

# Quality of life indicators and level of anxiety in children with type 1 diabetes (T1d)

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## ABSTRACT

One of the most common chronic diseases of our time is type 1 diabetes (T1D) which is not only a threat to the patient's life, but also a factor affecting the quality of life. Type 1 diabetes (T1D) is accompanied by early disability, disability, leads to the development of severe complications and a decrease in the patient's resource reserves. Analysis of the literature shows that the issues of studying T1D concern mainly the somatic state of patients. There are very few works devoted to assessing the psyche in T1D, they are scattered, not deep enough and systematized, which is due to the complexity and polymodality of the subject of study. This article analyses the severity of disorders of the psychoemotional status in children with T1D. The psychological characteristics of children were revealed depending on the stage of T1D.

**Keywords:** T1D; Psycho-emotional status; Children; Quality of life: Anxiety.

### Cite this article as:

Tulegenova, G.A., Kim, S.V., Dossimov, A.Z., Dolotova, L.V., Kaliyeva, A.T., Davidovich, S.G., & Kurmanalin, B. (2021). Quality of life indicators and level of anxiety in children with type 1 diabetes (T1d). *Journal of Human Sport and Exercise*, 16(4proc), S1806-S1815. <https://doi.org/10.14198/jhse.2021.16.Proc4.27>

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Abstract submitted to: Spring Conferences of Sports Science. [Costa Blanca Sports Science Events](#), 21-22 June 2021. Alicante, Spain.

JOURNAL OF HUMAN SPORT & EXERCISE ISSN 1988-5202.

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doi:10.14198/jhse.2021.16.Proc4.27

## INTRODUCTION

In recent decades, in connection with the development of the ideas of restorative medicine, the task of determining the resources of the human body and his personality for successfully overcoming the consequences of various diseases, preserving or increasing the ability to perform various types of life activities has become increasingly urgent. In this regard, for practitioners working in medical institutions, as well as in institutions of medical and social examination and rehabilitation, it is an extremely important aspect of their activities to determine not only the clinical prognosis, but also the socio-psychological prognosis, on which the success of the patient's adaptation to conditions depends of life associated with illness (Patrakeeva, Novoselova, Zalevskaya & Rybkina, 2015).

The modern concept of accompanying patients with T1D interprets this disease as a "*way of life*" to which they must adequately adapt, making the most of their own capabilities and measures to restore and compensate for existing disorders. Any measures of restorative treatment and rehabilitation programs can be implemented only with the patient's personal need for adaptation in the conditions of a chronic illness, as well as with an adequate assessment of his body and psyche.

The objective factors that reduce the capabilities of the psyche include: premorbid features, age, shape, severity and duration of the disease, the presence of complications, traumatic situations. Much attention is paid to the study of psychological factors in T1D. Cognitive, intellectual capabilities of patients with T1D, their emotional and personal characteristics, attitude, adaptation to the disease, quality of life, changes in psychological relationships in connection with the disease are studied.

Despite the variety of such works, they basically only state the facts of the revealed psyche features in T1D without attempting a differentiated typological analysis, although it is known that a typological approach to the study of personality with the definition of its characteristics is necessary to understand the rehabilitation and adaptive capabilities of the patient.

Even more problematic is the question of the methodology and techniques for assessing functional, including psychological, human resources that would be available in working with patients (Dina, 2014).

One of the topical areas of pediatrics is the study of the quality of life (QOL) (Novak & Ionova, 2007). Any chronic somatic disease puts a person in special life circumstances, where it is necessary to take into account many conditions and changes introduced by the disease in his life (Samoilova & Oleinik, 2010). Taking into account the modern realities of life, an assessment of the quality of life becomes necessary for an optimal assessment of the clinical picture (Novak & Ionova, 2007).

T1D at the present stage continues to be one of the most pressing problems of world medicine. A significant decrease in age limits, the development of many complications, an increase in disability and mortality of patients, determine T1D as the first priorities of national health programs of all countries of the world without exception, enshrined in WHO regulations (Samoilova & Oleinik, 2010; Noskova, Kolbasina & Pozdeeva, 2010; Ametov, Avakova & Doskin, 2008; Ametov, 2009). There are studies in the literature on the influence of socio - economic factors on the quality of life in T1D, improving the treatment of the disease by referring to the patient and his health in more complex ways, and not only from a medical point of view (Ametov, Avakova & Doskin, 2008; Ametov, 2009; Madeleine, Didsbury, Kim et al., 2016; Martins, Mascarenhas, Morandini et al., 2018).

According to the annual reports of the Ministry of Health of the Republic of Kazakhstan, the number of children with type 1 diabetes mellitus in 2018 was 3065, and in 2019 3469 children, which corresponds to an increase of 18% (Report of the regional health department of Aktobe region for 2019).

Quality of life assessment in clinical practice is important for assessing the course of the disease, early detection of problems and determining which type of insulin therapy will be adequate to maintain acceptable metabolic control in each patient (Delamater, de Wit, McDarby et al., 2014; Lustman, Anderson, Freedland et al., 2000).

Some studies have shown that girls, older children, and specific socio-demographic factors such as single-parent families, low family income can affect metabolic control and impair the quality of life (Madeleine, Didsbury, Kim et al., 2016). There is also research devoted to the analysis of emotional and psychosocial aspects, such as self-management and self-esteem, resilience and parenting, which positively affects the quality of life in children (Cameron, de Beaufort, Aanstoot et al., 2013). A systematic review assessed the quality of life of people with diabetes mellitus in children with T1D (Nieuwesteeg, Pouwer, van der Kamp et al., 2012). The results of this review indicate that, in general, children with diabetes have a similar quality of life compared to their healthy peers, but there are some differences in age and gender. The studies included in this review were mostly descriptive and no studies were included that compared with general population data.

Traditionally, in medical science and practice, it was customary to pay attention to the biomedical aspects of the disease: clinical and metabolic parameters that characterize the patient's condition and reflect the results of treatment. However, being necessary and sufficient for an acute disease, in chronic diseases the aspects of their influence on the patient's quality of life, his mental and social status, both in relation to the disease itself and the results of its treatment, are highlighted (Surkova. Antsiferov & Mayorov, 2000).

Childhood is a period of character formation and the formation of a person's socio-psychological adaptation. The feeling of one's own imperfection due to a disease that has arisen often reduces the quality of life of disabled children, contributes to the formation of an inferiority complex, accentuation on one's own condition and is the cause of frequent, sometimes serious, emotional disorders that aggravate the severity of the disease. Therefore, disability at the present time should be considered not only from the side of existing ailments and limitations of social functions, but also from the standpoint of a deterioration in the quality of life.

The World Health Organization pays great attention to the development of the science of quality of life as an important tool when deciding on methods of treatment, prevention, forms of rehabilitation, research and training of medical personnel. Assessment of various parameters of quality of life (QOL) in children with disabilities, namely: physical, mental, emotional, social and functioning at school, facilitates the implementation of complex treatment and rehabilitation measures. The study of the quality of life, based on the subjective perception of the person himself, is very sensitive and sometimes more informative than the generally accepted objective criteria (Novik & Ionova, 2007; Petrov & Sedova, 2001). The concept of "quality of life" of a patient is complex and multifaceted. Among the many criteria, one can single out those in which the emphasis is on the "patient's voice", they, as a rule, are of a general nature and indicate "the integration of the disease into the patient's daily life." Among the components of the quality of life are usually called functionality, perception, symptoms of the disease. The criteria for the quality of life are the psychological, social and functional aspects of life associated with the disease (Nikiforova & Konovalenko, 2011).

Individual quality of life is defined as an assessment of the compliance of individual desires and aspirations with their fulfilment or the possibility of fulfilment. This definition can be clarified: not just what the patient says, but what he says to himself about what he is. The definition, in which an attempt is made to combine all aspects of the quality of life, sounds like this: the possibilities of physical and social functioning, perceived by the patient as a certain level of physical and mental well-being.

Turning to diabetology, we note that at the turn of the century, many medical problems associated with the tactics of treating diabetes mellitus (DM) have been resolved. Studies have ended, which have given an answer to the main question of diabetology about the ratio of compensation for diabetes mellitus and its complications. Therapeutic measures have been developed for all complications of diabetes mellitus. Patient education has become part of the arsenal of remedies. However, each patient with diabetes mellitus is still forced to pay the "price" on a daily basis for their disease in different spheres of life (Surkova. Antsiferov & Mayorov, 2000). This price is more diverse, therefore, taking into account aspects of the patient's quality of life is of particular importance.

The evidence base, which suggests that young patients with type 1 diabetes have a higher incidence of mental disorders, is increasing (Delamater, 2009):

- Depression;
- Anxiety;
- Eating disorder;

Anxiety can be a normal response of the body to stress, but sometimes it becomes a functional disorder that unduly affects a person's daily life (Christie & Martin, 2012). Several studies have shown that anxiety about diabetes negatively affects disease management and glycemic control. Depression and anxiety are often comorbid conditions in patients with T1D.

Interestingly, the symptoms of the two conditions can act in opposite directions with respect to diabetes management and glycemic control. Thus, it is recommended that anxiety be assessed separately from the assessment of depression (Lloyd, Pouwer & Hermanns, 2013). Anxiety symptoms:

- Persistent anxiety or fears that prevent the patient from focusing on something or concentrating;
- Frequent experiences and fears about developing chronic complications of diabetes, not associated with emotional burnout;
- Perfectionism or overly vigilance in relation to the control of diabetes and in general.

### ***Purpose of the study***

To study the indicators of the quality of life and the level of anxiety in children with type 1 diabetes mellitus (DM) living in the city of Aktobe and the Aktobe region.

## **MATERIALS AND METHODS**

The work was carried out in the endocrinology department of the AMC "Children's Hospital", 30 children with a diagnosis of type 1 diabetes mellitus, who received insulin therapy (pump, syringe), aged 8 to 12, were examined. The control group consisted of 30 healthy children of the same age studying at school No. 51 in Aktobe. Children of the main group were registered with an endocrinologist for 3-6 years.

The criterion for inclusion in the main group was the presence of type 1 diabetes mellitus without complications, the criterion for exclusion in the main group was the presence of severe concomitant pathology.

Based on the compiled questionnaire, an anamnesis was collected, which took into account the adherence to the diet, the drugs received, the blood sugar level. Anthropometric data (weight, height) were determined by standard measurement, then the body mass index (BMI) was calculated. After collecting anamnesis, measuring anthropometric data and determining blood sugar, the SF-36 questionnaire was used to assess the quality of life and a test to determine generalized anxiety disorder in children.

The quality of life assessment was determined by the SF - 36 questionnaire, which was developed in 1992 by American scientists Jonh E. Ware and Cathy D. Sherbourne at the US Center for the Study of Medical Results. The SF-36 questionnaire possesses reliable psychometric properties and is acceptable for conducting population studies of the quality of life. The SF-36 questionnaire consists of 36 questions grouped into 8 scales: physical functioning (PF), role-playing activity (RP), body pain (BP), general health (GH), vitality (VT), social functioning (SF), emotional condition (EC) and mental health (MH).

The answers were subjected to the recoding procedure according to the algorithm developed by the authors, according to a 100-point system. All scales form two indicators: mental and physical well-being, the higher the indicator, the better the child's quality of life.

Anxiety disorder in children of the study and control groups was assessed using the test for the presence of generalized anxiety disorder (GAD-7).

The GAD-7 test is a short self-screening questionnaire for measuring the severity of generalized anxiety disorder, where scores are calculated by assigning values of 0, 1, 2, and 3 to the response categories "Not disturbed," "Several days," "More than half the time," and "Almost daily". Scale scores (GAD-7) range from 0 to 21 and are ranked as follows:

*0 - 4 points - the minimum level of anxiety, 5-9 points - moderate, 10-14 - medium, 15 - 21 points - high.*

For the statistical processing of the weight - growth indicator, Student's criteria were used. For the quality of life indicators in the main and control groups, the method of descriptive statistical processing was used. The significance of differences in quantitative indicators between the two groups was assessed using the Mann-Whitney test. Differences were considered statistically significant at  $p < .05$ .

## RESULTS AND DISCUSSION

Psychosocial factors play a significant role in the treatment of young patients with type 1 diabetes. Many adolescents and children with type 1 diabetes can find it difficult to deal emotionally with their condition. T1D can lead to discrimination and restrictions on the young patient's social relations with peers and society as a whole, as well as affect their academic performance and/or success.

Sixty children controlled by age and body mass index (BMI) were stratified according to the following diagnosis: children with type 1 diabetes mellitus (n=30) and healthy children (n=30) aged 8-12 years. The survey of children with diabetes (n = 30) was carried out in the endocrinology department of the AMC "Children's Hospital", healthy children (n = 30) - in secondary school No. 51 in Aktobe.

Children diagnosed with diabetes mellitus received the following insulin preparations: apidra-11 (36.6%), novorapid-1 (3.3%), lantus-14 (46.6%), humalog-4 (13.3%). The data obtained with the analysis of the research results are presented in tables (1-3) and in figures 1 and 2.

Table 1. BMI indicators in children.

Scale	N (0)	Healthy children (n-30)	Children with T1D (n-30)	$p \leq .5$
BMI	60	18.84329±3.76	16.17051±2.04	.001

As can be seen from Table 1, the BMI indicators in the main group were (16.17051 ± 2.04), in the control group (18.84329 ± 3.76), which indicates significant differences in BMI in the main group compared to the control group ( $p \leq .001$ ).

As a control of the sugar level, the venous blood glucose index was chosen, which was determined in the children of the main group. The average value of glucose in venous blood was 7.060 + 0.98  $\mu\text{mol/l}$ , which indicates a compensated state of carbohydrate metabolism in children with type 1 diabetes mellitus.

During the period of hospitalization in the hospital, children with type 1 diabetes mellitus were surveyed using the SF-36 questionnaire at the "School of Diabetes". The results of the questionnaire are presented in table 2 and in figures 1,2

Table 2. Quality of life indicators in children with T1D.

Scale	N (0)	Healthy children (n-30) Me[Q1; Q3]	Children with T1D (n-30) Me[Q1; Q3]	$p \leq .5$
Physical component of health (Ph)				
PF	60	90[75.0;100.0]	90[50.0;90.0]	.03
RP	60	87.5[50.0;100.0]	100[75.0;100.0]	.37
BP	60	82.0[52.0;100.0]	84.0[64.0;84.0]	.85
GH	60	74.5[65.0;95.0]	87.0[62.0;97.0]	.58
Mental component of health (Mh)				
VT	60	75.0[60.0;80.0]	50.0[50.0;60.0]	.01
SF	60	81.5[62.5;100.0]	87.5[75.0;87.0]	.80
RE	60	100 [66.6;100.0]	100.0 [100.0;100.0]	.06
MN	60	80.0[64.0;96.0]	74.0[64.0; 75.0]	.11

The analysis of indicators, according to the SF-36 questionnaire, reflected the negative impact of type 1 diabetes on the quality of life of children (Table 2). The largest significant difference was noted on the scales of the physical component of health (PH), which amounted to 90 [75.0; 100.0] in healthy children and 90 [50.0; 90.0] in children of the main group ( $p \leq .03$ ). This indicator indicates that children in the main group more often experienced significant restrictions in daily activities and associated physical activity than children in the control group (Mann-Whitney Figure 1).

The results presented in Table 2 showed the absence of significant differences in the answers of the main group respondents for most parameters of the general sample and the control group, such as: role-playing activity (RP) (in the main group -100 [75.0; 100.0] in the control group -87.5 [50.0; 100.0] points, respectively), body pain (BP) (in the main group 84.0 [64.0; 84.0] and 82.0 [52.0; 100, 0] in the control group, respectively), the indicator of general health (GH) (in the main group - 87.0 [62.0; 97.0] in the control group - 74.5 [65.0; 95.0] points, respectively).

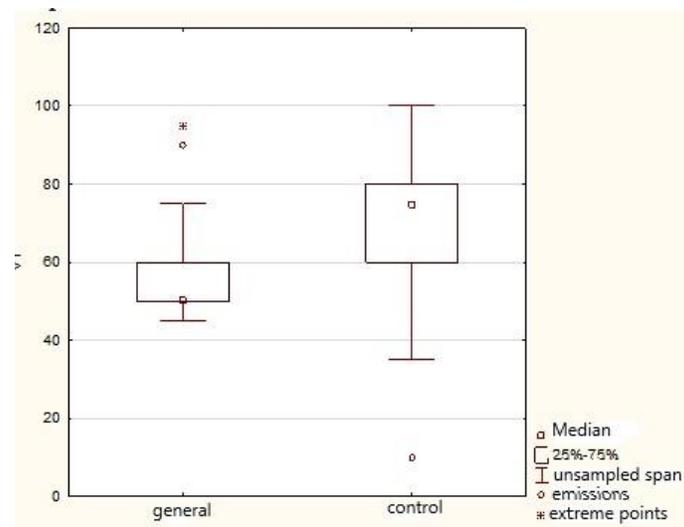


Figure 1. Mann-Whitney diagram #2. Viability index in children with type 1 diabetes.

Analysing the indicators of the mental component of health, it was found that the vitality indicator (VT), which determines strength and energy, was recorded with a pronounced difference in children with type 1 diabetes mellitus - 50.0 [50.0; 60.0] ( $p < .01$ ) compared with the control group 75.0 [60.0; 80.0] (Table 2 and Mann-Whitney Figure 2).

Other indicators of the mental component of health: social functioning (SF) (87.5 [75.0; 87.0] points in the main group and 81.5 [62.5; 100.0] points in the control group), an indicator of emotional state (RE) (100.0 [100.0; 100.0] points in the main group and 100 [66.6; 100.0] points in the control group), as well as an indicator of role functioning (MH) (74.0 [64, 0; 75.0] points in the main group and 80.0 [64.0; 96.0] in the control group, respectively) did not have significant differences between the groups. Recorded mental health data indicate that indicators such as social functioning, an indicator of emotional state, an indicator of role functioning are less susceptible to the negative influence of the disease.

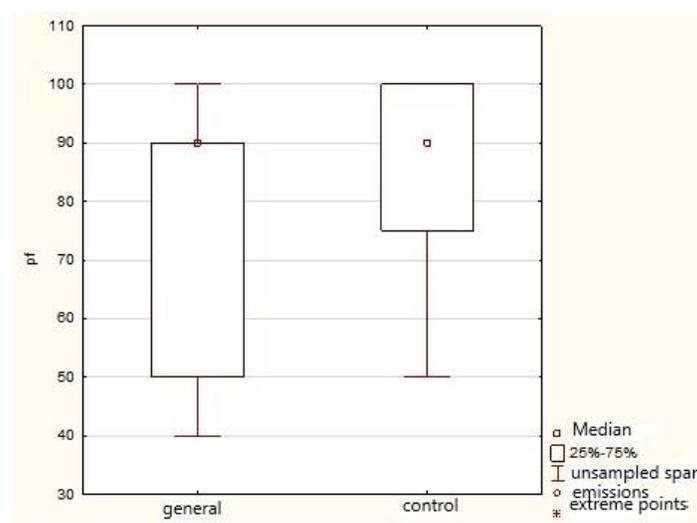


Figure 2. Mann-Whitney diagram # 2. Physical functioning indicator.

For a more complete analysis of psycho-emotional data in both groups, the level of anxiety was determined according to the GAD-7 scale, which confirmed the previously obtained data. The results are shown in Table 3.

Table 3. Anxiety level in children with type 1 diabetes.

Scale	N (60)	Healthy children (n-30)	Children with T1D (n-30)	$p \leq .5$
Anxiety level	60	1.43%	1.5%	.51

As can be seen from Table 3, the level of anxiety in children in the main group was 1.5%, while in the control group it was 1.43%, which indicates an increased level of anxiety in children with type 1 diabetes.

Teenagers try to find their identity separate from their families. In this age group, there is a struggle for independence from parents and other adults, which often manifests itself in a worsening of the course of diabetes. The task is to find the degree of parental involvement in the control of diabetes, without the risk of worsening its course (Luyckx & Seiffge-Krenke, 2009). Several studies have shown that high levels of family cohesion, consistency in diabetes management, support, and collaborative problem solving are associated with higher adherence to therapy and glycemic control. While conflicts, lack of division of responsibilities reduce adherence and lead to poor disease control. Research results also showed the influence of socio-demographic factors, such as single parent, low income, and the association of these factors with a higher risk of poor control of type 1 diabetes (Delameter, 2009). In addition, according to Russian authors, the phobia of the loss of a child, the excessive concentration of parents on illness are also closely associated with poor compensation for diabetes, possibly due to the negative impact of such fear and retardation of the child's mental development (Motovilin, Shcherbacheva, Andrianova et al., 2008). Children and adolescents may require significant emotional support from friends. Teens have a strong need to fit in with their environment and to be accepted outside of the family.

It is very important to belong to a peer group and conform to the social norms of that group. If a child feels negative reactions from peers about their therapy, then they may have problems with adherence to therapy and stress will increase, and this will lead to a deterioration in glycemic control. In contrast, support from friends and peers has a positive effect on adherence, but there is a correlation depending on the area in question. For example, it was found that social support is correlated with greater adherence to nutrition and sports behaviour (La Greca & Mackey, 2009). Research results show that many of our teens and children are more likely to conform to their friends' norms at all costs. Diabetes control may not be in the first place in the list of priorities at a given age (Court, Cameron, Berg-Kelly & Swift, 2009).

## CONCLUSIONS

Currently, more and more attention is paid to psychological and social factors and their importance in the control of type 1 diabetes. Thus, in the 2009 ISPAD guidelines it is noted that "*psychosocial factors are the most important aspects influencing the treatment of diabetes mellitus*".

Thus, the quality of life in children with type 1 diabetes mellitus tends to deteriorate. Deterioration in the quality of life is primarily manifested in reliably low indicators of physical functioning, indicators of strength and energy, i.e. vitality, as well as an increased level of anxiety.

The obtained indicators of the quality of life associated with the health of children with type 1 diabetes mellitus serve as a weighty argument for the development of a therapeutic training program for this contingent,

implemented with the participation of medical workers and aimed at increasing motivation, improving the condition of patients, achieving the maximum possible compensation.

In conclusion, I would like to say that despite the development of new technologies in diabetes, such as insulin pumps and continuous glucose monitoring systems, the availability of a large number of validated questionnaires, scales, techniques and trainings to maintain the physical, social and psychological health of young patients with type 1 diabetes, the main the personal qualities of the doctor and the attentive attitude towards the patient remain. The doctor must be honest with his patients, respect their decisions and worldview, accept them as they are, be open to new, positive, show interest in patients and their problems. And in many ways, this will have a stronger impact on the treatment of diabetes than just the practical techniques and strategies developed. The development of these qualities in oneself should be a priority in the professional development of doctors, especially those working with more susceptible groups of the population, such as adolescents and young people.

## REFERENCES

- Ametov, A.S. (2009). Selected lectures on endocrinology. Moscow: Medical Information Agency LLC, pp. 91-129.
- Ametov, A.S., Avakova, K.A., & Doskin, E.V. (2008). An integrated approach to assessing the compensation of type 1 diabetes mellitus and the quality of life in patients receiving insulin pump therapy. *Diabetes mellitus*, no 4, pp. 80-84. <https://doi.org/10.14341/2072-0351-5597>
- Cameron, F.J., de Beaufort, C., Aanstoot, H.J. et al. (2013). Lessons from the Hvidoere International Study Group on childhood diabetes: be dogmatic about outcome and flexible in approach. *Pediatr Diabetes*, no 14, pp. 473-480. <https://doi.org/10.1111/pedi.12036>
- Christie, D. & Martin, C. (2012). *Psychosocial Aspects of Diabetes Children, Adolescents and their families*. Oxford: Radcliffe Publishing Ltd.
- Court, J.M., Cameron, F.J., Berg-Kelly, K. & Swift, P.G.F. (2009). Diabetes in adolescence. *Pediatric diabetes*, no 10, pp. 185-194. <https://doi.org/10.1111/j.1399-5448.2009.00586.x>
- Delamater, A.M. (2009). Psychological care of children and adolescents with diabetes. *Pediatric diabetes*, no 10(12), pp. 175-184. <https://doi.org/10.1111/j.1399-5448.2009.00580.x>
- Delamater, A.M., de Wit, M., McDarby, V. et al. (2014). ISPAD Clinical Practice Consensus Guidelines. Psychological care of children and adolescents with type 1 diabetes. *Pediatr Diabetes*, no 15(20), pp. 232-244. <https://doi.org/10.1111/pedi.12191>
- Dina, A. V. (2014). Psycho-emotional characteristics of patients with diabetes mellitus. *Bulletin of modern clinical medicine*, no 7.
- La Greca, A.M. & Mackey, E.R. (2009). Adherence to pediatric treatment regimens. *Handbook of Pediatric Psychology*. New York: Guilford Press.
- Lloyd, C.E., Pouwer, F. & Hermanns, N. (2013). Screening for Depression and Other Psychological Problems in Diabetes. London: Springer-Verlag. <https://doi.org/10.1007/978-0-85729-751-8>
- Lustman, P.J., Anderson, R.J., Freedland, K.E. et al. (2000). Depression and poor glycemic control: a meta-analytic review of the literature. *Diabetes Care*, no 23, pp. 934-42. <https://doi.org/10.2337/diacare.23.7.934>
- Luyckx, K. & Seiffge-Krenke, I. (2009). Continuity and Change in Glycemic Control Trajectories from Adolescence to Emerging Adulthood: Relationships with family climate and self-concept in type 1 diabetes. *Diabetes care*, no 32(5), pp. 797-801. <https://doi.org/10.2337/dc08-1990>

- Madeleine, S., Didsbury, S., Kim, M. et al. (2016). Socio-economic status and quality of life in children with chronic disease: A systematic review. *J Paediatr Child Health*, no 52(12), pp. 1062-1069. <https://doi.org/10.1111/jpc.13407>
- Martins, K.A.K.F., Mascarenhas, L.P.G., Morandini, M. et al. (2018). Health-related quality of life in a cohort of youths with type 1 diabetes. *Rev. Assoc. Med. Bras.*, no 11(64). <https://doi.org/10.1590/1806-9282.64.11.1038>
- Motovilina, O.G., Shcherbacheva, L.N., Andrianova, E.A. et al. (2008). Child-parenting relationships in families of children with type 1 diabetes. *Diabetes*, no 4, pp. 50-54. <https://doi.org/10.14341/2072-0351-5591>
- Nieuwesteeg, A., Pouwer, F., van der Kamp, R. et al. (2012). Quality of life of children with type 1 diabetes: a systematic review. *Curr Diabetes Rev.*, no 8, pp. 434-443. <https://doi.org/10.2174/157339912803529850>
- Nikiforova, E.M., & Konovalenko, N.V. (2011). Peculiarities of psychoemotional status in children with type 1 diabetes mellitus. *Volgograd scientific medical journal*, no 2 (30), pp. 31-33.
- Noskova, V.A., Kolbasina, E.V., & Pozdeeva, T.V. (2010). Quality of life in children with diabetes mellitus. *Medical Almanac*, no 3(2), pp. 93-96.
- Novak, A.A., & Ionova, T.I. (2007). Guidelines for the study of the quality of life in medicine. Moscow: ZAO "OLMA Media Group".
- Patrakeeva, E.M., Novoselova, N.S., Zalevskaya, A.G. & Rybkina, I.G. (2015). Psychological and social characteristics of young patients with type 1 diabetes mellitus. A practitioner's perspective. *Endocrinologist. Diabetes*, no 1, pp. 48-57. <https://doi.org/10.14341/DM2015148-57>
- Petrov V.I. & Sedova, N.N. (2001). The problem of the quality of life in bioethics. Volgograd: Volgograd State Institution "Publisher". Report of the regional health department of Aktobe region for 2019.
- Samoilova, Yu.G., & Oleinik, O.A. (2010). Integral indicators of the quality of life of children and adolescents with type 1 diabetes mellitus. *Pediatrics*, no 3(89), pp. 57-63.
- Surkova, E. V., Antsiferov, M. B. & Mayorov, A. Yu. (2000). *Diabetes*.

