



Review Article

The impact of obesity towards prostate diseases

Dyandra Parikesit, Chaidir Arief Mochtar, Rainy Umbas*, Agus Rizal Ardy Hariandy Hamid

Department of Urology, Faculty of Medicine, Universitas Indonesia, Cipto Mangunkusumo Hospital, Jakarta, Indonesia

ARTICLE INFO

Article history:

Received 31 July 2015

Accepted 13 August 2015

Available online 24 November 2015

Keywords:

Benign Prostate Hyperplasia

Obesity

Prostate Cancer

Prostatitis

ABSTRACT

Evidence has supported obesity as a risk factor for both benign prostate hyperplasia (BPH) and prostate cancer (PCa). Obesity causes several mechanisms including increased intra-abdominal pressure, altered endocrine status, increased sympathetic nervous activity, increased inflammation process, and oxidative stress, all of which are favorable in the development of BPH. In PCa, there are several different mechanisms, such as decreased serum testosterone, peripheral aromatization of androgens, insulin resistance, and altered adipokine secretion caused by inflammation, which may precipitate the development of and even cause high-grade PCa. The role of obesity in prostatitis still remains unclear. A greater understanding of the pathogenesis of prostate disease and adiposity could allow the development of new therapeutic markers, prognostic indicators, and drug targets. This review was made to help better understanding of the association between central obesity and prostate diseases, such as prostatitis, BPH, and PCa.

Copyright © 2015 Asian Pacific Prostate Society, Published by Elsevier. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Obesity has risen alarmingly within the past few years, with an incidence of approximately one case in every three adults in the USA, compared with one in six adults 2 decades ago.¹ Global prevalence of obesity in men in Europe and Asia ranges from 4% to 30%.^{2–6} According to the *Riset Kesehatan Dasar*⁷ (Indonesia) in 2007, the prevalence of obesity in populations above 15 years of age was 10.3%. This number has grown approximately 20% within less than 5 years.⁸ This geographic pattern can be explained, at least in part, by different socioeconomic conditions, as well as by lifestyle (sedentary lifestyle and lack of physical activity) and nutritional factors (western diet).

It is well known that obesity is associated with an increased risk of heart disease and diabetes. Most of these excess deaths were attributed to coronary artery disease, diabetes, and kidney disease. There are no clear indications that the obesity prevalence is returning back to healthier levels.⁹ Recent studies have also looked into its relationship with prostate disease.^{10–12} The aim of this study is to evaluate the association between central obesity and

prostate disease [prostatitis, benign prostate hyperplasia (BPH), and prostate cancer (PCa)].

2. Definition of obesity

The World Health Organization and The National Institutes of Health define overweight as a body mass index (BMI) of greater than 25 kg/m², and obesity as BMI of greater than 30 kg/m², whilst in Indonesia, according to the *Riset Kesehatan Dasar*⁷ by the Health Ministry in 2010, overweight is defined as a BMI of between 25 kg/m² and 27 kg/m² and obesity is more than 27.1 kg/m².⁸ Though easy to determine, BMI has its limitations, such as the inability to both differentiate between fat and muscle, and measure fat distribution in the body (since fat in different regions may contribute different functions), especially in elderly individuals.^{13–15}

Central obesity is known to be more dangerous than general obesity because it is able to produce hormonal and systemic modifications leading to inflammation. Waist circumference (WC) in determining visceral adiposity has been used in various studies as an alternative measurement and definition of central obesity.¹⁶ WC can be measured either at the narrowest torso circumference or at the midpoint between the lower ribs and iliac crest.¹⁷ This relatively practical application has led to the wide use of WC in many studies as a tool to measure central obesity.^{18–20} The measurement of WC, which represents abdominal adipose tissue, has been reported to increase at a faster rate than BMI, which counts

* Corresponding author. Department of Urology, Cipto Mangunkusumo Hospital, Universitas Indonesia, Diponegoro Number 71, Central Jakarta, DKI Jakarta, 10430, Indonesia.

E-mail address: rizalhamid.urology@gmail.com (R. Umbas).

the body's entire weight including both adipose tissue and muscle mass. In addition, the adverse health consequences of obesity may be underestimated by trends of BMI.^{21,22} Central obesity can be diagnosed if WC is larger than 90 cm in men and 80 cm in women.²³

There is evidence linking the amount of adipose tissue to the level of both acute and chronic inflammation.^{24–30} However, there are certain types of adipose tissue, which vary from different adipose tissue location and composition, that are strongly correlated with inflammation.^{6,19,21,22,24,31,32} Adipose tissue is divided into two categories: visceral (abdominal/central) adipose tissue (VAT) and subcutaneous (peripheral) adipose tissue (SAT).²⁵ VAT has a distinct characteristic in terms of function and inflammation compared to SAT. VAT is mainly composed of omental, mesenteric fat, and retroperitoneal fat masses by delineation along the dorsal borderline of the intestines and the ventral surface of the kidney.³⁰ Adipocytes from VAT appear to have reduced capacity for lipogenesis and greater capacity for lipolysis than SAT cells, with VAT containing more proinflammatory and angiogenic cytokines than SAT.²¹ Fox et al²⁴ demonstrated that the VAT compartment is metabolically active, secreting such vasoactive substances as inflammatory markers and adipocytokines, which may contribute to its role in the inflammation process. Alterations in plasma lipoprotein levels, particularly increased triglyceride and decreased high density lipoprotein levels, has also been associated with VAT distribution.³⁰ Because obesity often associates with a sedentary lifestyle, and physical activity decreases the risk of prostate problems, this could suggest novel prevention and treatment strategies through weight loss and lifestyle changes.³³

3. Obesity and prostatitis

Prostatitis is a common but poorly defined condition, without clear diagnostic criteria and treatment approaches.³⁴ Age, race, and geographic region have been identified by several studies to be a significant risk factor for chronic prostatitis.^{35–37} Prostatitis is found in approximately 10–14% of men of all ages and racial origin and nearly 50% of men at some point in their life encounter this condition.^{5,19,37–42}

There is currently no evidence about the relationship between obesity and prostatitis. Although it still remains unclear, there are few studies reviewing this relationship between obesity and prostatitis using the BMI parameter. Wallner et al¹² showed that increased BMI has a protective effect on prostatitis risk after adjustment for age.¹² The odds of having a history of prostatitis were decreased by approximately 68% in obese men (BMI > 30 kg/m²) when compared with men with a BMI of 25 kg/m². This result is likely due to the influence of physical activity on this relationship. This study revealed that the odds of developing prostatitis in men who were vigorously physically active were 67%. In the same study, a larger percentage (57.8%) of the men characterized as obese were found to engage in vigorous exercise compared with overweight (4.8%) and normal weight men (22.4%). Unfortunately, this particular study did not state the type of exercise performed by their participants. Studies regarding this subject are paramount in determining the risk of prostatitis in people with obesity. Thus many studies relating obesity and prostatitis are still needed and might be enlightening.

4. Obesity and BPH

BPH is the most common nonmalignant medical condition of the prostate occurring in middle aged and older men.⁴³ BPH is a

histological diagnosis associated with unregulated proliferation of connective tissue, smooth muscle, and glandular epithelium within the prostatic transition zone. Cellular proliferation leads to increased prostate volume and increased stromal smooth muscle tone.⁴⁴ According to a recent epidemiological study, BPH affects 70% of men aged 60–69 years old and 80% of those ≥ 70 years old.⁴²

Many studies have shown that obese men have a higher risk for BPH, as shown in Table 1.^{19,33,45–49,51} Even though there are many standards, according to patients' characteristics (e.g., race) in categorizing patients' BMI and WC to diagnose obesity, all studies have resulted in the same conclusion that obesity, central or general, is a risk factor for BPH and worsened urinary symptoms. Increased WC was significantly and positively associated with prostate volume, serum prostate-specific antigen, and International Prostate Symptom Score, and therefore worsened the patients lower urinary tract symptoms.¹⁹

There are many hypotheses that have been suggested for the effect of obesity on BPH. Central obesity exerts several systemic effects. Obesity will increase intra-abdominal pressure, which in turn increases bladder pressure and intravesical pressure, with the potential to exacerbate and cause worsened BPH symptoms.⁵² Another mechanism is altered endocrine status. Increased estrogen to androgen ratio due to the enzyme P450 aromatase expressed by fat tissue.⁵³ Therefore, an adipose tissue mass will increase the aromatase activity and the conversion of the androgens to estrogens (testosterone to estradiol and androstenedione to estrone). Increased fat mass and aromatase activity reduces the testosterone concentrations and allows for the preferential deposition of abdominal adipose tissue/VAT as the positive caloric balance which results in a hypogonadal obesity cycle. Continued production of estradiol caused by fat mass accumulation may result in gonadotropin suppression, with a further reduction in the testosterone levels and the development of a progressive hypogonadal state thus favorable in the development of BPH.⁵⁴ Increased sympathetic nervous activity in central obesity has been known to influence the development of BPH and the severity of urinary obstructive symptoms.^{38,45} However, difficulties in measuring sympathetic nervous activity and heterogeneity in characterizing obesity may cause lack of a conclusive relationship between sympathetic nervous activity and obesity.⁴⁵

Another proposed hypothesis is the inflammation process and oxidative stress.^{29,55–57} Central obesity promotes microvascular disease and inflammation, which in turn contributes to ischemia, oxidative stress, and an intraprostatic environment favorable to BPH.⁵² Changes in regulation of programmed cell death may lead to hyperplastic and precancerous transformation.⁴⁰ In patients with central obesity, there is evidence of increased chronic inflammation cause by the secretion of inflammation cytokines by the visceral fat.^{50,58} Inflammation is a very intricate phenomenon involving humoral (cytokines) and cellular (leucocyte, monocyte, and macrophages) elements.⁵⁷ In normal mechanisms, there is a balance between proinflammatory (growth factor release and angiogenesis) and anti-inflammatory (decrease of those processes) processes, leading to inflammation resolution.⁵⁹ However, in chronic inflammation, mainly consisting of chronically activated T cells and mononuclear phagocytes, there is persistence of proinflammatory factors causing disturbances in the inflammation process. This will further promote the inflammation process by releasing more proinflammatory cytokines as well as various other growth factors.⁵⁹ T cells influence matrix formation and potential epithelial secretions. They then promote prostate stromal and epithelial proliferation/hyperplasia by inducing fibromuscular

Download English Version:

<https://daneshyari.com/en/article/4274077>

Download Persian Version:

<https://daneshyari.com/article/4274077>

[Daneshyari.com](https://daneshyari.com)