

## Factors Associated with Sex Hormones and Erectile Dysfunction in Male Taiwanese Participants with Obesity

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### ABSTRACT

**Introduction.** Obesity has been receiving an increasing amount of attention recently, but investigations regarding the potential impact of obesity, sexual behaviors, and sex hormones on erectile dysfunction (ED) in men have not completely clarified the association.

**Aim.** To identify the relationship between ED, sexual behavior, sexual satisfaction, sex hormones, and obesity in older adult males in Taiwan.

**Methods.** Data were obtained from a baseline survey of 476 older adult males ( $\geq 40$  years old). Their demographic data, body mass index (BMI), sex hormones, sexual desire, sexual satisfaction, and ED status were assessed.

**Main Outcome Measures.** The International Index of Erectile Function-5 (IIEF-5), Sexual Desire Inventory (SDI), and Sexual Satisfaction Scale (SSS) were used to assess ED, sexual desire, and sexual satisfaction.

**Results.** In all, 476 men were available for analysis. The mean age of the sample was  $51.34 \pm 7.84$  years (range 40 to 70 years). The IIEF total score had a mean of  $19.44 \pm 4.98$ ; 264 (55.5%) subjects had ED, 250 (52.9%) were currently obese (BMI  $\geq 27$ ), and 297 (62.4%) had metabolic syndrome. The results showed an increased risk of ED among obese men and subjects with lower levels of sex hormones and lower sexual desire. Testosterone levels were lower in subjects with obesity ( $P < 0.001$ ). Among the predictors of ED, obesity (odds ratio [OR] = 1.62, 95% CI = 1.07–2.44,  $P = 0.021$ ), abnormal high sensitivity C-reactive protein (hs-CRP) (OR = 10.59, 95% CI = 4.70–23.87,  $P < 0.001$ ), and lower serum full testosterone (OR = 3.27, 95% CI = 2.16–4.93,  $P < 0.001$ ) were significantly independent factors.

**Conclusions.** This study supports the idea of a close relationship between low levels of sex hormones, sexual desire, sexual satisfaction, obesity, and ED, and also shows that low free testosterone and hs-CRP may predict ED, even in obese populations. **Shi M-D, Chao J-K, Ma M-C, Hao L-J, and Chao I-C. Factors associated with sex hormones and erectile dysfunction in male Taiwanese participants with obesity. J Sex Med 2014;11:230–239.**

**Key Words.** Erectile Dysfunction; Obesity; The International Index of Erectile Function-5 (IIEF-5); Testosterone; Testosterone Deficiency; Sexual Desire; Sexual Satisfaction; High Sensitivity C-Reactive Protein; Metabolic Syndrome

### Introduction

Obesity has become a major public health problem of global significance. The prevalence of obesity has dramatically increased in past decades in both developed and developing countries. The World Health Organization (WHO)

reported that more than 1.4 billion adults, 20 and older, were overweight, and over 200 million men and nearly 300 million women were obese [1]. According to a national survey taken between 1993–1996 and 2005–2008, the prevalence of overweight and obesity (defined as body mass index [BMI]  $\geq 24$  kg/m<sup>2</sup>) in Taiwan had increased

dramatically, from 33.4% to 50.8% among men and from 31.7% to 36.9% among women [2]. Overweight and obesity have been recognized as important and independent risk factors for many chronic diseases such as diabetes mellitus (DM), hypertension, stroke, cardiovascular diseases (CVD) and malignant diseases [3–5]. Both obesity and underweight were related to an increase in all-cause mortality among adult ethnic Chinese people in Taiwan [6]. Obesity has been proven to be associated with a variety of chronic diseases such as coronary artery disease (CAD), hypertension, type II diabetes, and several cancers, and is also considered the second leading avoidable cause of mortality in Western countries [7,8].

Some study results have shown that low serum total testosterone (TT) predicts the development of central obesity and the accumulation of intra-abdominal fat [9–11]. A number of studies support the association of obesity [12,13], DM [14,15], metabolic syndrome 9MetS) [16–18], and low serum testosterone [19] with sexual dysfunction, including erectile dysfunction (ED) [20–22]. Larsen et al. [23] found evidence from four prospective and seven cross-sectional studies for a direct association between obesity and ED, but evidence in only one cross-sectional observational study [24] for a relationship between obesity and female sexual dysfunction.

In a survey of ED in Taiwan, 1,060 men above the age of 30 years completed a telephone interview. The prevalence of ED, as defined by the International Index of Erectile Function-5 (IIEF-5), was 27% among all respondents and 29% among those aged  $\geq 40$  years [25]. Our previous study showed a close relationship between low testosterone, obesity, and ED, and also that obesity and low testosterone may predict ED, even in a young population [26]. Obesity is associated with ED in men [27], but the evidence in relation to other sexual health outcomes has been equivocal.

Although the influences of obesity and age on ED have attracted attention recently, few studies have focused on this issue in Asian populations. There is strong evidence showing that BMI is a major risk factor for ED, and that low levels of serum testosterone contribute to ED [18,28,29]. However, there is no evidence that the effects of BMI are far-reaching enough to extend to male erectile function. There have been a few studies up to now dealing with the impact of BMI on male erectile function and sexual behavior in Taiwan. The links between ED and BMI and atherosclerosis risk factors suggest that ED may be a warning

sign of poor health and a heightened risk of illness in men.

### Aims

The aim of this study was to evaluate the prevalence of ED in men with high BMI. We also attempted to find the correlation among risk factors for BMI in men, atherosclerosis risk factors and low serum testosterone in relation to the development of ED. We investigated sexual behaviors and sexual health in relation to BMI, as well as the implications for public health practices. We also hypothesized that increasing BMI would be associated with decreased sexual functioning.

### Materials and Methods

#### Subjects

Subjects selected for this study were men aged over 40 years who took part in our community health examinations. These participants were older adults who came from the local community in eastern Taiwan. Participants were eligible if they could read and complete the questionnaire. Inclusion criteria were male patients, age between 40 and 65 years, with ED as defined by the IIEF, and who were willing to sign informed consent for study participation. Exclusion criteria were the use of any androgen therapy or any ED medications during the previous 3 months (7 months for implantable testosterone); any serious medical (like myocardial infarction or heart failure), psychiatric (like schizophrenia), or neurological conditions (other than mild cognitive impairment) that may affect brain structure or cognition; a history of head trauma with loss of consciousness lasting more than 5 minutes; a current or past history of substance abuse or medication, such as antidepressants, that was likely to affect sexual function (especially affect erectile function); or they were unwilling to complete the forms. Subjects who were sexually inactive were excluded from the study. Inclusion criteria for controls were ages between 40 and 65 years and the signing of informed consent for study participation. A total of 512 participants were evaluated from March 2010 to January 2012, and 476 (92.9%) completed questionnaires were returned.

#### Ethical Issues

The study protocol was reviewed and approved by the Ethical Committees for Human Research at

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