0	0.784	43.5	36.4	0.173
Age 15-17 years (%)	58.1	57.0		53.5	63.6	
Living with both parents (%)	79.7	64.5	<b>&lt; 0.001</b>	70.3	57.1	0.069
Large family (%)	8.2	23.6	<b>&lt; 0.001</b>	19.6	29.7	0.128
Public school (%)	85.3	83.9	0.611	88.1	77.9	0.068
Residing in metropolitan area + suburbs (%)	62.4	67.6	0.187	60.8	75.3	<b>0.042</b>
Currently dieting (%)	12.3	15.8	0.205	20.8	9.1	<b>0.034</b>
Overweight and obesity (%)	9.9	13.6	0.144	14.6	10.8	0.468
Smokers (%)	21.7	13.4	<b>0.013</b>	12.0	15.3	0.536
Physically active (%)	16.4	13.0	0.257	12.9	14.3	0.784
Daily fruit consumption (%)	45.0	44.1	0.834	37.8	50.9	0.089
Reported medical diagnosis of depression (%)	2.4	6.0	<b>0.010</b>	6.1	5.3	0.838
Poor school performance (%)	5.2	7.6	0.212	8.0	6.5	0.703
<b>Boys</b>						
n	876	149		81	59	
Age [mean, (SD)]	14.7 (1.2)	14.9 (1.2)	0.113	14.9 (1.2)	14.7 (1.2)	0.493
Age 13-14 years (%)	44.2	44.3		42.0	49.2	0.399
Age 15-17 years (%)	55.8	55.7		58.0	50.8	
Living with both parents (%)	81.7	69.9	<b>0.001</b>	69.6	69.0	0.935
Large family (%)	7.0	16.3	<b>&lt; 0.001</b>	20.0	10.5	0.140
Public school (%)	83.6	86.6	0.928	90.1	81.4	0.135
Residing in metropolitan area + suburbs (%)	65.5	67.9	0.931	64.1	75.9	0.142
Currently dieting (%)	7.0	7.0	0.994	9.2	1.7	0.067
Overweight and obesity (%)	24.1	27.8	0.338	32.1	19.3	0.098
Smokers (%)	12.9	11.8	0.709	13.9	10.7	0.580
Physically active (%)	28.8	28.9	0.982	35.8	20.3	<b>0.047</b>
Daily fruit consumption (%)	40.9	36.1	0.279	32.1	40.4	0.320
Reported medical diagnosis of depression (%)	1.0	2.1	0.288	3.8	0.0	0.136
Poor school performance (%)	7.4	8.1	0.773	9.6	5.5	0.388

\*Pearson's  $\chi^2$  test (Student's t-test for age and BMI as a continuous variables).

three models were not detected for those whose LOR was  $\geq 6$  years.

For the adolescent boys, no differences were observed in ED risk between natives and immigrants as a whole, or when comparing natives with the two immigrant LOR groups.

## Discussion

### Results related to ethnicity

The findings of this study indicate that female immigrant adolescents carry a greater risk of having an ED than their Spanish counterparts, while no differences were detected in the ED risk between male native and immigrant adolescents. To our knowledge this risk has not been previously examined in Spain. The only re-

search found with any similitude at all is a study performed in Ceuta (a Spanish city in North Africa) a higher prevalence of ED was observed in Muslim adolescents of both sexes (12-20 years) than in Christian adolescents, probably due to the common cultural ties of these subjects with the neighboring country Morocco<sup>28</sup>.

Very few studies outside Spain have compared ED risks in immigrant and native populations. We therefore consider of interest studies that have addressed related issues including those assessing the influence of ethnicity on ED. The findings of many of these investigations are partially consistent with the present results obtained in female adolescents. For example, the frequency of unhealthy eating behaviors was reported higher among Asian than Caucasian adolescents living in the UK<sup>3</sup>. In Croatia, restrained eating behavior seems to be more common among immigrant adolescents of both sexes compared to natives<sup>29</sup>. Asian ado-

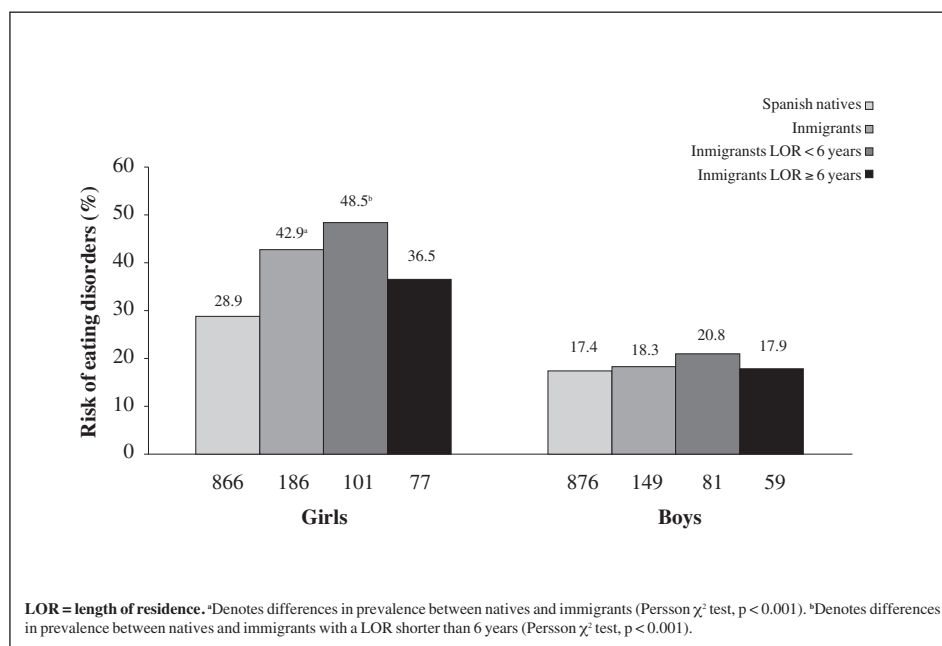


Fig. 1.—Eating disorder risk prevalences according to SCOFF scores recorded in Spanish and immigrant adolescents living in the Madrid region, Spain (surveyed 2007-8).

**Table II**  
Logistic regression models for the risk of having an eating disorder in Spanish native and immigrant adolescents (13-17 years), overall and by length of residence (LOR) in the Madrid region, Spain. Sample comprised of 2,077 subjects

	Model 1			Model 2			Model 3		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
<b>Boys</b>									
Spanish	1.00			1.00			1.00		
Immigrants	1.06	0.66-1.68	0.802	1.12	0.68-1.85	0.647	1.13	0.66-1.94	0.634
Length of residence									
Spanish	1.00			1.00			1.00		
Immigrants < 6 years	1.24	0.69-2.22	0.458	1.23	0.64-2.33	0.525	1.16	0.59-2.29	0.657
Immigrants ≥ 6 years	1.02	0.50-2.07	0.949	1.24	0.59-2.61	0.558	1.37	0.61-3.10	0.441
<b>Girls</b>									
Spanish	1.00			1.00			1.00		
Immigrants	1.84	1.32-2.57	<0.001	2.01	1.36-2.98	<0.001	1.95	1.29-2.95	0.001
Length of residence									
Spanish	1.00			1.00			1.00		
Immigrants < 6 years	2.29	1.49-3.50	<0.001	2.40	1.44-3.99	0.001	2.44	1.42-4.18	0.001
Immigrants ≥ 6 years	1.42	0.86-2.33	0.164	1.65	0.94-2.91	0.079	1.66	0.92-2.99	0.091

**Model 1**, adjusted by age.

**Model 2**, adjusted by age, cohabiting with parents, family size, school, area of residence, smoking, dieting, physical activity and daily fruit consumption.

**Model 3**, adjusted by age, cohabiting with parents, family size, school, area of residence, smoking, currently dieting, physical activity, daily fruit consumption, overweight or obese, school performance and depression.

lescent girls in Australia showed higher scores in attitudes to and psychopathology of ED than their Caucasian counterparts<sup>3</sup>.

Moreover, several authors have reported results indicating a higher vulnerability to ED or related issues among native subjects compared with immigrants, or among Caucasian subjects compared with other ethnicities (those with a more likely migrant background) while other investigations have detected no such differences. Thus, in two studies carried out in the UK, Cau-

casian mothers and daughters reported higher levels of restrained eating than Asian mothers and daughters<sup>15</sup>, although there were no differences between young British and Asian girls (mean age 21-22 years) in terms of having ED<sup>10</sup>.

In the United States, female Caucasian and Latino adolescents have shown a higher ED risk than their African counterparts<sup>9</sup>. However among adults, no differences were observed between native Americans and other ethnicities in ED symptoms<sup>30</sup>, which is in line

with the lack of differences observed among women belonging to different ethnic groups<sup>12</sup>.

### *Results related to acculturation*

The findings of the present study also reveal a greater risk of ED in female immigrants living in Spain for < 6 years compared to female natives, but this difference disappears when these girls have lived for  $\geq 6$  years in this country. This outcome suggests that a longer time of residence is slightly protective against ED in adolescent girls. However, no differences were detected when we compared our two length of residence groups of male immigrants and male native adolescents.

Few studies have addressed the relationship between acculturation or length of residence and ED in adolescents. In agreement with our results, a study carried out in Australia revealed that less acculturated Asian adolescent girls aged 14-17 years scored higher in attitudes to and psychopathology of ED than those who were more acculturated<sup>3</sup>. Partially in line with our results, in children of both sexes living in the US, length of residence was not correlated with ED, while stronger identification with the host culture was associated with a greater likelihood of ED<sup>14</sup>. To the best of our knowledge, no Spanish study exists with which to compare our results. In Europe, a single study examining this issue among Asian mothers and daughters, all adults living in London, concluded that acculturation was not associated with eating behaviors (restrained eating and calorie concerns)<sup>15</sup>, contradicting what we observed in girls.

Much of the information from the US and Australia conflicts with our observations in adolescents and studies performed in adults have provided inconsistent results. For example, in a study comparing Hispanic, Asian, Black and White adult women aged 18-44 years in the US, more acculturated subjects were more prone to suffer from ED<sup>12</sup>, which is in disagreement with our results. Similarly, positive correlation was noted between LOR and the risk of certain ED among males and females aged 18 years or older<sup>13</sup>.

In Australia, identifying with the western culture (indicating greater acculturation) was positively associated with disordered eating, and a negative relationship was detected between identification with the culture of origin and disordered eating in Muslim-Australian women aged 18-44<sup>4</sup>. Besides, a longer LOR in Australia was linked to more weight dissatisfaction in young women aged 18-23 years, despite a shorter time of residence being correlated with more dieting and bingeing<sup>6</sup>.

### *Possible causes of ED risk*

The main reason for a female immigrant adolescent showing a higher ED risk than a female native adoles-

cent could be stress during the course of acculturation<sup>31</sup>. In the US, acculturation stress and body dissatisfaction combined have been shown to make female students from different ethnic groups more vulnerable to bulimic symptoms. Specifically, those who reported body dissatisfaction combined with a low level of acculturation stress were less vulnerable to these bulimic symptoms<sup>32</sup>. Further, a higher level of acculturation stress was linked to higher rates of ED symptoms in Black and Latino women living in the US<sup>16</sup>. However, according to other authors, stress could diminish with a greater LOR<sup>33</sup>, which would be in agreement with our results.

Otherwise, it is possible that immigrants from non-western countries adopt the social standards of western societies, given that the acculturation process implies an adaptation of values and behaviors as a result of interaction with the host culture<sup>5</sup>. This could be extended to eating attitudes and behaviors. Accordingly, female immigrant adolescents would be pressured to adopt a thin model of beauty as the cultural stereotype, especially the western ideal of a slim female body. In this regard, Mexican-American women with an Anglo orientation showed a greater preference for a thinner body and less tolerance for overweight figures than those with a Mexican orientation<sup>34</sup>. This pressure and the internalization of the thin ideal present in western countries, have been identified as risk factors for the body dissatisfaction and body image problems associated with ED<sup>35</sup>.

### **Conclusions and limitations of the study**

Based on our results, we may conclude that: 1) female immigrant adolescents living in the Madrid region carry a greater ED risk than their female Spanish peers. We were able to detect this link independently of the model used to adjust for several co-variables; 2) female immigrant adolescents living in Spain for fewer than 6 years are more prone to develop an ED than female native adolescents, while female immigrants living for 6 years or longer in the country show a similar risk to their female native peers; and 3) length of residence could be an independent factor affecting ED risk.

Our study has several limitations. The first is that variables were self-reported, which compromises the quality of data. In addition, the group of immigrants was multiethnic and it is possible that different countries of origin could determine a different response when individuals come into contact with another culture. Another limitation is that we have used the length of residence as an indirect measure of acculturation, which could be incomplete; unfortunately, no other measure was available in the AFINOS study. Also, information on socioeconomic status (e.g., family income, work activities or level of parent studies) was not available because of the low completion rate of the questionnaire by parents (under 40%) in the AFINOS study. Consequently, we could not enter this informa-

tion as a co-variable in the regression models. Lastly, the cross-sectional design of our study precludes establishing cause-effect relationships. Despite these limitations, the lack of research assessing ED risk in immigrant adolescent populations makes this a pioneer study performed on a wide representative epidemiological sample of adolescents from the Madrid region.

## References

- Patrick L. Eating disorders: a review of the literature with emphasis on medical complications and clinical nutrition. *Altern Med Rev* 2002 Jun; 7 (3): 184-202.
- Furnham A, Adam-Saib S. Abnormal eating attitudes and behaviours and perceived parental control: a study of white British and British-Asian school girls. *Soc Psychiatry Psychiatr Epidemiol* 2001; 36(9): 462-70.
- Jennings PS, Forbes D, McDermott B et al. Acculturation and eating disorders in Asian and Caucasian Australian adolescent girls. *Psychiatry Clin Neurosci* 2005; 59 (1): 56-61.
- Mussap AJ. Acculturation, body image, and eating behaviours in Muslim-Australian women. *Health Place* 2009; 15 (2): 532-9.
- Arcia E, Skinner M, Bailey D et al. Models of acculturation and health behaviors among Latino immigrants to the US. *Soc Sci Med* 2001; 53 (1): 41-53.
- Ball K, Kenardy J. Body weight, body image, and eating behaviours: relationships with ethnicity and acculturation in a community sample of young Australian women. *Eat Behav* 2002; 3 (3): 205-16.
- INE (Instituto Nacional de Estadística -National Institute of Statistics-). Available in: <http://www.ine.es/jaxi/menu.do?type=pcaxis&path=%2Ft20%2Fe245&file=inebase&L=0>.
- Fichter MM, Xepapadakos F, Quadflieg N et al. A comparative study of psychopathology in Greek adolescents in Germany and in Greece in 1980 and 1998-18 years apart. *Eur Arch Psychiatry Clin Neurosci* 2004; 254 (1): 27-35.
- Pernick Y, Nichols JF, Rauh MJ et al. Disordered eating among a multi-racial/ethnic sample of female high-school athletes. *J Adolesc Health* 2006; 38 (6): 689-95.
- Furnham A, Husain K. The role of conflict with parents in disordered eating among British Asian females. *Soc Psychiatry Psychiatr Epidemiol* 1999; 34 (9): 498-505.
- Jennings PS, Forbes D, McDermott B et al. Acculturation and eating disorders in Asian and Caucasian Australian university students. *Eat Behav* 2006; 7 (3): 214-9.
- Cachelin F, Veisel C, Barzegarnazari E et al. Disordered eating, acculturation, and treatment-seeking in a community sample of hispanic, asian, black, and white women. *Psychol Women Q* 2000; 24 (3): 244-56.
- Alegria M, Woo M, Cao Z, Torres M et al. Prevalence and correlates of eating disorders in Latinos in the United States. *Int J Eat Disord* 2007; (Supl. 40): S15-21.
- Ayala GX, Mickens L, Galindo P et al. Acculturation and body image perception among Latino youth. *Ethn Health* 2007; 12 (1): 21-41.
- Ogden J, Elder C. The role of family status and ethnic group on body image and eating behavior. *Int J Eat Disord* 1998; 23 (3): 309-15.
- Gordon KH, Castro Y, Sitnikov L et al. Cultural body shape ideals and eating disorder symptoms among White, Latina, and Black college women. *Cultur Divers Ethnic Minor Psychol* 2010; 16 (2): 135-43.
- Veiga OL, Gomez-Martinez S, Martinez-Gomez D et al. Physical activity as a preventive measure against overweight, obesity, infections, allergies and cardiovascular disease risk factors in adolescents: AFINOS Study protocol. *BMC Public Health* 2009; 9: 475.
- INE (Instituto Nacional de Estadística -National Institute of Statistics-). Available in: <http://www.ine.es/jaxi/tabla.do?path=/t20/p319/a2007/p02/10/&file=04006.px&type=pcaxis&L=0>
- Rueda Jaimes GE, Diaz Martinez LA, Ortiz Barajas DP et al. [Validation of the SCOFF questionnaire for screening the eating behaviour disorders of adolescents in school]. *Aten Primaria* 2005 15; 35 (2): 89-94.
- Morgan JF, Reid F, Lacey JH. The SCOFF questionnaire: assessment of a new screening tool for eating disorders. *BMJ* 1999 4; 319 (7223): 1467-8.
- Johnson WG, Rohan KJ, Kirk AA. Prevalence and correlates of binge eating in white and African American adolescents. *Eat Behav* 2002; 3 (2): 179-89.
- Newton M. Eating alone, parents' marital status, and use of radio and girls' magazines were risk factors for eating disorders. *Evid Based Nurs* 2003; 6 (4): 120.
- Calero Martínez J, Escardíbul JO. Evaluación de servicios educativos: el rendimiento en los centros públicos y privados medido en PISA-2003. Documents de treball IEB. 2007. p. 7.
- Dominguez-Berjon MF, Borrell C, Cano-Serral G et al. [Constructing a deprivation index based on census data in large Spanish cities(the MEDEA project)]. *Gac Sanit* 2008; 22 (3): 179-87.
- Prochaska JJ, Sallis JF, Long B. A physical activity screening measure for use with adolescents in primary care. *Arch Pediatr Adolesc Med* 2001; 155 (5): 554-9.
- Rodríguez Martín A, Novalbos Ruiz JP, Martínez Nieto JM et al. Characteristics of eating disorders in a university hospital-based Spanish population. *Eur J Clin Nutr* 2005; 59 (3): 459-62.
- Cole TJ, Bellizzi MC, Flegal KM et al. Establishing a standard definition for child overweight and obesity worldwide: international survey. *BMJ* 2000 6; 320 (7244): 1240-3.
- Ramón FJ. Imagen corporal y conducta alimentaria en una muestra de adolescentes de distintas culturas de Ceuta [tesis doctoral]. Granada: Universidad de Granada; 2010. Available in: <http://hera.ugr.es/tesisugr/18935801.pdf>
- Skreblin L, Sujoldzic A. Acculturation process and its effects on dietary habits, nutritional behavior and body-image in adolescents. *Coll Antropol* 2003; 27 (2): 469-77.
- Franko DL, Becker AE, Thomas JJ et al. Cross-ethnic differences in eating disorder symptoms and related distress. *Int J Eat Disord* 2007; 40 (2): 156-64.
- Berry JW. Acculturative stress. In: Lonner WJ, Wong PTP, Wong LCJ, editors. Handbook of multicultural perspectives on stress and coping. Canada: Langley, BC; 2006. p. 287-9.
- Perez M, Voelz ZR, Pettit JW et al. The role of acculturative stress and body dissatisfaction in predicting bulimic symptomatology across ethnic groups. *Int J Eat Disord* 2002; 31 (4): 442-54.
- Caplan S. Latinos, acculturation, and acculturative stress: a dimensional concept analysis. *Policy Polit Nurs Pract* 2007; 8 (2): 93-106.
- Cachelin FM, Monreal TK, Juarez LC. Body image and size perceptions of Mexican American women. *Body Image* 2006; 3 (1): 67-75.
- Stice E. Risk and maintenance factors for eating pathology: a meta-analytic review. *Psychol Bull* 2002; 128 (5): 825-48.