

PREVALENCE OF DIABETIC KETOACIDOSIS AND ASSOCIATED
PRECIPITATING FACTORS AMONG PEDIATRIC DIABETIC PATIENTS ON



FOLLOWUP AT ST PAULS PEDIATRIC DIABETIC CLINIC 2009-2010 E.C

SUBMITTED TO SPHMMC PUBLIC HEALTH DEPARTMENT AS FULLFILMENT
OF DEGREE OF MEDCINE

BY Dr **SURAFEL MEKONNEN (Intern)**

MARCH 2010

PREVALENCE OF DIABETIC KETOACIDOSIS AND ASSOCIATED
PRECIPITATING FACTORS AMONG PEDIATRIC DIABETIC PATIENTS ON



FOLLOWUP AT ST PAULS PEDIATRIC DIABETIC CLINIC 2009-2010 E.C

SUBMITTED TO SPHMMC PUBLIC HEALTH DEPARTMENT AS FULLFILMENT
OF DEGREE OF MEDCINE

BY **SURAFEL MEKONNEN(Intern)**

Advisors Mr Tesfalem Teshome(MSc)

DR Bereket Fantahun (Assistan professor of pediatric endocrinology)

MARCH 2018

AKNOWLEDGMENT

This is the beginning my beginning for which I would thank GOD of my ancestors who taught pursuit of wisdom. Then I would thank my advisors Mr Tesfalem(MPH)and Dr Bereket Fantahun (Assistant professor of pediatric endocrinology) Dr Bezawit Nigussie. And my family for your support.

SUMMARY

Background-Diabetes is one of the common non communicable diseases due to different mechanisms resulting in hyperglycemia. It has acute and chronic complications of which diabetic ketoacidosis is the commonest acute complication especially in type one diabetic patients and .type one diabetes is commonly seen in pediatric patients. Diabetic ketoacidosis result from diminished insulin which allows the body to use free fatty acid whose metabolic excess result in pathways forming ketone bodies. These ketone bodies accumulate and form acidosis and released in urine. It is precipitated by omission of drug ,infections of any form, stressful condtions of life like divorce in a family, exam times for school children.

Objective: assessment of the prevalence of diabetic keto acidosis in pediatric patients having follow up at stpauls pediatric diabetic clinic and precipitating factors.

Methods: this study will be institution based cross sectional study conducted on patients presenting to diabetic clinic from 2009_2010 E.C by chart review

Work plan Data will be collected by investigator from secondary source by chart review of patients on 2018 G.C after ethical clearance is granted by department of public health.

Budget—The research will be conducted with total cost of 2530 ET BIRR.

Contents

AKNOWLEDGMENT	III
SUMMARY	IV
1. INTRODUCTION	1
1.1. BACKGROUND	1
1.2. STATEMENT OF THE PROBLEM	3
1.3 SIGNIFICANCE OF THE STUDY	5
2 OBJECTIVE-	6
3LITRATURE REVIEW	8
3.1Prevalence of DkA	8
4 METHOD AND MATERIAL	15
4.1 Study area-	15
4.3 Study design	15
4.3 Source population	16
4.4 Sample size and Sampling Procedure	17
4.1.1SAMPLE SIZE DETERMINATION	17
4.1.2 Sampling Technique	17
4.4 Data collection and analysis	17
Method-	17
TOOL	17
Data processing and analysis	17
4.5 Ethical consideration	17
4.6 Result dissemination	18
5 Workplan	19
5.1Table 1:work plan	19
6BudgetPlan	20
6.1 Table 2:Total budget break down	20
7 REFERENCE	21
Checklist to be filled by investigator(in consulting chart)	24

ABBREVIATIONS

<i>DKA</i>	<i>Diabetic ketoacidosis</i>
<i>DM</i>	<i>Diabetes Mellitus</i>
<i>T1D</i>	<i>Type one Diabetes</i>
<i>T2D</i>	<i>Type two Diabetes</i>
<i>HHS</i>	<i>Hyperosmolar hyperglycemic state</i>

1. INTRODUCTION

1.1. BACKGROUND

Diabetes mellitus (DM) is a name given to a group of common metabolic disorders that share the phenotype of hyperglycemia. Several distinct types of DM are caused by a complex interaction of genetics and environmental factors. Depending on the etiology of the DM, factors contributing to hyperglycemia include reduced insulin secretion, decreased glucose utilization, and increased glucose production. The metabolic dysregulation associated with DM causes secondary pathophysiologic changes in multiple organ systems that impose a tremendous burden on the individual with diabetes and on the health care system.

Diabetes is associated with serious complications, which can be acute or chronic. Acute include diabetic ketoacidosis (DKA), which is a medical emergency and caused by excess ketone body production as a result of uncontrolled diabetes. And Hyperglycemic Hyperosmolar State. The major chronic complications are Micro vascular complications including diabetic retinopathy, diabetic nephropathy and diabetic neuropathy. Macrovascular complications include coronary artery disease, leading to heart attacks), cerebrovascular disease (leading to strokes), and peripheral vascular disease.

Diabetic ketoacidosis (DKA) is a state of uncontrolled diabetes and it is characterized by hyperglycemia, a high anion gap acidosis, and the presence of ketonemia and ketonuria (ketone bodies in the blood and urine). Although it can occur in patients with type 2 diabetes (during periods of severe stress), DKA primarily occurs in patients with type 1. Type 1 diabetes is caused by the

(usually autoimmune) destruction of the pancreatic beta cells, which leads to an absolute insulin deficiency. Thus, patients with type 1 have an absolute requirement for insulin and will develop DKA if they do not receive it.(14-18)

In A retrospective study study conducted at Tikur Anbessa Specialized Referral Hospital from 1997-2007 on prevalence of newly diagnosed type one DM patients presenting with diabetic ketoacidosis 80% were admitted to ward with DKA. With case fatality of 6%.both male and female are affected equally.30.6% cases were less than 4 years of age. The parents' monthly income, level of education and the residential area were not found to have association with early seeking of medical advice.(1)

1.2. STATEMENT OF THE PROBLEM

Globally-The international diabetes federation estimated that 415 million adults were diabetic in 2015. Among children less than 15 years old the estimate for type 1 diabetes was 542,000 with a yearly incidence of 86,000 Northern European (Finland, Sweden and Norway) and Persian Gulf (Kuwait and Saudi Arabia) countries have a very high incidence of type I diabetes. The highest incidence is between the ages of 10 - 14 (5). The incidence of DKA in Denmark is about 12.9 per 100,000 per year and higher in males than females. The mortality was 4% and higher in those above 70 years of age (6)

In a study conducted in Australia .DKA hospitalisation rates among children and young people with type 1 diabetes were: 1.4 times as high among females as males and Similar between 2009–10 and 2014–15 and 1.5 times as high for those living in Outer regional and Remote and very remote areas as for those living in Major cities with 2.4 times as high for those in the lowest socioeconomic group as for those in the highest socioeconomic group.(7) DKA remains a major source of mortality and morbidity due primarily to the development of cerebral edema, which is the gravest complication of DKA (4). Despite advances in many areas of the management of DKA, the mortality from Cerebral edema has remained constant for decades. This rare disorder, complicating about 1% of cases of DKA in children, is lethal in 20% to 50% of victims (1-3).

In Ethiopia A retrospective study study conducted at TikurAnbessa Specialized Referral Hospital from 1997-2007 on prevalence of newly diagnosed type one DM patients presenting with diabetic ketoacidosis 80% were admitted to ward with DKA. With case fatality of 6%.both male and female are affected

equally.30.6% cases were less than 4 years of age. The parents' monthly income, level of education and the residential area were not found to have association with early seeking of medical advice.(4)

A study which shows prevalence of DKA in patients on follow up is not conducted at this hospital ,which is tertiary hospital with its own pediatric diabetic clinic,the aim of the research is to see the prevalence of diabetic ketoacidosis and precipitating factors in patients on follow up this hospital diabetic clinic. And it will fill give feedback on the achievements of the diabetic clinic.

1.3 SIGNIFICANCE OF THE STUDY—

This study will fill the gap in knowledge of the the prevalence of Diabetic Ketoacidosis in patients who have already started follow up with health education about complications of diabetes and affect of missing insulin inecting and other precipitating factors so that the diabetic clinic can act accordingly .It will also be as stepping stone for other researches.

2 OBJECTIVE-

2.1GENERAL OBJECTIVE

To assess prevalence of diabetic ketoacidosis among patients having follow up at St. Paul's pediatric diabetic clinic and precipitating factors.

2.2SPECIFIC OBJECTIVES-

- To assess prevalence of DKA in patients having follow up
- To assess precipitating factors by sex, socioeconomic status, educational level of family,

3 LITERATURE REVIEW

3.1 Prevalence of DKA

Diabetic ketoacidosis (DKA) is a major acute metabolic complication of T1D that is typically marked by acidosis, ketosis and usually hyperglycaemia. The symptoms of uncontrolled diabetes that may lead to development of DKA are typically of short duration and include polyuria, polydipsia, polyphagia, weight loss, vomiting, abdominal pain and fatigue.

The Current criteria for diagnosis of DKA published by the International Society for Paediatric and Adolescent Diabetes is blood glucose $>11\text{mmol/L}$, venous $\text{pH} < 7.3$ or bicarbonate $< 15\text{mmol/L}$, and ketonaemia and ketonuria. but there are different cut off point for diagnosis from study to study. (7) The condition is precipitated by several situations which include skipped insulin doses, newly diagnosed type 1 diabetes, infections, inter-current illness among others. Patients present with nausea, vomiting, polyuria, polydipsia and weight loss. The most consistent clinical finding is dehydration which is reflected by hypotension, renal hypo perfusion, electrolyte imbalance and altered sensorium.

According to the International Diabetes Federation, approximately 542 000 children 0–14 years of age have T1D, with 86 000 new cases diagnosed worldwide each year.

A systematic review done from 65 studies and 5 different continent in age group between 0-20 years stated the highest frequency of DKA being in UAE(80%), Romania(67%), Taiwan(65%) and Saudi Arabia(59%) and the lowest frequency were seen in Sweden(14%), Canada(18.6%), Finland(22%)

and Hungary(23%) (8).Another population based study conducted in under 15 children in Austria for around 20 years (1989-2009) reported that the frequency of DKA to be 37.2%. The same study DKA was defined as, mild DKA $\text{PH} < 7.3$ and/or > 7.1 and severe DKA as $\text{PH} < 7.1$ or clinical sign of severe acidosis such as hyperventilation or unconsciousness (8).

Another systematic review on Incidence and prevalence of diabetic ketoacidosis (DKA) among adults with type 1 diabetes mellitus from 19 studies showed that there were 11 publications in North America (USA and Canada), five publications in Europe and two publications in Israel and one publication in China Overall, eight studies reported incidence rate, with a range of 0–263 per 1000 Person years, and 11 studies reported prevalence with a range of 0–128 per 1000 people The lowest incidence rates were reported in Israel and North America (both 0 events per 1000 Person Years) and the highest in China (263 events per 1000 Person Years) The lowest prevalence was reported in Sweden (0 per 1000 people) and the highest in Canada (127.9 per 1000 people) (9)

In north America Results from two long-term observational cohorts found that the incidence of DKA showed a general reduction over the duration of study follow-up, with an incidence rate of approximately 20 cases per 1000 Person Years at baseline to 0 events at the 12 year follow-up in one cohort and a decrease from approximately 30 cases per 1000 Person Years at baseline to < 10 cases per 1000 Person Years at the 18 year follow-up in another cohort.(9,19)

A US-based study from a single clinic in Colorado compared continuous subcutaneous insulin infusion pump users (42% of patients) with patients

treated with multiple daily injection (58% of patients), over the study period of approximately 1 year, only patients treated with CSII experienced any DKA events. In this investigation, the cumulative incidence of DKA was calculated to be 55.6 per 1000 people for CSII users.(10)

Overall incidence and prevalence of DKA in Europe--Incidence rates ranged from approximately 8 cases per 1000 Person Years in a study of 113 young adults in Oxfordshire, England to 51.3 cases per 1000 Person Years (reported rate based on pH <7.3 or hospital admission for DKA) for over (9)

While inpatient mortality rates for DKA are generally very low (<1% in Scotland and in the USA rates vary substantially based on healthcare setting; a recent analysis conducted in India reported that up to 30% of hospitalised DKA cases result in inpatient death. Among all T1D-related deaths for patients aged less than 30 years, 54%–76% can be attributed to DKA.(8)

A hospital based cross sectional study in under 19 years of age in Iran, (1995-2005), showed that the frequency of DKA to be 24%. This study considered DKA as blood glucose level >250mg/dl, arterial PH<7.3, blood bicarbonate <15mmol/L and ketonuria greater than 2+ in dipstick urine test with recent positive symptoms of polyuria, polydipsia, nocturia and weight loss .(11)

IN Ethipia A retrospective study conducted at TikurAnbesa specialized referral Hospital from September 1997 to September 2007, the frequency of DKA in children less than 12 years of age, was found to be 80%. The mean age at presentation was 6 years and the lowest age was nine and half months. There were 7 deaths during the study period that makes the case fatality rate 6 % the deceased were newly diagnosed DM patients in DKA. Both sexes were equally affected. Significant number of children 31 (30.6%) were less than

four years of age. The study defined DKA as patient presenting with vomiting, dehydration, kussmaul breathing, lethargy or coma and biochemically random blood sugar (RBS) > 250 mg/dl, glucosuria and ketonuria(4)

3.2 Associated Risk factors

A systematic review on 40 studies in 31 countries on the associated factors of DKA on newly diagnosed children found out different risk factors. In this systematic review the effect of age was reported in 32 studies. These studies showed that children <2 years old had three times the risk of presenting in diabetic ketoacidosis compared to children aged ≥ 2 years significantly. Twenty one studies reported the effect of sex on the frequency of diabetic ketoacidosis, of which only one study showed the significant effect of sex on DKA. In this systematic review the effect of family history on DKA was reported by six studies. Although having a first degree relative with type 1 diabetes decreased the frequency of diabetic ketoacidosis in three studies it did not predict a diagnosis of new onset diabetes before . The others associated risk factors reported by this systematic review were parental consanguinity, parental education, family structure, ethnicity, health insurance status, residence, family income, parental employment, delayed diagnosis(>24hours), diagnostic error, number of medical consultation before diagnosis, preceding illness/febrile illness(12).

Colombian Multicentric Study on Epidemiology of Diabetic Ketoacidosis in Children with Type 1 Diabetes Mellitus by Observational, case series study on published on 2017 Patients were recruited over a 24-month period in which all of the ketoacidosis episodes admitted to pediatric intensive care units were evaluated. Patients with newly diagnosed type 1 diabetes and DKA occurring

as the first presentation of the disease where exclude. The study included a total of 52 diabetic ketoacidosis events in 47 children with T1DM previously diagnosed from May 2014 through May 2016. Patients were ages 3 to 17, 30 of whom were girls. It showed There was poor diabetes control in 86.5% of patients as evidenced by HbA1c between 9.3 and 14% with a median of 12%. Patients in the study used intermediate to high insulin doses of 0.74 – 1.2 units/ Kg with a median of 0.91 units/Kg. Three patients presented more than one ketoacidosis event, one of whom presented two events and two presented three events. None of the patients died during a DKA episode. One hundred percent of patients belonged to middle and low socioeconomic classes (51.9% lower class and 48.1% middle class). the causes of ketoacidosis identified from that research were: Nonadherence to treatment, 44.8% of episodes; intercurrent infection, 39.7% of episodes; trauma or surgical procedure, 3.4% of episodes. Also, 26.9% of patients did not have the necessary supplies for adequate glycemic control at the time of decompensations. Amongst these supplies, in 23.1% of episodes, patients did not have glucose test strips, in 11.5%, patients did not have a glucose meter or insulin injectors, in 12.1%, they did not have insulin (ultra-rapid or basal), A single child may have been lacking insulin, insulin injections supplies and glucose strips at the same time. 13.8% cases had no cause attribution. Eighteen patients were diagnosed with mild DKA (blood pH between 7.2 and 7.3 or bicarbonate e between 10 and 15 mEq/L), 16 presented moderate DKA (pH between 7.1 and 7.2 or bicarbonate between 5 and 10 mEq/L), and 18 patients had severe DKA (pH < 7.1 or bicarbonate < 5 mEq/L).(13)

In a study in ItalyThe frequency of DKA was significantly higher in under 2 children than the other group . Of whom 9.4% of the patients had first degree

relatives with diabetes. DKA occur in less frequency in children who have first degree relatives with type 1 than children who do not have first degree relatives with type 1 diabetes. First degree relatives and age at onset of DKA found to have a significant association with DKA (12).

In a study conducted at TikurAnbesa one fourth of the cases had family history of DM, 81.2% were from Addis Ababa and nearby town. Significant number of children (53.5%) had families who joined secondary and higher education. In this study average monthly income and level of education did not show significant association with DKA. In 44.6% of patients the precipitating factor for DKA was infection. Over all the study revealed around 7 deaths with 6% case fatality rate. Of these deaths one of the patients died because of cerebral edema (4).

Clinical Characteristics of Diabetic Ketoacidosis in Children with Newly Diagnosed Type 1 Diabetes in Addis Ababa, Ethiopia: A Cross-Sectional Study(10)--- A total of 421 charts from children below the age of 12 years who were diagnosed with DKA between January 2009 and December 2014 were reviewed. Among a total of 395 patients with DKA, who were hospitalized during the five year period under review, 142(35.8%, 95% CI [31.6%, 40.8%]) were newly diagnosed. Of 142 newly diagnosed DM children at the primary diagnosis of DKA, more than half, 77(55.9%) were males. The mean age at presentation was 7.08 ± 3.8 years (7.4 ± 3.74 years for boys and 6.66 ± 3.85 years for girls). Of 395 children the marital status of the mother/father/guardian with whom the child live; 330(83.5%) were married, 36(9.1%) were separated, 15(3.8%) were widowed, and the rest were single. The mean and standard deviation of family income were 2569 ± 1216 . The

majority, 182(46.1%) of children were from Orthodox Christian religion family followed by, 113 (28.5%) Muslims and 60(15.2%) Protestants. Of the total respondents; majority completed at least high school grades and above (100(25.3%) were above grade 12, 93(23.5%) were 9–12). Of 395 children's mother/caregiver; more than half were a housewife, 137(34.7%) and civil servant, 92(23.3%) by occupation .

From this study one-third of the children 131(33.2%) had first-degree relatives with diabetes. Less than half (43.0%) of the parents of children knew about the sign and symptoms of

4 METHOD AND MATERIAL

4.1 Study area-

St Paul's Hospital Millennium Medical College is one of tertiary hospitals in Ethiopia. STUDY AREA- St. Paul's Hospital Millennium Medical College. A tertiary hospital in Addis Ababa, Ethiopia located in coordinates of 9°2'52"N 38°43'41"E. The hospital was built in 1969 (was named St Paul General Specialized Hospital until 2008) by Emperor Haile Selassie in collaboration with the German Evangelical Church, as a source of medical care for underserved populations. It currently has 392 beds, with an annual average of 200,000 patients and a catchment population of more than 5 million. Approximately 75% of the patients receive medical services free of charge. There are over 1300 clinical and non-clinical staff in over 13 departments, most recently launching its new hemodialysis unit and renal transplant center. There are over 13 departments which include: Forensic medicine and toxicology, internal medicine, neurology, general surgery, ENT, psychiatry, ophthalmology, dentistry (maxillofacial surgery), radiology, dermatology, gynecology, obstetrics, pediatrics, biomedicine, emergency medicine. The pediatrics department has its own subspecialty clinics of which pediatric endocrinology is one. Led by Dr Bereket Fantahun, Pediatric Endocrinologist the clinic works weekly every Monday on office hours. On average 20 patients are seen per day. Most of the patients come from Addis Ababa and Burayu.

4.3 Study design- institution based cross sectional study.

4.3 Source population—all diabetic pediatric patients having follow up at pediatric endocrinology clinic. Since the total number of patients is 214 no sampling is used.

4.4 Sample size and Sampling Procedure

4.1.1 SAMPLE SIZE DETERMINATION

There are total of 212 patients on follow up . All of them are included in the study.

4.1.2 Sampling Technique

Since there is no sampling used no technique was applied.

4.4 Data collection and analysis

Method- DATA will be collected by investigator from secondary data source. By document review. Using check list prepared by consulting information from patient chart.

TOOL-Using check list prepared by investigator after assessing the available information documented on patients chart.

Data processing and analysis

The collected data will be manually checked for completeness, accuracy and clarity and then analyzed by using SPSS(version 20). Descriptive statistical methods will be used and the data will be presented by using graphs and tables.

4.5 Ethical consideration

The proposal will be submitted to the Department of public health for approval. Following the approval , an official letter of co-operation will be written to the concerned bodies by the department of Public Health . As the study will be conducted through review of medical records. The recorded data will not be accessed by a third person and will be kept confidentially.

4.6 Result dissemination

The results of the study will get presented to the Department of Public Health in SPHMMC and following which the final edition will be submitted to the department.

5 Workplan

5.1 Table 1: work plan

Time	Jan11- 25/2018G	Jan21- feb 8/2018	Mar12-May 7 /2018	May7-May 24 /2018	May 24- June15/ 2018	Jun25-27/ 2018	July30/2018
Activities	C						
Draft proposal development	?						
Final proposal development		?					
Data collection and feeding to spss			?				
Data analysis and result				?			
Draft report preparation					?		
Defence						?	
Final report submission							?

6BudgetPlan

6.1 Table 2:Total budget break down

No	Description		Unit cost	Multiple factor	Total cost
1	Personnel		500.00	3	1500.00
2	Transport		0	0	0
3	Material	Photocopy	3.00	250	750.00
		pen	5.00	10	50
4	10%contingency				230
5	Grand total				2530

7 REFERENCE

- 1) Jennifer F. Wilson, in the clinic Diabetic Ketoacidosis. American College of Physicians, 2010 page ITC 1-5
- 2) Kitabchi AE, Umpierrez GE, Miles JM, Fisher JN. Hyperglycemic crises in Adult Patients with Diabetes. Diabetes care 2009; 32: 1335-1343(5)
- 3) DJ Van Zyl. Diagnosis and treatment of diabetic ketoacidosis.SA Fam practice 2008; 50, 1: 35-9.
- 4 Fantahun B and Gedlu E. Prevalence of DKA in newly diagnosed DM pediatric patients in TikurAnbesa specialized hospital. Ethiopian Journal of Pediatrics and child Health ,May 2008,4;1
- 5 The International Diabetes Federation diabetes atlas, Seventh edition 2015. The International Diabetes Federation (2015).
- 6 Otto M Henriksen., et al. “Diabetic Ketoacidosis in Denmark Incidence and Mortality Estimated from Public Health Registries”. Diabetes Research and Clinical Practice 76.1 (2007): 51-56.
- 7 WolfsdorfJ , Glaser N, Sperling MA. Diabetic ketoacidosis in infants, children, and Adolescents. Diabetes Care, 2006; 29(5): 1150-9
- 8 E. Schober, B. Rami & T. Waldhoer, Diabetic ketoacidosis at diagnosis in Austrian children in 1989–2008: a population-based analysis, Diabetologia 2010 53:1057–1061.
- 9 Farsani S, Brodovicz K, Soleymanlou N, Marquard J,Wissinger E,Maiese B Incidence and prevalence of diabetic ketoacidosis (DKA) among adults with type 1 diabetes mellitus (T1D)

10 Garg SK, Walker AJ, Hoff HK, et al. Glycemic parameters with multiple daily injections using insulin glargine versus insulin pump. *Diabetes Technol Ther* 2004;6:9–15.

11 Razavi Z. Frequency of Ketoacidosis in Newly Diagnosed Type 1 Diabetic children OM

12 Usher-Smith JA, Thompson MJ, Ercole A, Walter FM. Factors associated with the presence of diabetic ketoacidosis at diagnosis of diabetes in children and young adults: a systematic review. *BMJ* 2011; 343: 4092.

13 Jaramillo-Arango C, López-Alarcón YP, Jaramillo-Bustamente JC, Fernández-Laverde M, Pardo-Carrero R, et al. (2017) Colombian Multicentric Study on Epidemiology of Diabetic Ketoacidosis in Children with Type 1 Diabetes Mellitus. *Endocrinol Metab Int J* 5(2): 00118. DOI: 10.15406/emij.2017.05.00118

14) Marigliano M, et.al Diabetic ketoacidosis at diagnosis: role of family history and

class II HLA genotypes, *European Journal of Endocrinology* (2013) 168: 107–111

15 Siyoum H, Gizaw M, Sileshi B Clinical Characteristics of Diabetic Ketoacidosis in Children with Newly Diagnosed Type 1 Diabetes in Addis Ababa, Ethiopia: A Cross-Sectional Study

16. Gibb FW, Teoh WL, Graham J, et al. Risk of death following admission to a UK hospital with diabetic ketoacidosis. *Diabetologia* 2016;59:2082–7.

17) Hekkala A, Knip M, Veijola R: Ketoacidosis at diagnosis of type 1 diabetes in children in Northern Finland: temporary changes over 20 years. Diabetes Care 2007, 30(4):861 –866.

18) Majaliwa E.S, Mohn A, Chiavaroli V, Ramaiya K, Swai A.B.M and Chiarelli F Management of DKA in children and adolescents in sub Saharan Africa; A review, East African Journal Medical April 2010, 87: 4

19) Wolfsdorf J, Glaser N, Sperling MA, American Diabetes Association. Diabetic ketoacidosis in infants, children, and adolescents: A consensus statement from the American Diabetes Association. Diabetes Care 2006 May; 29(5):1150-1159

Checklist to be filled by investigator(in consulting chart)

1.Socio-Demographic Variables

1.1 What is the age of the child(Enter in the space)_____ year

1.2 The child sex? 1. Male 2. Female

103 What is the child religion? 1. Orthodox 2. Islam 4 Protestant 4.

Catholic5.Others (Specify

1.4.A Occupation of the childmother/guardian1. Unemployed2. Civil servant

3. Student4. House wife5. Daily laborer 6. Pensioned7.Merchant

8.others/specify

108.B Occupation of the childfather/guardian 1. Unemployed2. Civil servant

3. Student4. House wife5. Daily laborer 6. Pensioned7.Merchant 8.others/

2. ASSOCIATED RISKFACTORS OF DKA

2.1 Is the child known type 1 DM?1.Yes 2.No

2.2 Did the child have any sign andsymptoms of DKA 1-2weeksbefore the onset of DKA 1.Yes 2.No

If 2,Skip to number 2.4

2.3 If yes, which sign andsymptoms?1. Polydepsia2.polyuria3.Weight loss 4.1 & 2 5.1&36.2&3 7.others

2.4 With which DKA symptoms did the child present? -----

2.5 Do the child parents know the sign and symptoms of DKA/DM?

1.Yes 2.No If 2 Skip to number 209

2.6 If yes, which sign/symptoms?

2.7, did he/she omit insulin before onset of DKA? 1.Yes 2.No

2.8 Did the child have any infection 1-2week before the onset of DKA? 1.Yes

2.No If 2 Skip to number 2.10

2.9 If yes, which site? 1.UTI 2. Pneumonia 3 Other site
