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ONSET OF PUBERTY: A SIGNIFICANT RISK FACTOR FOR OBESITY AND TYPE-2 DIABETES AMONGST CHILDREN

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Abstract

Type 2 diabetes was found only in middle age or older adults. But now a day, increase in obesity in children, type 2 diabetes is increasing in young people. Age remains the single most significant risk factor for diabetes among growing children. 2048 children were undergone questionnaire and dietary survey and health examination. The highest prevalence of impaired glucose level was observed in 15-17 years of age groups i.e. 37.5% and diabetics were more in 12-14 years i.e. 43.48%. The lowest incidence rate was detected in 9-11 years of age group. Number of children >17 was very less and most of them not participated in the study. Incidence rate for impaired glucose level and diabetic children in different age groups is highly significant in all age groups. Children who were at the risk of overweight/ overweight were more in age group 12-14 years. Increased growth hormone secretion in puberty is responsible for the insulin resistance during puberty.

Keywords: Type 2 Diabetes, Children, Age Groups, Overweight.

1. INTRODUCTION

Currently, children with type 2 diabetes are usually diagnosed over the age of 10 years and are in middle to late puberty. Puberty has been identified as important in the development of type 2 diabetes in children. Changes in hormone levels during this period cause insulin resistance and decreased insulin action and resulting in hyperinsulinemia. Therefore, it is quite understandable that type 2 diabetes in children most often occurs during mid-puberty (Arslanian, 2002). Increased growth hormone secretion in puberty is suggested to be responsible for the insulin resistance during puberty. In type 2 diabetes, an asymptomatic child can be diagnosed by screening or during routine medical check-up.

2. MATERIALS AND METHODS

2048 children had undergone questionnaire and dietary survey and health examination. Out of these, 1017 were from urban population and 1031 from rural population Children and adolescent aged 10-19 years were selected randomly for questioning regarding the different aspects of epidemiology and their health examination was done. The permission from parents of the children, undergoing examination and questionnaire survey was also taken on the self designed consent form. The Centers for Disease Control and Prevention (CDC) suggests two levels of concern for children based on the BMI-for-age charts.

At the 85th percentile and above, children are "at risk for overweight". At the 95th percentile or above, they are "overweight". The cutoff for underweight of less than the 5th percentile is based on recommendations by the World Health Organization Expert Committee on Physical Status 1998.

Fasting Blood Sugar

Fasting blood sugar test was performed. The diagnostic criteria for diabetes mellitus have been modified from those previously recommended by WHO (1985).The revised criteria for the diagnosis of diabetes is used which is as follows:

Categories of Fasting plasma glucose (FPG) values are as follows:

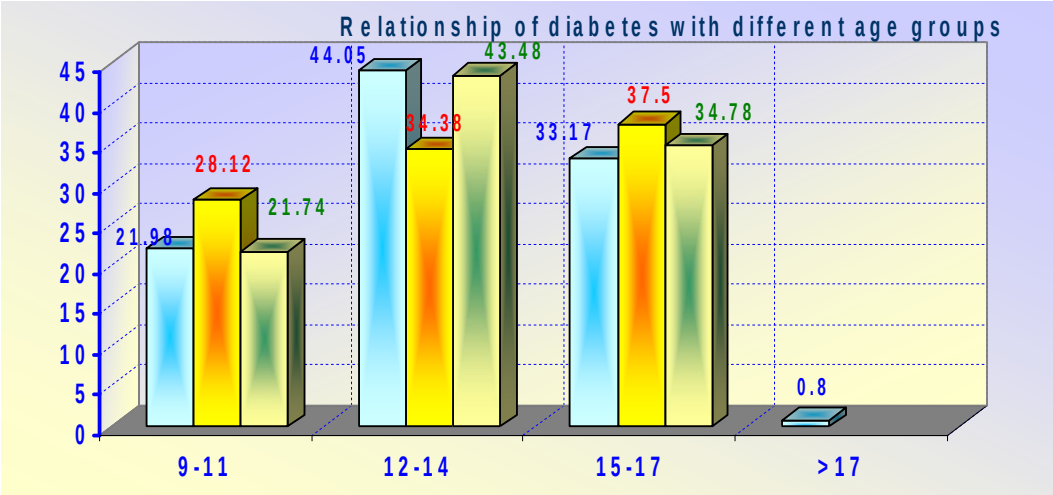
- FPG <110 mg/dl(6.1 mmol/l) = normal fasting glucose;
- FPG 110 (6.1 mmol/l) and <126 mg/dl (7.0 mmol/l) = IFG (Impaired Fasting Glucose)/Prediabetes.
- FPG ≥126 mg/dl (7.0 mmol/l)= diabetes
  (Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2003)

3. RESULTS AND DISCUSSION

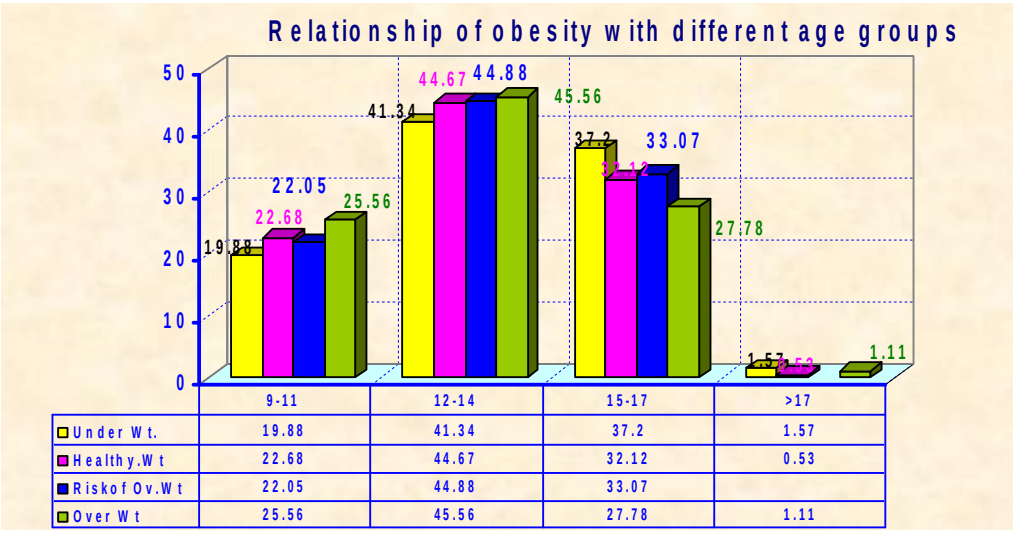
Prevalence of diabetes mellitus in different age groups from the total population is shown in Table-1 and have also represented graphically. The highest prevalence of impaired glucose level was observed in 15-17 years of age groups i.e. 37.5% and diabetics were more in 12-14 years i.e. 43.48%. The lowest incidence rate was detected in 9-11 years of age group. Number of children >17 was very less and most of them not participated in the study.

Table 1: Prevalence of impaired glucose levels and diabetes in different Age Groups

Group/Sub Group	9-11		12-14		15-17		Above 17	
	N	%	N	%	N	%	N	%
FBG Categories								
1. <110	438	21.98	878	44.05	661	33.17	16	0.80
2. 110-126	9	28.12	11	34.38	12	37.50		
3. >=126	5	21.74	10	43.48	8	34.78		
|Chi^2=1.85(df:6) C=0.03;								
Percentile Based								
1.Under Wt.	101	19.88	210	41.34	189	37.20	8	1.57
2.Healthy Wt.	300	22.68	591	44.67	425	32.12	7	0.53
3.At Risk	28	22.05	7	44.88	42	33.07		
4.Over Wt.	23	25.56	41	45.56	25	27.78	**1**	1.11
|Chi^2=12.83(df:9) C=0.08;								



Incidence rate for impaired glucose level and diabetic children diabetic subjects in different age groups is highly significant in all age groups. Children who were at the risk of overweight and overweight were more in age group 12-14 years.



It is very important to find out the prevalence of diabetes and obesity in different age groups because this parameter is further related with other factors involved in the onset of this disease. However, it has been found from the literature that there are very few studies taking more than one or two age groups. However, in the present study four different age groups have been taken in order to narrow down detection of most vulnerable age group. So while discussing a aspect sometimes the comparison is found only in one or two parameters. Age remains the single most significant risk factor for diabetes among growing children. Most of the previous studies were based on known diabetic subjects and it was present in more aged persons because the detection was delayed in lower age groups. As present study shows that impaired glucose levels are more in lower age groups. Most of the studies regarding non-insulin dependent diabetes mellitus were in adults i.e. >25 years of age but <19 age groups were ignored in all. There are so many studies of Insulin dependent diabetes mellitus in this age group but not of non- Insulin dependent diabetes mellitus. Disease can be prevented if detected at proper time and its complications can be avoided. Only a few studies are available for reference in <19 years of age group regarding non-insulin dependent diabetes. But it is

considered prudent that this group should also be included in the study and very important observations have been found in this study. Currently, children with type 2 diabetes are usually diagnosed over the age of 10 year and are in middle to late puberty. Puberty is also possible risk factor and appears to play a major role in the development of type 2 diabetes in children. Insulin resistance rose continuously in German children from age 5 through the early teens, preceding the onset of puberty. Yet this increase was not related to the onset of islet antibodies in these children, who were at genetic risk of type 1 diabetes (Raab et al. 2013). German girls who experience early puberty are at higher risk of pre-diabetes and type 2 diabetes as well, irrespective of their weight (Stockl et al, 2012). During puberty, there is increased resistance to the action of insulin, resulting in hyperinsulinemia. Increased growth hormone secretion in puberty is suggested to be responsible for the insulin resistance during puberty. Reported cases of type 2 diabetes in children showed a peak age of diagnosis during the usual pubertal age period, although there have been individuals described who were diagnose pre-pubertally.

In the present study, obesity and type -2 diabetes were found to be more prevalent in the pubertal age groups of 12-14 years. A study from Sweden shows that among people diagnosed before age 35, type 1 incidence peaked at age 10-14 (around the time of puberty) in both boys and girls in 1983, the start of the study period. By the end of the study period (2007), type 1 incidence peaked in girls at an earlier age, 5-9 years, while the peak in boys did not change (Dahlquist et al. 2011).The onset of puberty, due to fluctuating and changing hormonal levels, has been identified as a significant landmark in the development of obesity and type 2 diabetes. If the child already reveals a tendency to the disease, puberty may well tip the balance towards diabetes. Large-scale, international type 1 diabetes registries show that in general, type 1 diabetes incidence increases with age during childhood, and peaks at puberty (Soltesz et al. 2007). In healthy children, insulin resistance starts to increase a few years before puberty begins, around age 7 (weight gain only explains a small part of this increase) (Jeffery et al. 2012). The onset of puberty may be a time of increased sensitivity to environmental factors (Roy et al. 2009).

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