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The Prevalence of Diabetes-Related Complications in Patients Referred to Hospitals in Torbat Heydariyeh, Iran, in 2018-2019

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Abstract

Diabetes mellitus (DM), as one of the cumbersome challenges facing public health worldwide, is characterized by numerous chronic complications. Concerning major changes occurring in most organs of the body, this condition gives rise to early or late complications, so that the overall costs of healthcare in this respect have been mostly reported for hospitalization as well as treatment and care for the disease and its complications. Given the prevalence of DM and its complications and the fact that no surveys have been so far conducted on the prevalence of DM-related complications in Torbat Heydariyeh, Iran. This study aimed to reflect on DM-related complications in patients referred to the hospitals located in Torbat Heydariyeh, Iran, in 2018-2019. This cross-sectional study was performed on 250 medical records of patients with DM admitted to 9-Dey Education Hospital in this city. For this purpose, the demographic characteristics information, as well as the complications caused by DM, was extracted from the patients' medical records. The data were further analyzed using the SPSS Statistics software 20 including descriptive and analytic methods. The study results suggested that the most frequent DM-related complication was observed for circulatory system diseases (41.5%) and the least frequent one was about neurotic disorders (4%), respectively. There was also a significant relationship between the type of complication and the variables of gender, age, marital status, and type of DM ($p<0.05$). Nevertheless, no significant difference was found between the variable of the type of complication and the variables of occupation, place of residence, and fasting blood sugar levels. Ultimately, it was concluded that providing patients and their families with appropriate training could help them control blood sugar levels, which could significantly reduce DM-related complications.

Key words: Prevalence, Diabetes Mellitus, Diabetes Mellitus-Related Complications, Iran.

Introduction

Diabetes mellitus (DM), known as a chronic disease and a metabolic condition, is characterized by elevated levels of blood sugar, induced by insufficient production of insulin hormone by the pancreas or the inability of the body to exploit the insulin produced. Over the past few decades, the number of cases and the prevalence rates of DM have been steadily growing [1]. As well, the number of individuals with DM has increased from 108 million in 1980 to 422 million in 2014 and the majority of them have been living in low- and middle-income countries. Moreover, 6.1 million annual deaths have been directly attributed to DM, spreading up to 340 million people in 2025, as expected [1]. On the other hand, DM has been identified as the fifth cause of death and morbidity across the world [2].

The prevalence rate of DM in Iran is also relatively high (7.7%). According to the International Diabetes Federation (IDF), Iran is predicted to be among the countries with the highest prevalence rate of DM in the coming years [3]. Regarding the report released by the Research Institute for Endocrine Sciences at Shahid Beheshti University of Medical Sciences, Iran, at least two million people have been thus far affected with DM until 2019, and 200 thousand individuals are being added to these patients in this country each year [4,5]. The World Health Organization (WHO) has also estimated that the number of patients with DM in Iran will reach more than 6.4 million people by 2030 [6].

DM has been thus far grouped into three broad categories, including type I DM (T1DM), type II DM (T2DM), and gestational DM (GDM). T1DM is hereditary and it is the most common type of DM in children and adolescents [7]. This type of DM is also known as an autoimmune disease that mostly affects individuals aged 7-15 but there is the possibility of its incidence at any age [8,9]. Likewise, various genetic, environmental, and immunological factors contribute to the development of this disease [8]. As T1DM develops most often in children, this age group is involved with acute and chronic complications from an early age [10]. T2DM is also caused by insulin resistance and peripheral insulin deficiency, so both genetics and environment might play roles in its development [11]. This type of DM constitutes more than 90% of the types of DM [12]. The prevalence rate of DM all over the world among adults aged over 18 years has also amplified from 4.7% in 1980 to 8.5% in 2014 [13]. The prevalence of both types of DM across the world is additionally growing although it is more evident for T2DM than T1DM [14]. GDM is also caused by transient carbohydrate intolerance with different intensities, which is firstly initiated or diagnosed during pregnancy [15,16]. The prevalence rate of GDM is similarly mounting worldwide as one of the most common complications during pregnancy [17]. According to the estimates declared by the WHO, the prevalence rate of GDM in 2035 compared with its values in 2000 will compound by 1.5 times [18]. Accordingly, prevention and control of GDM at this time is a necessity because the abnormal rise in blood sugar levels can cause fetal and maternal diseases [5]. Among the most common neonatal complications are fetal macrosomia, metabolic disorders in neonates (e.g., hyperglycemia and hypoglycemia), hyperbilirubinemia, newborn respiratory distress syndrome (NRDS) [19], infant mortality [20], and abortion [21]. Therefore, women with GDM during pregnancy and their children are at risk of infection with DM and those living in developing countries require special care [22]. DM can thus make major changes in most organs of the body and even lead to early or late complications [23]. This condition can thus result in complications such as cardiovascular diseases (CVDs), nephropathy, neuropathy, sexual dysfunction, ischemic heart disease, hypertension, retinopathy, cataract, as well as frequent infections. About its complications, DM is also one of the major causes of disabilities such as blindness, kidney failure, coronary artery thrombosis, and the like [24,25]. Among the reasons for the escalating trend in DM are modifications in lifestyles, obesity, and declines in levels of physical activities [14]. Research evidence in this respect suggests that DM and its complications can be prevented by healthy diets, regular exercise programs, as well as controlled blood sugar, blood pressure, and triglyceride (TG) levels [26]. Given the prevalence of DM and its complications and the fact that no research had been conducted on the prevalence rate of DM in Torbat Heydariyeh, Iran, to the best of the authors' knowledge, this study aimed to examine DM-related complications in patients referred to hospitals in Torbat Heydariyeh, Iran, in 2018-2019, to propose appropriate strategies to control and prevent DM-related complications and to design more effective measures and training programs.

Materials and Methods

This cross-sectional study was fulfilled after making necessary coordination with Torbat Heydariyeh University of Medical Sciences and 9-Dey Education Hospital in Torbat Heydariyeh,

Iran, to access the medical records of the patients with DM in 2018-2019. A total number of 320 medical records of the patients admitted to this teaching hospital were accordingly reviewed and finally, 250 cases were studied due to incomplete information in some medical records. Information, including gender, type of DM, place of residence, marital status, length of stay, TG levels, blood pressure, CVDs, nephropathy, retinopathy and neuropathy was extracted from the patients' medical records and the related checklist was completed for each patient. To import and analyze the data, the SPSS Statistics software 20 was used. Then, descriptive parameters were reported in the form of frequency, percentage, and mean. The Chi-square test was also employed to examine the relationships between the variables of type of DM-related complication, age, occupation, marital status, gender, place of residence, type of DM, and fasting blood sugar levels. The analyses were finally completed at the significance level of 0.05.

Results and Discussion

In this study 250 patients were examined, 52.8% were female. As well, 90.4% of women were homemakers and 52.65 of men were self-employed. The majority of the patients (54.6%) were living in the city of Torbat Heydariyeh (men: 50.7% and women: 49.3%). In terms of marital status, 13.4% of patients were single, 81.8% were married, and 4.9% were widowed. Considering the type of DM, 93.2% of the patients suffering from T2DM, 51.1% of the cases were female and 48.9% of the individuals were male. And in T1DM including 76.5% of women and 23.5% of men. The length of stay was also between 1 and 22 days with a mean±standard deviation (SD) of 5.94±4.16. Of the 250 patients admitted, 76.8% of them had been treated but 8.8% of the individuals had expired. The most frequent DM-related complication diagnosed was circulatory system diseases (n=103, 41.5%) and the least frequent one was related to neurotic disorders (n=10, 4%).

There was also a significant relationship between the type of DM-related complications and the variables of gender, age, marital status, and type of DM ($p<0.05$). Nevertheless, no significant difference was found between the variable of the type of DM-related complication and occupation, place of residence, and fasting blood sugar levels.

The results of the present study indicated a higher prevalence rate of DM in women. In other surveys, e.g., Lee [27], the ratio of women to men with DM had been also reported by one in four. Najafipour et al. had correspondingly stated that DM in women had been more visible compared with that in men [28]. In another study, the high prevalence rate of T2DM in older men than their female peers had been associated with high levels of visceral fat in the elderly men than women [29]. Other studies had similarly shown that the male gender was a risk factor for DM [30,34]. Besides, some surveys had reported a higher prevalence rate of T2DM in men [37,35], but Ramachandran had found that the prevalence rate in both genders had not been significantly different [38]. These results could be attributed to some factors such as obesity and stress, as the most highlighted risk factors, which are more common in women. Many factors like differences in genetic and endocrine structures between the genders as well as discrepancies in biological factors, culture, lifestyle, and psychosocial state might be further responsible for differences between women and men with DM and its complications. Therefore, further studies on the pathophysiological mechanisms of gender specific DM and its complications can enhance self-care behaviors in people with DM in the future and increase awareness of the risk of infection in a particular gender. Therefore, biological factors such as genetic predisposition, sex hormones, and neural pathways as well as differences in behavior and environment between women and men need to be taken into account in novel treatments [39]. One of the major concerns in recent years has been the high prevalence of metabolic complications, especially DM because such complications cannot be treated, they even damage the organs of the body in affected patients, and cause serious health problems. In addition to work disabilities in patients, such complications bring about socioeconomic and emotional burdens [40]. In this regard,

approximately 40% of the total costs of DM in the United States have been directly related to hospitalization for the treatment and care of DM-related complications [41]. The given disease, as one of the cumbersome challenges facing public health in the world, is also accompanied by numerous chronic complications, including coronary artery disease, peripheral artery disease, and cerebral stroke, similarly described as macrovascular complications due to their closer associations with the mechanisms involved in atherosclerosis [42,43]. On the other hand, it has been characterized by diabetic microangiopathy or microvascular complications in the eye (retinopathy), the kidney (nephropathy), and the peripheral nervous system (neuropathy) [39,44].

In the present study, cardiovascular complications and neuropathy had the highest and the lowest frequencies. It should be noted that peripheral artery disease is caused by the narrowing of the blood arteries, whose risk of infection increases due to older age, duration of DM, and presence of neuropathy [42,45]. This complication was significantly higher in men than in women. The results of the survey by Ranjbar et al. had also demonstrated a higher percentage of this complication [46]. However, Abbassian et al. had obtained a relatively lower percentage (18.6) in this respect [47]. Besides, Deshpande et al. had found that CVDs especially in patients with ischemic heart disease and cerebral stroke had a 65% share in mortality and morbidity in patients with DM [48]. The data relating to the complications of CVDs associated with DM, from 1950 to 2003, for different populations, had further pointed to a dramatic reduction in the cardiovascular complications in patients with DM over time [49,50]. It seems that DM mitigates the protective effect of the female gender against CVDs and nephropathy, whereas the results of the present study reported the complications of peripheral vascular system at a significantly higher level in men compared with women, but no significant difference was observed between both genders in terms of nephropathy-related complications.

In the survey by Heshmati et al., the most frequent DM-related complication had been reported to be neuropathy [51], which was not in agreement with the present study. Pop-Busui had further noted that diabetic neuropathy had influenced more than 50% of all patients with DM [52]. Ashok and Dutta in their separate studies had also reported a small percentage of DM-related complications [53,54]. Another microvascular complication is also nephropathy that starts with microalbuminuria and then progresses to kidney failure. In a study in 2002, DM-related nephropathy included 44% of the new cases of end-stage renal disease (ESRD), so that 153,730 people with the ESRD caused by DM had undergone kidney transplants or had received treatments along with dialysis [48]. The prevalence rate of nephropathy in the present study was 40% and it was in second place in terms of complications. In the surveys by Abbassian et al., Shahbazian et al., Kalantar et al., a high prevalence rate of nephropathy-related complications had been additionally reported [47,55,56]. Raman et al. had correspondingly found a high prevalence of nephropathy [57]. In general, improvements in the control of blood sugar, blood pressure, and TG levels can reduce the risk of complications in individuals. As an example, in a person suffering from DM, complications can drop by 40% if there is a 1% reduction in the glycated hemoglobin (HbA1c). Lowering blood pressure by 10 mm Hg would further minimize the risk of developing any complication of DM by up to 12% and the control of serum TG levels can lessen the risk of developing cardiovascular complications up to 20-50%. To make it clear, better control of these risk factors in people with DM can lead to favorable results [48]. However, adopting healthy diets, doing regular exercise, and adhering to medication regimens can lead to controlled blood sugar, blood pressure, and TG levels, and sharply reduce the burden of DM-related complications in each country. As well, boosting the management of DM-related complications along with providing patients with better training in terms of disease management can significantly reduce mortality and morbidity caused by elevated blood sugar levels [58]. The use of standardized methods of reporting and treatment lists, meeting the extra needs of monitoring target

populations, providing feedback, supporting decision-making for clinical systems, and examining DM-related complications can thus increase further [59]. Although identifying the reasons for changes in the prevalence of complications in the population studied here and other different groups seems difficult, sensitivity to ethnicity, age, diagnostic methods practiced for DM-related complications, healthcare centers, and other risk factors can shape such differences. Providing a universal coverage of healthcare services, access to cost-effective medications, as well as early diagnosis and treatment of such complications can significantly diminish the economic burden of DM and highlight the need for a long-term strategy to minimize the burden of this condition and its complications [60].

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Footnotes

Authors' Contribution: Hamideh Hamidi Nasab, Sahar Rezvani and Fahimeh Bazyar collected data and Somaye Barzanouni analyzed the data. Nayreh Kasiri and Seyedeh Nahid Seyedhasani wrote the manuscript.

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References

1. world health organization. Diabetes [Internet]. Available from:https://www.who.int/health-opics/diabetes#tab=tab_1.
2. Metzger BE, Coustan DR. Summary and recommendations of the fourth international workshop conference on gestational diabetes mellitus. Diabetes Care. 1998;21(2):B161-7.
3. Ghannadiasl F. Food Insecurity Among Type 2 Diabetic Patients Referred To The Nutrition Clinic In Ardabil City. Iranian Journal of Diabetes and Metabolism. 2018;17(5):257-63.
4. Koshki F, Haroonrashidi H. Effectiveness of Mindfulness-based Stress Reduction Training on the Quality of Sleep and Psychological Distress in Patients with Type II Diabetes. J Diabetes Nurs. 2019;7(3):844-56.
5. Endocrinology and Metabolism Research Institute of Shahid Beheshti University of Medical Sciences. Familiarity with diabetes 2020 [Internet]. Available from: https://endocrine.ac.ir/article/%D8%A2%D8%B4%D9%86%D8%A7%DB%8C%DB%8C-%D8%A8%D8%A7-%D8%AF%DB%8C%D8%A7%D8%A8%D8%AA-2019.
6. Hedayati A, Gholampour Y, Dehghan A. The relation between sleep disorders and Hemoglobin A1c levels in patients with type II diabetes mellitus. Medical Journal Of Mashhad University Of Medical Sciences. 2016;59(3): 179-87.
7. Kermansaravi F, Navidian A, Ansarymoghadam A. Quality of Life in Type 1 Diabetic Adolescents in Zahedan (2011). IJEM. 2011,13(6):651-657.
8. Masoud AH, Keyhani AAH, Sheykh Bahaei N, Salehi I, Vojgani M, Rajab AE, et al. IL-12 gene polymorphism in type i diabetes melitus. Medical Journal Of Mashhad University Of Medical Sciences. 2007;50(97):283-6.
9. Behrman RE, Vaughan III VC. Nelson textbook of pediatrics: WB Saunders Company; 1983.
10. d'Annunzio G, Accogli A, Tallone R, Bolloli S, Lorini R. Environmental factors and type 1 diabetes mellitus in pediatric age group. Genes and Autoimmunity: Intracellular Signaling and Microbiome Contribution. InTech. 2013.
11. Kameswaran V, Bramswig NC, McKenna LB, Penn M, Schug J, Hand NJ, et al .Epigenetic regulation of the DLK1-MEG3 microRNA cluster in human type 2 diabetic islets. Cell metabolism. 2014;19(1):135-45.
12. Wu Y, Ding Y, Tanaka Y, Zhang W. Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention. Int. J. Med. Sci. 2014;11(11):1185-200.
13. Sarwar N GP, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio et al. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular disease: a collaborative meta-analysis of 102 prospective studies. Emerging Risk Factors Collaboration. Lancet 2010;26(375):2215-22.
14. Corriere M, Rooparinesingh N, Kalyani RR. Epidemiology of diabetes and diabetes complications in the elderly: an emerging public health burden. Current diabetes reports. 2013;13(6):805-13.
15. Cunningham F. leveno KL, Bloom SL, Hauth JC, Rouse DJ, Spong Cy. Williams obstetrics. McGraw Hill; 2010.
16. Fauci AS. Harrison's principles of internal medicine: McGraw-Hill. Medical Publishing Division; 2008.
17. Nguyen BT, Cheng YW, Snowden JM, Esakoff TF, Frias AE, Caughey AB. The effect of race/ethnicity on adverse perinatal outcomes among patients with gestational diabetes mellitus. Am J Obstet Gynecol. 2012;207(4):322.e1-6.
18. Hadden D. Geographic, ethnic, and racial variations in the incidence of gestational diabetes mellitus. Diabetes. 1985;34(Supplement 2):8-12.
19. Larijani BAF, Pajouhi M, Bastanhagh M, Marsosei V, Hossein Nejad A. Prevalence of gestational diabetes in women referring to Tehran University of Medical Sciences

hospitals (1993-1994). International Journal of Endocrinology and Metabolism. 1999;1(2):125-33.
20. Keshavarz M. Prevalence of gestational diabetes mellitus in Shahrud township. Journal of Mazandaran University of Medical Sciences. 2003;13(41):90-7.
21. Wu P, Velez Edwards DR, Gorrindo P, Sundermann AC, Torstenson ES, Jones SH, et al. Association between first-trimester antidepressant use and risk of spontaneous abortion. Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy. 2019;39(9):889-98.
22. Nimavat NK, Dadwani RS, Kartha GP. Prevalence of gestational diabetes mellitus and associated risk factors amongst antenatal women attending urban health center of Rajkot City ,Gujarat. International Journal of Community Medicine and Public Health. 2019;6(7):3033-7.
23. Azizi F, Hatami H, Janghorbani M. Epidemiology and control of common diseases in Iran. Tehran: Eshtiagh Publications; 2000.
24. Ahmadi A, Hasanzadeh J, Rahimi M, Lashgari L. Factors affecting the quality of life in patients with type 2 diabetes Chahar Mahal Bakhtiari. J North Khorasan Univ Med Sci. 2011;3(1):7-13.
25. Park K. Park's Textbook Preventive & Social Medicine. 2002.
26. Shi L, Shu XO, Li H, Cai H ,Liu Q, Zheng W, et al. physical activity, smoking, and alcohol consumption in association with incidence of type 2 diabetes among middle-aged and elderly Chinese men. PloS one. 2013;8(11):e77919.
27. Lee SC, Pu YB, Chow CC, Yeung V, Ko G, So WY, et al. Diabetes in Hong Kong Chinese: evidence for familial clustering and parental effects. Diabetes Care. 2000;23(9):1365-8.
28. Najafipour F, Azizi F, Zareizadeh M. The epidemiological study of type II diabetes family in Tehran. Iranian J of Diabetes and Lipid Disorders. 2004;4(1):35-42.
29. Nordström A, Hadrévi J, Olsson T, Franks PW, Nordström P. Higher prevalence of type 2 diabetes in men than in women is associated with differences in visceral fat mass. J Clin Endocrinol Metab. 2016;101(10): 3740-6.
30. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus—present and future perspectives. Nature reviews endocrinology. 2012;8(4):228-36.
31. Tracey M, McHugh S, Buckley C, Canavan R, Fitzgerald A, Kearney P. The prevalence of Type 2 diabetes and related complications in a nationally representative sample of adults aged 50 and over in the Republic of Ireland. Diabetic Medicine. 2016;33(4):441-5.
32. Wändell PE, Carlsson AC. Gender differences and time trends in incidence and prevalence of type 2 diabetes in Sweden—a model explaining the diabetes epidemic worldwide today?. Diabetes research and clinical practice. 2014;106(3):e90-e2.
33. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27(5):1047-53.
34. Sattar N. Gender aspects in type 2 diabetes mellitus and cardiometabolic risk. Best practice & research Clinical endocrinology & metabolism. Best Practice & Research Clinical Endocrinology & Metabolism. 2013;27(4):501-7.
35. Yang W, Lu J, Weng J, Jia W, Ji L, Xiao J, et al. Prevalence of diabetes among men and women in China. New England journal of medicine. 2010;362(12):1090-101.
36. Anjana R, Pradeepa R, Deepa M, Datta M, Sudha V, Unnikrishnan R, et al. Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase I results of the Indian Council of Medical Research–INdia DIABetes (ICMR–INDIAB) study. Diabetologia. 2011;54(12):3022-7.
37. Soriguer F, Goday A, Bosch-Comas A, Bordiú E, Calle-Pascual A, Carmena R, et al. Prevalence of diabetes mellitus and impaired glucose regulation in Spain: the Diabetes Study. Diabetologia. 2012;55(1):88-93.
38. Ramachandran A, Snehalatha C, Satyavani K, Sivasankari S, Vijay V. Cosegregation of obesity with familial aggregation of type 2 diabetes mellitus. Diabetes, Obesity and metabolism. 2000;2(3):149-54.
39. Barrett EJ, Liu Z, Khamaisi M, King GL, Klein R, Klein BE, et al. Diabetic microvascular disease: an endocrine society scientific statement. The Journal of Clinical Endocrinology & Metabolism. 2017;102(12):4343-410.
40. Mahlangu T, Dludla PV, Nyambuya TM, Mxinwa V, Mazibuko Mbeje SE, Cirilli I, et al. A systematic review on the functional role of Th1/Th ۲cytokines in type 2 diabetes and related metabolic complications. Cytokine. 2020;126:154892.
41. Zhang P, Engelgau MM, Norris SL, Gregg EW, Narayan KV. Application of economic analysis to diabetes and diabetes care. Annals of internal medicine. 2004;140 (11):972-7.
42. Fowler MJ. Microvascular and macrovascular complications of diabetes. Clinical diabetes. 2008;26(2): 77-82.
43. Mozaffarian D, Wu JH. Flavonoids, dairy foods, and cardiovascular and metabolic health: a review of emerging biologic pathways .Circulation research. 2018;122(2): 369-84.
44. Forbes JM, Cooper ME. Mechanisms of diabetic complications. Physiological reviews. 2013;93(1):137-88.
45. Copeland LA, Swendsen CS, Sears DM, MacCarthy AA, McNeal CJ. Association between triglyceride levels and cardiovascular disease in patients with acute pancreatitis. PloS One. 2018;13(1) :e0179998.
46. Ranjbar Omrani GH, Soveid M, Rajaii H, Sadegh AAS. The incidence of chronic diabetic complications during 12 years in patients referring to clinics of Shiraz University of Medical Sciences. 2004;3:127-34.
47. Abbasian M, Delvarianzadeh M. Evaluation of diabetes complications among the diabetic patients visiting the Shahroud diabetic's clinic. 2008.

48. Deshpande AD, Harris Hayes M, Schootman M. Epidemiology of diabetes and diabetes-related complications. Physical therapy. 2008;88(11):1254-64.
49. Fox CS, Coady S, Sorlie PD, Levy D, Meigs JB, D'Agostino RB, et al. Trends in cardiovascular complications of diabetes. JAMA. 2004;292(20):2495-9.
50. Booth GL, Kapral MK, Fung K, Tu JV. Recent trends in cardiovascular complications among men and women with and without diabetes. Diabetes Care. 2006;29(1):32-7.
51. Heshmati H, Behnampour N, Khorasani F, Moghaddam Z. Prevalence of chronic complications of diabetes and its related factors in referred type 2 diabetes patients in Freydonkenar diabetes center. Journal of Neyshabur University Of Medical Sciences. 2014;1(1):36-43.
52. Pop-Busui R, Boulton AJ, Feldman EL, Bril V, Freeman R, Malik RA, et al. Diabetic neuropathy: a position statement by the American Diabetes Association. Diabetes Care. 2017;40(1):136-54.
53. Ashok S, Ramu M, Deepa R, Mohan V. Prevalence of neuropathy in type 2 diabetic patients attending a diabetes center in South India. The Journal of the Association of Physicians of India. 2002;50(4):546-50.
54. Dutta A, Naorem S, Singh TP, Wangjam K. Prevalence of peripheral neuropathy in newly diagnosed type 2 diabetics. Int J Diab Dev Countries. 2005;25:30-3.
55. Shahbazian H. Roshan Pajoh F. The Prevalence of nephropathy in Early Diagnosis of type 2 diabetes in patients of diabetes clinic of Ahvaz. Jundishapur Univ Med Sci. 2006;3(50):600-7.
56. Kalantari F, Hovsepian S, Haghighi S, Amini M. The prevalence of cardiovascular risk factors in patients with type 1 diabetes in Isfahan, Iran. Iranian Journal of Diabetes and Metabolism. 2007;6(3):255-62.
57. Raman R, Gupta A, Krishna S, Kulothungan V, Sharma T. Prevalence and risk factors for diabetic microvascular complications in newly diagnosed type II diabetes mellitus. Sankara Nethralaya Diabetic Retinopathy Epidemiology and Molecular Genetic Study (SN-DREAMS, report 27). Journal of Diabetes and its Complications. 2012;26(2):123-8.
58. Gregg EW, Li Y, Wang J, Rios Burrows N, Ali MK, Rolka D, et al. Changes in diabetes-related complications in the United States, 1990–2010. New England Journal of Medicine. 2014;370(16):1514-23.
59. Harding JL, Pavkov ME, Magliano DJ, Shaw JE, Gregg EW. Global trends in diabetes complications: a review of current evidence. Diabetologia. 2019;62(1):3-16.
60. Pradeepa R, Mohan V. Prevalence of type 2 diabetes and its complications in India and economic costs to the nation. European journal of clinical nutrition. 2017;71(7):816-24.