
Mood Disorders in Children and Adolescents with Type 1 Diabetes

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Abstract: Diabetes Mellitus is a chronic disease than can cause negative mood, interpersonal problems, inefficacy, anhedonia and negative self-confidence. In addition, quality of life is affected for the patient and his/her family, mainly in everyday and social activities as well as in psychological status. In the present study the relationship between type 1 Diabetes Mellitus and mood disorders in children and adolescents has been investigated, as well as the factors affecting, negatively or positively, the way these disorders are manifested. Seventy two children and adolescents (47 girls and 25 boys) that attended hospital's outpatient's clinics in northern Greece were the sample of the study. Participation was voluntary; having obtained informed consent from parents and children. The Children Depression Inventory (CDI Kovacs, 1980) was used. Data analysis was conducted using SPSS 20.00. The research revealed that boys experience more interpersonal problems and inefficacy than girls. Looking with more details into the participants' family status statistical significance was detected only regarding negative mood. Higher depression scores were noticed for "single parent families" followed by "divorced parents", while children who lived with both parents scored the lowest. The results showed that statistically significant difference existed in the total CDI score and the subscales of negative self-confidence and inefficacy. Children up to 12 years old scored lower than children older than 13 years old. In conclusion, diabetes is requiring from children and their families adjustment in everyday life in order to achieve a good health and mental status. Knowledge of early signs and symptoms of childhood depression can help parents and teachers to detect them and ask for professional help and support. Healthcare professionals should plan care in a way that psychological support, positive motivation and compliance to treatment could be enhanced.

Keywords: Adolescents, Children, Diabetes Mellitus Type 1, Mood Disorders

1. Introduction

Diabetes Mellitus (DM) is a disease with worldwide impact, affecting both adults and children. The number of children and adolescents suffering from DM type 1 is constantly rising [1]. DM is causing many and a painful change in a young person's life, as it requires daily self-control of blood glucose and changes in dietary and other habits. On the other hand, its complications affect personal as

well as social life of the patient [2] [3] [4] [5].

Metabolic control in adolescents is more fatiguing and difficult than in adults. This is maybe due to normal changes during adolescence, to insulin resistance and, partly, to low self-care. Efforts to cope with the disease can affect the sense of independence developed by young people at this age, causing them to feel more disadvantaged than their peers [6] [7]. The effort to effectively manage DM, the realization of the disease's chronicity and the possibility of adverse effects

are the main reasons of developing psychological problems in children and adolescents with DM [5] [8] [9]. In addition, adolescence itself, with the biological and psychological changes that are associated with this period of time, is highly possible to aggravate various types of mental health instability.

The majority of children and adolescents respond well enough to the demands of DM management without any particular problems [10] [3]. However, there are some youngsters that manifest serious psychological problems, such as post-traumatic stress, anxiety and/or behavioral disorders, intense anger with violent outbursts, eating disorders, refusal to take insulin and school absenteeism [11] [12] [13] [14] [15] [16] [17]. Finally, literature has demonstrated that depressive disorders are more common in young people with DM than non-diabetics of the same age [18] [19]. However, it is likely that a lot of the above mentioned problems will be reduced after the first year of DM diagnosis, and the child and his/her family will adapt well to the new reality [12] [20].

Mood disorders, mainly depression, are quite common in diabetics irrespective of their age or DM type [21] [17] [22]. It is estimated that 30% of patients with DM have depressive symptoms, while DM incidence is 2-3 times higher than in general population [23] [22].

There are four main types of mood disorders, as described in the Diagnostic and Statistical Manual of Mental Disorders V-text revision (DSMV-TR): depressive disorders, bipolar disorder, mood disorder due to a disease and mood disorders caused by substances [24].

As mentioned above, the relationship between depression and DM has been well documented by several studies. However, knowledge about the cause and the way depression affects DM management is limited. Researchers conclude on that depression is highly associated with DM and the increased risk for complications from the disease; while a patient's better mental state is positively linked to glycemic control [25] [26].

In this context the present study was decided to investigate the relationship between DM type I and mood disorders in children and adolescents, as well as to find any factors that affect negatively or positively the manifestation of mood disorders.

2. Methods

An analytical time study was conducted in children and adolescents with DM type 1 in northern Greece hospitals during a period of four months.

2.1. Sample and Process

A convenience sample of 72 children and adolescents was used. Inclusion criteria were age (≤ 18 years old), parental consent and at least one year since the diagnosis of DM. Exclusion from the study was decided for those that were unable to write and speak Greek.

Data were collected in paediatric outpatient's clinics in

northern Greece hospitals. Questionnaires were distributed to patients in a closed envelope prior to their examination and were delivered back to the research team at the end of the appointment.

2.2. Research Tool

Data collection was conducted using a self-completed questionnaire consisting of two parts. The first part contained questions on demographics and the second consisted of an evaluation scale of child depression, The Kovacs' Children's Depression Inventory (CDI) [27].

Children's Depression Inventory is a self-referencing questionnaire that assesses depressed mood as experienced by the individual. This questionnaire is not used to diagnose depression, but as an indicator of symptoms. Higher scores mean more depressive symptoms. Depression diagnosis is set only after a clinical interview and assessment of the individual according to the DSM-IV or ICD-10 diagnostic criteria.

The research tool consists of 27 items (questions) scored on a 3-point scale (0, 1, 2) and subdivided into five sub-scales. The CDI sub-scales measure negative mood, interpersonal problems, inefficiency, anhedonia and negative self-confidence. The total depressed disposition index derives from the sum of the five sub-scales of the CDI, with the average score ranging from 45 to 55. Cronbach's internal reliability index of the questionnaire was 0.41 to 0.71 for the five sub-scales, while for the total scale it was 0.87.

2.3. Ethics

Throughout the study, ethical principles of human research included in the Declaration of Helsinki were kept [28]. Approval from the Scientific Committees of all the hospitals that the research was conducted, as well as the directors of paediatric clinics was obtained. Parents and the study population were provided oral and written information and were asked for written informed consent and permission to use data from the medical records. Furthermore, participants were informed about the purpose of the study and the benefits that would derive from it, anonymity, confidentiality of information, voluntary participation and the right to deny participation without any impact on their care.

2.4. Statistical Analysis

Statistical processing of the results was performed with IBM SPSS Statistics 20.0. In the descriptive statistics, continuous variables were expressed by mean (M) and standard deviation (SD). Categorical variables were expressed in absolute frequencies and percentages. Verification of the regularity of the variables was performed using the Kolmogorov-Smirnov criterion and Trimmed Means for continuous variables. Parametric statistical test One-Way ANOVA was applied, as all variables had a normal distribution. Furthermore, Pearson correlation coefficient was applied for continuous variables. Statistical significance level was set at $p < 0.05$.

3. Results

3.1. Descriptive Statistics

Seventy two individuals agreed to participate in the study

(response rate 73%), with an average age of 14.0 (± 2.0) years old. Almost one third of the sample were boys (34.7%, n=25). DM was first diagnosed at the age of 7.3 (± 3.5) years old. Demographic and clinical characteristics are presented in Table 1.

Table 1. Demographic and clinical data.

Sample (n=72)		f	%
Gender	Boys	25	34.7
	Girls	47	65.3
Educational status	High school (9 years of education)	43	59.7
	Lyceum (12 years of education)	25	34.7
	Do not answer	4	5.6
Family status	Parents married	52	72.2
	Parents divorced	16	22.2
	Single parent family	1	1.4
	Do not answer	3	4.2
Diagnosis	Random	65	90.3
	Scheduled appointment	6	8.3
	Do not answer	1	1.4
Age	< 12 years old	19	26.4
	> 13 years old	53	73.6

3.2. Comparisons

One-way ANOVA was applied to examine statistically significance according to gender, family status, and diagnosis of DM type 1 in terms of their overall score in the CDI and their score in each sub-scale (Table 2).

Boys (n=25, M=1.88, SD=1.45) experienced more Interpersonal Problems than girls (n=47, M=.68, SD=.84). Differences between boys and girls were statistically significant [F(1,70)=19.8, p<.001, $\eta^2=.02$] with a small effect size according to η^2 index. Differences in boys' mean score (n=25, M=2.64, SD=2.39) and girls' (n=47, M=1.64, SD=1.61) were statistically significant in the subscale of Inefficiency [F(1,70)=5.01, p=.028, $\eta^2=.06$] with a mean effect size according to η^2 index. Mean differences' between boys and girls in the remaining sub-scales and in the overall questionnaire scale appeared to be not statistically significant.

While testing for differences in participants' means according to their family status, a statistical significance was detected regarding the sub-scale of Negative Disposition [F(2,66)=3.33, p=.042, $\eta^2=.09$]. The highest mean score was recorded for the category "single parent family" (n=1, M=6.00), followed by "divorced parents" (n=16, M=3.63, SD=1.86). Children that lived with both parents scored the lowest score in the particular sub-scale (n=52, M=2.62, SD=1.82).

On correlations according to age, a statistically significance with the overall score of the questionnaire (p=.049) was detected and with the sub-scale of Interpersonal Relationships (p=.004) (Table 3). While in the correlation based on the date of DM's first diagnosis, no statistically significant difference was found either in the overall score of the CDI or separately in any of the sub-scales (Table 4).

Table 2. Means and standard deviations according to gender and age groups for the total score of Children Depression Inventory and its sub-scales.

Scales & sub-scales	CDI		Negative Mood		Interpersonal Problems		Inefficiency		Anhedonia		Negative Self-esteem	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Gender												
Boys	10.88	7.25	2.80	1.71	1.88	1.45	2.64	2.14	2.08	2.18	1.48	1.48
Girls	9.36	6.64	2.77	2.07	0.68	.84	1.64	1.61	2.72	2.01	1.55	1.47
	p=.374		P=.944		p<.001		p=.028		p=.213		p=.841	
Diagnosis												
Randomly	9.63	6.72	2.75	1.93	1.1	1.27	1.89	1.8	2.45	2.11	1.45	1.38
Scheduled appointment	14.0	7.29	3.5	1.87	1.33	0.52	3.33	2.07	3.17	1.84	2.67	2.0
	p=.135		p=.367		p=.648		p=.068		p=.423		p=.050	
Family status												
Divorced parents	12.3	3.79	3.63	1.86	1.31	1.35	2.75	1.48	2.69	1.7	1.94	.85
Single parent	20.0		6.0		3.0		2.0		7.0		2.0	
Married parents	9.46	7.23	2.62	1.82	1.06	1.2	1.85	1.94	2.46	2.12	1.48	1.60
	p=.115		p=.042		.244		.239		.092		.535	

CDI=Children Depression Inventory, SD=Standard Deviation

Table 3. Comparisons between age and Children Depression Inventory and its sub-scales.

Variables		
Age	PearsonCorrelation	1
	Sig. (2-tailed)	
	N	72
Negative Mood	PearsonCorrelation	,170
	Sig. (2-tailed)	,153
	N	72
Interpersonal Problems	PearsonCorrelation	,331**
	Sig. (2-tailed)	,004
	N	72
Inefficiency	PearsonCorrelation	,202
	Sig. (2-tailed)	,089
	N	72
Anhedonia	PearsonCorrelation	,106
	Sig. (2-tailed)	,377
	N	72
Negative self-esteem	PearsonCorrelation	,179
	Sig. (2-tailed)	,133
	N	72
CDI score	PearsonCorrelation	,233*
	Sig. (2-tailed)	,049
	N	72

CDI=Children Depression Inventory

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Table 4. Correlations of the age of first diagnosis of Diabetes Mellitus to Childre Depression Inventory and its sub-scales.

Variables		
Age of first diagnosis of DM	PearsonCorrelation	1
	Sig. (2-tailed)	
	N	71
Negative Mood	PearsonCorrelation	-,119
	Sig. (2-tailed)	,325
	N	71
Interpersonal Problems	PearsonCorrelation	-,040
	Sig. (2-tailed)	,741
	N	71
Inefficiency	PearsonCorrelation	,049
	Sig. (2-tailed)	,682
	N	71
Anhedonia	PearsonCorrelation	-,138
	Sig. (2-tailed)	,250
	N	71
Negative self-esteem	PearsonCorrelation	,015
	Sig. (2-tailed)	,899
	N	71
CDI score	PearsonCorrelation	-,066
	Sig. (2-tailed)	,583
	N	71

DM=Diabetes Mellitus, CDI=Children Depression Inventory

* . Correlation is significant at the 0.05 level (2-tailed).

** . Correlation is significant at the 0.01 level (2-tailed).

4. Discussion

In the present study, an attempt was made to record mood disorders in a population of adolescents with DM, as well as

the factors that positively or negatively affect the onset of these disorders. The results showed that there was a statistically significant difference in the means of total CDI score and its' sub-scales of Ineffectiveness and Negative Self-confidence. Children up to 12 years of age have lower

scores than children over 13 years of age. Symptoms of mood disorders are regulatory in children and adolescents, but the diagnosis of depressive disorders is less common in younger children. Similar results were also found by other researchers; children under the age of 13 showed lower rates of disorders (2.8%) than children over 14 (5.6%), while for children <8 years old, the percentage was barely 1% [29] [30] [31]. Adolescence may be the cause of these disorders, as at this age young people are trying to become independent from their carers and are more concerned about acceptance by their peers, while at the same time they are trying to gain a new identity. Teenagers manage DM in a different way than younger children who are directly dependent on parental support and care.

Statistical analysis revealed differences in means according to gender. Boys scored higher in the sub-scale of Inefficiency and reported that they experience more Interpersonal Problems than girls. These findings are consistent with the results of reference [32] which found that teenagers with DM have a high rate of behavioral disorders with aggressive and antisocial behavior, especially those with repeated hospital admissions. In another research four years later, [33] boys showed intense aggression, problems in Interpersonal Relationships, learning problems and the use of addictive substances.

Further analysis, used to study differences in participants' means according to their family status showed statistically significance only in the sub-scale of Negative Disposition. The highest mean was recorded for the category of "single parent family" with the category "divorced parents" following, while children reporting that they live with both parents scored the lowest score. It has been reported that being a member of a single parent family, the pressure caused by single-parenthood and inadequate sources of support, was found to affect negatively the early seek for care, immediately after the onset of DM symptoms [34]. Low socio-economic family status was a high risk factor for poor glycemic control and frequent hospital admissions, also [34].

Family plays a very important role in developing children's and adolescents' attitudes towards health and disease management [35]. Parental control over children, of various ages, with chronic diseases should be characterized by patience, warmth and should be aim-orientated. Furthermore, parental interventions are associated to effective implementation of the therapeutic plan. Setting specific aims, positive re-enforcement and constant self-care are contributing towards a positive outcome as well as a better patient adjustment.

5. Conclusions

The results of the present research cannot be generalized as the sample of the study was not representative. For this reason, findings have to be interpreted with great caution and relative constraints. In order to come to safer conclusions about the occurrence of mood disorders in children and adolescents, other factors such as HbA1c values, other health

problems and various socioeconomic factors should also be taken into account.

It was proven that children and adolescents did not experience intense mood disorders in general. However, some adjustment problems were found such as low self-confidence, interpersonal problems, inefficiency and negative mood. The existence of a healthy family environment is an important indicator of anticipating positive developmental outcomes for children and adolescents, as the main goal is achieving adolescents' independence, but not completely alienated from them.

The goal of the interdisciplinary team caring for children with DM and his/her family should be to develop skills in order to accept DM and the care plan, to relieve negative feelings and to have optimism and a sense of security. Organizing the life of a child with DM and his/her family through co-existence with the disease, requires showing increases responsibility for its management so that personal and family health and well-being are maintained.

Healthcare professionals are aware that poor psychosocial support, as well as inadequate education of children, especially adolescents, and their families, affects negatively their compliance to treatment approach, self-esteem and relationships with others.

It is extremely important that parents, teachers and other people involved in children and adolescents with DM care to be informed about the possible existence of depression in childhood and adolescence. Early recognition of disease symptoms and their management create the best protective conditions from future psychological and social problem. Milder types of depression can be seen as a lack of mental energy and well-being. Teenagers tend to be lame and ill-treated for longer times in most serious types of depression. When depressive disorder is in its worst form, adolescents sleep very few hours, lose their appetite, and are continuously descended, abstinent, and without vitality. Depressed teens feel helpless, sad and useless, and sometimes they find it impossible to cope with the challenges of life.

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