

Coping Skills and Associated Factors in Children and Adolescents with Type 1 Diabetes: A Systematic Review

Abbas Heydari¹, *Sara Shirdelzade²

¹Professor in Nursing & Dean, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran.

²PhD Student, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran.

Abstract

Background: Children with Diabetes Mellitus face numerous challenges and they rely on coping strategies for managing them. This review was done to assess effective factors on coping skills of these patients.

Materials and Methods: This is a systematic review on the effective factors on coping skills of children with diabetes mellitus. Data bases of Medline, Scopus, EMBASE, and Google Scholar were systematically reviewed for cross-sectional, cohort, case-control and randomized controlled trial assessing the effective factors on coping skills and strategies in diabetes, English articles without date restriction until Oct, 06, 2019. We included 543 articles and after reviewing and evaluating by Joanna Briggs Institute Critical Appraisal tools checklist, 14 articles remained for analysis.

Results: A review of 14 articles showed different scales were used for assessment of coping skills in the absence of a comprehensive one. Also, demographic factors, gender, social economic status, family size, sibling, disease variables, school performance, puberty, and metabolic control were factors assessed in different studies, but none of them were significant in all studies.

Conclusion: It seems in studies there is a lack of a comprehensive, standardized coping assessment tool appropriate for children and adolescents considering age, gender, puberty, socioeconomic status, and different psychosocial factors.

Key Words: Adolescent, Coping, Children, Type 1 Diabetes.

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*Corresponding Author:

Sara Shirdelzade, PhD Student, School of Nursing and Midwifery, Mashhad University of Medical Sciences, Mashhad, Iran. Fax: +985138597313

E-mail: shirdelzadehs971@mums.ac.ir, shirdel.sara@gmail.com

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1- INTRODUCTION

Diabetes mellitus type 1 is the most common endocrine disorder in children with prevalence of 0.2/1000 persons worldwide at least, which has life-threatening consequences such as cardiovascular disease, nephropathy, neuropathy, and even premature death (1-3). Diabetes mellitus (DM) is a chronic disease which needs lifelong support, protection, monitoring, and management (3). Adolescents and children with chronic diseases such as DM face numerous challenges; they suffer from both physical and psychological problems including anxiety, depression, and low self-esteem (4). To help manage the stress of DM development, children and adolescents rely on coping strategies (5). Lazarus and Folkman (1984) were the first researchers to extensively study coping, defining it as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding resources of the person" (5). The American Association of Diabetes Educators (AADE) has identified healthy coping as one of the self-care behaviors essential for effective diabetes self-management (6).

In caring for diabetes patients who have comorbid depressive symptoms, anxiety or distress, it is important to understand coping because the aim of it is to manage or avoid the anxiety and play a fundamental role in physical and psychological health, too (7). Also, children in their transition to adolescence (11-14 years) are vulnerable and have poor metabolic control, self-management, low quality of life, and more stressors (8). Despite the importance of coping with diabetes mellitus in metabolic control, consequences and prognosis, few articles assessed coping skills in childhood and adolescence and there is no conclusive research about associated factors of coping in children and adolescents with DM type

1. Therefore, this systematic review was performed to find the effective factors on coping skills of children and adolescents with type 1 diabetes in order to plan better self-management programs and glycemic control.

2- MATERIALS AND METHODS

2-1. Method

The present systematic review was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model (9) to assess the effective factors on the coping skills of children and adolescents with diabetes mellitus type 1 based on Joanna Briggs Institute (JBI) critical appraisal checklist (10). Databases of Medline (via PubMed), Scopus, EMBASE, and Google Scholar were searched without date restriction until Oct, 06, 2019 and completed by hand search (**Table.1**). This search process was done by two authors on English articles, two reviewers use checklists to appraise both quantitative and qualitative evidence. If the reviewers disagreed and could not solve their differences through discussion, a third reviewer was consulted.

2-2. Inclusion criteria

The inclusion criteria were: English language published, quantitative studies (clinical trials, cross-sectional, correlation, and cohort) on coping skills of children and adolescents with type 1 diabetes mellitus, study sample including children or adolescents younger than 19 years old with diabetes type 1, and a reliable and valid measure of an identified psychosocial factor relative to coping.

2-3. Exclusion criteria

The exclusion criteria were: studies on patients older than 19 years old, diabetes type 2, full texts were not accessible, abstracts of studies presented in

congresses, seminars, and conferences; a letter to the editor-in-chief, as well as short reports, case reports, and mixed method

designs. All found articles were reviewed and removed in several steps

Table-1: Databases, keywords, and search history.

Database	Date Searched	Key words	Articles Retrieved
PubMed	Oct, 06, 2019.	((coping skill[title/Abstract] OR adaptation[Title/Abstract])) AND (((diabetes type 1[Title/Abstract] OR diabetes mellitus juvenile-onset[Title/Abstract] OR insulin dependent diabetes mellitus[Title/Abstract] OR IDDM[Title/Abstract])) AND ((children[Title/Abstract] OR adolescents[Title/Abstract]))	371
Scopus	Oct, 06, 2019.	(TITLE-ABS-KEY (coping AND skill OR adaptation) AND TITLE-ABS-KEY (diabetes AND type 1 OR diabetes AND mellitus AND juvenile onset OR insulin AND dependent AND diabetes AND mellitus) AND TITLE-ABS-KEY (children OR adolescents))	177
Google Scholar		Coping skill OR adaptation AND children OR Adolescents AND diabetes	22100

2-4. Intervention and Outcomes

Coping skills and their effective factors in children and adolescents with type 1 diabetes were systematically reviewed based on the JBI critical appraisal checklists (10). These are independent checklists for cross-sectional, case-control, cohort, and clinical trial studies which consisted of 8, 10, 11, and 13 questions. Each question must be answered by yes, no, unclear, and not applicable and overall appraisal showed by include, exclude, and seek for more information. Those articles that had the most criteria ($\geq 50\%$ yes answers), and the overall appraisal of

inclusion were entered into the study (10). With mentioned keywords in databases of Medline (via PubMed), EMBASE and Scopus 354 and 177 articles respectively were found, and Google Scholar searches for grey articles (22,100 articles found). After removing duplicates and incompatible (other types of diabetes rather than type 1, no coping skill assessment), 13, 28, and 11 articles were left and 1 study was added by hand search. Finally, after studying abstracts and the full texts of them only 14 were remained for analysis (**Figure.1**).

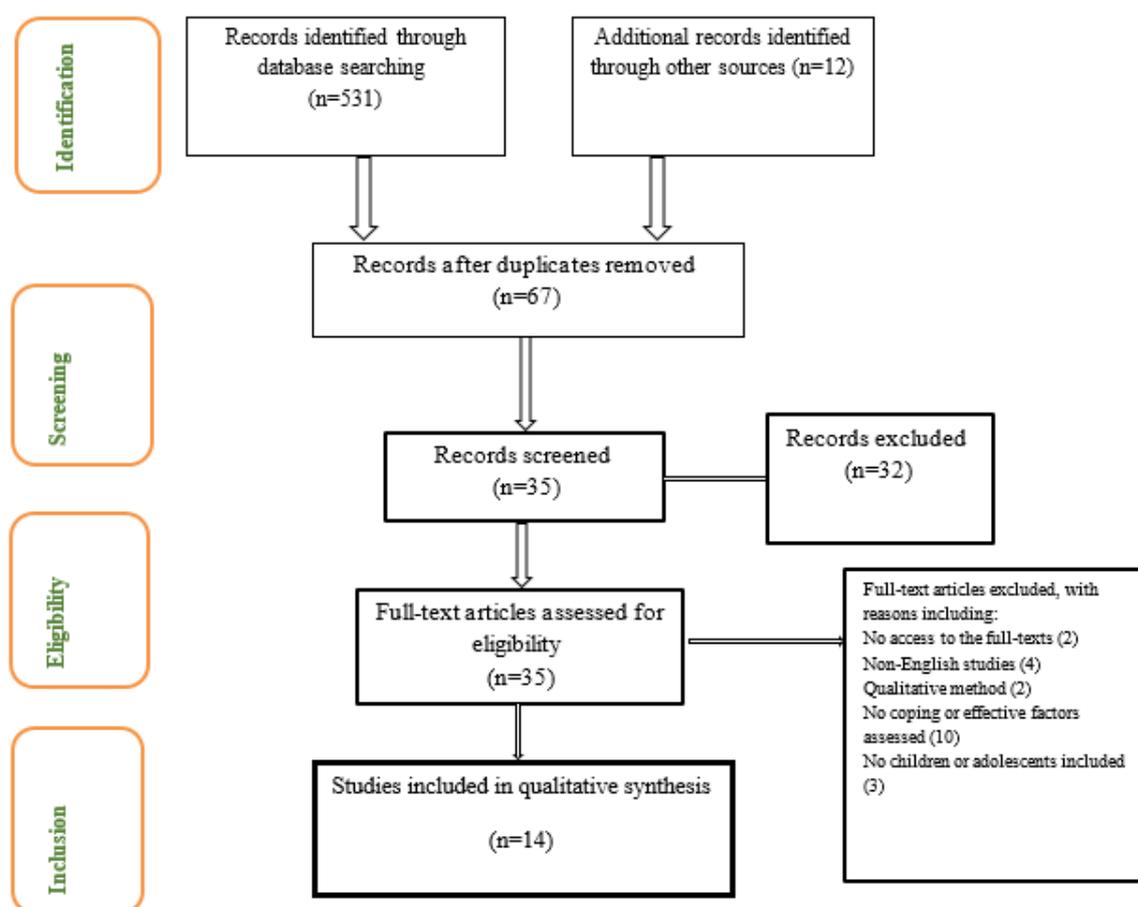


Fig.1: Process of searching and selecting articles for analysis.

2-5. Ethics

Although the ethics in systematic review is rarely assessed because of its secondary and intrinsic (i.e., technique of aggregating data from different studies) nature, there are some ethical concerns such as unethical studies entered the systematic review, and conflict of interest (11). In this study, ethical issues (confidentiality and informed consent) of each included article were assessed and all of them mentioned the confidentiality and informed consent in their methodology. Also, there is no conflict of interest in this systematic review.

2-6. Data extraction and Quality assessment

Two independent reviewers screened all titles and abstracts for inclusion. We then

independently assessed each selected reference for detailed evaluation. Two reviewers also independently abstracted relevant trial characteristics, and disagreements were resolved by discussion and consensus with the third author. Two reviewers independently appraised the quality of included articles based on their type in JBI appraisal checklists (10). These are independent checklists for cross-sectional, case-control, cohort, and clinical trial studies which consisted of 8, 10, 11, and 13 questions. All of the 14 articles had most of criteria and were not excluded. **Table.2** shows detailed information of the appraisal. The main outcome of this study was the effective factors on coping skills of children and adolescents with type 1 diabetes, so 14 articles were reviewed and reported them (**Table.2**).

Table-2: Critical appraisal of articles.

First Authors, Year	Design	Score	Decision
Frank, 1998	Cross-sectional	5/8 (5 yes of 8 questions)	include
Frank, 1998	Cohort	7/11(7 yes of 11 questions)	include
Grey, 1991	Cross-sectional	6/8 (6 yes of 8 questions)	include
Jacobson, 1986	Cross-sectional	8/10 (8 yes of 10 questions)	include
Kovac, 1985	Cohort	6/11 (6 yes of 11 questions)	include
Kovac, 1986	Cohort	6/11 (6 yes of 11 questions)	include
Mullins, 1995	Cross-sectional	8/10 (8 yes of 10 questions)	include
Wysocki, 1993	Cross-sectional	5/8 (5 yes of 8 questions)	include
Berg, 2009	Cross-sectional	6/8 (6 yes of 8 questions)	include
Jaser, 2011	Cross-sectional	6/8 (6 yes of 8 questions)	include
Reid, 1995	Cross-sectional	6/8 (6 yes of 8 questions)	include
Hanson, 1989	Cross-sectional	5/8 (5 yes of 8 questions)	include
Hanson, 1992	Cross-sectional	5/8 (5 yes of 8 questions)	include
Skocic, 2010	Cross-sectional	6/8 (6 yes of 8 questions)	include

3- RESULTS

A total number of 543 articles were initially retrieved through searching with mentioned keywords, and then 67 articles remained after the removal of duplicate ones. Titles and abstracts of the articles were also reviewed and those relating to coping and effective factors in children and adolescents with type 1 diabetes were selected, and finally 14 articles and 1619 participants remained for further analysis (**Figure.1**). The main outcome of this study was the effective factors on coping skills of children and adolescents with type 1 diabetes, so 14 articles were reviewed and reported them (**Table.3**).

3-1. Coping or adaptation assessment

Different tools were used for assessment of coping or adaptation of children with diabetes type 1; but the most used were

Child Behavior Checklist (12, 13, 15, 17, 23, 24), and Children's Depression Inventory (14, 17, 18, 20, 21), and no specific coping or adaptability questionnaire was used in common. Most related tools for coping or adaptation were Child & Adolescents Adjustment Profile (14), Coping Orientation for Problems (14), Teen Adjustment to Diabetes Scale (19), Self-report Coping (21), Self-rated Coping Effectiveness (21), Adolescents Coping Orientation for Problem Experiences (22), and Scale of Coping with Stress (2). It seems lack of a specified, standardized and comprehensive tool for evaluating the coping status in children and adolescents compelled researchers to use various questionnaires or scales, which may be the cause of different conclusion in studies.

Table-3: General Characteristics of included studies.

First Author, Year	Objective	Study design & sample size	Tools, Instruments, or questionnaires	Findings, Effective factors on coping or adaptation, Reference.
Frank, 1998	Examining involving risk and resistance factors of adaptation among children with and without chronic illness	Cross-sectional 309 children in 3 groups: 107 children with JRA ¹ , 114 children with DM ² , and 88 healthy children	1. Hollingshead Index of Social Position 2. Child Psychiatric Functioning 3. Differential Emotions Scale-IV 4. The Child Behavior Checklist-Parent Version 5. Global Severity Index of the Symptom Checklist-90-Revised 6. Family Crisis Oriented Personal Evaluation Scales 7. Physical exam in JRA and HbA1C in DM groups.	Among children with DM the combined model of demographic variables, and mothers' depression did not significantly predict children's own reports of their adaptation, but did predict mothers' reports of their children's behavior problems (12).
Frank, 1998	Examine individual difference and group difference models of adaptation	Cohort: adaptation of children was tracked for 18 months from diagnosis 129 children: 27 children with JRA, 40 children with DM, 62 healthy children	1. Hollingshead Index of Social Position 2. Child psychiatric Functioning 3. Family Adaptability and Cohesion Scale-III-K 4. The Child Behavior Checklist-Parent Version 5. Global Severity Index of the Symptom Checklist-90-Revised 6. Family Crisis Oriented Personal Evaluation Scales 7. Physical exam in JRA and HbA1C in DM groups.	Four clusters were found for children's adaptation based on Child Behavior Checklist (CBCL), which were labeled CHILD1-CHILD4. Neither child adaptation trajectories nor family functioning trajectories differed with regard to disease status; but differed with regard to child age and the trajectory CHILD1 had less problems and were younger. Child, parental, and family trajectories did not differ with respect to family SES ³ , child's gender, and disease variables (e.g. disease group, control over disease). Adaptation to chronic illness over time was found to be more dependent on individual differences than on common characteristics of the illness (13).
Grey, 1991	Investigate the influence of age, coping behavior, and self-care on psychological, social, and physiologic	Cross-sectional 103 children between the ages of 8 and 18	1. Child and Adolescent Adjustment Profile (CAAP) and Self-Perception Profile for Children (SPPC) 2. State-Trait Anxiety Inventory for Children (STAIC) and Children's	Age was related with anxiety, depression, metabolic control, coping behaviors, and adaptation. Older children had higher depression and anxiety, and lower metabolic control, they used more avoidance and relaxation behaviors. Younger children had higher self-perceived competence, and used ventilating feeling. Lower adaptation was related to more ventilating feeling or avoiding problems.

1 Juvenile Rheumatoid Arthritis
2 Diabetes Mellitus
3 Socioeconomic Status

	adaptation		<p>Depression Inventory (CDI)</p> <p>3. HbA1C</p> <p>4. Coping Orientation for Problem Experiences (A-COPE)</p> <p>5. CHIP¹ for assessing parents' perceptions of their coping styles</p> <p>6. SCQ² for measuring self-care activities</p> <p>6. Tanner stages.</p>	<p>Higher self-perceived global self-worth was weakly associated with the use of humor, seeking spiritual support, and avoidance behaviors. Lower self-perceived competence was associated with the relaxation behaviors. Poorer metabolic control (higher HbA1C) was associated with several coping behaviors such as investing in close friends, avoidance behaviors, and daydreaming (14).</p>
Jacobson, 1986	<p>1.Examine the impact of diabetes on the adjustment of children and families, and the influences of psychosocial domains on diabetes attitudes, behaviors, metabolic control</p>	<p>Case-control</p> <p>Two groups:</p> <p>1.Children with recent onset of IDDM³ (n=64)</p> <p>2.Children with acute medical problems (n=68)</p>	<p>1. Coopersmith Self-Esteem Inventory and Perceived Competence Scale</p> <p>2. The Nowicki-Strick Land Locus of Control Measure and Perceived Control Scale</p> <p>3. The Child Behavior Checklist</p> <p>4. The Diabetes Adjustment Scale (DAS).</p>	<p>The diabetic group reported a lower sense of school cognitive competence. Results of DAS⁴ revealed most of the children see themselves as being in control of their diabetes, had positive attitudes toward the future, they didn't perceive diabetes as affecting enjoyment of school. There was no significant difference in DAS scores for gender, age or social class.</p> <p>They found a strong association between locus of control and adjustment to diabetes, such that the more external the perception of control, the worse the reported adjustment. Also, increasing reliance on unknown others or powerful others is correlated with less successful diabetes adjustment.</p> <p>Fewer symptoms were associated with better adjustment, and school performance was correlated directly with diabetes adjustment. Sociodemographic factors, such as social class of the family and age or gender of the child, do not influence level of adjustment (15).</p>
Kovac, 1985	<p>Document how they adjusted to the medical illness and to assess salient background factors</p>	<p>Cohort</p> <p>74 children newly diagnosed IDDM 8-13 years old</p>	<p>1. The Codington Life Events Scales</p> <p>2.The Beck Depression Inventory and the Hopkins Symptom Checklist 90-item version</p> <p>3. Psychiatric history and evaluation before IDDM and recent symptoms or disorders and psychiatric diagnosis confirmed the criteria of DSM-III⁵.</p>	<p>The presence of a psychiatrically diagnosable response was not associated with sex, age, prepubertal status, being from an intact family, or the extent of life stress prior to the diagnosis of IDDM; but, parents of children with reactive disorders reported notable marital problems. There was no association between the parents' initial psychological response to the IDDM and the likelihood of a reactive disorder in the offspring.</p> <p>Within about 2 months from the onset of the reactive disorders, 50% of the patients had remission of their psychiatric symptoms; over a period of 9 months, 93% of the patients had recovered. The time it took to recover from a psychiatrically diagnosable coping response was only associated with pubertal</p>

1 Coping Health Inventory for Parents

2 Self-Care Questionnaire

3 Insulin Dependent Diabetes Mellitus

4 Diabetes Adjustment Scale

5 Diagnostic and Statistical Manual of Mental Disorders

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				status. Prepubertal children took longer to recover from their disorders than pubertal children. Time to recovery was not affected by the child's sex, age at the onset of the reactive disorder, previous life stress, SES, or psychosocial variables (16).
Kovac, 1986	Examine the psychosocial aspects of IDDM in children	Cohort, 74 children newly diagnosed IDDM 8-13 years old	1.Children's Depression Inventory (CDI), the Revised Children's Manifest Anxiety Scale (RCMAS), Coppersmith's Self-Esteem Inventory (SEI) 2.Child Behavior Checklist's (CBCL) Social Competence Scale (by parents) for pre-illness competence 3. The Beck Depression Inventory and the Hopkins Symptom Checklist 90-item version for assessment of parent's initial responses to their child, illness.	There was no significant relationship between the children's psychological adjustment and presence of any psychiatrically diagnosable reaction to the discovery of the IDDM or marital distress among the parents Coping strategies: most of the children had accepted their disease as they did their injection by themselves at discharge and study intake (75%). From the beginning, most children used instrumental and problem-focused coping strategies. The child' behavior coping strategies were not significantly related to age, sex, and socioeconomic status. After 1 year follow up: With the passage of time, there were significant declines on the CDI and RCMAS, whereas SEI scores increased significantly. Increase in self-esteem had already occurred by midyear (17).
Mullins, 1995	Investigate the relationship between maternal and child emotional adaptation in CF ¹ and IDDM children	Case-control (IDDM & CF) 24 children with CF and 25 children with IDDM between ages of 7 and 13	1. Children's Depression Inventory (CDI) 2. The State Anxiety Trait for Children (STAIC) 3. The Brief Symptom Inventory (BSI) 4. Disease severity was assessed by a 7-point Likert-style measure by physicians (SEV-MD).	There were no significant differences between CF and IDDM groups on global measures of adaptation including CDI, child or maternal depression or anxiety. Results revealed in CF group maternal depression (inverse relationship), illness parameters, and demographic parameters were predictors of trait anxiety, and in IDDM group maternal depression was a significant predictor of child depression (higher maternal depression predicted higher child depression). Illness parameters (disease severity, length of time since diagnosis) were significant predictors of child depression for the IDDM group, but not for the CF group (18).
Wysocki, 1993	Association between aspects of family function and measures of diabetic control and adjustment to IDDM among adolescents.	Cross-sectional 115 adolescents with IDDM and their family (113 mothers and 78 fathers)	1.General Information Form 2. Teen Adjustment to Diabetes Scale (TADS) for assessing adjustment 3. Parent-Adolescent Relationship Questionnaire (PARQ) for assessing Skill Deficits-Overt Conflicts; Beliefs-Expectations; and Family Structure 4. HbA1C.	For all family members, the significant inverse correlations between scores on the Skill Deficits-Overt Conflicts scale and TADS indicated that families with more favorable communication and conflict resolution skills (i.e., lower PARQ scores) reported better adolescent adjustment to IDDM and better control of disease. Mothers' scores on the Family Structure scale were inversely correlated with TADS scores, suggesting that adolescents from families with fewer functional or structural problems were perceived by their mothers as displaying better

1 Cystic Fibrosis

				<p>adjustment to diabetes.</p> <p>Regression analysis showed adolescent age accounted for some variance in TADS scores, such that older adolescents had poorer adjustment to IDDM. For mothers, SES accounted for a small proportion of TADS variance, that is, higher SES was associated with poorer adjustment to IDDM. And the PARQ Skill Deficits-Overt Conflicts scale was the strongest predictor of HbA1C (19).</p>
Berg, 2009	Association between perceived coping effectiveness (PCE) and diabetes management	Cross-sectional 252 adolescents, their mothers and 188 fathers	<ol style="list-style-type: none"> 1. Stress and coping structured interview (dyadic stress appraisal, dyadic coping, perceived coping effectiveness) 2. Children's Depression Inventory 3. Self-Care Inventory 4. Self-Efficacy for Diabetes Management Scale 5. HbA1C. 	<p>Adolescents appraised mothers to be less uninvolved, more collaborative, and more supportive than fathers in their coping.</p> <p>Higher PCE was associated with higher adherence, lower depressive symptoms and higher self-efficacy. No interactions were found between PCE and age; but, better metabolic control (Lower HbA1c) occurred for adolescents with higher PCE.</p> <p>PCE in managing diabetes stressors was associated with depressive symptoms, self-efficacy for diabetes management, adherence, and metabolic control. PCE was higher in presence of dyadic coping with mothers, lower depressive symptoms,</p> <p>higher self-efficacy for diabetes management, better HbA1c, and better adherence (20).</p>
Jaser, 2011	Explore how the use of specific coping strategies impacts resilience (i.e. quality of life, competence and metabolic control) in adolescents with T1D	Cross-sectional 30 adolescents (10-16 years) and their mothers	<ol style="list-style-type: none"> 1. The Response to Stress Questionnaire (RSQ) 2. The Child Behavior Checklist (CBCL- completed by mothers) and The Youth Self Report (YSR- by adolescents) 3. The Pediatric Quality of Life Questionnaire 4. HbA1C for metabolic control. 	<p>Adolescents reported using secondary control coping strategies most often, but girls used more primary coping strategies than boys. In general, adolescents reported moderate levels of diabetes-related stress (DRS), and higher DRS were associated with significantly lower use of primary control and secondary control coping strategies, but stress was not related to disengagement coping. Greater use of primary and secondary control coping was related to significantly higher parent- and self-reported social competence, better diabetes-related quality of life, and better metabolic control. But higher parent-reported total competence, and total QoL¹ was only related to higher primary control coping not secondary coping.</p> <p>Greater use of disengagement coping strategies was related to lower self-reported social competence, and poorer metabolic control; but not related to total competence, parent-reported social competence, diabetes-related quality of life, total quality of life (5).</p>
Reid, 1995	Examine the developmental and situational differences in coping among	Cross-sectional 56 youngsters aged between 8-18 years developed diabetes	<ol style="list-style-type: none"> 1. Demographic variables 2. Self-report coping 3. Grade Point Average (GPA) for assessing academic adjustment 	<p>Most coping strategies used were approach coping (seeking social support, problem solving) and avoidance (distancing, internalizing, externalizing). Socioeconomic status, number of adults in the home, number of children in the home, age at diagnosis, and duration of illness were not significantly correlated with the coping scores, the global adjustment indices, or self-rated coping</p>

¹ Quality of Life

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	youngsters with diabetes	more than 1 year	4. Child Depression Inventory (CDI) 5. The Social Skills Rating System (SSRS) 6. Self-Rated Coping Effectiveness.	effectiveness variables in a systematic manner. Girls reported higher levels of avoidance coping than boys. Children and adolescents did not differ in their overall use of coping strategies and perception of controllability; but the situation of finger prick was significantly less controllable, and the general peer-argument was more controllable than others and children used higher levels of approach coping than adolescents. Higher levels of perceived control were related to lower levels of behavior problems and higher levels of approach coping. Approach coping strategies were the most used strategies, but higher levels of avoidance coping were related to lower GPAs and higher levels of depression (21).
Hanson, 1989	Examine the relationships between coping styles and health outcomes	Cross-sectional 135 adolescents with their parents	1. Self-Report Adherence Instrument 2. HbA1C for metabolic control 3. 54-item Adolescent-Coping Orientation for Problem Experiences (A-COPE). 4. The 30-item Family Adaptability and Cohesion Evaluation Scales (FACES-II) 5. A 50-items Adolescent-Family Inventory of Life Events and Change (A-FILE).	The ventilation and avoidance coping style was negatively related to adherence behaviors. Coping was not correlated with HbA1c. The ventilation and avoidance coping style positively related to the age of the adolescent and was marginally related to the duration of IDDM. In contrast, utilizing personal and interpersonal resources was negatively associated with duration of IDDM. Neither coping style related significantly to gender or SES (22). High ventilation and avoidance coping was predicted by high life stress, low family cohesion, older adolescent age, and the interaction of Family Adaptability × Duration of IDDM. Independent of family relations and life stress, older adolescent age was related to the more frequent use of ventilation and avoidance coping.
Hanson, 1992	Associations among sibling relations and the psychosocial and illness-specific adaptation of youth with IDDM	Cross-sectional 66 youths with IDDM and their parents	Illness-Specific Adaptation: 1. HbA1C 2. Semi-structured interview for treatment adherence (Factor 1: dietary adherence, Factor 2: monitoring and being prepared) 3. Acceptance of Illness Scale (AIS) General Psychological Adaptation: 1. The Self-Perception Profile for Children (SPP) 2. Child Behavior Checklist (CBCL) Family Function: 1. Family Adaptability and Cohesion Evaluation Scale (FACES-II) 2. Family Inventory of Life Events and	Dietary adherence was associated significantly with metabolic control, younger age, long disease duration (poorer adherence), family size (large family size related to poorer dietary adherence), high family cohesion and high family adaptability (flexibility; but, factor 2 was only marginally related to younger age, and had no relation to metabolic control). Low social class was associated significantly with low self-esteem and marginally with social competence. Girls had marginally higher acceptance of illness and fewer externalizing behaviors. Youths with older siblings had more positive adjustment to the illness, and youths with male siblings exhibited marginally better dietary adherence. High sibling conflict was related significantly to low self-esteem, low acceptance of the illness, and high levels of externalizing behaviors, and marginally with internalizing symptoms. Marginal associations were observed between (a) flexible family relations and better metabolic control; (b) high family cohesion and high self-esteem; (c) high

			<p>Changes (FILE)</p> <p>3. Marital Adjustment Scale</p> <p>4. Sibling Relationship Questionnaire (SRQ).</p>	<p>social competence and low externalizing symptoms; (d) low family life stress and both low externalizing symptoms and high social competence; and (e) high marital satisfaction with high acceptance of the illness, high social competence, and low levels of externalizing symptoms (23).</p>
Skocic, 2010	<p>The relationship among specific psychopathological dimensions, coping mechanisms, and metabolic control in a Croatian clinical sample of adolescents with IDDM.</p>	<p>Cross-sectional 101 adolescents (aged 11-18) with IDDM that was diagnosed at least 12 months ago</p>	<p>1. Youth Self Report (YSR) for assessing adaptive behavior and specific psychopathological dimensions.</p> <p>2. Scale of Coping with Stress (SCS)</p> <p>3. HbA1C for glycemic control.</p>	<p>Boys presented with significantly lower mean scores on withdrawn and internalizing subscales of YSR, and with significantly higher scores on the SCS emotional reactivity subscale compared to girls.</p> <p>YSR subscales of attention problems, delinquent behaviors, aggressive behaviors, externalizing, and total score had lower mean in optimal glycemic control group than the other 2 groups, and also this group had lower anxiety/depression, withdrawal, somatic, social problems, thought problems, and internalizing than high risk group.</p> <p>Also, optimal glycemic control group had significant higher mean scores compared to the other two groups in the following SCS subscales: problem solving, seeking help from family, cognitive restructuring. On the other hand, subjects with optimal glycemic control had significantly lower mean scores compared to both other groups in the following SCS subscales: emotional reactivity and avoidance. Gender did not moderate the relationship between glycemic control and any of the YSR or SCS subscale scores.</p> <p>HbA1C values were significantly directly correlated to all the YSR subscales as well as to the SCS subscales avoidance, emotional reactivity, and inversely correlated to problem solving, cognitive restructuring (2).</p>

3-2. Demographic and basic characters' effect

In all reviewed studies some demographic characters were observed. The most controversy was seen in age effectiveness, some of the articles showed the age is effective in coping with diabetes (13) (14, 16, 17, 19), and some did not (12, 15-17, 20, 21). The articles which had shown age is effective, discussed the younger children had better adjustment to and coping with developing diabetes type 1. Other demographic and basic factors are shown in **Table. 4.**

Table-4: Demographic factors and their relationship to coping or adaptation.

Demographic factor	Effective	Not Effective
Gender	(2, 23, 24)	(12, 13, 15-17, 21)
Social Economic Status	(19, 23)	(12, 13, 15-17, 21)
Family Size	(23)	(21)
Sibling	(23)	-
Disease variables (duration, control over it, number of symptoms)	(23), (17)(duration), (15, 18)	(13, 21)
School performance	(15, 21)	-
Puberty	(16)	-
Metabolic control	(2, 14, 20)	(13)

3-3. Psychological factors

Various factors were evaluated in reviewed studies including depression in mothers (12, 18), self-perceived global self-worth (14), locus of control (15), reliance on unknown or powerful others (15), psychiatric problems (16, 17), marital distress and satisfaction (17, 23), favorable communication (19, 23), conflict resolution skill (19), family functional or structural problems(19), child depression (20, 21), treatment adherence (20, 22), self-efficacy (20), diabetes-related stress (24), social competence (23, 24), diabetes-related quality of life and total quality of life (24), perceived control (21), behavior

problems (21), life stress (22, 23), family cohesion (22, 23), and family adaptability (22, 23).

4- DISCUSSION

In this systematic review different factors were assessed and are, for better understanding, presented here in three parts: coping assessment tools, demographic factors, and psychological factors.

4-1. Coping Assessment Tools

Coping and adaptation in children and adolescents with type 1 diabetes were evaluated with different tools, the most commonly used are Child Behavior Checklist, Child Depression Inventory (14, 17, 18, 20, 21), Beck Depression Inventory (16, 17), Hopkins Symptom Checklist (16, 17), Cooper-Smith Self-Esteem Inventory (15, 17), Child Psychiatric Functioning (12, 13), and Differential Emotion Scale (12, 13), State-Trait Anxiety Inventory for Children (14, 18) and Adolescents Coping Orientation for Problem Experiences (14, 22); others were only used in one study (Table 3). Various used scales for assessing coping and adaptation in children and adolescents shows the lack of a comprehensive and standardized tool, which indeed should be prepared by a mixed method research in order to find out what the real status of coping is in this group.

4-2. Demographic Factors

Although all reviewed studies considered at least one demographic factor, there is not enough evidence to say which one has an effective impact on coping or adaptation in children and adolescents. The most common assessed factors were age, gender, social economic status, and disease parameters that had controversial findings in different studies. Age was a significant effective factors in some studies (13, 14, 19, 22, 23), and in others it was not (12, 15-17, 20, 21), in significant articles the

younger children had better coping with diabetes rather than older children or adolescents (13, 19), better dietary adherence, monitoring and being prepared (23), less behavioral problems (13), older children had higher depression and anxiety, and lower metabolic control, they used more avoiding and relaxation behaviors. Younger children had higher self-perceived competence (14, 22). Also, gender was significant in some articles (2, 23, 24) and insignificant in others (12, 13, 15-17, 21). Jaser et al. showed girls had used more primary coping strategies than boys who used more secondary coping strategies (24). Primary coping strategies consisted of problem solving and emotional expression and secondary coping strategies including efforts to fit with or adapt to environment such as acceptance or cognitive restructuring (24). Also, Hanson et al. and Skocic et al. found girls had higher acceptance of illness and less externalizing behaviors, whereas boys had lower withdrawal and internalizing and higher emotional reactivity (2, 23). The internalizing reflects the internal stress and externalizing shows the conflict with others and aggressive behaviors (23).

Two studies showed significant effect of social economic status (19, 23), but in a completely different manner. Though Wysocki et al. stated higher social economic status is related with lower adjustment to type 1 diabetes, Skocic et al. revealed low social class was associated with low self-esteem and social competence (19, 23). In other studies the insignificant effect was reported (12, 13, 15-17, 21). The disease parameters considered in articles including disease duration, numbers of symptoms, time passed from diagnosis, disease severity, metabolic or glycemic control, and control over it. Although Frank et al. (13) in a cohort study showed disease variables such as control over diabetes had no significant effect on child, parental, and

family coping trajectories; in other studies, poor metabolic control was associated with dietary adherence (23), causing avoidance coping behaviors, daydreaming, and investing in close friends (14). On the other hand, better metabolic control was related to better perceived coping effectiveness (20), adaptive behavior, and coping with stress (2). Length of disease or time passed from diagnosis was another controversial finding, some showed it significant (17, 18, 23), and one insignificant (21). Other disease variables were fewer symptoms (15), disease severity (18). Other observed factors were puberty, sibling, family size, school performance and disease characteristics (such as duration, control over it, and number of symptoms). Kovac et al. (16) was the only study that considered puberty as a factor and showed the time it took to recover from a psychiatrically diagnosable coping response was associated with pubertal status. Prepubertal children took longer to recover from their disorders than pubertal children (16). In a study by Reid et al. (21), family size had no significant effect on coping strategy adopted by children or adolescents; but Skocic et al. (2) reported family size had significant effect on dietary adherence. Also, Hanson et al. showed siblings are effective in coping of children. Children who had older and male siblings had more positive coping, and higher sibling conflicts related to lower self-esteem, lower disease acceptance, and higher externalizing (23). Although various demographic factors were assessed in different studies, controversial results were found even in most evaluated factors like age and sex. It seems there should be a comprehensive study on coping skills of children and adolescents with type 1 diabetes and associated factors to reach a consensus.

4-3. Psychological factors

There are many psychologically significant factors assessed in these studies including

self-perceived global self-worth (14), locus of control (15), reliance on unknown or powerful others (15), favorable communication with family (19, 23), conflict resolution skill (19), family functional or structural problems (19), higher adherence (20, 22), self-efficacy (20), diabetes-related stress (24), social competence (23, 24), diabetes-related quality of life and total quality of life (24), perceived control (21), behavior problems (21), life stress (22, 23), family cohesion (22, 23), family adaptability (22, 23).

There were some factors evaluated in more than one study and different results were reported including marital distress, psychiatric problems, and child depression. Hanson et al. showed higher marital satisfaction related to higher competence (23), but it was insignificant in Kovac et al. (17). Psychiatric problems and depression were effective in 3 studies (16, 20, 21), and not effective in others (12, 17). Because various psychological factors are evaluated in studies, it becomes difficult to make a decision on the effective factors. Therefore, it is necessary to conduct more studies for each one to provide more evidence.

4-4. Study Limitations

This systematic review has some limitations. Due to the considerable heterogeneity between studies, we could not perform meta-analysis to evaluate statistically significant factors.

5- CONCLUSION

It seems there is lack of a comprehensive, standardized coping assessment tool appropriate for children and adolescents considering age, gender, puberty, socioeconomic status, and different psychosocial factors. Lots of factors were assessed in different studies such as age, sex, puberty, economic status, self-efficacy, and psychological factors, but many controversies in results were

observed. Therefore, more research on demographic factors and psychological factors is crucial.

6- CONFLICT OF INTEREST: None.

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