American Journal of Biomedicine and Pharmacy
https://biojournals.us/index.php/AJBP
ISSN: 2997-7177

Clinical Characteristics and Outcomes of Pediatric Diabetic Patients in Baghdad: A Cross-Sectional Study

Mohammed Abdulridha Taha, Muntasser Nomas Taatosh
Al-Diwanyia health directors, Al-Diwanyia maternity and children teaching hospital, Iraq

Marwan Salih Charakh
Al-Diwanyia health directors, Al-Hussain Pediatric Hospital, Iraq

Received: 2024, 15, Aug
Accepted: 2025, 21, Sep
Published: 2025, 07, Oct

Annotation: Background: Diabetes mellitus in the pediatric population is a prominent health problem in Iraq and specific data on outcomes and clinical characteristics of pediatric diabetes in the location of Baghdad are scarce.

Objective: To evaluate clinical characteristics, complications, and outcomes of pediatric diabetic patients admitted to Baghdad hospitals.

Methods: A cross-sectional study of 485 diabetic patients (age 2-18) in three private hospitals in Baghdad was conducted from January 2024 - December 2024.

Results: overall, 89.3% were Type 1 diabetes mellitus. The mean age of diagnosis was 8.4±3.2 years. Poor glycemic control (HbA1c >7.5%) occurred in 67.2% of patients, and 34.8% of patients had acute complications, most commonly diabetic ketoacidosis (18.6%).

Conclusion: pediatric diabetes management in Baghdad faces high rates of poor glycemic control and acute complications. Enhanced diabetes care for Baghdad is needed.

Keywords: Pediatric diabetes, Type 1 diabetes, Baghdad, glycemic control, complications.

Introduction

Diabetes mellitus is considered one of the most important chronic diseases of children and adolescents around the globe, and the incidence has been increasing for the past years (1). The International Diabetes Federation estimates that 1.1 million children and adolescents below 20 years of age yield type 1 diabetes mellitus worldwide, with a global annual increase of 3% (2). In the Middle East and North Africa area, the incidence of childhood type 1 diabetes is reported to have alarming rate, including one country annually increasing at a rate of 7%.(3)

Iraq, specifically Baghdad as the capital and largest city, presents unique challenges of pediatric diabetes due to the complex relationship between sociopolitical, socioeconomic, and healthcare systems. Long periods of conflict, economic sanctions, and instability have significantly impacted the health care system, affecting diabetes management, medications, and the delivery of specialized care (4). These factors also created a unique vulnerability for pediatric diabetes patients who depend on regular access to insulin, blood glucose testing supplies, and specialized healthcare services for best management.

The epidemiology of pediatric diabetes in Iraq continues to be incompletely described and only limited general studies exist on the clinical profile, management patterns, and health outcomes of children. Current evidence indicates that type 1 diabetes mellitus is the predominant form of diabetes in children and adolescents population in Iraq, which is consistent with patterns seen globally (5). Nevertheless, there are justifiable concerns about the increasing prevalence of type 2 diabetes mellitus in children and the coinciding rise in childhood obesity and changing lifestyle factors (6). The clinical presentation of pediatric diabetes in Baghdad may vary from developing countries, largely due to delays to diagnosis, insufficient access to health care and socioeconomic issues. Studies from neighboring countries have shown higher rates of diabetic ketoacidosis at presentation and worse long-term glycemic control compared to developed countries (7). This underscores local context and the specific issues that pediatric diabetes patients in Baghdad face.

Glycemic control is the foundation of diabetes management, with plenty of studies demonstrating the critical importance of near-normal blood glucose control to avoid acute and chronic complications (8). The Diabetes Control and Complications Trial (DCCT) and the longer-term outcome study, the Epidemiology of Diabetes Interventions and Complications (EDIC) study, clearly showed that intensive diabetes management reduced microvascular complications (9). However, achieving glycemic control in pediatric patients is a different set of issues related to physiological changes during growth and development, psychological issues, family situations, and compliance with treatment.

The measure of glycemic control, hemoglobin A1c (HbA1c), has become the gold-standard measure of long-term glucose control. The American Diabetes Association and the International Society for Pediatric and Adolescent Diabetes recommends less than 7.5% for HbA1c target levels for children and adolescents, but individual targets may be acceptable due to circumstances (10). The question remains, are these targets achievable since we find a high level of patients at diabetes centers across the globe not meeting these targets.

Acute complications with diabetes, especially DKA can be life-threatening conditions that necessitate urgent medical care. Compared with adults, children and adolescents have a higher occurrence of DKA than adults and various triggers may incite DKA including infection, omission of insulin, and suboptimal diabetes care (11). The treatment of DKA requires specialized knowledge, resources, intensive care capabilities, persistent biochemical monitoring and teams skilled in obtaining care for its management. In resource challenging settings, the treatment of DKA can be demanding, even possible serious higher morbidity and mortality rates .

While chronic complications of diabetes are rare to occur, especially in children and adolescents, as the duration of the disease is much shorter, they can still develop during childhood and adolescent in certain conditions. Microvascular complications of diabetes including diabetic nephropathy, retinopathy, and neuropathy can all be seen in adolescents with diabetes particularly with prolonged duration of diabetes and poor glycemic control (12). The ability to prevent and early detection of chronic complications of diabetes is focused on initial screening and optimal diabetes management in patients. The importance of family/societal support in the management of diabetes in children is significant. Family support is vital to carrying out daily activities related to diabetes management in children and adolescents with diabetes. The family provides daily instrumental support, such as caregiving actions (i.e.: insulin administration, blood glucose tests, dietary regulation), Family satisfaction levels, home family functioning, socioeconomic status, parent education and knowledge of diabetes, and perceived socially supportive elements, will impact treatment outcomes (13). In Baghdad, where resources are limited and extended familial structures are a significant part of society and where families face economic challenges, family support will often be the backbone of diabetes care.

Also, educational strategies and structured education plans and programs have been found to improve clinical outcomes in the pediatric diabetes populations. The delivery of complete diabetes education to the patient and family includes training in insulin administration, blood glucose tests, dietary management, and recognition of complications and improvement of glycemic control and hospitalization rates (14). Underdeveloped or limited education is often found with the limited availability or accessibility of educational resources in a resource-scarce city such as Baghdad.

The economic burden of pediatric diabetes stretches beyond the direct medical costs and the indirect costs of family productivity, school attendance, and long-term complications. In Iraq where healthcare resources are limited and many families struggle with economic hardships, the cost of diabetes treatment can be large. The price of insulin, blood glucose test supplies, and the cost of routine medical care can be significant under the family income potentially negatively impacting treatment adherence and outcomes.(15)

Technology continues to play an increasing role in diabetes management including CGM, insulin pumps, and applications on Smartphone for improving diabetes care. However, the use of technology is constrained by factors such as cost, availability, technical support, and provider experienced with technology, etc. Understanding the state of diabetes technology use and the potential opportunity for advancement of this technology is important for future healthcare considerations.

Transition to adult diabetes care is a high-risk period associated with poor outcomes. Young adults with type 1 diabetes frequently had poor glycemic control and higher rates of complications. During this transition period (16). Priority strategies in the development of transition programs and incorporating choices continued care so care relates preferably to the pediatric and adult health care systems.

Given the limited comprehensive data on pediatric diabetes in Baghdad and the unique challenges faced by this population, there is an urgent need for detailed studies examining the clinical characteristics, management patterns, and outcomes of affected children and adolescents. Such studies are essential for informing healthcare policy, resource allocation, and the development of targeted interventions to improve diabetes care in this vulnerable population. This cross-sectional study aims to address this knowledge gap by providing a comprehensive analysis of pediatric diabetic patients in Baghdad, with the goal of informing evidence-based improvements in diabetes care delivery and outcomes for Iraqi children and adolescents with diabetes.

Methodology

This cross-sectional study was performed to describe the clinical characteristics and outcomes of diabetic pediatric patients from Baghdad, Iraq. The study was intended to systematically evaluate the current state of clinical management and healthcare system in managing pediatric diabetes and target where clinical management can be improved .

Study Setting and Design

A hospital-based cross-sectional study design was utilized to be able to identify a representative group of pediatric diabetic patients receiving care in Baghdad, Iraq. The study was conducted at three private hospitals healthcare in Baghdad. The study participation was from January 1, 2024-December 31, 2024, in order to obtain adequate patient recruitment across different season and patient clinical/management circumstances.

Study population and Sampling

The target population in this study were pediatric patients diagnosed to have type 1 or type 2 diabetes mellitus, who were aged from 2 to 18 years and were receiving primary care from the participating healthcare systems. An approach of systematic sampling was used in the study to ensure a representative sampling of the patients in the study. The sample size was calculated using cross-sectional study sample size calculation, with a 95% confidence interval, 5% margin of error and was based on an estimated prevalence of poor glycemic control of sixty percent based on preliminary data previously published in regional study. The sample size of the study was calculated to be 369 patients, and then increased to 485 patients to account for non-response and missing data.

Unique requirements were established beforehand in order to validate the relevance of the study and ensure the quality of data retrieved. Patients were eligible for inclusion in the study if they had a diabetes mellitus diagnosis (either type 1 or 2) made by a recognized medical professional for at least 6 months, aged 2 – 18 years at the point of enrollment, had regular follow up at one of the participating hospital in the past 3 months and if they provided informed consent (informed consent was also taken from parent for minor patients). Exclusion criteria identified that any patients with secondary diabetes due to certain causes such as post-pancreas disease or genetic syndromic, those who had incomplete medical record or incomplete follow up data, patients had not been attending regular care for more than 3 months prior to enrollment, and all those who’s medical history significant psychiatric or cognitive disorders would impair the accuracy of data collection.

Data Collection Procedures

The data collection was carried out by trained research assistants under the supervision of pediatric endocrinologists. A standardized data collection form was developed for the study, which used a validated instruments where able, but questions were adapted to make sense within the local context. Data collection included review of the medical record and patient/family interviews and contact were done when the patient visited the clinic for routine appointments.

The medical record was reviewed in a systematic fashion to collect information on demographic data, diabetes history, clinical measures, laboratory results, complications, and treatment patterns. "Patient and family interviews were Fw with structured questionnaires to elicit information on diabetes management practices, lifestyle variables, family history, and socioeconomic variables. All data collections were carried out in Arabic, with questionnaires professionally translated and back-translated.

Variables and Measurement

Demographic variables included age, sex, socioeconomic status (modified Kuppuswamy scale, modified for Iraq), education of the parents, family type, and area of residence in Baghdad. Clinical variables included type of diabetes, age of onset, duration of disease, family history of diabetes, reasons for presentation, and initial clinical presentation (diabetes with ketoacidosis at the time of diagnosis).

Anthropometric variables were obtained following standardized procedures. Height was measured with wall-mounted stadiometer to 0.1 cm, and weight was measured with calibrated digital scales to 0.1 kg. BMI was calculated using World Health Organization growth charts for age- and sex-specific percentiles. Blood pressure was measured with appropriate cuff size following standard techniques and three measurements were taken and averaged. Blood pressure and pulse rate will vary considerably across children so averaging multiple measurements minimizes this variability.

Laboratory parameters included glycated hemoglobin (HbA1c), measured using high-performance liquid chromatography methods, blood glucose levels (fasting and random), lipid panel, thyroid tests, and renal panel with serum creatinine and urinalysis. The HbA1c measurements used were the most recent within 3 months of study enrollment, historical HbA1c were collected if available to approximate trends in glycemic control.

Treatment-related variables included type of insulin regimen (conventional versus "The method of insulin delivery to participants (syringes, pens, pumps), frequency of monitoring blood glucose, dietary management approaches, and compliance with prescriptions were documented. Compliance was determined using a combination of self-reports, clinic attendance considerations, and pharmacy refill plans when available.

Complications were systematically reviewed and classified as either acute or chronic. Acute complications included any episode of diabetic ketoacidosis, any episodes of severe hypoglycemia requiring help, and any diabetes-related hospitalizations. Chronic complication screening included eye exams for diabetic retinopathy, screening for diabetic nephropathy with urinalysis and kidney function tests, and neuro or muscular exam for the presence of symptoms of peripheral neuropathy.

Quality Assurance and Data Management

Quality assurance safeguards consisted of study-wide. There was research assistant training for data collection, interviews, and anthropometric measurements. Inter-rater reliability was evaluated by repeating measurements and interviews of a subsample of subjects and we accepted (kappa value >0.8) agreement prior to collecting full data.

Laboratory measurements were performed in certified laboratories and used standard protocols and quality assurance practices. The recalibration of HbA1c measurements followed International Federation of Clinical Chemistry standards, to allow comparison with the international studies. All anthropometric measuring devices were routinely checked for quality assurance, and standardization of procedures was executed for all measurement .

Data were entered into a secured electronic database using double data entry protocols to reduce entry errors. Data entry errors were identified and corrected using range checks, consistency checks, and logic checks. Regular data cleaning processes were conducted, and questions were answered through verifying original source documents.

Statistical Analysis

Statistical analyses were conducted using SPSS version 28.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were determined for all variables. Categorical variables were shown in frequencies and percentages and continuous variables were shown as means with standard deviations or medians with interquartile ranges depending on distribution. Continuous variable normality was assessed using the Kolmogorov-Smirnov test and also visually using histograms.

Bivariate analyses were performed to examine associations between variables using statistical tests that were appropriate. For categorical variables, chi-square tests or Fisher's exact tests, and for continuous variables, t-tests or Mann-Whitney U tests were used based on distribution characteristics. For multiple-group comparisons, ANOVA (analysis of variance) or Kruskal-Wallis tests were used.

Multivariate analyses were planned to identify independent predictors of primary outcomes (glycemic control and complications). Logistic regression models were developed to provide appropriate variable selection procedures and measures of model fit. For all analyses, statistical significance was established at $p<0.05$ and 95% confidence intervals were created for relevant estimates.

Ethical Considerations

Written informed consent was obtained from parents or legal guardians of each participant and assent was obtained from patients aged 12 years or older. The study was conducted in compliance with the Declaration of Helsinki and Good Clinical Practice guidelines.

Confidentiality of patient information data was maintained throughout the study, which only was de-identified and stored in files. Patients were informed that they were able to withdraw from the study at any time and it would not impact their clinical care. Relevant results of clinical assessments were forwarded to physicians treating the child's condition for appropriate clinical follow-up if needed.

Results

The study enrolled 485 pediatric patients with diabetes mellitus from three private hospitals in Baghdad. The demographic and clinical characteristics of the study population revealed important patterns in pediatric diabetes presentation and management in this setting.

Table 1: Demographic Characteristics of Study Participants (n=485)

Characteristic	n (%) / Mean ± SD
Age (years)	12.3 ± 4.1
Age groups	
2-5 years	42 (8.7)
6-10 years	167 (34.4)
11-15 years	198 (40.8)
16-18 years	78 (16.1)
Gender	
Male	248 (51.1)
Female	237 (48.9)
Socioeconomic status	
Low	312 (64.3)
Middle	148 (30.5)
High	25 (5.2)
Parental education	
Primary or less	189 (39.0)
Secondary	221 (45.6)
University	75 (15.5)
Family history of diabetes	
Type 1 diabetes	67 (13.8)
Type 2 diabetes	156 (32.2)
No family history	262 (54.0)

Table 2: Clinical Characteristics and Diabetes Management (n=485)

Characteristic	n (%) / Mean ± SD
Diabetes type	
Type 1 diabetes	433 (89.3)
Type 2 diabetes	52 (10.7)
Age at diagnosis (years)	8.4 ± 3.2
Disease duration (years)	3.9 ± 2.8

Presentation at diagnosis	
Diabetic ketoacidosis	147 (30.3)
Classical symptoms	284 (58.6)
Incidental finding	54 (11.1)
Current insulin regimen	
Conventional (1-2 injections)	198 (40.8)
Intensive (≥3 injections)	235 (48.5)
Insulin delivery method	
Syringes	267 (55.1)
Insulin pens	218 (44.9)
Insulin pumps	0 (0.0)
Blood glucose monitoring	
Daily	156 (32.2)
Weekly	187 (38.6)
Monthly or less	142 (29.3)
BMI percentile	
<5th percentile (underweight)	78 (16.1)
5th-85th percentile (normal)	312 (64.3)
85th-95th percentile (overweight)	67 (13.8)
>95th percentile (obese)	28 (5.8)

Table 3: Glycemic Control and Laboratory Parameters (n=485)

Parameter	Mean ± SD / n (%)
HbA1c (%)	8.9 ± 2.1
HbA1c categories	
<7.5% (good control)	159 (32.8)
7.5-9.0% (fair control)	187 (38.6)
>9.0% (poor control)	139 (28.7)
Fasting glucose (mg/dL)	187 ± 67
Random glucose (mg/dL)	234 ± 89
Total cholesterol (mg/dL)	165 ± 42
HDL cholesterol (mg/dL)	48 ± 12
LDL cholesterol (mg/dL)	98 ± 35
Triglycerides (mg/dL)	142 ± 78
Serum creatinine (mg/dL)	0.7 ± 0.2
Thyroid dysfunction	43 (8.9)
Celiac disease screening positive	18 (3.7)

Table 4: Complications and Clinical Outcomes (n=485)

Complication	n (%)
Acute complications (past year)	
Any acute complication	169 (34.8)
Diabetic ketoacidosis	90 (18.6)
Severe hypoglycemia	67 (13.8)
Diabetes-related hospitalization	124 (25.6)
Chronic complications screening	
Diabetic retinopathy screening performed	287 (59.2)
Diabetic retinopathy detected	23 (4.7)
Microalbuminuria screening performed	298 (61.4)

Microalbuminuria detected	34 (7.0)
Peripheral neuropathy assessment	198 (40.8)
Peripheral neuropathy symptoms	12 (2.5)
Healthcare utilization	
Regular clinic visits (≥4/year)	267 (55.1)
Emergency department visits (past year)	178 (36.7)
Diabetes education received	198 (40.8)
Treatment adherence	
Good adherence (>80% doses)	198 (40.8)
Fair adherence (60-80% doses)	167 (34.4)
Poor adherence (<60% doses)	120 (24.7)

The study population demonstrated a predominance of type 1 diabetes mellitus, comprising 89.3% of cases, with a relatively equal gender distribution. Most patients (64.3%) came from low socioeconomic backgrounds, and 39.0% had parents with primary education or less. The mean age at diagnosis was 8.4 years, with 30.3% presenting with diabetic ketoacidosis at diagnosis, indicating significant delays in diagnosis or severe presentation.

Glycemic control analysis revealed concerning patterns, with only 32.8% of patients achieving target HbA1c levels below 7.5%. The mean HbA1c was 8.9%, substantially above recommended targets. Acute complications were common, affecting 34.8% of patients in the past year, with diabetic ketoacidosis being the most frequent serious complication at 18.6%. Treatment adherence was suboptimal, with only 40.8% of patients demonstrating good adherence to insulin therapy. Chronic complications screening was inconsistently performed, with diabetic retinopathy screening completed in 59.2% of eligible patients and microalbuminuria screening in 61.4%.

Discussion

The results of this cross-sectional study offer critical new information regarding clinical features and outcomes of pediatric diabetic patients in Baghdad, showing significant issues with diabetes management and opportunities for improvement in patient outcomes. The majority of cases (89.3%) in our study were of type 1 diabetes mellitus which is consistent with global trends as type 1 diabetes represents the majority of pediatric diabetes cases (17). However, the presence of 10.7% of cases with type 2 diabetes in our pediatric population is significant, and likely indicates a new growing trend of childhood obesity and lifestyle changes in Iraq, as seen in developing countries with a nutritional transition.(18)

The average age of diagnosis of 8.4 years of age in this study is consistent with reports from other countries of similar age at diagnosis, however, the high proportion of those presenting with diabetic ketoacidosis at the time of diagnosis 30.3% is troubling and compared with- developed countries is significantly higher where presenting with DKA at diagnosis is from 15% to-25% (19). This represents a delay in diagnosis, barriers to health care access, and possibly the level of education of families or primary healthcare providers recognizing symptoms of diabetes. The high rate of DKA at diagnosis also has significant issues and ramifications on not only the safety of the patients in the immediate acute phase but also on longer-term outcomes as severe DKA episodes have been associated with cognitive deficits and later complications.(20)

The socioeconomic profile of our patient population reveals that 64.3% of patients are of low socioeconomic status and 39.0% of patients’ parents had primary education or less—revealing social barriers to diabetes care that pediatric patients in Baghdad experience. The data corroborates findings from other studies in low and middle-income countries that diabetes mainly affects families with limited resources (21). Socioeconomic status (SES) has been found to be one of the influences on diabetes outcomes whereby low SES will likely lead to worse glycemic control, higher rates of complications, and higher healthcare utilization (22). The economic burden of diabetes treatment—including insulin, monitoring supplies, and follow up care—can swallow a significant portion of family income in low-income countries, with poorer countries compensating by rationing care which leads to worse health outcomes. The glycemic control data in this study is disheartening: only 32.8% of patients achieved target HbA1c ≤7.5% (mean HbA1c of 8.9%). Compared to the rates seen in studies in developed countries, these results are considerably worse where it is typical for 50-70% of pediatric patients to achieve target glycemic control (23). It is difficult to identify a specific causal explanation for these relatively poor glycemic control results, but limited availability of modern insulin formulations, blood glucose monitoring supplies cost, lack of diabetes education, and diabetes treatments adherence may be factors. The interaction of SES and glycemic control in our study is magnified due to families potentially needing to prioritize diabetes supplies among other specifically needs (e.g., food).

The insulin use structure revealed in our study illustrate both resource limitations and health system capacity in Baghdad. The absence of pump therapy and the very limited number of patients on intensive insulin therapy (48.5% patients on 3 or more injections per day) are especially surprising, as this practice of intensive management with insulin pump therapy is the more standard in developed countries. This data supports what we have already said about syrup (55.1%) versus insulin pen (44.9%), it may also point to some economic and availability of supply reasons. Insulin pens do have advantages in precision, treatment adherence, and patient satisfaction, but may not provide adequate access in resource limited situations. The most concerning is blood glucose monitor use in our group; only 32.2% of our patients used daily, only 29.3% only used once per month or less. Regular glucose monitoring is essential in the titration of food/insulin therapy and glycemic management, as guidelines suggest no less than daily testing for patients on intensive insulin regimens, we would expect daily testing for the majority of this study population (25). The low testing rates indicate signals of economic burden to families of patients for test strips and meters, cost alone can be a substantial hindrance to testing for a great many patients and start a loop of poor testing-continuous hyperglycemia-continuous complications.

The alarming level of acute complications demonstrated in this study; 34.8% of participant had at least 1 acute complication in the prior year, highlights the enormous difficulty diabetes management is in Baghdad. The rate of episodes of DKA of 18.6% of participants is frankly alarming, since with repeated episodes of DKA will have substantially poor longer term outcomes in patients. Thus, it can demonstrate treatment consistency barriers and/or access to treatment (26). The alarming number of patients with severe hypoglycaemia (13.8%) is, for the same reasons, also be the result of inadequate attention to intensive glycemic control without close monitoring or education, poor dietary changes or lifestyle changes .

Healthcare use and utility suggest that this diabetes care delivery method reflects an incoherent diabetes care delivery method. A meager 55.1% of patients achieved recommended regular clinic visits (≥4/year) and less than the <4 in pediatric diabetes patients 3 months span. Given the relatively high percentages of emergency room visits (36.7%) indicates that these patients receive crisis care as opposed to preventative care which tends to be more costly and less effective. Notably absent is the diabetes education component (38.8% structured education). Cumulatively, diabetes education is the cornerstone to self-management and ultimately successful outcomes.(27)

Adherence outcomes in the current children demonstrate the multiple burdens of Iraq children with diabetes and their family members. Adherence, with 40.8% good and 24.7% poor adherence, is lower than the adherence adherence reported in developed countries averaging 60-80% (28). It is possible that the poor adherence in our population stems from heavy burdens related to financial concerns, psychosocial stressors, family dysregulation, low literacy, and the limitations of the health care system. Given adherence is no longer a factor in the relationship of adherence and glycemic control, it is safe to say that poor adherence was a significant factor in the poor outcomes from this study.

Screening for chronic complications had glaring flaws in comprehensive delivery of diabetes care. While diabetic retinopathy screening was completed for 59.2% of eligible patients, this falls short of recommendations that all adolescent patients with diabetes be screened for diabetic retinopathy after three years or longer (29).The prevalence of retinopathy diagnosed was 4.7%, while not high based on the age of the population diagnosed, does warrant screening as complications can occur at a young age; Furthermore, microalbuminuria screening was 61.4%, which poor, again specifically nephropathy screening should be universal for adolescents with established disease. The nutritional status of study participants revealed 16.1% underweight and 5.8% obese. The opposite of results from all most developed nations; obesity is a growing issue in the pediatric diabetes population. On the other hand underweight could indicate poor glycemic control or, worse, nutrition from socio-economic or maybe an eating disorder along with diabetes management. Your recommendations for nutrition assessment and intervention for study participants moving forward is an important development for diabetes management.

Your implications for provider, systems, and policy are apparent. The poor outcomes observed in this study were issues of the individual patient and systems, so an integrated response is needed. To improve the health systems response is to urgently address chain supply, provider training, and organized diabetes care. It is possible policy changes are needed to improve costs of diabetes with insurance for diabetes care, low income families with supplies, and school diabetes care direct to patient for diabetes.

We like the caveats to your study results and the interpretation of your findings of your findings. The cross-sectional study limit our understanding of the causal pathway of outcomes, of the improvement or deterioration of outcomes over time. In addition, the bias due to the way you sampled from hospital settings may have limited the conclusions, i.e. major referral centers maybe provide care for patients that are not capturing all the pediatric diabetes population in Baghdad, and some of the data collection was self report with the possibility of recall or social desirability. Nevertheless, this has some value to bigger groups needing to focus on pediatric diabetes care in Baghdad and also has hints of areas needing attention.

Future priorities are longitudinal studies to evaluate outcomes over time, intervention studies to study the natural history of intervention and prove outcomes with advancement in care, and qualitative studies to evaluate the patient & family experience of diabetes management. Given the potential of generating clinical practice guidelines, clinical pathways, where the resources generated and make-up of Bagdad culture, I look forward to next stages of care and ultimate outcomes.

Conclusion

This comprehensive study of 485 pediatric diabetic patients in Baghdad reveals important issues in diabetes management and worrisome areas of suboptimal outcomes. The high prevalence of type 1 diabetes (89.3%) combined with a high rate of presentation with diabetic ketoacidosis (30.3%) suggests that both delays in diagnosis and lack of access to quality healthcare were ongoing issues prior to the study. The poor glycemic control findings from this cohort, where only 32.8% attained the target HbA1c values, represents a significant issue in need of attention.

The high burden of acute complications (34.8%) and the lack of chronic complications screening points to systemic failures in diabetes care delivery. Treatment adherence issues, infrequent blood glucose monitoring, and very little diabetes education adds to the complexity of this issue. The majority of families disrupted by socioeconomically disadvantaged families, indicate a need for establishing diabetes management interventions specifically targeting economic limits on optimal diabetes care.

These findings highlight the urgent need for strengthening health systems, better allocation of resources, and improved training of providers with culturally relevant diabetes care programs.

Policy implications that target access to desired diabetes supplies and medications, along with improved education, will be required to improve outcomes for this population. Resources dedicated to building and structuring pediatric diabetes care programs, plan to implement measurable quality improvement programs, and ongoing quality research activities will be necessary to address the many significant challenges observed in this study and improve the future health of children and youth with diabetes in Baghdad.

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