Archives of Health Science
Research Article

The Indications and Outcomes of Admission of Patients with Diabetes Mellitus to the Diabetic and Endocrine Center in Tripoli, Libya, 2015

Halla Elshwekh*[1], Nesrein M. Bendala[1], Haifa Elhadi Alshwikh[2], Ariej M. Mustafa[1], Aida Elkituni[3]

[1]Biotechnology Research Center, Libyan Authority For Scientific Research, Tripoli, Libya
[2]Internal Medicine Specialist, University of Tripoli, Tripoli, Libya
[3]Diabetic and Endocrine Center, Tripoli, Libya

***Corresponding author:** Halla Elshwekh, Biotechnology Research Cente, Tripoli, Libya.

Abstract

Background: Diabetes mellitus (DM) is the pandemic of our time, patients with type 1 or type 2 diabetes mellitus are frequently hospitalized, usually to treat conditions other than diabetes.

However, there is still deficit data in our region about the indications of hospitalization of patients with diabetes.

Aims: To determine the indications and outcomes of admission of patients with diabetes to the Diabetic and Endocrine Center in Tripoli, Libya.

Methods: This is a retrospective case-series study conducted in The Diabetic and Endocrine Center in Tripoli. It covers 1023 patients with diabetes admitted between 1st January and 31st December 2015. All the data was collected from the patient files, including Demographic data and clinical characteristics, laboratory investigations, and outcomes.

Results: The mean age of the patients was 49.52 ±20.44 years. The female-to-male ratio was 1.3:1. Type 2 diabetes composed 51.3% of admission, 47.6% of the patients had diabetes for >10 years, 58.6% had no prior chronic illness, 24.1% had cardiovascular diseases, and 5.5% had autoimmune diseases. The mean hospital stay was 4.15±3.6 days, 64.1% were admitted to the ICU, and 75.9% on insulin therapy. 54.2% had recurrent history of admission. The mean HbA1C was 11.22±2.71%. The main causes of admission were DKA (41.7%), followed by hyperglycemia (40.2%). 10.9% of patients had emergency hypertension, and 0.7% cardiovascular complications, 3.9% had neurological diseases on admission combined with hyperglycemia or DKA. Infection reported 5.8% of admitted cases, mainly in the urinary tract, and lower extremity (3.7 and 2.6% respectively), followed by chest infection (2.5%). 31% had macro-vascular, and 17.5% had micro vascular complications. 92% were discharged with good general conditions and 0.9% died from diabetic complication.

Conclusion: The most frequent reason for diabetes-related admissions according to this analysis was the acute metabolic complications of diabetes itself, co morbidity such as cardiovascular diseases was more common in type 2, whereas autoimmune diseases more prevalent in type 1.

Keywords: Diabetes, Hospitalization, Outcomes.

Introduction

Diabetes mellitus (DM) is the pandemic of our time, it is a chronic multisystem disease, which is due to several factors including genetic, socioeconomic, and behavioral factors that interact

together and cause impairment in insulin secretion along with insulinresistance[1].

Patients with both type 1 and 2 diabetes mellitus are frequently admitted to a hospital, usually for treatment of conditions other than the diabetes[1,2]. In one study, 25 percent of patients with type 1 diabetes and 30 percent with type 2 diabetes had a hospital admission during one year[3,4].Many studies conducted before analyzed the burden of hospitalization among people with diabetes and the causes that led to the admission and the data was extremely variant, some pointed to infection where others to cardiovascular hazards, however others contributed the main cause of admission to metabolic manifestations including hyper/ hypoglycemia and HONK[2,5,6].

Our study was carried out parallel to a study conducted in the same year at The University of Tripoli hospital on adult diabetic patients. Our study included 1023 patients with a wider age range when compared to the other study. This will add more comprehension regarding the different reasons and outcomes of hospitalization of individuals with diabetes.

Aim of Study

The aim of our study is to report the causes of admission of patients with diabetes to medical wards and the emergency unit of the Diabetic and Endocrine Center, and to determine the demographic characteristics of the patients, different risk factors, outcomes, and duration of hospital stay.

Patients and Method

This is a retrospective descriptive hospital based study of patients with diabetes admitted into the medical wards and emergency unit of the Diabetic and Endocrine Center in Tripoli, Libya over a one-year period from1st January to 31st December 2015. The study included 1023 patients with a known history of type 1 or 2 DM, patients without a known history of diabetes, and with gestational diabetes were excluded. Data was collected from the patient files which contained the following (age, gender, address, occupation, diabetes history, co morbidity, recurrent admission, family history of diabetes, duration of hospital stay, admission to intensive care unit or ward, indications of admission, and outcome). Laboratory investigations were collected from the files and included (urea, HbA1c, serum cholesterol, serum LDL, serum HDL, serum Triglyceride, FBG, PPBG).The investigations were all carried out in the laboratory department of the Diabetic Center. The targeted glycemic control was defined as HbA1c ≤ 7.5% and poor glycemic control is any level beyond >7.5%. The outcome of hospitalization was registered, including discharge with good general condition, discharge against medical advice (DAMA), transfer to another hospital, and mortality with including the cause of death.

Statistical Analysis

Statistical analyses were completed using SPSS (Statistical Package for Social Science) version 21. The data was expressed as number percentages, means ±standard deviation (SD). Regarding the normally distributed (parametric) quantitative data, means and standard deviations were used, and P value of less than 0.05 ($P < 0.05$) was considered significant.

Results

The total number of admitted patients with diabetes were 1023, males were 439(42.8%), while females 584(58.2%) of the study population, giving a female-to-male ratio of (1.3 to 1.0). The mean age of the study population was 49.52± 20.44 years. The age of the patients ranged between 14 and 96 years, the frequency of age was higher among age group 26-35years (19.9%), but was lower for those above ≥75 years (11.2%) (Figure1).The Majority of admitted patients were from Tripoli (80.3%), slightly below half (48.8%) were employees, while 9.4% were students (Table 1). Of the 1023 patients, 526 (51.3%) had type 2 diabetes and 497 (48.7%) had type 1 diabetes. The mean duration of diabetes was 17.08±24.73 years, patients with longer durations of diabetes registered high admission rates reaching 46.2% for those with more than 11 years of diabetes (Figure 2). In terms of treatment of diabetes, 75.9% were on

insulin, 14.9%on combination therapy of insulin and oral anti diabetic drugs, while the remaining 9.2% treated by oral antidiabetics. More than half of the patients (64.1%) were admitted to the ICU, while those admitted to the ward were 35.9%. The duration of hospitalization ranged from 1 day to 36 days, with a mean of 4.15±3.6 days. The recurrent admission history was reported in 556(54.2%) of diabetic patients. Positive family history presented in 702 patients(68.6%), while 149(14.5%) had a negative family history; and for the remaining files the presence or absence of family history was not registered.In terms of laboratory findings of the admitted diabetic patients (Table 2), the mean HbA1C value was 11.22±2.71%, glycemic control in the majority(98%) of the admitted patients was poor, only 2% of the admitted patients had their HbA1Cin the target level. Regarding the reasons of admission (Figure 3)87.5% of the study populations had acute metabolic complications of diabetes, with DKA as the most frequent cause of admission (41.7%), followed by uncontrolled hyperglycemia (40.2 %) then hypoglycemia (2.9 %), the remaining 3.9% were admitted with different causes like preoperative preparation, trauma, acute gastritis, and anemia(Figure 3). Infection headed the list of causes for admission in the DKA group, while in uncontrolled hyperglycemia it was11.4% of the cases, urinary tract infection was 3.7% of all infection causes, then lastly chest infections (2.5%) (Table 3).

Emergency hypertension was reported in 10.9% of cases, 1% had myocardial infraction, and 2%experienced arrthmyia, while 1.5% of cases suffered from diabetic nephropathy, and stroke related to DM occurred in 2.5%of admitted patients (Tables 4,5).

Regarding previous comorbidities, cardiovascular disease was reported in 24% of the cases, 4.5% had neurological diseases and 5.8%autoimmune diseases (Figure 5). Concerning the prevalence of diabetic complications, diabetic micro-vascular disease was registered in 17.4% of cases, where on the other handmacro-vascular complications were found in 31%(Table 6). The outcome of hospitalization was favorable in most of the study population as92.1% of the patients showed improvement in their conditions and were discharged, while 0.9% died due to different reasons including septic shock (0.1%), cardiogenic shock (0.3%), uremic complications (0.2%) and sever DKA (0.2%) (Figure6).

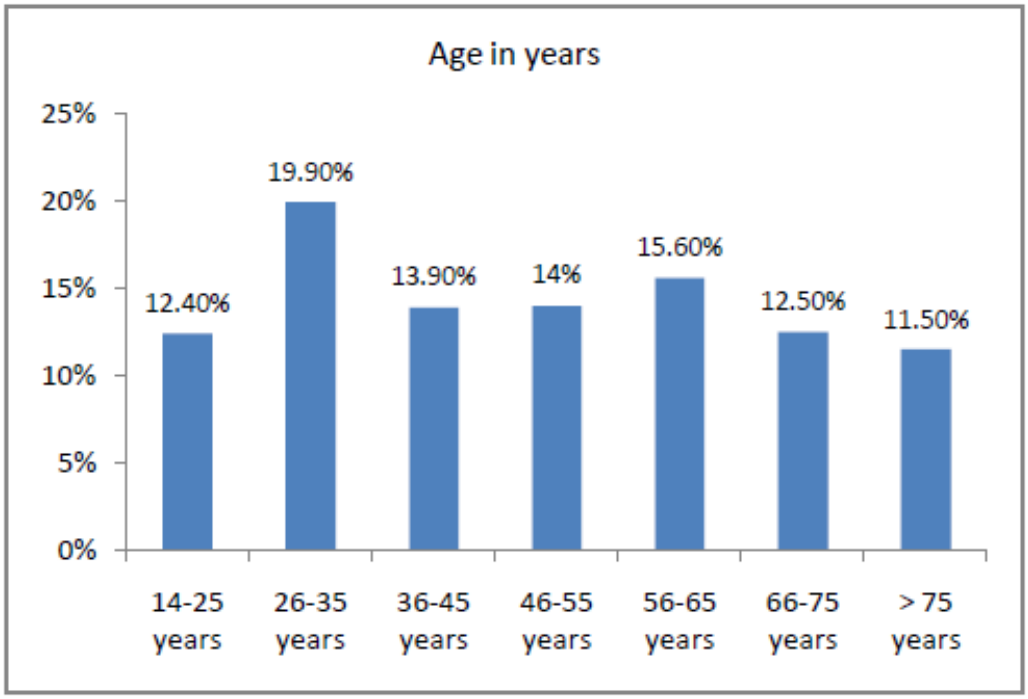

Figure1. Distribution of the patients by age.

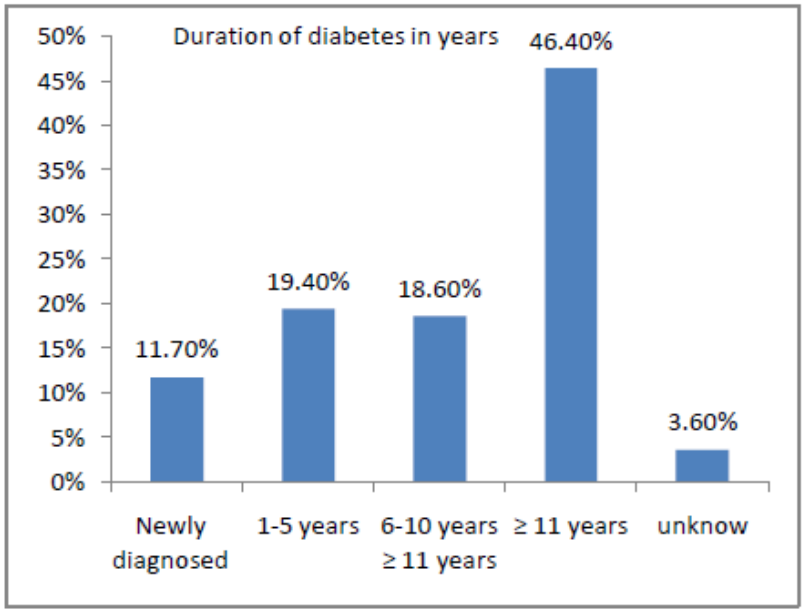

Figure2. Distribution of patients by duration of diabetes.

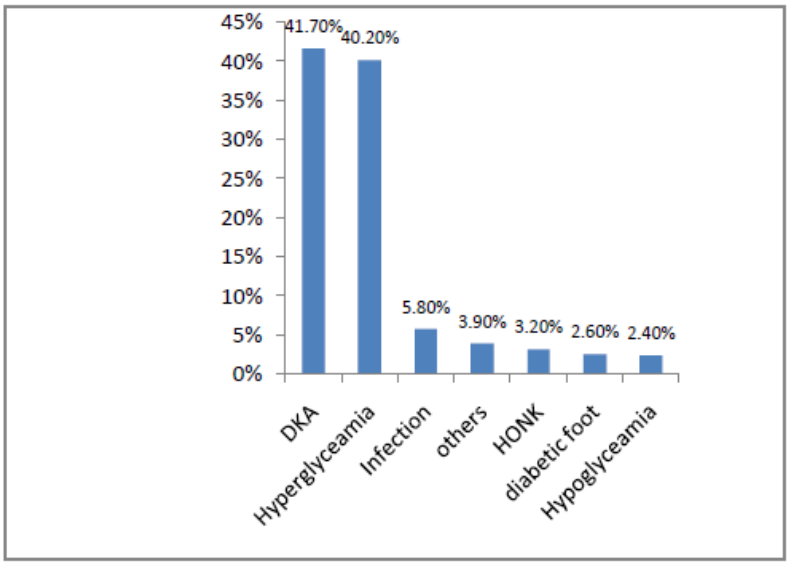

Figure3. Distribution of patients according tothe cause of admission.

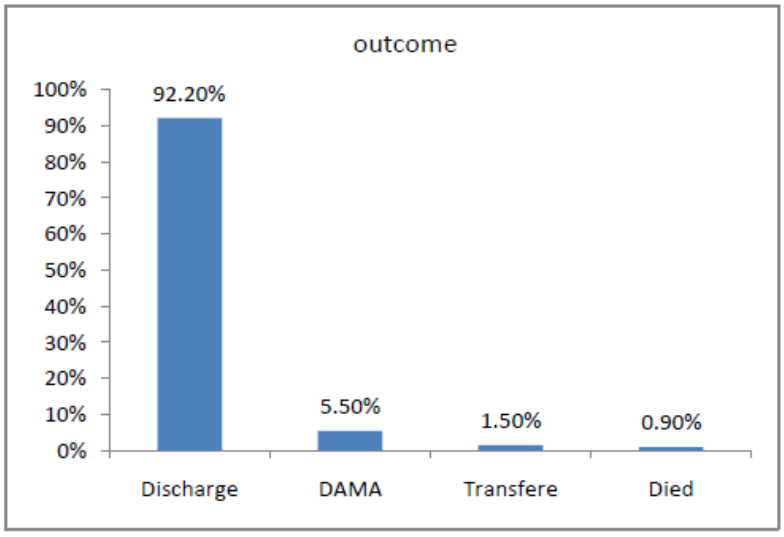

Figure4. Distribution of patients according to the outcome of admission.

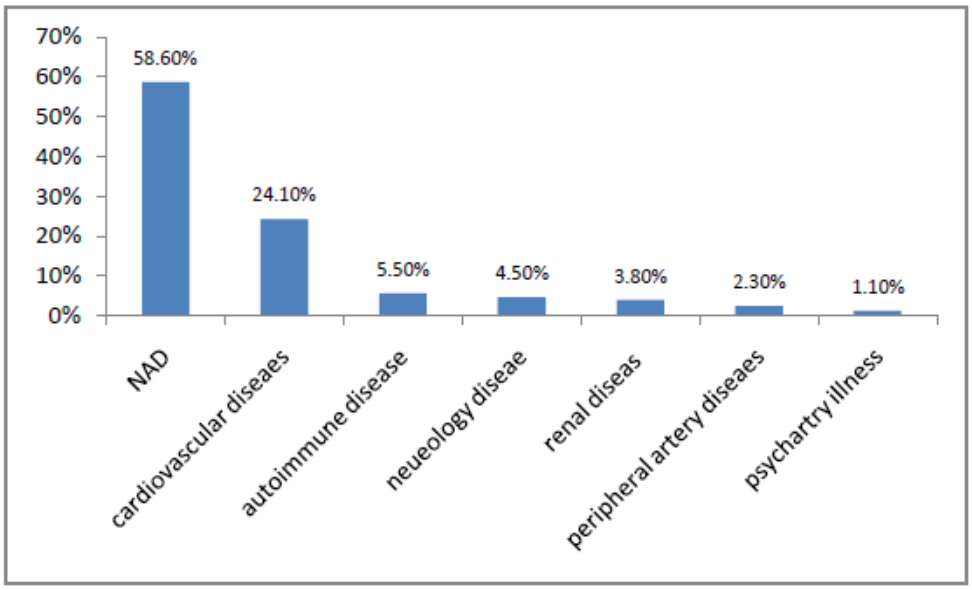

Figure5. Distribution of comorbidities.

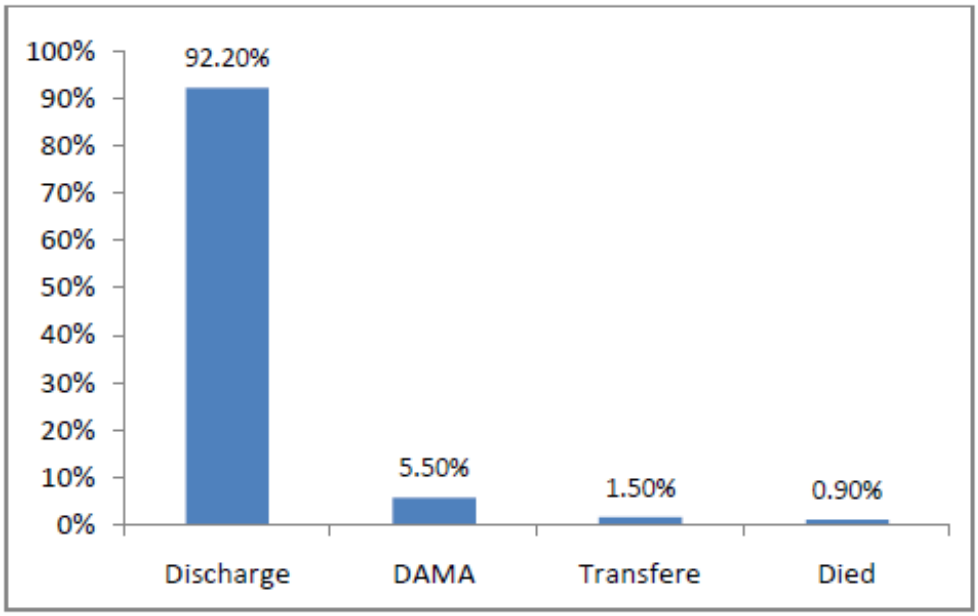

Figure6. Distribution of outcomes

Table1. General characteristic of study population (N=1023)

Character	Number	Percentage
Address		
Inside Tripoli	823	80.3%
Outside Tripoli	200	19.6%
Occupation		
employee	489	47.8%
House wife	284	27.7%
Students	96	9.4
Retired	91	8.8
Free job	63	6.2
Recurrent admission		
Yes	556	54.2%
No	467	45.8%

Table2. Laboratory findings of the study population.

Laboratory investigation	Mean ±SD
HbA1c (%)	11.22±2.71
Fasting blood sugar	260 ±61
Random blood sugar	323 ±56
Cholesterol (mg/dl)	168.09±53.34
Low density lipoprotein(mg/dl)	119.08±47.70
High density lipoprotein(mg/dl)	51.68±35.09
Triglyceride (mg/dl)	168.44±114.62
Urea (mg/dl)	39.11±272.01

Table3. Distribution of the types of infections causinghyperglycemia. (N=116)

Character	Number	% incategory	% in the whole study sample
Chest infection	25	21.6%	2.5%
Urinarytract infection	38	32.8%	3.7%
Diabetic foot	27	23.3%	2.6%
Skin infection	10	8.6%	1%
Acute tonsillitis	6	5.2%	0.6%
Acutegastroenteritis	6	5.2%	0.6%
Acute otitis media	4	3.4%	0.4%

Table4. Distribution of cardiovascular diseases combined with hyperglycemia (N=121)

Character	Number	% incategory	% in the whole study sample
Emergency Hypertension	112	92.6%	10.9%
Coronary artery disease	5	4.1%	0.4%
Heart failure	4	3.3%	0.3%

Table5. Distribution of neurology diseases combined with hyperglycemia (N=42)

Character	Number	% incategory	% in the whole study sample
Cerebro-vascular accident	26	62%	2.5%
Epilepsy	14	33.3%	1.3%
Transient ischemic attack (TIA)	2	4.7%	0.1%

Table6. Distribution of diabetic complications (N=1023)

character	Number	Percentage
NAD	527	51.5%
Neuropathy	100	9.7%
Retinopathy	40	3.9%
Nephropathy	39	3.8%
cardiovascular disease	247	24.1%
neuro vascular disease	46	4.5%
lower limb ischemia	24	2.3%

Discussion

Diabetes-related admission is found to be higher among other hospital admissions and people with diabetes require long periods of admission. These higher rates of hospitalization attributed mainly to the complications of diabetes[1]. This study is a retrospective analysis of indications and outcomes of diabetic admission at the Diabetes and Endocrine Center in Tripoli, Libya during 2015. The age of the study population ranged between 14 to 96 years with the mean age of 49.52± 20.44 years. In a parallel similar study conducted in the University of Tripoli Hospital the mean age was60.7 years[4], others registered mean age of 57± 14 years (3). The burden of diabetes is often described in terms of its influence on working-age adults, diabetes in older adults is linked to higher mortality, reduced functional status, and increased risk of hospitalization[7]. In this study, just above

half of the hospitalized patients were female (57.2%) with a female to male ratio of 1.3:1. Similar results were found in a previous study (55.8%)[5]. This may be assigned to the fact that women tend to have a high body mass with lack of physical activity when compared to men. It was found that just above half of the admissions (51.3%) were Type 2DM, which was different from the findings in other studies(85%, 90%) respectively[2,4].This can be explained by the increased incidence of obesity, over weight and sedentary life in our society, in addition to that type 2 diabetes is more prevalent than type 1[8]. Our analysis confirms the current understanding that the duration of diabetes is correlated with the risk of hospitalization. Over half of our hospitalized patients had been diabetic for more than ten years and one-third of them had been a known diabetic for at least six years before admission. The association between the duration of diabetes and its complications has been shown to be mainly due to micro-vascular complications, particularly nephropathy and micro-albuminuria. As type 2 diabetes is frequently diagnosed years after onset, the complications are a marker of the duration of the disease [9]. Compared to other studies, we found that 64.3%of the 1023admissions were to the ICU and35.5%to the ward. In a previously published study, 51.9% of admissions were to the ICU and 48.1% to the ward[4]. The admissions to the intensive care unit (ICU) were mainly attributed to the acute metabolic complications of diabetes like (diabetic ketoacidosis, hyperosmolar coma, and hypoglycemia); few others were due to underlying pathology and co-morbidity[9]. Our analysis marked that the associated co-morbidities are the significant factors responsible for such critical admissions and DM was a secondary contributor or sometimes an accidental finding. The duration of hospitalization ranged from 1 day to 36 days, with a mean of 4.15±3.6 days. This study showed that the mean length of hospital stay was shorter for diabetes mellitus type 1 (4 days) than for type 2 (6 days). It revealed that type 2 DM is twice as likely to cause admission to the hospital with a prolonged inpatient stay, which is also found in previous studies[10]. Additionally, the severity of hyperglycemia correlates with the length of hospital stay, as found in other literature[11]. Where in a different study, the duration of hospital stay ranged from 1 to 51 days, with a median duration 9 days [5]. In previous observation the median length of stay was 7 days (IQR 1-30 days). The variation from one study to another may be related to the patient characteristics, underlying co-morbidities and the prevalent diabetic complication. Mean HbA1c in this analysis was 11.22±2.71 % which was higher when compared to the other studies (9.1 ±1.2 %)[4,12]. One previous analysis of correlation between good glycemic control and admission rates found that HbA1c correlated significantly with hospitalization in type 1 but not in type 2 diabetes. It was stated that the poor glycemic control was not associated with increase in admission rates in patients with type 2, as those patients were admitted mainly with cardiovascular and atherosclerotic risks despite that they were maintaining reasonable glycemic control[12]. The seindicating uncontrolled hyperglycemia and requiring insulin therapy. With regard to treatment before admission, our results reported that most of our patients (75.9%) used insulin therapy indicating poor glycemic control in 98% of them, which is close to previous studies where one stated that 60% of the admitted patients were on insulin mono-therapy[5], and another study registered 65.4% [6].

The predominant observed cause of admission in this study was acute metabolic complications; DKA was the most frequent of them(41.7%), followed by hyperglycemia (40.2%), 2.4% of admissions was due to hypoglycemia and 3.2% due to hyperosmolar hyperglycemic state (HHS), in addition 5.8% of admissions were due to infection. Our study has found that most of the cases of diabetic ketoacidosis were registered in type 1 diabetes patients while hyper/ hypoglycemia and HHS were in type 2 diabetes. Another study found that diabetic ketoacidosis (DKA) was the most common reason for hospitalization which attributed for admission ofpatients[13,14]. Similar results in another study carried out in Libya, 91.6% of patients admitted with DKA had type 1 DM[15].Different observations found that acute metabolic and endocrine

complications represented only over one-tenth of all admission causes.[2,5,16]

In this study,25 out of 1023 file records of admissions were due to hypoglycemic events and mainly for elderly patients with type2 diabetes, who were on insulin or long acting sulfonylurea drugs, which is similar to a previous study[5]. This may be related to the lack of awareness about hypoglycemia symptoms and to self-care practice in which patients adjust their treatment at home without consulting their physicians; or could be related to their diabetes complication. All types of infections that have caused hospitalization were registered and they are in order, urinary tract infection, diabetic foot, chest infection, skin infection, tonsillitis, gastroenteritis, and lastly otitis media; it was found that infection in general was responsible for 11.4% of overall admissions. On the contrary, another study showed that almost half of the patients were hospitalized because of infection[17]. This confirms the widely held idea that diabetes itself raises the risk of all infections, regardless of age or sex. However, linked factors also include the duration of diabetes disease, poor control of DM, the existence of other comorbid conditions, and chronic squeal. It was observed that cardiovascular diseases were frequently combined with hyperglycemia in the admitted patients. Most of the cardiovascular events were attributed to emergency hypertension 10.9%, and only 0.4% and 0.3% was coronary artery disease and heart failure respectively. On the other hand, previous studies found that most of the cardiovascular events on admission were attributed to coronary artery disease in the form of myocardial infarction and unstable and stable angina[5]. Similarly, Al-adsani *et al.* observed that cardiovascular system disorders, such as acute coronary syndrome and heart failure were the most registered CVS hazards among the admitted patients with diabetes[18]. With regard to neurological diseases in our study, the main cause was cerebrovascular accident (2.5%), followed by epilepsy(1.3%) and TIA(0.1%), which correlates with other literature[16]. Regarding previous co morbidities, the majority of our patients did not have any co morbidity prior to their admission; which was surprising and different from previous studies. Alittle over 24% of the patients had cardiovascular disease, such as hypertension, which is more common as a single chronic disease or in conjunction with other comorbid disorders, including ischemic heart disease, congestive heart failure, and arrhythmia.

Hypertension was registered before in many studies as the single comorbid condition associated with diabetes[5,17],the second common comorbidity found among our patients were different types of autoimmune diseases such as thyroid disease (hypo/hyperthyroid), celiac disease, vitiligo, Addison disease, and autoimmune hepatitis (5.8%). This prevalence was more common in type1 than type 2 diabetes, as reported in previous literature[18]. This can be explained by Type 1 diabetes (T1D) is frequently associated with a number of other endocrine and non-endocrine autoimmune illnesses. Recent updates therefore recommended routine autoantibody testing in T1D patients and first-degree relatives for endocrine and non-endocrine autoimmunity[19]. The outcome in our study was good, as the majority of the patients were discharged in good general condition; the mortality rate was 0.9% of the patients. Observational and prospective randomized clinical trials in patients with diabetes, as well as in critically ill and non-critically ill patients have shown a strong relationship between hyperglycemia and poor clinical outcomes, such as mortality, infections and hospital complications[20,21].

Recommendations

The main goals in patients who are hospitalized with diabetes are to minimize disruption of the metabolic state, prevent adverse glycemic events, return the patient to a stable glycemic balance as quickly as possible, and ensure a smooth transition to outpatient care.

Maintaining a realistic blood sugar target and educating patients is mandatory.

Limitations of the Study

The data was collected from one center in Tripoli, which dealt more with acute complications of diabetes, where

cases with acute cardiovascular or cerebrovascular complications are usually not admitted.

A lot of information was missed from the file records such as habits, including smoking and exercise, and there was a shortage in the laboratory investigations.

Conclusion

The most frequent reason for diabetes-related admissions according to this study was acutemetabolic complications of diabetes itself, co morbidity such as cardiovascular diseases weremore common type2 DM, whereas autoimmune disease more prevalent in type 1 DM. Chronic complication of diabetes such as myocardial infarction, cerebral hemorrhage and renal failure are still the main causes of death among admitted patients with diabetes. Health education for the public and medical staff is crucial, reasonable glycemic control and risk factor management along with early screening for complications would definitely reduce admission rates especially in those with recurrent hospitalization.

Authors Contributions

Author/s testify that all persons designated as authors qualify for authorship and have checked the article for plagiarism. If plagiarism is detected, all authors will be held equally responsible and will bear the resulting sanctions imposed by the journal thereafter.

References

[1] Ahmann, A. Comprehensive Management of the Hospitalized Patient with Diabetes. The Endocrinologist8, 250 (1998).

[2] Moss, S. E., Klein, R. & Klein, B. E. Risk factors for hospitalization in people with diabetes. Arch. Intern. Med.159, 2053–2057 (1999).

[3] Khalid, J. M. et al. Rates and risk of hospitalisation among patients with type 2 diabetes: retrospective cohort study using the UK General Practice Research Database linked to English Hospital Episode Statistics. Int. J. Clin. Pract.68, 40–48 (2014).

[4] Haifa Elhadi, A. & Faiza, H. Overview of glycemic control among admitted patients with diabetes in Tripoli University Hospital. J. Cardiol. Cardiovasc. Med.7, 013–016 (2022).

[5] Haifa Elhadi, A. & Faiza, H. Reasons for admission of individual with diabetes to the Tripoli Medical Center in 2015. Diabetes Metab. Syndr.13, 2571–2578 (2019).

[6] Elsayed, A. M., Elbadawy, A. M., Ibrahim, W. M., Sallama, M. & Abd El Moniem, R. O. Indications and Outcome of Admission of Patients with Diabetes Into Benha University Hospitals, Egypt: A Prospective Study. Benha Med. J.38, 266–279 (2021).

[7] Brown, A. F., Mangione, C. M., Saliba, D., Sarkisian, C. A., & California Healthcare Foundation/American Geriatrics Society Panel on Improving Care for Elders with Diabetes. Guidelines for improving the care of the older person with diabetes mellitus. J. Am. Geriatr. Soc.51, S265-280 (2003).

[8] Gajewska, M., Gebska-Kuczerowska, A., Gorynski, P. & Wysocki, M. J. Analyses of hospitalization of diabetes mellitus patients in Poland by gender, age and place of residence. Ann. Agric. Environ. Med. AAEM20, 61–67 (2013).

[9] Young, B. A. et al. Diabetes complications severity index and risk of mortality, hospitalization, and healthcare utilization. Am. J. Manag. Care14, 15–23 (2008).

[10] American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care36 Suppl 1, S67-74 (2013).

[11] Falciglia, M., Freyberg, R. W., Almenoff, P. L., D'Alessio, D. A. & Render, M. L. Hyperglycemia-related mortality in critically ill patients varies with admission diagnosis. Crit. Care Med.37, 3001–3009 (2009).

[12] Holman, N. et al. Risk factors for COVID-19-related mortality in people with type 1 and type 2 diabetes in England: a population-based cohort study. Lancet Diabetes Endocrinol.8, 823–833 (2020).

[13] Eledrisi, M. S. & Elzouki, A.-N. Management of Diabetic Ketoacidosis in Adults: A Narrative Review. Saudi J. Med. Med. Sci.8, 165–173 (2020).

[14] Vellanki, P. & Umpierrez, G. E. Increasing Hospitalizations for DKA: A Need for Prevention Programs. Diabetes Care41, 1839–1841 (2018).

[15] Elkituni, A. et al. Profile of diabetic ketoacidosis at the National Diabetes and Endocrine Center in Tripoli, Libya, 2015. Diabetes Metab. Syndr.15, 771–775 (2021).

[16] Gosmanov, A. R., Gosmanova, E. O. & Kitabchi, A. E. Hyperglycemic Crises:

Diabetic Ketoacidosis and Hyperglycemic Hyperosmolar State. in Endotext (eds. Feingold, K. R. et al.) (MDText.com, Inc., 2000).

[17] Shah, B. R. & Hux, J. E. Quantifying the risk of infectious diseases for people with diabetes. Diabetes Care26, 510–513 (2003).

[18] Al-Adsani, A. M. S. & Abdulla, K. A. Reasons for hospitalizations in adults with diabetes in Kuwait. Int. J. Diabetes Mellit.1, 65–69 (2015).

[19] Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. BMJ317, 703–713 (1998).

[20] Montori, V. M., Bistrian, B. R. & McMahon, M. M. Hyperglycemia in acutely ill patients. JAMA288, 2167–2169 (2002).

[21] Evans, N. R. & Dhatariya, K. K. Assessing the relationship between admission glucose levels, subsequent length of hospital stay, readmission and mortality. Clin. Med. Lond. Engl.12, 137–139 (2012).

Citation: Halla Elshwekh et al., (2024), "The Indications and Outcomes of Admission of Patients with Diabetes Mellitus to the Diabetic and Endocrine Center in Tripoli, Libya, 2015", Arch Health Sci; 8(1): 1-10.

DOI: 10.31829/2641-7456/ahs2024-8(1)-009