Tinsae Alemayehu, Damte Shimelis. *Ethiop Med J, 2017, Vol. 55, No.2*

ORIGINAL ARTICLE

PREVALENCE OF DIABETES MELLITUS IN 7– 12 YEARS OLD SCHOOL CHILDREN PRESENTING TO DEPARTMENT OF PEDIATRICS AND CHILD HEALTH, TIKUR ANBESSA SPECIALIZED TEACHING HOSPITAL, ADDIS ABABA, ETHIOPIA

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ABSTRACT

Introduction: *Information concerning the prevalence of diabetes mellitus is sparse n Ethiopia. The study was conducted to evaluate the prevalence of diabetes mellitus among children aged 7–12 years presenting to Tikur Anbessa Specialized Teaching Hospital and identify the factors influencing its diagnosis.*
Methods: *A cross-sectional descriptive study was performed on children aged 7–12 years presenting with complaints other than symptoms of diabetes mellitus from July 2013 to January 2014.*
Results: *A total of 1,067 participants were involved; 41% were females and 59% were males. The mean age was 9.5+/- 2.5 years. 116 parents of study participants (10.87%) had appropriate knowledge of symptoms of diabetes mellitus, while 236 (22.12%) had adequate knowledge regarding its nature. 90% of parents failed to recognize that diabetes mellitus could affect children younger than 15 years. Prevalence of diabetes mellitus was 2.81/1000 cases. Impaired fasting glucose/impaired glucose tolerance was detected in 8.43/1000 cases. Parental educational level was associated with failure to recognize symptoms of diabetes mellitus and lacking knowledge of its nature.*
Conclusion: *There is a high prevalence of diabetes mellitus among children aged 7–12 years presenting to Tikur Anbessa Specialized Teaching Hospital. Hence, we recommend the design and implementation of community based screening and health education programs.*

Key words: *Diabetes mellitus, Non-communicable diseases, Child, Ethiopia*

INTRODUCTION

The global prevalence of chronic non-communicable diseases (NCDs) is on the rise, with the majority affected being populations in developing countries. Among these, type 1 Diabetes Mellitus accounts for a large number of cases and is as well the most common pediatric endocrine disorder, affecting 1 in 300 to 500 children younger than 18 years of age (1,2).

Outcomes from hospital based prevalence studies to screen for asymptomatic diabetic children offer different observations–from as low as 0.1 per 1000 cases in Ebonyi state, Nigeria; Sudan and Tanzania (3,5,7), 0.26 per 1000 in Southern India (4) to as high as 1.82 per 100,000 in the United states (6) and 3.1 per 1000 in Kano, Nigeria (8). A bimodal peak was noted in Sudan with the first peak at around age 7 years and the second being between ages 12–14 years. Comparable results were seen in south India with the peak age for diagnosis being 12 years (4,7).

The report from Kano especially noted that most diagnoses were made in families with low socio-economic living conditions, which alerts countries like ours to conduct a similar study. More grounds to conduct such studies are discovered when the increasing incidence trend for childhood type 1 DM is noted among African children. This in particular is well articulated in reports from Khartoum, Sudan (a two-folds rise in 3 years) and Oran, Algeria (a five folds increase in 7 years) (7,14).

Awareness about treatment and control of Diabetes is extremely low among developing nations like Ethiopia. Limited available evidence suggests an increasing prevalence of Diabetes and its risk factors among populations in the developing world over the past decade. Information concerning the prevalence of Diabetes in Ethiopia is sparse.

Our aim was to evaluate the prevalence of asymptomatic diabetic children aged 7–12 years presenting To Tikur Anbessa Specialized Teaching Hospital, Addis Ababa and identify factors influencing its diagnosis. This information could assist clinicians and public health workers in evaluating the extent of the

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problem and may lead to more effective medical management and health education programs.

PATIENTS AND METHODS

A hospital based cross-sectional study was conducted in the months between July 2013 and January 2014 in Tikur Anbessa Specialized Teaching Hospital, Department of Pediatrics and Child Health, Addis Ababa. The study included 1067 children in the age group between 7 and 12 years who presented to the regular pediatric out-patient department with complaints other than symptoms of diabetes mellitus.

The study subjects were selected using simple random sampling, recruiting every 10th patient presenting to the regular out-patient department. Patients aged less than 7 years or more than 12 years, and those presenting with symptoms and signs of diabetes mellitus or referred with a diagnosis of Diabetes mellitus or its complications were excluded. The interview questionnaire was structured into three sections (Socio-demographic characteristics, questions relating to knowledge of symptoms of diabetes mellitus, questions pertaining to the presence of symptoms characteristic of diabetes mellitus and dietary histories, and finally measurements).

The definition of Diabetes Mellitus was based on the fulfillment of the presence of symptoms of DM (Polyuria, Polydipsia and unexplained weight loss with glucosuria and ketonuria) plus a random blood sugar of greater or equal to 200 mg/dL. Knowledge about symptoms of Diabetes Mellitus was defined as being able to list correctly at least 3 symptoms out of 5 listed on the questionnaire. Knowledge about the nature of Diabetes Mellitus was defined as being able to answer correctly to least 2 questions out of the 3 listed on the questionnaire.

Obesity in this study was defined as a BMI greater than 95th percentile for age and sex. Low socio-economic status was taken as a purchasing power of less than 1.25 US$ based on the World health organization (WHO) wealth standards. Low (Inadequate) exercise levels were defined as duration of physical activity of less than the recommended 1 hour per day (for ages 7–12 years). Physical activity was defined as any activity that involves the use of one or more large muscle groups and raises the heart rate. Examples: Playing competitive sports like football and basketball, walking, swimming, jumping ropes, etc (1).

Data were collected using a combination of a structured questionnaire and measurements of weight, height, body mass index, waist circumference and random blood sugar (RBS). Data collectors were 5 intern physicians supervised by investigators. The questionnaire was pretested on 3% of the study participants found outside of the study area and modifications were made on the basis of the findings.

After completing the interview, the participants' height, weight, body mass index, waist circumference and random blood sugar (RBS) were measured and recorded by interviewers. Weight measuring scales were checked and adjusted at zero level between each measurement. RBS was measured after confirming the child had eaten at least 2 hours before testing by a Sensocard glucometer and reported in mg/dL after making the conversion from mmol/dL. A second fasting blood sugar measurement was performed on those found to have a RBS measurement in the diabetic or impaired glucose tolerance range. Statistical analyses were done using bivariate methods. Chi-squared tests were used when comparing groups and 95% confidence intervals (CI) were calculated. Statistical significance was accepted at the 5% level ($p<0.05$).

All research protocols were approved by the research review board of the Department of Pediatrics and child health, school of medicine, college of health sciences, Addis Ababa University. Confidentiality of the information was assured by the data collectors and principal investigators. Participants having Diabetes Mellitus by our measurement were referred to the Pediatric Endocrinology follow-up clinic at Tikur Anbessa Specialized teaching hospital, Addis Ababa and those with impaired fasting glucose/impaired glucose tolerance were referred to nearby health facilities for close follow-up. The parents or caretakers of both groups were also given appropriate health education on the implication of the results.

RESULTS

A total of 1067 children were included in this study. 438 (41%) were females and 629 (59%) were males. 516 children (48.3%) were between the ages of 7-9 and 551 (51.7%) were between 10-12 years of age. The mean age at presentation was9.5 +/- 2.5 years. The mean RBS was 121.7 mg/dL. 3 children were diabetic and 9 had impaired fasting glucose (IFG) making the prevalence of diabetes 2.8/ 1000 and IFG 8.4/1000 children in this cohort. There is no age or gender difference in the prevalence of diabetes or IFG in the study subjects (Table 1).

Table 1: Age and gender characteristics of children in relation to their glycemic status, July 2013 and January 2014, Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia

Characteristics of participants	**Glycemic status** Normoglycemic I	mpaired fasting glucose	Diabetic	**P-value**
Age				
7-9	580	5	2	
10-12	475	4	1	0.872
Gender				
Female	435	4	1	
Male	620	5	2	0.197

Table 2: Demographic characteristics of children with diabetes mellitus and families, July 2013 and January 2014, Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia.

Age (yrs)	No	%
7 – 9	516	48.4
10 – 12	551	51.6
Region of residence		
Addis Ababa	414	38.82
Oromia	299	28.02
Amhara	134	12.56
SNNPR	117	10.97
Tigray	32	3.0
Others	71	6.63
Religious affiliation		
Orthodox Christianity	616	57.73
Muslim	256	24
Protestant Christianity	169	15.84
Others	26	2.43
Monthly family income		
< 700 birr	299	28.02
700 – 1500	310	29.05
1500 – 2500	267	25.02
2500 – 3500	102	9.56
3500 – 5000	54	5.06
> 5000	28	2.62

Key: SNNPR – Southern nations, nationalities & peoples region

116 parents or caretakers of the study participants (10.9%) had appropriate knowledge of symptoms of Diabetes Mellitus. This was judged by being able to list correctly at least 3 symptoms out of the 5 listed on the questionnaire (Polyuria, polydipsia, polyphagia, generalized body weakness, weight loss). 236 parents or caretakers (22.1%) had adequate knowledge regarding the nature of Diabetes Mellitus as adjudged by knowing that a family history or obesity are risks for DM and identifying which age groups can possibly be affected) but 90% of caretakers of the study subjects failed to recognize that Diabetes Mellitus could affect children below the age of 15 years.

5.8% and 5.7% of caretakers of study participants had family history of diabetes among first degree relatives and family history of hypertension respectively. Obesity was seen in 0.9% of participants.

81.2% of the study participants performed adequate daily physical exercise. Table 3 shows the anthropometric characteristics of study participants in relation to their glycemic status. There is no statistical difference between underweight, normal and overweight children with respect to their glycemic status or height. 23.6% (n=252) of the study participants were underweight, 10(0.94%) were overweight; 46% (n=491) were stunted.

Table 3: Anthropometric characteristics of children in relation to their glycemic status, July 2013 and January 2014, Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia

Anthropometric characteristics	**Glycemic status**			**P value**
	Normoglycemic	Impaired fasting	glucose Diabetic	
underweight	249	2	1	
Normal weight	809	6	2	
overweight	9	1	0	0.743
Stunted	484	5	2	
Normal height	579	4	1	
Above normal	4	0	0	0.659

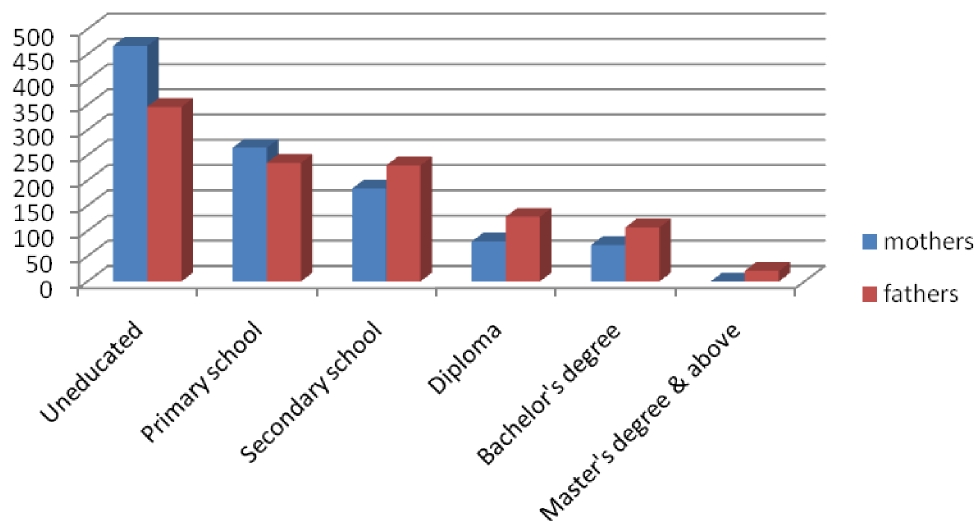

Figure 1: Educational level of parents/caretakers of children with diabetes mellitus,

July 2013 and January 2014, Tikur Anbessa Specialized Teaching Hospital, Addis Ababa, Ethiopia

Maternal and paternal educational level was found to be related to possessing adequate knowledge on the symptoms of diabetes and the nature of diabetes. Figure 1 shows the educational level of parents/ caretakers of participants in this study. In this study, factors like the gender of the participants, the region they lived in, their religion, monthly income of their families, family histories of diabetes mellitus and hypertension, and adequacy of exercise were not significantly associated with the diagnosis of diabetes mellitus.

DISCUSSION

The prevalence of diabetes (2.8/1000) and impaired fasting glucose (8.4/1000) in our cohort is higher when compared to hospital based studies conducted in Ebonyi State, Nigeria(0.1/1000), Southern India (0.26/1000) and the United States (1.82/1000) (3-7). It more closely relates to what was observed among childhood diabetes mellitus in Kano, Nigeria (3.1/1000)(8). This high prevalence may be due to changing life style conditions and because diabetes mellitus in Ethiopia is getting the attention it deserves only recently. Secondly, this study was hospital-based and close to 40% of the participants involved resides mostly in the urban catchment area of our hospital.

Parental educational level and possessing inadequate knowledge regarding symptoms of Diabetes and the nature of Diabetes were found to be related. In this study, anthropometric measurements, gender of the participants, the region they lived in, their religion and the monthly income of their families were not significantly associated with Diabetes Mellitus. The study among children in Kano, Nigeria showed that close to three fourth of patients belonged to lower socio-economic classes (8). This is also in contrast to what was observed among 2,280 people across all age groups in Ethiopia, where a low body mass index (BMI) was seen in most diabetic individuals(9). Contrary to our findings, a boy to girl prevalence ratio of approximately 3:1 was noted in Nigerian Igbo children and a female predominance in Libyan children (10-12); while no significant differences were seen in gender in young Tunisians (13).

Conversely to what was detected in Algerian cases of juvenile insulin-dependent diabetes (14), family history of Diabetes Mellitus was not found to be significantly associated to the diagnosis of Diabetes Mellitus among our study subjects. The same held true for a family history of hypertension, presence of Obesity and adequacy of exercise.

Limitations: The limitation of this study is that it is hospital-based and results do not necessarily translate to the findings in our community.

Conclusion and recommendations; There is a high prevalence of diabetes mellitus among children aged 7–12 years presenting to the Children’s Department of Tikur Anbessa Hospital in Addis Ababa. Our study results suggest a need for designing and implementing community-based screening and health education programs.

ACKNOWLEDGEMENT

The authors would like to extend their appreciation to the College of Health Sciences, School of Medicine, Addis Ababa University and the Ethiopian Pediatric Society for providing the financial support for this study. We would also like to extend our gratitude to study participants and data collectors.

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