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Disordered eating behaviors among Christian and Muslim adolescents in Ceuta, a multicultural town

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ABSTRACT

Studies on disordered eating behaviors (DEB) in multicultural populations with multiple religious/cultural affiliations are needed in order to clarify the relationship between cultural background and DEB. Therefore, we compared the presence of DEB among Christian and Muslim adolescents who share their school environment, controlling for the effect of body mass index, demographic variables and lifestyle habits. A sample of 493 girls and boys (339 Christian, 138 Muslim) whose mean (± SD) age was 14.8 (± 1.7) years completed self-reporting questionnaires and underwent measurements of anthropometric data. Religious/cultural affiliation was defined by self-identification. The dependent variable, DEB was assessed by means of the Eating Disorders Inventory (EDI-2). Muslim girls and boys score higher than Christians on EDI-2 total scores, especially on the perfectionism subscale. Bivariate and multivariate analyses were used to determine the characteristics associated with DEB, which were detected in 24% of participants (19% of Christians and in 35% of Muslims). Among girls, DEB were directly associated with overweight or obesity, the presence of frequent quarrels with parents, academic failure and spending more than 3 h a day watching screen images. Among boys, DEB were directly associated with overweight or obesity and Muslim background; and inversely associated with age and socioeconomic status.

1. Introduction

Eating disorders (ED) are a major concern for both epidemiologists and clinicians, including pediatricians (Campbell and Peebles, 2014). In contrast to what happened three decades ago, an increased number of publications about ED across cultures (Soh and Walter, 2013) show that disordered eating behaviors (DEB) are now more pronounced in non-Western than in Western samples (Podar and Allik, 2009). Non-Western populations living in contact with a Western lifestyle show an increased risk for ED (Abdollahi and Mann, 2001; Al-Adawi et al., 2002; Feinson and Meir, 2014; Ghazal et al., 2001; Latzer et al., 2007a,b; Nakai et al., 2014; Nobakht and Dezhkam, 2000; Thomas et al., 2016).

Nevertheless, Muslim populations are involved in most of this sort of prevalence studies (Abraham and Birmingham, 2008), which consistently report observed increased rates of DEB among Muslim adolescents who live in Western countries or who are the first generation exposed to the Western media, suggesting a conflict between secularism and religious conservatism. Abraham and Birmingham (2008) have claimed for carefully designed studies in multicultural populations with multiple religious affiliations in order to further clarify the relationship between religion and ED, controlling for potential confounding factors.

Certain cultural practices derived from the Islamic religion are closely related with eating behaviors such as ritual fasting or the consideration of sexual maturation as an indication of the appropriateness of early marriage. Not being obligatory for children, “the experience of fasting teaches Muslims self-discipline and self-restraint” (Azizi, 2002). The practice of Ramadan fasting is introduced at an early age (recommended at age 7 and obligatory when reaching puberty) while the choice of a potential spouse and the age of marriage are considered to

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be timely not long shortly after puberty (see websites, accessed 10 November 2018: http://www.islamweb.net/eramadan/articles/169245/rulings-on-fasting-children-i and https://www.al-islam.org/religion-al-islam-and-marriage/age-marriage). These practices may differ from the customs of the Christian population and may affect attitudes toward one's body shape and eating behavior. Such considerations have led us hypothesize that religious (cultural) affiliation – together with other variables – may be associated with DEB.

Among the other variables, it is well established that high body mass index (BMI) (Calado et al., 2011; Costa et al., 2008; Dias Santana et al., 2017; Feinson and Meir, 2014; Jackson and Chen, 2014; Kjelsås and Augestad, 2004; Lai et al., 2013; Le Grange et al., 2006) is associated with DEB in adolescents.

Sex differences, in terms of a higher prevalence of DEB among girls, have been confirmed in large samples of adolescents of Western (Austin et al., 2008; Micali et al., 2015; Rikani et al., 2013) and non-Western societies (Ghazal et al., 2001; Jackson and Chen, 2014; Lai et al., 2013; Nakai et al., 2015). An inverse relationship between age and risk of DEB have been found in adolescent non-clinical samples (Jackson and Chen, 2014; Martínez-González et al., 2003; Patton et al., 1999) but the opposite occurs among diagnosed individuals (Becker et al., 2007).

Low (Power et al., 2008) or high (Costa et al., 2008) socioeconomic status of the family, poor academic functioning (Yanover and Thompson, 2008) and patterns of lifestyle, such as time spent watching television or different electronic screen devices (Schooler and Trinh, 2011; Tiggemann, 2003) or weekly hours of physical activity (Kjelsås and Augestad, 2004), may be also associated with DEB in adolescents.

The objective of the present developmental cross-sectional-design study was to investigate the association of DEB with religious (cultural) affiliation, BMI and lifestyle habits, controlling for the effect of age and socio-economic status, in girls and boys living in the city of Ceuta, a location at the “cross-roads” of continents and cultures whose inhabitants are mainly Christian or Muslim.

2. Method

2.1. Participants and setting

The sample consisted of 556 adolescent students, from three public schools (including secondary and high school levels), randomized from 4,873 students of 11 schools in the city of Ceuta, Spain (see location on the map in Fig. 1). This city, under the sovereignty of Spain since 1688 (Encyclopaedia Britannica, 2018), has a long tradition of inter-cultural peaceful coexistence (since Christians and Muslims have lived together for several centuries, along with smaller communities of Jews and in recent decades, with people from India). Ceuta had a population approaching 75,000 inhabitants in 2004 and 84,500 in 2016; the proportion of foreigners was 3.84% (88.5% Moroccans) in 2004 and 6.43% (88.4% Moroccans) in 2016 (Instituto Nacional de Estadística, 2018).

From the eleven public schools (including secondary and high school levels), three were selected, one located downtown and two in the periphery, representing the social composition of Ceuta and assuring that it included around 30% of Muslim students. Then individuals were randomly selected from classrooms, stratified by sex, academic level and main religious/cultural affiliation. Out of 4873 students, the calculated appropriate sample size was 534 individuals. Questionnaires were filled validly by 493 (response rate 92%; 270 girls and 223 boys). The data were taken during the academic year 2003–04.

The study was approved by the local educational authority and the Ceuta School of Nursing Institutional Review Board (Ethics Committee). Parents gave informed consent; the students gave their assent and filled an anonymous self-administered questionnaire. The response rate was 88.7% (493/556); only three students or their parents declined participation.

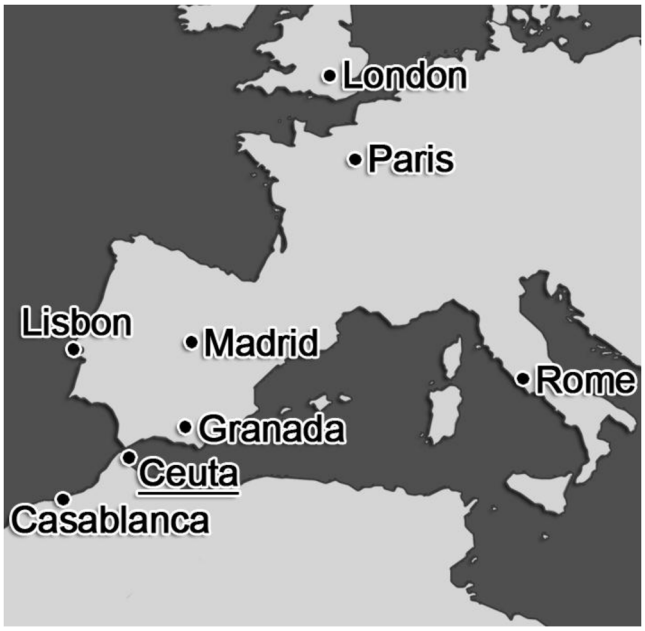

Fig. 1. Location of Ceuta in the map.

2.2. Instruments and procedure

The self-reporting questionnaire was administered in small groups (10–15 participants) supervised by a research assistant (a trained Nursing student) who helped resolve doubts and assured completeness. It included check marking of specific questions as those reported in Table 3 (and described in Section 2.2.1) and the Eating Disorders Inventory, version 2 (EDI-2) (Corrall et al., 1998).

2.2.1. Socio-demographic, family, academic, lifestyle and anthropometric variables

We collected data on sex, age of the adolescents and their parents, number of siblings, socioeconomic status of the family, religious background (Christian, Muslim, Jewish, Hindu, other), family conflicts (frequent quarrels with parents, frequent quarrels with siblings: never, sometimes, often, always), data concerning the school (academic failure, measured as failing in at least three subjects in the previous academic year) and lifestyle (time watching TV or different electronic screen devices and frequency of sport practice).

Anthropometric measures included weight and height, as well as waist and hip circumferences (in cm); these measures were taken by students of Nursing of the same sex of each participant. Weight was measured using an electronic scale in kilograms; and height was measured with a stadiometer in centimeters.

BMI was calculated from weight and height taking into account sex and age (Centers for Disease Control and Prevention, 2018), thus obtaining the sex- and age-standardized BMI (zBMI), which was used to classify the individual condition as underweight, normal weight, overweight or obesity.

2.2.2. Disordered eating behaviors

The validated Spanish version of the EDI-2 (Corrall et al., 1998) was used to assess ED symptoms. The EDI-2 includes 91 items: 64 items from the original Eating Disorders Inventory (EDI) (Garner et al., 1983) grouped into eight scales (drive for thinness, perfectionism, bulimia, body dissatisfaction, ineffectiveness, interpersonal distrust, interoceptive awareness, and maturity fears), and 27 additional items grouped into three other scales (asceticism, impulse regulation, and social insecurity). Each item has six possible responses: 0 (never), 1 (seldom), 2 (sometimes), 3 (often), 4 (almost always) or 5 (always).

Based on a general population study of Spanish adolescents (Morandé et al., 1999) and a subsequent validation study (Gandarillas et al., 2003), we considered as individuals with DEB or probable ED cases those scoring >50 on the sum of the eight original subscales of the EDI (EDI-2 refers to all 11 scales in version 2, including the three additional subscales).

2.3. Statistical analysis

The SPSS 24.0 program was used for statistical analysis. Dimensional variables and frequencies were compared by parametric or non-parametric tests as appropriate.

The bivariate association between the presence of DEB and independent variables was initially explored by means of either two-way cross-tabulations or mean comparisons. The relationships between EDI or EDI-2 total scores with sex and religious affiliation, and with the interaction term (sex by religious affiliation), were tested by means of two-way analysis of variance (ANOVA); we proceeded similarly with religious affiliation and age groups and their interaction.

Some psychometric properties of the EDI-2 in the present dataset were assessed, separately in boys and girls, by means of reliability analysis (coefficients of internal consistency, standardized Cronbach's alpha) of the EDI-2 subscales and calculation of their inter-correlations.

The variables independently associated with the presence of DEB and with the EDI total score were identified by logistic regression and multiple linear regression analyses, respectively. The independent variables manually introduced in the multivariate models were those with p values <0.25 in their respective bivariate analysis. The strength of the association of those variables was represented by odds ratios (OR) and partial r in the logistic regression and the multiple linear regression models, respectively.

In some of the bivariate analyses, only Christian with Muslim adolescents were included. However, the rest of participants were not excluded from the multivariate analyses aimed at identifying the variables independently associated with the presence of DEB (logistic regression) or with the EDI total score (multiple linear regression).

3. Results

3.1. General data

Among the 493 students, 270 (55%) were girls; and 223, boys. Their mean (± SD) age was 14.8 (± 1.7) years, exactly the same for both sexes. Concerning religious affiliation, 69% (339/493) identified themselves as Christians and 28% (138/493) as Muslims; among the remaining 3% (16/493), there were 4 Jews, 4 Hindu and 8 of no religion or marginal identification. The socio-economic status distribution was not significantly different between Christians and Muslims: lower, 47% and 38%; medium, 47% and 54%; and higher, 6% and 8%, respectively (χ^2 = 2.78; df = 2; p = 0.25). They did not differ in zBMI: 21.7 ± 4.0 *vs.* 22.1 ± 4.2 (Student t = 1.13; df = 475; p = 0.26). Detailed information on anthropometric measures is presented in Table 1.

The sex-stratified reliability analysis of the EDI-2 in the present dataset shows diverse internal consistency among its subscales, ranging from excellent with *drive for thinness* (standardized Cronbach's alpha of 0.86 in girls and 0.76 in boys) to poor with *asceticism* (0.43 in both girls and boys). For the whole EDI (eight subscales together), the standardized Cronbach's alpha was 0.88 in girls and 0.86 in boys. Moreover, the EDI-2 subscales were highly inter-correlated (see specific psychometric information on supplementary Tables S1 and S2).

Higher scores on both EDI and EDI-2 were associated with Muslim affiliation and female sex. Detailed comparisons of total scores and subscale scores are presented in Table 2.

3.2. Factors associated with disordered eating behaviors

Two-way analysis of variance (ANOVA) showed that EDI total score significantly varied with sex (p = 0.037) and religious affiliation (p < 0.001), but the interaction of sex with religious affiliation was not significant (p = 0.60). EDI-2 total score significantly varied with religious affiliation (p < 0.001) but not with sex (p = 0.34).

Similarly, two-way ANOVA showed that EDI total score significantly varied with religious affiliation (p < 0.001) and age group (p < 0.001), yet the interaction of religious affiliation with age group was not significant (p = 0.11). EDI-2 total score significantly varied with religious affiliation (p < 0.001) and age group (p < 0.001) but not with their interaction (p = 0.17).

As can be observed in Fig. 2, the differences between Christians and Muslims in the proportion of participants with DEB were significant at the 14-15-year age group among girls and at the <14-year age group among boys.

The presence of DEB (EDI > 50) was detected in 24% (118/493) of our sample, only slightly higher in girls than in boys [27% *vs.* 20%; χ^2 = 3.16, df = 1, p = 0.076; OR = 1.5 (95% CI, 0.96–2.2)]. EDI total score appeared to decrease with age among the 375 participants scoring ≤50 (Spearman's r_s = −0.20, p < 0.001) and to increase among the 118 participants above the >50 cut-off (r_s = 0.18, p < 0.05).

DEB were present in 19% (66/339) of Christians and in 35% (48/138) of Muslims [χ^2 = 12.65, df = 1, p < 0.001; OR = 2.2 (95% CI, 1.4–3.4)]. Among girls, DEB were present in 23% of Christians and 37% of Muslims (p = 0.014); among boys, in 16% of Christians and 31% of Muslims (p = 0.015) (see supplementary Table S3 for more details on the bivariate associations of independent variables with the presence of DEB).

There was an interaction of sex with age when we first analyzed (by logistic regression) the presence of DEB in the whole sample (p < 0.01) and we therefore performed sex-stratified multivariate analyses. Among

Table 1
Anthropometric measures of girls and boys of Christian or Muslim affiliation.

Measures	Girls (263)		Boys (214)	
	Christian (180)	Muslim (83)	Christian (159)	Muslim (55)
Height (m)	1.61 ± 0.07	1.62 ± 0.07	1.68 ± 0.09	1.71 ± 0.09
Weight (kg)	56.0 ± 12.5	58.7 ± 11.5	62.2 ± 15.1	64.1 ± 14.4
zBMI (kg/m^2; range)	21.5 ± 3.8 (13.8–39.7)	22.3 ± 4.2 (15.4–35.6)	21.9 ± 4.2 (14.6–41.1)	21.9 ± 4.3 (15.0–32.8)
Chest (cm)	86.2 ± 8.8	88.5 ± 8.7	85.1 ± 10.5	85.3 ± 10.3
Waist (cm)	72.5 ± 9.5*	75.7 ± 9.3*	79.2 ± 11.7	80.6 ± 13.1
Hip (cm)	92.9 ± 10.4*	96.2 ± 11.3*	91.5 ± 11.8	92.6 ± 11.5
Height-hip ratio	1.75 ± 0.20	1.71 ± 0.20	1.87 ± 0.27	1.87 ± 0.22
Waist-hip ratio	0.78 ± 0.10	0.79 ± 0.09	0.87 ± 0.14	0.87 ± 0.13

Note: zBMI, sex- and age-standardized body mass index.
Student t tests between Christian and Muslim girls or boys.: *p < 0.02 (no other significant differences).

Table 2
Scores [median (25th–75th percentile)] on the Eating Disorders Inventory, original (EDI) and revised version (EDI-2), of girls and boys of Christian or Muslim affiliation.

EDI-2 subscales	Girls (263)		Boys (214)		Statistical analysis	Significant *post-hoc* pair-wise comparisons
	Christian (180)	Muslim (83)	Christian (159)	Muslim (55)	*p* values (Kruskal-Wallis test among the 4 groups)	
Dive for thinness (DT)	3 (0–8)	3 (1–10)	2 (0–3)	3 (0–6)	< 0.001	CG >>> CB; MG >>> CB; MB > CB
Bulimia (B)	0 (0–3)	1 (0–4)	0 (0–3)	1 (0–4)	0.11	
Body dissatisfaction (BD)	6 (2–12)	6 (2–11)	3 (1–7)	6 (1–9)	0.006	CG >>> CB; MG > CB
Ineffectiveness (I)	3 (1–6)	3 (1–7)	2 (0–6)	3 (0–8)	0.40	
Perfectionism (P)	3 (1–6)	6 (3–9)	4 (1–6)	6 (3–9)	< 0.001	MG >>> CG; MB >>> CG; MG >>> CB; MB >>> CB
Interpersonal distrust (ID)	3 (1–5)	4 (2–7)	3 (1–6)	5 (2–8)	0.069	
Interoceptive awareness (IA)	3 (1–7)	4 (2–10)	3 (1–6)	3 (2–7)	0.053	
Maturity fears (MF)	7 (5–10)	9 (6–12)	7 (5–10)	8 (5–13)	0.060	
Asceticism (A)	3 (2–5)	3 (2–5)	3 (2–4)	4 (2–6)	0.17	
Impulse regulation (IR)	6 (2–7)	6 (1–9)	3 (0–8)	6 (1–10)	0.13	
Social insecurity (SI)	3.5 (1–6)	4 (1–7)	4 (1–7)	5 (3–9)	0.012	CB > CG; MB >>> CG; MB >> MG; MB > CB
EDI total score [mean ± SD][#]	33.5 (22–49) [38.3 ± 21.3]	42 (29–59) [45.8 ± 24.0]	29 (19–42) [32.8 ± 16.9]	43 (27–55) [42.6 ± 19.9]	< 0.001	MG >> CG; CG > CB; MG >>> CB; MB >>> CB
EDI-2 total score [mean ± SD][##]	47 (31–66) [51.4 ± 27.4]	55 (38–74) [59.7 ± 30.1]	40 (28–61) [46.1 ± 23.6]	60 (37–77) [59.8 ± 27.4]	< 0.001	MG > CG; MB > CG; MG >>> CB; MB >>> CB

Note: The EDI-2, compared with the original EDI, includes three additional subscales (in *italics*). CB, Christian boys; CG, Christian girls; MB, Muslim boys; MG, Muslim girls (>>>, $p \leq 0.001$; >>, $p \leq 0.01$; >, $p \leq 0.05$).
[#] A two-way ANOVA showed that there are significant effects of sex ($p = 0.037$) and religious affiliation ($p < 0.001$) but not of their interaction ($p = 0.60$).
[##] A two-way ANOVA showed that there is a significant effect of religious affiliation ($p < 0.001$) but not of sex ($p = 0.34$).

Fig. 2. Proportion (%) of girls (upper graph) or boys (lower graph) with disordered eating behaviors according to age group and religious/cultural affiliation (Christian in light bars and Muslim in dark bars; statistically significant differences, $^*p < 0.02$).
Note: Among girls, chi-square tests showed that religious affiliation was significant ($p = 0.014$), but age group was not; stratified analysis showed that, within the 14–15 age group, religious affiliation was significant [$p = 0.014$; OR = 2.9 (95% CI, 1.2, 6.8)]. Among boys, chi-square tests showed that both religious affiliation ($p = 0.015$) and age group ($p = 0.004$) were significant; stratified analysis showed that, within the <14 age group, religious affiliation was significant [$p = 0.017$; OR = 5.1 (95% CI, 1.2, 21.0)].

girls (Table 3), DEB were directly associated with overweight or obesity, the presence of frequent quarrels with parents, academic failure and spending more than three hours a day watching TV or different electronic screen devices. Among boys (Table 3), DEB were directly associated with overweight or obesity and Muslim background; and inversely associated with age and socioeconomic status. The results of the logistic regression (Table 3) and the multiple linear regression (Table 4) analyses are mostly coincident and complementary in this respect.

4. Discussion

4.1. Main findings

The main contribution of this study is a comparison between Christian and Muslim adolescents who live together, yet not as a result of migration; in this case, the families have been living together (in Ceuta) for multiple generations. The differences in DEB, separately analyzed among girls and boys, were controlled for other relevant variables including zBMI, demographics and lifestyle variables.

Our study showed that Muslim affiliation was independently associated with DEB among both girls and boys, especially among the latter. The features associated with the presence of DEB were different in Christians and Muslims, and in girls as opposed to boys, but in general DEB co-vary with zBMI.

Multivariate analyses showed that, among girls, DEB were directly associated with overweight or obesity, the presence of frequent quarrels with parents, academic failure and spending more than three hours a

Table 3
Logistic regression analysis of factors associated with disordered eating behaviors (EDI total score > 50) among 270 girls and 223 boys.

Variables	Girls[a]			Boys[b]		
	Adjusted OR	95% CI	*p* value	Adjusted OR	95% CI	*p* value
Body mass index (zBMI)			<0.001			0.014
Normal weight (18.5 − 24.9)	1.0			1.0		
Underweight (<18.5)	0.45	0.17 − 1.2	0.11	0.79	0.28 − 2.2	0.64
Overweight (25 − 29.9)	3.5	1.4 − 8.5	0.007	3.7	1.2 − 11.4	0.023
Obesity (≥30)	29.9	3.5 − 257.1	0.002	6.6	1.6 − 28.0	0.010
Age						0.003
Younger (<14)				1.0		
Medium (14 − 15)				0.61	0.25 − 1.5	0.28
Older (>15)				0.12	0.04 − 0.42	0.001
Religious background			0.036			0.035
Christian	1.0			1.0		
Muslim	2.2	1.1 − 4.3	0.010	3.1	1.3 − 7.3	0.011
Other	0.48	0.04 − 5.4	0.49	2.0	0.27 − 14.9	0.44
Socio-economic status			0.020			0.010
Low	1.0			1.0		
Medium	1.05	0.54 − 2.0	0.90	0.40	0.17 − 0.94	0.035
High	3.2	0.86 − 12.1	0.081	0.82	0.21 − 3.1	0.77
Quarrels with parents			0.004			
Never or sometimes	1.0					
Often or always	4.8	1.6 − 14.2				
Academic failure			0.027			
No	1.0					
Yes	2.4	1.1 − 5.3				
Hours watching TV or different electronic screen devices			0.051			0.43
Up to 2 h	1.0			1.0		
2–3 h	1.2	0.51 − 2.7	0.71	0.97	0.35 − 2.7	0.95
More than 3 hours	2.4	1.1 − 5.4	0.029	1.7	0.66 − 4.2	0.29
Practice of sport (h/week)						0.12
Low (<3)				1.0		
Medium (3 − 6)				0.73	0.36 − 2.1	0.73
High (>6)				0.23	0.05 − 0.98	0.047

Abbreviations: CI, confidence interval; EDI, Eating Disorders Inventory.

[a] The variables manually included in the logistic regression procedure were those with *p* values <0.25 in the bivariate analysis (see Supplementary Table S3). For the logistic regression, the Hosmer-Lemeshow goodness-of-fit test showed that the logistic model was appropriate ($\chi^2 = 6.43$; df = 8; $p = 0.60$); Nagelkerke $R^2 = 0.31$.

[b] The variables manually included in the logistic regression procedure were those with p values <0.25 in the bivariate analysis (see Supplementary Table S3). For the logistic regression, the Hosmer–Lemeshow goodness-of-fit test showed that the logistic model was appropriate ($\chi^2 = 7.47$; df = 8; $p = 0.49$); Nagelkerke $R^2 = 0.28$.

day watching TV or electronic screen devices. Among boys, DEB were directly associated with overweight or obesity and Muslim background; and inversely associated with age and socioeconomic status.

4.2. Association of religious (cultural) background with disordered eating behaviors

EDI and EDI-2 total scores were significantly higher among Muslim than among Christian adolescents. What particularly distinguished them was higher *perfectionism* among both girls and boys. Furthermore, what distinguished girls from boys was different among Christians with respect to Muslim adolescents. Among Christians, girls scored higher than boys on both *drive for thinness* and *body dissatisfaction,* in line with the observations in a large Spanish clinical sample of adults treated for ED (Islam et al., 2015). Among Muslims, boys scored higher than girls on *social insecurity,* contrary to the findings of the above authors (Islam et al., 2015). Across cultures, adolescent females score higher than their male counterparts on certain personality traits, especially on conscientiousness, openness to experience, and neuroticism (De Bolle et al., 2015).

Previous trans-cultural studies suggest that, as non-Western cultural groups undergo a process of approaching Western beauty prototypes, they suffer greater rates of ED, as a review study recognizes (Pike et al., 2014). Among Arab schoolgirls in Israel, the prevalence of DEB

Table 4
Multiple linear regression of factors associated with Eating Disorders Inventory (EDI) total score in girls and boys.

Variables	Girls[a]			Boys[b]		
	Partial *r*	t_{exp}	*p* value	Partial *r*	t_{exp}	*p* value
Standardized body mass index (zBMI)	0.47	8.37	<0.001	0.26	4.00	<0.001
Age (years)	−0.18	−2.83	0.005	−0.37	−5.89	<0.001
Religious background (Muslim)	0.09	1.46	0.15	0.28	4.27	<0.001
Socio-economic status (higher)	0.06	0.90	0.37	−0.15	−2.26	0.025
Quarrels with parents	0.17	2.72	0.007	0.16	2.43	0.016
Academic failure	0.18	2.94	0.004			
Hours watching TV or different electronic screen devices	0.19	3.03	0.003			

[a] Coefficient of determination (adjusted R^2) = 0.28, F (7, 254) = 15.54, $p < 0.001$.

[b] Coefficient of determination (adjusted R^2) = 0.22, F (5, 215) = 13.68, $p < 0.001$.

(measured with EDI-2) is lower in Christian than in Muslim or Druze girls (Latzer et al., 2007a). In our study, Muslim affiliation was associated with the presence of DEB in girls and boys, the association being more intense among boys. Our results in girls coincide with the findings of Latzer et al. (2007a) who did not investigate boys.

4.3. Body mass index and disordered eating behaviors

Although there are some cultural differences concerning fast which lead to different ritual practices —absolute fast for food and drink from dawn to sunset during Ramadan among Muslims after puberty; and partial fast just for food during two days, Ash Wednesday and Good Friday (see website, accessed 18 December 2018: http://www.archspm.org/resources_articles/lenten-regulations-fasting-abstinance/), among Catholic Christians aged 18–59 years— no differences were found in zBMI between Christians and Muslims, either girls or boys (Table 1).

In our sample, overweight and obesity were associated with DEB in both girls and boys, in line with previous studies showing that obesity in childhood is a risk factor for the development of ED, particularly binge eating disorder (Decaluwé and Braet, 2003; Fairburn et al., 1998). Some cross-sectional studies in Portuguese (Costa et al., 2008) and Brazilian (Dias Santana et al., 2017) adolescent girls and boys and in Norwegian university students (Kjelsås and Augestad, 2004) also show higher BMI scores among participants with DEB. Moreover, among both males and females (as it occurs in our cross-sectional study), being overweight is a risk factor for the development of ED two years later (Sancho et al., 2007). Even among boys, a one-point increase in BMI at age 10 is associated with 80% increased odds of dieting at 14 years [OR = 1.80 (95% CI, 1.33–2.44)] (Micali et al., 2015). Moreover, restrained eating adopts a growing linear tendency throughout the weight categories of normal weight, overweight and obesity (Silva and Capurro, 2013). Another prospective study, however, shows that body dissatisfaction outperforms BMI for predicting the onset of ED (Rohde et al., 2015). In general, among children, overweight is associated with peer problems, which in turn are linked with psychiatric disorders (Hestetun et al., 2014).

4.4. Socio-demographic characteristics and disordered eating behaviors

The presence of DEB was slightly higher in girls (27%) than in boys (20%), a difference not as pronounced as in previous cross-sectional studies among adolescents of northern Spain (15.7% in girls and 2.2% in boys; Sáiz Martínez et al., 1999), eastern Spain (6.3% in girls and 1.2% in boys; Rojo-Moreno et al., 2015), northern Italy (15.8% and 2.8%; Miotto et al., 2003), Germany (33% and 15%; Herpertz-Dahlmann et al., 2008), the United States (14.5% and 3.5%, or 24.8% and 11.1%, according to different definitions; Austin et al., 2008) and Brazil (strict dieting or fasting in 2005: 23.7% of girls and 13.7% of boys; Dias Santana et al., 2017). Yet in a Spanish 2-year prospective study, baseline (mean age of 11) prevalence of ED was not significantly different between girls (3.63%) and boys (3.23%), whereas two years later the respective rates were 5.67% and 1.84% (Sancho et al., 2007). Lifetime prevalences of different ED obtained through structured interviews and standard diagnostic criteria sum total figures of 6.3% for female and 1.2% for male adolescents in Valencia, Spain (Rojo-Moreno et al., 2015) and 7.7% and 1.2% in Holland (Swanson et al., 2011), while in the United States the respective figures are 7.7% and 4.3%, a finding that leads the authors of that nationwide study to wonder about the reasons behind the “lack of a female preponderance” (Smink et al., 2014). Japanese (Nakai et al., 2015) and Chinese studies (Jackson and Chen, 2014; Lai et al., 2013) also arrive at a preponderance of DEB among female (*vs.* male) adolescents.

Older age (>15 years) was independently associated with a lower prevalence of DEB, especially among boys. The lower probability of having DEB with increasing age, among both sexes, was found in previous cohort studies (Martínez-González et al., 2003; Patton et al., 1999) and a meta-analysis of 94 studies (Podar and Allik, 2009). However, when we distinguished the subgroup of participants above our cut-off for defining the presence of DEB, we observed a direct correlation between EDI total score and age, as described among ED diagnosed groups and in contrast with general population studies (Podar and Allik, 2009). Though the inverse relation of age with ED could be explained by the influence of socio-cultural background in younger age (Becker et al., 2007), it remained, among the boys of our study, after controlling for religious affiliation and other variables. Furthermore, among our girls, age remained significant after controlling for potential confounding variables in the multiple linear regression analysis.

The relevance of the socioeconomic level differed by sex. Among girls, the presence of DEB was significantly associated with highest socio-economic level in our bivariate analysis, in agreement with a cross-sectional study of Portuguese girls (Costa et al., 2008) and in contrast with a cross-sectional study of Latin American girls that find a higher proportion of girls with ED among those with low socioeconomic level (Power et al., 2008). Nevertheless, a community cohort study of Spanish girls found no association between socioeconomic status and ED (Martínez-González et al., 2003). Among boys, the independent inverse relationship of DEB with middle socio-economic level may support the finding of more DEB among boys of lower socio-economic status (Costa et al., 2008). Therefore, we might interpret a clear interaction between sex and socioeconomic status, whereby girls of high and boys of low (or high, but not middle) socioeconomic status are at higher risk of DEB.

4.5. Lifestyle variables and disordered eating behaviors

Academic failure was associated with DEB among our girls, but not among our boys. In a cross-sectional study of an online-collected sample of 1,305 undergraduates, eating and body image disturbances were associated with interference in academic functioning and achievement, especially in females (Yanover and Thompson, 2008).

Quarrels with parents were associated with the presence of DEB in both girls and boys, although more strongly and significantly among girls. Some studies in clinical samples (Cunha et al., 2009; Wade et al., 2007) find a relationship of parental conflicts with anorexia nervosa in females; and a community-based prospective longitudinal study finds that difficulties with parents are associated with ED and that “not being loved enough by the mother” at the age of 13 conveys a 3-fold risk of developing an ED two years later (Beato-Fernández et al., 2004).

TV exposure and use of different electronic screen devices has become quite prevalent among adolescents, with at least two thirds of individuals exceeding 2 h/day of screen time (Atkin et al., 2014); Spanish male and female adolescents (in 2004–2005) used to spend on TV viewing an average of 4–5 h/day (Calado et al., 2011). High TV viewing is associated with more friendship difficulties among girls (Atkin et al., 2015). Our results are in line with Schooler and Trinh (2011), who find a prospective association between TV viewing and lower body satisfaction among girls but not among boys. Moreover, media influence to lose weight is significantly and independently associated with unhealthy weight control behaviors among girls in general and more intensely among those with low self-esteem, but only among boys with overweight or obesity (Mayer-Brown et al., 2016).

Practicing sport was not associated with the presence of DEB in girls or boys in our study, although a trend of an inverse association can be observed in boys (Table 3). Adolescents who practice vigorous physical activity experience better family functioning and good friendship relationships (Atkin et al., 2015). It is unclear whether there is a relationship between physical activity and DEB among the general population. In physically active university students (of both sexes), the risk of DEB among those exercising 7 or more hours per week was not higher than among those exercising less than 7 h (Kjelsås and Augestad, 2004), though the subscales of *drive for thinness* and *body*

dissatisfaction were the most important predictors of weekly hours of physical activity for students of both sexes. Meanwhile, the prevalence of ED is higher among elite athletes than in the general population, especially among females practicing leanness-dependent sports (Sundgot-Borgen and Torstveit, 2004).

4.6. Strengths and limitations

Among the strengths of our study, we should mention its stable multi-cultural setting; the families of most Ceuta students have been living there for generations. The proportion of immigrant population in Ceuta was lower [3.8% (88.5% Moroccans) in 2004 and 6.4% (88.4% Moroccans) in 2016] than in the whole of Spain (9.9% in 2016) (Instituto Nacional de Estadística, 2018). Our sample was representative of the adolescent student population of Ceuta and the anthropometric variables were carefully measured (not taken from self-report).

The EDI-2 showed appropriate psychometric qualities in our sample, similar to those found in other samples of adolescents whose language is English (Shore and Porter, 1990) or Spanish (Urzúa et al., 2009).

Our study has some limitations, possibly including its cross-sectional design and the fact that most data were obtained through self-report; and the main dependent variable was defined by a cut-off on the EDI, rather than by diagnostic criteria. Nevertheless, with an EDI ≥ 50 cut-off (Gandarillas et al., 2003), DSM-IV cases of ED were identified with a sensitivity of 72.2% and a specificity of 84.5%. Our cut-off, chosen to be clinically meaningful as a screening tool, probably identified both definite and sub-threshold cases of ED, though sub-threshold cases are far more frequent than definite cases (Lahortiga-Ramos et al., 2005) and may represent individuals at high-risk for ED (Rohde et al., 2015). The cross-sectional design prevents one from making any causal attribution between DEB and certain variables such as zBMI and lifestyle features, although others (such as sex, age and religious/cultural affiliation) can be considered *a priori* as risk factors. Self-report bias may affect the questionnaire responses and reporting about behavior, but not other participant's variables; moreover, anthropometric measures were not self-reported but taken by research assistants.

4.7. Conclusion

In a multicultural location, DEB can affect both girls and boys, although the potential effects of other variables vary according to sex. There is a complex interaction of DEB with a series of demographic variables including cultural/religious background, age and socioeconomic status, with individuals who are overweight or obese being particularly vulnerable. These observations might guide health promotion initiatives as well as therapeutic interventions.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2018.12.089.

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