Journal of Epidemiology and Global Health (2014) 4, 13–21

http:// www.elsevier.com/locate/jegh

Socioeconomic status and obesity in Cairo, Egypt: A heavy burden for all

Mona Mowafi [a,*], Zeinab Khadr [b], Ichiro Kawachi [a], S.V. Subramanian [a], Allan Hill [c], Gary G. Bennett [d]

[a] *Harvard School of Public Health, Department of Social and Behavioral Sciences, 677 Huntington Avenue, Boston, MA 02115, United States*
[b] *American University in Cairo, Social Research Center, AUC Ave., P.O. Box 74, New Cairo 11835, Egypt*
[c] *Harvard School of Public Health, Department of Global Health and Population, 677 Huntington Avenue, Boston, MA 02115, United States*
[d] *Duke University, Department of Psychology and Neuroscience, Box 90086, Durham, NC 27708, United States*

Received 8 November 2012; received in revised form 13 August 2013; accepted 1 September 2013
Available online 16 October 2013

KEYWORDS
Social epidemiology;
Health inequities;
Socioeconomic status;
Obesity; Egypt

Abstract Studies have generally shown a positive association between socioeconomic status (SES) and obesity in low-income countries, but few have tested this relationship in the Middle East where obesity prevalence is extraordinarily high and the nutrition profile more closely resembles developed world contexts. The objective of this study is to examine the SES-obesity association in Cairo, Egypt.

Multinomial regression analyses were conducted and predicted probabilities were found for overweight and obesity status among adult men and women in a stratified analysis. Data were taken from the 2007 Cairo Urban Inequity Study which collected information on 3993 individuals from 50 neighborhoods in the Cairo Governorate. Five different measures of SES were utilized — education, household expenditures, household assets, subjective wealth, and father's education. No significant associations were found between most measures of SES and overweight/obesity in this population. Overweight and obesity are prevalent across the SES spectrum.

These findings suggest that obesity programs and policies should be targeted at all SES groups in Cairo, although specific mechanisms may vary by SES and should be explored further in future studies.

1. Introduction

The global obesity epidemic reflects rapidly changing environments as societies develop, cultures

* Corresponding author. Tel.: +1 703 362 8266.
E-mail address: mmowafi@post.harvard.edu (M. Mowafi).

http://dx.doi.org/10.1016/j.jegh.2013.09.001

integrate, food habits globalize, and urbanization and its corollary urban lifestyle replaces more active rural living [1—3]. These shifts are often captured by the term *nutrition transition*, which refers to the interplay of economic, demographic, environmental and cultural changes in a society that are associated with shifting patterns of nutritional intake [4—7]. Macro-level country studies have shown that the nutrition transition is often closely related to a country's level of economic development, and the progression of a country in terms of it economic and nutrition transitions is related to the association between socioeconomic status (SES) and obesity among individuals [8—10]. Generally, countries with lower levels of economic development are earlier in the nutrition transition and exhibit a positive SES-obesity association among individuals. Those countries that are more developed tend to be further along in the nutrition transition and usually exhibit an inverse SES-obesity association among individuals [11]. The 'crossover effect' from a positive to a negative SES-obesity association tends to happen earlier for women as compared with men according to the evidence [8].

While these trends hold true for countries in which obesity prevalence is closely aligned with levels of economic development, it is not clear that they do so for countries in which obesity prevalence far exceeds that which may be expected given their level of economic development. The Middle East provides an interesting context in which to study the hypothesis that the nutrition transition may operate independent of economic development in some circumstances, since obesity rates are generally high despite the marked variation in economic development throughout the region [12—16].

Egypt, in particular, may epitomize this paradox since obesity prevalence is very high compared with the country's level of economic development. Urban Egyptian women are disproportionately affected and have a higher prevalence of overweight/obesity compared with most other developing nations [9,17]. In a study exploring SES-obesity associations in developing countries, Monteiro et al. observed a positive association in Egypt using the 1995—1996 Demographic and Health Survey (DHS) data, in line with its relatively low level of economic development at the time [8]. A closer look, however, reveals that Egypt was an outlier in comparison with other countries in this study. Particularly concerning, Egypt's observed overweight/obesity prevalence (69.9%) far exceeded that which was expected (~35.0%) given the country's level of economic development (GNI: $990 per capita) and urbanization (43.1%). Further, the ratio of overweight to underweight in urban Egypt was 99.9 (overweight: 69.9%; underweight: 0.7%), far exceeding that which was seen in Western industrialized nations before the current obesity epidemic (overweight: 27—47%; underweight: 3—4%) [9].

Given this unique nutrition profile, this study sought to explore the Egyptian SES-obesity association in more detail. While obesity prevalence is increasing in Egypt [16,18], few studies have analyzed the distribution of this outcome across SES groups. This study aims to clarify SES-obesity associations among adult men and women in Cairo, the largest city in Egypt. This study hypothesized that an inverse association would be observed, similar to that seen in developed nations. It was further expected that this association would be more pronounced in women compared with men given that the crossover from a positive to inverse association tends to happen earlier among women in the developing world [8].

2. Methods and procedures

2.1. Data source

The Cairo Urban Inequity Study (UIS) surveyed 5710 households in 50 neighborhoods of the Cairo Governorate (~8 million people). The study implemented a multi-stage complex survey design in which 50 of 634 neighborhoods were selected using a stratified random sample of low, medium, and high deprivation neighborhoods [19]. To select households, a block was randomly chosen from each of the 50 neighborhoods, and a full listing was created from which households were randomly selected proportional to neighborhood size. Half were randomly assigned to men and the other half to women for individual questionnaire administration ($\geqslant$22 yrs inclusion criteria). When a household had more than one adult of the assigned gender, one individual was randomly selected to participate in the questionnaire. The overall survey response rate was 69.9%, yielding a total of 3993 households from which 1990 men and 2003 women participated in individual questionnaires in addition to the household survey. Survey weights were used to account for non-response such that study results may be generalized to the Cairo Governorate.

For the current analysis, underweight cases (<18.5 kg/m^2; $n = 43$), pregnant women ($n = 98$), and those missing information on BMI ($n = 297$) were excluded. Eight additional cases were ex-