



# Psychological Well-being in Parents of Paediatric Patients with TD1. Role of Family Conflict and Parental Fear of Children's Self-injecting on Their Glycaemic Control and Psychological Well-being

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## Authors' contributions

This work was carried out in collaboration between all authors. Authors MT and MM designed the study. Author MT performed the statistical analysis, managed the literature and wrote the first draft of the manuscript with assistance of author SB. Authors VP and NP collected the medical and psychological data in the hospital. All the authors read and approved the final manuscript.

## Article Information

DOI: 10.9734/BJESBS/2017/30323

Editor(s):

(1) Shao-I Chiu, Taipei College of Maritime Technology of Center for General Education, Taiwan.

Reviewers:

(1) Hend S. Saleh, Zagazig University, Egypt.

(2) Shana Traina, Janssen Global Services, USA.

(3) Maria Demetriou, Democritus University of Thrace, Greece.

Complete Peer review History: <http://www.sciencedomain.org/review-history/17151>

Original Research Article

Received 2<sup>nd</sup> November 2016  
Accepted 25<sup>th</sup> November 2016  
Published 7<sup>th</sup> December 2016

## ABSTRACT

**Aims:** This study aims to assess psychological well-being and life perceptions in parents of paediatric patients with T1D and to identify how the parents' fear of children's self-injecting and conflicts could influence the paediatric patients' glycaemic control and well-being.

**Study Design:** One-time point cross-sectional study.

**Place and Duration of Study:** The participants were recruited from patients attending the

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Paediatric Department of the Hospital of Bolzano (Italy) in 2011–2012.

**Methodology:** Paediatric patients (n=59) with a mean age of 13.19 years (SD=3.26, range 8-18) and their parents were contacted during the check-ups and self- and proxy-reported questionnaires were administered. Parents were principally represented by mothers (n=48), married (79.7%) and with a medium perceived economic situation (54.2%).

**Results:** Glycaemic control was severely inadequate, especially if paediatric patients were older at the time of assessment and younger at diagnosis and if parents declared more conflicts with them. Parental fear about their child's self-injection of insulin was identified as a key element impacting externalising/internalising symptoms and on worries about the illness.

**Conclusion:** By examining family conflicts and parenting practices, it will be possible to set up specific psycho-social interventions to increase adolescents' treatment adherence and to mitigate the family conflicts and fears that may arise in the context of the daily management of the illness.

*Keywords: Paediatric diabetes; parental conflicts; parental fears; psychosocial symptoms; quality of life; health status.*

## ABBREVIATIONS

*HbA1c* : Glycosylated hemoglobin

*T1D* : Diabetes mellitus type I

## 1. INTRODUCTION

### 1.1 Epidemiology and Incidence of Diabetes Mellitus Type I

Diabetes is one of the most common chronic diseases among children in the world and it is considered a health emergency by the World Health Organization. In Italy in 2012, 15,563 patients were identified with T1D, aged less than 18 years, treated in 68 diabetes centres. Accordingly, the prevalence of T1D was calculated to be about 1.4 patients per 1,000 people with a large geographical variation: highest in Sardinia, intermediate in Central-Southern Italy, and high in Northern Italy [1].

### 1.2 Glycaemic Control, Psychopathologic Disturbances and Quality of Life in Children and Adolescents with T1D

Glycosylated haemoglobin (HbA1c) is a measure of satisfactory control of glycaemic value associated with a good adherence to treatment and with a reduction of clinical symptoms. Currently, the satisfactory control of glycaemic value is indicated by a HbA1c value of <7.5%. When paediatric patients enter the development stage of adolescence, glycaemic control typically worsens [2,3]. Teenagers with T1D are trained to acquire greater self-management and to balance their autonomy/dependence on parents with a shared responsibility for management of the illness [4], even if close parental monitoring of

care completion could contribute to better adherence [5].

Adolescents are more at risk regarding their well-being and in developing behavioural psychopathologic problems, especially those who show high levels of glycosylated haemoglobin [6]. They reported more externalising disorders and the presence of family conflicts [7,8] that may lead to non-adherence to treatment and poor glycaemic control [9].

Protective factors for a positive treatment outcome of diabetes and quality of life were parents' higher educational status and higher family income [10], strong family cohesion and balanced family climate [8,11], with lower levels of parental stress [12], family involvement and support in management of the illness [13,14]. Parental emotional over-involvement [15], adolescent–parent discordance on responsibility for diabetes care [16] and higher family conflict [17] negatively impacted children's glycaemic control.

### 1.3 Psychological Well-being and Life Perceptions in Parents of Children/Adolescents with T1D

In a recent review [18], the prevalence of parental psychological distress across all studies ranged from 10% to 74%, with an average of 19% of parents reporting distress 1 to 4 years after diagnosis. Parental psychological distress in parents of children with TD1 and lower family functioning were associated with higher child psychopathological symptoms, more problematic child behaviour, lower child self-report of quality of life, and negative effects on diabetes

management [3,19]. Greater parental general stress and greater parental diabetes-specific stress were associated also with poorer parent mental health [20] and parenting stress was related to depressive symptoms and to the parental fear of hypoglycaemia [21]. Lower income level was a risk factor for higher symptoms of anxiety and depression in mothers [22]. The need for “constant vigilance” may contribute to their emotional distress, including symptoms of anxiety and depression [23] and the ways in which they cope with diabetes-related stress were associated with psychological distress and family conflict [24], showing more anxiety and perceived stress compared to fathers [25].

#### 1.4 Aims and Expected Results

Life perceptions and psycho-social well-being in parents of children and adolescents with T1D in the Italian population in South-Tyrol district has never been addressed. A recent study on the same paediatric patients stressed their good psychological condition, compared with a control age-matched group of sane peers [26]. Children and adolescents and their families had to adapt to their disease according to the demands of their particular local and cultural environment that intercalates Italians and Austrian/German Italians [27].

We have three goals. The first is to understand the impact of diabetes and related worries about life using paediatric diabetic patients' self-reports. We want to investigate the possible socio-demographic and illness risk factors associated with their perceived quality of life, such as current age, age at diagnosis [8], economic condition [6] and level of glycosylated haemoglobin. Also the parental factors that could influence psychopathology symptoms should be identified, such as family conflict [18], or parents' fears about diabetes management [22]. We expect to confirm the results of previous literature, namely worse health-related quality of life is closely associated with high levels of glycosylated haemoglobin [6,7]. We expect that parental fear about child's self-injection of insulin and self-testing of glucose could be predictive for children's well-being.

The second goal deals with the subgroup of adolescents with diabetes type I, in order to focus on their family conflicts and related quality of life. We expect that the perception of conflict between adolescent patients and their parents

could influence their metabolic control and psychological well-being [8], with worse perceptions of quality of life [11,13]. We also expect to find that adolescents from families with higher income and education status report better self-management skills than those from poorer families and that adolescents who have had the disease for a longer time period have poorer glycaemic metabolic control [10].

The third and last goal is to understand parents' well-being and life perceptions and the associated risk factors, such as female gender [25], family conflict [24], parental fears [22] and daily illness management stresses [23].

## 2. MATERIALS AND METHODS

### 2.1 Participants

The participants were recruited from patients attending the Paediatric Department of the Hospital of Bolzano (Italy) during 2011–2012. Eligibility criteria were: treatment for diabetes mellitus type I, currently aged 3–18 years, attending the hospital for annual hospital follow-ups, at least 6 months from the diagnosis. We excluded patients with learning or sensory problems, genetic syndromes, and those who were unable to complete questionnaires.

We identified 122 eligible patients and their parents; of these, 104 were informed of the study and contacted by phone before their visit to the clinic in the study period. The final number of participants who completed questionnaires were 59 patients and their parents (response rate=56.73%). Table 1 illustrates their socio-demographic and medical information.

### 2.2 Procedure

This project was included in the daily clinical psychological service and it was approved by the local ethical committee. The researchers telephoned the patients' parents to explain the study before their check-up visit or contacted them directly when they attended the clinic for appointments. Upon arrival at the clinic, the researchers gave to the patients and their parents a package including information about the study, a consent form for the parents and the questionnaires to assess the research variables. Stamped, addressed envelopes were supplied for the return of the questionnaires.

**Table 1. Socio-demographic and disease characteristics of patients and their parents**

Characteristic		Frequency	%
<b>Mean age, years(SD)</b>	<b>13.19 (3.26) range 8-18 ys</b>		
Age groups	8-10 ys	16	27.1
	11-18 ys	43	72.9
Child's gender	Males	26	44.1
	Females	33	55.9
	Total	59	100
Respondent's parents	Fathers	11	18.65
	Mothers	48	81.35
	Total	59	100
Mother's education	5 years of schooling	0	0
	8 years of schooling	14	23.7
	13 years of schooling	35	59.3
	>13 years of schooling	9	15.3
	Not reported	1	1.7
Father's education	5 years of schooling	2	3.4
	8 years of schooling	15	25.4
	13 years of schooling	29	49.2
	>13 years of schooling	10	16.9
	Not reported	3	5.1
Mother's employment status	Housewife/retired/unemployed	15	25.4
	Part-time	23	39
	Full-time	20	33.9
	Not reported	1	1.7
Father's employment status	Househusband/retired/unemployed	3	5.1
	Part-time	1	1.7
	Full-time	53	89.9
	Not reported	2	3.4
Perceived economic situation	Low	9	15.3
	Medium	32	54.2
	High	18	30.5
Home situation	Rent home	9	15.3
	Home ownership with mortgage	26	44.1
	Home ownership without mortgage	19	32.2
	Other	5	8.5
Romantic relationship	Married	47	79.7
	Cohabitants	5	8.5
	Separated	6	10.2
	Single	1	1.7
N Siblings	0	11	18.6
	1	37	62.7
	≥2	11	18.7
Age at diagnosis, Mean months (SD)	95.73 (42.58) range 17-176 months		
Disease duration, Mean months (SD)	46 (47.06) range 6-190 months		
Last HbA1c (SD)	8.08 (1.06) range 6.4-10.7		

### 2.3 Instruments

In this study, several instruments were used, derived from the international literature on the assessment of: 1. paediatric patients and parents' perceptions of their children; 2. Parents'

psycho-social well-being and satisfaction with the use of insulin. The instruments were chosen following the aim to understand the possible parental influences on diabetes management and psychological symptoms of paediatric patients. We preferred the rapidity and easiness

of the surveys that underline the possible family conflicts and parental fears.

### **2.3.1 Child assessment**

#### *2.3.1.1 Child behavior checklist 6–18 (CBCL) [28] and youth self-report 11-18 (YSR) [29]*

CBCL is completed by parents and it was used to detect emotional and behavioural problems in children and adolescents aged 6–18 using a three-point Likert scale (0=absent, 1= occurs sometimes, 2=occurs often). YSR is completed directly by the child or adolescent aged 11–18 years.

The CBCL and YSR are part of the Achenbach System of Empirically Based Assessment (ASEBA). The CBCL/6–18 consists of 113 questions relating to the parent's experiences in the past six months and it comprises eight syndrome scales that showed good internal coherence in this study: Anxious ( $\alpha=0.76$ ), depressed ( $\alpha=0.70$ ), somatic complaints ( $\alpha=0.84$ ), social problems ( $\alpha=0.70$ ), thought problems ( $\alpha=0.74$ ), attention problems ( $\alpha=0.79$ ), rule-breaking behaviour ( $\alpha=0.70$ ), and aggressive behaviour ( $\alpha=0.80$ ) which are grouped into two higher order factors: internalising and externalising.

The eight syndrome scales of the YSR are identical to those of the CBCL and the Cronbach's alpha showed good internal coherence in this study: Anxious ( $\alpha=0.82$ ), depressed ( $\alpha=0.60$ ), somatic complaints ( $\alpha=0.60$ ), social problems ( $\alpha=0.72$ ), thought problems ( $\alpha=0.50$ ), attention problems ( $\alpha=0.79$ ), rule-breaking behaviour ( $\alpha=0.68$ ), and aggressive behaviour ( $\alpha=0.81$ ). The 2001 revision also added six Diagnostic Symptoms Manual-oriented scales consistent with DSM diagnostic categories: affective problems, anxiety problems, somatic problems, ADHD, oppositional defiance problems, and conduct problems. The CBCL and the YSR are also scored on competence scales regarding activities, social relations, school and total competence.

#### *2.3.1.2 KINDL<sup>R</sup> health related quality of life questionnaire [30]*

The KINDL<sup>R</sup> is a generic instrument for assessing Health-Related Quality of Life in children and adolescents aged 3 years and older. Two versions (parent's and child's form) of the KINDL<sup>R</sup> questionnaire were adopted as self-report measures for different age groups: for

children aged 8-11; for adolescents aged 12-16. The questionnaire consists of 24 Likert-scale items associated with six dimensions: physical well-being, emotional well-being, self-esteem, family, friends and everyday functioning (school or nursery) with an additional sub-scale titled "Disease". Higher scores indicate a better Quality of Life (QOL) and lower scores indicate worse QOL. As a generic questionnaire, the KINDL<sup>R</sup> can be used to assess Health-Related Quality of Life in healthy as well as in ill children and adolescents. However, in order to also enable the assessment of Health-Related Quality of Life due to chronic diseases, several modules were developed to be used in addition to the core instrument. One module focusses on the Health-Related Quality of Life of chronically ill children or children who are actually in hospital, respectively, while other modules aim to assess the disease-/condition-specific Health-Related Quality of Life (for Asthma, Diabetes, Epilepsy, Cancer, Neurodermatitis, Obesity and Spina bifida). Alpha coefficient values were not psychometrically good, so only parental reports on children's self-esteem (8-16 years old) were considered ( $\alpha=0.77$ ) in our analysis.

#### *2.3.1.3 Diabetes quality of life for youth-short form DQOLY-SF [31]*

This short form (18 items) is a more precise version of the Diabetes Quality of Life Youth (DQOLY) with improved construct validity and with items known to be associated with metabolic control. Each item has five possible scores with a value from 0 to 4, with 0 representing 'never' and 4 'all the time'. Higher scores indicate a more negative impact of diabetes and poorer QOL, and lower scores indicate better QOL. This modified version generally exceeds the standard reliability coefficients and has both face and content validity. It is possible to use this modified version in adolescents of all ages as the items have been found to have no developmental trends, which could confound the quality of life scores. The two subscales, which also showed a good internal coherence in this study, are: impact of diabetes on daily life ( $\alpha=0.67$ ; N item=11), and worries about diabetes ( $\alpha=0.75$ ; N item=7). This questionnaire was administered directly to patients aged 10 years or over.

#### *2.3.1.4 Revised diabetes family conflict scale DFCS-R [32]*

The parent-patient interactions for diabetes management can include family conflict that challenges adherence and glycaemic outcomes.

Discrepancies in level of autonomy and follow-through with diabetes-related decisions and adolescent views about parents' lack of understanding or intrusive behaviour can co-occur with diabetes-specific family conflict. This revised conflict scale includes 19 management tasks, including diabetes management (e.g., logging blood glucose results, carrying food with fast-acting carbohydrates, and being absent from school), and it is available in child (aged 8–18) and parent versions. The response set is on a three-point Likert scale (1=never argue, 2=sometimes argue, and 3=always argue), ranging from 19 to 57 (19=no conflict to 57=high level of conflict). Higher scores correspond to major family conflict. Internal consistency in this study was good for both child ( $\alpha=0.91$ ;  $n$  items=19) and parent versions ( $\alpha=0.91$ ;  $n$  items=19).

### 2.3.1.5 Diabetes fear of injecting questionnaire D-FISQ [33]

The D-FISQ is a 30-item self-report questionnaire consisting of two subscales that measure fear of self-injecting and fear of blood glucose testing. Each item is scored 0 for never, 1 for almost never, 2 for almost always, or 3 for always. The D-FISQ is administered to each subject (child version) and his/her parent (parent version). A total score is obtained for each questionnaire by summing the item scores. A score  $\geq 6$  is considered positive for needle fear, such that higher scores indicate major needle fear. Alpha coefficients from 0.85 to 0.91 showed good internal coherence of the scales. The D-FISQ can help to identify patients in the paediatric population with type 1 diabetes who may have fear of self-injecting or fear of self-testing. The prevalence of needle fear appears to be greater in the paediatric than in the adult population, with 27% of paediatric patients affected by needle anxiety [22].

## 2.3.2 Parent assessment

### 2.3.2.1 Socio-demographic and medical information

Each parent filled out a socio-demographic questionnaire about the patient's level of schooling, mother's and father's education and type of employment, their family's perceived economic situation, their family's type of home situation. Medical information was extracted by the researchers from the medical records such as date of diagnosis, last HbA1c glycosylated haemoglobin level and age at diagnosis.

### 2.3.2.2 Feelings and emotions (from the childhood cancer survivor study CCSS) [34]

The Feelings and Emotions questionnaire includes 24 items. The first 18 items are divided into three dimensions (somatisation, depression and anxiety). The last 6 items include three questions where parents have to name their emotions and respectively indicate their intensity. Parents are asked to refer about how they felt in the last 7 days and each of the first 18 items is rated on a 5-point Likert scale from 0 (not at all) to 4 (extremely). Alpha coefficients ranged from 0.79 to 0.88, showing good internal consistency. Higher scores correspond to more negative parental symptomatology.

### 2.3.2.3 Ladder of life (from the CCSS) [34]

The parent has to evaluate his/her present life, his/her life 5 years before and his/her life in the future (after 5 years) on a 1 to 10 scale. In this way we can have information about individual perception of the past, the present and the future. Higher scores on ladder of life evaluations are considered more positive.

### 2.3.2.4 Well-being and satisfaction of CAREgivers of CHILDREN with diabetes questionnaire [35]

The WE-CARE questionnaire is filled out by parents to understand their experiences in managing their children's diabetes with 37 items categorised by domain into four multi-item scales: Psychosocial Well-being (13 items), Ease of Insulin Use (9 items), Treatment Satisfaction (9 items), and Acceptance of Insulin Administration (6 items). This questionnaire is about parents' well-being and the care that they provide for their children with diabetes. Some items on this questionnaire measure parental agreement or disagreement with each reported statement on a 0-4 Likert scale. On other questions they have to indicate the level of bother or burden or the impact of the illness on their lives on a 0-4 Likert scale. The item score needs to be reversed such that a higher score means more satisfaction. Alpha values were good (from 0.52 to 0.91), showing good internal coherence and reliability.

## 2.4 Statistical Methods

Descriptive measures of central tendency and variability were computed for all relevant

variables on parents' psychological well-being and their coping with diabetes management. We ran preliminary Pearson bivariate correlations to find the possible significant associations between the examined variables. Based on the correlation results, ANCOVAs and hierarchical regression analysis were run to identify the predictive factors on the outcome measures. Statistical significance was evaluated at the level of  $p=0.05$ , with adjustments for multiple comparisons, after controlling for the normal distribution of the test scores and the homogeneity of variances.

### 3. RESULTS AND DISCUSSION

#### 3.1 Glycaemic Control and Predictive Factors

Glycaemic control was adequate (6–7.5%) in just 33.9% of paediatric patients, and inadequate (>7.5%) in the majority of the patients (66.1%). A hierarchical regression model was run with the last value of HbA1c as the dependent variable and socio-demographic and illness factors (age at diagnosis, age at assessment, duration of the illness) in the first block and parental influencing factors (parental conflict score, parental fears on self-injecting) in the second one. The second model explained a major part of the variance ( $R^2 = 0.41$ ;  $F = 8.80$ ;  $p = 0.0001$ ) identifying older actual age ( $\beta = 0.47$ ;  $p=0.0001$ ), younger age at diagnosis ( $\beta = -0.27$ ;  $p=0.001$ ) and higher parental conflict score ( $\beta = 0.45$ ;  $p=0.001$ ) as significant predictive factors.

#### 3.2 Perceived Quality of Life of Paediatric Patients: Models Identifying Stable and Modifiable Predictors

Descriptive frequencies showed that paediatric patients reported a limited impact of diabetes on life (Mean = 0.73; SD = 0.44) and low worries about the illness (Mean = 0.71; SD = 0.63). The self-esteem reported by parents about their child was average (Mean = 3.87; SD = 0.62).

ANCOVA analyses identified a model (explaining 57% of variance) with two predictors of Impact of Diabetes on Life scale reported by pre-adolescents and adolescents: HbA1c value ( $F_1 = 6.43$ ;  $p = 0.019$ ;  $\eta^2 = 0.22$ ;  $B = 0.68$ ) and father's education status ( $F_3 = 4.55$ ;  $p = 0.01$ ;  $\eta^2 = 0.38$ ;  $B = 0.82$ ). Higher values of this health status parameter and lower father's education status were associated with more

worries reported by younger patients about their illness.

Worries about the illness were predicted by parental fears on self-injecting ( $F_1 = 5.72$ ;  $p = 0.02$ ;  $\eta^2 = 0.16$ ;  $B = 0.64$ ) and by parental perceptions of their child's self-esteem ( $F_1 = 5.55$ ;  $p = 0.02$ ;  $\eta^2 = 0.22$ ;  $B = 0.62$ ). The model explained 43% of variance.

#### 3.3 Psychological Well-being in Paediatric Patients According to Parental Perceptions: Models Identifying Stable and Modifiable Predictors

A series of ANCOVAs were then run to identify predictors of CBCL outcomes in children with diabetes I. The independent fixed variables included in the model were: perceived economic situation (low, medium, high), father's education status (5 years of schooling, 8 years, 13 years of schooling, >13 years) and age at assessment (8-10 years old vs 11-18 years old). The covariates included in the model were: duration of illness, age at diagnosis, glycosylated haemoglobin value, parent's reported conflict mean score and parent's fear of child's self-injecting. The dependent variables were the two CBCL higher order factors (internalising and externalising) and the DQOLY scales. Table 2 shows the results.

#### 3.4 Psychological Well-being of Parents and Diabetes Management Stress

Parents declared having minimal symptomatology in the three psychopathology areas: somatisation (Mean = 1.23; SD = 0.39), depression (Mean = 1.38; SD = 0.61) and anxiety (Mean = 1.39; SD = 0.46). They also declared good life perceptions at present (Mean = 7.31; SD = 1.56), in reference to the past (Mean = 7.37; SD = 2.11) and towards the future (Mean = 7.88; SD = 1.53), even if there was important variability especially in the past life perceptions and they mostly used (64.62%) negative adjectives to describe their current emotional status. Dealing with illness management, they declared a low level of treatment satisfaction (Mean = 1.35; SD = 0.56; range: 0-2.63), a low acceptance of insulin administration (Mean = 1.82; SD = 0.53; range: 0.67-2.83), a high score of fears towards child's self-injecting management (Mean = 2.47; SD = 3.27; range: 0-15), but a low average conflict with children (Mean = 1.40; SD = 0.36; range 1-2.47).

### 3.5 Predictors of Parental Psychological Well-being

Hierarchical regression models were run to identify the best predictors of parents' symptomatology (anxiety, depression, somatisation) and life perceptions. In the first block we included socio-demographic and illness variables (last value of HbA1c, parent's gender, child's age at diagnosis, duration of the illness). In the second one, we added the diabetes management factors (fear of child's self-injections, treatment satisfaction, ease of insulin use and insulin acceptance). The parental anxiety symptoms were best predicted ( $R^2 = 0.32$ ;  $F = 3.67$ ;  $p = 0.01$ ) by parent's gender ( $\beta = -0.25$ ;  $p = 0.05$ ) and parental fear of child's self-injecting ( $\beta = 0.39$ ;  $p = 0.005$ ) (Fig. 1). The depression symptomatology was significantly influenced ( $R^2 = 0.39$ ;  $F = 4.17$ ;  $p = 0.001$ ) by ease of insulin use ( $\beta = -0.32$ ;  $p = 0.02$ ) and insulin acceptance use ( $\beta = 0.36$ ;  $p = 0.006$ ) (Fig. 2), while somatic symptoms were influenced ( $R^2 = 0.33$ ;  $F = 3.12$ ;  $p = 0.01$ ) exclusively by ease of insulin use ( $\beta = -0.32$ ;  $p = 0.02$ ) (Fig. 3).

### 3.6 Discussion

Parental psychological symptoms, family conflicts and fears are important research and clinical issues in paediatric diabetes care, which this study addressed for the first time in the South Tyrol district.

The inadequate glycaemic control reported by these patients is alarming for the possible short- and long-term negative effects on their health, therefore it is fundamental to understand the risk factors of this poor treatment adherence. This study confirmed as risk factors current older age (corresponding to adolescence stage [4]) and family conflict [8], while also adding the lower age at diagnosis. Another aim of this study was to identify stable and modifiable risk factors for psychological functioning of paediatric patients with T1D using parental reports.

Our results did not confirm high glycosylated haemoglobin as a key factor, as the literature suggested [4,6-7] nor older age at assessment [4, 5]. Internalising symptoms were predicted by lower father's educational level, lower children's self-esteem reported by parents and by higher parental fear of child's insulin self-injecting. The glycosylated haemoglobin seemed to be a key

factor only with quality of life perceptions in pre-adolescents and adolescents, specifically in the dimension of impact of diabetes on life [6], together with lower father's education level. This last factor could be considered stable, because it is related to family conditions and it emerged as associated only with treatment adherence in precedent studies [10], not with children's psychological well-being as in this study. Perhaps the parents with lower educational status show more difficulties in care-giving, especially in supporting their children in their emotion regulation. Future studies with larger samples could better explain this result.

Parental fear about their child self-injecting insulin was identified as a key factor that explained internalising and externalising symptoms and the worries about the illness together with the child's self-esteem. This factor has never been studied before and it could be associated with parental illness management stress.

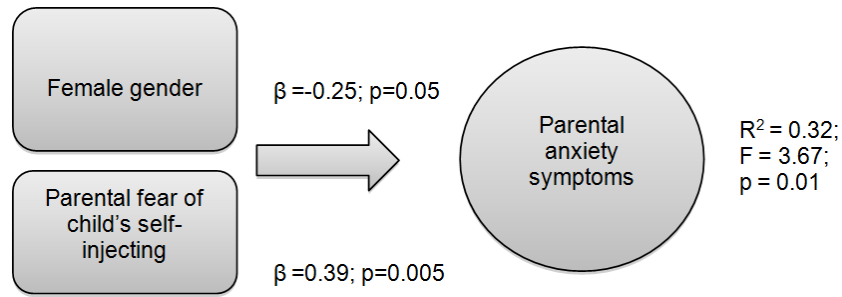
Parents self-reported good psychological well-being and higher life perceptions, even if they mostly used negative adjectives to describe their current emotional status. Their declared moderate conflicts with children, even if they reported fears towards child's self-injecting insulin and self-glucose control, a difficult acceptance of insulin administration and lower general treatment satisfaction. Mothers with more fear about child's self-injecting have more anxiety symptoms confirming the literature results [25], while depressive and somatic symptomatology were strongly influenced by insulin acceptance and management [23].

Some of the limits of this study are that only the Italian clinic population of South Tyrol was involved, so the study lacks generalisability to the entire Italian population. It would be useful to involve other Italian centres both in the south (i.e., Sardinia) and in the centre. It would be interesting also to have a longitudinal design, not just a one-time-point design. In addition, the self-reported questionnaires are not a strictly objective measure as respondents may answer questions in order to be viewed favourably by others. This bias can interfere with the interpretation of average tendencies as well as individual differences. Future studies should take into consideration other measures such as focus groups, especially for adolescents, where they could more freely express their specific needs and their worries.

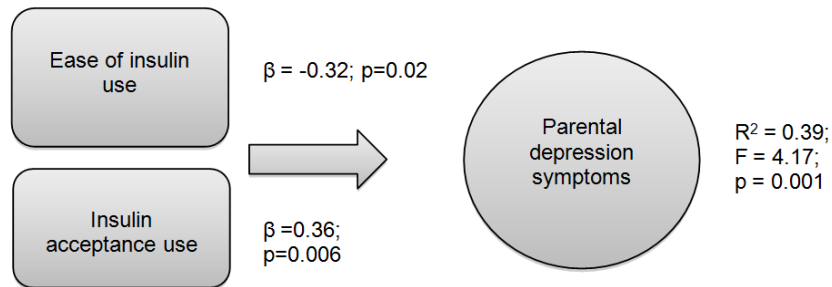


**Table 2. ANCOVAS to identify predictors of psychological symptoms in children with diabetes using parental perceptions**

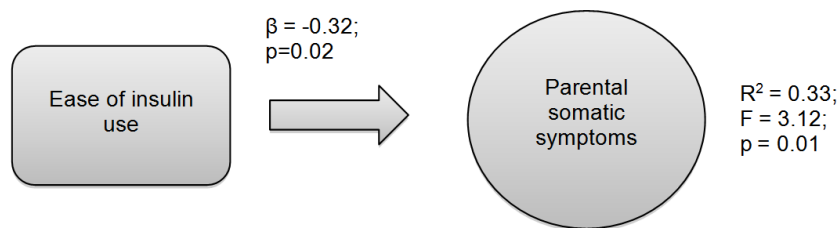
DV: Outcome CBCL and DQOLY-SF	N	Source	df	F	P value	$\eta_p^2$	B	Estimated marginal means (Confidence interval 95%)			
Internalising symptoms	59	Father's education level	3	5.99	.002	.37	.93	5 ys schooling 19.27 (11.9-26.6)	8 ys schooling 7.62(3.8-11.6)	13 ys schooling 6.24 (4.5-7.9)	>13 ys schooling 3.04 (-0.2-6.3)
		KINDL Self-esteem	1	10.98	.002	.27	.89	Mean of covariate KINDL self-esteem = 3.86			
		Parental fear of child's self-injecting	1	19.65	.0001	.4	.99	Mean of covariate Parental fear of child's self-injecting = 2.81			
Externalising symptoms	59	Parental fear of child's self-injecting	1	4.46	.04	.08	.54	Mean of covariate Parental fear of child's self-injecting = 2.81			
Impact of diabetes on life	59	Father's education level	3	4.55	.001	.38	.82	5 ys schooling 0.5 (-0.2-1.3)	8 ys schooling 0.4 (0.2-1.6)	13 ys schooling 1.1 (0.7-1.5)	>13 ys schooling 1.3 (0.7-1.8)
		Last HbA1c	1	6.43	.019	.22	.68	Mean of covariate Last HbA1c = 8.06			
Worries about the illness	59	KINDL Self-esteem	1	5.55	.02	.16	.62	Mean of covariate KINDL self-esteem = 3.86			
		Parental fear of child's self-injecting	1	5.72	.02	.16	.64	Mean of covariate Parental fear of child's self-injecting = 2.81			



**Fig. 1. Predictors of parental anxiety symptomatology**



**Fig. 2. Predictors of parental depression symptomatology**



**Fig. 3. Predictors of parental somatic symptomatology**

Another bias could also be represented by the self-selection sample (56.73% response rate) that could influence the findings.

The strengths of this study are the inclusion of only one type of diabetes and the adoption of a multi-method approach that allows for understanding the family influences on paediatric patients' health related quality of life and symptomatology.

#### 4. CONCLUSION

With this study, new in the Italian context, it will be possible to set up a useful psycho-social screening to identify paediatric patients with diabetes who are at greater risk of psychological symptoms, poor glycaemic control and maladaptive adaptation to the illness. The health

professionals who take care of these patients could work together to dampen the dangerous metabolic control indexes, to improve the children's self-esteem and to dampen the parental fears that negatively influenced parents' and children's well-being, so they can lead a normal life as much as possible. By examining the family conflicts and the parenting practices, it will be possible to set up specific psycho-social interventions to increase adolescents' treatment adherence and to mitigate family conflicts and fears that may arise in the context of the daily management of the illness.

#### CONSENT

All authors declare that written informed consent was obtained from the parents of pediatric patients.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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