RESEARCH
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EPIDEMIOLOGICAL OF DIABETES MELLITUS AND HYPERGLYCAEMIA IN ELEMENTARY SCHOOL

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Abstract
Objectives: To determine of incidence and prevalence diabetes mellitus among elementary schools, and to find out the differences between demographic characteristics and random blood sugar.
Methods: Nonexperimental design descriptive correlation study was conducted in a sample of elementary school in al-Sadr city. Purposive sampling non randomly selected students with type I diabetes dependent insulin in the educational stage (1-6) at age (5-14) years. Information on disease variables were obtained through send questionnaire to the student parents. The Centers for Disease Control and prevention growth charts were used.
Results: The total number of elementary school students in the selected 40 schools was 100 had T1DM. And shows that the 51% of students are females and 49% are males. 55% of them is healthy weight, most of students with type I diabetes have hyperglycemia.
Conclusion: The prevalence of type 1 diabetes mellitus was 0.49 per 100 and incidence 0.22 per 100. There is significant difference in number of random blood sugar with number of insulin doses while there is no significant relationship among random blood sugar and other demographic characteristics.
KEYWORDS: Epidemiology, Diabetes Mellitus, Hyperglycemia

Introduction
Diabetes mellitus (DM) is a chronic metabolic disease characterized by high blood sugar and high glycated hemoglobin (1). DM develops when the cell of the body becomes resistant to insulin or when the pancreas cannot make enough insulin (2). It is important problem in public health worldwide (3). DM is a leading cause of increase morbidity and mortality in the world(4). it is a one of epidemic disease in the world as a rapid increase in prevalence(5). Type one diabetes mellitus (TIDM) characterized by the autoimmune distraction of pancreatic cells (6). Different factors may contribute to type I diabetes including exposure to certain of viruses and genetics factor (7) .Children with diabetes is at risk for a complication related to high and low blood glucose levels are treatable and can be expected with reasonable care. Complications can include disturbances in fat metabolism, nerve impairment, and eye disorders(8) And it is can be treated and prevented. It ranks among the top ten causes of outpatient visits in Iraq (9). Hyperglycemia referred to as elevated blood glucose (sugar) levels (10) Resulting from defects in insulin secretion(11). Chronic hyperglycemia can cause long-term damage(12) .The child's growth and development may be seriously impacted if they suffer frequent of ketoacidosis and poor glycemic control (13). Epidemiology It is the study of disease and health their distribution and determinants among the population and implications this a study to the prevent and treatment of health issues(14). The prevalence of type I diabetes mellitus in children has increased globally, however a reason is still unknown, predisposing variables and viral infection may be able to caused (15).Additionally, the incidence of TIDM is rising by 3-5 percent year in the majority of the populations, with a prevalence rate of about 0.25 percent(16). TIDM as a chronic illness not just impacts on the patient, but also the family as a whole(17). Chronic diseases require long-term adherence to treatment is important for the control(18) . Diabetes has a negative impact on society, the economy, and development, especially in underdeveloped countries or among populations that are not motivated to implement personal health programs (19). To inhibit the onset chronic diseases associated of diabetes effective management is essential to reduce the early and long-term complications(20). It is therefore essential to provide comprehensive services including health education (21)

Purpose of the study
To determine of incidence and prevalence diabetes mellitus among elementary school's students at third al- Russafa education directorate in al-Sadr city. To find out the differences between demographic characteristics and random blood sugar

Methods
The study is nonexperimental design descriptive correlation study was conducted in an elementary school in al-Sadr city during the period of December 17, 2023 and January 17, 2024. The study divided al-Sadr city to ten cluster and selected 40 schools from each cluster through the simple random sample. The study population is (purposive) sampling non randomly included (100) students was chosen based on a set of criteria include: 1) students with type I diabetes dependent insulin in the educational stage (1-6) at age (5-14) years. 2) students who do not suffer from chronic diseases. Information on disease variables were obtained through send questionnaire to the student parents and used interviews through telephone with them to complied data .The questionnaire was developed based on the extensive literature review and consists of (Age,

gender, educational stage, admissions to enter the hospital per month, times to take insulin daily, weight, length, body mass index, measuring random blood sugar, Date of incidence of the disease, duration of diabetes).After that, the anthropometric measurements measures taken by researcher .The weight measures in the (Seca) device, height in (Metric tape) and random blood sugar level two hours after breakfast using the (One Call Plus). The Centers for Disease Control and prevention growth charts were used. The questionnaire was validated through the experts and its reliability was verified through a pilot study the Cronbach's alpha value in current was 0.810 which indicate very good reliability. Statistical Package for Social Sciences (SPSS), version 26.0 program were us for all the analyses that fallow. Number and percentage (NO and %) us to describe the sociodemographic characteristics, while the men and standard deviation were us to determine the levels of random blood sugar and age, while the spearman's rank correlation coefficient was used to determine the correlation among sociodemographic characteristics with random blood sugar.

Results

Table 1: Socio-Demographic Characteristics

Variable	classifications	N(n=100)
Age (year)	6>9 years	30
	9> 12 years	42
	12 >15 years	28
Gender	Male	49
	Female	51
Times to take insulin daily	once	9
	Twice	48
	Three times	43
Random Blood Sugar		
	Mild(≤280mg/dl)	56
	Moderate (281 – 380mg/dl)	26
	Severe (381 mg/dl ≤)	18
Duration of DM (year		
	< 1 year	46
	2 – 5 years	54
Age at onset diabetes	1-3 years	5
	4-6 years	29
	7-9 years	45
	10 years or more	21

Table2: Distribution of Elementary School Students according to age the highest percentage of them in age group of 9 – less than 12 years as 42% of them and average of M±SD is 9.7 ± 2.3 years. According to gander female was slightly more than male. Times to take insulin daily reveals that 48% of them taking two dose per day. The minimum read of RBS test was 55 mg/dl while maximum read was 496 mg/dl; 56% of elementary school students associated with random blood sugar of less than 280 mg/dl while 26% associated with 281-380 mg/dl. Reveals to duration of diabetes 2 – 5 years is 54% while <1 year of them is 46%. Age at onset diabetes refers to 7.5±2.3 years. In which 45% of them are diagnosed at age 7 – 9 years.

Table 2: Prevalence and Incidence Rate of Diabetes Mellitus among Elementary School Students

Prevalence Rate

$$\text{Prevalence Rate} = \frac{\text{Total existing cases}}{\text{Total population at risk}} \times 100$$

Where: Total existing cases of diabetes mellitus = 100
Total population of elementary school students = 20174

$$\text{Prevalence Rate} = \frac{100}{20174} \times 100 = 0.49$$

$$\text{Incidence Rate} = \frac{\text{Number of new cases}}{\text{Total population at risk}}$$

Where:
New cases of diabetes mellitus = 46
Total population of elementary school students = 20174

$$\text{Incidence Rate} = \frac{46}{20174} \times 100 = 0.22$$

The total number of elementary schools in the selected (40) schools was total population (20174) and 100 of them had T1DM. The table 3-1 shows that prevalence rate refers to 0.49 per 100 while the incidence rate refers to 0.22 per 100 student diabetes mellitus.

Table 3: Significant Differences in Random Blood Sugar among Elementary School Students with regard to their Sociodemographic Variables

Variables		Random Blood Sugar				Sig
		Mild	Moderate	Severe	Total	
Age (year)	6 – less than 9	16	10	4	30	F= .684 P-value= .507 Sig= N. S
	9 – less than 12	25	9	8	42	
	12 – less than 15	15	7	6	28	
	Total	56	26	18	100	
Gender	Male	25	14	10	49	t= 1.211 P-value= .229 Sig= N. S
	Female	31	12	8	51	
	Total	56	26	18	100	
Times to take insulin daily	One	6	3	0	9	F= 3.843 P-value= .025 Sig= S
	Two	21	16	11	48	
	Three	29	7	7	43	
	Total	56	26	18	100	
Body mass index	Underweight	4	2	3	9	F= 1.055 P-value= .372 Sig= N. S
	Healthy	28	16	11	55	
	At risk overweight	14	6	3	23	
	Overweight	10	2	1	13	
	Total	56	26	18	100	

This table manifests that there is significant difference in number of random blood sugar with regard to number of insulin doses at p-value= .025, while there is no significant relationship among random blood sugar and other variables of the students.

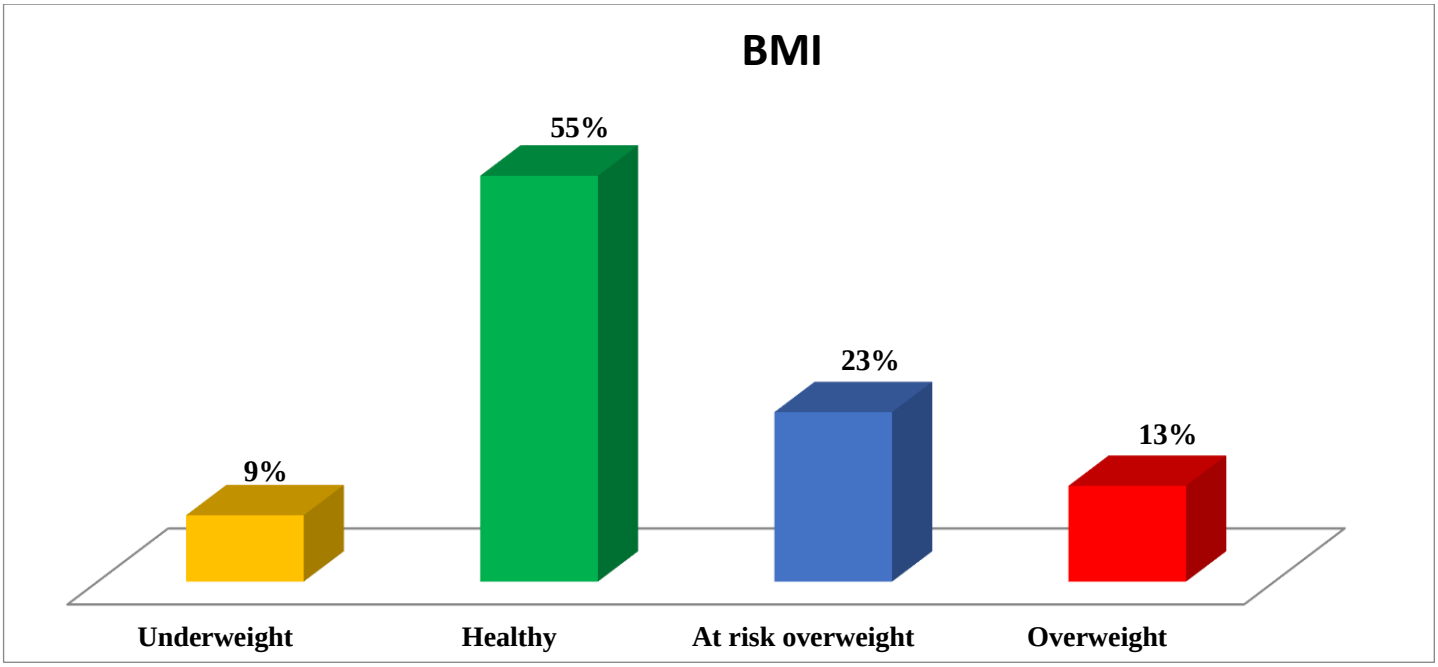

Figure 1: Distribution of Elementary School Students according to Body Mass Index (N=100)

This figure reveals that that (55%) of elementary school students are seen with healthy weight, but (23%) of them are at risk of overweight, and 13% of them are overweight.

Discussion

The student's age as shows that the average is 9.7 ± 2.3 years. The highest percentage with age group of 9 – less than 12 years as with percentage of (42%). This result agrees with a study which reported that the age group 9-11 makes the majority of student's and more than other groups with percentage (56%) of them (22).Thus, Type I diabetes can be appeared at any age, but it could be obvious in to two age group. The ages of 4 and 6 represented the first group. And the age of 10 to 14 years old represented the second group (23).Related to the gander study shown that the (51%) of elementary school students are females. These findings are agreed with Iraqi Ministry of Health's report which explains that females who represent (63%) are more than males who represent (60%). Furthermore, these findings are agreed with two studies, one which has done in Baghdad City which showed that the majority of study sample were females with percentage (56.2%) (22) . Whereas, another study with percentage (50.20) (24).Majority of samples are from female(25). Another study done in a Saudi Arabia indicated that the incidence and prevalence of diabetes is rising particularly among females(26). Finding revealed that (48%) students are taking two dose of insulin per day. This result is agreed with a study has been done with a sample of (50.0%) patient that explained half of patients take insulin twice daily(1) .It is revealed that (55%) of student's diabetes are healthy weight, but (23%) of them are at risk of overweight, and (13%) of them are overweight. This result is agreed with a study has done in Baghdad City which has showed that more students are healthy weight with percentage (74.5) and (16.6) of them are at risk of overweight and (6.9) of them are overweight (22). However, a Canadian study has been found that children with T1DM are overweight (24.1%) (27).TIDM children face difficulties in maintaining a healthy weight due to weight gain brought on by supraphysiological insulin dosages and overeating to prevent or treat hypoglycemia(28) . Another study was reported that the (69%) from a study subject within the normal weight range(29). There is association between diabetes and heredity, overweight, sedentary life, and diet(30) .Finding revealed that a minimum reading of RBS test is (55 mg/dl) while a maximum reading is (496 mg/dl). (56%) of students associated with random blood sugar of less than 280 mg/dl while (26%) associated with (281-380 mg/dl). These results have been are indicate to their lack of control over the level of diabetes. Thus, the lack of interest and care of parents cause this result. These results are agreed with a study which explained that the lack of glycemic control in TID particularly in children could cause deep impact on cognition and brain structure. Dysglycemia (hyperglycemia or hypoglycemia) interferes with crucial processes in the developing brain such as neuronal proliferation myelination and synapse formation. On stratification by glycemic control the children with hyperglycemia had lower general cognitive abilities slower fine motor speed, and lower receptive language scores (31). Hyperglycemia also leads to high levels of reactive oxygen species, which are lethal to β cells, and to high levels of cytoplasmic calcium(32). The average age at infection of diabetes is referred to 7.5±2.3 years. (45%) of them are diagnosed with diabetes at age (7 – 9) years. This result is agreed with a study which has reported that the age group (2-11) years when the diagnose with T1D (60.42) (33). Another study has reported that the main age has TID is (7-8) years (34) Revealed to period of infection diabetes in students from (2 – 5) years is (54%) while <1 year of diabetes mellitus is (46%). This result is agreed with a study which reported that the majority of participants have duration with DM less than five years (15). This finding is agreed with a study has showed that duration of diabetes is (2–5) years (35). Whereas, another study has done in Bagdad city is stated that the duration of DMI at the time of diagnosis <1 year is (46.1) (34) .There is a significant difference in number of random blood sugar with regard to number of insulin doses at p-value= .025, whereas there is no significant relationship among random blood sugar and other variables of the student .This result has agreed with a study that has indicated that there is a significant relationship between daily bolus insulin injections and glycemic control P < 0.0001). An average Individuals who are administering three daily bolus insulin injections had an estimated (11%) chance of achieving (>70%) of controlling on diabetes. The probability of achieving (>70%) increased with the time of daily bolus injections. Glycemic control was associated with daily bolus insulin injection. This could improve glycemic control among patient with T1D (36). The study finding showed that the prevalence rate is referred to (0.49) per 100 and incidence rate is referred to (0.22) per 100 students who are diagnosed with diabetes. This result is agreed with a study which reported that a prevalence of (0.46) per 1,000 it also explained that the prevalence of diabetes in children is rising and how it is important to control the disease (37). While another study has been reported that the incidence rates type I diabetes from (0 to 19) years of age is increased by (1.4%) annually (38).

Conclusions

The prevalence rate of students diagnosed with diabetes refers to 0.49 per 100 and incidence rate refers to 0.22 per 100.There is significant difference in number of random blood sugar with number of insulin doses. Most students with type I diabetes have hyperglycemia.

Recommendations

Parents should take care to monitor and measure the blood sugar level before the child arrives at school. School nursing health counselling must be present in schools and to provide counsellors to management of students with type I DM.

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