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Is Gender Important on Laboratory Variables and Complications in Type-2 Diabetes Mellitus?

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Abstract

Objective: Type 2 Diabetes mellitus (T2DM) is the most prevent metabolic disease. Gender differences are important in the epidemiology, pathophysiology, and treatment of many diseases. The aim of this study is to investigate the gender effect on laboratory variables and complications in patients with T2DM.
Materials and Methods: In this descriptive cross-sectional study, patients with T2DM between 35 -65 years old who referred to Diabetes Research Center, Yazd, Iran during 2018-2019 were studied. Demographic features and clinical information of patients were extracted from patients' medical records. All information and variables were examined in two groups according to gender and the data were analyzed using SPSS 19.
Results: Totally, 1931 patients were enrolled in the study (988 females and 943 males). Most of the patients (68.6%) were treated with insulin. Body mass index was higher in women than in men. The variables of LDL (P= 0.029), triglyceride (P< 0.001) and retinopathy (P= 0.021), were significantly different between men and women.
Conclusion: The results of this study showed there are significant differences between male and female patients with T2DM in terms of lipid profiles and retinopathy.
Keywords: Complications**,** Diabetes mellitus, Gender

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Introduction

Diabetes mellitus (DM) is one of the most common metabolic diseases in the world (1). In 2019, about 463 million adults worldwide had diabetes, which is expected to increase to 552 million by 2030 (2). There is growing evidence that gender differences are important in the epidemiology, pathophysiology, and treatment of many diseases, especially for non-communicable diseases. Therefore, in various studies on chronic and non-communicable diseases, the gender variable is considered as one of the main risk factors and an important factor in biomedical research (3). Genetic, epigenetic, nutritional and lifestyle changes are considered as risk factors for diabetes and improve its complications (4). Since these factors are different in men and women considering the different biological functions of hormones, the difference in body composition, physiological differences in glucose and fat metabolism so, gender is a significant factor in the development, management and complications of diabetes (5). Treatment strategies based on gender can provide more acceptable results. At present, the patient's gender has no effect on clinical decisions (6). A comparison between women and men with T2DM has shown that obesity, high blood pressure and high cholesterol are more common among women (7). Also endocrine-related factors of greater inflammation and oxidative stress in women were implicated in gender inequality. Moreover, previous studies indicated that diabetes reduces the protective effect of female gender on cardiovascular disease and nephropathy. Finally, these factors can lead to excessive mortality in diabetic women (8). Therefore, there is a need for further evidence-based researches on biological differences and gender-sensitive therapeutic concepts.

Considering the significant prevalence of diabetes in Yazd province (9) and the limitation of the number of studies that have examined the role of gender in the laboratory markers and complications in patients with T2DM, this study was conducted with the aim of investigating the gender effect on laboratory variables and complications of diabetes in patients with T2DM.

Material and methods

This analytical cross-sectional study was conducted in Yazd Diabetes Research Center during 2018-2019. Sample size was determined with consideration of 95% confidence level, test power of 80% and type one error (alpha) equal to 5%, based on the formula of comparing the two ratios considering the control of blood sugar 30% among clients and a difference of 0.05. Accordingly, 1000 men and 1000 women were counted.

Inclusion criteria included patients with definite diagnosis of diabetes, aged 35 to 65 years who have a medical record in Diabetes Research Center. Participants with type 1 diabetes, gestational diabetes or incomplete medical record were excluded. All patient information such as demographic and clinical data (e.g. age, gender, glycosylated hemoglobin, blood lipid profile, treatment type and presence of nephropathy and retinopathy) was extracted from patients' medical records. Participants were divided into two groups according gender. Data were analyzed via appropriate statistical tests such as independent T-test and chi Square test in SPSS software version 19. A P-value less than 0.05 was also considered statistically significant.

Ethical considerations

This study was approved by the Ethics Committee of the Sahid Sadoughi University of Medical Sciences,Yazd, Iran. (Code: IR.SSU.MEDICINE.REC.1400.370).

Results

A total of 1913 patients were included in this study, of which 980 (51.22%) were women and 933 (48.78%) were men. Demographic

and clinical features of participants are presented in Table 1.

As shown in Table2 among laboratory variables, Triglyceride (*P*< 0.0001) and LDL (*P*= 0.028) were significantly different between men and women. Other variables did not show any difference between two gender (*P*>0.05).

Frequency of diabetes complications (retinopathy and nephropathy) is presented in Table 3. Frequency of retinopathy in men and women was 39.4% and 54.1%, respectively and this difference was statistically significant (*P*= 0.021). Almost 30% of men and 27% of women had retinopathy, although this difference was not significant (*P*= 0.078).

Discussion

The results of the present study showed that laboratory variables and the frequency of diabetes complications are different between women and men with type 2 diabetes. Comparing the lipid profile, it was found that cholesterol and LDL levels were higher in women than men, although only the difference in LDL level was significant. In addition, cholesterol levels were significantly higher in men than in women. Although ,in line with the results of our study, previous studies have reported the different types of dyslipidemia in both women and men with diabetes(10) but, usually women with type 2 diabetes have worse control over lipid profiles than men (11,12). Transition periods in women, such as menstrual cycle, pregnancy, breastfeeding and menopause, influence lipid levels and in the menopausal transition, due to declining estrogen levels along with advancing age, women develop a more adverse lipid profile (13,14). Remembering that the mean age of people in this study was over 50 years old, the higher level of LDL among women can be attributed to sex hormones. Furthermore, in this study women's BMI was higher than men's, and as it has already been determined, there is a direct relationship between increasing BMI and raised LDL levels (15). Considering that the high level of LDL has been identified as the most related factors to cardiovascular disea se (16), so the relative

Table 1. Demographic and clinical features of participants (n=1931)

Variables	Mean (±SD)		*P*-value
	Male	Female	
Age	56.76 (±9.02)	55.71 (±9.39)	0.76*
Age of diabetes' diagnosis	48.43 (±12.58)	47.62 (±12.18)	0.218*
BMI	28.37 (±4.3)	29.95 (±4.9)	<0.0001*
Type of treatment (%)			
Oral	265 (28.5%)	320 (32.7%)	0.047**
Insulin	666 (71.5%)	660 (67.3%)	

*Independent T- test
** Chi- square

Table 2. Mean of laboratory variables according to gender

Variable	Mean(±SD)		*P*-value*
	Male	Female	
HbA1c	8.51.(± 2.01)	8.37(±1.9)	0.588
Triglyceride	208.35 (±132.4)	185.31 (±101.4)	0.000
cholesterol	177.84 (±46.59)	183.66 (±46.10)	0.296
HDL	43.12 (±12.765)	48.93 (±14.34)	0.134
LDL	95.83 (±34.11)	101.46 (±42.21)	0.028

* Independent T- test

Table 3. Frequency of diabetes complications according to gender

Complications	N (%)		*P*-value*
	Male	Female	
Retinopathy	366 (39.4%)	432 (54.1%)	0.021
Nephropathy	282 (30.2%)	267 (27.2%)	0.078

* Independent T- test

risks of cardiovascular complications associated with diabetes are higher in women than in men (17).

Regarding the complications of diabetes, the frequency of retinopathy was significantly higher among women than men. Previous studies have reported different results regarding the role of gender in diabetic retinopathy. Contrary to our findings, the results of two large studies in Italy and US showed that the frequency of retinopathy was higher in men than in women (18,19). However, another study conducted in China, in line with our study, reported a higher frequency of retinopathy in women (20). The difference in the results can be attributed to the difference in the methodology of the studies, considering the age and duration of diabetes diagnosis as confounding factors in investigating the relationship between gender and the frequency of retinopathy is very important (21). In addition, when retinopathy is investigated according to different types, it leads to different results, so that in previous studies, frequency of PDR was associated with female whereas NPDR was associated with male gender (22). In present study, the frequency of nephropathy was higher in men than in women, but this difference was not significant. Generally evidence for the effect of gender on the prevalence of diabetic kidney disease and disease progression is limited and contradictory. According to previous findings, kidney disease is different in men and women. In women, albuminuria is milder and the response to treatment is better, while in men, albuminuria is a stronger predictor of chronic kidney disease. Furthermore one of the important factors in determining the role of gender in the frequency of kidney diseases is the definition of the disease. When eGFR values are used to define kidney disease, the frequency is significantly higher in women than in men (23). Factors such as age and social factors can be decisive in this field (24).

Conclusion

Lipid profile and frequency of retinopathy among women and men with type 2 diabetes are significantly different. LDL levels and the frequency of diabetic retinopathy is higher in women while the triglyceride level is higher in men.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

Authors' contributions

Conception or design of the work: R. A, A. Gh and F. Gh

Data collection: F. Gh, H. N

Data analysis and interpretation: N. N, A. M, A. Gh

Drafting the article. F. GH, A. M, N. N and H. N

Critical revision of the article: R. A, N. N

References

1. Entezari Z, Injinari N, Vakili M, Namiranian N. Identification of Factors Related to Sexual Dysfunction in Type 2 Diabetic Women. Iranian journal of diabetes and obesity. 2023; 15(2): 66-72.
2. Mehrabbeik A, Azizi R, Rahmanian M, Namiranian N, Shukohifar M, Asi M. Design and Psychometrics of Diabetes Knowledge Questionnaire. Journal of Medical Education. 2022;21(1): e130597.
3. Hafez SM, Allam FA, Elbassuoni E. Sex differences impact the pancreatic response to chronic immobilization stress in rats. Cell Stress and Chaperones. 2021;26(1):199-215.
4. Rosen ED, Kaestner KH, Natarajan R, Patti ME, Sallari R, Sander M, et al. Epigenetics and

epigenomics: implications for diabetes and obesity. Diabetes. 2018;67(10):1923-31.
5. Ciarambino T, Crispino P, Leto G, Mastrolorenzo E, Para O, Giordano M. Influence of gender in diabetes mellitus and its complication. International journal of molecular sciences. 2022;23(16):8850.
6. Kautzky-Willer A, Harreiter J. Sex and gender differences in therapy of type 2 diabetes. Diabetes Research and Clinical Practice. 2017;131:230-41.
7. Wright AK, Kontopantelis E, Emsley R, Buchan I, Mamas MA, Sattar N, et al. Cardiovascular risk and risk factor management in type 2 diabetes mellitus: a population-based cohort study assessing sex disparities. Circulation. 2019;139(24):2742-53.
8. Hendriks SH, Blanker MH, Roelofsen Y, van Hateren KJ, Groenier KH, Bilo HJ, et al. Gender differences in the evaluation of care for patients with type 2 diabetes: a cross-sectional study (ZODIAC-52). BMC Health Services Research. 2018;18:1-9.
9. Azimi-Nezhad M, Ghayour-Mobarhan MP, Parizadeh MR, Safarian M, Esmaeili H, Parizadeh SM, et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanisation, education, marital status and occupation. Singapore medical journal. 2008;49(7):571.
10. Shahwan MJ, Jairoun AA, Farajallah A, Shanabli S. Prevalence of dyslipidemia and factors affecting lipid profile in patients with type 2 diabetes. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2019;13(4):2387-92.
11. Wright AK, Kontopantelis E, Emsley R, Buchan I, Mamas MA, Sattar N, et al. Cardiovascular risk and risk factor management in type 2 diabetes mellitus: a population-based cohort study assessing sex disparities. Circulation. 2019;139(24):2742-53.
12. Peters SA, Woodward M. Sex differences in the burden and complications of diabetes. Current diabetes reports. 2018;18(6): 33.
13. Holven KB, van Lennep JR. Sex differences in lipids: a life course approach. Atherosclerosis.2023;384:117270.
14. Connelly PJ, Azizi Z, Alipour P, Delles C, Pilote L, Raparelli V. The importance of gender to understand sex differences in cardiovascular disease. Canadian Journal of Cardiology. 2021 ;37(5):699-710.
15. Hussain A, Ali I, Kaleem WA, Yasmeen F. Correlation between body mass index and lipid profile in patients with type 2 diabetes attending a tertiary care hospital in Peshawar. Pakistan journal of medical sciences.2019;35(3):591-7.
16. Gă man MA, Cozma MA, Dobrică EC, Bacalbaş a N, Bratu OG, Diaconu CC. Dyslipidemia: a trigger for coronary heart disease in Romanian patients with diabetes. Metabolites. 2020;10(5):195.
17. Angoulvant D, Ducluzeau PH, Renoult-Pierre P, Fauchier G, Herbert J, Semaan C, et al. Impact of gender on relative rates of cardiovascular events in patients with diabetes. Diabetes & metabolism. 2021;47(5):101226.
18. Cherchi S, Gigante A, Spanu MA, Contini P, Meloni G, Fois MA, et al. Sex-gender differences in diabetic retinopathy. Diabetology. 2020;1(1):1-10.
19. Lundeen EA, Burke-Conte Z, Rein DB, Wittenborn JS, Saaddine J, Lee AY, Flaxman AD. Prevalence of diabetic retinopathy in the US in 2021. JAMA ophthalmology. 2023;141(8):747-54.
20. Li M, Wang Y, Liu Z, Tang X, Mu P, Tan Y, et al. Females With Type 2 Diabetes Mellitus Are Prone to Diabetic Retinopathy: A Twelve-Province Cross-Sectional Study in China. Journal of diabetes research. 2020;2020(1):5814296.
21. Hashemi H, Rezvan F, Pakzad R, Ansaripour A, Heydarian S, Yekta A, et al. Global and Regional Prevalence of Diabetic Retinopathy; A Comprehensive Systematic Review and Meta-analysis. Seminars in Ophthalmology. 2022;37(3):291-306.
22. Sultan S, Fawwad A, Siyal NA, Butt A, Khokar AR, Basit A. Frequency and risk factors of diabetic retinopathy in patients with type 2 diabetes presenting at a tertiary care hospital. International Journal of Diabetes in Developing Countries. 2020;40:87-92.
23. Giandalia A, Giuffrida AE, Gembillo G, Cucinotta D, Squadrito G, Santoro D, et al. Gender differences in diabetic kidney disease: focus on hormonal, genetic and clinical factors. International journal of molecular sciences. 2021;22(11):5808.
24. Thomas B. The Global Burden of Diabetic Kidney Disease: Time Trends and Gender Gaps. Current Diabetes Reports. 2019;19(4):18.