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Original Research Article

Determination of the presence of metabolic syndrome in patients of erectile dysfunction and assess correlation of its components with erectile dysfunction in a tertiary care hospital in central India

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ABSTRACT

Background: Erectile dysfunction (ED) is a common medical condition that affects approximately 100 million men worldwide and is currently recognized as a major public health problem. Metabolic syndrome (Met S) is a complex entity consisting of multiple interrelated factors including insulin resistance, central adiposity, dyslipidaemia, endothelial dysfunction and atherosclerotic disease, low-grade inflammation, and in males, low testosterone levels. we aimed to investigate the relationship between metabolic syndrome and ED presence and severity.
Methods: Patient who came to urology OPD with c/o of ED and were evaluated for it with physical examination, questionnaire, investigations>after confirmation of ED were evaluated for presence of metabolic syndrome and its individual components
Results: Out of these 202 patients, 98 patients were found to have metabolic syndrome. The mean age of participating patients in this study was 47.2±5.6 years. Metabolic syndrome was diagnosed in 98 (34.78%) of 202 patients. Statistically significant association was found between ED and metabolic syndrome, waist circumference and fasting blood glucose ($p<0.001$ with each parameter). We also found a significant correlation between hypertension and ED but no significant correlation with triglyceride levels or HDL levels.
Conclusions: ED is strongly associated with metabolic syndrome and the efforts for treatment of erectile dysfunction must be made in the context of metabolic syndrome and its constituents with a low threshold to diagnose the cardiovascular disease.

Keywords: Erectile dysfunction, Metabolic syndrome, Urology, Hypogonadism

INTRODUCTION

The overall prevalence of ED has been reported to be 16-25 per cent in the general population depending on the cohort of study and the definition of ED being applied.[1] ED is a common medical condition that affects approximately 100 million men worldwide and is currently recognized as a major public health problem.[1] Metabolic syndrome (MS) is a complex entity consisting of multiple interrelated factors including insulin resistance, central adiposity, dyslipidaemia, endothelial dysfunction and atherosclerotic disease, low-grade inflammation, and in males, low testosterone levels.

The experts of the national cholesterol education program (NCEP) adult treatment panel (ATP)-III created an operational definition of MetS in 2001. MetS was defined by the presence of three of the following: abdominal circumference >102 cm, hypertriglyceridemia >150 mg/dl, high-density lipoprotein cholesterol 40 mg/dl,

blood pressure: >130/85 mmHg or glycemia 110 mg/dl. MetS is associated with a twofold increase of 5- to 10-year risk for CVD (cardiovascular disease). The relationship between MetS and CVD has been established, as well as the relationship between CVD and ED.

In addition, sex hormone-binding globulin levels are inversely associated with obesity. These associations are also supported by findings of the Massachusetts male ageing study, which evaluated changes in sex steroid hormones in relation to BMI and waist-to hip ratio

In this study, we aimed to investigate the relationship between metabolic syndrome and ED presence and severity.

METHODS

Type of study

The type of study was prospective observational study.

Study population

Patients with erectile dysfunction attending urology OPD at Shyam Shah medical college, Rewa.

Duration

The study conducted from October 2018 to November 2020.

Inclusion criteria

The inclusion criteria of study included patients who attending urology OPD with erectile dysfunction, patients attending cariology OPD with hypertension, diabetes and patients above >18 years <60 years (incidence of co morbidities is high above 60 years. which could have confounded the study).

Exclusion criteria

The exclusion criteria of study excluded patients with psychogenic ED, ED due to neurogenic cause (spinal trauma, paraplegia)-patients with known ischemic heart disease, patients with UTI, patients with other urological infirmities and not willing to consent for filling the questionnaire.

Patient with ED were evaluated for it with physical examination, questionnaire, investigations after confirmation of ED were evaluated for presence of metabolic syndrome and its individual components. All the patients diagnosed with ED were counselled about the study which we planned to enrol them for and only after they have consented, they were evaluated further. IIEF is a validated scoring method for evaluating erectile dysfunction which consists of 25 questions covering all the domains of sexual function namely and is used routinely for the evaluation and treatment follow up pf ED. Patients filled the IIEF questionnaire by themselves. ED status was determined using IIEF-EF domain. 8 Scoring of the IIEF-EF domain allowed classification of each patients having no (26-30), mild (17-25), moderate (11-16), or severe (0-10) ED. The physical examination of all the patients was conducted and the anthropometric data as well as the blood pressure general survey conducted measurement of height, weight, hip girth, and waist circumference (WC) were noted. Supine WC was measured at the level of umbilicus with the person breathing silently according to the WHO guidelines. Blood samples were obtained from all patients in a fasting state for serum TG, HDL cholesterol, and FBG analysis according to NCEP ATP-III criteria. When a patient had three or more risk factors, a presumptive diagnosis of metabolic syndrome was made. The patients with following risk factors were defined as; HDL-cholesterol <40 mg/dL, BP ≥130/85 mmHg; FBS ≥110 mg/dL; TG ≥150 mg/dL; and WC>102 cm was asked to be evaluated by a urologist for erectile dysfunction. The study was approved by the Institutional ethics committee. The data so collected was then tabulated and analysed with chi -square tests and logistic regression analysis using MS excel software.

RESULTS

202 patients were diagnosed with ED in urology OPD. The data regarding the weight, height, BMI, waist line, blood pressure was recorded. Out of these 202 patients, 98 patients were found to have metabolic syndrome. The data so collected was then tabulated and analysed with logistic regression analysis.

The mean age of participating patients in this study was 47.2±5.6 years. Metabolic syndrome was diagnosed in 98 (34.78%) of 202 patients and the rest of the patients) did not meet all the criteria of Met S Patients with metabolic syndrome were slightly older and had lower IIEF-EF domain scores than the patients without metabolic syndrome (Table 1). In regarding to IIEF-EF domain, 98 (64.47%) patients with metabolic syndrome and 104 (36.49%) patients without metabolic syndrome had the diagnosis of ED. A significant association between the presence of metabolic syndrome and ED was elaborated. Chi square analysis revealed significant differences in rates between groups with regard to ED severity ($p<0.001$, Table 1).

Table 1: ED and metabolic syndrome.

Variables	ED	No ED	Total
Metabolic syndrome	98	64	152
No Metabolic syndrome	104	171	275
Total	202	225	427

CR>3.842, calculated chi^2 =21.4910, p value<0.0001

Table 2: Waist circumference and ED.

Variables	ED	No ED	Total
Waist line >102 cm	90	68	158
Waist line <102 cm	112	157	269
Total	202	225	427

CR>3.842, calculated chi^2 =9.3795, p value<0.002194

Table 3: Fasting blood glucose and ED.

Variables	ED	No ED	Total
FBS >110	133	118	241
FBS <110	69	107	176
Total	202	225	427

CR>3.842, calculated chi^2 =8.1110, p value<0.0001

Table 4: Blood pressure and ED.

Variables	ED	No ED	Total
BP >130/85 mmHg	151	113	264
BP <130/85 mmHg	52	111	163
Total	202	225	427

CR>3.842, calculated chi^2 =26.3597, p value<0.0001

Table 5: Triglyceride levels and ED.

Variables	ED	No ED	Total
Triglyceride level >150 mg/dl	126	119	245
TG level <150 mg/dl	76	106	182
Total	202	225	427

CR>3.842, calculated chi^2 =0.5975, p value=0.43952

The IIEF domain scores of patients that were classified according to the existence of one metabolic risk factor are compared in Table 3. Scores were significantly lower in patients with abnormal WC, HT and FBG. As shown in Figure 1, patients were grouped according to the number of risk factors they had and their mean IIEF scores were plotted against it. EF domain scores significantly decreased as the number of metabolic risk factors increased (p<0.001).

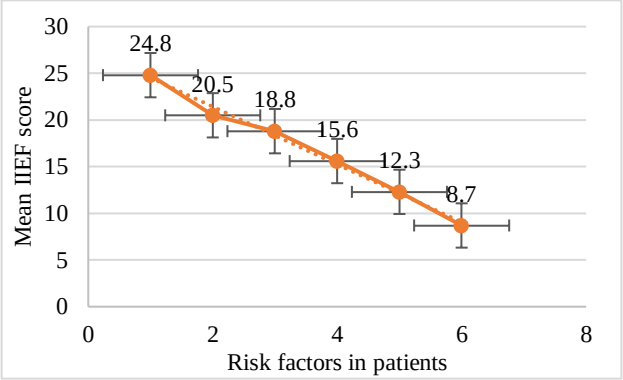

Figure 1: Mean IIEF score decreases with increasing number of risk factors.

Table 6: High density lipoprotein levels and ED.

Variables	ED	No ED	Total
HDL cholesterol <40	118	167	285
HDL cholesterol>40	84	58	142
Total	202	225	427

CR>3.842, calculated chi^2 =11.2795, p value <0.000784

Table 7: Body mass index and ED.

Variables	ED	No ED	Total
BMI >24.99 kg/m^2	95	127	222
BMI <24.99 kg/m^2	107	98	205
Total	202	225	427

CR>3.842, calculated chi^2 =3.5888, p value=0.058171

Table 8: ANOVA.

Variables	df	SS	MS	F	Sig. F			
Regression	9	601.683	66.8537	11.7354	8.99E-13			
Residual	110	626.6414	5.69674					
Total	119	1228.325						
Intercept	**Coefficients**	**Standard error**	**t stat**	**P value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
	30.82387	7.54604	4.08477	8.4E-05	15.8693	45.7783	15.869	45.778
20	-0.02606	0.02236	-1.1656	0.24629	-0.07038	0.01824	-0.0703	0.0182
165	-0.10082	0.01000	-10.072	2.66E-17	-0.12065	-0.08098	-0.1206	-0.080
140	0.00414	0.01500	0.27596	0.78308	-0.02559	0.03387	-0.0255	0.0338
84	-0.00837	0.03378	-0.2477	0.80477	-0.07531	0.05857	-0.0753	0.0585
115	0.046332	0.04824	0.96027	0.33902	-0.04928	0.14194	-0.0492	0.1419
330	0.002729	0.00218	1.24712	0.215	-0.00161	0.00706	-0.0016	0.0070
36	-0.03579	0.07206	-0.49668	0.620408	-0.17862	0.10702	-0.1786	0.1070
74	-0.01851	0.02261	-0.81863	0.414768	-0.06332	0.02629	-0.0633	0.0262
24.01	-0.04639	0.08943	-0.51871	0.605004	-0.22364	0.13085	-0.2236	0.1308

The presence of each metabolic risk factor and ED were cross-tabulated. Crude OR were 3.29 (95% CI 1.784-6.047) for WC, 1.96 (95% CI 1.084-3.552) for HT, 2.44 (95% CI 1.485-4.016) for FBG, 1.52 (95% CI 0.927-2.503) for TG and 0.97 (95% CI 0.595-1.571) for HDL correlation of ED with age=-0.05302, correlation of ED with FBS=-0.66084, correlation of ED with BP=0.072434, correlation of ED with waist circumference=0.026484, correlation of ED with HDL=-0.00421, correlation of ED with triglyceride level=-0.00227, correlation of ED with BMI=-0.00774.

DISCUSSION

ED is considered to be an independent risk factor for CVD and can be a harbinger of future cardiovascular events. Given this relationship, each encounter for ED should be viewed by healthcare providers as an opportunity to screen for CVD and other comorbid conditions, including the MetS, that can significantly affect a man's overall health. While universally accepted screening guidelines are lacking, expert panels do recommend an approach to risk stratification in men with ED. The prevalence of ED among diabetic men has been reported to be 69.3%.[1] The infrequency (79.2%), non-sensuality (74.5%), dissatisfaction with sexual acts (71.9%), noncommunication (70.8%) and impotence (67.9%) were studied in this study.[1] And decreased testosterone levels were found to play a role in it and it progresses with age. Irrespective of the criteria used in the definition, MetS is a harbinger for global dysfunction. Among those with SD, the prevalence of MetS was 44.2, 52.1 and 80.0% using the NCEP ATP III, IDF and WHO criteria respectively. The prevalence of MetS observed in this study is similar to the 90.1% observed among men with ED and the 96.5% of MetS subjects exhibiting ED.[2,3] The significant difference in the estimated prevalence of MetS between those with and without ED from this study could be due to the development of endothelial dysfunction since both ED and MetS are thought to be mediated by endothelial dysfunction. The mean IIEF-EF scores of the studied patients with three or more metabolic risk factors were found to be low further reinforcing the fact that with an increasing number of metabolic risk factors, the severity of ED is also accentuated. In this study we assessed the individual relationship of each metabolic risk factor with ED separately. We found a significant association between ED and the metabolic risk factors of abnormal WC and FBG. Moderate and severe ED is more prevalent in patients having these metabolic risk factors. Diabetes mellitus is a well-known risk factor of ED, therefore the relationship between FBG and ED in our study is consistent with the literature. The risk of ED in our diabetic patients is consistent with the prevalence of studies of diabetic patients.[4,5]

Several studies have indicated that obesity is an independent risk factor for CVD and ED.[6,7] Some authors have previously assessed the impact of obesity which was not particularly abdominal obesity.[7-9] However our study focussed on abdominal obesity which was represented by the WC and was found to be correlated well with ED. Demir demonstrated this relationship between ED and abdominal obesity in their article.[12]

Abdominal obesity is associated with increased coagulability, endothelial dysfunction, and inflammation. Increased cytokine levels and other factors which cause insulin resistance and increased cardiovascular risk may be responsible for this condition.[13,14] Numerous studies have demonstrated that endothelial dysfunction occurs early in the insulin-resistant state and is predictive of future dysfunctional vascular diseases such as ED and CVD.[15,16]

More ever our results suggest that WC, FBG and HTN are significantly associated with ED risk and consequently a greater emphasis should be given to these variables when assessing and prognosticating. In our study we used most of these variables as a categorical variable according to ATP-III criteria and then these were subjected to multivariable regression analysis to assess the impact of each variable studied. High triglycerides and HDLs did not have any relation and with ED risk and correlation with BMI was not found to be statistically significant.

The mechanisms which underlie in co -evolution of MetS and ED have sparked a massive interest in the scientific community. multiple mechanisms are involved. Hypogonadism, which may be caused by MetS, can lead to secondary ED through altered testosterone-oestrogen ratio which leads to loss of libido and is amenable to exogenous testosterone administration. stimulating the expression of nitric oxide synthase by testosterone also helps in this regard, thereby increasing the availability of nitric oxide in cavernosal tissue.[17-19]

Atherosclerotic disease arsing as a consequence of Met S itself may also lead to ED by affecting the vascular tissues of the penis, endothelial dysfunction due to MetS is also well established, which has been implicated in vascular disorders.[20,21] The endothelium is a vital source of nitric oxide, the main vasodilatory neurotransmitter for erection. Endothelial dysfunction therefore leads to a decrease in vascular nitric oxide levels, with resulting impaired vasodilation; the increase in free radical concentration also leads to atherosclerotic damage.[22]

Low levels of androgens are strongly associated with MetS and its components.[23] In a study of men with low serum testosterone, García-Cruz et al found that MetS was associated with significantly lower IIEF scores. Incidence of moderate to severe ED was higher among subjects with MetS versus those without. Severity of ED was found to be associated with severity of MetS, with an increased mean number of MetS components seen as ED severity increased.

We also found a significant correlation between hypertension and ED However this may be due to our cut-off value being 130/85mmHg and a higher value would have excluded so many patients. Hypertension is

an also confounding factor because it is itself a risk factor for peripheral vascular disease which can result in ED.

We had some limitations in our study. It was an observational study, not prospective in nature which would have given us more information about causality of ED. Secondly most common cause of ED is many times an underlying factor which is not easy to rule out and modifies the ultimate effect of presentation of such patients. Our sample population was also hospital based therefore a study with generalised population-based sample may be informative.

CONCLUSION

Metabolic syndrome is continuously increasing in its prevalence, especially among the aging population and its social as well as economic impact is huge. With its individual components, metabolic syndrome remains an important risk factor not only for cardiovascular morbidity and mortality, but also for both male and female sexual dysfunction. In men particularly, there is abundant evidence demonstrating the association between erectile dysfunction and the modifiable metabolic risk factors that make up the metabolic syndrome. The efforts for the treatment of erectile dysfunction must be made in the context of metabolic syndrome and its constituents with a low threshold to diagnose the cardiovascular disease.

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REFERENCES

1. Owiredu WK, Amidu N, Alidu H, Sarpong C, Gyasi-Sarpong CK. Determinants of sexual dysfunction among clinically diagnosed diabetic patients. Reprod Biol Endocrinol. 2011;9:70.
2. Bansal TC, Guay AT, Jacobson J, Woods BO, Nesto RW. Incidence of metabolic syndrome and insulin resistance in a population with organic erectile dysfunction. J Sex Med. 2005;2:96-103.
3. Corona G, Mannucci E, Schulman C, Petrone L, Mansani R, Cilotti A et al. Psychobiologic correlates of the metabolic syndrome and associated sexual dysfunction. Eur Urol. 2006;50:595-604.
4. Wilson PW, Kannel WB, Silbershatz H, D'Agostino RB. Clustering of metabolic factors and coronary heart disease. Arch Intern Med. 1999;159:1104-9.
5. Corona G, Mannucci E, Mansani R. Organic, relational and psychological factors in erectile dysfunction in men with diabetes mellitus. Eur Urol. 2004;46:222-8.
6. Shiri R, Koskimaki J, Hakkinen J, Tammela TLJ, Huhtala H, Hakama M et al. Effects of age, comorbidity and lifestyle factors on erectile function: Tampere Ageing Male Urological Study (TAMUS). Eur Urol. 2004;45:628-33.
7. Seftel AD, Sun P, Swindle R. The prevalence of hypertension, hyperlipidemia, diabetes mellitus and depression in men with erectile dysfunction. J Urol. 2004;171:2341-5.
8. Martin-Morales A, Sanchez-Cruz JJ, Saenz de Tejada I, Rodriguez-Vela L, Jimenez-Cruz JF, Burgos-Rodriguez R. Prevalence and independent risk factors for erectile dysfunction in Spain: results of the Epidemiologia de la Disfuncion Erectil Masculina Study. J Urol. 2001;166:569-74.
9. Rimm EB, Stampfer MJ, Giovannucci E. Body size and fat distribution as predictors of coronary heart disease among middle-aged and older US men. Am J Epidemiol. 1995;141:1117-27.
10. Esposito K, Guigliano F, Di Palo C, Giugliano G, Marfella R, D'Andrea F et al. Effect of lifestyle changes on erectile dysfunction in obese men: a randomized controlled trial. JAMA. 2004;291:2978-84.
11. Walczak MK, Lokhandwala N, Hodge MB, Guay AT. Prevalence of cardiovascular risk factors in erectile dysfunction. J Gend Specif Med. 2002;5:19-24.
12. Demir T. Prevalence of erectile dysfunction in patients with metabolic syndrome. Int J Urol. 2006;13:385-8.
13. McFarlane SI, Banerji M, Sowers JR. Insulin resistance and cardiovascular disease. J Clin Endocrinol Metab. 2001;86:713-18.
14. Guerre-Millo M. Adipose tissue hormones. J Endocrinol Invest. 2002;25:855-61.
15. Grundy SM. Obesity, metabolic syndrome, and coronary atherosclerosis. Circulation. 2002;105:2696-8.
16. Lakka HM, Lakka TA, Tuomilehto J, Salonen JT. Abdominal obesity is associated with increased risk of acute coronary events in men. Eur Heart J. 2002;23:706-13.
17. Corona G, Mannucci E, Ricca V, Lotti F, Boddi V, Bandini E et al. The age-related decline of testosterone is associated with different specific symptoms and signs in patients with sexual dysfunction. Int J Androl. 2009;32:720-8.
18. Reilly CM, Zamorano P, Stopper VS, Mills TM. Androgenic regulation of NO availability in rat penile erection. J Androl. 1997;18:110-15.
19. Yassin AA, Saad F, Gooren LJ. Metabolic syndrome, testosterone deficiency and erectile dysfunction never come alone. Andrologia. 2008;40:259-64.
20. Nehra A, Azadzoi KM, Moreland RB, Pabby A, Siroky MB, Krane RJ et al. Cavernosal expandability is an erectile tissue mechanical property which predicts trabecular histology in an animal model of vasculogenic erectile dysfunction. J Urol. 1998;159:2229-36.
21. Koca O, Caliskan S, Ozturk MI, Gunes M, Kilicoglu G, Karaman MI. Vasculogenic erectile dysfunction and metabolic syndrome. J Sex Med. 2010;7:3997-4002.
22. Huang PL. A comprehensive definition for metabolic syndrome. Dis Model Mech. 2009;2:231-7.
23. Laaksonen DE, Niskanen L, Punnonen K, Nyyssönen K, Tuomainen TP, Salonen R et al. Sex hormones, inflammation and the metabolic syndrome: a population-based study. Eur J Endocrinol 2003;149:601-8.

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