Comparison of Eight Weeks Sub Maximal Aerobic Exercises During Dialysis on Calcium Level and Life Quality of Hemodialysis Patients in Bojnurd

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ABSTRACT
Reason for doing this study is analyzing the effect of eight weeks aerobic exercises under maximum while being dialyzed on their phosphorous serum, calcium, hemoglobin, blood pressure and the life quality of hemodialyzed patients in Bojnurd. The sample study were 20 patients who suffer from kidney malfunctions (10 of them in experimental group and 10 in control group) of hemodialyzed patients after receiving their written agreement. Mean and Standard deviation of the age of experimental group were 31.1± 9.5 and observational group 35.1±4.5, height of experimental group 1.60± 12.5 and observational group 1.64±9.4, weight of experimental group 55.60± 16.6 and observational group 60.5±11.5 kilograms. A dialyzed background for experimental group was ±30.94, 49.4 and for observational group was ±35.5, 40.8. All of them were kidney malfunctioning patients. They didn’t have any heart-vascular and diabetes and their medicine dosage were unchangeable during eight weeks exercise. On the first day of aerobic exercise they had blood checkup and fill out questionnaire. They were working with mini-bikes for eight weeks. They had three sessions a week and each one 30 minutes exercise and the intensity of each one was 95%. After eight weeks they had blood checkup again and fill out SF-36 quality life questionnaire. After collecting and giving data to SPSS 16 software, raw data were analyzed. After confirming the data distribution is normal using the KOLMOGEROF-SMERINOF, then related and independent T-student test was taken to analyze the changes intra-groups and inter-group. Results of this study showed that there is no significant difference between hemoglobin, blood diastolic pressure, blood phosphorous level and life quality (general health, role playing limitation because of physical reason and pain) of kidney malfunctioning patients but it was a significant difference between calcium, blood systolic pressure results and life quality with physical function under scale. But despite the average difference in mental aspect, statistically the difference of this aspect is not significant.

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INTRODUCTION

Chronic renal failure is one of the most common diseases that affect many people every year. If these chronic diseases like diabetes and high blood pressure are not controlled properly, they could lead to renal failure. Disease progression and patient outcome largely depends on the underlying control. Even most of kidney patients follow this procedure but they get to final levels of their kidney disease and then they need alternative solutions like dialysis. These conditions can affect most of personal and social aspect of their lives such as physical activities, occupation, life quality and etc. [1]. On the other hand sport and movement is the base of human life and health is one of important basics of each person and sport is the factor that keeps it [2].

Chronic renal failure is one of those that not only affect physical health but endanger other aspects of health. Right now, if these patients cannot receive a kidney, they use modern method like hemodialysis to prevent imminent death but at the same time they get involved in wide range of problems such as physical, mental, economical and social that generally affect their lives.

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Some of kidney activities in body are waste disposal, accurate liquid and chemical compound adjustment, secrete some hormones and activate vitamin D. But when %95 of kidney tissue get affected, poison collecting in body reach the level that without dialysis or kidney transplant living could not be possible. [17]

Hemodialysis has two kinds of side effects some of them are during it is happening such as Hypotension, muscle cramps, nausea and vomiting, headache, chest pain, skin itching and dry skin and some long term side effects which known as Uremic syndrome and it involve Motor neuropathy, Skeletal muscle myopathy or cardiac, Peripheral vascular changes (the overall increase in vascular resistance), Anemia (loss of erythropoietin products), Inefficiency of bone metabolism, Somatic varied complaints, Unconsciousness, fatigue, Depression and anxiety. Some other symptoms of Uremic syndrome are decreased physical work capacity by about 50 percent in compare to healthy people at same age and gender, decrease life quality, Cardiovascular disease including ventricular hypertrophy, Congestive Heart Failure, Coronary artery disease and hypertension. [18].

Most of Hemodialysis patients have inactive life style. Significantly they are in lower level of physical strength than the normal population. Low levels of physical endurance in patients with chronic renal failure are an important factor of health-related quality of life and even affect the level of death in statistic. Wide limits of muscle strength in patients with chronic renal failure and dialysis treatment is identified which is the inevitable side effect in these patients [10]. These are some of the restrictions on the exercise threshold, reduced physical capacity and increased functional disability that we can mention. Generally the appearance of chronic renal failure and doing therapeutic procedures such as hemodialysis leads to lifestyle changes and health status of the patient and not only physical health but also endanger other aspects of health that affect life quality of the patient [10].

In today’s world, it is important to improve the quality of life. Quality of life is the gap between expectations and experiences of people from life. Typically, patients with similar clinical conditions report different life quality. So assessment of life quality helps medical team to understand the patients' perceptions of health and ability to function and sense of well being and consider methods for improving patients’ life quality. Several studies showed that exercise during dialysis can improve quality of life in hemodialysis patients. According to Nonoyama and et al, the mean of physical and mental quality of life in hemodialysis patients after 3 months of exercise training, respectively from 28/8 and 52/1 changed to 31.8 and 53.7 [11].

Henrique and et al showed that aerobic exercise can improves physical capacity and reduce blood pressure and improve quality of life of Hemodialysis patients. Physical exercises as an alternative treatment in hemodialysis patients can lead to health, mental and social beneficial effects and become a way to maintain independent functioning and physical endurance to improve the quality of life of the patient not only personal benefits. It could also have social benefits such as reducing the costs of health and social care [10]. Although the frequency of renal replacement therapies vary in different geographical areas but it is the method that is used in most hemodialysis patients.

Despite doing dialysis regularly for replacement in some renal disorders, in hemodialysis patients that suffer from some uremic syndrome it is shown that doing physical exercises can reduce these symptoms and their death [12].

Providing motivation to perform exercise in hemodialysis patients is facing many problems such as the low quality of life and physical ability. Many researchers have tried a lot of efforts to increase the adoption of physical activity to do exercise training during dialysis, it means when the patient is immobile or watching television. From the physiological viewpoint, doing exercises during dialysis with the increase in muscle blood flow and increased capillary opening can lead to increased output of urea and other toxins from the tissues into the vascular system and then dispose of the dialysis. In the few studies Beneficial effects of exercise during dialysis shown in a onetime exercise or on a long-term exercise or sports programs to measure the effectiveness of dialysis (kt/v). In other limited studies, effects of intradialytic exercise on the excretion of phosphorus was studied. It is shown in one of these studies that intradialytic exercise significantly increased the excretion of phosphorus weekly although in none of these studies decrease in serum phosphorus was not statistically significant.

Considering the beneficial effects of exercise on blood pressure control its effect on blood pressure was studied during dialysis which in some patients, a significant decrease in blood pressure was observed and in other cases, there were no significant changes in blood pressure.

Previous studies on the effect of intradialytic exercise on various variables such as serum phosphorus levels, blood pressure, hemoglobin, quality of life that are examined simultaneously are so limited. It should be mentioned generally incidence of chronic renal failure and therapeutic procedures such as hemodialysis resulted in a change in lifestyle and health status of the person and not only physical health but also jeopardizes other health aspect that all these factors affect the patient's quality of life.

In this study the effects of exercise during hemodialysis on dialysis efficacy, levels of calcium and phosphorus-lowering drugs, hypertension and antihypertensive drugs and anemia in hemodialysis patients and also the effects of exercise on quality of life before and after an 8-week training program was evaluated. Now, according to mentioned cases, researcher is looking to find an answer of this question; Does 8 weeks of
submaximal aerobic exercise during hemodialysis on calcium level of dialysis patients has effects on Bojnurd patients or not? And also what kinds of effects 8 weeks of submaximal aerobic exercise during hemodialysis have on life quality of Bojnurd patients? So we could maybe take a small step to identify effectively and resolve problems of those patients during dialysis and via presenting results of this study to these patients we can effectively help them and reduce and prevent their problems.

**Methodology:**

This is a Quasi-experimental research with pretest – posttest with experimental and control group. Eight-week break without doing exercise was given to control group and eight weeks aerobic exercises was given to experimental group. Blood samples were collected in the laboratory by expert and questionnaires were completed in two stages. The statistic population of the study, were all patients on hemodialysis in Bojnurd which the arrangements was made by the researcher with the Department of Hospital and chief technical officer and head nurse of hemodialysis ward. Of the 70 hemodialysis patients, 40 individuals participated in the study voluntarily and with full consent.

Forty patients who were eligible for the study were selected and were divided in two groups; an experimental group who participated in exercises and a control group. Sampling was selectively targeted. According to diagnosis of physicians in dialysis ward of Bojnurd Emam Ali Hospital, among the candidates according to the entrance criteria, subjects were selected.

**Entrance criteria:**

- The subjects were all patients with kidney failure and their age range is between 17-40 years old
- The subjects did not have any heart problems and diabetes.
- The subjects consumed medications during the training period is fixed
- Having written and personal consent
- Participants were approved by the physician for training courses

In order to obtain the informed consent of individuals to participate in this research, participants were asked to attend in an introduction session. This session was held two weeks before starting aerobic exercises in Bojnurd Emam Ali Hospital. Participants were fully justified about how to perform exercises correctly and the number of repetitions and duration of exercise.

In a mentioned meeting a day before starting exercising period participants were justified about necessary nutritional care, limitations in physical activity, time of testing session, getting enough sleep the night before the experiment and important points also were reviewed and at the end members stated their oral and written consent of the subjects (see Appendix 2) to participate in this study.

**Tools and Data collecting:**

Consent form to participate in the study (Appendix 5)
Preparation questionnaire restarting physical activity PAR-Q & YOU (Appendix 7)
General Health Standard Questionnaire (Appendix 6)
Life quality Standard Questionnaire (Appendix 9)
Tape meter with an accuracy of one centimeter, Fisco brand, made in China
A scale with an accuracy of 100 grams, Rohs brand, made in China
Special Kit for measuring the blood CBC with cell counting of Sismex kx_21 made in Japan
Special Kit for measuring blood calcium and phosphorous with auto-analyzer of Biolise 24i, made in Japan
Laboratory Mini-bike 5, made in Japan

After collecting data and giving them to SPSS-16 software, raw data were analyzed in a way that to calculate indexes of central tendency and dispersion and drawing of plot graphs of the variables in descriptive statistics. After confirming normal distribution of data using Kolmogorov-Smirnov test, to investigate comparisons of variation within the group and between-group, respectively we used T-student related and independent method. Test theories with significant level of $P<0.05$ were tested.

**Study findings:**

Data collected were raw numbers and by using statistic we make them meaningful to help reaching goals of study. Data analysis is a part of process of scientific research and one of the main pillars of each study which by using that all study activities are controlled until reaching a result.

Subjects’ specifications are containing these. The study includes 20 patients in Bojnurd who suffer chronic renal failure and regularly they are getting dialysis three times a week as outpatient in Bojnurd Emam Ali hospital. Study samples had 6-120 months background of getting dialysis. Twenty of hemodialysis patients were divided in two groups (each one 10) and first group were practiced in Sub maximal aerobic exercise that were experimental group and Second group that was control group were practiced without aerobic exercises.
Study findings of descriptive data showed that mean and standard deviation of age of experimental group are 31.6000±8.7 and mean and standard deviation of age of control group are 35.1000±4.5 and mean and standard deviation of height of experimental group are 1.6080±1.2 and mean and standard deviation of height of control group are 1.6460±9.4 and mean and standard deviation of weight of experimental group are 31.6000±8.7 and mean and standard deviation of weight of control group are 30.9600±12.6.

Information about the mean and standard deviation of calcium before and after 8 weeks submaximal aerobic exercise in Table 1-1 and Normal distribution of the data is presented in Table 2.1.

Table 1-1: Data of mean and standard deviation of study variables including before and after 8 weeks submaximal aerobic exercise.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Post test</th>
<th>Pretest</th>
<th>Groups</th>
<th>Calcium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation +Mean</td>
<td>9.68±1.06</td>
<td>8.86±1.15</td>
<td>Control</td>
<td></td>
</tr>
<tr>
<td>Standard deviation +Mean</td>
<td>9.47±1.00</td>
<td>8.61±1.37</td>
<td>Experimental</td>
<td></td>
</tr>
</tbody>
</table>

Before each test first we test data of being normal using Kolmogorov-Smirnov test and results are:

Table 1-2: Data normal distribution (Kolmogorov-Smirnov).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Post test</th>
<th>Pretest</th>
<th>Groups</th>
<th>Calcium</th>
</tr>
</thead>
<tbody>
<tr>
<td>p-value</td>
<td>0.328</td>
<td>0.545</td>
<td>Control</td>
<td>Calcium</td>
</tr>
<tr>
<td>z</td>
<td>1.00</td>
<td>0.928</td>
<td>Control</td>
<td>Calcium</td>
</tr>
<tr>
<td>Z</td>
<td>0.674</td>
<td>0.806</td>
<td>Control</td>
<td>Calcium</td>
</tr>
</tbody>
</table>

With respect to p-value that obtained and all of them are bigger than .05, Normal distribution assumption is accepted.

Based on results of table 1-3, there is no significant difference between levels before and after calcium level in experimental group and 8 weeks submaximal exercise has no effect on calcium level of dialysis patients.

Table 1-3: Levels before and after calcium in Experimental group.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Changes within group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant level</td>
<td>F value</td>
</tr>
<tr>
<td>0.933</td>
<td>0.681</td>
</tr>
<tr>
<td>0.933</td>
<td>0.46857</td>
</tr>
</tbody>
</table>

Table 1-4: Results of within group changes the effect of 8 weeks exercise of maximal aerobic on calcium level in pretest post test of two groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Changes within group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant level</td>
<td>Freedom degree</td>
</tr>
<tr>
<td>0.015</td>
<td>9</td>
</tr>
<tr>
<td>0.055</td>
<td>9</td>
</tr>
</tbody>
</table>

Considering significant level of calcium change that is 0.015 and that it is less than 0.055, It can be concluded that doing exercises had effect on calcium level.

Considering the results in Table 1-5, there is a significant difference (p>0.05) between levels before and after calcium in experimental group and 8 weeks submaximal exercise had effect on calcium level of dialysis patient.

Table 1-5: Comparison between groups of life quality (life quality, general health, physical function, role limitations due to physical health, pain and fatigue) in two groups chronic renal failure in Bojnurd Emam Ali Hospital.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Life quality aspect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant Level</td>
<td>F</td>
</tr>
<tr>
<td>0.000</td>
<td>30.960</td>
</tr>
<tr>
<td>0.611</td>
<td>0.268</td>
</tr>
<tr>
<td>0.022</td>
<td>6.268</td>
</tr>
<tr>
<td>0.737</td>
<td>0.316</td>
</tr>
<tr>
<td>0.647</td>
<td>0.217</td>
</tr>
<tr>
<td>0.225</td>
<td>1.579</td>
</tr>
</tbody>
</table>

Discussion:
Calcium data and findings analysis:

The result of this study showed a significant difference of calcium between two groups of chronic renal failure (p≥0.05). Considering results of theories related to calcium that shows calcium mean, it can be concluded submaximal aerobic exercise effect on blood factors of chronic renal failure and it is consistent with the findings
of most researchers. It is based on 8 weeks submaximal aerobic exercise can improve calcium level and these results are not consistent with RIAHI study findings. And increase and changes in blood factors are related to: time, integration activity, outside condition like degree of readiness and the health of people. So if we have more activity in a longer time it can make more changes it needs to be mentioned that the researcher did not observe any changes on blood factors after 8 weeks of regular aerobic exercise on chronic renal failure so they decided to continue the exercise for 4 more weeks and after this 3 months submaximal aerobic exercise saw a significant difference on blood factors that was consistent with findings of Qafourifard and Gaeini.

It has a long history that knowledge of exercise and physical activity can improve patients’ health. Geshtel believes that for two main reasons people need fitness programs, first exercising and doing physical activities regularly can increase the efficiency and health of the cardiovascular system and muscle, second fitness increase human capacity to benefit fully from the benefits of living. Individual fitness is a fundamental issue, which is vital to ensuring the health and wellbeing of the population and society. Increase the efficiency of the body cannot be obtained except through physical education and physical activity from any other training program and physical education should be an integral part of the education program.

The present results show a significant difference in the quality of life and subscales (physical functioning, general health, role limitations due to physical and social performance) were observed between two groups of active and inactive patients. \((p\leq0.05)\) Burgner believes that main criteria for the meaning of life are: symptoms, functional status, social functioning, fatigue, pain, and emotional status and cognition, sleep, rest, energy and vitality, health and consensual understanding of living. A large number of researchers have expressed physical, mental, psychological and social dimensions as the concept of quality of life. So the life quality concept is a general and ambiguous sense that is made of physical, mental, spiritual and social dimensions. Nowadays the quality of life assessment to measure the impact of disease and treatment for an individual's life is seen as a major and important element. Considering that in inactive group null theory is confirmed and in active group null theory is rejected, confirming null theory in an active group is depending on the impact of independent variables on the dependent variable. So regular exercise for improving the health and quality of life subscales (physical functioning, general health, role limitations due to physical and social performance) affect on employees’ life. This finding fits with research on various aspects of quality of life in Iran has been done at irregular intervals. According to our research and investigation, a limited number of studies have written on the quality of life in Iran. In study of Abdollahpour and et al they investigate the factors affecting the life quality of government staff in Boukan and the results showed that the average of the four domains of quality of life (physical, psychological, social and environmental) of Boukan government staff are respectively 66.9, 61.64, 67.8 and 51.5. Main factors in each domain were; educational level, having disease in physical dimension, employment status in mental health, State of residence, marital status and number of years employed in the environmental health and social well-being.

**Conclusion:**

Eight weeks of regular aerobic exercise in the fitness level (3 sessions per week, each session lasting 30 minutes) can improve improved hematologic parameters (calcium) and it also improves the quality of life subscales (quality of life, general health, physical functioning, role limitations due to physical limitations, pain and fatigue) of the patients. It is recommended to analyze the exercise at different intensities and periods of acute and chronic renal failure patients so maybe it can lead to more results.

**REFERENCES**


