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Assessing Quality of Life in Children and Adolescents Diagnosed with Pulmonary Tuberculosis

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Abstract

Work is devoted to studying the quality of life parameters of children and adolescents with different forms of tuberculosis. Laboratory and instrumental methods of examination of patients do not cover all aspects of tuberculous infection and do not allow valuing the condition of children and adolescents with pulmonary tuberculosis. During the analysis of quality of life parameters, there is a possibility to define the influence of the disease on physical, psychological, and social aspects of the organism's functioning. The analysis of quantitative indexes children and adolescents quality of life was conducted depending on gender sign, area of residence, and form of tuberculosis. For research of quality of life in pediatric practice, the questionnaire of Pediatric Quality of Life Inventory—PedsQL—is used. The questionnaire of PedsQL 4.0. includes 23 questions, incorporated in 4 scales. Every question has 5 variants of answers: “no,” “hardly ever,” “sometimes,” “often,” and “almost always,” from which one has to be chosen, most going near a situation.

Keywords: quality of life, analysis, children, adolescents, tuberculosis

1. Introduction

The World Health Organization (WHO) estimated that nearly one third of the population of the planet is infected with *Mycobacterium tuberculosis* (MBT), as 8–10 million new active cases of pulmonary tuberculosis (TB) are registered annually [1]. The general epidemic situation on tuberculosis for the last 10–15 years has negatively affected the incidence of tuberculosis in children. First, the contact with adults suffering from tuberculosis, especially with bacterial isolation, causes new cases of infection of MBT in children. At the same time, social and economic reforms have given to considerable decrease in number of healthy children in structure of younger generation – from 4 to 10% [2]. In modern social and economic conditions, a relevant task is to create optimum conditions for healthy motherhood, providing the birth and development of a healthy child [3, 4]. Becomes obvious that negative processes of formation of health of younger generation are connected with growth of socially caused diseases at children and pregnant women, in particular tuberculosis [5]. The development of health care has put in the forefront the need for assessing the health of a child taking into account many, first of all social,

factors [6]. During an economic crisis, the leading value, from the point of view of maintaining health, is on the quality of life of the child and his or her family members [7]. In recent years, the directions of studying the quality of life of children in clinical and in social pediatrics have extended [8]. WHO has suggested considering quality of life (life quality) as an optimum condition of perception by certain people and the population in general how their requirements as opportunities for achievement of well-being and self-realization are given are satisfied. Tuberculosis, influencing the physical state and psychology of behavior of an individual, changes his or her place and role in society [1]. In this regard, one of the new criteria for the evaluation of efficiency of delivery of health care is the quality of life. Today, it sounds as follows: the quality of life is a perception by an individual of his or her situation in life in the context of culture and the system of values in which the individual lives, and in connection with the purposes, expectations, standards, and the interests of this individual [9]. As quite often health depends on the level of availability of medical care, WHO considers the general availability of medical care of acceptable quality to children and adolescents mandatory at the present stage of development of society. Traditional criteria do not cover all aspects of a tuberculosis infection and do not allow estimating a condition of the sick child comprehensively. During the analysis of the quality of life parameters, there is an opportunity to define the influence of a disease on physical, psychological, and social aspects of functioning of an organism [10]. The use of this simple and reliable method will allow to improve the quality of medical care at different stages of treatment to children with chronic diseases, in particular, TB patients.

2. Purpose

To carry out the analysis of initial level of quality of life at children and adolescents depending on a sex, age, when using various methods of detection of a disease, to estimate indicators of quality of life depending on a form of tubercular process.

3. Materials and methods

In the conditions of children's department of the Samarkand State tuberculosis hospital, 90 children and adolescents aged 5–18 years subdivided into various subgroups have been examined. The quality of life was estimated by gender (2 subgroups: girls—56 and boys—34) and in various age groups (3 subgroups: adolescents aged 13–18 years—27 persons, children of school age 8–12 years—44 persons, children of preschool and younger school age 5–7 years—19 persons). Pulmonary tuberculosis has been for the first time revealed by means of various techniques: during inspection of risk groups by means of the medicine Diaskintest, the digital fluorographic device “ProScan 2000” was used as a recourse for medical care. The surveyed are divided into 3 relevant subgroups of 30 children and adolescents. For a century around the world, tuberculin was used for the diagnosis of tuberculosis and the detection of the latent tuberculosis infection. The main lack of tuberculin test is the large number of false positive reactions, in connection with cross-reactions of the antigens, which are contained in many species of mycobacterium and in strains of a bacillus of Calmette-Guerin (BCG). Diaskintest[®] (allergen recombinant in standard cultivation) is the recombinant protein produced by genetically modified culture of *Escherichia coli* and contains two antigens (ESAT-6 and CFP-10) that are present at virulent strains of mycobacterium of tuberculosis and absent in a vaccinal strain of BCG. With an intradermal injection of Diaskintest[®] for persons with a tuberculosis infection, a

specific skin reaction, which is a delayed-type hypersensitivity, develops. This reaction is absent in people vaccinated with BCG and not infected with MBT. Because of the outbreaks of tuberculosis that have become frequent around the world, in recent years, the value of fluorography as an identification method has increased. The main advantages of digital photofluorography are high informational content of the image, the minimum dose at inspection, convenience of archiving and extraction of data, lack of an X-ray film and chemicals, and high bandwidth of the equipment. The digital fluorography became comparable with survey radiographic pictures. It means that the ability to detect the pathology sharply increases during mass inspections. Dose loadings from the simplest digital photofluorography are 10 times less. Such small dose allows expanding the age group for X-ray prevention of tuberculosis. At the same time infiltrates and the centers come to light with big constancy in all departments of lungs and have the outlined borders; disintegration cavities, come to light always convincingly; lymph nodes distinctly are found in zones, inaccessible to an ordinary radiological research. If necessary it is possible to send pictures for expeditious consultations on computer networks, and the consultant not the subjective report of the surveying doctor, and primary diagnostic information is transferred to any distances.

In terms of the clinical forms, the primary forms of tuberculosis prevailed in 50 (55.6%) patients: tuberculosis of intrathoracic lymph nodes in 34 (37.8%) patients and primary tuberculosis complex in 16 (17.8%). The secondary forms of tuberculosis prevailed in 40 (44.4%) respondents: tuberculous pleurisy in 3 (3.3%), disseminated tuberculosis in 12 (13.3%), and infiltrative tuberculosis in 25 (27.8%) patients. On the basis of these forms, patients have been divided into two subgroups.

In all subgroups, the analysis of initial level of quality of life was carried out. For a research on quality of life in pediatric practice, the questionnaire of Pediatric Quality of Life Inventory—PedsQL—proved effective. For the assessment of quality of life, all 23 criteria have been united in 6 scales: FF—physical functioning, EF—emotional functioning, SF—social functioning, SF—life in a school/garden, PSF—psychosocial functioning, and TS—a total scale. Answers to these questions open such problems for the child as the ability for independent movement and active actions, the self-service level, the emergence of pain and also experience of negative emotions, sleep disorder, and difficulties in communication with peers, problems in training, etc. The questionnaire is divided into blocks depending on age—5,–7, 8–12, and 13–18 years. The total of points pays off on a 100-mark scale after the procedure of scaling: the total size is higher, the quality of life of the child is better. Answers of children were expressed further in points. In the questionnaire for children of 5–7 years, 3 possible answers in connection with age features of these children were offered, and the graphic system of answers was used: the symbolical image of the person with a smile meaning “never,” persons with the neutral expression meaning “sometimes,” and persons with the negative expression meaning “often.” For children of 8–12 years and adolescents of 13–18 years, each question has 5 possible answers: “no,” “almost never,” “sometimes,” “often,” and “almost always,” from which it is necessary to choose one, the most suitable to a situation. All children answering the questionnaire had no mental disease according to the basic and associated diseases. Statistical processing of results of the research was carried out with the use of Microsoft Excel 2007 programs. Quantitative signs are presented in the form of average arithmetic \pm a standard mistake. The statistical analysis was carried out by means of a statistical package of the SPSS program (Statistical Package for the Social Sciences Inc., USA) version 14.0 in Russian. The analysis of data included standard methods of descriptive and analytical statistics. The t-test for independent selections, t-test for dependent selections, and the one-factorial dispersive analysis (ANOVA) were used for the comparison of average values of selections. Correlation

analysis was applied to establish communication between parameters of quality of life and social factors. The probability of a mistake $p < 0.05$ was regarded as significant, $p < 0.01$ —very significant, and $p < 0.001$ —the most significant.

4. Results

4.1 Quality of life of patients depending on gender sign

The comparative analysis of initial level of quality of life separately on gender sign has not revealed significant differences on a total scale— 61.7 ± 2.3 and 59.4 ± 3.5 points (**Table 1**). However, subjective indicators of physical functioning for boys were much higher, than those for girls— 66.5 ± 2.3 and 56.2 ± 3.5 points. Boys noted difficulties in lifting heavy objects by registering feeling of pain in extremities and low level of energy more often. It is more difficult for girls to cope with physical activities in the form of a run or a long walk; they noted weakness and difficulty in performing daily household activities more often. On the scale of emotional functioning, indicators are higher for girls— 65.8 ± 3.9 , than those for boys— 61.2 ± 3.3 points, and they have revealed the high level of viability to new conditions; however, existence of such problems as emotional sensitivity and internal dissatisfaction with the appearance of a chronic disease is noted. In boys, emotional problems are generally connected with sleep disorders and feeling of aggression and rage because of the state of and need for a long hospital stay and also existence of fear, uncertainty in the future. Points on the scale of social functioning for boys are also authentically higher, than those for girls— 62.1 ± 3.7 and 50.1 ± 2.9 that is explained by aspiration of boys to leading and self-realization in children's and adolescents collective. The main problem points noted by boys were connected to impossibility to quickly improve the relations with peers. Girls often pointed that peers often teased them, and it was difficult to feel on an equal basis with healthy children. At the same time, difficulties when performing tasks in school led to a considerable decrease in an indicator and school functioning of boys, than girls— 56.7 ± 2.5 and 65.8 ± 2.4 points. For girls, difficulties with storing and concentration were observed more, and they skipped classes in connection with feeling sick more often. Nevertheless, in the analysis of a total scale of psychosocial functioning, indicators have appeared low, but are higher for boys (61.4 ± 3.6) than for girls (58.9 ± 2.9).

4.2 Quality of life of patients depending on age

The analysis of quality of life in various age groups has shown that by criterion of physical functioning the highest rates are noted in subgroup of children of 5–7 years— 60.2 ± 4.4 points (**Table 2**). As a rule, these children have only certain

Aspects of quality of life	Boys n = 34 (M ± σ)	Girls n = 56 (M ± σ)
Physical functioning	66.5 ± 2.3	56.2 ± 3.5
Emotional functioning	61.2 ± 3.3	65.8 ± 3.9
Social functioning	62.1 ± 3.7	50.1 ± 2.9
School functioning	56.7 ± 2.5	65.8 ± 2.4
Psychosocial functioning	61.4 ± 3.6	58.9 ± 2.9
Total scale	61.7 ± 2.3	59.4 ± 3.5

Table 1.
Indicators of quality of life of patients depending on gender sign (in points).

Aspects of quality of life	5–7 years n = 19 (M ± σ)	8–12 years n = 44 (M ± σ)	13–18 years n = 27 (M ± σ)
Physical functioning	60.2 ± 4.4	43.0 ± 3.0	52.6 ± 3.3
Emotional functioning	57.6 ± 5.2	48.3 ± 3.0	50.1 ± 3.2
Social functioning	58.3 ± 6.7	48.2 ± 3.1	40.2 ± 4.0
School functioning	39.2 ± 5.2	45.6 ± 2.0	48.9 ± 2.4
Psychosocial functioning	52.0 ± 4.5	47.3 ± 2.7	46.4 ± 3.0
Total scale	55.0 ± 4.4	47.8 ± 2.6	48.6 ± 3.2

Table 2.
Indicators of quality of life of patients depending on age (in points).

difficulties in performing household chores and lifting heavy objects, and a part of children noted fast development of fatigue. Indicators for children of 8–12 years were the lowest— 43.0 ± 3.0 points, and they pointed to difficulties in performing physical activity at school and in the visited sport sections. It is explained by decrease in number and volume of physical exercises, restriction of participation in sports, and need for restraint during physical activities. In the subgroup of adolescents of 13–18 years, indicators of physical functioning were 52.6 ± 3.3 points, and these patients often pointed to difficulties in overcoming big distances on foot and when running, pain in various parts of the body, and lack of force. On the scale of emotional functioning, high rates also belong to children of 5–7 years— 57.6 ± 5.2 points, and they often pointed to existence of a bad dream and depression of mood in connection with violation of a habitual day regimen. Similar indicators were approximately equal in the second and third subgroups of patients— 48.3 ± 3.0 and 50.1 ± 3.2 points. Respondents often noted fear for the future, and some adolescents aggressively behaved that is caused by high knowledge of the disease and thereof emotional reaction of children of advanced age and adolescents. On the scale of social functioning, children of 5–7 years have the highest rates— 58.3 ± 6.7 points, and they noted difficulties in the period of initial communication with the children who are, as well as themselves, in an antituberculous hospital. Children of 8–12 years pointed that, according to them, other children did not want to be on friendly terms with them and often teased them that has found the reflection on indicators of quality of life in social aspect— 48.2 ± 3.1 points. In adolescents of 13–18 years, the lowest indicators on this scale— 40.2 ± 4.0 points—are noted, and they noted the lameness in comparison with healthy age-mates—development of stigmatization in consciousness of adolescents. The scale indicator “school functioning” has authentically reflected the presence of social and psychological problems of children of the first subgroup suffering from tuberculosis— 39.2 ± 5.2 points. At the age of 5–7 years, children begin to study at school, and there is a change of friends, collective, the mode; information loading that is a stress source. In view of the fact that during this period there was both an inspection and treatment of children concerning a tuberculosis infection; all this, certainly, was expressed in low indicators of school functioning. Children of 8–12 years and adolescents had higher rates on this scale of functioning— 45.6 ± 2.0 and 48.9 ± 2.4 points. These subgroups of patients often skipped classes in connection with weight of the state and also had difficulties in storing of material, which has been presented to their attention. On the total scale of psychosocial functioning, indicators of all subgroups were close to each other, with small advantage in the first subgroup— 52.0 ± 4.5 , 47.3 ± 2.7 , and 46.4 ± 3.0 points. From the results of the total scale of functioning, indicators of patients of the first group prevailed over the others— 55.0 ± 4.4 , 47.8 ± 2.6 , and 48.6 ± 3.2 that testifies to high adaptation opportunities of children of younger school age.

4.3 Quality of life of patients depending on the disease form

Indicators of quality of life in groups of patients depending on the form of a disease are presented in **Table 3**.

The indicator of quality of life considerably differed at various methods of detection of tuberculosis of respiratory organs. On the scale of physical functioning, the highest rates are recorded in the first subgroup—revealed during inspection with the Diaskintest— 65.4 ± 3.7 — and it were patients who have been examined because of identification in family of the adult patient with active tuberculosis. These children and adolescents kept the physical functioning; only in a small part of children, some decrease in physical activity owing to existence of burdening due to the main disease pathology was noted. In subgroup of the patients revealed actively—at recourse for a medical care, indicators of quality of life in aspect of physical functioning the lowest indicators— 55.1 ± 3.1 were that has been connected by existence of extensive process in a pulmonary parenchyma. These children and adolescents often observed bed rest and have been limited to activity within medical office. The subgroup of patients revealed by indicators of a physical state by digital fluorography was equal to average assessment on the scale of a physical state among all examined patients— 60.9 ± 2.2 points (on average 60.5 ± 3.4 points). It demonstrates that the method of digital fluorography has revealed patients both with limited, and with pathology, widespread in a lung, which is reflected in different degree on their physical functioning. Indicators of emotional functioning of the patients revealed by the Diaskintest and digital fluorography have close and rather high rates— 68.1 ± 2.8 and 65.1 ± 3.9 points. In these subgroups of patients, the existence of depression of mood owing to being diagnosed with a chronic disease was noted, many expressed concern about preservation of vigorous activity in the future. Indicators of social functioning of the patients revealed by the Diaskintest and digital fluorography also have rather high rates— 71.4 ± 4.7 and 70.5 ± 3.2 points. At the same time at representatives of the third subgroup—the patients revealed at recourse for a medical care, to a thicket at adolescents with common and destructive forms of tuberculosis, authentically low results— 54.9 ± 3.3 points are observed. In the patients of the third subgroup, the main reasons for decline in quality of life in the social sphere are they had restrictions in communicating with peers because of understanding of the infectious nature of the disease and their possible transmissibility for people around. Life at school for children and adolescents revealed by a test method with the Diaskintest and digital fluorography is broken to a lesser extent (64.8 ± 2.5 and 60.7 ± 1.5 points), than at identification at recourse for a medical care— 54.7 ± 2.9 points. An average value on the scale of school functioning among all three subgroups surveyed was 60.1 ± 3.6 points.

Aspects of quality of life	Diaskintest	Digital fluorography	Recourse for a medical care	All
Physical functioning	65.4 ± 3.7	60.9 ± 2.2	55.1 ± 3.1	60.5 ± 3.4
Emotional functioning	68.1 ± 2.8	65.1 ± 3.9	47.2 ± 3.1	60.1 ± 3.7
Social functioning	71.4 ± 4.7	70.5 ± 3.2	54.9 ± 3.3	65.6 ± 3.1
School functioning	64.8 ± 2.5	60.7 ± 1.5	54.7 ± 2.9	60.1 ± 3.6
Psychosocial functioning	70.1 ± 4.4	68.4 ± 2.6	50.7 ± 2.8	63.1 ± 2.8
Total scale	68 ± 3.7	65.1 ± 3.1	52.5 ± 3.1	61.9 ± 3.3

Table 3. Indicators of quality of life of patients depending on the method of identification (in points).

The received results speak about existence of problems in school, which are often connected with poor progress in such disciplines as mathematics, physics, and chemistry demanding bigger concentration and assiduity. The scale of psychosocial functioning as a result of scales of emotional and social activity has revealed big differences for the children and adolescents revealed at test with the Diaskintest— 70.1 ± 4.4 points and at recourse for a medical care— 50.7 ± 2.8 points that once again is confirmed by results on each of these scales. The average level of quality of life (a total scale) was the lowest at identification at recourse for a medical care— 52.5 ± 3.1 points, the highest—children when carrying out have tests with the Diaskintest and carrying out digital fluorography in groups of the increased risk (68.0 ± 3.7 and 65.1 ± 3.1 points). The general point among all contingent surveyed was on average 61.9 ± 3.3 points.

4.4 Quality of life of patients depending on associated diseases

Indicators of quality of life in groups of patients depending on the form of disease are presented in **Table 4**.

Initial level of quality of life separately in forms of a disease has revealed insignificant distinctions on a total scale— 63.7 ± 2.8 points—in the group of patients with primary forms of tuberculosis of respiratory organs and 59.9 ± 2.7 points for children and adolescents with secondary forms of a disease. However, subjective indicators of physical functioning for patients with primary forms were much higher, than in the second subgroup (67.5 ± 2.1 and 58.2 ± 3.4). It proves that the inflammatory process in respiratory organs is more extensive, it is more difficult for the patient to cope with physical activities in the form of a run or a long walk, and they noted weakness and difficulty in performance of daily household chores more often. Also for children and adolescents with secondary forms of tuberculosis, decrease in number and volume of physical exercises is noted. Indicators of emotional functioning are approximately equal in the first and second subgroup of patients— 63.2 ± 3.7 and 64.8 ± 3.7 that reflect negative influences of a disease on an emotional condition of the patient regardless of the form of tuberculosis of respiratory organs. Children of both subgroups are emotionally unbalanced that is expressed in capriciousness, unwillingness for a long hospital stay, and refusal of medical and diagnostic manipulations. Social functioning in the group of children and adolescents with primary forms of tuberculosis is reliable above similar indicators in the second subgroup— 64.7 ± 2.8 and 51.9 ± 2.4 . This results from the fact that the general condition of patients of the first subgroup clinically does not change considerably; these forms of tuberculosis proceed most often with symptoms that do not influence communication with peers in a group, whereas secondary forms of tuberculosis in children and, especially, in adolescents proceed as clinically expressed that causes the necessity of temporary restriction of the

Aspects of quality of life	Primary forms n = 50 (M ± σ)	Secondary forms n = 40 (M ± σ)
Physical functioning	67.5 ± 2.1	58.2 ± 3.4
Emotional functioning	63.2 ± 3.7	64.8 ± 3.7
Social functioning	64.7 ± 2.8	51.9 ± 2.4
School functioning	51.7 ± 2.9	53.8 ± 1.8
Psychosocial functioning	64.2 ± 2.6	56.3 ± 2.1
Total scale	63.7 ± 2.8	59.9 ± 2.7

Table 4.
Indicators of quality of life of patients depending on the form of disease (in points).

social activity by patients. So, adolescents of the second subgroup, patients with disseminate forms of tuberculosis, are forced to observe a high bed rest that, along with emotional depression, leads to narrowing of communication by other patients within the chamber or with the persons who are looking after them. On the scale of school functioning of reliable differences, it is almost not established— 51.7 ± 2.9 and 53.8 ± 1.8 points. Patients, both in the first and second subgroups, equally often experience difficulties when performing tasks at school and skip classes because of feeling sick or needing medical manipulations. The scale of psychosocial functioning as total scale of emotional and social functioning has revealed authentically high rates of quality of life in the first subgroup of patients, than in the second— 64.2 ± 2.6 and 56.3 ± 2.1 . It is explained by the existence of numerous and ineffective courses of treatment of the anamnesis and by alarm and fear of uncertainty of the future. Children and adolescents of the second subgroup have big degree of consciousness and knowledge of the chronic pathology and realize the need for a continuous intake of medicines in the hospital conditions. It leads to lower indicators of quality of their life in comparison with patients of the first subgroup.

5. Conclusions

1. Influence of a chronic disease on quality of life of children and adolescents had gender specifics: in girls, it was the physical well-being, while for boys, more relevant were problems with functioning in school, first of all.
2. The estimated quality of life for children of 8–12 years and adolescents of 13–18 years is much below than for children of 5–7 years.
3. In group of the children revealed at recourse for medical care indicators of quality of life is lower, than on average among all surveyed.
4. Inspection methods are more extensive and more invasive, especially when decline in quality of life is experienced. According to priority diagnostics on the basis of test with the medicine Diaskintest in comparison with diagnostics at recourse for a medical care is.
5. Secondary forms of tuberculosis, widespread, with existence of destructive changes more influence indicators of physical and social functioning that is also reflected in total scales. The clinical form of the disease significantly does not influence indicators of emotional and school functioning of children and adolescents suffering from tuberculosis in respiratory organs.

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