# Prevalence of Metabolic Syndrome in Men with Erectile Dysfunction

Thesis

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By

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| Abb. | Full term |
|---|---|
| *ACP* | *American College of Physicians* |
| *AHA* | *American Heart Association* |
| *AIs* | *Aromatase inhibitors* |
| *ATP* | *Adults Treatment Panel* |
| *BMI* | *Body mass index* |
| *BP* | *Blood pressure* |
| *CAD* | *Coronary artery disease* |
| *CC* | *Corpora cavernosa* |
| *cGMP* | *Cyclic GMP* |
| *CNS* | *Central nervous system* |
| *CRP* | *C-reactive protein* |
| *CS* | *Corpus spongiosum* |
| *CVD* | *Cardiovascular disease* |
| *DDAIP* | *Dodecyl 2-(N,N-dimethylamino)propionate* |
| *DSM* | *The Diagnostic and Statistical Manual of Mental Disorders, Fifth* |
| *ED* | *Erectile dysfunction* |
| *ENHP* | *Egyptian National Hypertension Project* |
| *eNOS* | *Endothelial nitric oxide synthase* |
| *FBS* | *Fasting blood sugar* |
| *FDA* | *Food and drug administration* |
| *FSH* | *Follicle-stimulating hormone* |
| *FXR* | *Farnesoid X receptor* |
| *GTP* | *Guanosine triphosphate* |
| *HDL* | *High-density lipoprotein* |
| *HDL-C* | *High-density lipoprotein cholesterol* |
| *HT1A* | *Hydroxytryptamine 1A receptor* |
| *HT2C* | *Hydroxytryptamine 2C receptor* |
| *ICI* | *Intracavernosal injections* |
| *IDF* | *International Diabetes Federation* |
| *IIEF-5* | *International Index for Erectile Function* |

# List of Abbreviations cont...

| Abb. | Full term |
|---|---|
| *IL-1* | *Interleukin-1* |
| *ISSM* | *International Society for Sexual Medicine* |
| *LH* | *Luteinizing hormone* |
| *LHRH* | *LH-releasing hormone* |
| *MetS* | *Metabolic syndrome* |
| *MS* | *Multiple sclerosis* |
| *NANC* | *Nonadrenergic, noncholinergic* |
| *NHLBI* | *National Heart, Lung, and Blood Institute* |
| *NIH* | *National Institutes of Health* |
| *NO* | *Nitric oxide* |
| *PAI-1* | *Plasminogen activator inhibitor-1* |
| *PDDU* | *Penile Duplex Doppler Ultrasound* |
| *PDE 5* | *Phosphodiesterase 5* |
| *PDE5i* | *Phosphodiesterase 5 inhibitor* |
| *PGE1* | *Prostaglandin E1* |
| *PSA* | *Prostate-specific antigen* |
| *SC* | *Stem cell* |
| *SCI* | *Spinal cord injury* |
| *SHBG* | *Sex hormone binding globulin* |
| *T2DM* | *Type 2 diabetes mellitus* |
| *TG* | *Blood triglycerides* |
| *TGs* | *Tryglycerides* |
| *TNF-α* | *Tumor necrosis factor-alpha* |
| *TRT* | *Testosterone replacement therapy* |
| *TSH* | *Thyroid-stimulating hormone* |
| *WC* | *Waist circumference* |
| *WHO* | *World Health Organization* |
| *WHR* | *Waist-to-hip ratio* |

# INTRODUCTION

**Metabolic syndrome** (MetS) is a disorder of energy storage and use, which is characterized by central obesity, dyslipidemia, raised blood pressure (BP) and high blood sugar levels. Patients with MetS (also known as insulin resistance syndrome) have an increased risk of cardiovascular disease (CVD) and type 2 diabetes ***(Kaur, 2014; Chaudhary et al., 2016).***

According to guidelines from the National Heart, Lung, and Blood Institute (NHLBI) and Adults Treatment Panel III (ATP III) and the American Heart Association (AHA) ***(Alberti et al., 2009),*** MetS is diagnosed when a patient has at least 3 of the following 5 conditions:

- Waist circumference (WC) of more than 40 inches in men.
- Fasting blood sugar (FBS) level of 100 mg/dl or above.
- Blood pressure (BP) of 130/85 mm/hg or above.
- Blood triglycerides (TG) level of 150 mg/dl or higher.
- High-density lipoprotein (HDL) cholesterol levels of 40 mg/dl or less for men.

**Erectile dysfunction (ED)** is the most common male sexual dysfunction. It is a condition in which a person is unable to get or keep an erection firm enough for satisfactory sexual

intercourse ***(Rew and Heidelbaugh, 2016).*** Assessment of a male with ED is done by full sexual history taken including International Index for Erectile Function (IIEF-5) which provides a broad measure of sexual function ***(Rosen et al., 1999),*** physical examination to assess the patient's overall health, genital examination to assess local abnormalities, laboratory tests, endocrinal assessment of serum testosterone, prolactin and thyroid function, penile hemodynamic assessment by Color Doppler duplex ultrasound and other additional test modalities like nocturnal penile tumescence, intracavernosal injection, penile brachial index, cavernosometry and cavernosography ***(Hatzimouratidis et al., 2016).***

**Erectile dysfunction (ED)** is not considered a normal part of aging and could be a sign of a more serious health problem. It shares many risk factors with systemic conditions characterized by impaired endothelial function including MetS, for which ED is considered to be an independent risk factor ***(Walczak et al., 2002; Esposito et al., 2005).*** A better understanding of this association is warranted in order to properly counsel, screen, and treat patients presenting with ED as well as to identify comorbid and potentially life-threatening conditions ***(Sanchez et al., 2017).***

# Aim of the Work

The aim of this study was to identify the prevalence of MetS and its different components among patients with ED.

Chapter 1

# Erectile Dysfunction

## Introduction

Erectile dysfunction (ED), as defined by the International Consultation on Sexual Medicine, is the consistent and recurrent inability to acquire or sustain an erection of sufficient rigidity and duration to engage in satisfactory sexual intercourse ***(McCabe et al., 2016).***

A physical cause can be identified in about 80% of cases. These include CVD, diabetes mellitus, and neurological problems such as following prostatectomy, hypogonadism, and drug side effects. Psychological impotence is where erection or penetration fails due to thoughts or feelings; this is somewhat less frequent, in the order of about 10% of cases ***(Chowdhury et al., 2017).***

The knowledge of this condition had remained limited until the 1970s. Since that time, advances in molecular biology techniques have drastically improved the understanding of penile physiology and the pathophysiology ***(Prieto, 2007).***

The process of achieving an erection involves coordination among psychological, neurological, and vascular pathways, which combine to facilitate a physiologic response in the penile vasculature. In response to parasympathetic signaling

received from the pudendal and pelvic splanchnic nerve plexuses, the penile cavernosal tissue releases nitric oxide (NO) ***(Zaid et al., 2017).***

Historically, ED has been considered an age-dependent disease, with most men developing signs and symptoms of ED after 65 years of age. However, studies have demonstrated an increasing incidence of ED in men younger than 40 years, and this trend is likely underestimated because of under-reporting by younger patients ***(Shamloul & Ghanem, 2013).***

Until the 1970s, ED in men younger than 40 years was believed to be primarily of psychogenic origin. As such, diagnostic evaluation of young men with ED before the 1970s consisted almost exclusively of obtaining a psychosexual history and offering treatments limited to behavioral therapy and herbal supplementation ***(Burnett, 2012).***

Studies have reported that as many of young men with ED have an organic (vascular, neurologic, hormonal, fibroproliferative, or medication-induced) component to their condition ***(Burnett et al., 2011).***

## Epidemiology

Erectile dysfunction is one of the most common sexual dysfunctions in men world-wide ***(McKinlay, 2000).*** The prevalence of ED in the general population has been highly variable because of differences in ED criteria, population selection, and

modalities used to measure erectile function. The prevalence of ED is positively correlated with age, with 52% of men 40 to 70 years old having some degree of ED ***(Feldman et al., 1994).***

Erectile dysfunction is usually underestimated in many developing countries because it is not a life-threatening condition. Also, due to the associated stigma, men with the problem rarely seek help. Some believe that the condition would resolve on its own (primarily younger men) and others have the perception that ED is a normal part of aging (primarily older men) ***(Rhoden et al., 2002).***

The age-adjusted prevalence rates of ED among men attending primary care clinics was found to be 57.4% in Nigeria ***(Fatusi et al., 2003),*** 63.6% in Egypt ***(Seyam et al., 2003),*** and 80.8% in Pakistan ***(Shaeer et al., 2003).***

World-wide estimates of ED prevalence range from 2% in men younger than 40 years to 86% in men 80 years or older ***(Prins et al., 2002).***

One American cross-sectional study found a fourfold increase in the prevalence of ED in men in their 70s compared with men in their 20s ***(Feldman et al., 1994).***

## Anatomy of the Penis (figure 1)

The penis has two functions: sexual and urinary. It is located above the scrotum, and it is linked to the pubic symphysis by two ligaments ***(Roberts & Pryor, 1997).***