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Confounding Risk Factors in Developing Type 1 Diabetes Mellitus among Children and Adolescents at Sulaimani Chronic Diabetes Health Center

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ABSTRACT

Diabetes Mellitus consider as a common chronic health condition throughout the world and the most common endocrine disease in children and adolescences. The study aim is to determine the risk factors, which lead to type 1 diabetes mellitus among children and adolescent in diabetes health center at Sulaimani city. the study was conducted using descriptive cross sectional study at a special center for Type 1 Diabetes Miletus A questionnaire was created and administered to a (170) mothers or fathers as a convenience sample. Descriptive statistics analysis such as (frequency, percentage, mean and stander deviation) and also to identify the effective factors affecting diabetes in children and Adolescents Factorial analysis (principal component analysis) was used. The finding show that, 39.4 % of samples were aged between (9-13) years old, which stated as the highest rate among all age groups, while the minority of age was between (1-4) years old, which was equal to 8.2% of the total and the (Mean ±S.D) was equal to 10.44±4.04 respectively. The majority of age at diagnosis was between (5-8) years old, which is 35.3% and their food habit was normal diet, which is 73.5%, while the Sugar diet and Fatty diet were 25.9% and 0.6%y respectively. Most of the participants, 19.4% of the participant's family history was Type 2 diabetes, which was the first rank of the family history and majority of them were Kurdish in nationality. Age at diagnosis and mode of delivery considered as the first factor affect the type 1 diabetics mellitus. The second most common factor effect on diabetes disease in children and adolescents are maternal habit and maternal disease followed by Gestational age at birth and Neonatal disease, then food habits, Neonatal weight was estimated as the fourth component factors affecting Type 1 diabetes mellitus. The fifth component factors in ranking are Residency and Family history of autoimmune disease, finally the weakest factor is nationality by total variance of 8.552%. the early year of child's life played a vital role in development of type 1 diabetes

mellitus, also maternal diseases (gestational diabetes, pre-eclampsia and perinatal infection during pregnancy), healthy diet during pregnancy and education programs are recommended

1. INTRODUCTION

Diabetes Mellitus (DM) is a common chronic health condition throughout the world and the most common endocrine disease in children and adolescences [1]. Globally, the rate of type I diabetes mellitus has been increased by 2-5% annually, and approximately in 2010 about 1:300 cases in 18 years of age were suffered from T1DM in the US population [2]. The incidence has decreased among children aged 2-6 years with significant increases between age 10 - 14 years [2,3]. Deficiency in secretion of insulin or an autoimmune disease of the beta cells destruction of pancreas mostly leads to Type 1 diabetes among children, [3]. T1DM (insulin-dependent diabetes mellitus) that is due to 'unknown cause' [4]. Various causes of impairment in the pancreatic beta-cell functions are dietary component, viral infection, the autoimmune disease.

Although, genetic risk factors is another predisposing risk factor for developing T1DM, allowing the autoimmune process to progress [5,6]. Typically, T1DM is diagnosed after the onset of obvious hyperglycemia [7]. Islet autoimmunity has defined as the persistently existence of autoantibodies to pancreatic beta-cell islet antigens. Usually, islet immunity occurs in early life, and the prevalence has increased in the second years of life [8,9].

Recently a study has been indicated that perinatal infection that affects children in utero, or during early childhood [10]. A variety of maternal-related incidents are linked in the development with risk of type 1diabetes among children but not in adults [11]. Another factor that may contribute to diabetes, is thyroid disease. A strong relationship between the occurrences of thyroid disease and relatives of a diabetic patient in compared with children and adolescents did not have diabetes[12].

This study has been conducted to find out the maternal and neonatal risk factors in the development of T1D among children and adolescents in the diabetes health center at Sulaimani city.

2. METHODS AND MATERIALS

This study was conducted through using a descriptive cross sectional study at a special center for T1DM children at Sulaimani City. Either parent of diagnosed T1DM children were participated in this study. A structured interview has been applied using a validated questionnaires based on T1DM‘s epidemiological risk factors in children and adolescents after a comprehensive review of literature in order to reach the study's objectives. A questionnaire was created and administered to a (170) mothers or fathers as a convenience sample. The data were about Child and adolescent socio-demographic information such as (age , age of diagnosis, residency, nationality, food habit and family history of autoimmune disease) then Potential maternal risk factors during pregnancy (prenatal) such as maternal food habit and maternal disease during pregnancy) and Potential neonatal risk factors (postnatal such as mood of delivery, gestational age, neonate weight and disease) affecting T1DM using a structured informant questionnaire.
The data was collected from (170) enrolled either parents who registered their children to the diabetes center through a telephone conversation because of the situation of Covid 19. Non-probability sampling was used to select purposive sample of participants who met the criteria of selection. The permission was taken from the center first, and then the researchers were asked about the telephone number for each family in order to get their approval for their participation in this study. Interviews were conducted individually with each with telephone follow-up, The

data were about Child and adolescent socio-demographic information such as (age , age of diagnosis, residency, nationality, food habit and family history of autoimmune disease) then Potential maternal risk factors during pregnancy (prenatal) such as maternal food habit and maternal disease during pregnancy) and Potential neonatal risk factors (postnatal such as mood of delivery, gestational age, neonate weight and disease) affecting T1DM using a structured informant questionnaire. All statistical computation is enhanced using statistical method (SPSS 21). The data had been coded, tabulated, and presented in a descriptive form. The statistical procedure that was applied to determine the results of the present study included:

1. Alpha-cronbach has been used for testing the reliability of the questionnaire.
2. Descriptive statistical data analysis (Child and adolescent demography, Potential maternal risk factors and Potential neonatal risk factors)
3. Inferential data analysis:
   - **A.** Descriptive statistics data (frequency, percentage, mean and stander deviation)
   - **B.** Factorial analysis (principal component analysis) was used in order to identify the effective factors affecting Diabetes decease in children and Adolescents
   - **C.** One way ANOVA (F-test)

3. RESULTS

Table 1): Child and adolescent demography data

Variables	Frequency	Percent
Age (Date of birth)		
1-4 years old	14	8.2
5-8 years old	42	24.7
9-13 years old	67	39.4
14-17 years old	47	27.6
Mean ±S.D	10.44±4.04	
Age at diagnosis of type 1 diabetes (if known)		
1-4 years old	58	34.1
5-8 years old	60	35.3
9-11 years old	47	27.6
14- 17 years old	5	2.9
Residency		
Rural	7	4.1
Urban	97	57.1
Sub-urban	66	38.8
Nationality		
Kurd	169	99.4
Arab	1	0.6
Other	0	0.0
Childs and adolescent food habits		
Normal diet	125	73.5
Fatty diet	1	0.6
Sugar diet	44	25.9
Family history of autoimmune disease		
Type I DM	4	2.4
Type I DM	33	19.4
Type I +Type II DM	5	2.9
Thyroid disease	23	13.5
Heart disease	11	6.5
Cancer disease	3	1.8
No disease	23	13.5
Type 2 diabetes mellitus +thyroid disease	23	13.5
Type 1 diabetes+ thyroid disease	3	1.8

Thyroid disease + heart disease	9	5.3
Type 2 diabetes mellitus + heart disease	9	5.3
Type 2 diabetes mellitus + cancer disease	3	1.8
Heart disease + cancer disease	2	1.2
Type 1 diabetes mellitus + cancer disease	1	0.6
Thyroid disease + cancer disease	1	0.6
Type 1 DM + type II diabetes mellitus +heart disease	1	0.6
Type II DM + thyroid disease + heart disease	8	4.7
Type 11 DM + thyroid disease + cancer disease	5	2.9
Type II DM+ heart disease + cancer disease	3	1.8
Maternal habits		
Normal	97	57.1
Tea	73	42.9
Maternal disease		
No disease	104	61.2
Pre-eclampsia	8	4.7
Gestational diabetes	2	1.2
Perinatal infection	52	30.6
Gestational diabetes + perinatal infection	4	2.4
Total	**170**	**100**

It is clear from the table (1): 39.4 % of participants were aged between (9-13) years old, which estimated as the highest rate among all age groups followed by 27.6% were between (14-17) years old, while the minority of age 8.2% were between (1-4) years old and the (Mean ±S.D) was to equal 10.44±4.04. In addition, the majority of age at diagnosis was between (5-8) years old, which was 35.3%,34.1% were diagnosed between (1-4) and 27.6 of age at diagnosis 34.1% and 27.6 of age at diagnosis (9-11) years old and only 2.9% was between (14-17) years old. Among the study participants, 57.1% were from urban residency. The majority of nationality was Kurdish nationality which was 99.4% of the study. The majority of the Childs and adolescent food habits was normal diet, which was 73.5%, while the Sugar diet and Fatty diet were 25.9% and 0.6% by respectively. Most of the participants, 19.4% of Family history was Type 2 diabetes, which, was the first rank of the family history. While, 2.9%, 1.8% and 1.2% of the family history was (Type 1+Type 2diabetes), (Type 2 diabetes + cancer disease) and (heart disease + cancer disease) respectively. In addition, the majority of 57.2% of maternal habits were normal followed by only 42.9% were tea habits. In addition, the highest rate 61.2% of maternal not suffered from disease and 30.6% had Perinatal infection, and only 2.4% was (Gestational diabetes + perinatal infection) which was the lowest percentage among all Maternal diseases.

Table (2): Potential neonatal risk factors data

Variables	Frequency	Percent
Mode of delivery		
Vaginal delivery	101	59.4
Instrument vaginal delivery	0	0.0
Cesarean section	69	40.6
Gestational age at birth		
Preterm	26	15.3
Full term	136	80
Post term	8	4.7
Neonatal weight		
Normal weight	140	82.4
Underweight	11	6.5
Overweight	10	5.9
Obesity	9	5.3

Neonatal disease		
No disease	64	37.6
Respiratory disease	10	5.9
Jaundice	36	21.2
Infection	29	17.1
Heart disease	2	1.2
Respiratory disease + jaundice	14	8.2
Jaundice + infection	9	5.3
Jaundice + heart disease	1	0.6
Respiratory disease + infection	1	0.6
Respiratory disease + jaundice disease + infection	4	2.4
Total	**170**	**100**

It is clear from the table 2: 59.4% of participants had Vaginal delivery and only 40.6% was Caesarean section. Most participants, 80% were full term and only 15.3% were preterm. While, 4.7% of them were post term. Most participants, 82.4% were normal weight while 6.5% and 5.9% of the neonatal weight were underweight and overweight respectively and only 5.3% of them were Obesity. In addition, 37.6% of them were healthy no neonatal disease and the second rank of the neonatal disease was Infection which was 17.1%. Jaundice + heart disease and respiratory disease + infection of the Neonatal disease was the lowest percentage among all Neonatal disease

Table (3): Socio-demographic risk factors

(3.1) :Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %	Total	% Of Variance	Cumulative %
1	1.692	21.148	21.148	1.692	21.148	21.148	1.684	21.055	21.055
2	1.396	17.452	38.600	1.396	17.452	38.600	1.370	17.127	38.182
3	1.046	13.069	51.669	1.046	13.069	51.669	1.079	13.487	51.669
4	.974	12.172	63.841						
5	.961	12.018	75.860						
6	.945	11.818	87.678						
7	.668	8.351	96.029						
8	.318	3.971	100.000						

(3.2):Rotated Component Matrixa

Factors	Component		
	1	2	3
Age	.913	.022	.007
Age at diagnosis	.892	.013	-.040
Residency	-.117	.287	-.684
Nationality	.006	-.311	.046
Childs and adolescent food habits	.061	.478	.151
Family history of autoimmune disease	-.147	.193	.754
Maternal habits	.057	.625	-.016
Maternal disease	-.107	.731	-.127

Table (3.1) and (3.2) shows three socio-demographic data affecting the rate of Diabetes in children and Adolescents using the correlation matrix analysis, among risk factors by using (principal component analysis PCA). The analysis indicated that three in eighth items were eliminated are as follows:

The first principal component is the Age of the child, it represents the most effective factor, which explained the variance equal to (21.148%) from the total cumulative variance (51.669%) in loading value equal to (0.913) followed by Age at diagnosis factor, as the other most effective risk factor in loading value equal to (0.892).

The second most Common factor effect on Diabetes Disease in Children and Adolescents and its occupied variance value equal to (17.452%) from the total cumulative variance (51.669%) and includes four risk factors: Nationality risk factor in loading value equal to (-0.311), Childs and adolescent food habits risk factor in loading value equal to (0.478), Maternal habits risk factor in loading value equal to (0.625) and Maternal disease risk factor in loading value equal to (0.731).

Third principal components: it's occupied variance value equal to (13.069%) from the total cumulative variance (51.669%) and it includes two risk factors: Family history of autoimmune disease risk factor in loading value equal to(0.754) and Residency risk factor to loading value equal to (-0.684).

Maternal habits risk factor in loading value equal to (0.625) and Maternal disease risk factor in loading value equal to (0.731).

Third principal components: it's occupied variance value equal to (13.069%) from the total cumulative variance (51.669%) and it includes two risk factors: Family history of autoimmune disease risk factor in loading value equal to(0.754) and Residency risk factor to loading value equal to (-0.684).

The analysis indicated that three in eighth items were eliminated are as follows:

1st Factor:

This factor containing these variables (Age of the child and age at diagnosis) by total variance 21.148%.

F_1 = 0.913(Age of the child) +0.892(Age at diagnosis)

2nd Factor:

This factor containing these variables (Nationality, Childs and adolescent food habits, maternal habits and maternal disease) by total variance 17.452%.

F_2 = -0.311(Nationality) +0.478(Childs and adolescent food habits) +0.625(Maternal habits) +0.731(Maternal disease)

3rd Factor:

This factor containing these variables (Family history of autoimmune disease and Residency) by total variance 11.050%.

F_3 = 0.754 (Family history of autoimmune disease) -0.684(Residency)

Table (4): Potential neonatal risk factors

(4.1):Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.228	30.706	30.706	1.228	30.706	30.706	1.183	29.585	29.585
2	1.096	27.393	58.100	1.096	27.393	58.100	1.141	28.514	58.100
3	.962	24.040	82.140						
4	.714	17.860	100.000						

(4.2):Rotated Component Matrix[a]

Factors	Component	
	1	2
Mode of delivery	.174	-.772
Gestational age at birth	-.738	.372
Neonatal weight	.121	.520
Neonatal disease	.770	.368

Table (4.1) and (4.2) underlines two potential neonatal risk factors in the fourth items, which affects the presence of Diabetes in children and Adolescents as it represents below:
First principal components: its occupied variance value equal to (30.706%) from the total cumulative variance (58.100%) and it includes two risk factors: Gestational age at birth in loading value equal to (-0.738) and Neonatal disease to loading value equal to (0.77).
Second principal components: its occupied variance value equal to (27.393%) from the total cumulative variance (58.100%) and it includes two risk factors: Mode of delivery in loading value equal to (-0.772) and Neonatal weight to loading value equal to (0.52).

The analysis of study identified from factor, which are clarify 58.100% of the variance, and the result identified four (2) factors, for example

1st Factor:

This factor containing these variables (Gestational age at birth and Neonatal disease) by total variance 30.706%.

F_1 = -0.738 (Gestational age at birth) +0.77(Neonatal disease)

2nd Factor:

This factor containing these variables (Mode of delivery and Neonatal weight) by total variance 27.393%.

F_2 = -0.772 (Mode of delivery) +0.52 (Neonatal weight)

Table (5): Risk Factors for Diabetes Mellitus among children and Adolescents

(5.1): Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.975	16.457	16.457	1.975	16.457	16.457	1.881	15.676	15.676
2	1.550	12.916	29.373	1.550	12.916	29.373	1.419	11.826	27.501
3	1.179	9.823	39.196	1.179	9.823	39.196	1.306	10.881	38.382
4	1.105	9.206	48.402	1.105	9.206	48.402	1.108	9.235	47.618
5	1.035	8.626	57.028	1.035	8.626	57.028	1.105	9.211	56.829
6	1.026	8.552	65.580	1.026	8.552	65.580	1.050	8.752	65.580
7	.926	7.719	73.299						
8	.862	7.187	80.486						
9	.763	6.361	86.847						
10	.659	5.488	92.335						
11	.615	5.126	97.461						
12	.305	2.539	100.000						

(5.2):Rotated Component Matrix

Factors	Component					
	1	2	3	4	5	6
Age (Date of birth)	.860	-.027	-.125	.001	-.035	-.061
Age at diagnosis	.874	-.061	-.023	.053	.009	-.036
Residency	-.051	.119	.171	.010	.824	.045
Nationality	-.082	-.135	-.158	.068	-.053	.842
Childs and adolescent food habits	.029	.237	-.036	-.817	.052	-.037
Family history of autoimmune disease	-.092	.128	.451	-.022	-.585	.148
Maternal habits	-.029	.738	-.201	.029	-.100	-.209
Maternal disease	-.027	.671	.335	-.111	.218	.140
Mode of delivery	-.519	-.192	-.139	.112	-.077	-.463
Gestational age at birth	.285	.305	-.557	.027	-.044	.175
Neonatal weight	.061	.420	.036	.632	.106	-.005
Neonatal disease	.055	.094	.740	.079	.022	-.048

According to the table (5.1) and (5.2) shows six risk factors affecting the presence of Diabetes in children and Adolescents using the correlation matrix analysis, among risk factors by using (principal component analysis PCA). The analysis indicated that three in eighth items were eliminated are as follows:

The analysis of study identified from factor, which are clarify 65.580% of the variance, and the result identified four (6) factors, for example

1st Factor:

This factor containing these variables (Age, Age at diagnosis and Mode of delivery) by total variance 16.457%.

F_1 = 0.860 (Age) +0. 874 (Age at diagnosis) -0.519(Mode of delivery).

2nd Factor:

This factor containing these variables (Maternal habits and Maternal disease) by total variance 12.916%.

F_2 = 0.738(Maternal habits) +0.671(Maternal disease)

3rd Factor:

This factor containing these variables (Gestational age at birth and Neonatal disease) by total variance 9.823%.

F_3 = -0.557 (Gestational age at birth) +0.740(Neonatal disease)

4th Factor:

This factor containing these variables (Childs and adolescent food habits and Neonatal weight) by total variance 9.206%.

F_4 = -0.817 (Childs and adolescent food habits) +0.632(Neonatal weight)

5th Factor:

This factor containing these variables (Residency and Family history of autoimmune disease) by total variance 8.626%.

F_5 = 0.824(Residency)-0.585 (Family history of autoimmune disease)

6th Factor:

This factor containing these variables (Nationality) by total variance 8.552%.

F_6 = 0.842 (Nationality)

Table (6): Comparison between Potential maternal risk factors during pregnancy with age of child and adolescent

Variables	Items	Mean	S.D	Significance test
Maternal habits	Normal	10.33	4.27	F=0.171 P=0.68
	Tea	10.59	3.73	
	Smoking	0	0	
Maternal disease	No disease	10.72	3.91	F=0.913 P=0.458
	Pre-eclampsia	8.00	4.75	
	Gestational diabetes	11.00	2.83	
	Perinatal infection	10.29	4.18	
	Gestational diabetes + perinatal infection	9.75	4.65	

It is clear in the table (6) that there is no statistically significance difference between age of child and adolescent in Maternal habits p=0.68 and Maternal disease p=0.458 because the result of the p-value was more than the common alpha 0.05.

Table (7): Comparison between Potential neonatal risk factors with age (Date of birth) of child and adolescent

Variables	Items	Mean	S.D	Significance test
Mode of delivery	Vaginal delivery	11.2	3.88	*a)* *b)* *F=9.177* **P=0.003**
	Instrument vaginal delivery	0	0	
	Cesarean section	9.3	4.03	
Gestational age at birth	Preterm	8.1	3.65	**F=5.578** **P=0.005**
	Full term	10.9	3.96	
	Post term	10.0	4.34	
	Normal weight	10.3	4.08	

Neonatal weight	Underweight	9.7	4.07	**F=0.808 P=0.491**
	Overweight	11.8	3.05	
	Obesity	11.7	4.21	
Neonatal disease	No disease	11.0	4.06	**F=1.379 P=0.201**
	Respiratory disease	9.7	3.3	
	Jaundice	10.56	4.44	
	Infection	10.38	3.36	
	Heart disease	11.5	7.78	
	Respiratory disease + jaundice	8.14	4.67	
	Jaundice + infection	8.67	2.4	
	Jaundice + heart disease	12.0	----	
	Respiratory disease + infection	8,0	----	
	Respiratory disease + jaundice disease + infection	12.25	2.36	

It is clear in the table (7) that there is statistically significance difference between age (Date of birth) of child and adolescent in Mode of delivery p=0.003 and Gestational age at birth p=0.005, because the result of the p-value was less than the common alpha 0.05.But, there is no statistically significance difference between age (Date of birth) of child and adolescent with Neonatal weight and Neonatal disease, because (p-vale >0.05).

4. DISCUSSION

Insulin-dependent diabetes mellitus (IDDM) is also known as Type 1 diabetes, which is a chronic autoimmune disease in children. This study anticipated determining the environmental factors that dispose to type 1DM in children and adolescents. Potential maternal predisposing risk factors during pregnancy (prenatal) such as maternal food habit and maternal disease during pregnancy) and Potential neonatal risk factors (postnatal such as the mood of delivery, gestational age, neonate weight, and disease) affecting T1DM among children and adolescents.

Regarding the child and adolescent demographic data, the current study found that the highest rate of age was between (9-13) years old. Age at diagnosis of T1DM is a major risk factor for the development of T1DM, the majority of age at diagnosis of type 1 diabetes is between 5-8 years old.

This was further reported in a study [2] that demonstrated that the incidence of type1diabetes is higher in children rather than the adult. Furthermore, in a similar study conducted in a six-center in the USA, the study revealed that approximately 80% of all DM cases for all type diabetes were found among those less than 9 years of age[13].

Family history of Type 2 Diabetes appears to be a risk factor for T1DM. This article reported that family history of T2DM has been listed among the crucial risk factors in contributing to the risk of T1DM. Therefore, the majority of diabetic patients were from a family history of T2DM in first and second-degree relatives. Similarly, a study by [14] in Yogoslavia revealed and [15] in Sweden also adjusted and found the association between T1DM and family history of T2DM. However, the finding is inconsistent with the study, which was conducted in Italy, the study noted that children who have family history of type 2 diabetes mellitus was not impacted the risk of type 1 diabetes [16].
In terms of another autoimmune disease (such as thyroid disease), this study represents that about 13.5% of the family history was thyroid disease among the first and second degree of a diabetic patient. Similarly, a study in 2009, reported that [12], thyroid daises among relative of the diabetic patient was significantly classified with increased risk of developing T1DM. The most common endocrine disease is both DM Type I and thyroid disease. (HLA-DR3) genes

were the major HLAallele causative to the genetic thyroid disease and type 1 diabetes susceptibility [17].

Regarding the maternal habits and mother who have illness in pregnancy, this study referred to the higher number of diabetic children's mothers had no particular dilatory habits, and only about nearly half of maternal habits were drinking tea at the time of pregnancy, being a confounding risk factor in the association between type 1 DM of their offspring , in a similar study has stated by Visalli et al. in Italy, tea habits during pregnancy were considerably linked to DM Type 1 in their offspring [18].

Among maternal diseases (gestational diabetes, pre-eclampsia, and prenatal infection), this indicated that the highest percentage of maternal diabetic children had no diseases during pregnancy, but a quarter of maternal infection during pregnancy is relatively small as a confounding risk factor of T1DM. In a study in Sweden, the investigator indicated that enter viral infection in pregnancy is a risk factor for childhood-onset diabetes in their children before 15 years of age [19]. However, in a cohort study between (1989-1998) from Norway [20], this study identified 1824 cases were diagnosed with T1 diabetes diagnosed, the study has determined that perinatal infection, pre-eclampsia, and cesarean section have not contributed factors for an increased occurrence of Type 1 DM in their offspring. Mother gestational diabetes (GDM) in this study estimated as the lowest percentage among all maternal disease, this results is inconsistent with [21], the study showed in an Iranian hospital in 2015, in a case-control retrospective study, one-hundred participants aged between 1-15 years were recruited, the study reported that there was an important relationship between mothers GDM and early childhood type 1diabtes, which noticed (OR=3,789 P=0.05).
This study has demonstrated that birth weight is not correlated with an increased risk of Type I DM among children and adolescents, this result is consistent with a matched case-control studies, which concluded that there was no relationship between birth weight and DM Type1 [22,23]. In contrast, in a recent meta-analysis revealed that over birth weight (more than 4 kg) was associated with a higher risk of T1DM (10% (OR 1.10, 95% CI (1.04, 1.19); p = 0.003), in comparison to those who have a birth weight between 3.0 and 3.5 kg [23].
Regarding potential neonatal risk factors, this study stated the highest percentage of participants had no diseases during the childhood period. Jaundice and infection in this study indicated 21%,17% respectively. Similarly, a study in the UK [24], in Europe [25], was reported neonatal jaundice, infection, and respiratory disease are risk factors for T1DM. In addition, an Iranian study was also stated that children who have jaundice at delivery birth, or after delivery, and ABO incongruity are at increased risk of Type1DM [10].
Among mothers types of delivery such as (NVD(normal vaginal delivery), cesarean section(S.C). The results of this study found that nearly half of mother's diabetic patients had delivered by S.C, this is results in a meta-analysis observational [26], the study indicated that cesarean section is linked with the developing to the risk of type 1 DM of their offspring.

5. CONCLUSION

The early childhood period of age has a significant role in developing an increased risk of T1DM among children and adolescents, also maternal diseases (gestational diabetes, pre-eclampsia, and prenatal infection during pregnancy), maternal habits (tea drinking during pregnancy). Besides, there was a higher percentage of T1DM in those who have a family history of thyroid disease and Type 2 DM in the first -degree and second-degree relatives and is one of the significant confounding risk factors for type 1diabetes among children and adolescents. A healthy diet during pregnancy and education programs are recommended for their family to give awareness about the importance of routine screening test in order to detect the disease in early age of children.

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