



Presentation and character for adult patients with diabetes in Libya

Samia A. Elmiladi  

National Diabetes Hospital, Faculty of Medicine, University of Tripoli, Tripoli, Libya

Received: 13-01-2022, Revised: 12-02-2022, Accepted: 04-03-2022, Published: 31-03-2022

Copyright © 2022 Elmiladi SA. This is an open access article distributed under the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

HOW TO CITE THIS

Elmiladi SA (2022) Presentation and character for adult patients with diabetes in Libya.
Mediterr J Pharm Pharm Sci. 2 (1): 83 - 90. <https://doi.org/10.5281/zenodo.6399891>

Keywords: Body mass index, diabetes mellitus, Libya, pre-diabetes, hypertension

Abstract: Diabetes is a global issue, the diabetes epidemic is expected to continue, and the burden of diabetes causes catastrophic expenditure for healthcare system. The current study aimed to determine the presentation, the clinical feature and cardio-vascular risk factors in patients with diabetes. A retrospective observational study had been conducted in out-patients department at Almustaqqal Almosherq Centre during September, 2013 till September, 2020, the total number of attended out-patients department were 1 024, 820 patients who were selected for this study. A special perform was completed for every patient, which included details about patient's demographics, points in clinical history, relevant investigations and clinical examinations were recorded. The study reported that out of 820 patients, 66.0% (n = 538) was female and their age range was between 14 - 87 years with a mean age of 56.53 ± 13.49 years, 96.0% (n = 791) were clinically diagnosed as type II diabetes, 07.0% of the patients were diagnosed as pre-diabetes, the duration of diabetes ranged from newly diagnosed to more than 10 years, with 46.0% (n = 379) of the studied population were more than 10 years diabetes duration, 70.0% (581) were presented with classical symptoms of diabetes. Initial treatment for diabetes also different in the studied sample, were absent of anti-diabetic medications in 30.0% (n = 248) of the patients, they refused to start glucose lowering drugs, 34.6% (n = 284) of them have morbid obesity (body mass index is more than 40), 80.0% (n = 662) have high HBA1c (more than 8 g%), 40.3% (n = 240/596) were uncontrolled hypertension on anti-hypertension drugs, 95.6% (n = 682/713) were controlled on treatment of lipid lowering drugs. This study showing the presentation of diabetes were the common, type II diabetes, at age group between 41 - 66 years about 65.0%, female sex, with high body mass index, high glycated hemoglobin and uncontrolled hypertension. There is concern that diabetic patients were occurring at a high frequency in younger adults, where longer duration of illness could increase the risk of developing more complications in later life. The rate of coexist cardiovascular risk factors (hypertension, dyslipidaemia and obesity) in Libyan patients with diabetes is highlighted.

Introduction

Diabetes kills and disables, striking people at their most productive age depriving families or reducing the life-expectancy of old people. No country is immune from diabetes is at that does not respect

borders or social class. Diabetes global estimates, in 2017, the prevalence of diabetes among people aged 20 - 79 years were 424.9 million, this expected to be increased by 2045 to be 628.6 million [1]. Diabetes is a growing global problem.

The burden of diabetes drains national healthcare budgets, reduces productivity, slows economic growth and causes catastrophic expenditure for healthcare system. Healthcare expenditure for people with diabetes are assumed to be on average two-fold higher than people without diabetes [1]. Libya is one of the countries in Middle East and North Africa region (regions of International Diabetes Federation). In MENA region, prevalence of diabetes was 39 million in 2017, this will be 82 million by 2045, thus, raising by 110% (this is the second highest raising rate after Africa region, diabetes prevalence is 10.8%, the second highest among IDF regions, the number of people with diabetes is expected to increase by 111.8% by 2045, also in MENA region 50% of deaths due to diabetes were in people under the age of 60 [1, 2]. In Libya, there were 442.500 cases of diabetes in 2017, by 2045 this will rise to 762.500. The prevalence of diabetes in adults were 11.2%. Prevalence estimates of diabetes were equal in both sex before the age of 30 years than will be higher in female than male across the rest of the age groups. Also, mortality due to diabetes is higher in female than male across all the age groups [2]. It is estimated that 80% of people with diabetes live in low- and middle-income countries and the socially disadvantaged in any country are the most vulnerable to the disease, with most deaths occurring under the age of 60 years [3, 4], with type II diabetes being the predominant, accounting for 70.0 - 90.0% of the cases [4, 5]. The disease which is now regarded as a pandemic due to rapidly spreading in most developing countries and particularly affecting poor populations in sub-Saharan Africa [2 - 4]. Prevalence of diabetes is on the increase, with ageing of the population and lifestyle changes from a traditional healthy and active life to a modern sedentary, stressful life and over-consumption of energy-dense foods [5 - 8], associated with rapid urbanization and westernization. Diabetes mellitus is a chronic illness that requires continuing medical care and patient self-management education related to diet, exercise and medication in order to prevent acute and chronic complications. Glycemic control plays a major role in the outcome of diabetes mellitus [5,

9]. In this study, we observed clinical characters, presentations and cardio-vascular risk factors in patients presented with diabetes.

Materials and methods

This is a retrospective study carried out with diabetic Libyan patients attended out-patients unit at Almustaqpal Almosherq Centre during the period of September 2013 to September 2020, where demographical data of the patient including gender, age at presentation, away of presentation, duration of diabetes, type of diabetes as clinically determined (auto-antibodies not available), follow up visits, body weight, with body mass index were all recorded. Presence of hypertension, treatment with glucose lowering drugs were also taken presenting HBA1c, intake of lipid lowering drugs. An ethical approval was obtained from Bioethics Committee at Biotechnology Research Center, Tripoli, Libya with reference number of BEC-BTRC 11-2022).

Statistical analysis: Data for continuous variables are expressed as mean \pm standard deviation and analyzed. Chi-square test and Pearson coefficient were used (2-sided) as p value 95% confidence interval (95.0% CI) with $P < 0.05$ is considered statistically significant. All data were performed with Statistical v10.0 (StatSoft, Tulsa, OK, USA) or STATA v11 (StataCorp LLC, College Station, Texas, USA).

Results

A total of 1 024 Libyan patients were enrolled in this study, 820 patients were included in the study (80.0%). Their age were ranged from 14 to 87 years with a mean \pm SD of 56.53 ± 13.49 years. Female patients represent 66.0% of the studied sample, and female to male ratio is 1.9 : 1. At presentation, five patients were not known to be diabetic (three patients are females and two patients are males) and 815 patients were known to be diabetic. Diabetes type I were 21 patients (11 are female and 10 patients are male), 791 patients with diabetes type II (521 are female and 270 patients are male), gestational diabetes were in two female patients, secondary diabetes (steroid induced or pancreatic

disease) were found in five female patients and one male patient. There were different duration of diabetes among studied sample which vary from newly 198 patients (122 female patients and 76 male patients). 110 patients (70 female patients and 40 male patients) were varied from two to five years. 133 patients (88 female patients and 45 male patients) were varied from five to ten years. Above ten years of diabetes duration were 379 patients (259 female patients and 120 male patients). The classical symptoms of diabetes (polyuria, polydipsia and weight loss) were presented in 581 patients (378 female patients and 203 male patients) and diagnosis by chance were presented in 239 patients (161 female patients and 78 male patients).

In **Table 1**, initial treatment for diabetes is different in the studied sample, where absent of anti-diabetic medications in 248 patients (162 female patients and 86 male patients), only start biguanides were in 96 patients (67 females and 29 males), on dipeptidyl peptidase-4 inhibitors were presented in 12 patients (7 females and 5 males), sulfonyurea intake were in 114 patients (62 females and 52 males), combined oral hypoglycemic drugs usually biguanides is the main drug were presented in 57 patients (38 females and 19 males), insulin use alone in 103 patients (62 females and 41 males) and combined insulin therapy and oral hypoglycemic drugs were presented in 190 patients (141 females

Table 1: Distribution of Libyan patient's characters (age and clinical presentations)

Characters	14 - 27	28 - 40	41 - 53	54 - 66	67 - 89	Total	P value
Sex							
Female	14	50	132	216	126	538	0.056
Male	09	29	90	85	68	281	
Total	23	79	222	301	194	819	
Clinical determined type of diabetes							
Type 1	13	06	01	01	00	21	0.001***
Type2	07	71	219	299	194	790	
Secondary diabetes	01	02	02	01	00	06	
Gestational diabetes	02	00	00	00	00	02	
Total	23	79	222	301	194	819	
Duration of diabetes							
Newly < 1 year	11	32	74	61	20	198	0.001***
2 - 5 years	04	17	34	32	23	110	
5 - 10 years	03	15	45	43	27	133	
More than 10 years	05	15	69	165	124	378	
Total	23	79	222	301	194	819	
Symptom at presentation							
Classical poly-symptoms	20	50	148	215	145	578	0.156
Chance (Asymptomatic)	03	29	74	86	49	241	
Total	23	79	222	301	194	819	
Follow up							
Regular	04	38	139	181	131	493	0.001***
Lost	19	41	83	120	63	326	
Total	23	79	222	301	194	819	
Treatment intake							
Non	09	37	81	81	40	248	0.001***
Biguanides	02	08	29	31	26	96	
Di-Peptidyl Peptidase 4 Inhibitors	00	00	08	04	00	12	
Sulfonylureas	00	05	30	45	34	114	
Combined oral hypoglycaemic	00	04	19	21	12	56	
Insulin only	10	10	18	33	32	103	
Combined insulin and oral-hypoglycaemic drugs	02	15	37	86	50	190	
Total	23	79	222	301	194	819	

and 49 males). Body weight of the studied patients were ranged from 44 kg to 156 kg (85.49 ± 17.05). Body mass index (BMI) were calculated for each patient, underweight was presented in 14 patients (01.7%), normal BMI in 136 patients (16.6%),

over-weight were in 178 patients (21.7%) and obesity were in 204 patients (24.9%) and morbid obesity in 284 patients (34.6%). The duration of diabetes was ranged from newly to more than ten years at the time of sampling (**Table 1**).

Table 2: Distribution of patient's characters (age and investigations)

Characters	14 - 27	28 - 40	41 - 53	54 - 66	67 - 89	Total	P value
Body mass index							
Under weight	05	02	04	02	01	14	0.001***
Normal	05	20	39	45	27	136	
Over weight	04	10	42	70	51	177	
Obese	06	15	58	75	51	205	
Morbid obese	03	32	79	106	63	283	
Total	23	79	222	298	193	815	
Blood pressure							
Normal	17	44	74	57	29	221	0.001***
Controlled with treatment	03	23	78	151	101	356	
Uncontrolled	03	12	70	92	63	240	
Total	23	79	222	300	193	817	
Glycated haemoglobin HBA1c							
At presentation							0.01**
Pre-diabetes < 6 g%	00	11	16	19	13	59	
6.5 - 7 g%	00	12	24	41	21	98	
8 - 9 g%	09	31	107	125	97	369	
< 10 g%	14	25	75	115	63	292	
Total	23	79	222	300	194	818	
Anti-hyperlipidaemia drugs							
None	19	43	25	15	2	104	0.000***
Controlled with treatment	04	32	190	272	184	682	
Uncontrolled	00	04	07	13	07	31	
Total	23	79	222	300	193	817	

Discussion

The present study evaluated the clinical character and presenting feature of patients with diabetes who attended during seven years, and assessed the associated risk factors for cardiovascular disease including obesity, hypertension and hyperlipidaemia and shown type II diabetes is the commonest type in both sexes (diabetes affected female more than male by 1.9 : 1). Female affected more across all the age groups, at age 54 to 66 years, the common age group for female patients account for 26.0% while in male patients, the common age group is earlier (41 to 53 years), revealing for 10.0%. Clinically diagnosed as type I diabetes showed that female preponderance with 52.0% females versus 48.0% males; such female preponderance is also observed in previous studies [1, 9, 10]. On other studies, male preponderance,

with male-to-female ratio of 1.3: 1 which reported in UK, Denmark and India [9, 11 - 13]. With regard to duration of diabetes, different from less than one year to more than ten years, common period of this presentation where more than 10 years. Regarding female and male, 30.0% and 15.0% respectively, this indicates that most of the patients don't seek consultant advice with later in their disease duration. For patient's follow-up and patients' self-care where noticed is more common with female patients record for 68.0% but patients with irregular follow up were 39.6%.

Obesity has increasing epidemic, worldwide and nearly tripled, it is recognized as a disease eight, the risk of hypertension up to five times higher in obesity [5, 7] approximately 75.0% of hypertension attributable to weight [7, 10]. Patients with obesity

have higher triglycerides, lower HDL-C11, they estimated that each unit change in body mass index increases ischemic events [6, 14, 15]. As evidence based weight loss prevents progression from impaired glucose tolerance to diabetes, as well as weight loss can lead to remission of diabetes [14, 15]. This effect varies across individuals. Usually, patients presented with high body mass index reflect high risk for obese individual to develop diabetes. These facts are in line with the present study, type II diabetes and obesity are more common in female, over weight were 12.5% in female, but male patients were 08.0%. For obese range, also female (18.0%) in contrast to male (06.0%), as well as morbid obesity in female were five times of male patients. Even though a wide range of choices are now available for treating type II diabetes, including several new pharmacological classes of drugs that are indicated in the current American Diabetes Associations - European Association for the Study of Diabetes (ADA/EASD) and American Association of Clinical Endocrinologists (AACE) recommendations. About 50% of the patients with type II diabetes fail to achieve adequate glycemic control (glycated hemoglobin, HbA1c, < 07.0%) [16, 17]. Using data from the National Health and Nutrition Examination Survey, targets for glycemic control (HbA1c) were achieved by about 50% of the participants. In a multicenter study conducted in Eastern Europe, Asia and Latin America showed that 95% of the study participants had poor glycemic control [18 - 20]. Similarly, high proportions of type II diabetic patients with poor glycemic control ranging from 50.0 to 95.8% were reported in Brazil, South Indian, Karnataka, Uganda, Mthatha and Ghana [19 - 20]. In Ethiopia, hospital-based cross-sectional studies done at Gondar, Ambo, Jimma and Limmu indicated that 57.5%, 50.0%, 70.9% and 63.8% of the participants had poor glycemic control, respectively [21]. These findings were similar with the current findings which shown that glycaemic control as reflected with HBA1c level are 35.6% were above 10.0%, and 45.0% were above 08.0% that indicates with bad or uncontrolled diabetes even with intake of glucose lowering drugs, in the other hand, patients

in target control who have HBA1c < 07% were found to be in 11.9%.

In the current study, duration of symptoms before diagnosis was widely varied from seven days to seven months based on severity of hyperglycaemia, explained the cause why many patients with newly diagnosed diabetes remain without treatment. About 20.0% of the female patients remain without glucose lowering agents and 10.0% of the male refused drugs for hyperglycaemia. Regarding treatment given for hyperglycaemia, 10.0% were on biguanides alone, 01.5% were on dipeptidyl peptidase-4 Inhibitors alone, while in combination was 07.0%, sulfonylurea were common oral hypoglycaemic drug alone and in combination with biguanides and DPP-4 Inhibitors (15.0%). Insulin therapy is mandatory and life saving for type I diabetes which represents 02.5%, also insulin therapy is important for type II diabetes, in total insulin therapy account for 12.5% and with combination with oral hypoglycaemic drugs were 23.0%. The study revealed that hypertension and diabetes usually coexist, norm-tension 25.0% mostly in female and young patients, but hypertension may present before or during or after diabetes presentation (75.0%) who are hypertensive diabetes patients; diagnosed and under anti-hypertensive treatment (40.0%). Prevalence was positively correlated with age in general, with the peak value at 54 - 66 years old and then decreased.

For clinical purposes, hypertension, among diabetic patients, is a world-wide public-health challenge the frequency of hypertension among diabetic population is almost twice that of non-diabetic patients [19]. Compared with other cardiovascular disorders, hypertension is the most common comorbid disease in diabetic patients and its effects are devastating if not controlled [23]. Concentrating on detecting and managing hypertension in patients with diabetes is one of the most effective things that can be done to prevent diabetes complications [22 - 23]. There is a lack detailed basic data on the prevalence and determinants of hypertension in many countries in sub-Saharan Africa including Ethiopia [24]. Overall prevalence of hypertension among diabetic patients was 75.0%. This is in line with several studies conducted so far.

Accordingly, studies conducted in Benghazi, Libya, in Morocco in Jordan in Iraq and in Botswana [20 - 29]. However, the current study is higher than a study conducted in Pakistan, in Bahrain, in Taiwan and in Jos, Nigeria [30 - 36]. Also, higher than a study conducted in Southern Ethiopia at Sidama zone, in Turkey and in India [28, 34]. The possible reason for such discrepancy might be due to differences in study population, socio-demographic characteristic, study settings, study design, habit of visits to health setups and differences in lifestyle of the participants. The peak age at presentation were 54 - 66 years old, this might be due to aging being generally associated with a decline in various physiological functions and non-communicable diseases including hypertension. Furthermore, increasing age has also been linked with a high incidence of disease [5, 37]. Dyslipidemia is one of the risk factors for vascular complications in diabetic patients because it increases free fatty acid flux secondary to insulin resistance and aggravated by increased inflammatory adipokines [38]. According to the Framingham Heart Study, in diabetic patients, the prevalence rate for high cholesterol was double in females and this rate for high plasma triglyceride is similar in male and female patients [37 - 39]. A cross-sectional, multicenter, hospital-based diabetes registry conducted in Thailand showed more than 80.0% of

diabetic patients had dyslipidemia but 40.0% of patients who received lipid-lowering medication achieved the target low-density lipoprotein cholesterol level. This is similar with our study which shown most of the patients are taken statin and well tolerated, some patients don't reach the target control even with drug intake. Regarding treatment of dyslipidaemia which is recommended as primary prevention for all the patients with diabetes above 40 years of age and or diabetes duration more than ten years, and as secondary prevention for all diabetes to prevent vascular events.

Conclusion: Type II diabetes is the most common type in Libya, which can be prevented delayed and controlled as well as can avoid disability and mortality related to diabetes. Education is the cornerstone to diabetes management. Health-care priority should be directed to prevention programme for diabetes rather than treatment of complications, as nearly 50.0% of diabetes who are asymptomatic, so in the concern of treatment of only the iceberg is not cost-effective. Application of good selective screening for high-risk group is mandatory to avoid acute and chronic diabetes complications. Risk factors of cardio-vascular disease can be minimized by screening patients for obesity, hypertension and hyperlipidemia.

Acknowledgments: The author would like to thank Almustaqbal Almosherq Centre for help to carry out this work.

Conflict of interest: The author declares absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Ethical issues: Including plagiarism, informed consent, data fabrication or falsification and double publication or submission have completely been observed by author.

Data availability statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author declarations: The author confirms all relevant ethical guidelines have been followed and any necessary IRB and/or ethics committee approvals have been obtained.

References

1. Whiting DR, Guariguata L, Weil C, Shaw J (2011) IDF Diabetes Atlas: Global estimates of the prevalence of diabetes for 2011 and 2030. *Diabetes Research and Clinical Practice*. 94 (3): 311-321. doi:10.1016/j.diabres.2011.10.029.
2. Al Rashed AM (2011) Pattern of presentation in type 1 diabetic patients at the diabetes center of a university hospital. *Annals of Saudi Medicine*. 31 (3): 243-249. doi.org/10.4103/0256-4947.81529.
3. Cahill GF, Mc Devill HO (1981) Insulin-dependent diabetes mellitus: The initial lesion. *The New England Journal of Medicine*. 304: 1454-1464. doi: 10.1056/NEJM198106113042403.

4. Bloom A, Hayes TM, Gamble DR (1975) Register of newly diagnosed diabetic children. *British Medical Journal*. 3 (5983): 580-583. doi: 10.1136/bmj.3.5983.580.
5. Colosia AD, Palencia R, Khan S (2013) Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: A systematic literature review. *Diabetes, Metabolic Syndrome and Obesity*. 6 (1): 327-338. doi: 10.2147/DMSO.S51325.
6. Cassano PA, Segal MR, PS Vokonas, PS, Weiss ST (1990) Body fat distribution, blood pressure, and hypertension. A prospective cohort study of men in the normative aging study. *Annals of Epidemiology*. 1 (1): 33-48. doi: 10.1016/1047-2797(90)90017-m.
7. Kotchen TA (2010) Obesity-related hypertension: epidemiology, pathophysiology, and clinical management. *American Journal of Hypertension*. 23 (11): 1170-1178. doi: 10.1038/ajh.2010.172.
8. Savini I, Catani MV, Evangelista D, Gasperi V, Avigliano L (2013) Obesity-associated oxidative stress: strategies finalized to improve redox state. *International Journal of Molecular Sciences*. 14 (5): 10497-10538. doi: 10.3390/ijms140510497.
9. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, Peters A, Tsapas A, Wender R, Mathews DR (2015) Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the study of diabetes. *Diabetes Care*. 38 (1): 140-149. doi: 10.2337/dc14-2441.
10. Wong ND, Patao C, Wong K, Malik S, Franklin SS, Iloeje U (2013) Trends in control of cardiovascular risk factors among US adults with type 2 diabetes from 1999 to 2010: comparison by prevalent cardiovascular disease status. *Diabetes and Vascular Disease Research*. 10 (6): 505-513. doi: 10.1177/1479164113496828.
11. Cahill GF, Mc Devill HO (1981) Insulin-dependent diabetes mellitus: The initial lesion. *The New England Journal of Medicine*. 304: 1454-1464. doi: 10.1056/NEJM198106113042403.
12. Bloom A, Hayes TM, Gamble DR (1975) Register of newly diagnosed diabetic children. *British Medical Journal*. 3 (5983): 580-583. doi: 10.1136/bmj.3.5983.580.
13. Rajesh V, Jeethu MM, Linu T, Mathew J (2018) Impact of demographic variables on blood pressure and glycemic control. *Asian Journal of Pharmaceutical and Clinical Research*. 11 (10): 179-181. doi.org/10.22159/ajpcr.2018.v11i10.25599.
14. De P, Banu S, Muthukumar D (2018) Predictors of poor glycemic control in type 2 diabetic patients in South Indian population. *International Journal of Research in Medical Sciences*. 6 (2): 545-550. doi.org/10.18203/2320-6012.ijrms20180295.
15. Fiagbe J, B S, Opong J, Takramah W, Axame W, Owusu R, Parbey PA, Adjuik M, Tarkang E, Kweku M (2017) Prevalence of controlled and uncontrolled diabetes mellitus and associated factors of controlled diabetes among diabetic adults in the hohoe municipality of Ghana. *Diabetes Management*. 7 (5): 343-354.
16. Handelsman Y, Bloomgarden ZT, Grunberger G (2015) American association of clinical endocrinologists and American college of endocrinology - clinical practice guidelines for developing a diabetes mellitus comprehensive care plan - 2015. *Endocrine Practice*. 21 (1S): 1-87. doi.org/10.4158/EP15672.
17. Inzucchi SE, Bergenstal RM, Buse JB, Diamant M, Ferrannini E, Nauck M, Peters AL, Tsapas A, Wender R, Mathews DR (2015) Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the study of diabetes. *Diabetes Care*. 38 (1): 140-149. doi: 10.2337/dc14-2441.
18. Lozovey NR, Lamback EB, Mota RB, Caarls MB, Neto LV (2017) Glycemic control rate in type 2 diabetes mellitus patients at a public referral hospital in Rio de Janeiro, Brazil: demographic and clinical factors. *Journal of Endocrinology and Metabolism*. 7 (2): 61-67. doi: https://doi.org/10.14740/jem390w.
19. Rajesh VM, Linu T, Mathew J (2018) Impact of demographic variables on blood pressure and glycemic control. *Asian Journal of Pharmaceutical and Clinical Research*. 11 (10): 179-181. doi.org/10.22159/ajpcr.2018.v11i10.25599.
20. Adeniyi OV, Yogeswaran P, Mbenza B, Goon D, Ajayi IA (2016) Cross-sectional study of patients with type 2 diabetes in OR Tambo district, South Africa. *British Medical Journal Open*. 6 (7): e010875. doi: 10.1136/bmjopen-2015-010875.
21. Bayisa B, Bekele M (2017) Glycemic Control and associated factors among type II diabetic patients on chronic follow up at Southwest Ethiopia. *Research and Reviews: Journal of Medical and Health Sciences*. 6 (3): 13-20.
22. Kahya NE, Harman E, Dolek D, Tutuncuoglu AP, Emren SV, Ievent F, Korkmaz G, Tuluçe SY, Nazlı C (2014) Rate of blood pressure control and antihypertensive treatment approaches in diabetic patients with hypertension. *Türk Kardiyoloji Dernrgi Arsivi (Turkish Cardiology Association Archive)*. 42 (8): 733-740. doi: 10.5543/tkda.2014.53384.
23. Paul B, Sapra B, Maheshwari S, Goyal R (2000) Role of losartan therapy in the management of diabetic hypertension. *The Journal of the Association Physicians in India*. 48 (5): 514-518. PMID: 11273147.
24. Kotchen TA (2007) Hypertension control: trends, approaches, and goals. *Hypertension*. 49 (1): 19-20. doi: 10.1161/01.HYP.0000250394.05703.06.

25. Abdissa D , Kene K (2020) Prevalence and determinants of hypertension among diabetic patients in Jimma University Medical Center, Southwest Ethiopia, 2019, *Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy*. 13: 2317-2325. doi: 10.2147/DMSO.S255695.
26. Nouh F, Omar M, Younis M (2017) Prevalence of hypertension among diabetic patients in Benghazi: A study of associated factors. *Asian Journal of Medicine and Health*. 6 (4): 1-11. doi: 10.9734/AJMAH/2017/35830.
27. Berraho M, Achhab YE (2012) Hypertension and type 2 diabetes: a cross-sectional study in Morocco (EPIDIAM Study) Mohamed. *The Pan African Medical Journal*. 11, 52. PMID: 22593788. PMCID: PMC3343680.
28. Alqudah BM, Mahmoud H, Alhusamia S, Sh A, Al L, Alawneh ZE (2017) Prevalence of hypertension among diabetic type 2 patients attending medical clinic at Prince Hashem bin Abdullah Hospital in Aqaba. *Indian Journal of Medical Research and Pharmaceutical Science*. 4: 47-54. doi: 10.5281/zenodo.815699.
29. Mansour AA (2012) Prevalence and control of hypertension in Iraqi diabetic patients: a prospective cohort study. *The Open Cardiovascular Medicine Journal*. 6: 68-71. doi: 10.2174/1874192401206010068.
30. Arshad AR (2014) Control of blood pressure in hypertensive patients with diabetes mellitus type 2. *Pakistan Heart Journal*. 47 (02): 78-83. doi: 10.13140/2.1.2283.5845.
31. Tseng CH (2006) Higher risk of hypertension in indigenous type 2 diabetic patients in Taiwan. *Journal of Hypertension*. 24 (9): 1817-1821. doi: 10.1097/01.hjh.0000242406.76085.c4.
32. Chuhwak EK, Puepet FH, Okeahialam BN, Ohwovoriole AE (2002) Hypertension and diabetes in Jos, Nigeria. *Diabetes International*. 12: 25-26.
33. Giday A, Wolde M, Yihdego D (2010) Hypertension, obesity and central obesity in diabetics and non-diabetics in Southern Ethiopia. *Ethiopian Journal of Health Development*. 24 (2). doi: 10.4314/ejhd.v24i2.62964.
34. Satman I, Yilmaz T (2002) Population-based study of diabetes and risk characteristics in Turkey. *Diabetes Care*. 25 (9): 1551-1556. doi: 10.2337/diacare.25.9.1551.
35. Venugopal K, Mohammed MZ (2014) Prevalence of hypertension in type-2 diabetes mellitus. *Journal of Health Research*. 1 (4): 223-227. doi: 10.4103/2348-3334.142981
36. Satman I, Omer B, Tutuncu Y, Kalaca S, Gedik S, Dincag N, Karsidag K, Genc S, Telci A, CanbazB, Turker F, Yilmaz T, Cakir B, Toumilehto J (2013) Twelve-year trends in the prevalence and risk factors of diabetes and prediabetes in Turkish adults. *European Journal of Epidemiology*. 28 (2): 169-180. doi: 10.1007/s10654-013-9771-5.
37. Chegade JM, Gladysz M, Mooradian AD (2013) Dyslipidemia in type 2 diabetes: prevalence, pathophysiology, and management. *Drugs*. 73 (4): 327-339. doi: 10.1007/s40265-013-0023-5.
38. Kannel WB (1985) Lipids, diabetes, and coronary heart disease: insights from the Framingham study. *American Heart Journal*. 110 (5): 1100-1107. doi: 10.1016/0002-8703(85)90224-8.
39. Pratipanawat T, Rawdaree P, Chetthakul T, Bunnag P, Ngarmukos C, Benjasuratwong Y, Leelawatana R, Kosachunhanun N, Plengvidhya N, Deerochanawong C, Suwanwalaikorn S, Krittiyawong S, Mongkolsomlit S, Komoltri C (2006) Thailand diabetes registry project: current status of dyslipidemia in Thai diabetic patients. *Journal of Medical Association of Thailand*. 89: S60-S65. PMID: 17715835.