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ORIGINAL RESEARCH article

Presentation and character for adult patients with diabetes in Libya

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Abstract: Diabetes is a global issue, the diabetes epidemic is expected to continue, and the burden of diabetes causes catastrophic expenditure for the healthcare system. The current study aimed to determine the presentation, the clinical feature and cardiovascular risk factors in patients with diabetes. A retrospective observational study was conducted in the out-patients department at Almustaqpal Almosherq Centre from September 2013 to September 2020, the total number of attended out-patient department were 1 024, 820 patients who were selected for this study. A special performance was completed for every patient, which included details about the patient's demographics, points in clinical history, relevant investigations and clinical examinations 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 was 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 8.0 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 showed the presentation of diabetes was common, type II diabetes, in the age group between 41-66 years about 65.0%, female sex, with high body mass index, high glycated hemglobulin and uncontrolled hypertension. There is concern that diabetic patients occur at a high frequency in younger adults, where a longer duration of illness could increase the risk of developing more complications in later life. The rate of coexisting cardiovascular risk factors (hypertension, dyslipid-aemia, 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 if it that does not respect borders or social class. Diabetes global estimates, in 2017, the prevalence of diabetes among people aged 20-79 years was 424.9 million, this is 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

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causes catastrophic expenditure for the healthcare system. Healthcare expenditures for people with diabetes are assumed to be on average two-fold higher than for people without diabetes [1]. Libya is one of the countries in the Middle East and North Africa region (regions of the International Diabetes Federation). In the MENA region, the prevalence of diabetes was 39 million in 2017, this will be 82 million by 2045, thus, rising by 110% (this is the second highest rising rate after Africa region, where 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 was 11.2%. Prevalence estimates of diabetes were equal in both sex before the age of 30 years then will be higher in females than males across the rest of the age groups. Also, mortality due to diabetes is higher in females than males 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]. The prevalence of diabetes is on the increase, with aging 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 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 characteristics, presentations and cardiovascular risk factors in patients presenting with diabetes.

Materials and methods

This is a retrospective study carried out with diabetic Libyan patients who attended the out-patients unit at Almustaqpal Almosherq Centre from 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 was also taken presenting HBA1c, intake of lipid-lowering drugs. Ethical approval was obtained from the Bioethics Committee at the Biotechnology Research Center, Tripoli, Libya with the reference number BEC-BTRC 11-2022).

Statistical analysis: Data for continuous variables are expressed as mean±standard deviation and analyzed. The Chi-square test and Pearson coefficient were used (2-sided) as p-value 95.0% confidence interval (95.0% CI) with $p<0.05$ are 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, and 820 patients were included in the study (80.0%). Their age ranged from 14 to 87 years with a mean±SD of 56.53±13.49 years. Female patients represent 66.0% of the studied sample, and 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 had 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 was in two female patients, secondary diabetes (steroid-induced or pancreatic disease) were found in five female patients and one male patient. There were different durations of diabetes among the studied sample which vary from newly 198 patients (122

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female patients and 76 male patients). 110 patients (70 female patients and 40 male patients) 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 was 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 was 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 and 49 males). The body weight of the studied patients ranged from 44 kg to 156 kg (85.49±17.05). Body mass index (BMI) was calculated for each patient, underweight was presented in 14 patients (01.7%), normal BMI in 136 patients (16.6%), over-weight was in 178 patients (21.7%) and obesity was in 204 patients (24.9%) and morbid obesity in 284 patients (34.6%). The duration of diabetes ranged from newly to more than ten years at the time of sampling (**Table 1**).

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**	
Male	09	29	90	85	68	**281**	0.056
Total	**23**	**79**	**222**	**301**	**194**	**819**	
Clinical determined type of diabetes							
Type 1	13	06	01	01	00	**21**	
Type2	07	71	219	299	194	**790**	
Secondary diabetes	01	02	02	01	00	**06**	**0.001*****
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**	
2-5 years	04	17	34	32	23	**110**	
5-10 years	03	15	45	43	27	**133**	**0.001*****
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**	
Chance (Asymptomatic)	03	29	74	86	49	**241**	0.156
Total	**23**	**79**	**222**	**301**	**194**	**819**	
Follow up							
Regular	04	38	139	181	131	**493**	
Lost	19	41	83	120	63	**326**	**0.001*****
Total	**23**	**79**	**222**	**301**	**194**	**819**	
Treatment intake							
Non	09	37	81	81	40	**248**	
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**	**0.001*****
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**	

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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**	
Normal	05	20	39	45	27	**136**	
Over weight	04	10	42	70	51	**177**	**0.001*****
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**	
Controlled with treatment	03	23	78	151	101	**356**	**0.001*****
Uncontrolled	03	12	70	92	63	**240**	
Total	**23**	**79**	**222**	**300**	**193**	**817**	
Glycated haemoglbulin HBA1c							
At presentation							
Pre-diabetes < 6 g%	00	11	16	19	13	**59**	
6.5-7.0 g%	00	12	24	41	21	**98**	**0.01****
8.0-9.0 g%	09	31	107	125	97	**369**	
<10.0 g%	14	25	75	115	63	**292**	
Total	**23**	**79**	**222**	**300**	**194**	**818**	
Anti-hyperlipidaemia drugs							
None	19	43	25	15	2	**104**	
Controlled with treatment	04	32	190	272	184	**682**	**0.000*****
Uncontrolled	00	04	07	13	07	**31**	
Total	**23**	**79**	**222**	**300**	**193**	**817**	

Discussion

The present study evaluated the clinical character and presenting features of patients with diabetes who attended for seven years, and assessed the associated risk factors for cardiovascular disease including obesity, hypertension and hyperlipidaemia and showed 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 type I diabetes showed female preponderance with 52.0% females versus 48.0% males; such female preponderance is also observed in previous studies [1, 9, 10]. In other studies, male preponderance, with a male-to-female ratio of 1.3: 1 which reported in the UK, Denmark and India [9, 11-13]. About duration of diabetes, different from less than one year to more than ten years, the common period of this presentation where more than 10 years. Regarding females and males, 30.0% and 15.0% respectively, 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 recorded at 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, and the risk of hypertension is up to five times higher in obesity [5, 7] approximately 75.0% of hypertension is 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 a high body mass index reflect high risk for obese individuals to develop diabetes. These facts are in line with the present study, type II diabetes and obesity are more common in females, overweight was 12.5% in females, but male patients were 08.0%. For the obese range, also females (18.0%) in contrast to males (6.0%), as well as morbid obesity

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in females 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. A multicenter study conducted in Eastern Europe, Asia and Latin America showed that 95.0% 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 India, 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 to the current findings which showed that glycaemic control as reflected in HBA1c level 35.6% were above 10.0%, and 45.0% were above 08.0% indicates bad or uncontrolled diabetes even with the 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, the duration of symptoms before diagnosis was widely varied from seven days to seven months based on the severity of hyperglycaemia, explaining the cause of why many patients with newly diagnosed diabetes remained 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 07.0%, sulfonylurea was common oral hypoglycaemic drugs 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 accounts for 12.5%, and in combination with oral hypoglycaemic drugs it accounts for 23.0%. The study revealed that hypertension and diabetes usually coexist, with norm-tension 25.0% mostly in female and young patients, but hypertension may present before, during, or after diabetes presentation (75.0%) who are hyper-tensive 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 decreasing.

For clinical purposes, hypertension, among diabetic patients, is a worldwide public health challenge the frequency of hypertension among the 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 hyper-tension 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 of detailed basic data on the prevalence and determinants of hypertension in many countries in sub-Saharan Africa including Ethiopia [24]. The overall prevalence of hypertension among diabetic patients was 75.0%. This is in line with several studies were conducted so far. Accordingly, studies conducted in Libya, Morocco, Jordan, Iraq, and Botswana [20-29]. However, the current study is higher than a study conducted in Pakistan, Bahrain, Taiwan and Jos, Nigeria [30-36]. Also, higher than a study conducted in Southern Ethiopia at Sidama zone, in Turkey and India [28, 34]. The possible reason for such discrepancy might be due to differences in the study population, socio-demographic characteristics, study settings, study design, the habit of visits to health setups and differences in lifestyle of the participants. The peak age at presentation was 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

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secondary to insulin resistance and is 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 to our study which showed most of the patients are taking 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 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 cornstone to diabetes management. Healthcare priority should be directed to prevention programmes for diabetes rather than treatment of complications, as nearly 50.0% of diabetes who are asymptomatic, so the concern of treatment of only the iceberg is not cost-effective. Application of good selective screening for high-risk groups is mandatory to avoid acute and chronic diabetes complications. Risk factors of cardiovascular disease can be minimized by screening patients for obesity, hypertension and hyperlipidemia.

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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.

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