Sexual Dysfunction in Males and Females with Type 2 Diabetes Referring to Healthcare Centers of Zarand, Kerman: A Cross-Sectional Study

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Abstract

Background: Sexual dysfunction is a common complication of type 2 diabetes in males and females. Although sexual function is important, it is often neglected as a component of type 2 diabetes care.

Objectives: This study aimed at investigating the association between sexual function and marital dissatisfaction in males and females with type 2 diabetes living in southern Iran.

Methods: This study was a case-control research, which was carried out on 120 non-pregnant females and 120 males with type 2 diabetes. In addition, available samples of healthy individuals (120 females and 120 males), who referred to central cares located in Zarand, Kerman during year 2015, were used as the control group. The female sexual function data was obtained based on a questionnaire compromised of Rosen female sexual function indices (FSFI, 2000). The international index of erectile function (IIEF) questionnaire was used to obtain male sexual dysfunction data.

Results: Forty-one diabetic individuals (17.08%) of total diabetic participants had impaired sexual function, 29 of which (70.73%) were male (with higher rates in males than females, P < 0.05). In addition, 12 diabetic patients (5%) had decreased sexual desire and 66.6% were diabetic males. There was no significant difference in sexual desire between healthy and diabetic groups. Sexual arousal was significantly (P < 0.001) lower in the diabetic group compared with healthy individuals. In addition, sexual lubrication (P = 0.008), orgasm (P = 0.003), satisfaction (P = 0.05), and dyspareunia (P = 0.05) scores were significantly higher in the healthy group in comparison to the diabetic group. Severe erectile dysfunction was significantly (P < 0.001) greater between diabetic than the healthy group. Sexual dissatisfaction was significantly (P < 0.001) higher in diabetic males compared to healthy individuals; the amount of libido average and marital life satisfaction were significantly lower in diabetic males (P = 0.01).

Conclusions: Based on the findings of this study, counseling, and prevention of diseases, such as diabetes is suggested along with a focus on marital and sexual relations at the age of fertility.

Keywords: Sexual Disorders, Type 2 Diabetes, Male Sexual Dysfunction, Female Sexual Dysfunction, Iran

1. Background

Diabetes is well-known as the silent epidemic of the present century and as one of the biggest health problems in all countries (1). According to the modern lifestyle, diabetes prevalence is growing in both developed and developing countries (2, 3). In the 21st century, diabetes has turned into a major challenge in community health management, and it is especially more serious in the Middle East (3, 4). More than 230 million individuals worldwide currently have diabetes (5). The Eastern Mediterranean and the Middle East with a population of 592 million have the highest incidence rate in the world. Also, this region has the highest rate of death caused by diabetes in males and females (6, 7). Iran, as a Middle Eastern country, has 3.5 million diabetic patients (8). On the other hand, diabetes is the cause of many physical and mental disorders. Sexual disorders are one of the chronic mental complications of diabetes. However, sexual disorders are mainly assessed based on several sexual dysfunctions, such as erectile dysfunction ejaculation disorders and decreased sexual desire in males, and sexual arousal, orgasm, satisfaction, and pain in the females (9). In fact, sexual dysfunction is three times more in diabetic individuals compared with healthy individuals (10, 11). Reduced sexual desire is...
also high in people with diabetes (12). Many studies have been performed on sexual dysfunction in diabetic males and females (13, 14). Sexual disorders in diabetic males are present in 50% of cases before the age of 60, yet their prevalence appears to be lower in diabetic females (15). Besides, sexual disorders in males and females are divided into two main psychological and physical groups (genetic causes, hormonal disorders, autonomic neuropathy, atherosclerosis, and vascular failure) (16, 17). In diabetic females, vascular, neurological, and psychological problems are the main causes of reduced sexual desire, vaginal lubrication and secretions, arousal disorders, orgasmic problems, and dyspareunia (18). In male diabetic patients, neurological disorders and psychiatric problems reduce erection or decrease the number of sperms (19, 20). Although marital satisfaction and sexual function are undesirable in diabetic patients, the assessment of sexual dysfunction and marital dissatisfaction in females and males with type 2 diabetes is questionable.

2. Objectives

Considering the lack of comprehensive studies in this regard in southern Iran, the present study was conducted to investigate sexual dysfunction and marital dissatisfaction among males and females with type 2 diabetes in Zarand, Kerman.

3. Methods

This study was a cross-sectional research that was conducted on individuals referring to health care centers of Zarand city, Kerman province, Iran during year 2015. They were selected by using available sampling in accordance with the medical ethics code IR.KMU.REC.1395.121. This study used a total of 480 individuals, which enrolled within two healthy (n = 120 males and females) and diabetic groups (n = 120 diabetic males and females). The criteria for entering the study included: Non-pregnant women that were at the pregnancy age, being able to read and write, being married, having at least three years of marital life, not having a chronic illness in the partner, such as depression, history of diabetes greater than one year, not affected by retinopathy, kidney failure, amputation, and non-development of cerebrovascular accidents, and cardiac events over the past 12 months.

3.1. Instruments

Files and questionnaires of patients comprised of two parts. The first part included a demographic questionnaire that determined age, physical complications caused by diabetes, such as heart diseases (blood pressure and electrocardiography), nephropathy (urine analysis and Albuminuria) retinopathy (ophthalmology examination and microvascular injuries), and neuropathy (peripheral and autonomic examination). The second part contained questions regarding sexual dysfunction. Rosen female sexual function index (2000) contains 19 items with six subscales of sexual desire, sexual arousal, vaginal moisture, orgasm, dyspareunia, and sexual satisfaction, scored between two and 36. The highest score of this scale shows the best sexual function and less pain (21). Male sexual function: Participants completed questions one to five of the international index of erectile function (IIEF) questionnaire, which is a multidimensional scale for assessing erectile dysfunction (22). The primary outcomes were erectile function score, calculated as the sum of questions one to five from the IIEF with a maximum score of 25. Also, the respondents’ reduced sexual desire and sexual dysfunction at erection in males and vaginal lubrication in females were measured by using the Laumann questionnaire (22, 23). Meanwhile, the researchers tried to do their best to diminish their distrust through assuring them about anonymity and confidentiality of their data and overall analysis of the questionnaires. In addition, the questionnaires were completed in a private room by the subjects with no direct observation of the researcher.

3.2. Data Analysis

The collected data were analyzed using SPSS 16 software. Variables with Shapiro-Wilk values \( P > 0.05 \) were considered normal and used from independent samples \( t \)-test for comparing them between the two groups. The frequency and relative frequency of demography characteristics were presented based on health situation (healthy and diabetic). The presence or absence of diabetic complications were presented and compared between diabetic males and females using chi-square test and differences with \( P \leq 0.05 \) were considered significant.

4. Results

The mean age of the respondents in the healthy and diabetic female group were 43.29 ± 4.77 and 42.65 ± 4.4, respectively (Table 1) and the mean age of the respondents in the healthy and diabetic male group were 43.87 ± 5.68 and 42.99 ± 4.68, respectively (Table 1). There were no significant differences between healthy and diabetic females on age (\( P = 0.29 \)), employment condition (\( P = 0.6 \)), educational level (\( P = 0.89 \)), place of residence (\( P = 0.24 \)), economical condition (\( P = 0.18 \)), and cigarette or alcohol consump-
tion ($P = 0.43$, Table 1). Also, there were no significant differences between healthy and diabetic males regarding age ($P = 0.19$), employment condition ($P = 0.18$), place of residence ($P = 0.52$), economical condition ($P = 0.22$), and cigarette or alcohol consumption ($P = 0.31$, Table 2). A higher number of healthy males with college or higher educational level were reported than diabetic males ($P < 0.001$, Table 2). On the other hand, the number of healthy and diabetic males were statistically significant at different educational levels in this study ($P < 0.05$, Table 2).

In the present study, the diabetic males and females suffered from diabetes for $4.75 \pm 2.5$ and $4.88 \pm 2.57$ years, respectively (Table 3). Overall, 96.7% of males and 97.5% of females had more than 140 mg/dL two-hour blood sugar, therefore, they received both Met and GBC pins. Moreover, there were 5.8% males and 3.3% females with heart problems. Overall, 8.3% of diabetic males and 6.7% of diabetic females had liver disorders, whereas, 5.8% of males and 5% of females were observed by nephropathy. Retinopathy was the most common diabetic complication (29.2% of males and 20% of females), which were observed in this study. Furthermore, 13.3% of diabetic males and 12.5% of females suffered from neuropathy (Table 3).

Different dimensions of sexual function in diabetic and healthy females are presented in Figure 1. The female sexual function indices were scored between two to 36, and the highest score showed the best sexual function and less pain. There was no significant difference in sexual desire between healthy and diabetic groups. Sexual arousal was significantly ($P < 0.001$) lower in the diabetic group compared with healthy individuals. In addition, sexual lubrication ($P < 0.001$), orgasm ($P < 0.001$), satisfaction ($P < 0.001$), and dyspareunia ($P < 0.001$) scores were significantly higher in the healthy group in comparison diabetic individuals (Figure 1).

In Figure 2, the four main domains of male sexual function in healthy and diabetic males with IIEF questionnaire are presented. Severe erectile dysfunction was observed significantly ($P < 0.001$) greater in diabetic than healthy groups. However, sexual desire, the amount of intercourse satisfaction and overall satisfaction were significantly ($P < 0.001$) lower in diabetic males compared to healthy males.

Generally, 41 diabetic individuals (17.08%) from all diabetic participants had impaired sexual function, 29 of which (70.73%) were male (with higher rates in males than females, $P < 0.05$). In addition, 12 diabetic patients (5%) had decreased sexual desire, 66.6% of which were diabetic males.

### 5. Discussion

This study was conducted to investigate the relationship between type 2 diabetes, sexual function, and marital dissatisfaction in males and females with type 2 diabetes in Zarand, Kerman. The basic characters in diabetic and healthy subjects indicated that the incidence of type 2 diabetes was not affected by educational and eco-
Table 1. Demographic Characteristics Based on Health Situation in Diabetic (N = 120) and Healthy (N = 120) Women*

| Variables                   | Healthy | Diabetic | PValueb |
|-----------------------------|---------|----------|---------|
| Age, y, mean ± SD           | 43.29 ± 4.77 | 42.65 ± 4.44 | 0.29    |
| Job                         |         |          | 0.6     |
| Employed                    | 64 (53.3) | 68 (56.7) |         |
| Housewife                   | 56 (46.7) | 52 (43.3) |         |
| Educational level           |         |          | 0.89    |
| Primary school              | 28 (23.3) | 28 (23.3) |         |
| High school                 | 36 (30.1) | 31 (25.8) |         |
| Diploma                     | 34 (28.3) | 38 (31.7) |         |
| College or higher           | 22 (18.3) | 23 (19.2) |         |
| Place of living             |         |          | 0.24    |
| City                        | 61 (50.8) | 52 (43.3) |         |
| Village                     | 59 (49.2) | 68 (56.7) |         |
| Economic situation          |         |          | 0.38    |
| Goodc                       | 70 (58.3) | 80 (66.7) |         |
| Moderatec                   | 50 (41.7) | 40 (33.3) |         |
| Cigarette or alcohol consumption | 8 (6.6)  | 6 (5)    | 0.43    |

*aValues are expressed as No. (%) unless otherwise indicated.

bP < 0.05 was considered statistically significant. Chi-square test and t-test were used for comparing these variables.

cGood economic situations: family income per mouth > 4 × 10^6 Rial; moderate economic situation: families receive income per mouth between 1.5 - 4 × 10^6 Rial.

...nomic conditions, cigarette or alcohol consumption and place of residence in females, yet type 2 diabetes incidence was significantly lower in males with college or higher educational level. As diabetes mellitus is related to some sociodemographic factors within the Iranian population (24), the researchers could not find any data regarding educational, economical situations, urban-rural differences and cigarette or alcohol consumption prevalence of type 2 diabetes in Zarand, Kerman. The results conducted on educational level of males were in line with previous investigations (25, 26). Rahmanian et al. reported that diabetes is most prevalent in Iranian individuals with lower educational level (26). In addition, a higher prevalence of diabetes mellitus in an urban area of different Iranian provinces has usually been reported compared with rural areas (27, 28).

In addition, some diabetic complications, such as nephropathy, neuropathy, and retinopathy were observed between diabetic individuals. Vafaeimanesh et al. presented significant correlations between sexual dysfunctions and retinopathy and nephropathy. They suggested that chronic problems, such as retinopathy and nephropathy can be considered as risk factors for sexual dysfunction (21, 29).

The comparison of the mean scores of sexual functions in type 2 diabetic and healthy individuals indicated that type 2 diabetes can influence sexual dysfunction and marital satisfaction in both males and females. These findings were in line with previous studies (30-32). In addition, the current findings indicated a significantly lower score of sexual function and marital satisfaction in diabetic males compared to diabetic females. It was shown that its prevalence is higher in diabetic males and it is estimated to influence 20% to 85% of diabetic males, while, this issue is probably less common in diabetic females (29). Seid et al. reported 35% to 90% of diabetic males have erectile dysfunction that can be the result of high blood glucose-induced penile microvascular injuries (33). As marital dissatisfaction increases, physical and mental pressures can reduce one’s sexual and physical health and ability (34). In addition, sexual dysfunction and marital dissatisfaction could lead to divorce and end up in the breakdown of marital life (35).

5.1. Conclusions

Based on the results of this study and other studies, it could be suggested that type 2 diabetes causes chronic sexual dysfunction and reduced sexual desire in both genders.
Table 2. Demographic Characteristics Based on Health Situation in Diabetic (N = 120) and Healthy (N = 120) Men

| Variables            | Healthy | Diabetic | P Valueb |
|----------------------|---------|----------|----------|
| **Age, y, mean ± SD**| 43.87 ± 5.68 | 42.99 ± 4.68 | 0.19     |
| **Job**              |         |          |          |
| Employed             | 82 (68.3) | 72 (60)  | 0.18     |
| Housewife            | 38 (31.7) | 48 (40)  |          |
| **Educational level**|         |          | < 0.001  |
| Primary school       | 21 (17.5) | 38 (31.7) |          |
| High school          | 25 (20.8) | 30 (25)  |          |
| Diploma              | 36 (30)  | 41 (34.2) |          |
| College or higher    | 38 (31.7) | 11 (9.1) |          |
| **Place of living**  |         |          | 0.52     |
| City                 | 58 (48.3) | 53 (44.2) |          |
| Village              | 62 (51.7) | 67 (55.8) |          |
| **Economical situationc** | | | 0.22 |
| Good                 | 84 (70)  | 75 (62.5) |          |
| Moderate             | 36 (30)  | 45 (37.5) |          |
| **Cigarette or alcohol consumption** | 41 (34.16) | 46 (38.33) | 0.31 |

Values are expressed as No. (%) unless otherwise indicated.

bP < 0.05 was considered statistically significant. Chi-square test and t-test were used for comparing these variables.

cGood economic situations: family income per mouth > 4 × 10^6 Rial; Moderate economic situation: families receive income per mouth between 1.5 - 4 × 10^6 Rial.

Table 3. The History of Medication, Biochemical and Physical Complication Caused by Diabetes in Diabetic Men and Women

| Variables                  | Diabetic Individual, N = 240 | P Value |
|----------------------------|------------------------------|---------|
| **Duration of diabetesb, y** | 4.75 ± 2.5 | 4.88 ± 2.57 | 0.7     |
| **Medication, No. (%)**    |                              |         |
| Met + GBC                  | 116 (96.7) | 117 (97.5) | 0.7     |
| **Biochemicalb**           |                              |         |
| FBS, mg/dL                 | 153.25 ± 65.85 | 148.22 ± 63.7 | 0.55   |
| HbA1c, %                   | 10.05 ± 2.84 | 10.42 ± 2.37 | 0.28   |
| 2-hour blood sugar, mg/dL  | 146.1 ± 2.19 | 146.33 ± 1.87 | 0.37   |
| Insulin, µU/mL             | 224.24 ± 84.83 | 211.04 ± 77.38 | 0.21   |
| **Physical, No. (%)**      |                              |         |
| Heart problems             | 7 (5.8) | 4 (3.3) | 0.35     |
| Liver problem              | 10 (8.3) | 8 (6.7) | 0.62     |
| Nephropathy                | 6 (5) | 7 (5.8) | 0.78     |
| Retinopathy                | 35 (29.2) | 24 (20) | 0.1      |
| Neuropathy                 | 16 (13.3) | 15 (12.5) | 0.85     |

Abbreviations: GBC, glibenclamide; Met, metformin.

Values are expressed as mean ± SD unless otherwise indicated.

bP < 0.05 was considered statistically significant. Chi-square test and t-test were used for comparing these variables.
Therefore, counseling and control of type 2 diabetes in females at gestational age and males at different ages are recommended.

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Footnotes

Authors’ Contribution: Study concept and design: Maryam Alikamali; analysis and interpretation of data: Sedigheh Khodabandeh; data collection: Maryam Motezadeh; data analysis and interpretation of data: Maryam Alikamali; study concept and design: Alikamali. MN, MM, Janghorbani M. All authors declare that there was no conflict of interest.

References

1. Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999-2002. JAMA. 2004;291(23):2847-50. doi: 10.1001/jama.291.23.2847. [PubMed: 15990935].

2. Hjelm K, Mufunda E, Nambozi G, Kemp J. Preparing nurses to face the pandemic of diabetes mellitus: A literature review. J Adv Nurs. 2010;63(3):424–34. doi: 10.1111/j.1365-2648.2009.05248.x. [PubMed: 19603567].

3. Anderson D, Christison-Lagay J. Diabetes self-management in a community health center: Improving health behaviors and clinical outcomes for underserved patients. Clin Diabetes. 2008;26(1):22-7. doi: 10.2337/diabetes.26.1.22. [PubMed: 18455456].

4. Whiting DR, Guariguata L, Weil C, Shaw J. IDF diabetes atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. Diabetes Res Clin Pract. 2011;94(3):311-21. doi: 10.1016/j.diabres.2011.07.029. [PubMed: 22079681].

5. Keymahan R, Amini M, Jinghorbani M. Prevalence and risk factors of diabetes, pre-diabetes and metabolic syndrome in first-degree relatives of patients with type II diabetes. J Kerman Univ Med Sci. 2013;20(2):215-28. Persian.

6. Eckel RH, Kahn SE, Ferrannini E, Goldfine AB, Nathan DM, Schwartz MW, et al. Obesity and type 2 diabetes: What can be unified and what needs to be individualized? J Clin Endocrinol Metab. 2011;96(6):1654-63. doi: 10.1210/jc.2010-0565. [PubMed: 21602457]. [PubMed Central: PMC3206399].

7. Hinnouho GM, Czernichow S, Dugravot A, Nabi H, Brunner EF, Kivimaki M, et al. Metabolically healthy obesity and the risk of cardiovascular disease and type 2 diabetes: The Whitehall II cohort study. Eur Heart J. 2015;36(9):551-9. doi: 10.1093/eurheartj/eth412. [PubMed: 24670781]. [PubMed Central: PMC4344958].

8. Wildman RP, Muntner P, Reynolds K, McGinn AP, Rajpathak S, Wylie-Rosett J, et al. The obese without cardiometabolic risk factor clustering and the normal weight with cardiometabolic risk factor clustering; prevalence and correlates of 2 phenotypes among the US population (NHANES 1999-2004). Arch Intern Med. 2008;168(15):1657-24. doi: 10.1001/archinte.168.15.1657. [PubMed: 18695075].

9. Corona G, Mannucci E, Mansani R, Petroni I, Bartolini M, Giommi R, et al. Organic, relational and psychological factors in erectile dysfunction in men with diabetes mellitus. Eur Urol. 2014;66(2):222-8. doi: 10.1016/j.eururo.2014.04.001. [PubMed: 24545871].

10. Penson DF, Latini DM, Lubeck DP, Wallace KL, Henning JM, Lue TF, et al. Do impotent men with diabetes have more severe erectile dysfunction and worse quality of life than the general population of impotent patients? Results from the exploratory comprehensive evaluation of erectile dysfunction (ExCEED) database. Diabetes Care. 2013;36(4):1093-9. doi: 10.2337/diacare.36.4.1093. [PubMed: 23663579].

11. Elkin P, Mathieu C, Van Der Brul A, Vanderschueren D, Demyttenaere K. Prevalence and predictors of sexual dysfunction in patients with type 1 diabetes. Diabetes Care. 2002;25(2):409-14. doi: 10.2337/diacare.25.2.409. [PubMed: 12457871].

12. Erol B, Tefekli A, Sanli O, Ziyalan O, Arumagan A, Kendirci M, et al. Does sexual dysfunction correlate with deterioration of somatic sensory system in diabetic women? Int J Impot Res. 2003;15(1):98-202. doi: 10.1081/JI100009988. [PubMed: 12904806].

13. Guay AT. Sexual dysfunction in the diabetic patient. Int J Impot Res. 2013;25 Suppl 1:S47–50. doi: 10.1038/sj.ijir.3900779. [PubMed: 23187481].

14. Jackson G. Sexual dysfunction and diabetes. Int J Clin Pract. 2004;58(4):358-62. doi: 10.1111/j.1440-1614.2004.00180.x. [PubMed: 15161202].

15. Enzlin P, Mathieu C, Vanderschueren D, Demyttenaere K. Diabetes mellitus and female sexuality: A review of 25 years’ research. Diabet Med. 1998;15(10):809-15. doi: 10.1002/sj.41096819981010.350-3899-AYID-DA&89-3.0.CO;2-Z. [PubMed: 9796877].

16. Ziae-Rad M, Vahdaninia M, Montazeri A. Sexual dysfunctions in patients with diabetes: A study from Iran. Reprod Biol Endocrinol. 2008;6:30. doi: 10.1186/1477-7827-6-30. [PubMed: 1842781]. [PubMed Central: PMC2887789].

17. Hadipour M, Abolhasani F, Molavi-Vardanjani H. [Health related quality of life in patients with of type II diabetes in Iran]. Payesh. 2013;12(2):135-41. Persian.

18. Johannes CB, Araujo AB, Feldman HA, Derby CA, Kleinman KP, McKinlay JB. Incidence of erectile dysfunction in men 40 to 69 years old: Longitudinal results from the Massachusetts male aging study. J Urol. 2000;163(2):460–3. doi: 10.1016/S0022-5347(05)79003-1. [PubMed: 10647654].

19. Fode M, Krogh-Jespersen S, Brackert NL, Ohl DA, Lynne CM, Sonksen J. Male sexual dysfunction and infertility associated with neurological disorders.Asian J Androl. 2012;14(1):68-70. doi: 10.1080/jaja.2011.70. [PubMed: 22188899]. [PubMed Central: PMC375555].

20. Malidis C, Aghaie I, McClure N, Kliesch S. [The influence of diabetes mellitus on male reproductive function: A poorly investigated aspect of male infertility]. Urologe A. 2011;50(3):333-7. German. doi: 10.1007/s00120-010-2440-1. [PubMed: 21207007].

21. Elyasi F, Kashfi Z, Tafsheh B, Bahar A, Khademlooo M. Sexual dysfunction in women with type 2 diabetes mellitus. Iran J Med Sci. 2015;40(3):206-13. [PubMed: 25999619]. [PubMed Central: PMC440881].

22. Laumann EO, Paik A, Rosen RC. Sexual dysfunction in the United States: Prevalence and predictors. JAMA. 1999;281(6):537-44. doi: 10.1001/jama.281.6.537. [PubMed: 10032210].

7. Shiraz E-Med J. 2019;20(8):e84268.
23. Nappi R, Salonia A, Trisha AM, van Lunsen RH, Vardi Y, Kodigu A, et al. Clinical biologic pathophysiologies of women's sexual dysfunction. J Sex Med. 2005;2(1):4-25. doi: 10.1111/j.1743-6109.2005.00102.x. [PubMed: 16422901].

24. Azimi-Nezhad M, Ghaour-Mobarhan M, 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 Med J. 2008;49(7):575-8. [PubMed: 18695867].

25. Kavanagh A, Bentley RJ, Turrell G, Shaw J, Dunstan D, Subramanian SV. Socioeconomic position, gender, health behaviours and biomarkers of cardiovascular disease and diabetes. Soc Sci Med. 2010;71(6):1150-60. doi: 10.1016/j.socscimed.2010.05.038. [PubMed: 20667641].

26. Rahmanian K, Shojaei M, Sotoodeh Jahromi A. Relation of type 2 diabetes mellitus with gender, education, and marital status in an Iranian urban population. Rep Biochem Mol Biol. 2013;2(2):64-8. [PubMed: 26989761]. [PubMed Central: PMC4757057].

27. Khorrami Z, Yarahmadi S, Etemad K, Khodakarim S, Kameli ME, Hazaveh ARM. Urban-Rural Differences in the Prevalence of Self-Reported Diabetes and its Risk Factors: The WHO STEPS Iranian Noncommunicable Disease Risk Factor Surveillance in 2011. Iran J Med Sci. 2017;42(5):481-7. [PubMed: 2923481]. [PubMed Central: PMC5722866].

28. Mazloomzadeh S, Rashidi Khazaghi Z, Mousavinasab N. The prevalence of metabolic syndrome in Iran: A systematic review and meta-analysis. Iran J Public Health. 2018;47(4):473-80. [PubMed: 2990013]. [PubMed Central: PMC5996131].

29. Vafaeeimanesh J, Razi M, Hosseinzadeh F, Parham M. Evaluation of sexual dysfunction in women with type 2 diabetes. Indian J Endocrinol Metab. 2014;18(2):175-9. doi: 10.4103/2230-8210.129107. [PubMed: 2474152]. [PubMed Central: PMC3987266].

30. Fallahi M, Mozaffari-Khosravi H, Alkhami-Ardekani M, Dehghani A. Evaluation of sexual function in men with diabetes mellitus type 2: Yazd Diabetes Research Center. Iran J Diabetes Obes. 2014;6(3):336-41.

31. Corona G, Giorda CB, Cucinotta D, Guida P, Nada E, Subito-De Study Group. Sexual dysfunction in type 2 diabetes at diagnosis: Progress over time and drug and non-drug correlated factors. PLoS One. 2016;11(10). e0157915. doi: 10.1371/journal.pone.0157915. [PubMed: 27706160]. [PubMed Central: PMC505725].

32. Alikamali M, Khodabandeh S, Motesaddi M. The effect of personality traits on sexual function in women with type II diabetes in Zarand, Iran, in 2016. J Diabetes Nurs. 2017;9(2):149-60. Persian.

33. Seid A, Gerensea H, Tarko S, Zenebe Y, Mezemir R. Prevalence and determinants of erectile dysfunction among diabetic patients attending in hospitals of central and northwestern zone of Tigray, northern Ethiopia: A cross-sectional study. BMC Endocr Disord. 2017;17(1):36. doi: 10.1186/s12902-017-0167-5. [PubMed: 28298205]. [PubMed Central: PMC5353861].

34. Fatemi SS, Taghavi SM. Evaluation of sexual function in women with type 2 diabetes mellitus. Diab Vasc Dis Res. 2009;6(1):38-9. doi: 10.3132/dvdr.2009.07. [PubMed: 19156627].

35. Abu Ali RM, Al Hajeri RM, Khader YS, Shegem NS, Ajlouni KM. Sexual dysfunction in Jordanian diabetic women. Diabetes Care. 2008;31(8):1580-1. doi: 10.2337/dc08-0061. [PubMed: 18458440]. [PubMed Central: PMC2494660].