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Population-attributable fraction of hypertension associated with obesity, abdominal obesity, and the joint effect of both in the Central Provinces of Iran

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Abstract The prevalence of obesity has been increasing in Iran over the past decade. This study aimed to determine the population-attributable fraction (PAF) of hypertension associated with obesity, abdominal obesity, and the joint effect of both in the central provinces of Iran. Prevalence of hypertension was extracted from the Iranian Ministry of Health Non-Communicable Disease Risk Factor InfoBase 2009. Measure of association between obesity and hypertension was extracted from Tehran Lipid and Glucose Study, for males and females, in order to calculate the PAF of hypertension associated with obesity. Age standardization of the reported prevalence of obesity was done using the World Health Organization method. The PAF of hypertension associated with the joint effect of obesity and abdominal obesity in females was highest in Semnan Province: 22.7 [95% confidence interval (CI): 4.2—35.6], followed by Qom 21.09 (95% CI: 3.7—33.1), and Yazd 20.3 (95% CI: 3.5—32.1). In males, the highest PAF was observed in Qom Province 31.07 (95% CI: 16.7—41.1), followed by Semnan 29.6 (95% CI: 15.9—39.3), Qazvin 25.9 (95% CI: 13.7—34.5), Tehran 24.2 (95% CI: 12.7—32.3), and Isfahan 20.4 (95% CI: 3.5—27.4). Prevalence of hypertension is higher in more developed provinces. PAFs suggest that a sizable share of hypertension in these provinces is associated with obesity. It is recommended that health promotion programs focus on obesity in the provinces

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with a higher share of hypertension due to obesity.

1. Introduction

Hypertension is one of the major risk factors for cardiovascular diseases. It affects over one billion of the world's population and is the main underlying cause of stroke and heart attack [1]. It is estimated that by 2025, the prevalence of hypertension will be increased by 60% to >1.5 billion [2].

The World Health Organization estimates that 600 million people around the world are at risk of major cardiovascular events including myocardial infarction, stroke, and heart failure due to high blood pressure. Furthermore, hypertension counts for 13% of all mortality, which corresponds to 7.1 million deaths/y. It is also responsible for 62% of all strokes and 49% of all myocardial infarctions [1,2].

According to the 2009 National Survey of Non-Communicable Diseases Risk Factors in Iran, around 16% of the population between the ages of 15 years and 64 years are hypertensive [1].

The results of various studies on risk factors for noncommunicable diseases in Iran show that 11% of males and 11.9% of females have high blood pressure >160/95 mmHg, and a recent study indicated that 16.9% of males and 14.7% of females aged >20 years have high blood pressure >140/90 mmHg [1—5].

Age, sex, race, socioeconomic condition, smoking, and obesity are among the most important risk factors of hypertension [4]. There is a strong correlation between body weight and hypertension; as weight increases, the risk of high blood pressure increases by 2—6-fold [5]. For every 10 kg increase in weight, systolic blood pressure increases by 2—3 mmHg [4]. Obesity can predict hypertension in later life [5]. Obesity is a modifiable risk factor of cardiovascular diseases. Several studies have shown that weight loss, even moderate, can reduce systolic hypertension and cardiovascular risk consequently [6—8].

The most prevalent effects of being overweight and obese on health include hypertension, dyslipidemia, and coronary heart disease [9]. In 2005, 937 million adults around the world were overweight, and the number of obese people was 396 million [10]. These numbers were doubled, compared with 20 years ago [11]. For instance, in the Middle East and North Africa, it was stated that >60% of cases of stroke are associated with hypertension [12].

According to the Global Burden of Disease Study 2010 (GBD 2010), the three risk factors that account for the most disease burden in Iran are dietary risks, high blood pressure, and high body mass index (BMI). The leading risk factors for children aged <5 years and adults aged 15—49 years were childhood underweight and at dietary risks, respectively. In 2010, of the burden of disease attributable to 15 leading risk factors in Iran, the second most important risk factor was high blood pressure and the third factor was being overweight and obesity [13]. Various studies in Iran demonstrated that the prevalence of obesity (BMI > 30) in Iran is 14.4% among males and 29.5% for females [1,2]. The prevalence of obesity in Iran is high and is growing rapidly [1]. Little is known about the impact of obesity and abdominal obesity on hypertension in Iran and its provinces. This study, aimed to determine the population-attributable fraction (PAF) of hypertension associated with obesity, abdominal obesity, and the joint effect of them in the central provinces of Iran.

2. Materials and methods

In this study, prevalence of obesity according to age and sex in different Iranian provinces was extracted from the Iranian Ministry of Health Non-Communicable Disease Risk Factor InfoBase in 2009. The national surveillance of risk factors for noncommunicable diseases have become executive since 2004 and have been repeated five times at the provincial level (2004, 2006, 2007, 2008, and the most recent in 2009). A World Health Organization method was used for age standardization of the prevalence of hypertension across different provinces [14]. In 2009 survey, 89,404 persons were chosen from the whole province using a systematic approach and multistage cluster sampling method. The appropriateness of the selected cluster distribution with the distribution of the number of households in different areas of the province and the rural and urban populations was sampling specifications. Data collection included three steps as follows: Step 1 (verbal): collection of questionnaire-based information about demographics and health behaviors included basic