

# Assessment of quality of life in children after successful treatment of hip dysplasia as compared with normal controls

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## ABSTRACT

**Objective:** To document the quality of life of children who have been treated for developmental dysplasia of the hip (DDH) within the first 3 years of life successfully after a minimum follow-up period of 2 years, and compare their results with healthy age-matched children.

**Methods:** Thirty patients with DDH treated between 1998 and 2002 in Ankara Numune Education and Research Hospital, Ankara, Turkey and 19 age-matched healthy controls were included in this study with the approval of the ethical committee. The mean follow up period was 56.1 months. Each child's parents answered the Child Health Questionnaire-Parent Form 50 (CHQ-PF50) after giving informed consent. The answers were evaluated, and scores were calculated and results were analyzed.

**Results:** There were no significant differences in 14 health-related quality of life concepts, according to the CHQ instrument's outcomes, between the healthy controls and the patients with DDH who were successfully treated within the first 3 years of life. Only the physical functioning concept was found to be lower for the DDH patients (Mann Whitney U test,  $p=0.036$ ).

**Conclusion:** Although children who were successfully treated for DDH may have impairment in physical functioning after a certain period of follow-up, there was no significant impairment in physical and psychosocial summary scores, in comparison with their age-matched controls.

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Treatment methods for developmental dysplasia of the hip (DDH) vary depending on the age of the patients. Nonsurgical methods are generally preferred during the first year of life and several surgical algorithms are described after this age.<sup>1-4</sup> Although there are many reports on the natural history, risk factors, prognostic signs, complications and their management, and follow-up schedules, health-related quality of life measurements have not been a consideration for DDH patients.<sup>5-12</sup> All DDH treatment methods have been developed to improve the quality of life of those it affects. Therefore, quality

of life concepts and quality of life measurement instruments have become increasingly important.<sup>13</sup> The assessment of pediatric health status demands outcome measures specifically designed to reflect the unique needs of the pediatric population.<sup>14</sup> The Child Health Questionnaire (CHQ) is a generic health quality measurement instrument, designed to define the physical and psychosocial well being of children; taking into consideration the 4 weeks preceding the compilation of the questionnaire.<sup>15-17</sup> The aim of this study was to document the quality of life of children who have been treated for DDH within the first 3

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years of life successfully after a minimum follow-up period of 2 years, and compare their results with healthy age-matched children.

**Methods.** Children who were treated for DDH before the age of 3, either surgically or non surgically, with successful clinical results (excellent or good), according to the Barrett's modification of McKay's criteria, with living parents and no additional health problems after a minimum follow-up period of 2 years, were included in this study.<sup>18</sup> Control individuals were children with living parents, no health problems, no prior surgical interventions, and no history of a hospital stay. According to the selection criteria, 30 patients with DDH out of a total of 47 treated between 1998 and 2002 and 19 age-matched healthy controls were selected for this study with the approval of the ethical committee. There were 19 patients, treated by non-surgical, and 11 by surgical methods (**Table 1**). They were recalled and examined clinically, and 2 surgeons reviewed their files. The mean age of all patients at the beginning of the treatment was 10.2 months (between 1 and 35 months). The male to female ratio was 3:7. There were 17 left, 10 right, and 3 bilateral cases. The mean acetabular index was 38.2 degrees (between 32-46 degrees) before the treatment. The mean age at the compilation of the questionnaire was 5.5 years (between 5 and 6 years) for the patients and 5.8 (between 5 and 7 years) for the control group. The improvement in the acetabular indices was analyzed by Mann-Whitney U test and  $p < 0.05$  were considered to be significant. Fourteen patients were treated with a Pavlik Harness. Patients were followed closely for confirmation of hip reduction during the first 2 weeks after the application of the harness by ultrasonography or direct radiographs. Routine follow-up visits were carried out every 2 weeks thereafter. The minimum full time duration of wear of the harness was 3 months. Harness treatment ended when acetabular development was sufficient. Five patients, with a mean age of 8 months, were treated by closed reduction. Adductor releases were performed for 2 children. The interventions were completed under general anesthesia. Hip reduction was confirmed both before and after the hip spica cast application. The cast was applied for 3 months. After then, an abduction brace was worn full time for 1.5 months and an additional 1.5 months as weaning period while sleeping. Eleven patients were treated by surgical methods. Four of these patients had open reduction, 3 needed Salter innominate osteotomy, and for 4 patients, Salter innominate, femoral shortening, and femoral derotation osteotomies were performed. Adductor tenotomies were carried out in 8. The hip

spica plaster casts were applied for 1.5 months and abduction braces were worn full time for an additional 1.5 months. For the weaning period, patients wore the abduction brace for 1.5 months while sleeping. All the parents of the patients and healthy controls were given an informed consent and then were asked to complete the CHQ-Parent Form 50 (CHQ-PF50). They completed the questionnaire in an appropriate room allocated for this study. Fifteen health concepts and physical and psychosocial summary scores were calculated for each test subject. The questionnaire has been cross-culturally adapted and validated for our country as part of a project including 32 countries by the Pediatric Rheumatology International Trials Organization.<sup>16,17</sup> The CHQ-PF50, which includes 50 questions, was used to measure 15 health concepts. Those concepts are global health, physical functioning (PF), role/social, emotional/behavioral limitations, role/social physical limitations, bodily pain discomfort, behavior (BE), global behavior, mental health (MH), self-esteem (SE), general health perception (GH), change in health, emotional impact on the parent, impact on the parent's personal time, limitations in family activities, and family cohesion. Parents were instructed to take into consideration the 4-week period preceding their completion of the questionnaire, except PF, and GH parts. The 50 items were recorded, and the actual scores were transformed into real scores. The Physical Summary Score (PsS) and Psychosocial Summary Score (PhS) were defined. The calculations were carried out according to a coding system specifically designed by the author of the instrument using CHQ.<sup>15</sup> The mean scores of the 15 concepts of the 2 groups were compared by Mann Whitney U test and  $p < 0.05$  were considered to be significant.

**Results.** According to Barrett's modification of McKay's criteria, 21 out of 30 of our patients were defined as clinically excellent and 9 as well. The mean acetabular index was 12.3 degrees, after a mean follow-up period of 56.1 months (between 25 and 71 months), showing the significant improvement radiologically (Mann-Whitney U test,  $p = 0.001$ ). The CHQ results were listed in 2 groups as patients and healthy controls (**Table 2**). There were no significant differences in 14 health-related quality of life concepts, according to the CHQ instrument's outcomes, between the healthy controls and the patients with DDH who were successfully treated within the first 3 years of life. The PsS and PhS scores were equal as well. Only the physical functioning concept was found to be lower for the DDH patients (Mann Whitney U test,  $p = 0.036$ ).

**Table 1** - Acetabular index improvement of the patients included in this study, during follow-up (N = 30).

Treatment method	Number of the patients	Mean age at reduction (months)	Left/Right	Bilateral	Mean follow up period (months)	Mean acetabular index (degrees) Before treatment	Mean acetabular index (degrees) After treatment
Pavlik harness	14	3	6/6	2	65	36.5	14.1
Closed reduction and hip spica cast	5	8	4/1	-	55	34.4	14.8
Open reduction	4	14	3/0	1	55	39	14
Pelvic osteotomy and open reduction	3	18.3	2/1	-	46.6	40.6	12.6
PO and OR and FSDO	4	28.7	2/2	-	34.5	40.5	12

PO - pelvic osteotomy, OR - open reduction, FSDO - femoral shortening and derotational osteotomy. ( Mann Whitney U test,  $P=0.001$ )

**Table 2** - Mean of the scores for Child Health Questionnaire concepts for groups.

Health concepts	Patients n=30	Healthy controls n=19	Difference between the groups
Global health	97.5 ± 2.5	98.1 ± 2.4	NS
Physical functioning	96.7 ± 4.7	99.2 ± 2.2	$p=0.036$
Role/social, emotional/behavioral limitations	98.6 ± 4.2	99.2 ± 3.2	NS
Role/social physical limitations	98.8 ± 4.3	98.2 ± 5.3	NS
Bodily pain discomfort	99.3 ± 2.5	97.8 ± 7.1	NS
Behavior	98.9 ± 2.8	98.6 ± 3.1	NS
Global behavior	98 ± 5.1	97.6 ± 5.6	NS
Mental health	99.1 ± 2.6	98.9 ± 3.5	NS
Self-esteem	98 ± 5.2	97.2 ± 6.5	NS
General health perception	99 ± 2.8	98.2 ± 4.7	NS
Change in health	5	4.8 ± 0.3	NS
Emotional impact on the parent	98.3 ± 3.7	97.5 ± 5.2	NS
Impact on the parent's personal time	96.7 ± 8	97.3 ± 6.5	NS
Limitations in family activities	87.4 ± 19.2	79.4 ± 21	NS
Family cohesion	88.6 ± 16.8	94.7 ± 10.4	NS
Physical summary scoring	57.54 ± 1.8	57.5 ± 2.2	NS
Psychosocial summary score	64.2 ± 1.6	63.9 ± 1.7	NS

NS- not significant

**Discussion.** The long-term goal of the treatment of DDH is an acetabulum and femoral head that are within the normal range of alignment at the completion of skeletal growth. Even though much is known regarding DDH's natural history, risk factors, prognostic signs, complications and their management, and follow-up schedules, there is a lack of knowledge regarding the quality of life of DDH patients. Patients with DDH have historically been treated as early as possible, considering the accepted treatment algorithms.<sup>1,3,12,19</sup> Early hip reductions were reported to be associated with better functional results, less proximal growth disturbances, and fewer degenerative changes.<sup>6,8-10,18</sup> According to our evaluation, there were significant improvements following treatment, in the acetabular index of the patients involved in this study, as well as good clinical results for their hips. Yet, there are several questions that remain unanswered considering the early treatment. Do we expose children to serious

psychosocial problems while we are performing long-term treatment for hip? Does the long-term wearing of a cast and brace make impairment in the quality of life of children with DDH? Do we really improve the quality of life of the DDH patient as we treat them or do we impair them in physical and psychosocial aspects? What is the quality of life of the children with DDH in comparison with their age matched healthy controls after they were treated successfully? As it stands now, we do not have any literary proof to say that we obviously enhance the quality of life of our patients, even if we obtain good clinical results after treatment. Health-related quality of life measurements of patients with DDH have not yet been documented. The sick child and his/her family is a unit. The health status of the child is a pervasive aspect of not only his/her, but also each family member's quality of life. Despite the disease in question, if we are about to treat a child patient, we must realize that in addition

to the patient, we are directly influencing the quality of life of their family as well. From this point of view, doctors should establish that their treatment strategies reach their goals. We have to know and be able to evaluate the outcome of our treatment. Measuring and understanding the everyday functioning and well being of children helps us to be aware of what science has to offer and how to apply it to every day practice.<sup>15</sup> Health status, functional status, and quality of life are 3 concepts, often used interchangeably, to refer to the same domain of "health". The health domain negatively ranges from valued aspects of life, including death, to the more positively valued aspects, such as role function or happiness.<sup>20</sup> Patients are treated to have a better, more functional, and happy life. The CHQ is a generic health quality measurement instrument, which provides reliable information regarding the everyday functioning and well being of children in ways that matter most to them and their families.<sup>15,16</sup> It measures the physical and psychosocial well being of children >5 years of age. It has been cross-culturally adapted and validated for a sort of countries in 2001 and found to be a reliable and valid tool for the functional, physical, and psychosocial assessment of children with juvenile idiopathic arthritis.<sup>17</sup> Currently, CHQ is being used for diverse child populations with various conditions, such as cerebral palsy, pediatric trauma, cystic fibrosis, sinusitis, scoliosis, and other spinal abnormalities, and cancer. For pediatric trauma patients', physical scores were found to be lower than age-matched norms within the 6 months post injury period. For spina bifida patients, the level of disability was inversely related to only the physical aspect of the quality of life of the children. The CHQ has been reported to provide useful information regarding the impact of health status on children and their families over time, thus providing enhancement of the clinical decision-making and treatment process.<sup>15,21-24</sup> Physical functioning, social life limitations due to poor physical health, general health, bodily pain, and the parental impact in time and emotions are taken into consideration while calculating the PhS. The PsS is calculated according to the MH, BE, SE, social life limitations as a result of behavioral and emotional troubles, and parental impact in time and emotions. They represent the general condition of an individual's physical and psychosocial aspects.<sup>15</sup> The ages of our patients and controls were between 5 and 7 years. High success rates were observed in tests of the internal consistency criterion of the CHQ-PF50 scales in this age group of children.<sup>15</sup> Based on the results and analyses of this study, the children with DDH, who were treated successfully within the first 3 years

of life, have limitations in physical functioning in comparison with the age-matched norms. This domain is defined by 6 items questioning the performance of the child during playing soccer, running, riding a bike, getting around the neighborhood, climbing the stairs, walking, bending, lifting and taking care of him/herself. Some of the parents of the DDH patients have answered several of these questions as 'limited a little' or 'limited some'. That's why the average PF scores of the DDH group are lower than the age matched healthy controls. On the other hand, the DDH patients have no limitations in schoolwork or activities with friends as a result of physical health, pain, and emotional or behavioral problems. They are satisfied with their abilities, appearance, family/peer relationships, and life overall. They do not exhibit aggressive, immature, or delinquent BE, and feel peaceful, happy, and calm. They do not limit/interrupt family activities nor are they a source of family tension. The parents believe their child's health is much better now than a year before, and will continue to improve as well. The parents are experiencing no limitations in personal time and no emotional stress due to their child's physical and psychosocial health, and report that family relations are rather good. Therefore, the PsS and PhS of our patients showed no significant impairment in comparison with their age-matched controls to summarize. According to our findings, we can say that for the children with DDH who were treated successfully within the first 3 years of life, long-term wear of cast and brace did not give a rise to impairment in the quality of the life, as measured several years after the treatment. The children were not exposed to permanent physical and psychosocial problems during the long lasting treatment of DDH. Improving the condition of the hip is better for the quality of the life. Although, further studies are needed on larger patient population, with comparison between results of quality of life after different treatment methods in different age groups, this study has been designed to specify the health-related quality of life after successful treatment of DDH within the initial three years of life, with a minimum 2 years follow up period. Therefore, patients were selected on bias to standardize other environmental factors those might potentially influence it. Even the number is small; this paper deals with new outcome measures in DDH for health-related quality of life.

In conclusion, children with DDH who have been successfully treated within the first 3 years of life, may have limitations in some physical activities, however, the overall quality of their life will be as good as their age matched controls.

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