



ADAM Questionnaire; Is it a Predictor of Androgen Deficiency in Type 2 Diabetes Mellitus Male Patients?

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Abstract

Background: Diabetes Mellitus is a growing epidemic in the world. It accelerates the aging process and has been proven to reduce Androgen levels in males earlier, through various mechanisms. This study is done to analyse the clinical utility of the ADAM questionnaire in patients with diabetes mellitus in diagnosing androgen deficiency.

Aim: To estimate the prevalence of androgen deficiency among male diabetic patients. To evaluate the efficiency of the ADAM questionnaire, as a tool for diagnosing androgen deficiency, in males with type 2 diabetes mellitus.

Materials and Methods: A prospective study involving 50 type 2 diabetic patients without any other comorbidities was conducted in Rajah Muthiah Medical College. The patients were initially screened with ADAM questionnaire and blood samples were taken for analysing serum testosterone levels.

Results: 28 patients had low androgen levels according to the ADAM questionnaire among which 13 were found to have low serum testosterone levels. There was a statistically significant correlation between ADAM score and Testosterone levels.

Conclusion: ADAM questionnaire can be effectively utilized in male type 2 diabetes mellitus patients. It can be used as a first line investigation for finding androgen deficiency in those patients before subjecting them for serum Testosterone levels.

Keywords: Type 2 diabetes mellitus, Serum Testosterone, ADAM questionnaire.

Introduction

Androgen deficiency occurs as a physiological phenomenon in the elderly men but it is accelerated among patients with co-existing systemic diseases⁽¹⁾. Male sex steroids or androgens include *testosterone*, *dihydrotestosterone*, and *androstenedione*. Hypogonadism is defined as the presence of clinical symptoms and low testosterone levels (total testosterone <8 nmol/l or 2.3 ng/ml)⁽²⁾. Depression, loss of libido,

loss of energy, muscle fatigue and bone mineral loss are the common clinical manifestations of androgen deficiency. Since, the deficiency has effects on all systems of the body, it cripples the daily activities of the patient. These problems can be prevented by timely diagnosis and early intervention with hormone replacement therapy.

Diabetes mellitus accelerates almost all the aging-related process including decreasing the levels of androgens. The connection between testosterone

deficiency and diabetes is bidirectional. Various factors such as metabolic syndrome, decreased sex hormone-binding globulin, androgen receptor polymorphisms, decreased antioxidants, Leydig cells dysfunction, cytokines mediated inhibition (e.g. TNF α , IL-1 β , IL-6) of steroid production and increased aromatase activity can play a role in the relationship between androgen deficiency and diabetes^(3,4). But, hypogonadism is one of most underdiagnosed complication of diabetes mellitus. Free serum testosterone level is the gold standard for diagnosing androgen deficiency. But, financial and technical constraints are associated with measuring free testosterone levels especially in developing countries. Hence, clinical-based non-invasive or non-interventional tools were designed to diagnose hypogonadism. One such tool is St. Louis University's Androgen Deficiency in Aging Male (ADAM) questionnaire.

ADAM is found to be as effective as more complex questionnaire like Canadian Society for the Study of the Aging Male and male sex steroid biochemical panel^(5,6). It comprises of 10 questions related to symptoms associated with low testosterone, libido, strength of erections, muscular strength and energy. However, the exact prevalence and effectiveness of screening are lacking in the available literature. This study is done to estimate the prevalence of hypogonadism in diabetic males and the clinical application of ADAM Questionnaire for identifying androgen deficiency in such patients.

Objectives

- To estimate the prevalence of androgen deficiency among diabetic patients.
- To evaluate the efficiency of ADAM questionnaire as an androgen deficiency diagnostic tool in males with diabetes mellitus.

Materials and Methods

It is a prospective study involving 50 type 2 diabetes patients without any other comorbidity

conducted in a Rajah Muthiah Medical College, Chidambaram which serves a rural population in Tamil Nadu. Simple random sampling is done. Informed consent has been obtained. The patients were initially screened with ADAM questionnaire and blood sample was taken for analysing serum testosterone levels. The normal range for early morning total testosterone in adult males is considered between 2 ng/ml to 6.9 ng/ml (5th to 95th percentile respectively), according to the user manual of Demeditec Testosterone ELISA kit (DE1559), which was employed for analysing serum testosterone.

Inclusion Criteria

1. Age \geq 35 years and \leq 65 years
2. Males
3. Known case of Type 2 Diabetes Mellitus

Exclusion Criteria

1. History of infertility or impotence before the onset of diabetes mellitus
2. Known case of Chronic Liver disease or chronic kidney disease
3. Undescended testes
4. Lack of Secondary Sexual characters
5. Hormone replacement therapy
6. History of Trauma to Testicles
7. History of Radiotherapy or cancer chemotherapy
8. Known case of Hypothyroidism or Hyperthyroidism
9. BMI \geq 28
10. Known case of Hypertension
11. Known case of any malignancy
12. Taking drugs like spironolactone, Betablocker, Antipsychotics, Antiepileptics, Antiparkinsons drugs
13. Type 1 Diabetes Mellitus

ADAM questionnaire

- 1. Do you have Decrease in Libido? Yes/ No
- 2. Do you have lack of Energy? Yes/ No
- 3. Do you have decrease in strength? Yes/ No
- 4. Have you lost height? Yes/ No
- 5. Have you noticed a decrease in enjoyment of life? Yes/ No
- 6. Are you sad or grumpy? Yes/ No
- 7. Are your erections less strong? Yes/ No
- 8. Have you noted a recent deterioration in your ability to play sports? Yes/ No
- 9. Are you falling asleep after dinner? Yes/ No
- 10. Has there been a recent deterioration in your work performance? Yes/ No

*** If you Answer Yes to number 1 or 7 or if you answer Yes to more than 3 questions, you may have low Testosterone**

The collected data was analysed using SPSS 22 software and parameters were compared using chi-square test.

Results

Table 1: Age distribution

Age	n	Percentage %
35-39	3	6
40-44	5	10
45-49	10	20
50-54	12	24
55-59	12	24
60-65	8	16
Total	50	100

Majority of the study population were between 50 to 60 years (n = 24, 48%). The mean age of the study group is 51.74 years

Table 2: Androgen deficiency by ADAM Questionnaire

Androgen deficiency	N	Percentage %
Yes	28	56
No	22	44
Total	50	100

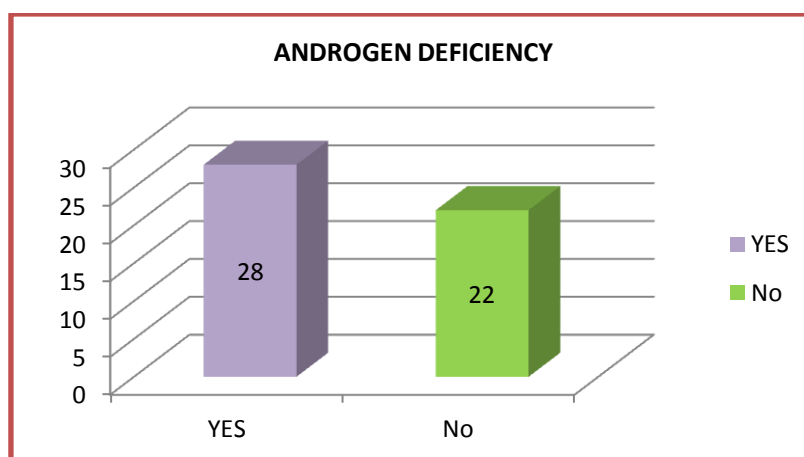
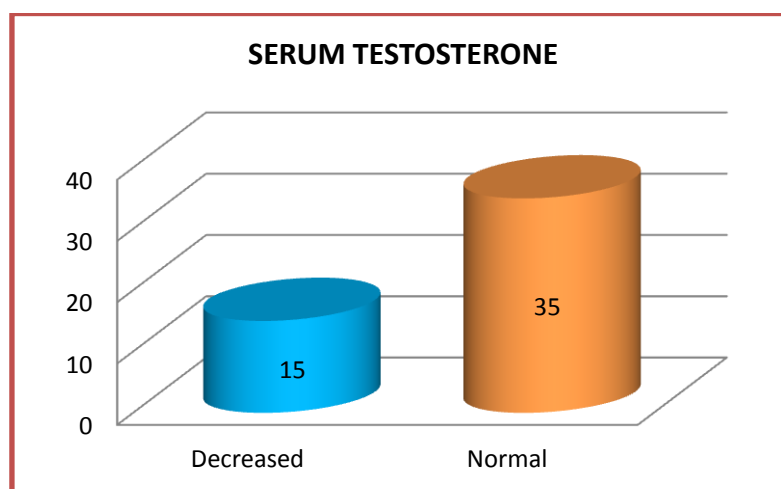


Table 3: Serum Testosterone levels Among study population

Serum testosterone	n	Percentage %
Decreased	15	30
Normal	29	70
Total	50	100



28 patients (56%) responded that they have androgen deficiency based on the ADAM questionnaire whereas serum total testosterone was found to be low in 15 patients (30%)

Table 4: Cross-table between Androgen deficiency by ADAM Score and Serum Testosterone

	Serum Testosterone deficient	Normal serum testosterone	Chi Square value	P Value
Yes for androgen deficiency by ADAM score	13	15	8.179	0.004
No for androgen deficiency by ADAM score	2	20		

Table 4 shows the cross-table between biochemical hypogonadism and the ADAM test result. The response to ADAM questionnaire test had a direct correlation with androgen deficiency analysed by serum testosterone levels.

The sensitivity of the ADAM questionnaire test in the present study to detect androgen deficiency among diabetic male is 86.66% while the specificity is 57.14%.

Discussion

This study among 50 diabetic male aged between 35 to 65 years in the rural population of Chidambaram revealed that testosterone levels are low among diabetic population. In a study by Yeap et al., about two time’s lower testosterone levels was observed among diabetics as compared to men without diabetes mellitus⁽⁷⁾. A metanalysis

by Ding et al. analysing 3825 men confirmed that lower level of serum testosterone was more prevalent in type 2 Diabetic men⁽⁸⁾. Oh et al. also proved a inverse relationship between serum total testosterone and type 2 diabetes mellitus⁽⁹⁾. Yialamas et al. have suggested in their study that testosterone may affect insulin resistance through changes in body composition and may also regulate insulin sensitivity⁽¹⁰⁾. The prevalence of androgen deficiency among diabetic men in the present study is about 30%. This is closely comparable with study by Ajmer et al revealed 30% diabetic men had low levels of testosterone⁽¹³⁾.

John E. Morley et al validated the ADAM questionnaire for finding androgen deficiency in males aged more than 40 years. Marin et al. reported first that the testosterone replacement

therapy improved insulin resistance therefore will improve the status of diabetes mellitus⁽¹⁴⁾. In this study, 26% of diabetic men had both low testosterone levels and androgen deficiency as per ADAM test. This was similar to study by Ibraheem Khan and his colleagues, in which 30% were positive for both the test⁽¹³⁾.

The sensitivity and specificity of the present analysis is of 86.66% and 57.14% respectively, which is comparable with the original validation of The ADAM questionnaire (sensitivity and specificity of 88 and 60%)⁽⁶⁾ against the serum bioavailable testosterone levels. But, Dhinsa and colleagues suggested that the ADAM questionnaire lacks specificity and this questionnaire is useful only in the presence of a biochemical evidence of low level of serum testosterone⁽⁴⁾. Morley et al., compared the ADAM, using bioavailable testosterone as the 'biochemical gold standard' for diagnosis of hypogonadism, found sensitivity and specificity to be 97 % and 30% for ADAM respectively⁽¹⁵⁾.

Conclusion

The present study identifies testosterone deficiency in a significant proportion in type 2 diabetes mellitus males. Also, this study highlights requirement of implementing screening programmes, in order to detect testosterone deficiency at early stages in all type 2 diabetes mellitus male patients and supplement testosterone accordingly. ADAM Questionnaire is a predictor of androgen deficiency in male type 2 diabetes mellitus patients. This questionnaire should be considered useful for identifying at risk individuals, but, biochemical confirmation is essential prior to initiating any treatment. More studies are necessary to establish the role of testosterone replacement on quality-of-life and the diabetes profile of Indian men.

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