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RESEARCH ARTICLE

INFLUENCE OF ETHNICITY AND URBANIZATION STATUS ON OBESITY IN MOROCCO: CASE STUDY OF THE SOUSSI ETHNIC GROUP IN THE CITY OF CASABLANCA

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ABSTRACT

This study aims to assess the influence of Urbanization, urban migration and ethnicity on the obesity prevalence in the ethnic group in a Moroccan large city. We used a sampling of 304 adults, based on the ethnicity, gender and age. Anthropometric and body composition's parameters were measured; obesity and abdominal obesity (AO) were defined according to WHO body mass index (BMI) and waist-to-hip ratio (WHR) cut-offs. Also, the cut-off points of body-fat percent (%BF) were determined. Prevalence of obesity and high %BF were much higher in women than in men (38.3vs.13.5% and 83.9vs.61.9% respectively). Adjusted AO and high %BF prevalence's were greatest in men with intermediate residence's time in town (OR=4.13[1.33-12.32] and 3.90[1.58-9.66]). In women, adjusted AO prevalence was lowest in second's generation of Soussi migrant (OR=0.24[0.04-0.67]). These results allow us to conclude that anthropometric and body statuses of our population depend on the time spent in town for men. While in women, it was more related to their ethnicity-migration status.

INTRODUCTION

Background

Between 1980 and 2008, obesity prevalence has nearly doubled worldwide (WHO, 2012). In 2008, obesity had reached half a billion adults, 10% of men and 14% of women being obese, while they were only 5% and 8%, respectively, in 1980 (WHO, 2013). This pandemy prevails at high levels in developed countries and is increasing dramatically in developing countries (Ndiye, 2007; Seirvo & al, 2006).

Obesity is more frequent in urban areas, especially in developing countries (Ziraba *et al*., 2009; Abubakari, 2008; Villamor, 2006). Urbanization is characterized by an abundant diet, a reduced physical activity (Jacobi *et al*, 2010; Monda, 2007; Schmidhuber and Shetty, 2005; Biritwum and Gyapong, 2005; FAO, 2004) and higher incomes (Popkin, 2004). In immigrants, recently influenced by the city lifestyle, overweight is perceived as desirable (Siervo *et al*., 2006; Metcalf, 2000; Rguibi and Belahsen, 2004; Holdsworth *et al*., 2004; Lahmam *et al*, 2008; Rahim and Baali, 2011). All these factors contribute to the increase of obesity prevalence. Recent studies have estimated that nearly 50% of urban African population are overweight (Kamadjeu *et al*., 2006; Sodjinou *et al*., 2008). In Morocco, the prevalence of overweight and obesity were 32.9% and 17.9% in 2011, higher in urban areas than in rural areas (34.9% vs. 29.5% and 21.2% vs. 12.6% respectively) (Alami, 2011)

In 2030, more than a third (38.7%) of African population would become urban, increasing from 414 million in 2011 up to 744 million of habitants. Moreover, Africa presents an important urbanization rate (55.6%) (WUP, 2007), which is different and variable according to the country. In 2010, Morocco had an urbanization rate of 57.8% and an annual growth of its urban population of 1.6% (HCP, 2014; Banque Mondiale, 2013). Between 1994 and 2004, the importance of rural migration in the urban population growth has decreased by 4.2% (Khachani, 2008).

Immigrants recently living in the city become obese by getting used to the urban lifestyle (Sobngwi *et al*., 2004). Some studies in developing countries have shown that obesity is positively correlated to time spent in town (Tsolekile, 2007; Ntandou *et al*., 2008; Duboz *et al*., 2011). As well, literature interprets the rising obesity prevalence in Morocco by the persistence of overweight valorisation in certain ethnicities and cultures (Siervo *et al*., 2006; Rguibi and Belahsen, 2004; Rahim, and Baali, 2011; Kamadjeu *et al*., 2006; Rguibi and Belahsen, 2006).

From the 50's, Morocco has known important migration flows between different regions (Khachani, 2008), contributing to a mixture of social and cultural values between the population of these regions. This internal mobility of individuals, even of families, would lead to lifestyle and dietary behaviour changes, both, in the migrant population and the locals; hence, consequences on their nutritional status (Giraud, 2007; Monqid, 2007). In this paper, we will discuss the effect of migration and urbanization on anthropometrics and body composition of urban people from Casablanca.

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MATERIAL AND METHODS

Population of the study: This work is part of the project ALIMI (study of the interrelation between migration and food habits). A cross-sectional survey has been conducted in December 2011 in the North-West area of Casablanca the Soussi are persons born in the Souss-Massa region. They are mountainous villages, existing in south-western Morocco, They experience the highest rate of migration to major cities in Morocco (19.4%) meanwhile the city of Casablanca includes 30% of Morocco's urban population and 16% of the migrant population of the country (CERED, 2008)

The sampling was based on a quotas method issued by a computation of the Region statistical services according to the following criteria: sex, ethnicity and age, in order to include in the study their influence on the variation of obesity prevalence. It yielded a sample of 304 participants (149 women and 155 men) of whom 176 declared themselves as Soussi and 128 not Soussi as an ethnic group, and whom 161 were less than 40 years-old and 143 were older. We have excluded pregnant or breast-feeding women, and all people that presented an illness. Only data from the population aged between 18 to 75 years old was included in this study.

Material and Methodology: Data collection has been done using a questionnaire that included demographic and socio-cultural characteristics; anthropometric measurements and body composition data have been collected for each individual in accordance with WHO guidelines (WHO, 1995). Height (in cm) has been measured with a vertical height scale (Seca France, Semur-en-Auxois). Waist Circumference (in cm) and Hip circumference (in cm) were measured by a rib-meter (Seca). The monitor of body composition (Omron Santé France, Rosny-sous-bois) allowed weight measure (in kg) and body composition evaluation (percentage of body fat, %BF), as well as Body Mass Index calculation (BMI in kg/m²). We used WHO cut-off points for BMI (WHO, 1995) and Waist-Hip-Ratio (WHR) (WHO, 2008) as anthropometric indicators to define the body status of our participants. Also, the cut-off points of %BF were determined according to the slices indicated on the monitor manual of impedance-meter (Omron healthcare, 2008).

The relative time of residence in town (RTR) has been calculated from the following formula

RTR= (Number of years spent in town/ age) x 100.
Ethnicity is a variable constructed on the basis of ethnicity acknowledged by our study population and of their birthplace (Soussi migrants of first generation: MGI) or of their parents birthplace (Soussi migrants of second generation: MGII), Urban is represented by people who was born in the city. Data input and statistical analysis have been realized using IBM SPSS Statistics 19 under Windows.

A chi-square test was performed to examine the link between anthropometric indicators and the factors studied. Also, an association between variables was calculated by using an adjusted logistic regression model (binary regression). In this regression we have used Yes/No method for each anthropometric parameter studied. BMI: obese/ not obese; WHR: normal / high risk; %BF: low & middle / high risk. All results were considered significant at $p<0.05$.

RESULTS

Our study population presented a mean BMI of 26.1 ± 6.2 kg/m², a mean WHR of 0.86 ± 0.1 and a mean %BF of 31.6 ± 13.7 %.

Gender analyses showed greater values of BMI and %BF in women than in men (BMI: 28.3±0.4 vs. 23.9±0.5 kg/ m², %BF: 41.3±0.7 vs. 22.3±0.8%, respectively in women and men) (Table 1 and 2). 13.5% of men and 38.3% of women was obese, (Table 1 and 2). Our study also showed that obesity (BMI>30kg/m²) prevalence and abdominal obesity (high WHR) prevalence were higher in women (38.3 % and 59.7%) than in men (13.5% and 9.7%). Moreover, high %BF was more prevalent in women (83.9%) than in men (61.9%) (Tables 1 and 2).

Ethnicity

Our results show that the ethnic group of our survey population was not linked to WHR variation in men ($\rho1=0.05$) (Table 1). On the other hand, ethnicity was associated to BMI ($\rho2=0.04$) and WHR ($\rho2=0.003$) in women (Table 2). When adjusted, only the association of ethnicity with abdominal obesity in women was still significant ($\rho=0.05$). Migrant GII had the lowest risk of abdominal obesity (OR=0.24[0.04–0.67]) (Table 2).

Relative time of residence in the city (RTR)

Analysis of data (Table 1) showed that RTR is associated to WHR ($\rho1=0.03$) and %BF ($\rho1=0.04$) in men,
Indeed, RTR represented a risk factor increasing the prevalence of abdominal obesity in men (5.9% for a RTR>80% to 20.5% for a RTR between 40 and 80%). Thus the RTR adjusted association confirms this connection with the WHR ($\rho2=0.044$): men with RTR from 40 to 80% have the highest adjusted risk of abdominal obesity(OR=4.13[1.33–12.82]) (table 1).Our results indicate the same trends for prevalence of %BF in men too (53.9% to 82.1% respectively) and adjusted risk of high %BF greatest in men having a RTR from 40% to 80% (OR=3.90[1.58–9.66]) (Table 1).

Age

In Table 2, we found no link between age and BMI ($\rho1=0.05$) in women. While, in women too, an association was detected between age and WHR ($\rho2=0.001$) and between age and %BF ($\rho2=0.03$). Indeed, there is an increase of WHR (from 43.0% to 81.3%) and %BF (from 74.7% to 93.8%) according to age.
The adjusted regression between %BF and age indicates a connection between these two variables ($\rho2=0.03$), thus the highest prevalence were recorded among women aged from 40 to 59 years-old (94.4%, OR=5.76, CI 1.61-20.52, $\rho2=0.006$). Also, the one amongst WHR and age was significant (P2=0.012). Thus, persons who presented the higher prevalence of high WHR were women aged from 40 to 59 years-old (77.8%, OR=4.63, CI 2.12-10.11, $\rho2=0.0001$) and those who were more than 60 years (81.3%, OR=5.73, CI 1.21-21.72, $\rho2=0.01$).

Socioeconomic level

Data in Tables 1 and 2 indicate no significant association between socioeconomic status of our study population and the changes in all anthropometric parameters.

Educational level

Among women (Table 2), an association between level of education and changes in all anthropometric parameters was observed (BMI: p1=0.001, WHR: p1=0.0001, % BF: p1=0.002).

Thus, in women, a decrease in the prevalence of obesity is noted according to educational level (from 48.6% to 11.1%, ρ1 =0.001). Also, the adjusted regression of educational level was significant for BMI (ρ2=0.005) and women with a secondary level of education had the lowest risk of obesity (OR=0.23[0.09-0.57]).

The variation of the data dealing with WHR (Table 2) indicates a decrease of abdominal obesity prevalence according to educational level (from 79.7% to 0%, ρ1=0.001). The adjusted regression analysis confirmed the association between educational achievement and changes in WHR (ρ2=0.006) with lower abdominal obesity risksin women with a primary (OR=0.25[0.09–0.69]) and secondary study's level (OR=0.19[0.08-0.44]) than in women with a low educational level.

Data concerning the %BF (Table 2) showed similar results. Indeed, there has been a decrease in %BF according to educational level (from 90.5% to 44.4%, ρ1=0.002). Thus, the results of the adjusted association indicated that the women with a superior educational level had the lowest risk of high %BF (OR=0.08[0.01-0.38]).

DISCUSSION

Ethnicity

In this study, data analysis has shown that Soussi ethnicity of our females' participants is associated with a relatively low prevalence of abdominal obesity in migrant Soussi women of second generation. 70% of women migrant GII are under the age of 40 years, with 29% of these having a weekly heavy physical activity, at least once per week (data not shown), which may explain the low abdominal obesity prevalence among migrant GII, as compared to migrant GI and urban (31%, 72% and 66% respectively). This low prevalence could also be explained by the relative decline of the classical valorisation of overweight in women who could now be aspiring to get a thinner shape. Also, ethnicity has no link with the men's abdominal obesity.

The ethnic group is among the most studied risk factor in its relationship with obesity. The studies of Tremblay *et al*., (2004) and Cossrow and Falkner (2004) have found that the prevalence of obesity varies depending on the ethnic group and the geographical origin of the person. The study conducted by Rahim & al., (Kamadjeu *et al*.,, 2006), has demonstrated that the Saharawi women are two times more obese than those originating from other regions of Morocco and live in the city of Smara (in the south of Morocco). In addition, the nutrition literature has shown that the increase in the prevalence of obesity in Morocco is the result of the continuous valorization of obesity in some ethnicities (Rguibi and Belahsen, 2004, 2006; Lahmam and Baali, 2008; Rahim and Baali, 2011). Furthermore, migration is among the most studied factors in its relation with excess weight. Some studies conducted in African cities have shown that migrants have always been protected towards overweight as they arrived to the city, due to good dietary habits. This advantage disappears over time (Alami, 2011; Ntandou *et al*., 2008; Duboz *et al*., 2011). Also, Ossier's work (2013) has showed that migrants were not protected towards overweight and he had explained this difference by a quick social integration of migrants translated by a fast adoption of new dietary behaviours as soon as its socioeconomic status allows the migrant to.

Relative time of residence in town (RTR)

Our results have shown that high %BF and high WHR prevalence depend on RTR in men. The RTR<40% class is mainly occupied by migrant GI (85.7%), these individuals being new migrants from Souss. This region belonging, known by a lack in diet and an intense physical activity, may explain their low abdominal obesity prevalence and % BF (5.9% and 53.9% respectively). As they arrive in town (an area characterized by an abundance of food and reduced physical activity), migrant GI know a transitional period which may justify the increased of abdominal obesity prevalence (20.5%) and %BF (82.1%) among those with an RTR between 40 and 80%. People with RTR> 80% are mostly urban and migrant GII (35.3% and 42.2% respectively). These are considered as adapted to urban lifestyle.

Sodjinou *et al*., (2008) have reported no significant association between obesity prevalence and RTR while others studies proved the opposite. Ntandou *et al*., (2008) had shown that, in Benin, RTR was positively correlated with BMI and WHR variations, in both genders. In another study, Sobngwi *et al*., (2004) have demonstrated that obesity prevalence is greater in women who lived less time in the city. Also, the study conducted by Duboz *et al*., (2011) has shown that obesity prevalence is relative to the time of residence in the city (RTR) while concerning migrants who lived less than 10 years in town, whereas people who lived more than 10 years in urban areas do not present any association between obesity prevalence and time spent in town.

Age, socioeconomic status and education level

Age, socioeconomic status and education level are generally considered to have an important role in obesity prevalence (Sobngwi *et al*., 2004; Tremblay *et al*., 2004; Cossrow and Falkner, 2004; Ossier, 2013; Azizi *et al*., 2003). In our study, in women, there seems to be an association between age variation, WHR and %BF. Also, no link was noted between age and the changes in the obesity prevalence (high BMI). Some studies have shown that high WHR prevalence increases with age in women (Ossier, 2013; Azizi *et al*., 2003; Jafri *et al*., 2013). Others works have reported a positive association between obesity prevalence and age (Siervo *et al*., 2006; Rguibi and Belahsen, 2004; Ntandou *et al*, 2008). Indeed, Siervo *et al*., (2006) have demonstrated that, in Gambia, BMI and %BF variations were correlated with age in both sexes. Others works have shown that age affects obesity prevalence, regardless of sex (Jafri *et al*., 2013; Jackson *et al*., 2002). Thus, Meeuwsen *et al*., (2010) has explained this association by the fact that, under age effect, the human body loses muscle mass substituting it by others tissues (of which fat or extracellular water).

There is no association between the changes in socioeconomic status and that of all anthropometric parameters studied. Actually, studies conducted by Azizi *et al*., (2003) in Tahran and Ntandou *et al*., in Benin (2008), have also shown that

socioeconomic status is positively associated with BMI variation in men. In addition, studies conducted in Africa have shown that the increase of obesity prevalence is highly correlated with socioeconomic status (Sobngwi *et al*., 2004; Meeuwsen *et al*., 2010). Moreover, some works have shown that urban people with high socioeconomic status are more susceptible to be overweight than their poorer homologues (Ziraba *et al*., 2009; Abubakari *et al*., 2008; Villamor *et al*., 2006). They linked these results to dietary trends evolution and to city lifestyle, where urban population consume more refined food, with high energy density, and have less opportunity to practice physical activity.

The literature confirms the inverted ratio between educational level and weight: more educated a person is, the more it follows dietary guidelines and adopts a healthy lifestyle (Rahim and Baali, 2011; Sobngwi *et al*., 2004; Christensen *et al*., 2008; Sobal and Stunkard; 1989). The study conducted by Rahim *et al*., (Rahim and Baali, 2011) has shown that a significant negative association exists between education level in his study population and obesity prevalence: educated people were less exposed to obesity risk than the others.

Education level analysis in our participants has shown that WHR and %BF variation was negatively associated with education level in women. Indeed, high WHR and %BF prevalence is found in women of low background level.

CONCLUSION

This study showed that the prevalence of obesity is affected by age, education level and ethnicity among women and the relative time of residence in the city (RTR) only in men.

Indeed, there is no increased risk of obesity and excess fat in men and women migrants Soussi, whether first or second generation; in contrast, the second generation migrant women appears to be relatively protected from abdominal obesity. Also, men who spent between 40 and 80% of their lives in the city are at risk of abdominal obesity and excess fat, as compared to those who have spent more than 80% of their lives in the city.

These results allow us to conclude that anthropometric and body statuses of our study population depend on the time spent in town, especially among men who lived from 40% to 80% of their lives in the city, while in females, it was more related to their ethnicity-migration status, especially among women migrant GII.

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