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Detect of Vitamin-D Deficiency in Children Under Five Years with Type 1 Diabetes Mellitus at Diabetes and Endocrinology Center in Al- Nasiriya City

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الخلاصة:

الهدف: للكشف عن الأطفال المصابين بداء السكري من النوع 1 تحت سن خمس سنوات تجاه نقص فيتامين (د). لقياس مستويات فيتامين (د) لدى الأطفال دون سن الخامسة غير المصابين بالسكري ومقارنتها مع الأطفال المصابين بمرض السكر. لإيجاد علاقة ذات دلالة إحصائية بين نقص فيتامين (د) والبيانات الديموغرافية في الأطفال المصابين بداء السكري من النوع الاول تحت سن خمس سنوات.

المنهجية: تم إجراء دراسة وصفية للكشف عن نقص فيتامين (د) لدى الأطفال دون سن الخامسة المصابين بداء السكري من النوع الأول في مركز السكري والغدد الصماء في مدينة الناصرية. بدأت الدراسة من 6 تشرين الثاني 2019 إلى 17 اذار 2021. تم اختيار عينة غير عشوائية (غرضية) مكونة من 208 طفل مقسمة إلى (104) طفل في مجموعة الدراسة (الاطفال أقل من خمس سنوات يعانون من داء السكري من النوع 1 في مركز السكري والغدد الصماء) وتم اختيار (104) طفل في المجموعة الضابطة (الاطفال غير المصابين بداء السكري من النوع الأول في مستشفى محمد الموسوي للأطفال). وكانت أداة البحث عبارة عن استبيان وأخذ عينة دم لاختبار فيتامين (د). الاستبيان الذي تم تطويره مكون من جزئيين: الأول يحتوي على السمات الديموغرافية للمشاركين، والثاني يتضمن مستوى فيتامين (د) والعوامل المؤثرة عليه.

النتائج: توزيع عينة الدراسة حسب تصنيفها لمستوى فيتامين (د) حيث كان 31.7٪ من 104 طفل يعانون من نقص حاد، 48.1٪ منهم يعانون من نقص خفيف إلى متوسط ، و20.2٪ منهم عوز مثالي. هناك فروق ذات دلالة إحصائية بين مستوى فيتامين (د) ومجموعة الدراسة عند مستوى (p=0.05) لعينة اختبار (ت) وتوزيع العينة الضابطة حسب تصنيف مستوى فيتامين (د) حيث كان 23.1٪ من 104 طفل يعانون من نقص حاد، 41.3٪ منهم عوز خفيف إلى متوسط ، و35.6٪ منهم عوز مثالي. عند المقارنة بين مجموعات الدراسة والمجموعة الضابطة، نلاحظ انخفاضًا في نسب نقص فيتامين (د) وزيادة في المستوى الأمثل لفيتامين د مما يؤدي إلى تأثير مرض السكري على مستوى فيتامين (د). اختلاف ذو دلالة إحصائية بين مستوى فيتامين (د) لمجموعة الدراسة ومجموعة الضابطة بواسطة عينة اختبار ت المستقلة عند مستوى 0.05 P.

الاستنتاجات: خلصت الدراسة الحالية إلى أن نسبة الإصابة بنقص فيتامين (د) مرتفعة بين الأطفال دون سن الخامسة المصابين بداء السكري من النوع الأول، وأن العدد الأكبر منهم يعانون من نقص خفيف إلى متوسط. بالإضافة إلى ذلك، فإن الطفل لديه المزيد من عوامل الخطر التي تؤثر على مستوى فيتامين (د) مثل (وقت التعرض لأشعة الشمس، مدة التعرض لضوء الشمس في الأسبوع، فترة التعرض لأشعة الشمس، تناول الفيتامينات المتعددة، ومكمل فيتامين (د)).

التوصيات: عمل ندوات تثقيفية لأولياء الأمور حول مخاطر نقص فيتامين د. وتشجيع آباء الأطفال المصابين بسكري الأحداث على مراقبة مستويات فيتامين د باستمرار.

ABSTRACT

Objective: To detect Children with Type1 Diabetes Mellitus under Five Years toward Vitamin-D Deficiency, to measure vitamin D levels in children under Five Years with non- diabetes and to compare them with Diabetic child, and to find the significant relationship between Vitamin-D Deficiency and demographic data in Children with Type1 Diabetes Mellitus under Five Years.

Methodology: A descriptive analytic study design was carried out to Detect of Vitamin-D Deficiency in Children under Five Years with Type 1 Diabetes Mellitus at Diabetes and Endocrinology Center in Al-Nasiriya City. The study had started from October 6th, 2019 to March 17th, 2021. Non randomize (purposive) study of 208 child divided to (104) child were selected in the study group (child under five years that suffering from type 1 diabetes mellitus at Diabetes and Endocrinology Center) and (104) child were selected in the control group (child non-suffering from type 1 diabetes mellitus at Muhammad Al-Mousawi Pediatrics Hospital). The tool of the research was questionnaire and blood sample taken for test of vitamin D. The questionnaire which has been developed and two pieces consist of the research questionnaire. The first component contains the demographic features of participants; the second part includes level of vitamin D and its effected factors domain.

Results: The distribution of Study Sample according to their Classification of vitamin D level which of 31.7% of 104 children was Severe Deficiency, 48.1% of them was Mild- moderate Deficiency, and 20.2% of them were Optimal, a significant differentiation between the vitamin D level and study group at P ≤0.05 level of one sample t test. And distribution of control Sample according to their Classification of vitamin D level which of 23.1% of 104 children was Severe Deficiency, 41.3% of them was Mild-moderate Deficiency, and 35.6% of them was Optimal. At comparative between study and control groups, we notice a decrease in the percentages of vitamin D deficiency and an increase in the optimal of vitamin D level that lead to diabetes mellitus effect on vitamin D level. Highly significant differentiation between the vitamin D level of control and study groups by t test independent sample at P ≤ 0.05 level.

Conclusion: The present study concluded that the incidence of vitamin D deficiency is high among children under five years with type 1 diabetes and the largest number of them suffers from mild to moderate deficiency. In addition, the child has more risk factors that effect on vitamin D level such as (Time of Sun light exposure, Duration of sunlight in the week, Period of Sun light exposure, Multivitamin intake and Vitamin D Supplement).

Recommendation: The work of educational seminars for parents about the risks of vitamin D deficiency. Encouraging parents of children with juvenile diabetes to monitor vitamin D levels contently.

INTRODUCTION

Vitamin D deficiency is widespread, and in type 1 diabetes, repletion can enhance glycemic control. Data also indicates that diabetes, elevated hemoglobin A1C (HbA1c), insulin strength, development of diabetes, and also hypertension, and cardiovascular disease can be correlated with lack of vitamin D. In T1DM children with decreased serum 25-hydroxy-vitamin D (25OHD) levels and decreased insulin sensitivity, there is also a substantially greater insulin requirement [(1)].

Not only can vitamin D be influenced by diet, but also by other variables, such as skin tone, clothes, and physical activity. Proper diet, not only for the control of the disease but also for the prevention of its complications, is one of the most difficult problems for people with diabetes. The status of vitamin D is determined by the assessment of the levels 25OHD, vitamin D's inactive circulating form and an existing form of Marker of availability of vitamin D, which a half-life of two weeks [(2)].

Diabetes is one of the fastest-growing chronic conditions globally. Form 1 (DM1) diabetes mellitus, present in 5 to 10 percent of diabetes cases, results

from the loss of pancreatic beta cells, leading to insulin deficiency [3].

Observational studies have indicated that low vitamin D status may be associated with an increased risk for type 1 diabetes. For instance, because of geographical variation, there is a greater prevalence of type 1 diabetes, with more type 1 diabetes, in areas at higher latitudes. This may be attributed to less sunlight and thus lower levels of vitamin D. In northern Finland, there performed a cohort analysis. Data on children regarding vitamin D were gathered during 1 year [4].

The dosage of supplementation and the presence of suspected rickets in conjunction with the development of type 1 diabetes, their results were both important and amazing; 80 percent less likely to develop type (1) diabetes were children who took 2,000 IU of vitamin D daily. This indicates that taking vitamin D supplements during their first year of life could be important for all kids to help prevent the development of type 1 diabetes [5].

A further review of vitamin D present that vitamin D supplementation in childhood and adolescence has been shown to the risk of developing type 1 diabetes has decreased by 29 percent relative to Kids that have not been given vitamin D supplements. In parallel, evidence indicative of a dose-response effect was found by the researchers. Since β-cell destruction normally starts in childhood or early childhood and progresses when type (1) diabetes is diagnosed, in terms of the utility of vitamin D in people with type 1 diabetes, findings like these are intriguing. It is anticipated that this could be a preventive measure against the development of type 1 diabetes to start vitamin D supplementation soon after birth [6].

AIMS OF THE STUDY

The purpose of the present study is to detect Children with Type1 Diabetes Mellitus under Five Years toward Vitamin-D Deficiency, to measure vitamin D levels in children under Five Years with non- diabetes and to compare them with Diabetic child, and to find the significant relationship between Vitamin-D Deficiency and demographic data in Children with Type1 Diabetes Mellitus under Five Years.

METHODOLOGY

- **Study Design and Setting:** A descriptive analytic study design was conducted on child less than five years that suffering from type 1 diabetes mellitus in the study group at Diabetes and Endocrinology Center and non-suffering from type 1 diabetes mellitus in control group at Muhammad Al-Mousawi Pediatrics Hospital. The study had started from October 6th, 2019 to March 17th, 2021.
- **Sample of the study:** Non-randomize (purposive) study of 208 child divided to (104) child were selected in the study group and (104) child were selected in the control group. Patients assessed criteria were selected based on:

• Including Criteria for the Sample:

1. In the study group all participants' male and female are diagnosed as having type 1 diabetes.
2. In the control group all participants' male and female without type (1) diabetes or any diseases that effect on vitamin D.
3. The ages of all participants under 5 years.
4. The study and control sample correspond to gender, age, and sample number.

• **Excluding Criteria for the Sample:**

1. Patients with type 2 diabetes.
2. Parents that refused to contribute of his child in study.
3. Child age ≥ 5 years.

- **Data Collection Procedure**

The information is obtained by the use of a developing questionnaire (Arabic version), the researcher had held the whole responsibility of interviewing the study sample after explanation and clarification the objectives of the study to parent and

child, after taking the initial consent from parent to participate of the child in the study. The data collection process has been performed from February 6th, 2020 to October 7th, 2020. Usually (15-20) minutes spent for each child to complete the questionnaire and take a blood sample. The tool of the study is the questionnaire and blood sample for test of vitamin D. The questionnaire which has been developed and design for the purpose of the study after comprehensive reviews of literature and related studies available. Two pieces consist of the research questionnaire. The first component contains the demographic features of participants; the second part includes Level of Vitamin D and its Effected Factors Domain. Procedure of body mass index by using electronic digital scales, weight was calculated. Using a wall mounted stadiometer, height was measured. The body mass index was then determined by dividing weight over square height (kilogram/meter2) and assessing the child's growth status by percentile.

RESULTS

Table (1): Distribution of the Sample by Demographic Characteristics for (Study and Control Group) (N= 208 children):

Variables		Study group		Control group	
		f	%	f	%
Age group	2-3 years	18	17.3	28	26.9
	3-4 years	35	33.7	32	30.8
	4-5 years	51	49.0	44	42.3
	Total	104	100	104	100
	Mean & SD	3.721±0.725		3.615±0.837	
Gender	Male	36	34.6	36	34.6
	Female	68	65.4	68	65.4
	Total	104	100	104	100
BMI	Under weight	19	18.3	12	11.5
	Normal weight	76	73.1	65	62.5
	Overweight & Obesity	9	8.7	27	26.0
	Total	104	100	104	100
Feeding	Breast Feeding	29	27.9	20	19.2
	Bottle Feeding	45	43.3	49	47.1
	Mixed Feeding	30	28.8	35	33.7
	Total	104	100	104	100

f=frequency, %=percent, SD= standard deviation.

This table shows that the plurality of the study sample age group is (4-5 years) 51(49%), while 44 (42.3%) in the control sample at Mean & SD= 3.615±0.837 and 3.721±0.725 for study. The gender distributed equally between study and control sample and plurality in the female by 68 (65.4%). moreover, 76 (73.1%) of body mass index at normal weight class for the study sample and 65 (62.5%) for control sample. absent from the school for one time, and (61%) of them have times of no failed. In addition, the majority of child with Bottle feeding at frequency 45 (43.3%) in the study sample and 49 (47.1%) in the control sample.

Table (2): Distribution of the Study Sample by risk factor related to vitamin D for (Study and Control Group) (N= 208 children):

Variables		Study group		Control group	
		f	%	f	%
Time of Sun light exposure	No	13	12.5	8	7.7
	8-11 A.M	8	7.7	6	5.8
	11-3 P.M	70	67.3	75	72.1
	4- 7 P.M	13	12.5	15	14.4
	Total	**104**	**100**	**104**	**100**
Duration of sunlight in the week	< 2 days	12	11.5	15	14.4
	2-4 days	57	54.8	52	50.0
	5-7 days	35	33.7	37	35.6
	Total	**104**	**100.0**	**104**	**100.0**
Period of Sun light exposure	< 15 minutes	51	49.0	60	57.7
	≥ 15 minutes	45	43.3	37	35.6
	≥ 1 hour	8	7.7	7	6.7
	Total	**104**	**100.0**	**104**	**100.0**
Child with fit or epilepsy	Yes	5	4.8	7	6.7
	No	99	95.2	97	93.3
	Total	**104**	**100.0**	**104**	**100.0**
Multivitamin intake	No	75	72.1	81	77.8
	< 1 month	12	11.5	9	8.7
	1-3 months	12	11.5	13	12.5
	4-6 months	5	4.9	1	1.0
	Total	**104**	**100.0**	**104**	**100.0**
Vitamin D Supplement	No	89	85.6	86	82.7
	1-3 months	7	6.7	8	7.7
	4-6 months	8	7.7	10	9.6
	Total	**104**	**100.0**	**104**	**100.0**

F: Frequency, %: Percent

Present that (70) 67.3% of the study group at Time of Sun light exposure 11-3 P.M and (75) 72.1% on the other side. (57) 54.8% of duration of sunlight in the week was 2-4 days in the study group, while half of sample in the control group. Approximately half of study group of them Period of Sun light exposure have less fifteen minutes, on the opposite side (60) 57.7%. 99 children not have fit or epilepsy with study and two children less than that at control group. About three quarters of the sample at study group did not intake Multivitamin and about four-fifths of the sample did not take a multivitamin in the non-diabetes group. In the diabetes group (89) 85.6% of the sample does not take vitamin D Supplement and (86) 82.7% in the control group.

Table (3): Distribution and differentiation of the Study Sample by Vitamin D Level for (Study and Control Group) (N= 208 children)

Classification of vitamin D level	Diabetes mellitus				Non-Diabetes mellitus			
	f	%	Mean	S.D	f	%	Mean	S.D
Severe Deficiency	33	31.7	11.716	6.274	24	23.1	14.696	0.00
Mild- moderate Deficiency	50	48.1	20.332	8.129	43	41.3	24.232	0.00
Optimal	21	20.2	29.198	6.234	37	35.6	33.108	0.00
Total	**104**	**100**	**20.415**	**7.188**	**104**	**100**	**24.189**	**6.968**
t = 3.268 d.f = 206 Sig = 0.000								

f=frequency, %=percent, t= independent sample t test, d.f=degree of freedom, sig= significant, SD= standard deviation.

Table 3 appears highly significant differentiation between the vitamin D level of control and study groups (child with or without diabetes mellitus under 5 years) by use grand mean of vitamin D of study group (20.415) and grand mean of vitamin D of control group (24.189) and t test independent sample at P≤ 0.05 level.

Table (4): Distribution and Association between Vitamin D Level of Diabetes mellitus Group and Body Mass Index (n=104)

Variables		Vitamin D level					Chi square
		Severe Deficiency	Mild-moderate Deficiency	Optimal	Total	Mean ±S.D.	
BMI	Underweight	12	6	1	19	**18.513±6.161**	χ^2 =15.61 d.f = 4 Sig=0.001
	Normal weight	16	41	19	76	**26.411±7.364**	
	Overweight & obesity	**5**	**3**	**1**	**9**	**16.321±7.243**	
	Total	**33**	**50**	**21**	**104**	**20.415±7.188**	

X2= Chi square, d.f=degree of freedom, sig= significant, SD= standard deviation

Table 4 appears the distribution Body Mass Index of Study Sample according to their Classification of vitamin D level which highest number show at normal weight, 16 of them was Severe Deficiency, 41 of them was Mild- Moderate Deficiency, and 19 of them was Optimal. Also appear that obesity not found with child suffering from diabetes mellitus. Highly significant between the vitamin D level and Body Mass Index of study group at P ≤ 0.001 level.

Table (5): Distribution and Association between Vitamin D of Diabetes mellitus Group and Feeding (n=104)

Variables		Vitamin D level					Chi square
		Severe Deficiency	Mild-moderate Deficiency	Optimal	Total	Mean ±S.D.	
Feeding	Breast	13	11	5	29	**19.039±6.724**	χ^2 =4.234 d.f = 4 Sig=0.375
	Bottle	14	22	9	45	**22.224±7.41**	
	Mix	6	17	7	30	**19.983±7.375**	
	Total	**33**	**50**	**21**	**104**	**20.415±7.188**	

* X2= Chi square, d.f=degree of freedom, sig= significant, SD= standard deviation

Table 5 appears the distribution Feeding of Study Sample according to their Classification of vitamin D level which highest number show at bottle feeding, 14 of them was Severe Deficiency, 22 of them was Mild- Moderate Deficiency, and 9 of them was Optimal. Presents that there is no significant between the vitamin D level and Feeding of study group at P ≤ 0.05 level.

DISCUSSION

Finding results in (table 1) shows that the majority of the study sample age is (4-5) years 51 (49%) and 44 (42.3) in the control sample, and Mean & SD (3.721±0.725) of study and (3.615±0.837) of control. These finding compatible with Zhu [9], Pre-school age was the high prevalence of vitamin D deficiency among children aged 1 month to 16 years in Hangzhou, China, who found his study to be representative of the large age group. Female gender is the most distributed by study and control who participant in their study 68 (65.4%).

These finding compatible with study [10], Iraqi Population Relationship between Vitamin D and Body Weight: Case-Control Research, which found the great gender in his research was female. The body mass index in the study record large number of child in the normal weight class at diabetes mellitus is 76 (73.1%), also the normal weight class at non-diabetes mellitus is 65 (62.5%). These finding incompatible with study of Vitamin D Deficiency in children and teenagers, which was found to be indicative of the body mass index in his work, was overweight and obese [11]. While identical with High incidence of Type 1 Diabetes mellitus vitamin D deficiency and healthy children, who [12] result normal weight high percent in study and control groups, Concerning the feeding, the bottle feeding of the study and control are Record the highest number 45 (43.3%) for diabetes mellitus and 49 (47.1%) for non-diabetes mellitus. These findings compatible in study and control with Vitamin D Deficiency Prevalence in Healthy Infants and Toddlers [13] that found bottle feeding the great types of feeding (75%).

The results of the study group in (table 2) depict the responses of the study sample about diabetes mellitus is effect on vitamin D rather than non-diabetic mellitus. These finding compatible in study and control with Severe Vitamin D Deficiency in Youth with Type 1 Diabetes [14], which stated that it is important to be aware of the high prevalence of vitamin D deficiency and its adverse effect on skeletal health for those who care for children, particularly children with T1D. The results of the study group in (table 2) depict the responses of the study sample about Time of Sun light exposure is great number in 11-3 P.M of time 70 (67.3%) and Duration of sunlight in the week highly percent in (2-4 days) 57 (54.8%). Also the Period of Sun light exposure has 51 children (49.0%) with < 15 minutes at exposure.

The results of the control group in (table 2) depict the responses of the control sample about Time of Sun light exposure is great number in 11-3 P.M of time 75 (72.1%) and Duration of sunlight in the week highly percent in (2-4 days) 52 (50.0 %). Also the Period of Sun light exposure has 60 children (57.7 %) with < 15 minutes at exposure. These finding compatible in study and control with study [15], in recent-onset type 1 diabetic children in Iran, vitamin D status and related factors that said the major predictors of serum vitamin D deficiency were the length of exposure to sunlight during the weekend and sex. Boys and children who were exposed to sunlight for around 15 minutes on weekends were less likely to be vitamin D deficient than girls and those who were exposed to sunlight for less than 15 minutes. Reported in the study group, no child has seizure and epilepsy disease or fit about 99 (95.2 %).

Multivitamin intake that 75 (72.1 %) of the study subjects indicate with No, and no child consume Vitamin D Supplement has 89 (85.6%).

Reported in the control group, no child has fit and epilepsy disease about 97 (93.3 %). Multivitamin intake that 81 (77.8 %) of the study subjects indicate with No, and no child consume Vitamin D Supplement has 86 (82.7%), These finding compatible in study and control with research [16]. Also Researcher watches the child's consumption of vitamin D only from food in the study, as we have not enrolled patients with a history of vitamin D and multivitamin supplementation in the previous three months. As totally the result in this section similar with study of High prevalence of vitamin D deficiency in South Australia among 2-17 year-olds with acute fractures [17], that took about (food diary, sun exposure, vitamin D and multivitamin supplement).

Table 3 appears the distribution of Study Sample and appears the distribution of control Sample according to their Classification of vitamin D level. At comparative between study and control groups, we notice a decrease in the percentages of vitamin D deficiency and an increase in the optimal of vitamin D level that lead to diabetes mellitus effect on vitamin D level. Highly significant differentiation between the vitamin D level of control and study groups (child with or without diabetes mellitus under 5 years) by use grand mean of vitamin D of study group (20.415) and grand mean of vitamin D of control group (24.189) and P≤ 0.05 level at independent sample t test. Children and teenagers with T1DM are more vulnerable to Vitamin-D deficiency than non-diabetics [18], this conclusion compatible for my research. Also my study reaches to the same conclusion of research [8]. The researcher notices that diabetes mellitus has effect on vitamin D level rather than child without diseases and both children have vitamin D deficiency.

Table 4: Distribution and Association between Vitamin D Level of Diabetes mellitus Group and Body Mass Index indicate highest number at normal weight, 16 of them was Severe Deficiency, 41 of them was Mild- Moderate Deficiency, and 19 of them was Optimal. Also appear that obesity not found with child suffering from diabetes mellitus. Highly significant between the vitamin D level and Body Mass Index of study group at P ≤ 0.001 level, This identical with study of Children with vitamin D deficiency has had significantly higher BMI compared to participants with elevated serum 25(OH)D levels [11].

Table 5 Distribution and Association between Vitamin D Level of Diabetes mellitus Group and Feeding appears the distribution highest number at bottle feeding, 14 of them was Severe Deficiency, 22 of them was Mild- Moderate Deficiency, and 9 of them was Optimal. Presents that there is not significantly between the vitamin D level and feeding of study group at P ≤ 0.05 levels, these findings compatible in study and control with study [13], that result no association significant between toddler and vitamin D deficiency in bottle feeding.

CONCLUSION

The present study concluded that the incidence of vitamin D deficiency is high among children under five years with type (1) diabetes, and the largest number of them suffers from mild to moderate deficiency. In addition, the child has more risk factors that effect on vitamin D level such as (Time of Sun light exposure, Duration of sunlight in the week, Period of Sun light exposure, Multivitamin intake and Vitamin D Supplement).

RECOMMENDATIONS

The work of educational seminars for parents about the risks of vitamin D deficiency and Encouraging parents of children with juvenile diabetes to monitor vitamin D levels contently.

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