Original Article

Effect of home-based exercise on functional ability of hemodialysis patients: a systematic review and meta-analysis

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Abstract

Background and purpose: Hemodialysis patients suffer from impaired functional ability. Several pilot studies have been conducted concerning the effect of home-based exercise on functional ability of hemodialysis patients; however, there have been observed some contradictions between the results of these studies. The aim of this study was, therefore, to determine the effects of home-based exercise on functional ability of hemodialysis patients using meta-analysis.

Methods: In this review study, for the purpose of finding studies published electronically form 2000 to 2016, the papers published in journals indexed in the databases of "PubMed, Science Direct, Google Scholar" were used. Also, to analyze the full text of these articles, Stata Software Version 11 was used. Heterogeneity index between the studies was determined using Cochran (Q) c and I2 tests. Since heterogeneity was observed between the studies, a random effect model was used to estimate the mean score of the standardized difference of a 6-minute walk test in order to measure the functional ability of hemodialysis patients in two experimental and comparison groups.

Results: Four articles were finally selected in this meta-analysis. 68 patients were in the experimental group and 65 were in the control group. After the intervention, the mean score of the standardized difference of a 6-minute walk test in the experimental group with a confidence interval of 95% was 0.21 (-0.15, 0.57) units more than before the intervention, which was statistically not significant.

Conclusion: The results of the meta-analysis showed that home-based exercise increased the functional ability of hemodialysis patients although this effect was not significant.

***Keywords*:** Hemodialysis; Functional ability; Exercise

Citation: Shafipour V, Hatef M, Behboodi M, Esmaeili R, **Moosazadeh M.** Effect of home-based exercise on functional ability of hemodialysis patients: a systematic review and meta-analysis. Iran J Health Sci. 2017; 5 (2):42-53.

1. Introduction

Chronic renal diseases are among the major public health problems worldwide. Hemodialysis is the most common treatment for patients with acute and chronic renal failure (1). In 2013, there were about 2 million people with end stage of renal disease (ESRD) in the world and more than 650,000 people in the United States of America (2). Although hemodialysis can lengthen the patient's lifespan, it is difficult to control the progression of the disease; the complications and problems caused by this disease are a global concern (3). Some of these complications include hypertension, anemia, painful muscle contractions, dysrhythmia, bleeding, air embolism, digestive disorders, etc. (4-8). Patients undergoing hemodialysis, regardless of age, suffer from impaired functional ability (9-11). This disorder causes disability, dependency in daily activities, loss of job, increased risk of hospitalization and mortality (12, 13). In addition to controlling some of these side effects, exercise can reduce mortality, improve physical activities, decrease depression, and improve the quality of life in patients (14-17). Despite the significant impact of exercise on hemodialysis patients, these patients are inactive and have reduced physical activity and function (18, 19). Unawareness of the benefits of exercise, fear of injury, experience of disability, low power to exercise, lack of motivation, lack of sports facilities and lack of financial support are some of the reasons which decrease levels of mobility and exercise in hemodialysis patients (20-23). Various problems caused by physical inactivity have some effects on various aspects of lives of patients undergoing hemodialysis. Owing to the long-term hemodialysis treatment, these patients must change their lifestyles so as to control and manage their diseases more effectively. Several pilot studies have been conducted on the effect of home exercise on functional ability of hemodialysis patients; however, there have been some contradictions between their results. These contradictions cause some uncertainties about the effect of home exercise on increasing the functional ability of hemodialysis patients. These contradictions can be resolved using the existing study methods. Meta-analysis is one of these studies that can, by combining the results of earlier studies, provide a general estimate of the care. Therefore, the aim of this study was to determine the effect of home exercise on functional ability of hemodialysis patients using meta-analysis.

2. Method

Search strategy: In this study, to find Clinical trials studies published electronically up to 2016, papers published in journals indexed in Science Direct PubMed, Google Scholar and Cochrane databases were used. Keywords “hemodialysis, 6MWt, home base exercise and functional ability” along with operators “or/and” were used in the titles and abstracts of the studies. To increase the sensitivity, the list of references was also examined. The search was conducted by two researchers independently, and a third scholar examined and confirmed the results found by these two researchers. The search was conducted from June, 24 to July, 25.

Study Selection: Full texts or abstracts of all papers, documents and reports examined using the advanced search were extracted. After

removing duplicates, irrelevant articles were also excluded when examining the title, abstract and full text of the articles. It should be noted that to prevent bias caused by the reprint (transverse and longitudinal publication bias), the findings were examined so as to identify and remove duplicates.

Quality assessment: Two authors (A.B and M.M) evaluated the quality of the included trials. The quality of included trials was assessed using the Jadad Score. The Jadad Scale is a 5-point scale for measuring the quality of randomized trials. A score of three points or more indicates high quality (24, 25). The Jadad Scale includes how generation of random sequence is described (0 = no description; 1 = inadequate description; 2 = adequate description); how the blinding is carried out (2 = double-blinding with adequate description; 1 = double-blinding with inadequate description; 0 = wrong usage of double-blinding), and why and how often withdrawal of patients happens (When the numbers and reasons of withdrawal and exit of patients were reported, 1 was recorded. Otherwise, 0 was recorded). Two reviewers independently evaluated the studies. In the event of disagreement, further discussion and consultation were undertaken involving a third-party opinion.

Data Extraction: In each of the initial studies, data was extracted based on the title, the name of the corresponding author, year of publication, name of the country, the sample size in the intervention and control groups, average age, duration of exercise, time spent on each exercise, type of exercise in the experimental groups, type of intervention in the control group, the number of men and women participating in both groups, mean score of a 6-minute walking test and standard deviation in both groups.

Inclusion criteria: After the steps of evaluation process and after obtaining necessary scores, the studies with the following criteria were included in the study: The intervention type of study was home exercise, the population of hemodialysis patients was over 18, the type of consequence was functional ability, the type of study was intervention, and their language was English. Moreover, the studies reporting sample size, mean and standard deviation of a 6-minute walking test in the intervention and control groups were included.

Exclusion criteria: The studies which did not use a 6-minute walking test to assess the functional ability of patients, studies with unclear sample size, abstracts (without full texts) related to congresses and conferences, case studies and studies which did not obtain the minimum score of the quality assessment were excluded.

Analysis: To analyze the collected data, Stata Software version 11 was used. Heterogeneity index between the studies was also determined using Cochran (Q) and I2. Since heterogeneity was observed, a random effect model was used to estimate the mean score of the standardized difference of a 6-minute walking test. It should be noted that the inverse variance method and Cohen statistics were used as the estimation method. To assess the functional ability of the hemodialysis patients (with confidence interval of 95%), the point estimate of the standardized difference of mean score of a 6-minute walking test was also calculated in the forest plots. In

these plots, square size showed the weight of every study, and lines in both sides of the square showed the confidence interval of 95%. At the same time, the egger test was used to examine the publication bias, while in the present study, ρ value of less than 0.01 was considered as significant.

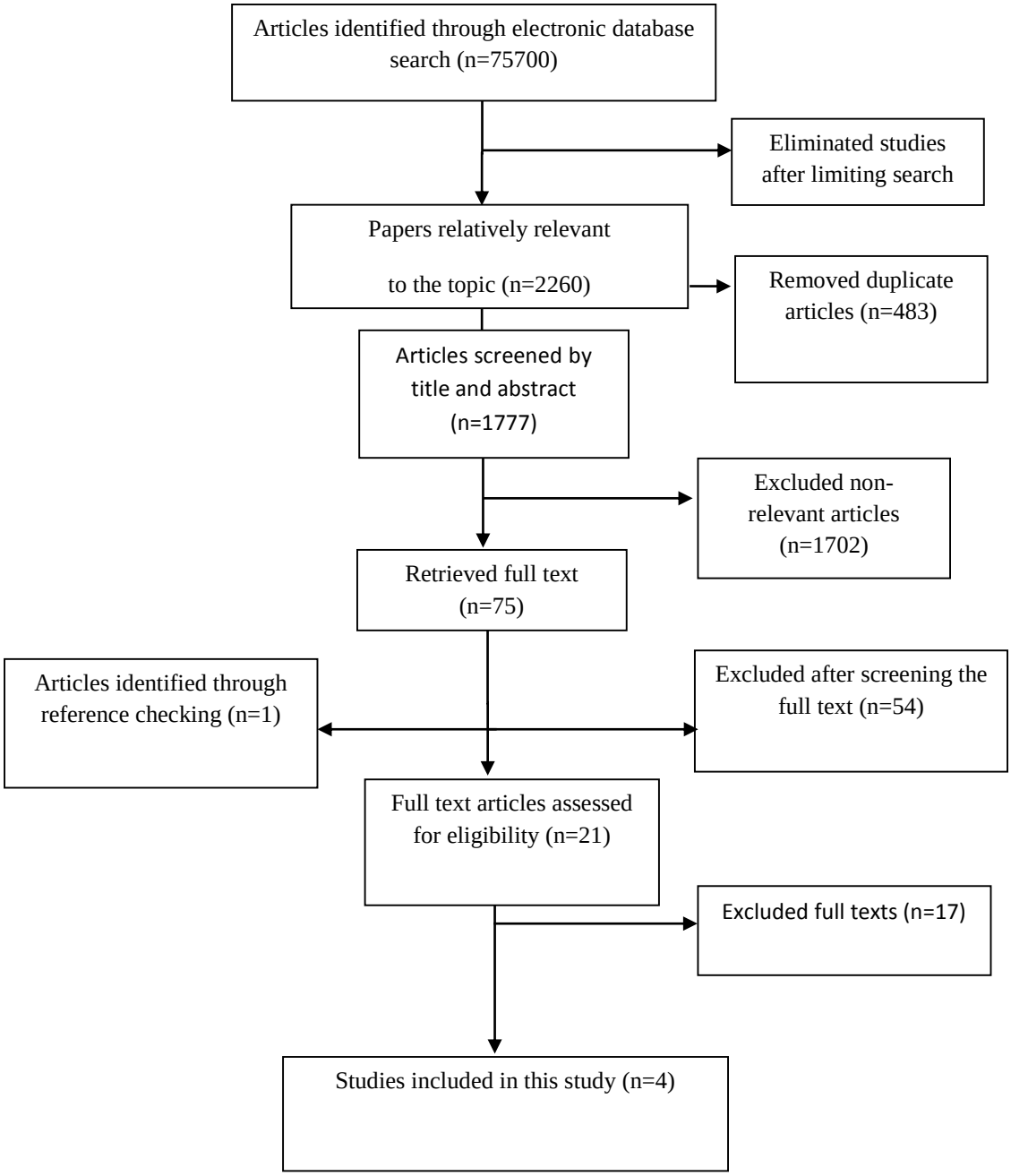

Figure 1. Literature search and review flowchart for the selection of primary studies

3. Results

In the current study, after searching different databases, 75700 articles were found; however, after limiting the search strategy, 73440 were excluded. Of the remaining 2260 articles, 483 were deleted due to the overlap of databases. After examining the titles and abstracts of the other 1777 articles, 1702 unrelated documents were also excluded. Hence, after the full texts of 75 articles were selected, 54 cases were found to be unrelated. After the references were examined, one article was found. The remaining 21 cases were then controlled by Jadad quality assessment checklist and inclusion and exclusion criteria, which resulted in the exclusion of 17 other cases. It should be noted that two of the articles were excluded because of their Arabic and Turkish language of publication. Finally, four studies were included in the process of systematic review and meta-analysis, as shown in Figure 1. These studies examined the effect of home exercise on functional ability of hemodialysis patients. The sample of the initial studies included 68 patients in the intervention group and 65 patients in the control group. Means and standard deviations were all reported in these studies. In the present research, the collected papers were examined in terms of the author's name, year of publication, country of study, and the type of exercise at home in both intervention and control groups (Table 1). In the intervention group, the patients walked at home, while the patients in the control group exercised during dialysis and under the supervision of the supervisor, or they received usual medical and nursing care. The duration of exercise was 6 months in all four studies. The age range of participants in these studies was 52-62 years, as shown in Table 2. By combining the results of these four studies, the mean score of the standardized difference of 6-minute walking test to measure the functional ability of the dialysis patients (with 95% CI (-0.10, 0.58)) was 0.24 units higher after the intervention than before the intervention; however, the difference was not statistically significant. The heterogeneity index between the studies was also zero (I-squared: 0%, Q = 1.2, P = 0.763). In the control group, the mean score of the standardized difference of 6-minute walking test with 95% CI (-0.25, 1.23) was 0.49 units higher after the intervention than before the intervention, although the difference was not statistically significant. The heterogeneity index between the initial studies was also high in the control group (I-squared: 72.3%, Q=10.8, P=0.013). After the intervention, the mean score of the standardized difference of 6-minute walking test with 95% CI (-0.95, 0.61) was -0.17 units lower in the experimental group than in the control group, which was not statistically significant, as shown in Table 3. At the same time, the heterogeneity index was high (I-squared: 76.7%, Q=12.9, P=0.005). In one of the initial studies included in this meta-analysis (a study by Massimo Bulckaen), the patients in the intervention group walked at home, and the patients in the control group walked at home and worked out in the gym (for two sessions) under the supervision of a coach. Working out in the gym included walking on a treadmill and exercising on the upper part of the back using ergometer. Thus, the intervention and supervision in the control group in this study was different from other studies. Therefore, in the second

stage of meta-analysis, this study was excluded, and the results of three other studies were combined using the meta-analysis. By combining the results of three studies, the mean score of the standardized difference of a 6-minute walking test (95% CI (-0.15, 0.57) was 0.21 units higher in the intervention group after the intervention than before the intervention, which was not statistically significant (figure 1). Meanwhile, the heterogeneity index between the results of the initial studies was zero (I-squared: 0%, Q=1, P=0.607). In the control group, the mean score of the standardized difference of a 6-minute walking test 95% CI (-0.25, 0.49) was 0.12 units higher after the intervention than before the intervention; which again did not make a statistically significant difference, as illustrated in Figure 2. It should also be noted that the heterogeneity index between the results of the initial studies was zero (I-squared: 0%, Q=0.12, P=0.940). After the intervention, the mean score of the standardized difference of a 6-minute walking test 95% CI (-0.29, 0.45) was found to be 0.08 units higher in the control group than in the intervention group, resulting in a statistically non-significant difference (Figure 3). It was also documented that the heterogeneity index between the results of the initial studies was high (I-squared: 53%, Q=4.3, P=0.115).

In order to examine the publication bias, the egger test was used, and again the results showed not any statistically significant difference in terms of the publication bias before and after intervention (β=20.1, P=0.490).

Table 1. Article characteristics used in this study

Author's name	Publication year	Country of study	Type of exercise at home	Type of intervention in the control group
Clara Bohm	2014	Canada	home walking	intradialytic cycling
Kirsten P. Koh	2009	Australia	home walking	usual care
Massimo Bulckaen	2011	Italy	home walking	Home walk +supervised gym training session
Anna Maria Malagoni	2008	Italy	home walking with treadmill	usual care

Table 2. Exercise program characteristics and average age of patient

Author's name	Exercise duration (month)	No. of exercises per week	Mean age of the control group	SD of age of the intervention group	Mean age of the control group	SD of age of the control group
Clara Bohm	6	3	53	16	52	14
Kirsten P. Koh	6	3	52.1	13.6	51.3	14.4
Massimo Bulckaen	6	2	60	9	51	12
Anna Maria Malagoni	6	2	62	10	66	14

Table 3. Results of a 6-minute walking test in the intervention and control group

Author's name	Sample size of the intervention group	6MWT before intervention, experimental group	SD, 6MWTbefore intervention, experimental group	6MWTafter intervention, experimental group	SD, 6MWT after intervention, experimental group	Sample size of the control group	6MWT before intervention, control group	SD, 6MWTbefore intervention, control group	6MWTafter intervention, control group	SD, 6MWT after intervention, control group	Women sample size	Men sample size
Clara Bohm	25	390.2	77	390	92.6	27	404.2	110	420.2	102	17	35
Kirsten P. Koh	21	444	127	493	143	22	431	160	452	144	12	19
Massimo Buckaen	9	386	152	445	131	9	410	75	512	64	5	13
Anna Maria Malagoni	13	308	105	351	118	7	275	69	271	76	6	14

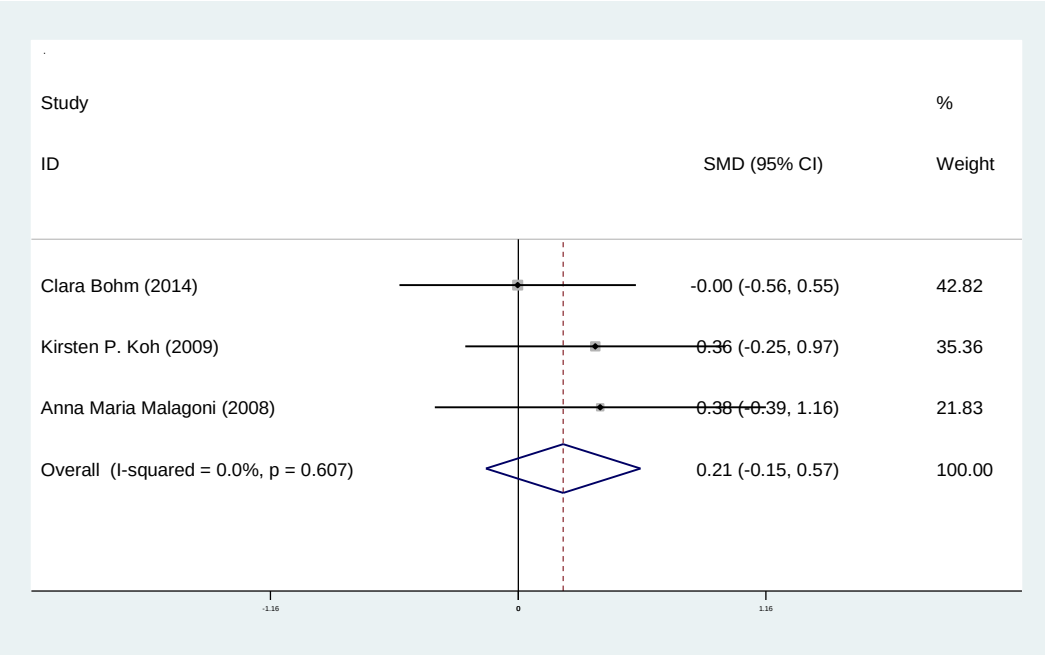

Figure 1. Mean score of the standardized difference of a 6-minute walking test in the experimental group before and after intervention in all initial studies and the general estimation

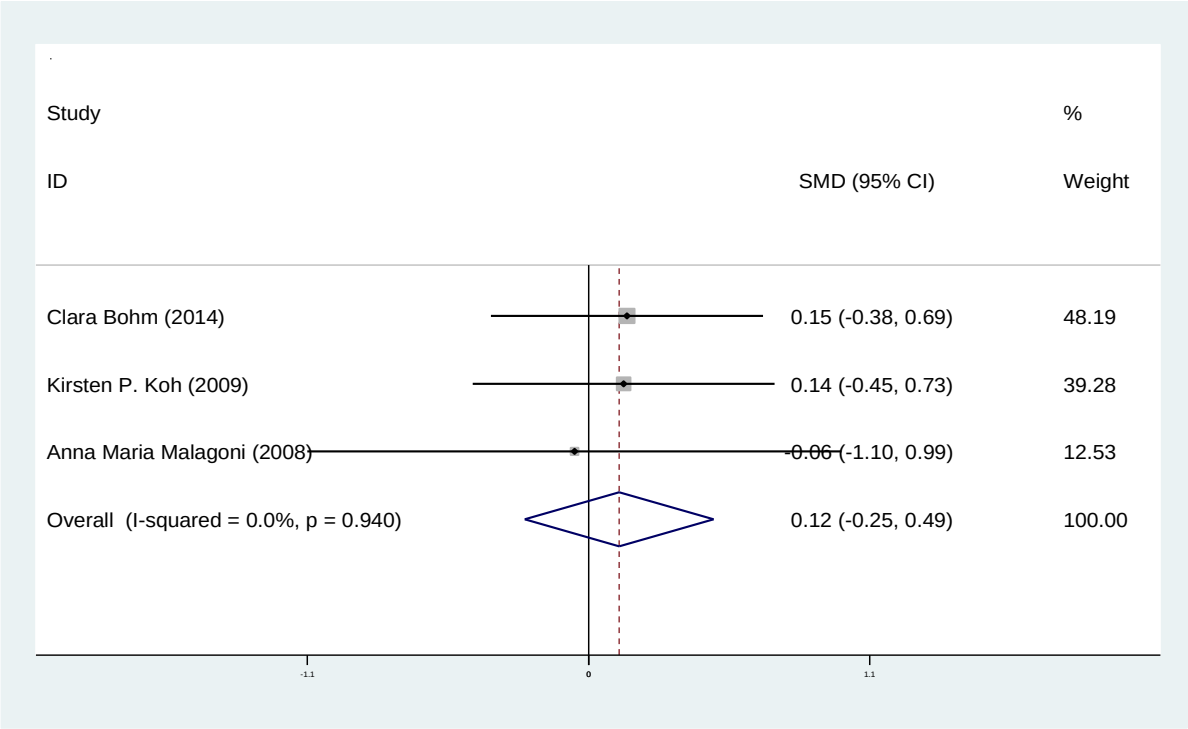

Figure 2. Mean score of the standardized difference of a 6-minute walking test in the control group before and after intervention in all initial studies and the general estimation

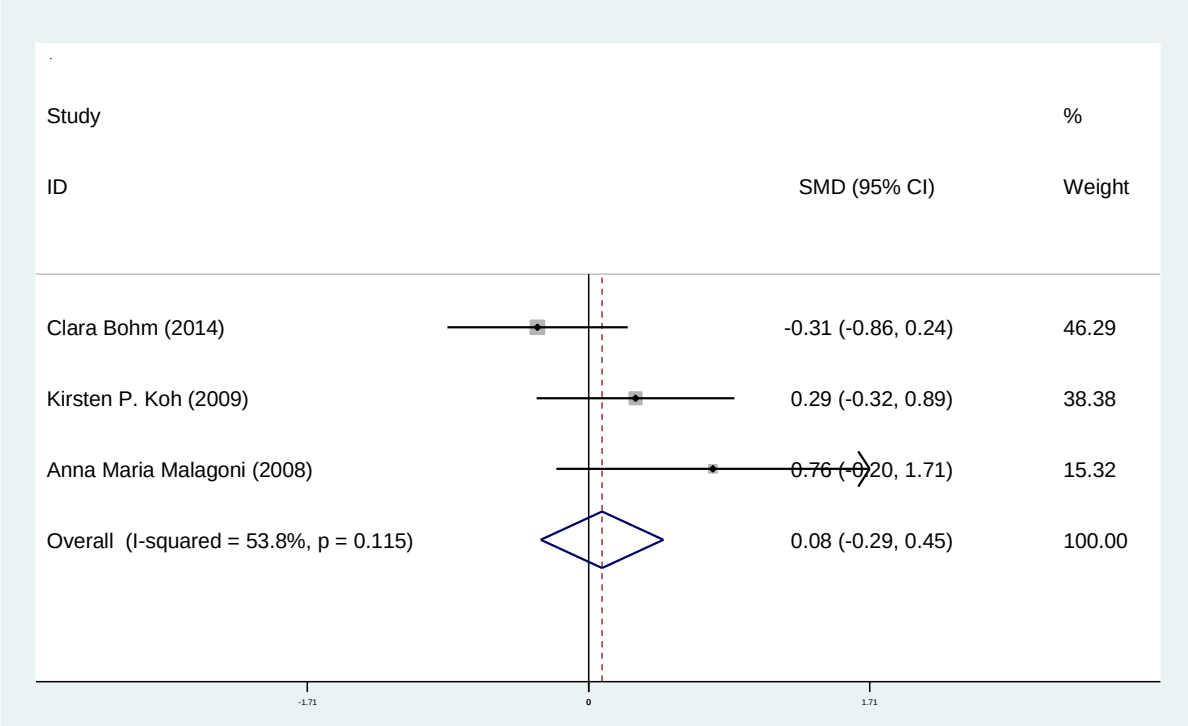

Figure 3. Mean score of the standardized difference of a 6-minute walking test in both experimental and control groups in all initial studies and the general estimation

4. Discussion

This meta-analysis and systematic review determined the effect of home exercise on the functional ability of hemodialysis patients. This meta-analysis showed that home exercise increased the functional ability of hemodialysis patients in three studies and kept it constant in one study. However, this increase was not statistically significant. The results of the measurement of the functional ability were also found to be different in the control group. Boehme et al. compared the intervention group who walked at home with patients who used a stationary bike during hemodialysis. In patients who walked at home, no significant change was observed in the results of a 6-minute walking test after 6 months (from 390.2 to 390.0 meters); however, it increased from 431m to 452m in the other group (24). Christian et al. compared patients who walked at home with patients who worked out during hemodialysis and those who received no intervention. The result of a 6-minute walking test in the group who walked at home was from 444m to 493m, but this value was from 463m to 526m in the group who exercised during the hemodialysis, and in the third group, it was from 431m to 452m (25). In a study by Malagony et al., patients who walked on the treadmill at home were compared with those who received routine medical care. In the experimental group, the result of a 6-minute walking test increased from 308m to 351m, while it decreased from 275m to 271m in the control group (26). In another research conducted by Bulckaen et al., patients in the intervention group walked at home, while patients in the control group walked at home and worked out (2 sessions per week) in a gym under the supervision of a supervisor. The exercise in the gym included walking on the treadmill and upper back exercise using an ergometer. The result of a 6-minute walking test was from 386m to 445m in the intervention group, while it was from 410m to 512m (a relatively significant increase) in the control group (27). One of the reasons why this meta-analysis was not significant was the lack of supervision of medical staff on how patients exercised at home and patients' inadequate training. In clinical practice guidelines for chronic kidney disease, it was stated that all hemodialysis patients should be advised and encouraged by a nephrologist and hemodialysis ward staff so as to increase their physical activities (28). Despite strong evidence which shows low physical activity in hemodialysis patients (29,30) and despite many reports which indicate the benefits of regular exercise for these patients, the medical team did not still advise the patients to exercise (31, 32). In a study on 505 nephrologists, 97% of the researchers found that the physical activity was important and essential in the care of hemodialysis patients; however, only 38% of them advised their patients to exercise regularly (33). Concerning their critical role in the rehabilitation of patients with physical and mental disabilities, nurses are able to help patients improve their abilities to perform daily activities and to decrease their social, psychological and economic problems (34, 35). It seems that if hemodialysis patients do some exercise at home under the supervision of medical staff, the positive effects of exercise will double. One of the limitations of this research was the diversity of parameters which affected the type and quality of performing sport programs (e.g. the time of exercise, number of exercise per week, and working out using devices like treadmill). Moreover, the diversity of patients'

conditions in the control group (exercise during dialysis, exercise under the supervision of a supervisor and normal care) was another limitation of the current study. The results of this meta-analysis showed that home exercise could increase the functional ability of hemodialysis patients, although this effect was found to be not significant. It is, therefore, suggested that patients exercise at home under the supervision of medical staff; if possible, patients are advised to go to sports centers such as gyms, especially sports medicine centers, since the desirable effects of exercise will increase by combining home exercise with exercise at sports centers.

References

1. Li H, Jiang YF, Lin CC. Factors associated with self-management by people undergoing hemodialysis: a descriptive study. Int J Nurs Stud. 2014;51(2):208-16. DOI:10.1016/j.ijnurstu.2013.05.012.
2. U.S. Renal Data SystemUSRDS 2013 Annual Data Report: Atlas of End-Stage Renal Disease. BethesdaMD. 2014.
3. Johansen KL. Exercise in the end-stage renal disease population. Journal of the American Society of Nephrology. 2007; 18 (6):1845-54. DOI: 10.1681/ ASN. 2007010009.
4. Kosmadakis GC, John SG, Clapp EL, Viana JL, Smith AC, Bishop NC, et al. Benefits of regular walking exercise in advanced pre-dialysis chronic kidney disease. Nephrology Dialysis Transplantation. 2012;27(3):997-1004. DOI: 10.1093/ndt/gfr364
5. Aghighi M, Heidary Rouchi A, Zamyadi M, Mahdavi-Mazdeh M. Rajolani H, Ahrabi S, et al. Dialysis in iran. Iran J Kidney Dis. 2008;2(1):11-5.
6. Moini V RF, Avazeh A, Jalalzadeh M, Hakami M, Akhlaghi M. The Combined Effect of Aerobic and Anaerobic Exercises on the Quality of Life in Hemodialysis Patients. Journal of Zanjan University of Medical Sciences. 2014:55-65.
7. Yurtkuran M ,Alp A, Dilek K. A modified yoga-based exercise program in hemodialysis patients: a randomized controlled study. Complementary therapies in medicine. 2007;15(3):164-71. DOI:10.1016/j.ctim.2006.06.008.
8. Gomes EP, Reboredo MM, Carvalho EV, Teixeira DR, Carvalho Filho L, Sanders-PinheiroH, et al. Physical activity in hemodialysis patients measured by triaxial accelerometer. Biomed Res Int. 2015;2015:645645. DOI: 10. 1155/ 2015/ 645645.
9. Kaysen GA, Larive B, Painter P, Craig A, Lindsay RM, Rocco MV, et al. Baseline physical performance, health, and functioning ofparticipants in the Frequent Hemodialysis Network (FHN) trial. American Journal of Kidney Diseases. 2011;57(1):101-12. DOI: 10.1053/ j. ajkd. 2010.08.021.
10. Painter P, Roshanravan B. The association of physical activity and physical function with clinical outcomes in adults with chronic kidney disease. Current opinion in nephrology and hypertension. 2013; 22(6): 615-23.DOI: 10.1097/ MNH. 0b013e328365b43a.
11. Matsuzawa R, Matsunaga A, Wang G, Yamamoto S, Kutsuna T, Ishii A, et al. Relationship between lower extremity muscle strength and all-cause mortality in Japanese patients undergoing dialysis. Physical therapy. 2014;94(7):947-56. DOI: 10.2522/ptj.20130270.
12. Altintepe L, Levendoglu F, Okudan N, Guney I, Savas CILLI A, Ugurlu H, et al. Physical disability, psychological status, and health-related quality of life in older hemodialysis patients andage- matched controls. Hemodialysis international. 2006;10(3):260-6. DOI: 10.1111/j.1542-4758.2006.00106.x

13. Peng Y-S, Chiang C-K, Hung K-Y, Chang C-H, Lin C-Y, Yang C-S, et al. Are both psychological and physical dimensions in health-related quality of life associated with mortality in hemodialysis patients: a 7-year Taiwan cohort study. Blood purification. 2010;30(2):98-105. DOI:10.1159/000319002.
14. Cheema BSB, Singh F. Exercise training in patients receiving maintenance hemodialysis: a systematic review of clinical trials. American journal of nephrology. 2005. DOI: 10.1159/ 000087184.
15. Heiwe S, Jacobson SH. Exercise training in adults with CKD: a systematic review and meta-analysis. American Journal of Kidney Diseases. 2014;64(3):383-93. DOI: 10.1053/j.ajkd.2014.03.020.
16. Ouzouni S, Kouidi E, Sioulis A, Grekas D, Deligiannis A. Effects of intradialytic exercise training on health-related quality of life indices in hemodialysis patients. Clinical rehabilitation. 2009;23(1):53-63. DOI: 10.1177/0269215508096760.
17. Segura-Orti E, Kouidi E, Lisón J. Effect of resistance exercise during hemodialysis on physical function and qualityof life: randomized controlled trial. Clinical nephrology. 2009;71(5):527. PMID: 19473613.
18. Tao X, Chow SKY, Wong FKY. A nurse-led case management program on home exercise training for hemodialysis patients: A randomized controlled trial. International journal of nursing studies. 2015;52(6): 1029-41. DOI: 10.1016/j.ijnurstu.
19. Kosmadakis GC, Bevington A, Smith A, Clapp E, Viana J, Bishop N, et al. Physical exercise in patients with severe kidney disease. Nephron Clinical Practice. 2010;115(1):c7-c16. DOI: 10.1159/ 000286344.
20. Delgado C, Johansen KL. Barriers to exercise participation among dialysis patients. Nephrology Dialysis Transplantation. 2012;27(3):1152-7. DOI: 10.1093/ndt/gfr404.
21. Heiwe S, Tollin H. Patients' perspectives on the implementation of intra-dialytic cycling—a phenomenographic study. Implementation Science. 2012;7. DOI: 10.1186/1748-5908-7-68.
22. Kontos PC, Miller K-L, Brooks D, Jassal SV, Spanjevic L, Devins GM, et al. Factors influencing exercise participation by older adults requiring chronic hemodialysis: a qualitative study. International Urology and Nephrology. 2007;39(4):1303-11. DOI: 10.1007/s11255-007-9265-z.
23. Bennett PN, Breugelmans L, Barnard R, Agius M, Chan D, Fraser D, et al., editors. Sustaining a hemodialysis exercise program: a review. Seminars in dialysis; 2010: Wiley Online Library.DOI: 10.1111/j.1525-139X.2009.00652.x.
24. Bohm1 C, Stewart K, Onyskie-Marcus J, Esliger D, Kriellaars D, Rigatto C. Effects of intradialytic cycling compared with pedometry on physical function in chronic outpatient hemodialysis: a prospective randomized trial. 2014: Oxford University. DOI: 10.1093/ndt/gfu248.
25. Koh, Kirsten P., et al. "Effect of intradialytic versus home-based aerobic exercise training on physical function and vascular parameters in hemodialysis patients: a randomized pilot study." American Journal of Kidney Diseases 55.1 (2010): 88-99. DOI: 10. 1053/ j. ajkd.2009.09.025.
26. Malagoni AM, Catizone L, Mandini S, Soffritti S, Manfredini R, Boari B, et al. Acute and long-term affects of an exercise program for dialysis patients prescribed in hospital and performed at home. JN journal of nephrology. 2008; 21(6):871. PMID: 19034871.
27. Bulckaen M, Capitanini A, Lange S, Caciula A, Giuntoli F, Cupisti A. Implementation of exercise training programs in a hemodialysis unit: effects on physical performance. JNEPHROL 2011; 24(06): 790-797. DOI: 10.5301/ JN. 2011. 6386.

28. Herzog CA, Asinger RW, Berger AK, Charytan DM, Díez J, Hart RG, et al. Cardiovascular disease in chronic kidney disease. A clinical update from Kidney Disease: Improving Global Outcomes (KDIGO). Kidney international. 2011; 80(6): 572-86. DOI: 10.1038/ki.2011.223.
29. Avesani CM, Trolonge S, Deléaval P, Baria F, Mafra D ,Faxén-Irving G, et al. Physical activity and energy expenditure in haemodialysis patients: an international survey. Nephrology Dialysis Transplantation. 2012;27(6):2430-4. DOI: 10.1093/ndt/gfr692.
30. Kim J, Shapiro B, Zhang M, Li Y, Porszasz J, Bross R, et al. Daily physical activity and physical function in adult maintenance hemodialysis patients. Journal of cachexia, sarcopenia and muscle. 2014;5(3):209-20. DOI: 10.1007/s13539-014-0131-4
31. Painter P, Clark L, Olausson J. Physical function and physical activity assessment and promotion in the hemodialysis clinic: a qualitative study. American Journal of Kidney Diseases. 2014;64(3):425-33. DOI: 10.1053/j.ajkd.2014.01.433.
32. Painter P. Exercise in chronic disease: physiological research needed. Exercise and sport sciences reviews. 2008;36(2):83-90. DOI: 10.1097/JES.0b013e318168edef.
33. Johansen KL, Sakkas GK, Doyle J, Shubert T, Dudley RA. Exercise counseling practices among nephrologists caring for patients on dialysis. American Journal of Kidney Diseases. 2003;41(1):171-8. DOI: http://dx.doi.org/10.1053/ajkd.2003.50001.
34. Rayyani M, Malekyan L, Forouzi MA, Razban AHF. Self-care self-efficacy and quality of life among patients receiving hemodialysis in South-East of Iran. Asian Journal of Nursing Education and Research. 2014;4(2):165.
35. Bağ E, Mollaoğlu M. The evaluation of self-care and self-efficacy in patients undergoing hemodialysis. Journal of evaluation inclinical practice. 2010;16(3):605-10. DOI: 10.1111/j.1365-2753.2009.01214.x.