

# The perceived self-efficacy and its interrelation with communication in family and glycemic control in adolescents with type 1 diabetes

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## ABSTRACT

**Objective:** In this study the effect of self-efficacy and family functioning on glycemic control of adolescence with Type 1 Diabetes (T1D) in Isfahan was investigated.

**Methodology:** In this Randomized Controlled Open Trial, adolescence with type 1 DM were studied. Selected patients were randomized in four intervention groups including group counselling with Cognitive Behavioural Therapy (CBT) approach for self-efficacy enhancement for diabetic patients, group training for Communication Skills Training (CST) for parents of diabetic patients, combination of CBT+ CST and routine diabetes management. Family functioning, self-efficacy for diabetes self-management and glycemic control of diabetic patients was measured using The McMaster Family Assessment Device (FAD), self-efficacy scale and HbA1c, respectively. Mentioned variables in all studied groups were measured before and after intervention and three months after intervention.

**Results:** CBT increased self-efficacy of studied population significantly which decrease the mean of HbA1c in studied population ( $P < 0.05$ ). CBT + CST and CST had not significant effect on HbA1c ( $P > 0.05$ ). HbA1c was not significantly different in different stages of evaluation in each group, but it was significantly different between CBT and control groups ( $P=0.07$ ).

**Conclusion:** In order to obtain more conclusive results it is recommended to study larger sample size of patients with T1D with consideration of their demographic and cultural factors, to design and implement multi-component studies to determine the relation between different psychosocial factors and their adherence to treatment regimens and metabolic control. Designing relatively long term multi-component and compilation strategies would be helpful in this regard also.

**KEY WORDS:** Type 1 diabetes, self-efficacy, communication, family functioning, glycemic control.

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## INTRODUCTION

Type 1 diabetes (T1D) is one of the most common chronic childhood diseases which is characterized by insulin deficiency due to progressive immune-mediated destruction of pancreatic islet beta cells.<sup>1,2</sup> Epidemiologic studies have indicated that though the incidence of the disease varies in different parts of the world but the worldwide incidence of T1D has been increasing by 2% to 5% worldwide.<sup>3</sup> Highest rate of the disease has been reported in Finland and Sardinia and lowest rate in Venezuela and China.<sup>4</sup> The rate was low in Asia and Iran also.<sup>5</sup>

Considering the different aspects of the disease treatment, management of T1D needs a multidisciplinary approach to achieve appropriate glycemic control, screen and prevent co morbid conditions and its related microvascular and macrovascular complications. Mentioned optimal outcome would be obtained if the patients have good adherence to diabetes management.<sup>6</sup>

Maintaining a good adherence to diabetes management requires cognitive, emotional, social and behavioural adaptations for both patients and their parents. Self -efficacy in patients and good familial relationship are factors that have an important role in this field.<sup>7</sup>

The degree of family involvement, mainly parents, during the course of the disease is one of the most important factors that could affect glycemic control of the patients. Several studies have indicated that positive family communication result in better metabolic control and psychosocial adjustment in patients with T1D.<sup>8-10</sup>

Though appropriate family communication could have mentioned beneficial effects but it seems that this factor alone could not be a factor for intervention. However the quality and extent of the involvement is different in different families. In addition during the childhood transition years the parents involvement could have decreased due to the factors such as that children spend more time away from home, they prefer to do their own care themselves.<sup>11</sup>

So in this situation the self- efficacy of patients could have an important role. It is defined as one's belief to carry out specific behaviour to achieve a specific goal.<sup>12</sup> Evidences showed that it has an important role in health behavior in adolescents and children, especially those with chronic diseases such as T1D. Moreover, patients with T1D have better adherence to diabetes management, better diabetes self-management and glycemic control and finally better quality of life if they have a strong sense of self-efficacy.<sup>13,14</sup>

Management of the disease would be more appropriate if it perform according to the child's age and stage of growth and development. Adolescence considered as a special stage of growth and development due to the developing sense of independence and personal identity and specific hormonal changes.<sup>15</sup> These changes in addition to other challenges such as choose priorities between psychosocial needs and diabetes management and adolescent-parent conflicts deteriorate the diabetes management in this age group .Consequently these

conflicts are considered as barrier for health-care providers involved in the management of diabetes.<sup>16</sup>

Though according to our regional studies the incidence of type 1 diabetes in Iran comparing with the neighbouring and Asian countries is low but considering its increasing worldwide incidence and the growing population of adolescence with type 1 diabetes in our community<sup>17</sup>, it seems that to obtain an appropriate diabetes management plan is important for preventing its related complication, improving patients quality of life and also costs of the disease.

So, considering that there is little evidences regarding the effect of different psychological factors on diabetes management among adolescence with T1D in our region specially the impact of family functioning and the patients self -efficacy on metabolic control and adherence to treatment, to plan interventions for enhancing mentioned factors, in this study the effect of self- efficacy and parent-adolescent communication on metabolic control of adolescence with T1D in Isfahan was investigated.

## METHODOLOGY

In this Randomized Controlled Open Trial, adolescents with type 1 DM, aged 12-18 years referred to the outpatient pediatrics clinics (diabetes clinics) of Isfahan city affiliated to Isfahan University of Medical Sciences were enrolled. Inclusion criteria were; diagnosis of type 1 diabetes of at least one year duration, no history of physical and/or mental illness, lack of long-term and short-term stress on the family and constant presence of both parents in the family.

Those who did not agree to participate in this study, absences of patient or their parents for more than three times in therapy sessions, lack of cooperation of at least one of the parents in doing their homework, incomplete questionnaires were all excluded.

The Medical Ethics Committee of the Isfahan University of Medical Sciences approved the study protocol and all patients and their parents gave their written consent.

Selected patients were randomized in four intervention groups including group counselling with Cognitive Behavioural Therapy (CBT) approach for self-efficacy enhancement for diabetic patients, group training for Communication Skills Training (CST) for parents of diabetic patients, combination of CBT+ CST and routine diabetes management. The training course in each group was an eight week course (90 min, once weekly). Studied subjects

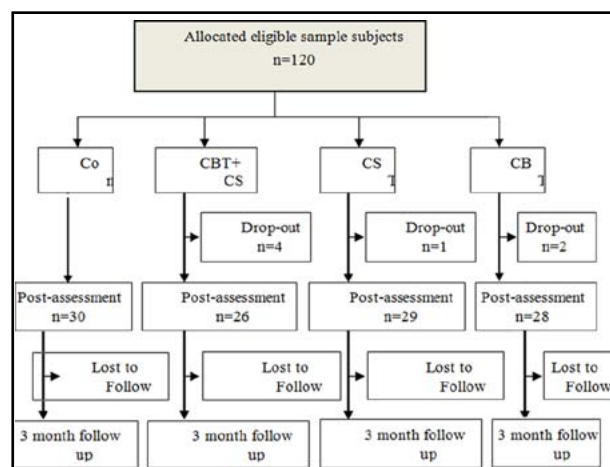


Fig.1: Flow of participants through each stage of the study. CBT= Cognitive Behavioral Therapy for self-efficacy enhancement. CST= Communication Skills Training.

allocated equally in four mentioned groups (three interventional and 1 control groups).

Fig.1 summarizes participants' progress during the trial, in keeping with the CONSORT (Consolidated Standards of Reporting Trials) criteria for clinical trials.<sup>18</sup> Baseline characteristics of all studied population were recorded by trained nurses using questionnaire.

Family functioning, communication, self efficacy for diabetes self-management and glycemic control of diabetic patients was measured using The McMaster Family Assessment Device (FAD)<sup>19</sup>, self-efficacy scale<sup>20</sup> and HbA1c, respectively, in all studied groups. Mentioned variables in all studied groups were measured before and after intervention and three months after intervention.

The McMaster Family Assessment Device (FAD), a newly developed questionnaire designed to evaluate families according to the McMaster Model

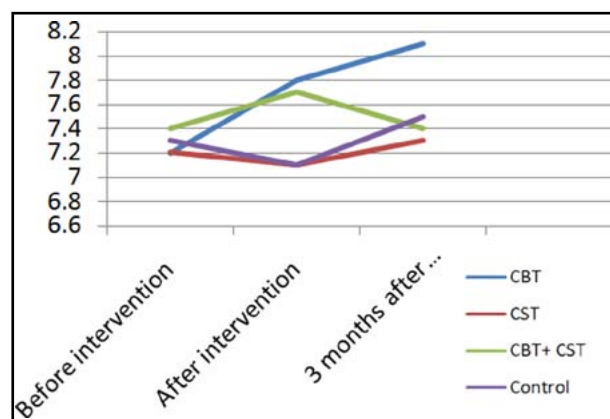


Fig.2: Mean of self efficacy during different stages of study. P value within groups: 0.2, P value between groups: 0.1, P value for their interaction: 0.007

of Family Functioning. The FAD is made up of seven scales which measure Problem Solving, Communication, Roles, Affective Responsiveness, Affective Involvement, Behavioural Control and General Functioning.<sup>19</sup> Cronbach's alpha for the subscales and Correlations between subscales have reported to be 0.72-0.90 and 0.37-0.76 respectively.<sup>21</sup> According to regional survey reported alpha for roles, general functioning and all scales were 0.49, 0.74 and 0.91 respectively.

The perceived self-efficacy scale for diabetic patients was obtained from Research and Education Center of Stanford University which was provided based on self-efficacy theory and the practical recommendation of Albert Bandura. The scale contains 8 subscales.

This 8-item scale was originally developed and tested in Spanish for the Diabetes Self-Management study. The score for each item was the number circled. If two consecutive numbers are circled, the lower number (less self-efficacy) was coded. If the numbers were not consecutive, the item was not scored. The score for the scale was the mean of the six items. If more than two items were missed, the scale had not scored. Higher number indicates higher self-efficacy.<sup>21</sup>

The self-efficacy scale translated to Farsi and its validity and reliability was evaluated in 50 sex and age matched adolescent of normal population. Calculated reliability and validity of the scale was 0.83 and 0.92 respectively. The face validity of the scale first was confirmed by some specialists of Isfahan Endocrine and Metabolism research center. Collected data was analyzed using SPSS software ver.15 and repeated measures ANOVA and Tukey tests.

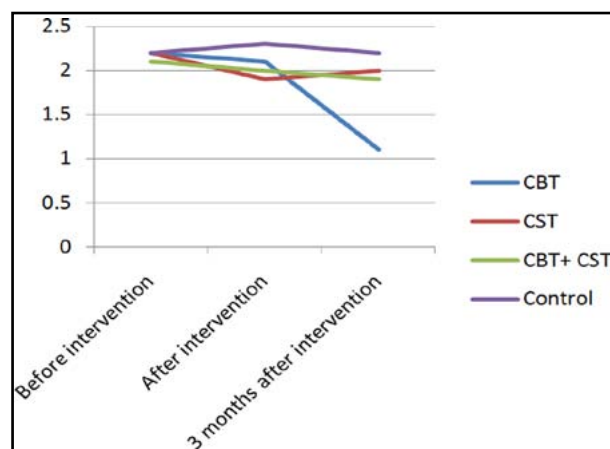


Fig.3: Mean of Family functioning during different stages of study.

P value within groups: 0.001, P value between groups: 0.004, P value for their interaction: 0.008

Table-I: Mean  $\pm$  SD of Self-efficacy, Family functioning, Family Communication and HbA1c in Cognitive Behavioral Therapy (CBT), Communication Skills Training (CST), CBT+ CST and control groups.

Variables	Stages of variables	Cognitive Behavioral Therapy (CBT) group	Communication Skills Training (CST) group	CBT+ CST group	Control group
Self-efficacy	Before intervention(n=	7.24 $\pm$ 1.72	7.2 $\pm$ 1.27	7.45 $\pm$ 0.86	7.35 $\pm$ 1.26
	After intervention	7.88 $\pm$ 1.29	7.07 $\pm$ 1.68	7.72 $\pm$ 0.92	7.06 $\pm$ 1.2
	3 months after intervention	8.12 $\pm$ 0.19	7.3 $\pm$ 1.4	7.44 $\pm$ 0.98	7.52 $\pm$ 1.08
Family functioning	Before intervention	2.17 $\pm$ 0.41	2.18 $\pm$ 0.41	2.15 $\pm$ 0.31	2.19 $\pm$ 3.6
	After intervention	2.08 $\pm$ 0.37	1.88 $\pm$ 0.27	2.02 $\pm$ 0.33	2.26 $\pm$ 0.35
	3 months after intervention	1.14 $\pm$ 0.30	2.01 $\pm$ 0.33	1.86 $\pm$ 0.25	2.18 $\pm$ 0.36
Family Communication	Before intervention	2.27 $\pm$ 0.6	2.16 $\pm$ 0.62	2.24 $\pm$ 0.45	2.14 $\pm$ 0.53
	After intervention	2.16 $\pm$ 0.54	1.51 $\pm$ 0.35	2.15 $\pm$ 0.46	2.31 $\pm$ 0.64
	3 months after intervention	1.87 $\pm$ 0.5	2.1 $\pm$ 0.45	1.49 $\pm$ 0.35	2.23 $\pm$ 0.58
HbA1c	Before intervention	8.41 $\pm$ 1.94	8.92 $\pm$ 2.62	8.4 $\pm$ 2.41	8.49 $\pm$ 1.47
	After intervention	7.54 $\pm$ 1.38	8.85 $\pm$ 2.65	7.66 $\pm$ 1.34	9.0 $\pm$ 1.45
	3 months after intervention	7.7 $\pm$ 1.18	7.6 $\pm$ 1.19	8.49 $\pm$ 2.63	8.7 $\pm$ 1.65

## RESULTS

Mean age of studied population was 14.9 $\pm$ 1.8 years. 58% of adolescents were male and 42% female. Mean age of studied population in CBT, CST, CBT+CST and control group was 15.2 $\pm$  1.7, 15.1 $\pm$  1.9, 14.1 $\pm$  1.8 and 15.3 $\pm$  1.8 respectively ( $P > 0.05$ ). Mean  $\pm$  SD of studied variables before, after and three months after intervention in four studied groups are presented in Table-I. Multistage ANOVA test indicated that mean of HbA1c was not significantly different in different stages of evaluation in each group, but it was significantly different between CBT and control groups ( $P = 0.07$ ).

Mean of studied variables during different stages of study and the results of repeated measures ANOVA test for studied variables within (during follow up) and between groups (different studied groups) & their interaction are presented in Fig. 2-5.

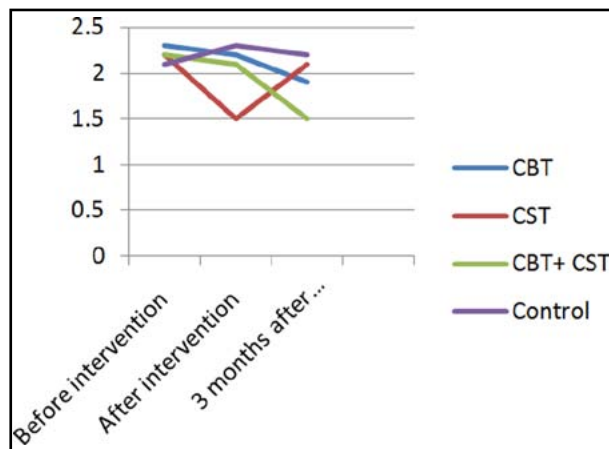


Fig.4: Mean of Family Communication during different stages of study.

P value within groups: 0.005, P value between groups: 0.001, P value for their interaction: 0.001

## DISCUSSION

In this study the effect of three interventions for improving patient perceived self-efficacy, parents-adolescent communication and combination of two mentioned interventions among type 1 diabetic patients evaluated. The results indicated that improving self-efficacy have significant effect on glycemic control of type 1 diabetic patients.

Proper management of type 1 diabetes is crucial for better quality of life and preventing its related long term and short term complication. Many studies have evaluated different interventional methods in this regard.<sup>22</sup> Diabetes self-management (DSM) is an important issue in this field specially with considering the fact that adolescents contains a great number of type 1 diabetic patients due to the improvement in the management of the disease.

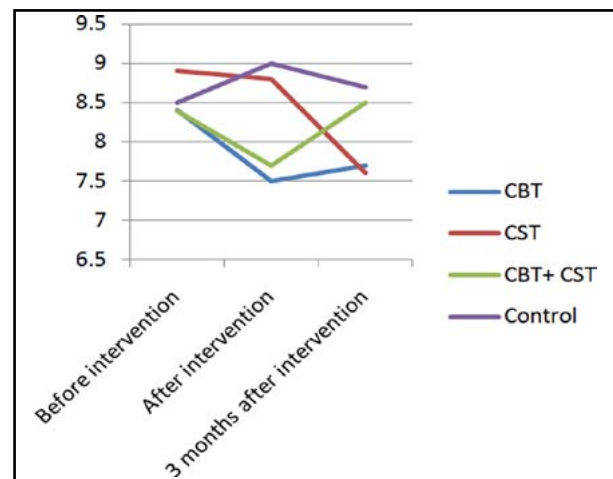


Fig.5: Mean of HbA1c during different stages of study.

P value within groups: 0.4, P value between groups: 0.007, P value for their interaction: 0.02.

Siousioura from Greece, reviewed all the interventional studies among type1 diabetic patients. They reported that the courses and approaches for diabetes treatment have evolved through time. They showed a transition from medical to educational and then psychotherapeutic approaches for diabetes management.<sup>22</sup>

It seems that focusing only on the physical aspect of the disease does not work properly and factors such as patient's emotions, coping styles, relationships and personality which could be improved by educational and psychotherapeutic intervention. Mentioned factors have an important role in diabetes management and self- management specially in a group of patients such as adolescents.

Self- efficacy and family functioning are two important factors which could be improved through educational and psychotherapeutic intervention and many studies have reported their effectiveness in this field. So in this study we evaluated the efficacy of mentioned factors separately and in combination among type 1 diabetic patients of Isfahan.

In this study intervention improved perceived self-efficacy and the glycemic control in a way that HbA1c reached to its recommended level (<8.0).

Evidences showed that self-efficacy is related to better glycemic control and DSM among adolescents.<sup>23,24</sup> It is considered as an important factor for making proper short-term and long term changes in health behaviours. Thus, adolescent with high self-efficacy have the ability to face with barriers to DSM in different situations of life.<sup>25</sup> The fact is mentioned by social cognitive theory (SCT) also.<sup>26</sup>

Chih et al in Taiwan have investigated the role of self-efficacy on blood sugar control measured by HbA1c among adolescents with type I diabetes mellitus. There was significant relationship between self-efficacy, measured by the Perceived Diabetes Self-Management Scale (PDSMS) and glycemic control. They concluded that adolescents with type 1 DM and higher self-efficacy, especially males, have a higher probability of reaching target diabetes control.<sup>27</sup>

In this study, CST in parents of adolescents with diabetes, had not improved the family functioning and communication significantly, but glycemic control had a trend to be improved in long term period. It may be due to inappropriate involvement of fathers in interventions or other familial related factors such as Parenting style, controlling method, marital dissociation and familial conflicts, different social roles of the parents and greater age difference between patients and their fathers than

their mothers. However evidences suggest that quality of family functioning such as impaired communications or parental abandoned relations is associated with poor glycemic control.<sup>28</sup>

In addition, as mentioned the degree and the methods of involvement and parents supervision should be adjusted according to different stages of children growth and development .It is suggested that the supervision should be implemented from the time of diagnosis for obtaining good result in this field.

In a review study, McBroom et al reviewed all the interventions and outcome measures that consisted of A1Cs, family relationships, and family conflict and indicated that family-centered interventions significantly improved A1Cs, enhanced family dynamics, and decreased family conflict. Family-centered interventions targeting children diagnosed with type 1 diabetes appear to be effective in enhancing health outcomes. These interventions focused on traditional 2-parent families.<sup>29</sup>

In current study the effect of combination therapy, CBT+ CST was similar to CBT after intervention and had not significant effect three month after intervention. It may be due to the facts that explained for CST.

The findings of current study showed that the combination therapy was effective in short term period, before follow up period but not for long time. It seems that the long term effect would be achieved if the intervention period increased or the intervention method modified in most appropriate way. Though in this study age and gender have not mediator role in final analysis but other studies have reported controversial reports in this regard.<sup>30-33</sup>

In a study in Turkey, the relation between self -efficacy, family cohesion and organization and metabolic control in adolescent with T1D was evaluated. There was not an interventional study but their results showed that there was not significant relationship between studied factors in total studied population but in girls there was positive correlation between self-efficacy and family cohesion.<sup>34</sup>

There are no similar study in literature review, but recently researchers emphasizes on the effectiveness of multi component approaches in comparing to single- component approaches for improving metabolic control.<sup>35</sup>

Though considering that this kind of interventional study which performed in this study and among adolescents group was considered as novel research in our region but it had some limitations which should be considered in future studies.

The limitations were as follows;

- Short follow up period due to educational, familial and cultural factors, the probability of lack of access to the participants due to the time and place of study, problems with parents and their families' cooperation.
- Potential biases due to limitations related to the accuracy of self-report questionnaires and three times of evaluation especially in this age group.
- Lack of access to a more valid indicator because HbA1c as an indicator of adherence to treatment could not provide a comprehensive picture of enhancement to treatment due to the short period of follow-up and psychological effects of puberty.
- Concerns of the patients and their families regarding hypoglycemic attacks which could interfere with intervention.
- Belonging of majority of participants to low socioeconomic class and their related stresses.

In summary considering the results of current study, in order to obtain more conclusive results it is recommended to study larger sample size of patients with T1D with consideration of their demographic and cultural factors, to design and implement multi-component studies to determine the relation between different psychosocial factors and their adherence to treatment regimens and metabolic control. Designing relatively long term multi-component and compilation strategies would be helpful in this regard also.

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