

Long Term Complications of Type 1 Diabetes Mellitus in Children and Young Adults

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ABSTRACT:

BACKGROUND:

Diabetes mellitus is a common chronic metabolic syndrome characterized by impaired metabolism of glucose; morbidity and mortality come from acute metabolic derangement and from long term complications that affect small and large vessels.

OBJECTIVE:

The assessment of the long term complications of diabetes mellitus in children and young adults

PATIENTS AND METHODS:

The study included 150 patients with type 1 diabetes mellitus attending the diabetic clinic of Children Welfare Teaching Hospital who were assessed for the presence of long term complications of diabetes mellitus.

RESULTS:

The total number of the sample was 150 patients with male to female ratio of 1:1.2 with median age of 12.2 years.

Long term complications occurred in 26.7% of patients; (75%) of them had diabetes for more than 5 years. These complications include eye complications (retinopathy and cataract) 12.6%, Renal complications (albuminuria, oedema, and hypertension) 10.6%, peripheral neuropathy 4.6%, limited joint mobility 6.6%, and short stature 17.3%.

CONCLUSION:

Long term complications were found in significant number of patients with type I diabetes mellitus which can occur in children with short duration of diabetes, and their frequency increases significantly with increasing duration of diabetes.

KEY WORDS: diabetic nephropathy, diabetic retinopathy, diabetic neuropathy, complications of diabetes mellitus.

INTRODUCTION:

Diabetes mellitus is a common chronic metabolic syndrome characterized by impaired metabolism of glucose and other energy yielding fuels and subsequent hyperglycemia as a cardinal biochemical feature⁽¹⁾. Morbidity and mortality come from acute metabolic derangement and from long term complications that affect small and large vessels⁽²⁾. Microvascular complications (retinopathy, nephropathy and neuropathy) develop in puberty or early adulthood, whereas macrovascular complications (ischemic heart disease and peripheral vascular disease) affect older adults⁽³⁾. The longer the duration of diabetes, the greater is the risk of complications which increase significantly following puberty⁽⁴⁾.

Diabetic retinopathy remains the most common cause of acquired blindness in young and older

adults. Early retinopathy is asymptomatic, but may be detected by sensitive methods e.g. fundus photography or fluorescein angiography in a large proportion of young people with diabetes duration of more than ten years⁽⁵⁾. Cataract has been described very soon after the onset of diabetes. They are rare, But may occur more often in adolescents with a long history of polyuria before diagnosis. Cataracts later in diabetes are of a consequence of prolonged poor metabolic control⁽⁶⁾. Glaucoma and other eye diseases are rare in the pediatric age group⁽⁵⁾.

Diabetic nephropathy is the most important cause of increased morbidity and premature mortality in patients with type I diabetes⁽⁷⁾. The incidence of diabetic nephropathy peaks after about 15 years of diabetes⁽⁸⁾. Hypertension caused by underlying diabetic nephropathy typically becomes manifest about the time that the patients develop microalbuminuria⁽⁹⁾.

Regarding diabetic neuropathy, adolescents with diabetes can show early evidence of neuropathy, but the longer the person has diabetes, the greater the risk⁽²⁾. Both peripheral and autonomic nervous

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systems can be involved. The most common type is peripheral neuropathy which affects the arms and legs⁽³⁾.

Severe growth retardation is seen very sporadically, nevertheless, the effect of the disease on growth is still controversial⁽¹⁰⁾. Limited joint mobility is demonstrated by opposing the hands in a praying position, which demonstrates the inability to straighten the interphalangeal and metacarpophalangeal joints with thickening of the skin. Severe forms more often associated with persistently poor metabolic control⁽⁵⁾.

PATIENTS AND METHODS:

This study included 150 patients with type I diabetes mellitus who were attending the diabetic clinic of the children welfare teaching hospital over a period of six months from the first of March to the first of September 2006. The following information collected directly from the patient, Their relatives or from their case sheets: name, Sex, Date of birth, date of diagnosis.

Height was measured with the child standing without shoes, with his heels and back in contact with an upright wall, His head is held so that he looks straight forward with the lower borders of the eye sockets in the same horizontal plane as the external auditory meati. A right-angled block is then slide down the wall until its bottom surface touches the child's head and a scale fixed to the wall is read. Height measurement was represented by standard percentile ranges according to the growth and development chart for boys and girls prepared by Tanner and Whithouse⁽¹¹⁾, With height below 3rd percentile regarded as short stature.

The patient was examined for oedema by pressing at the ankle or dorsum of foot or the leg by the thumb firmly for a sustained period in order not to miss slight oedema⁽¹²⁾.

Blood pressure was checked by measuring sphygmomanometer with appropriate cuff. Information about albumin in urine was taken from patient's case sheet from a previous examination or by sending the patient directly to do a urine test for albumin which is a precipitate test performed by adding sulphosalicylic acid to the urine with

heating as urinary albumin / creatinine ratio is not available.

Regarding eye examination, The information either taken from the patient case sheet from a previous examination as part of the annual examination for diabetic patients or if the patient had complaint especially for those who had diabetes for five years duration and if this information not available, We sent the patient for ophthalmologic examination in the ophthalmologic clinic of the medical city complex as examination for retinopathy by ophthalmoscopy is best performed through pharmacologically dilated pupils by a trained observer⁽⁵⁾.

Limited joint mobility was examined by asking the child to approximate the palmar surface of interphalangeal joints with finger fanned. Whether this is possible or not, Passive extension to the proximal and distal interphalangeal joints was done by the examiner (expected 180 degrees). Equivocal or unilateral findings regarded as negative⁽¹³⁾.

Neurological examination was performed by examining sense of touch using a piece of cotton, Reflexes using a hammer and sense of vibration using a tuning fork on the big toe of both legs.

Celiac disease was diagnosed either by serological test (+ve anti-endomyseal antibody) and / or jejunal biopsy.

Statistical analysis was done by the use of chi square test and a P value of < 0.05 considered significant.

RESULTS:

The total number of our patients was 150 with male to female ratio of 1:1.2. Their age ranges from 2 years – 30 years with median age of 12.2 years as some adult patients refused to be transferred to adult clinic and still followed in our clinic.

Ninety five patients (63.3) % had duration less than 5 years while 55 patients (36.7%) had duration of diabetes more than 5 years. Forty patients (26.7%) had long term complications; thirty of them (75%) had duration of diabetes more than 5 years while 110 patients (73.3%) had no complications, 25 of them (22.7%) had duration of diabetes more than 5 years (P value< 0.0001)(table1).

Table 1: Distribution of patients according to the duration of diabetes and presence of long term complications.

Duration (years)	With complications		Without complications		Total	
	No.	%	No.	%	No.	%
< 5	10	10.5	85	89.5	95	63.3
>5 -10	16	43.3	21	56.7	37	24.7
>10-15	10	83.4	2	16.6	12	8
> 15	4	66.7	2	33.3	6	4
Total	40	26.7	110	73.3	150	100

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Nineteen patients (12.6%) had eye complications; two of them (10.5%) had cataract with less than 5 years duration of diabetes and seventeen (89.5%) had retinopathy with more than 5 years duration of diabetes.

Sixteen patients (10.6%) had renal complications; fourteen of them (14/16) (87.5%) had duration of

diabetes more than 5 years and presented with albuminuria and edema, (four of them (4/14) 28.5% had hypertension also), and two patients (2/16) (12.5%) had duration of diabetes less than 5 years and presented with albuminuria and edema (P value < 0.0001) (Table 2).

Table 2: Distribution of patients with renal complications and duration of diabetes

Duration (years)	Albuminuria and oedema		Hypertension		Total	
	No.	%	No.	%	No.	%
< 5	2	2.1	0	0	95	63.3
>5 -10	5	13.5	1	2.7	37	24.7
>10-15	7	58.3	2	16.6	12	8
> 15	2	33.3	1	16.6	6	4

Seven patients (4.6%) had peripheral neuropathy; all of them had diabetes for more than 10 years.

Ten patients (6.6%) had limited joint mobility; All of them had diabetes for more than 5 years.

Twenty six (17.3%) patients had short stature, 12 of them (46.2%) had diabetes for less than 5 years;

6 of them had celiac disease(while the other 14 patients (53.8%) had diabetes for more than 5 years; 3 of them had celiac disease (P value < 0.0758) (table 3).

Table 3: Distribution of patients with short stature and duration of diabetes

Duration (years)	Short stature		Total	
	No.	%	No.	%
< 5	12	12.6	95	63.3
>5 -10	6	16.2	37	24.7
>10-15	7	58.3	12	8
> 15	1	16.6	6	4
Total	26	17.3	150	100

DISCUSSION:

In this study, Long term complications were found in (26.7%) of patients, majority of them (75%) have duration of diabetes more than 5 years. This may be due to long duration of diabetes, and poor control. The incidence of retinopathy was (11.3%), Majority of them (88.2%) have duration of diabetes more than 5 years. This finding was lower than the results reported by oslen BS et al study⁽¹⁴⁾ (60%) and Lovestam-Adrian M. et al study⁽¹⁵⁾ (45%). This may due to small size of the sample in this study.

Albuminuria was reported in (10.6%) of our patients diagnosed on basis of spot urine sample for albumin, most of them (87.5%) had duration of diabetes more than 5 years. This result is higher than that in Oslén BS et al study⁽¹⁴⁾ (12.7%) and Jawad K study⁽¹⁶⁾ (68.9%) with duration of diabetes more than 5 years and this may be due to poor control in these patients. In Olsen BS et al study⁽¹⁴⁾, Albuminuria was detected using albumin / creatinine ratio which made their results more accurate.

In addition, in this study two patients (12.5%) with

albuminuria had diabetes for less than 5 years, a result which is lower than that in Jawad K study⁽¹⁶⁾ (29.7%). Hypertension was found in (28.5%) of patients with albuminuria who had diabetes for more than 5 years. Various studies had revealed conflicting results regarding association between hypertension and albuminuria as in Riihimaa Ph et al study⁽⁸⁾, which did not show any significant relation between increases of urinary albumin level and mean systolic blood pressure.

Peripheral neuropathy was identified clinically in (4.6%) of patients who had diabetes for more than 10 years. This finding is lower than that in Hamid (8.3%) and Bao Xh et al⁽¹⁸⁾ (7.7%) studies.

Limited joint mobility was found in (6.6%) of patients with duration of diabetes more than 5 years. This result is much lower than that reported by Moneeb A. Study⁽¹⁹⁾ (21.5%) and Rozadilla A et al study⁽²⁰⁾ (42.7%). In addition, in patients with duration of diabetes less than 5 years, no case of limited joint mobility was reported in our study compared with (8.8%) in Moneeb A⁽¹⁹⁾ study.

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Height below 3rd percentile for age was identified in (17.3% of diabetics), 53.8% of them had diabetes for more than 5 years, a finding which is nearly similar to the findings reported by Moneeb A⁽¹⁹⁾ study. These findings may be due to fact that growth retardation occurred when the duration of diabetes was longer and this proposed to result from an inability to maintain a normal metabolic and hormonal state in diabetic children despite treatment or due to the presence of celiac disease.

CONCLUSION:

Long term complications were found in significant number of patients with type I diabetes mellitus which can occur in children with short duration of diabetes, and their frequency increases significantly with increasing duration of diabetes. So, proper follow up with annual screening for these complications are important factors in their early detection and appropriate management.

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