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Obesity and its socioeconomic determinants in Iran

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ABSTRACT

Objective: To investigate the socioeconomic inequality of obesity and its determinants in Iran.
Methods: Data was from Iran's surveillance system for risk factors of non-communicable diseases which was conducted on 89,400 individuals aged 15–64 years in 2005. Principal component analysis was used to create a new variable for defining socioeconomic status of participants. We assessed inequality by calculating a slop index of inequality and concentration index for obesity. Oaxaca-Blinder decomposition analysis was used to determine the determinants of inequality.
Results: The slop index of inequality and concentration index for obesity was −13.1 (95% Confidence Intervals [CI]: −16.3 to −9.8) percentage points and −0.123, respectively. The level of inequality varied widely between different provinces in Iran and was more severe in women and urban population. Obesity persisted in 20.2% (95% CI: 19.4–20.9) of the low-socioeconomic group and 11.0% (95% CI: 10.5–11.6) of the high-socioeconomic group. More than 90% of this gap was due to differences of independent variables (mainly age, gender and marital status) in two socioeconomic status groups.
Conclusions: A pro-rich inequality existed in the obesity in Iran. Older age, female gender and rural residency contributed most to the economic inequality of obesity.

1. Introduction

Obesity, defined as the condition of excess body fat, is a serious issue in both developed and developing countries An estimated 1.9 billion people worldwide were overweight in 2014 (World Health Organization, 2017). Obesity, which is strongly related to lifestyle and associated with age, sex, family income, and urbanization, is one of the non-communicable diseases that have recently been targeted for a global response (World Health Organization, 2013; Van Gaal and Mertens, 2009). For children, the likelihood of obesity is influenced by the educational and BMI levels of their parents, maternal history of gestational diabetes, high birth weight, urban residence, and eating food that was not prepared at home (Andegiorgish et al., 2012).

Evidence is abundant that the worldwide prevalence of obesity is increasing (Flegal et al., 2010). Aekplakorn et al. (2014) showed a linear increase of overweight and obesity in the Thai population from 1991 to 2009, with an average BMI gain of 0.95 kg/m^2 per decade. Rahmani et al. (2015) reported similar results in Iran in their systematic review, in which the prevalence of obesity was shown to have increased between 1995 and 2010. Azizi et al. (2005), in a study in Tehran, Iran, showed that the prevalence of obesity was most quickly increasing in the 30- to 40-year-old and 20- to 30-year-old age groups. Current studies indicate the relationship between obesity and socio-economic status (SES). (Jin et al., 2013; Baum and Ruhm, 2009; Römling and Qaim, 2011; Dahly et al., 2010; Ma, 2012; Brennan et al., 2010) Although obesity affects individuals from all socioeconomic groups (Monteiro et al., 2007), the association of obesity with socio-economic factors varies in developed and developing countries (Mclaren, 2007). Additionally, there are different patterns of obesity between SES and sex groups, especially in developing countries (Boissonnet et al., 2011; Dinsa et al., 2012).

A variety of recent studies have indicated that there is considerable inequality in health between wealthy and poor communities, even within the same country (Marmot, 2007). However, most causes of inequality would be preventable if their

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related factors were identified (Marmot, 2007). In a systematic review in Iran, the authors indicated that some of the variables that were associated with inequality in obesity include increased age, low educational levels, being married, residence in urban area, and female sex (Djalalinia et al., 2015). Iran's primary health care system was established roughly 45 years ago to allow more equal access to health care services for poorer populations as well as to equalize urban and rural access (World Health Organization, 2008). However, considerable inequality persists, as can be shown by examining the main factors affecting health across different socio-economic groups.

Iran's Ministry of Health and Medical Education established the Non-Communicable Diseases Surveillance Survey (NCDSS) in 2005 to address major problems existing in routine surveillance of NCDs. The results of their initial surveys on the prevalence of various risk factors for obesity and other non-communicable diseases have previously been published (Anon., 2017). Using NCDSS data, we have recently reported the socio-economic inequality in hypertension (Fateh et al., 2014). A different local study in Iran reported the existence of considerable socio-economic inequality among the risk factors for NCDs (Emamian et al., 2011; Moradi et al., 2013).

Although the association of socio-demographic factors with obesity has been investigated in Iran, (Bakhshi et al., 2015, 2010; Kiadaliri et al., 2016; Asgari et al., 2013) this nation-wide study aimed to describe for the first time in Iran the socio-economic inequality with obesity and its associated factors.

2. Methods

We applied the data from the first round of NCDSS in Iran, which was completed in 2005. Using the data available in the database of the Iran Post Company, 89,400 individuals aged 15–64 years were selected from all provinces via a systematic, multi-stage, proportional-to-size cluster sampling. (Delavari et al., 2005) Using principal component analysis, we developed a new variable to define the SES of the respondents. We selected eight socio-economic variables for the development of this variable, including type of home ownership, number of rooms in primary place of residence, car ownership, number of trips in the past year, marital status, education level, and primary job. For the next step of our analysis, we created dummy variables for nominal variables and then entered both the dummy variables and other continuous and ordinal variables (29 variables) into the model. The new socio-economic variable was divided into five quintiles.

Our next step was to evaluate obesity according to the different SES levels of the respondents (O'Donnell et al., 2008). The inequality was measured through comparing obesity prevalence among the socio-economic levels, as well as calculating the Concentration Index and Slope Index for inequality. Information about the generation of these indices can be found in a previous study in individuals with hypertension (Fateh et al., 2014). Briefly, the Slope Index of Inequality was computed through a regression analysis of obesity according to the cumulative relative position of each socioeconomic group. The concentration index was calculated using the "concindc" command in STATA software.

Obesity was defined as a body mass index of equal or more than 30 mg/kg^2. World Obesity Federation cut-offs (World Obesity Federation, 2017) were used to identify obese participants aged under 18 year.

The association of independent variables and obesity was investigated using a multiple logistic regression model.

The gap between the high and low socio-economic groups (defined by the median of the SES variable) was deconstructed into its determinants using the Oaxaca–Blinder decomposition method (Blinder, 1973; Oaxaca, 1973), which divides the gap into two components. The first component, "explained or endowment", arises because of differences in the groups' characteristics; the second, "unexplained or coefficient", is attributed to the

Table 1
Socioeconomic inequality in obesity prevalence according to different provinces, Iran, 2005.

Province	Overall	Across Socio-economic status (quintiles)					SII (95% CI)	C
	% 95% CI	Q1 % (95% CI)	Q2 % (95% CI)	Q3 % (95% CI)	Q4 % (95% CI)	Q5 % (95% CI)		
Sistan & B.	9.2 (7.5–10.9)	6.8 (5.3–8.3)	11.8 (8.1–15.5)	11.2 (8.3–14.0)	7.7 (4.8–10.6)	10.3 (5.7–15.0)	4.2 (−5.1–13.6)	0.072
Bushehr	14.7 (13.2–16.1)	15.0 (12.4–17.6)	20.4 (17.3–23.5)	15.9 (12.3–19.6)	11.7 (7.5–15.8)	8.0 (5.3–10.6)	−1.5 (−23.9–20.8)	−0.104
Qazvin	19.9 (18.0–21.7)	24.6 (19.2–30.1)	26.8 (22.6–31.0)	20.3 (17.0–23.6)	15.6 (12.4–18.8)	11.9 (7.9–15.9)	−2.7 (−34.7–28.3)	−0.139
Hormozgan	8.2 (6.3–10.1)	8.1 (4.6–11.6)	10.5 (6.7–14.3)	9.1 (6.5–11.8)	6.5 (4.4–8.5)	7.0 (4.4–9.7)	−3.0 (−8.1–2.1)	−0.062
Koh. & Boyer	19.4 (17.7–21.1)	22.4 (19.6–25.3)	25.4 (20.7–30.1)	22.7 (18.1–27.3)	15.9 (12.8–19.0)	11.5 (8.8–14.2)	−4.9 (−28.7–19.0)	−0.117
Fars	12.3 (11.1–13.5)	14.5 (11.4–17.6)	17.0 (14.1–20.0)	12.9 (10.5–15.3)	9.2 (7.3–11.2)	6.9 (4.9–9.0)	−5.7 (−18.6–7.2)	−0.133
Kerman	10.8 (9.7–12.0)	8.4 (6.8–10.1)	13.5 (10.3–16.6)	16.0 (12.6–19.4)	10.8 (7.3–14.2)	7.2 (3.5–10.9)	−7.4 (−23.5–8.7)	−0.009
Hamedan	13.5 (12.0–15.1)	16.2 (13.3–19.0)	20.0 (15.9–24.1)	13.1 (9.7–16.4)	8.8 (5.8–11.8)	6.3 (4.0–8.6)	−7.5 (−28.3–13.4)	−0.151
Mazanderan	23.4 (21.9–25.0)	30.4 (26.3–34.6)	34.2 (30.4–37.9)	23.7 (20.6–26.7)	17.0 (14.2–19.8)	13.7 (10.9–16.5)	−9.0 (−42.1–24.1)	−0.165
Kordestan	17.9 (16.8–19.0)	21.3 (18.9–23.8)	21.2 (18.1–24.3)	14.4 (10.9–17.9)	15.6 (11.8–19.4)	11.2 (8.1–14.3)	−9.9 (−21.8–2.0)	−0.086
Khorasan	13.8 (12.7–14.8)	13.5 (11.2–15.8)	20.3 (17.6–22.9)	14.9 (12.2–17.6)	10.8 (8.6–12.9)	9.8 (8.0–11.6)	−10.2 (−22.4–2.1)	−0.085
Ilam	13.2 (12.1–14.2)	16.4 (13.0–19.9)	16.3 (12.9–19.7)	12.9 (9.5–16.3)	8.9 (6.6–11.1)	9.8 (7.5–12.1)	−10.4 (−18.3–−2.5)	−0.114
Lorestan	13.4 (11.9–14.9)	14.2 (11.1–17.4)	19.4 (15.2–23.7)	15.9 (11.6–20.2)	9.8 (6.2–13.4)	7.9 (6.2–9.6)	−11.3 (−30.5–7.9)	−0.109
Zanjan	15.1 (14.2–15.9)	15.5 (13.4–17.7)	21.7 (18.6–24.8)	16.4 (13.6–19.3)	11.3 (7.9–14.7)	9.1 (6.2–12.0)	−11.5 (−34.6–11.6)	−0.067
Semnan	20.7 (19.0–22.3)	19.7 (14.2–25.3)	31.5 (27.0–36.0)	25.8 (22.4–29.3)	15.6 (11.7–19.5)	13.6 (10.6–16.5)	−12.8 (−31.9–6.2)	−0.133
Khozestan	23.2 (21.4–24.9)	26.9 (23.1–30.7)	28.1 (24.0–32.3)	24.4 (21.1–27.6)	19.5 (17.0–22.0)	16.8 (14.5–19)	−14.9 (−20.9–−8.9)	−0.090
East Azar.	21.6 (20.1–23.1)	23.3 (20.5–26.1)	29.2 (25.2–33.2)	24.2 (21.1–27.3)	15.3 (12.8–17.9)	14.1 (11.1–17.1)	−16.0 (−40.3–8.2)	−0.090
Ch. Mahal	14.6 (12.4–16.8)	18.5 (15.3–21.8)	19.7 (14.8–24.6)	15.4 (11.4–19.5)	9.1 (6.1–12.1)	5.7 (2.9–8.4)	−16.8 (−27.5–−6.1)	−0.165
West Azar.	22.2 (20.6–23.7)	25.2 (21.9–28.5)	29.1 (25.3–33.0)	23.8 (20.3–27.3)	17.8 (15.1–20.5)	12.7 (9.9–15.4)	−17.5 (−31.0–−4.1)	−0.096
Markazi	14.4 (13.0–15.8)	17.3 (13.7–20.9)	22.4 (18.4–26.5)	17.4 (14.2–20.6)	6.9 (4.6–9.3)	7.9 (5.7–10.1)	−17.3 (−40.8–6.2)	−0.185
Gilan	22.6 (20.5–24.7)	22.9 (17.8–28.1)	36.2 (31.3–41.0)	25.0 (21.2–28.7)	17.1 (13.7–20.6)	15.9 (12.5–19.2)	−17.6 (−38.0–2.8)	−0.122
Kermanshah	17.5 (15.6–19.5)	21.2 (16.8–25.6)	25.2 (20.7–29.8)	17.0 (13.0–20.9)	14.6 (11.6–17.6)	9.9 (7.1–12.8)	−17.6 (−28.0–−7.2)	−0.132
Tehran	19.3 (18.4–20.3)	36.7 (32.4–41.0)	33.2 (30.6–35.9)	21.1 (19.3–22.8)	14.9 (13.4–16.3)	12.4 (11.0–13.8)	−19.6 (−41.3–2.2)	−0.223
Golestan	24.2 (22.2–26.3)	30.7 (26.5–35.1)	30.8 (26.5–35.1)	21.9 (17.5–26.2)	17.9 (14.3–21.4)	15.9 (12.3–19.5)	−20.6 (−31.7–−9.4)	−0.124
Yazd	19.9 (18.3–21.5)	25.0 (20.1–30.0)	28.7 (23.5–33.8)	20.6 (18.0–23.3)	15.8 (12.0–19.5)	10.1 (7.1–13.2)	−20.5 (−35.2–−5.7)	−0.169
Isfahan	17.2 (15.9–18.6)	23.8 (19.4–28.2)	27.1 (23.6–30.7)	16.9 (14.4–19.4)	11.8 (9.7–14.0)	9.5 (7.1–11.9)	−21.7 (−31.0–−12.5)	−0.208
Ardebil	22.5 (20.7–24.3)	27.8 (24.0–31.6)	27.7 (23.1–32.3)	23.6 (19.4–27.8)	15.4 (12.1–18.6)	10.6 (7.7–13.6)	−23.8 (−41.1–−6.5)	−0.131
Qom	21.7 (19.8–23.5)	30.0 (25.1–34.9)	35.2 (30.9–39.6)	20.7 (16.8–24.6)	14.4 (11.1–17.6)	12.2 (9.4–15.0)	−27.3 (−48.9–−5.7)	−0.213
Iran (total)	17.7 (17.3–18.0)	20.2 (19.4–20.9)	25.1 (24.3–25.9)	19.1 (18.4–19.7)	13.6 (13.0–14.1)	11.0 (10.5–11.6)	−13.1 (−16.3–−9.8)	−0.123