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The prevalence of hypertension in diabetic patients in Iran; a systematic review and meta-analysis

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ABSTRACT

Context: Hypertension is one of the most important issues in advanced and developing countries and is prevalent in diabetic patients. The present study was aimed at estimating the prevalence of hypertension in diabetic patients in Iran through meta-analysis.

Evidence Acquisitions: The search was carried out using authentic Persian and English keywords in national and international databases including IranMedex, SID, Magiran, IranDoc, Medlib, ScienceDirect, PubMed, Scopus, Cochrane, Embase, Web of Science, Medline and Google Scholar search engine without any time limitation until 2017. Heterogeneity of studies was assessed using I^2 indexes. Data were analyzed using STATA software version 11.1.

Results: In 32 reviewed studies with a sample of 34714 subjects, the prevalence of hypertension in Iranian diabetic patients was 51% (95% CI, 43%-60%). The prevalence of hypertension was 55% in type I diabetics and 53% in type II diabetic patients. Meta-regression showed that there was no significant relationship between the prevalence of hypertension in diabetic patients with the sample size and year of study.

Conclusions: About half of the diabetic patients in Iran suffer from hypertension. Patients with type 1 diabetes suffer from hypertension 2% more than type 2 diabetes patients. The prevalence of hypertension in diabetic patients in Iran has not significantly decreased over the past years and diabetic patients in northern Iran are more likely to have hypertension than other parts of the country.

Implication for health policy/practice/research/medical education:
The prevalence of hypertension is high in diabetic patients in Iran. Half of diabetic patients suffer from hypertension, which is more common in type 1 diabetic patients than in type 2 diabetic patients (2% difference). Moreover, diabetic patients in the North of Iran suffer from hypertension more than patients in other regions of Iran.

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1. Context

Chronic diseases are one of the most important health problems in the world, affecting the economic, social situation and quality of life in patients (1-5). High blood pressure is one of the most common circulatory disorders, which is a global problem, and is a common, asymptomatic disease, often called "silent killer" (6-8). The World Health Organization (WHO) estimates that

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at least 1 billion people in the world have hypertension and about 1.7 million people die each year because of this disease (9). The highest acceptable blood pressure level in healthy people is 140/90 mm Hg, and according to the WHO, systolic hypertension is blood pressure above 140 mmHg and diastolic hypertension is blood pressure above 90 mm Hg (6-8).

One of the most important causes of death in the world is cardiovascular diseases, among which the causes of these diseases, blood pressure and diabetes are known as the major risk factors for these diseases (10-13). Diabetes refers to a set of disorders in carbohydrate, fat, and protein metabolism by the lack of insulin secretion or decreased sensitivity of the tissues to insulin (14).

Diabetes is a multifactorial disease, and it seems that genetic and environmental factors are involved in the disease (15). Type 2 diabetes is one of the major health problems in the world, which is rising rapidly in most parts of the world, and it is predicted that more than 592 million people will suffer from diabetes by 2035 (16-18). This is the most common type of diabetes in the whole world and accounts for about 90% of diabetics (10, 19, 20). According to a study, the prevalence of type 1 diabetes is also found to be about 0.3 among people aged 30 or below (21, 22).

The prevalence of hypertension in the 18-74-year-old American population was 29.7% (23), in French men was 37.9% and in French women was 22.2% (24), and in Canadian men and women was 16% and 13%, respectively (25). According to a study by Azizi et al in Tehran, the prevalence of hypertension in the age group of 20-29 years was 6.6% in men and 3.3% in women and in the age group of 60-69 years, it was 62.2% in women and 47.3% in men (26). Considering that various studies in Iran which have reported different statistics ranging from 8% to 85% for the prevalence of hypertension in diabetic patients, the need for a meta-analysis study seems necessary.

2. Evidence Acquisitions

2.1. Search strategy

The present research is a meta-analysis that studies the prevalence of hypertension in diabetic patients in Iran. To have access to the relevant Persian and English articles, Persian language databases such as IranMedex, SID, Magiran, IranDoc, Medlib and English language databases such as ScienceDirect, PubMed, Scopus, Cochrane, Embase, Web of Science, Medline were searched using Persian keywords and their English equivalent (Iran, Meta-analysis, Diabetic patients and hypertension), independently by two researchers. In order to finalize the search, keywords were also searched in Google Scholar search engine without time limit until 2017. It should be noted that the keywords were also searched in combined forms using OR/AND operators.

2.2. Selection of articles

All studies that reported the prevalence of hypertension in diabetic patients entered the study. To assess the quality of studies, the preferred reporting items for systematic review and meta-analysis (PRISMA) (27) checklist were used.

2.3. Data extraction

To reduce the reporting bias and error in data collection, two researchers independently extracted data from articles and extracted data into a checklist containing the following items; first author's name, title of the study, sample size, year and place of research, the prevalence of hypertension in diabetic patients, type of diabetic disease and body mass index (BMI).

2.4. Statistical analysis

To analyze and combine the results of various studies, the prevalence of hypertension in diabetic patients in each study was considered as a binomial distribution probability and its variance was calculated by binomial distribution. Heterogeneity of studies was evaluated using Q-test and I^2. Considering the heterogeneity of the studies, the random effects model was used to combine the results of various studies. The data were analyzed using STATA version 11 software and the significance level of the test was considered 0.05.

Meta-regression was used to investigate the relationship between the prevalence of hypertension in diabetic patients and the sample size and year of research. Sensitivity analysis was used to determine whether the omission of each study had any effect on the final meta-analysis.

3. Results

3.1. Summary of how to enter articles into meta-analysis process

Around 136 articles were found in the first step of the search, and 71 duplicate and overlapping articles were omitted after reviewing the titles. About 23 non-related articles were deleted due to non-compliance with the studied criteria. Abstracts of 42 possibly related articles were investigated and 10 articles were deleted due to incomplete information and lack of access to the full text. Finally, 32 papers were selected to enter the meta-analysis stage (Figure 1; Table 1).

In 32 articles with a sample size of 34714 people, the

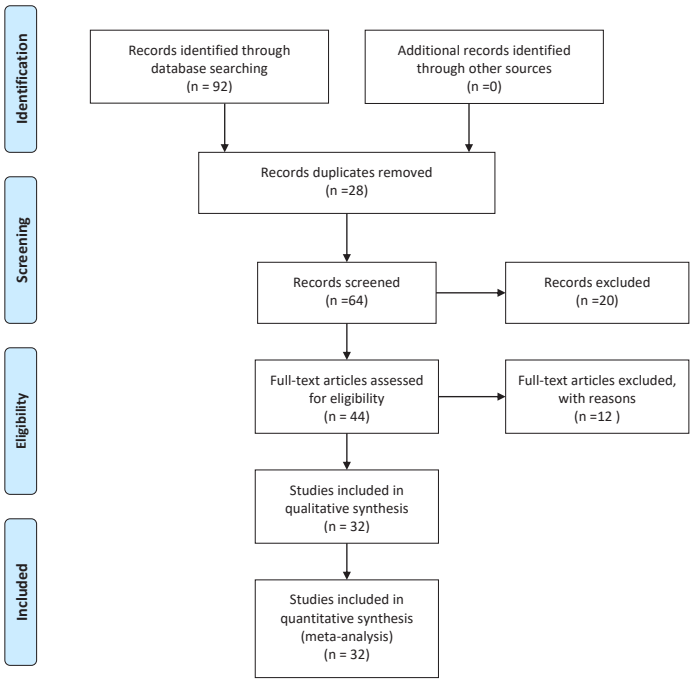

Figure 1. Flow Diagram of studies.

prevalence of hypertension in diabetic patients in Iran was 51% (95% CI: 43%-60%). The lowest and highest prevalence of hypertension in diabetic patients were in the study of Tabib et al (8%) (28), and Akbarpour et al (85%) (29), respectively. Given the heterogeneity of studies, the confidence interval for each study based on the random effects model is presented in Figure 2.

The prevalence of hypertension in patients with type 1 diabetes was 55% (95% CI: 29% - 81%) and in patients with type 2 diabetes was 53% (95% CI: 45%-61%). Therefore, hypertension was more visible in type 1 diabetes. In an analysis based on the age group, the prevalence of hypertension in patients aged 10-19 years old was 43% (95% CI: 35%-51%), in patients aged 20-29 years old was 77% (95% CI: 71%-83%), in patients aged 30-39 years old was 8% (95% CI: 4%-12%), in patients aged 40-49 years old was 33% (95% CI: 26%-40%), in patients aged 50-59 years old was 50% (95% CI: 43%-57%) and in patients aged 60-69 years old was 56% (CI 95%: 15%-98%).

The prevalence of hypertension in diabetic patients in the North of Iran was 59% (95% CI: 42% -75%), in the center was 44% (95% CI: 35%-53%), in the West was 51% (95% CI: 41%-60%) and in the East was 49% (95% CI: 40%-58%), and no study was conducted in the South of Iran. The highest and lowest prevalence of hypertension in diabetic patients were in the North and center of Iran, respectively.

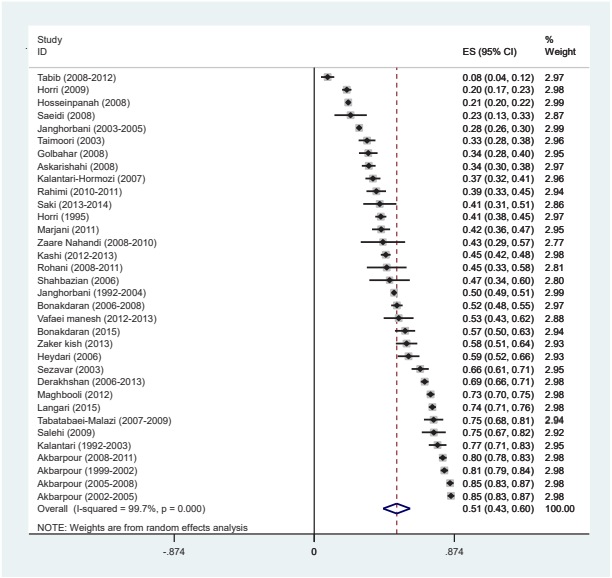

Figure 2. The prevalence of hypertension in diabetic patients in Iran and its 95% CI based on the author's name and years of research according to the random effects model. The midpoint of each section indicates the prevalence of hypertension in diabetic patients in each study. The lozenge shape shows the prevalence of hypertension in diabetic patients in Iran for all studies.

In Figure 3, meta-regression showed there was no significant relationship between the prevalence of hypertension in diabetic patients and the number of research samples (P = 0.470). In Figure 4, there was no significant relationship between the prevalence of

Table 1. Specifications of the articles that entered the meta-analysis step

Author	Age	Year	City	Type of diabetes	Sample size	Prevalence of hypertension (%)
Horri et al (30)	-	1995	Esfahan	Type 2 diabetes	770	41.5
Saeidi et al (31)	58.36±11.46	2008	Tehran	Type 2 diabetes	66	22.7
Taimoori et al (32)	-	2003	Esfahan	Type 2 diabetes	310	32.9
Sezavar et al (33)	28-80	2003	Ardebil	Type 2 diabetes	300	66.1
Shahbazian et al (34)	-	2006	Ahvaz	Type 2 diabetes	60	47
Horri et al (35)	60.29	2009	Esfahan	Type 2 diabetes	738	20.3
Golbahar et al (36)	56	2008	Shiraz	Type 2 diabetes	254	33.7
Janghorbani et al (37)	43	2003-2005	Esfahan	Type 2 diabetes	3396	28
Heydari et al (38)	52.39	2006	Esfahan	Type 2 diabetes	200	58.8
Rohani et al (39)	13	2008-2011	Tehran	Type 1 diabetes	62	45.2
Saki et al (40)	12.38	2013-2014	Shiraz	Type 1 diabetes	87	40.9
Zaare Nahandi et al (41)	45.43	2008-2010	Tabriz	Type 2 diabetes	49	42.9
Maghbooli et al (42)	58.48	2012	Tehran	Type 2 diabetes	1228	72.6
Vafaei manesh et al (43)	48.18	2012-2013	Qom	Type 2 diabetes	110	52.7
Bonakdaran et al (44)	54.8	2015	Mashhad	Type 2 diabetes	235	56.7
Akbarpour et al (29)	>20	1999-2002	Tehran	Type 2 diabetes	1045	81.2
Akbarpour et al (29)	>20	2002-2005	Tehran	Type 2 diabetes	1045	85.3
Akbarpour et al (29)	>20	2005-2008	Tehran	Type 2 diabetes	1045	84.8
Akbarpour et al (29)	>20	2008-2011	Tehran	Type 2 diabetes	1045	80.2
Kashi et al (45)	54.4	2012-2013	Sari	Type 2 diabetes	1021	44.6
Askarishahi et al (46)	55	2008	Yazd	Type 2 diabetes	459	34
Tabib et al (28)	32.17	2008-2012	Tehran	Diabetics	170	8.3
Bonakdaran et al (47)	52.7	2006-2008	Mashhad	Type 2 diabetes	752	51.6
Tabatabaei-Malazi et al (48)	67.31	2007-2009	Tehran	Diabetics	200	74.5
Salehi et al (49)	61	2009	Tehran	Type 2 diabetes	130	74.6
Derakhshan et al (50)	53.8	2006-2013	Rafsanjan	Type 2 diabetes	1392	68.9
Marjani et al (51)	53.11	2011	Gorgan	Type 2 diabetes	293	41.7
Hosseinpanah et al (52)	41.7	2008	Tehran	Diabetics	8212	21.2
Amini et al (53)	48.9	2001-2004	Esfahan	Type 2 diabetes	710	-
Kalantari et al (54)	22.5	1992-2003	Esfahan	Type 1 diabetes	219	77
Kalantari-Hormozi et al (55)	51	2007	Shiraz	Type 2 diabetes	400	36.6
Langari et al (56)	55.1	2015	Sari	Type 2 diabetes	1500	73.7
Janghorbani et al (57)	52	1992-2004	Esfahan	Type 2 diabetes	9889	49.8
Rahimi et al (58)	54.37 ±9.75	2010-2011	Kerman	Type 2 diabetes	248	38.7
Zaker Kish et al (59)	55.52 ±10.32	2013	Ahvaz	Diabetics	209	57.6

hypertension in diabetic patients and the year of study (P = 0.413).

4. Discussion

The prevalence of hypertension is quite diverse in different regions of a country and in different countries (60). In Mashhad, the prevalence of hypertension in diabetic patients was 51.6% (61). In the study of Safaee et al, the prevalence in diabetic patients in Isfahan was 56.2% (62). In a study by Kalantari et al on type 1 diabetic patients, the prevalence of hypertension was 7.7% (54). Considering the fact that in Iran there are different statistics on the prevalence of hypertension in diabetic patients, performing a meta-analysis seems necessary. According to 32 reviewed articles (1992-2017), the prevalence of hypertension in diabetic patients in Iran was 51% (55% in patients with type 1 diabetes and 53% in patients with type 2 diabetes). According to the statistics reported in the seventh report of the blood pressure monitoring committee, Chobanian et al estimated that 50% of diabetic patients had hypertension (6). That is consistent with our study.

In Figure 4, meta-regression showed that the prevalence of hypertension in diabetic patients did not significantly decrease over the last few years. Sensitivity analysis also showed that the prevalence of hypertension in diabetic patients in Iran decreased to 50.39 (95% CI: 42.99%-59.58%) by eliminating the study of Akbarpour et al (29), and increased to 52.75 (95% CI: 44.29% - 61.21%) by eliminating the study of Tabib et al (28). According to the result of the final meta-analysis, these two studies were the most effective ones.

According to the results of the American Diabetes Association, the prevalence of hypertension in diabetic

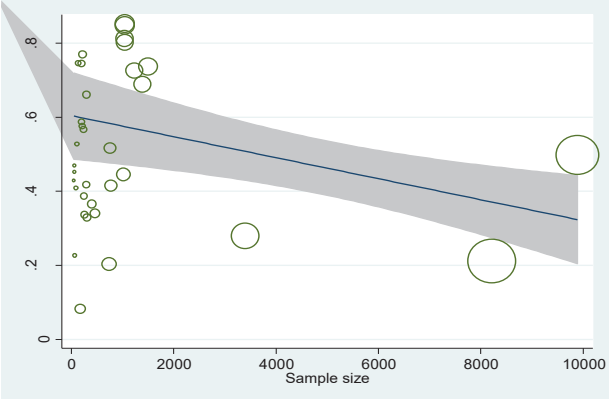

Figure 3. Relationship between the prevalence of hypertension in diabetic patients in Iran and number of research samples using meta-regression.

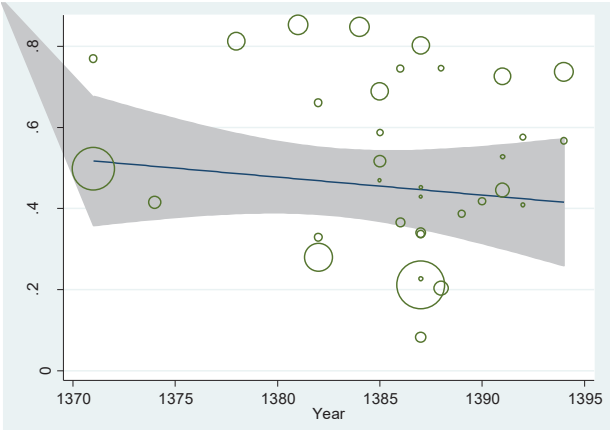

Figure 4. Relationship between the prevalence of hypertension in diabetic patients in Iran and the year of the study using meta-regression.

patients in 2003 was reported to be 20% to 60% (63). In a study conducted in Mexico, the incidence of hypertension in diabetic patients was 4.36 people per year and the 5-year incidence was 40% (64). In another study in Tanzania in 1995, the prevalence of hypertension in people with type 2 diabetes was 25.4% over the past 5 years (65). In a study conducted by Al-Maskari et al in 2004 in the United Arab Emirates, the prevalence of hypertension in diabetic patients was reported to be 34.9% (66). The prevalence of hypertension in Jordanian diabetic patients was 70.6% (67). In another study in Europe, 10% of all people with type 1 diabetes were diagnosed with hypertension (68). The prevalence of hypertension in diabetic patients in Iran is higher than that of diabetic patients in Mexico, Tanzania, the United Arab Emirates and Europe.

5. Study limitations

Insufficient data in some articles, lack of uniform distribution of studies in different regions of Iran. Some studies were conducted among diabetic patients and healthy subjects and the ones that did not report the prevalence of hypertension in the two groups were excluded.

6. Conclusions

The prevalence of hypertension is high in diabetic patients in Iran. Half of diabetic patients suffer from hypertension, which is more common in type 1 diabetic patients than in type 2 diabetic patients (2% difference). Moreover, diabetic patients in the North of Iran suffer from hypertension more than patients in other regions of Iran.

Authors' contribution

All the authors have contributed towards performing the study and preparation of the manuscript and they all have approved the latest version of the article.

Conflicts of interest

The authors declare no conflict of interest.

Ethical considerations

Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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References

1. Hasanpour Dehkordi A, Khaledi-Far A, Khaledi-Far B, Salehi-Tali S. The effect of family training and support on the quality of life and cost of hospital readmissions in congestive heart failure patients in Iran. Appl Nurs Res. 2016;31:165-9. doi: 10.1016/j.apnr.2016.03.005.
2. Solati K, Mousavi M, Kheiri S, Hasanpour-Dehkordi A. The effectiveness of mindfulness-based cognitive therapy on psychological symptoms and quality of life in systemic lupus erythematosus patients: a randomized controlled trial. Oman Medical Journal. 2017;32(5):378. doi: 10.5001/omj.2017.73.
3. Dehkordi AH, Solati K. The effects of cognitive behavioral therapy and drug therapy on quality of life and symptoms of patients with irritable bowel syndrome. J Adv Pharm Technol Res. 2017;8(2):67. doi: 10.4103/japtr.JAPTR_170_16
4. Soleimani F, Motaarefi H, Hasanpour-Dehkordi A. Effect of sleep hygiene education on sleep quality in hemodialysis patients. J Clin Diagn Res. 2016;10(12):LC01. doi: 10.7860/JCDR/2016/19668.8941

5. Parvareh M, Dehkordi AH, Sayehmiri K, Moghimbeigi A. Prevalence of depression among iranian elderly: systematic review and meta-analysis. Iranian Journal of Psychiatry. 2018;13(1):55.
6. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. The Seventh report of the joint national committee on prevention, detection, evaluation and treatment of high blood pressure: the JNC 7 report. JAMA. 2003;289(19):2560-72. doi: 10.1001/jama.289.19.2560
7. Duda RB, Kim MB, Darko R, Adanu RM, Seffah J, Anarfi J, et al. Results of the Women's Health Study of Accra: assessment of blood pressure in urban women. Int J Cardiol. 2007;117(1):115-22. doi:10.1016/j.ijcard.2006.05.004.
8. Delavari A, Mahdavi-hazaveh A, Nowrozinejad A. Planning of diabetes control in Iran. Tehran: Ministry of Health & Medical Education, undersecretary for health disease management center. 2005:24-30.
9. WHO. Reducing risks, promoting healthy life. Geneva, Switzerland Avariable from URL:World Health Organization http://www who int/whr/2002/en. 2002.
10. Papadopoulou-Marketou N, Paschou SA, Marketos N, Adamidi S, Adamidis S, Kanaka-Gantenbein C.Diabetic nephropathy in type 1 diabetes. Minerva Med. 2017 Dec 4. doi: 10.23736/S0026-4806.17.05496-9.
11. Deedwania PC. Diabetes is an independent risk factor for heart failure among community dwelling older adults. J Am Coll Cardiol. 2010;55(10):312-32.
12. Barrett -Connor E, Suarez L, Khaw K, Criqui MH, Wingard DL. Ischemic heart disease risk factors after age 50. J Chronic Dis. 1984;37(12):903-8.
13. Chae CU, Pfeffer MA, Glynn RJ, Mitchell GF, Taylor JO, Hennekens CH. Increased pulse pressure and risk of heart failure in the elderly. JAMA. 1999;281(7):634-9. doi: 10.1001/jama.281.7.634.
14. Papadopoulou-Marketou N, Chrousos GP, Kanaka-Gantenbein C.Diabetic nephropathy in type 1 diabetes: a review of early natural history, pathogenesis, and diagnosis. Diabetes Metab Res Rev. 2017;33(2). doi: 10.1002/dmrr.2841.
15. Stumvoll M, Goldstein BJ, van Haeften TW. Type 2 diabetes: principles of pathogenesis and therapy. Lancet. 2005;365(9467):1333- 46. doi: 10.1016/S0140-6736(05)61032-X.
16. van Dieren S, Beulens JW, van der Schouw YT, Grobbee DE, Neal B. The global burden of diabetes and its complications: an emerging pandemic. Eur J Cardiovasc Prev Rehabil. 2010;17:S3-8. doi: 10.1097/01.hjr.0000368191.86614.5a.
17. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, et al. Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group (Blood Glucose). National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. Lancet. 2011;378(9785):31-40. doi: 10.1016/S0140-6736(11)60679-X.
18. Kim JH, Kim DJ, Jang HC, Choi SH. Epidemiology of micro- and macrovascular complications of type 2 diabetes in Korea. Diabetes Metab J. 2011;35(6):571-7. doi: 10.4093/dmj.2011.35.6.571.
19. Zimmet P, Alberti KG, Shaw J. Global and Societal Implications of the Diabetes Epidemic. Nature. 2001;414(6865):782-7. doi:10.1038/414782a.
20. King H, Aubert R, Heman WH. Global Burden of Diabetes: Prevalence Numerical Estimates and Projections. Diabetes Care. 1998;21(9):1414-31.
21. Achenbach P, Bonifacio E, Koczwara K, Ziegler AG.Natural history of type 1 diabetes. Diabetes. 2005;54 Suppl 2:S25-31.
22. Silink M. Childhood diabetes: a global perspective. Horm Res. 2002;57(1):1-5. doi: 10.1159/000053304.
23. Kearney PM, Whelton M, Reynolds K, Whelton P, He J. World wide prevalence of hypertension: a systematic review. J Hypertens. 2004;22(1):11-9.
24. Asmar R, Vol S, Pannier B, Brisac AM, Tichet J, El Hasnaoui A. High blood pressure and associated cardiovascular risk factors in France. J Hypertens. 2001;19(10):1727-32.
25. Joffres MR, Hamet P, Rabkin SW, Gelskey D, Hogan K, Fodor G. Prevalence, control and awareness of high blood pressure among Canadian adults. Canadian Heart Health Surveys Research Group. CMAJ. 1992;146(11):1997-2005.
26. Azizi F, Ghanbarian A, Madjid M, Rahmani M. Distribution of blood pressure and prevelance of hypertension in Tehran adult population. J Hum Hypertens. 2002;16(5):305-12. doi:10.1038/sj.jhh.1001399.
27. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, al el. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev. 2015;4(1):1. doi: 10.1186/2046-4053-4-1.
28. Tabib A, Shirzad N, Sheikhbahaei S, Mohammadi S, Qorbani M, Haghpanah V, et al. Cardiac Malformations in Fetuses of Gestational and Pre Gestational Diabetic Mothers. Iran J Pediatr. 2013;23 (6):664-8.
29. Akbarpour S, Jahangiri Noudeh Y, Lotfaliany M, Zafari N, Khalili D, Tohidi M, et al. Trends in Anthropometric Indexes, Blood Pressure, Smoking and Lipids Over a Decade in Diabetic and Non-Diabetic Populations: Tehran Lipid and Glucose Study. Iran J Epidemiol. 2015;11(2):23-36.
30. Amini M, Horri N, Farmani M, Hassan Zadeh A. Annual and 5-year incidence rate of hypertension in type 2 diabetic patients. Iran J Endocrinol Metab. 2002;4 (3):173-7.
31. Saeidi M. Metabolic Syndrome and Hypertension in Diabetic Patients. Iran J Endocrinol Metab. 2009;11 (1):11-6.
32. Teimoori A, Behrouz Z, Amini M. The Prevalence Of

Hypertension And Dyslipidemia In Newly Diagnosed Patints With Type 2 Diabetes Mellitus. J Diabetes Metab Disord. 2004;4(1):99-103.
33. Sezavar H, Abbaszadeh L, Hosseinian A, Iranparvar M, Khodamoradzadeh M. A Survey on Hypertension Controlling in Type II Diabetic Patients Referring to Diabetes Clinic of Bou-ali Hospital, Ardabil. J Ardabil Univ Med Sci. 2003;3(3):27-32.
34. Shahbazian H, Roshan pazhooh F, Shahbazian H. A Survey on the Prevalence of Diabetic Nephropathy among Newly Diagnosed Type 2 Diabetes Patients Referring to Ahwaz University Diabetes Centre. Jundishapur Sci Med J. 2006;5(3):590-5.
35. Horri N, Farmani M, Ghassami M, Haghighi S, Amini M. Visual acuity in an Iranian cohort of patients with type 2 diabetes: the role of nephropathy and ischemic heart disease. J Res Med Sci. 2011;16(1):419–26.
36. Golbahar J, Rahimi M, Tabei M, Aminzadeh M. Clinical risk factors and association of hyperhomocysteinemia with diabetic retinopathy in Iranian type 2 diabetes patients A cross-sectional study from Shiraz, Southern Iran. Diabetes Metab Syndr Clin Res Rev. 2008;2(3):192-201.
37. Janghorbani M, Amini M. Low density lipoprotein cholesterol and metabolic syndrome in an Iranian high-risk population. Diabetes Metab Syndr. 2015;9(2):91-7.
38. Heydari I, Radi V, Razmjou S, Amiri A. Chronic complications of diabetes mellitus in newly diagnosed patients. Int J Diabetes Mellitus. 2010;2(1):61-3.
39. Rohani F, Hooman N, Moradi S, Mobarra M, Najafizadeh M, Tatarpoor P. The Prevalence of Pre-hypertension in Children with Type 1 Diabetes Mellitus. Int J Prev Med. 2014;5(1):44-9.
40. Saki F. Prevalence of Metabolic Syndrome in Children With Type 1 Diabetes in South of Iran. J Compr Ped. 2016;7(3):e37703. doi: 10.17795/compreped-37703.
41. Zaare Nahandi M, Khoshbaten M, Ramazanzadeh E, Abbaszadeh L, Javadrashid R, Masnadi Shirazi K, et al. Effect of non alcoholic fatty liver disease on carotid artery intima-media thickness as a risk factor for atherosclerosis. Gastroenterol Hepatol Bed Bench. 2014;7(1):55-62.
42. Maghbooli Z, Pasalar P, Keshtkar A, Farzadfar F, Larijani B. Open Access Predictive factors of diabetic complications: a possible link between family history of diabetes and diabetic retinopathy. J Diabetes Metab Disord. 2014;13(1):55.
43. Vafaeimanesh J, Raei 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.
44. Bonakdaran S, Shoeibi N. Is there any correlation between vitamin D insufficiency and diabetic retinopathy? Int J Ophthalmol. 2015;8(2):326-31. doi: 10.3980/j.issn.2222-3959.2015.02.20.
45. Kashi Z, Bahar A, Akha O, Sharif F, Kosaryan M, Jalalian R, et al. Ischemic Heart Disease and Related Factors in Patients with Diabetes Mellitus Type II. J Mazandaran Univ Med Sci. 2015;25 (129):9-16.
46. Askarishahi M, Hajizadeh E, Afkhami Ardekani M, Manaviat M. Estimate of the diabetic retinopathy hazard rates in type 2 diabetic patients with current status data. Int J Diabetes Dev Ctries. 2012;32(4):203-8.
47. Bonakdaran S, Ebrahimzadeh S, Noghabi S. Cardiovascular disease and risk factors in patients with type 2 diabetes mellitus in Mashhad, Islamic Republic of Iran. East Mediterr Health J. 2011;17(9):640-6.
48. Tabatabaei- Malazy O, Peimani M, Heshmat R, Pajouhi M. Status of diabetes care in elderly diabetic patients of a developing country. J Diabetes Metab Disord. 2011;10:1-8.
49. Salehi N, Hanifi Z, Khaleghparast S, Ghadrdoost B, Zafari nobari S, Vakili zarch A. Prevalence of obesity and diabetes in coronary artery disease. Heart J. 2011;12 (3):37-9.
50. Derakhshan R, khoshnood A, Balaee P. Evaluation of Abdominal Obesity Prevalence in Diabetic Patients and Relation with Other Factors of Metabolic Syndrome. Iran J Endocrinol Metab. 2010;12 (3):208-12.
51. Marjani A, Shirafkan A. The metabolic syndrome in type 2 diabetic patients in Gorgan: According to NCEP ATPIII and IDF definitions. Diabetes Metab Syndr. 2011;5(4):207-10. doi: 10.1016/j.dsx.2012.02.009.
52. Hosein Panah F. Identification of isolated glucose impairment using common clinical data: Tehran lipid and glucose study. Iran J Endocrinol Metab. 2008;10(5):423-33.
53. Amini M, Aminorroaya A, Safaei H, Behrooz Z, Teimori A. Prevalence Of Diabetic Retinopathy In Newly Diagnosed Type 2 Diabetic Patients In Isfahan, Iran. Acta Endocrinologica (Buc). 2008;4(4):415 - 23.
54. Kalantari F, Hovsepian S, Haghighi S, Amini M. The Prevalence Of Cardiovascular Risk Factors In Patients With Type 1 Diabetes In Isfahan, Iran. Iran J Diabetes Lipid Disord. 2007;6(3):255-62.
55. Kalantarhormozi MR, Siadatan SJ, Aria A, Dabbaghmanesh MH, Shams M, Sadeghalvad A, et al. Risk Factors Of Diabetic Mellitus In Shiraz City, 2007. Iran J Diabetes Met. 2007;7(2):159-66.
56. Kashi Z, Abediankenari S, Bahar A. ABO and Rh Blood Groups in Type 2 Diabetes Mellitus, North of Iran. J Mazandaran Univ Med Sci 2016;26(143):101-7.
57. Janghorbani M, Amini M. Metabolic syndrome in type 2 diabetes mellitus in isfahan, iran: prevalence and risk factors. Metab Syndr Relat Disord. 2007 5(3):243-54. doi: 10.1089/met.2005.0010.
58. Rahimi N, Gozashti M, Marefati H, Rahnama K, Aghaei I, Moosazadeh M. Prevalence of Cardiovascular Risk Factors in Diabetic Patients and its Relationship with

Opium Consumption. Jour Guilan Uni Med Sci. 2014;22 (88):49-57.
59. Zakerkish M, Rahimi N, Marefati H, Kovsarian Z. Prevalence of Cardiovascular Risk factors in Diabetic Patients Attending to Ahvaz Golestan Hospital. Jundishapur Sci Med J. 2013;12 (5):485-96.
60. The Lyons Group for the Campaign against Hypertension. Evaluation of subjects initially hypertensive. By the Lyons Cooperative Group in the Campaign against Hypertension. Arch Mal Coeur Vaiss. 1982;75:31-6.
61. Bonackdaran S, Taghavi M. Cardiovascular risk factors in patients with type 2 diabetes in Mashhad City. Iran J Endocrinol Metab. 2010;12(1):1-6.
62. Adler AI, Stratton IM, Neil HA, Yudkin JS, Matthews DR, Cull CA, et al. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. BMJ. 2000;321(7258):412-9.
63. Association AD. Treatment of hypertension in Adults with diabetes. Clin Diabetes. 2003;21 (3):122-27.
64. Arauz- Pacheco C, Parrott MA, Raskin P. The treatment of hypertension in adult patients with diabetes. Diabetes Care. 2002;25(1):134-47. doi: 10.2337/diacare.25.1.134.
65. Mugusi F, Ramaiya KL, Chale S, Swai AB, McLarty DG, Alberti KG. Blood pressure changes in diabetes in urban Tanzania. Acta Diabetol. 1995;32(1):28-31.
66. Al-Maskari F, El- Sadig M, Norman JM. The prevalence of macrovascular complications among diabetic patients in the United Arab Emirates. Cardiovasc Diabetol. 2007;6:24. doi: 10.1186/1475-2840-6-24.
67. Al- Amer RM, Khader Y, Malas S, Abu -Yghi N, Al-Bdour M, Ajlouni K4. Prevalence of risk factors of diabetic retinopathy among Jordanian patients with type 2 diabet. Digit J Ophthalmol. 2008;14(2):42-9. doi: 10.5693/djo.01.2008.013.
68. Koivisto VA, Stevens LK, Mattock M, Ebeling P, Muggeo M, Stephenson J, et al. Cardiovascular disease and its risk factors in IDDM in Europe. EURODIAB IDDM Complications Study Group. Diabetes Care. 1996;19(7):689-97. doi: 10.2337/diacare.19.7.689.