

Obesity and physical activity in children of immigrants

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Childhood overweight and obesity have increased in recent decades, reaching alarming proportions. Children with a migrant background seem to be particularly at risk of developing overweight and obesity. This article provides an overview of the prevalence of overweight or obesity among North African (NA) children living in their own countries or as immigrants in Europe. The aim is to show the effect of the migration process on this trend and to discuss its possible contributing factors. Publications were identified by a systematic search of PubMed and the existing literature. Original longitudinal or cross-sectional studies on the prevalence of childhood and adolescent overweight and obesity and of physical activity among ethnic groups from North Africa compared with the native population were reviewed. The results confirmed that children of NA origin in Europe have higher levels of overweight and obesity than the native ones, especially girls. However, this trend can also be detected in urban areas of NA countries. Important factors contributing to the increase of overweight and obesity among children and adolescents are discussed, in particular the westernization of eating habits, the level of physical activity and body image perception. The review shows that factors linked to acculturation in the host society and others maintained from the country of origin come into play in determining childhood overweight and obesity among NA immigrants in Europe. The importance of health promotion targeting the groups most at risk of childhood overweight and obesity, i.e. aspects of a healthy diet and the benefits of physical activity, is underlined.

Introduction

In recent decades, the prevalence of overweight and obesity among children has risen dramatically in the Western world, now reaching crisis proportions.¹ Obesity is associated with health problems in childhood and is a significant early risk factor for adult morbidity and mortality. It also affects self-esteem and influences social and cognitive development.² Besides genetics, the main causes of the worldwide increase of childhood obesity are environmental and cultural factors such as decreased physical activity (PA), increased sedentary lifestyle and unfavourable changes in eating habits.³ Children with a migrant background seem to be at higher risk of developing overweight and obesity. Migration to Western societies increases the risk of overweight and obesity as a consequence of acculturation and lifestyle changes: migrants tend to abandon their traditional food habits to adopt westernized dietary patterns containing high levels of fat, sugar and salt.⁴ Another aspect responsible for the increasing childhood obesity is the high exposure to media, in particular television, which exposes children to advertising for high-energy snacks, promotes a sedentary lifestyle and reduces PA.⁴ According to the World Health Organization,⁵ PA 'interacts positively with strategies to improve diet, discourages the use of tobacco, alcohol and drugs, helps reduce violence, enhances functional capacity and promotes social interaction and integration'. Research into the association between ethnicity and children's PA in various countries has yielded discordant results: children of an ethnic minority are sometimes more active⁶ or equally active⁷ or less active⁷ than children of an ethnic majority. In addition, migrants coming from developing countries may have a cultural preference for larger body sizes, as they are considered signs of health and wealth, leading the parents to be unconcerned about their children's overweight or obesity.^{2,8} Ethnic differences in the prevalence of childhood overweight/obesity, body image and PA have been investigated more extensively in USA than in Europe, where studies on this topic are scarce and fragmented.²

The aim of this review is to give a broad overview of published data on the prevalence of overweight and obesity, body image and

PA among North African (NA) immigrant children in European countries compared with the native ones and to NA children in their own country. NA migrants form a large part of the population currently living in Europe and seem to be at particular risk of developing overweight and obesity while in the host country. We also discuss the importance of developing specific interventions for these groups at an early stage to prevent long-term health problems.

Methods

An extensive search for publications on the prevalence of overweight or obesity, body image and PA among healthy NA children living in their own countries or as immigrants in Europe was conducted using PubMed. The research published on these topics since 2000 was analysed. Articles on original longitudinal or cross-sectional research on the prevalence of childhood and adolescent overweight and obesity among ethnic groups from North Africa compared with the native population were retrieved. The following methodological characteristics of the studies were evaluated: sample country, size and age, methods used to assess obesity and overweight, body image and level of PA. In almost all articles^{8–17}, the body weight status of children was categorized according to body mass index (BMI) values based on IOTF (International Obesity Task Force) recommended cut-off criteria;¹⁸ the only exception was Kumar *et al.*¹⁹ which used the US Centers for Disease Control and Prevention (CDC)/National Center for Health Statistics (NCHS) age- and sex-specific BMI reference distributions.²⁰

Results

Overweight and obesity among NA children in Europe

The PubMed search yielded few papers for overweight and obesity among NA children in Europe. Most of the articles regarded Moroccan immigrants, as they represent one of the largest ethnic minority groups in France (500 000 persons), Belgium (125 000

persons) and the Netherlands (280 000 persons).²¹ Given the increasing number of Moroccan immigrants in European countries, it is important to have some prognosis concerning obesity and overweight in this group. Table 1 shows the characteristics of the studies from European countries with data on the prevalence of overweight and/or obesity in immigrant children in comparison to native-born ones.

In all samples from the Netherlands, Moroccan children of both sexes had a higher prevalence of overweight and obesity than native ones. The only exception was the Moroccan boys reported by Snoek *et al.*⁹ Conversely, in Italian samples, Gualdi-Russo *et al.*¹² and Toselli *et al.*¹⁷ reported a lower prevalence of overweight in immigrant and African children than in Italian ones.

Fredriks *et al.*⁸ found a higher prevalence of overweight and obesity in both Moroccan and Dutch children living in large cities in the Netherlands (especially in Moroccans in the 4–7 years age range and in girls).

Instead, de Wilde *et al.*^{10,15} found that obesity declined significantly in Dutch and Moroccan children between 1999 and 2011, whereas overweight (including obesity) only declined in Dutch children. The differences result from an interaction of biological, cultural, socioeconomic and environmental factors.

Already from 2 to 5 years of age, children of Moroccan and NA origin had higher overweight than native Dutch and Swedish children.^{11,14,16} In agreement with this, Hof *et al.*²² found a higher BMI in Moroccan infants of all ages compared to Dutch children. Several factors were associated with overweight, in particular the maternal pre-pregnancy BMI. Women from ethnic minority groups had the highest prevalence of overweight, with pre-pregnancy BMI being a strong predictor of high BMI of their preschool aged children. In fact, genetic factors passed from mother to child could have a great effect on the variation in childhood BMI. Maternal weight gain during pregnancy is associated with the child's weight and weight gain in the first period of life. This suggests that weight gain in the first few months of life, which in turn may be affected by feeding practices, plays an important role in later life.

Moreover de Hoog *et al.*¹³ found that Moroccan mothers are more likely to underestimate their normal weight and overweight children. These children have a higher risk of weight gain. The ethnic differences in maternal underestimation are partly explained by their lower educational level. This suggests that first-generation immigrant mothers are more tied to their culture of origin than the mothers born in the Netherlands and that obesity is generally more accepted in these cultures. Snoek *et al.*⁹ and Ebenegger *et al.*³ found that Moroccan and Dutch children with lower parental educational levels had a higher prevalence of overweight and obesity than those with higher parental education, although Dutch adolescents had lower percentages of overweight and obesity than Moroccan ones. Ebenegger *et al.*³ found that parental migrant status and low educational level were related to a higher BMI. Watching TV was more prevalent in children of immigrant and low educational level parents and could contribute to overweight and obesity through an increase in caloric intake and inactivity. Despite the unequivocal evidence of a positive relationship between PA and health, technological progress results in a more inactive lifestyle from an early age due to the wide diffusion of static games in front of a screen. Veldhuis *et al.*¹³ found that, as early as 5 years of age, children of Moroccan ethnic background were at increased risk of overweight compared with Dutch contemporaries owing to parental weight status, TV watching and skipping breakfast. In Norway, a high proportion (64.1%) of 15- to 16-year-old adolescents from the Middle East and North Africa watched TV/video/used a computer for more than 3 h a day and as much as 68.7% were inactive (less than 1 h of PA a week outside of school).¹⁹ A similar situation was observed in Sweden: adolescent students (mean age 18.1 years) with a foreign background were

significantly more physically inactive than students with a Swedish background (54.4 vs. 41.1%) and especially girls (72.4 vs. 44.8%).²³

Lammle *et al.*²⁴ found that in Germany immigrant children and those with a lower socioeconomic status (SES) background were less physically active than non-immigrant children and those with a higher SES. Nielsen *et al.*²⁵ found that in Denmark 6- to 7-year-old children from an immigrant background seemed to have significantly lower participation in organized sports, based on self-reported data; however, if their amount of daily PA was objectively measured, they were not less physically active than children from the ethnic majority (86.4 daily minutes of PA vs. 83.3 daily minutes of PA, respectively) because they played outside more often. Therefore, accurate quantification of PA levels is required: the principal limit is the absence of a valid instrument for measuring the full complexity of PA in children, as they perform a large amount of unplanned play activities that cannot be assessed by self-report methods.

Several studies analysed the relationship between childhood overweight/obesity and the immigrant status of the mother. In Italian studies,^{12,17} the prevalence of overweight in both sexes was higher in children of Italian mothers than in those of immigrant mothers. Concerning obesity, Gualdi-Russo *et al.*¹² found a higher incidence in Italian daughters (almost double) than in those of immigrant mothers (multi-ethnic sample), while Toselli *et al.*¹⁷ found a higher prevalence in African females than in Italian females. These results may depend on genetic and cultural (nutritional) factors and on SES. The mother typically assumes the primary responsibility for the care and feeding of the children, even if Ebenegger *et al.*³ found no influence of maternal or paternal migrant status on adiposity and eating habits in children in Switzerland.

Gualdi-Russo *et al.*¹² found a good correlation between perceived body size and BMI values, indicating a good appropriateness of body image perception. This study, in agreement with Toselli *et al.*¹⁷ showed that on average each group preferred thinner body sizes and that body image satisfaction was lower among Italian girls. Moreover, Toselli *et al.*¹⁷ reported that overweight Africans of both sexes had a wrong perception of actual self, perceiving themselves to be thinner than they were. The differences in ideal body image and ideal body size across ethnic groups are due to different cultural pressure, media influence and comparison with peers.²⁶ In a study conducted on an Egyptian sample,²⁷ adolescent schoolgirls showed a strong correlation between perceived body size and BMI, reflecting strong acceptance of their body size. Most girls, from both urban and rural areas, wanted to be thin (respectively 51.3 and 40%), while 29.7% of the urban girls wanted to be normal-weight. In the rural sample, 9.1% wanted to be normal-weight and 9.7% wanted to be overweight, indicating an influence on body image of both the ethnic group to which they belong and the cultural environment in which they live.

Overweight and obesity among NA children living in North Africa

Developing countries face the double burden of both malnourished and over-nourished populations, with most overweight and obese children concentrated in urban areas. In these countries, the rapid progress of urbanization and demographic trends is associated with a cluster of non-communicable diseases and unhealthy lifestyles, described as the 'lifestyle syndrome' or the 'New World syndrome'. This has been suggested as the most probable aetiology for the very high rates of obesity and its consequent morbidity and mortality in developing nations. In addition, childhood obesity is still considered a sign of healthiness and high social class in such communities.

A review conducted by de Onis *et al.*²⁸ on nationally representative surveys from developing countries showed that, although the prevalence of overweight/obesity in developed countries is about

Table 1 Overview of studies on the prevalence of overweight/obesity in NA immigrant children in comparison to European populations

First author and publication year	Ethnic group	Sample size	Sex	Age (years)	Prevalence of overweight (obesity included)* (%)	Prevalence of obesity (%)		
The Netherlands Fredriks 2005	Moroccan	2855	Males	0–21	15.8*	3.1		
			Females	0–21	24.5*	5.4		
	Dutch Urban	14 500	Males	0–21	12.6*	1.6		
			Females	0–21	16.5*	2.8		
	Rural		Males	0–21	8.7*	0.8		
			Females	0–21	11.3*	1.4		
Snoek 2007	Moroccan	90	Males	11–16	9.1	0.0		
			Females	11–16	10.9	2.2		
	Dutch	7239	Males	11–16	10.2	0.8		
			Females	11–16	6.4	0.6		
De Wilde 2009	Moroccan 1999	1063	Males	3–6	12.8	5.1		
				7–10	10.7	7.9		
				13–16	9.5	0		
				Total	12.1	5.6		
			Females	3–6	20.3	7.7		
				7–10	20.3	5.8		
				13–16	18.5	7.7		
				Total	20.1	7.2		
			2007	1480	Males	3–6	11.8	5.9
						7–10	20.8	8.7
						13–16	22.7	8.3
						Total	16.7	7.2
	Females	3–6	18.0	6.3				
		7–10	24.8	6.6				
		13–16	17.7	7.1				
		Total	20.5	6.6				
	Dutch 1999	5349	Males	3–6	7.6	1.8		
				7–10	10.8	3.3		
				13–16	11.5	0.9		
				Total	8.8	2.2		
			Females	3–6	10.8	3.4		
				7–10	16.2	4.5		
				13–16	13.2	3.1		
				Total	12.6	3.7		
2007			5793	Males	3–6	5.2	1.2	
					7–10	13.1	4.2	
					13–16	12.2	2.5	
					Total	8.9	2.3	
Females	3–6	8.4	3.5					
	7–10	14.1	3.6					
	13–16	12.7	2.3					
	Total	10.9	3.3					
De Hoog 2011	Moroccan	245	Males and females	2	16.7*	–		
	Dutch	1718	Males and females	2	7.1*	–		
De Hoog 2012	Moroccan	161	Males and females	6.1 (0.5)	28.0*	–		
	Dutch	1744	Males and females	5.7 (0.5)	7.4*	–		
Veldhuis 2013	Moroccan	152	Males and females	5.8 (0.5)	19.1*	–		
	Dutch	7302	Males and females	5.7 (0.4)	8.2*	–		
De Wilde 2014	Moroccan 1999	1059	Males	3–16	18.1*	6.0		
				Females	3–16	26.1*	7.6	
				Males and females		3–16	22.1*	6.8
				2007	Males	3–16	23.9*	7.1
			Females		3–16	27.5*	7.2	
			Males and females		3–16	25.7*	7.2	
			2011		Males	3–16	23.2*	5.3
				Females	3–16	22.5*	5.5	
				Males and females		3–16	22.8*	5.4
				Dutch 1999	Males	5346	3–16	11.3*
			Females		3–16	16.0*	3.9	
			Males and females		3–16	13.6*	3.0	
	2007	Males	5793		3–16	11.3*	2.3	
		Females	3–16	14.3*	3.4			
		Males and females		3–16	12.8*	2.8		
		2011	Males	7114	3–16	10.6*	1.6	
	Females		3–16	12.3*	1.9			
	Males and females		3–16	11.4*	1.8			

(continued)

Table 1 Continued

First author and publication year	Ethnic group	Sample size	Sex	Age (years)	Prevalence of overweight (obesity included)* (%)	Prevalence of obesity (%)
Sweden						
Khanolkar 2013	North African	97	Males and females	4.8	28*	–
	Swedish	9342	Males and females	4.8	16*	–
Norway						
Kumar 2004	Middle East/North African ^a	340	Males	15–16	4.4	–
			Females	15–16	0.6	–
Switzerland						
Ebenegger 2011	Migrant ^b					
	Low PEL	189	Males and females	5.2 (0.6)	17.1	–
	Medium/high PEL	197	Males and females	5.2 (0.6)	10.3	–
	Non-migrant					
Low PEL	11	Males and females	5.2 (0.6)	27.3	–	
Medium/high PEL	145	Males and females	5.2 (0.6)	6.2	–	
Italy						
Gualdi-Russo 2012	Migrant ^c	321	Males	8–9	16.9	11.4
			Females	8–9	16.8	4.5
	Italian	2385	Males	8–9	22.1	9.3
			Females	8–9	20.2	8.9
Toselli 2014	African	60	Males	8.2 (1.5)	12.9	3.2
			Females	8.4 (1.7)	17.2	10.3
	Italian	1208	Males	8.3 (1.2)	20.9	8.7
			Females	8.4 (1.4)	22.3	6.8

Notes PEL, parental educational level.

^aAlgeria, Morocco, Turkey, Iran and Iraq.

^bEuropean and non-European countries (Africa, Asia and Latin America).

^cMoroccans, Albanians, Romanians, Chinese and Tunisians.

double that in developing countries (11.7 and 6.1%, respectively), over 80% of affected children live in developing countries.²⁸ In the developing world in 2010, NA had by far the highest prevalence of childhood overweight/obesity (17%), which was driven mainly by Egypt (20.5% in 2008). In addition, the prevalence of overweight school-age children in some NA countries, such as Egypt, has reached a level comparable to those in fully industrialized countries.^{28,29} Importantly, the relative increase of overweight/obesity in the past two decades has been higher in developing countries than in developed countries (an increase of 65 vs. 48% between 1990 and 2010), with an increased rate most marked in NA countries such as Morocco and Egypt.²⁸ In this regard, Rguibi and Belahsen³⁰ provided an overview of obesity and its determinants in six NA countries, with reported figures ranging from 6.8 to 9.2% in preschool children and 9–18% in school children and adolescents. Furthermore, the prevalence of overweight/obesity is reported to be high in older children and adolescents as compared to pre-schoolers in NA countries,^{27,31,32} with reported prevalence of obesity among under-age-five all higher than the overall prevalence in developing countries.²⁸

As illustrated in table 2, several countries in NA appear to show high levels of childhood obesity. In Egypt, e.g. the prevalence of overweight/obesity (Weight-for-Height Z-score, WHZ > 1) was over 25% in preschool children. The prevalence of obesity (WHZ > 2) in preschool children increased from 2.2% in the 1970s to 8.6% in 1996.³³ Similar trends are found in other parts of NA, such as Morocco and Tunisia.²⁸ Obesity among pre-school children was also reported to appear as early as 5 months of age (6.3% in Tunisia and 14.9% in Morocco) and decreased significantly after 24 months of age (but more so among Tunisian children), and it was higher among urban children than rural ones (14 vs. 12.6% in Morocco).³⁴

Data on obesity in older children show that 9.1% of adolescent Tunisian girls were at risk of overweight,³⁴ although other studies showed higher rates among adolescents (13.7% overall: 16% of girls and 11% of boys).³⁵ The same author reported a rate of 9.5% overweight among adolescents in a rural area of Tunisia (Sousse) (7.6% among males vs. 11.1% among females).³⁶ According to Aounallah-Skhiri *et al.*,³⁷ 20.4% of girls and 17.4% of boys aged

15–19 years were overweight. In Algeria, boys in the 6–10 years age range had rates of overweight/obesity of 6.8% in 2001 and 9.5% in 2006.³⁸ The same source reported a prevalence of overweight/obesity of 8.7% for girls age 6–10.³⁹ According to the latest survey conducted in Algeria (2010–11), 4.5% of girls aged 15–18 were obese and 15.5% were overweight. The equivalent figure for boys was 4.1% for obesity and 9.3% for overweight.⁴⁰ In 1998, 4.9% of 6- to 10-year-olds, 14.7% of 10- to 14-year-olds and 13.4% of 14- to 18-year-olds were obese in Egypt.⁴¹ In another study of female adolescents in Egypt, 35% of the girls were overweight and 13% were obese.²⁷ According to a recent study, 12.1% of Egyptian adolescents (7% of boys and 18% of girls) were overweight and 6.2% (6% of boys and 8% of girls) were obese.³² The only available data in Morocco on overweight adolescents are from two studies conducted among school-age children, one in Marrakech and the other in Rabat.^{42,43} The first study showed that the rates of overweight and obesity were 8 and 3% based on the WHO reference, while the respective values were 12.2 and 5.4% based on the IOTF reference. The other study, a cross-sectional survey of children enrolled in government primary schools, reported a prevalence of overweight/obesity of 8.7%, while overweight affected 5.1% and obesity affected 3.6%.

A decreasing trend of obesity and overweight, from 17.39% in 1995–98 to 8.49% in 2005–07, was observed in a study of 21 618 4- to 13-year-old children in Eastern Algeria, but this finding was not corroborated by the results from other cities in Algeria or other NA countries.^{38,44} The age group with the highest risk for overweight/obesity could not be established from the different studies conducted in NA countries because of the lack of uniformity in selecting age groups and the limited number of studies in different countries. However, despite the variety of definitions and cut-offs used and the different age groups studied, a relatively high percentage of overweight was observed among adolescents (15–18 years) in Algeria (9.3%) and at age 13–14 years in Tunisia, while in Egypt the most consistent correlates of BMI were age and rural residence.³² As reported by Kanter *et al.*,⁴⁵ gender disparities in overweight and obesity are exacerbated among females in developing countries, particularly in the Middle East

Table 2 Overview of studies on the prevalence of overweight/obesity in NA children

First author and publication year	Ethnic group	Sample size	Sex	Age (years)	Prevalence of overweight (%)	Prevalence of obesity (%)
Algeria						
Ben Amara 2008	Algerian (East)	251		8–12	15.9	5.6
Oulamara 2009	Algerian	19 263	Total (2001)	6–10	6.8	
			Total (2006)	6–10	9.5	
Taleb 2009	Algerian (urban area)	912	Total	6–12	18.6	5.3
Musaiger 2011	Algerian	459	Males	15–18	9.3	4.1
			Females		15.5	4.5
Saker 2011	Algerian	1520	Total	6–8	8.2	6.5
			Females		7.5	6.2
			Males		8.8	6.8
Raiah 2012 ⁵⁰	Algerian (Oran)	2252	Total	6–11	10	3.1
			Males		7.7	2.3
			Females		12.4	4
Egypt						
de Onis 2000	Egyptian	9766	Total	0–4.99	8.6	–
Salazar-Martinez 2006	Egyptian	1502	Total	11–19	12.1	6.2
			Females	11–14	7.2	6.6
				15–19	6.5	5.9
			urban	11–19	11.1	11.4
			rural	11–19	4.6	3.5
			Males	11–19	7	6
			Females	11–19	18	8
Jackson 2007	Egyptian	340	Females	10–19	35	13
National Nutrition Institute 2008 ⁵¹	Egyptian	6018	Males	10–18	11.5	6.5
			Females		15.2	7.7
Morocco						
MdS 2005 ⁵²	Moroccan	5621	Total	0–5	13.3	–
			Males		14.3	
			Females		12.4	
			urban		14.0	
			rural		12.6	
Rguibi 2007	Moroccan	4654	Total	<36 months	3.1	–
			Males		2.6	–
			Females		3.6	
			urban		4.3	
			rural		2.5	
Rguibi 2007	Moroccan	4502	Total	0–5	9.2	–
			Males		9.5	–
			Females		8.8	
			urban		10.1	
			rural		8.6	
Cherkaoui Dekkaki 2011	Moroccan (Rabat)	1570	Total	7–14	5.1	3.6
			Females		6.5	4.2
			Males		3.7	3
Sebbani 2013	Moroccan (Marrakech)	1418	Total	8–15	8	3
Tunisia						
Ben Miled 2000 ⁵³	Tunisian	951	Total	6–12	–	5.25
Ghannem 2001	Tunisian (Sousse-rural area)	793	Total	12–17	9.5	4
			Males		7.6	
			Females		11.1	
Ben Slama 2002 ⁵⁴	Tunisian (Ariana)	3148	Total	6–10	–	3.7
Ghannem 2003	Tunisian (Sousse-urban area)	1569	Total	13–19	13.7	7.9
			Males		16	6.0
			Females		11	9.7
Aounallah-Skhiri 2005	Tunisian	2928	Males	15–19	17.4	4.1
			Females		20.4	4.4
			Males urban		21.7	4.8
			Males rural		10.4	2.8
			Females urban		21.7	4.6
			Females rural		19.2	4.2
ONEP/UNICEF 2007 ⁵⁵	Tunisian	2741	Males	0–4.99	5.6	–
			Females		7.2	
			urban		6.8	
			rural		5.5	
Boukthir 2011 ⁵⁶	Tunisian	1335	Total	6–12	19.7	5.7
			Males		10.98	5.96
			Females		16.67	5.58
Koubaa 2012 ⁵⁷	Tunisian	121	Total		9.1	11.6

and NA. This was the case in Tunisia and Morocco, where the risk of overweight among adolescent girls was found to increase with age, while it decreased in boys.⁴⁵ The suggested underlying factors that appear to affect this gender disparity in overweight and obesity include socio-cultural beliefs and practices. In NA countries, fatness and obesity are desirable because these traits are associated with higher social status, fertility and prosperity.³⁴ Less PA and a tendency towards high-calorie diets were factors contributing to obesity in children from NA. Childhood obesity was most prevalent in urban areas and among the higher socio-economic classes in all NA countries. In Tunisia, e.g. obesity was more frequent in males of high SES, and about half of obese adolescents had excess calories and fat intake and a family history of obesity. A similar picture was seen in Egypt, where the prevalence of obesity among high SES adolescents was more than double that among low SES groups and more prevalent in urban girls than in rural girls.^{27,46} Ten per cent of males and females drank five or more cans of soda a day. As a result, teenagers were three times as likely to be overweight than they were 20 years ago. In Morocco, Tunisia and Algeria, the percentage of overweight/obese children was inversely proportional to the number of times a week they played sports.^{43,44,47,48} A survey of young Moroccans in 2006 reported a strong lack of awareness of the benefits of PA and its role in the prevention of obesity. This survey also showed that maintaining an ideal weight by practicing PA was devalued among less educated and poorer young people. Obesity is still widely perceived as a sign of good health, vitality and prosperity. These differences between sexes and areas of residence are still very important, particularly in young women. Only 14% of girls were reported to consider sport the means to maintain a healthy weight as compared with 27% of boys. This cannot be explained only by cultural and sociological factors, but it reveals another aspect of the status of women within the society and their place in the public space.⁴⁹

Discussion

In the last 20 years, an increase in overweight and obesity in children and adolescents has been observed in both developed and developing countries. In developed countries, children of immigrants seem to be particularly at risk. Examination of the literature regarding NAs living in NA countries and as immigrants in Europe has highlighted an increasing prevalence of overweight and obesity in children and adolescents of both groups. In several European countries, the prevalence of overweight and obesity is higher among children of Moroccan and Middle Eastern/NA immigrants than the native children of both sexes. The prevalence of overweight and obesity seems to be higher in NA female children and adolescents than in males both in Europe and in NA countries, suggesting that girls are particularly at risk.

Socio-cultural factors, in particular, should be viewed as the origin of the observed trends in increasing childhood overweight and obesity in immigrants of NA origin and in children living in NA urban areas. First of all, the westernization of eating habits leads to higher energy intake and a predisposition to weight gain. Body image perception and beauty ideals among NA societies can exacerbate the problem, as overweight and obesity are not perceived as a threat to health but are considered desirable and are associated with good health, higher social status, fertility and prosperity. Another major predisposing factor is the lack of a health-conscious exercise culture among NA societies. Children and adolescents are unaware of the benefits of PA and its role in preventing obesity. The lack of exercise is particularly diffuse among girls of NA descent. This fact, besides revealing an important aspect of the status of women within the society and their place in the public space, is likely at the origin of the higher prevalence of overweight and obesity found in girls living in NA countries and as immigrants in Europe. It seems, therefore, that childhood

overweight and obesity among NA immigrants in Europe are conditioned by factors linked to acculturation in the host society (the acquisition of Western eating habits) and other aspects maintained from the country of origin (e.g. body image perception, low PA, women's status and their place in society).

There are some limitations to this review. First, some studies were based on self-reported height and weight: self-reported height tends to be slightly overestimated and weight underestimated, resulting in an underestimation of BMI. Second, the ethnic origin of children was based on the country of birth of one or both parents. Moreover, in most studies the generation of immigration was not reported. Since the assessment of migration status is not uniform, comparisons between studies are difficult.

As overweight and obesity in childhood are associated with serious health risks, it is important to target the most at risk groups (i.e. daughters of immigrants) with health promotion messages and lifestyle intervention strategies aimed at preventing overweight, e.g. promotion of a healthy diet, information on the health risks linked to overweight and obesity and on the role of PA in weight control.

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Key points

- The health of the immigrant population has become a relevant topic from a public-health standpoint.
- Overweight and obesity prevalence in NA children and adolescents (especially in female sex) is increasing both in their countries of origin and in European host countries.
- NA migrant populations are unaware on the benefits of PA and its role in the prevention of obesity and on the health-related risks of obesity.
- Need of developing specific interventions must be accounted for migrants at an early age.

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