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Effectiveness Of Hydrotherapy On Health-Related Quality Of Life In Children With Juvenile Idiopathic Arthritis: A Randomized Controlled Trial

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Abstract

Background: Juvenile Idiopathic Arthritis (JIA) is a commonly occurring disease in children that cause major functional disabilities [1,2]. This study aims to evaluate the effectiveness of hydrotherapy in improving the health-related quality of life in children affected with juvenile idiopathic arthritis. **Methodology:** Total sixty-three children were recruited in the study; out of which three patients did not fully comply the inclusion criteria, so remaining sixty patients were randomized into experimental (n=30) and control group (n=30) by using systemic sampling. Control group was treated with conventional physical therapy only while experimental group received both conventional physical therapy and hydrotherapy for a duration of six weeks. Child Health Assessment Questionnaire (CHAQ) was used as measurement tool at the baseline and then after six weeks of intervention to evaluate the health-related quality of life in patients. **Results:** After six weeks of interventions, there were statistically significant improvement ($p < 0.001$) in outcome measures of both experimental and control group. But improvement in experimental group was more evident as there was greater reduction in the mean values of outcome measures as compared to control group. **Conclusion:** According to findings of study it was concluded that hydrotherapy has potential to improve health related quality of life in children affected with juvenile idiopathic arthritis.

Key Words: Health-related quality of life, JIA, CHAQ, Randomized controlled trial

INTRODUCTION

Juvenile idiopathic arthritis is a chronic autoimmune inflammatory disease of joints occurs in childhood with symptoms lasts for more than six weeks [3]. It usually occurs in children under the age of ten years with male to female ratio [3:1]. Its clinical features include insidious inflammation of joints with symmetrical involvement of more than one joint of the body. The American College of Rheumatology (ACR) has further classified juvenile idiopathic arthritis into three categories; oligo-articular, poly-articular and systemic onset of JIA [4,5]. In response to increased intra-articular pressure and pain in joints, a number of structural and physiological changes occur in JIA patients.

Disturbed body alignment and secondary changes in gait can be the conseqeuses of disease process. In addition, behavior of child and ability to exercise may also affect [6-10]. According to Bar-Or, JIA affected children have poor fitness and reduced functional capacity. There are two studies in previous literature which described the association of physical fitness with physical independence in JIA patients [11,12]. Focus of present study was on improvement of quality of life by the use of hydrotherapy in children with JIA. According to recent research in treatment of JIA, a multidisciplinary team approach is necessary for successful management of JIA [3,13]. Therapeutic exercises form the basis of the rehabilitation program for children with JIA. Physical therapy program can include all forms of exercises: range of motion exercises, isometric exercises, aquatic exercises and posture training [14,15]. There are three randomized controlled trial studies found in previously published literature describing the benefits of physical therapy in JIA patients [16-18]. In the current study, effects of hydrotherapy are evaluated to explain its importance as a treatment of choice for children with JIA. Immersion and physical activities in warm water had been reported to reduce muscle tone and sensitization to pain thus leading to relaxation and analgesic effects on body [19-22]. But now focus has moved from temperature and immersion to other properties of water (Buoyancy, friction, hydrostatic pressure). During immersion in water medium to high intensity exercise can be possible due to less weight load on lower limbs [23-26]. At the same time activity of many joints is possible in water that leads to decreased treatment time and without exaggerating the condition of affected joints exercise can be modified by using buoyancy and turbulence of water [27]. So, hydrotherapy can be very helpful in molding a positive lifestyle change for JIA patients as it is safer, and physiologically sound [28]. Health related quality of life is the measurement of functional independence and impact of disease on psychosocial life of child [29]. Influence of hydrotherapy on health-related quality of life in JIA affected children is still need to clear. So, this study was conducted to further investigate whether an aquatic training program can improve functional ability and quality of life in JIA children if added to the usual medical care and physical therapy care.

METHODOLOGY

Subjects: With the help of ACR classification criteria, [30] total 63 patients were recruited in this study; out of which three patients has not completely fulfilled the inclusion criteria, so sixty patients were left randomized into experimental group (n=30) and control group (n=30). Conventional physical therapy was given to both of groups while only experimental group received the hydrotherapy treatment.

Inclusion criteria: Children with age ranged from 3 to 16 years, Sign and symptoms of inflammation in one or more joints for a duration of six weeks and more, Exclusion of all other causes of arthritis, Patients who were stable on medication [30].

Exclusion criteria: Patients who did not fulfill the above-mentioned criteria.

Place and duration of study: Children hospital and the institute of child health care, Lahore from September 2013 to November 2013.

Sample size: This was a time-based study and all sixty-three patients were enrolled within three months of study duration.

Randomization: By using systemic sampling (a type of random sampling), all odd ordered patients (1^{st}, 3^{rd}, 5^{th}, etc.) were enrolled in experimental group and all even ordered (2^{nd}, 4^{th}, 6^{th}, etc.) patients were randomized in control group.

Intervention: Conventional physical therapy was given in the form of simple range of motion exercises (assistive and active movements of

limbs), relaxation exercises (slow and rhythmical movements of affected joints) and conditioning exercises (slow and brisk walk), to both experimental and control group. Treatment session was comprised of 8-10 repetitions of each exercise were performed three days a week for six weeks. Experimental group as an aquatic group also received hydrotherapy session one day in a week for six weeks.

Hydrotherapy program guidelines and precautions: Exercises in water were performed with following precautions and guidelines that were authorized by Arthritis Society Consultation and Therapy Services, Hydrotherapy program [31].

- Treatment time was at least for 25 to 30 minutes.
- Pain free movements were allowed only.
- Good posture was advised during exercises.
- Joints to be moved were submerged in water to reduce gravity effect.
- Lower limb exercises performed by holding edge of pool.
- Exercises were modified according to capabilities of each patient.
- Recommended time for each exercise was 5 to 10 minutes [31].

Types of exercises used in this hydrotherapy program:

Warm up exercise: Shoulder circumduction by circling of arms in forward and backward direction, Upper arm inward and outward rotation by extending arms in front of chest while keeping elbows straight then rotating them in and out, Lower arm internal and external rotation by standing on one leg and moving other one in circles, Walking forward with slow speed and arms swinging, Walking backward while keeping correct posture [31].

Range of Motion Exercise: Trunk side bending with hands on side of hip and feet in one place, Trunk rotation side to side while keeping feet slightly apart, Forearm supination and rotation with flexed elbows, Wrists extension and flexion with ninety-degree flexion of elbows, PIP and DIP joints movements by bending and stretching of fingers, Thumb opposition by touching tip of thumb with tips of other fingers one by one, Knee flexion and extension of one leg while standing on other leg, Ankle planter flexion and dorsiflexion by moving feet in upward and downward direction one by one [31].

Strengthening Exercise: Shoulder circles by bringing of arms together in forward and backward direction while keeping elbows straight, Shoulder shrugging by elevation of shoulders to the level of ear lobes holding it for 10 seconds and then relax, Reach and bend by stretching the arms in front of chest holding them for 10 seconds relaxing and then bending and holding of elbows behind back for ten seconds, Leg swinging by raising leg forward slowly up to a comfortable height, holding it there for count of five and then bringing it back to neutral position, Mini squats while holding the pool for balance and keeping feet few inches apart, Heel and toes off by standing on toes and heels alternatively and holding each position for count of five [31].

Conditioning Exercise: Slow walking across the pool, Front crawls in standing under water, Upper chest stroking by moving arms in forward and backward direction as far as possible, marching in place and across of pool, Side step walk around the pool [31].

Cool down Exercise: Arms side rotations in circles, Leg circumduction by moving each foot in outward and inward direction alternatively [31].

Outcome Measures

Child Health Assessment Questionnaire (CHAQ): Health related quality of life in JRA affected children was estimated by using Childhood Health Assessment questionnaire (CHAQ). It is an adaptive form (Parent's version) with proved validity by which estimation about health-related quality of life can be made accurately. Assessment of functional independence was done in eight areas of daily-living activities: Dressing and grooming, Arising,

Eating, Walking, Hygiene, Reach, Grip and Activities [32-35]. and then scoring was done in terms of level of difficulty or assistance required attributed on a scale ranged from 0-3, where; 0=indicates that child was unable to do task,1=indicates that activity was performed with no difficulty, 2=indicates that activity was performed with some difficulty, 3=indicates that activity was performed with much difficulty

So, if more difficulty was facing, higher the score was on scale [35,36]. When aids or some help was required for an activity, additional 1 score was added. The mean of all eight categories scores was calculated in the end [32].

Visual Analogue Scale (VAS): Discomfort or pain was assessed by using this 15 cm visual analogue scale that also included in (CHAQ) [32].

Follow Up: Health related quality of life was assessed at the start of the study and then after six weeks of intervention.

Ethical Issues: There was no ethical issues in this study as all the patients received the usual care and medical treatment.

STATISTICAL DATA ANALYSIS

The data was evaluated by using Statistical Package for Social Science (SPSS) v.23.0 software for window. It analyzed data by using descriptive statistics (frequency, mean ± standard deviation). Independence samples t-test and chi square test were also used to determine the difference in the subject's demographic and clinical features data of both experimental and control group. A paired samples t-test was used to determine the effects of hydrotherapy program in experimental group. A significant level of $p < 0.05$ was used for final evaluation.

Table 1 Comparison of demographic data and clinical features of study groups

Demographic/clinical features	Experimental group n=30	Control group n=30	p - value
Age(years) Mean (SD)	8.03 (3.16)	11.0 (3.29)	0.001
Duration of illness(months) Mean (SD)	17.66 (20.86)	28.63(23.85)	0.036
Age of onset (years) Mean (SD)	6.90 (2.84)	8.83 (3.20)	0.016
No. of joints involved Mean (SD)	11.26 (4.79)	7.06 (5.44)	0.002
JRA subtype no. (%) Oligo-articular Poly-articular	2 (6.7%) 23 (83.3%)	10 (33.3%) 15 50.0%)	0.183
Systemic disease of JIA	3 (10.0%)	5 16.7%)	

Table 1 shows that there was no significant difference in patients age, age of onset and no. of joints involved except duration of illness and JRA subtypes.

Table 2 Comparison of baseline assessment values between experimental (n=30) and control group (n=30)

Experimental group (n=30) Mean (SD)		Control group (n=30) Mean (SD)	p-value
CHAQ (0-3)	2.3273 (0.42596)	2.0222 (0.46681)	0.012
VAS (15cm)	2.0276 (0.33003)	1.8833 (0.33227)	0.084

Table 2 shows that there was no significant difference between baseline assessments of both groups at the start of study

Table 3 Comparison of changes in outcome measures within experimental group and control group

Outcome Measures	Experimental group (n=30)			Control group (n=30)		
	Pre Mean (SD)	Post Mean (SD)	p-value	Pre Mean (SD)	Post Mean (SD)	p-value
CHAQ	2.3273 (0.42596)	0.8384 (0.19419)	0.000	2.0222 (0.46681)	1.5957 (0.35049)	0.000
VAS	2.0267 (0.33002)	0.8200 (0.27089	0.000	1.8833 (0.33227)	0.9767 (0.37110)	0.000

Table 3 shows that there was improvement in outcome measures of both study groups in terms of significant p value, (0.001).

Table 4 Comparison of changes in outcome measures between experimental and control group

Outcome measures	Experimental group (n=30) pre and post Mean (SD)	Control group (n=30) pre and post Mean (SD)	p- value
CHAQ (0-3)	1.47900 (0.43237)	0.42650 (0.28491)	0.000
VAS (15cm)	1.20667 (0.27029)	0.90667 (0.22733)	0.000

Table 4 shows that in experimental group difference in mean (SD) was more than that of control group indicating greater reduction of score on CHAQ scale so the more improvement than control group after six weeks of intervention.

RESULTS

A total of sixty children with JIA were enrolled in this study and then randomized in experimental and control group with thirty children in each group. In the experimental group, there were 25 children with poly-articular JIA, 2 with oligo-articular and three with systemic disease of JIA. In control group, 15 children were with poly-articular JIA, 10 with oligo-articular and five were with systemic disease of JIA. In experimental group, the mean age was 8 years (SD 3.16; range 3-14 years) and in control group mean age was 11 years (SD 3.29; range 3-16 years). The mean duration of illness in experimental group was 17.66 months (SD 20.86; range 6-84 months) and 28.26 months (SD 23.86; range 6-96 months) was in control group. The mean age of onset of disease was 10 years (SD 2.84; range 2-11 years) in experimental group and 9 years (SD 3.21; range 3-14 years) in control group. The statistical analysis demonstrated no significant differences in demographic and clinical findings of both groups except duration of illness that showed some difference between the groups. There was also no statistically significant difference in outcome measures of both groups at the start of study but after six weeks of intervention, statistically significant improvement ($p < 0.001$) was found in outcome measures of both experimental and control group. But the mean value of outcome measures of experimental group was less than that of control group and it signifies more improvement in patients of experimental group at the end of study.

DISCUSSION

The main objective of this study was to assess the effectiveness of hydrotherapy on health-related quality of life in children with JIA, as these children have less mobility and encounter many hazards in performing functions of daily living [37]. In this study it was claimed that hydrotherapy may improve quality of life in JIA affected children and proved that claim by showing

significant improvement in health-related quality of life of JIA patients in experimental group as compared to control group. As in a study it was demonstrated that a reduction of 0.13 score on CHAQ scale can be labeled as significant improvement [38], and according to my study results, the mean score on CHAQ scale was reduced by 1.479 in experimental group as compared to 0.42650 reduction in mean score of control group. Although there was also improvement in quality-of-life children in control group but less as compared to experimental group. Pain relief was almost same in both of study groups. There was no worsening of symptoms in either group during study and all the patients that were enrolled in this study followed their respective plan of treatment. Duration, repetitions and mode of treatment were modified according to age of patient, disease severity and comfort of child. So, there was no ethical violation during the conduction of this study. There were a number of patients and parents who had difficulty in reading and writing in that case CHAQ was filled simply by asking questions from that questionnaire.

There were two studies available in previously published literature that assessed health related quality of life for effectiveness of hydrotherapy. Epps et al. conducted a controlled randomized study on JRA affected children to estimate effects of hydrotherapy treatment on outcome of that disease, health related quality of life and cost effectiveness of combined hydrotherapy and land-based exercise program. According to that study there was no statistical or clinically significant difference found between study groups except improvement in health-related quality of life of participants of experimental group who received a combination of hydrotherapy and land-based exercises [16]. In another controlled randomized study by Takken et al. patients in experimental group received hydrotherapy aerobic exercise program one day a week for duration 20 weeks of study, assessment was made at the initiation and after 20 weeks of treatment. According to their study results no significant improvements in number of affected joints, function or health related quality of life were reported [39]. The results of my study are consistent with randomized controlled study conducted by Epps et al [16]. that hydrotherapy is effective in improving quality of life outcomes in children with JRA as an additional method of treatment.

The positive aspects of this current study are the use of randomized controlled study design, valid outcome measures and adequate sample size. There were also limitations in my study as patients and their parents had to come for weekly hydrotherapy sessions in hospital from distant areas. Other limitation was that each child was treated individually rather than in group.

CONCLUSION

According to this study results, hydrotherapy has potential to improve health related quality of life in JRA affected children. So, it is concluded that hydrotherapy is an effective form of treatment for JRA patients and it should be suggested as a part of treatment in JRA along with conventional physical therapy and usual medical care.

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