

## **Exercise on haemodialysis**

Halima Resic, Sarajevo, Bosnia and Herzegovina

**Chairs:** Vidojko Djordjevic, Nis, Serbia  
Mick Kumwenda, Rhyl, UK



**Prof. Halima Resic**  
Clinic for haemodialysis  
Clinical Center  
University of Sarajevo  
Sarajevo, Bosnia and Herzegovina

slide 1



**Disclosure of Interest**  
**HALIMA RESIC**

**No interest conflicts to declare**

The details of each Disclosure of Interest are available at the Invited Speakers' desk (located in the Registration Area).

Thank you respected Chairman, respected auditorium.

slide 2

# Exercise on Hemodialysis

Halima Resic

Clinic for Hemodialysis  
University Clinical Center Sarajevo, Bosnia and Herzegovina

ERA-EDTA 52nd Congress  
London May 28th - 31th, 2015

It's a great pleasure that I can have this mini lecture 'Exercise on haemodialysis'.

slide 3

Can anyone name a  
**MEDICATION**  
that has more general benefits  
compared to physical activity and  
exercise  
?????

What I would like to answer maybe with you today is, can anyone name a medication that has more general benefits compared to physical activity and exercise?

slide 4

## Causes of **deconditioning** among patients with CKD (all stages)

- Uremic myopathy and/or neuropathy
- Anemia
- Recurrent hospitalizations
- Dialysis-related L-carnitine disorder
- Secondary hyperparathyroidism
- Androgen abnormalities (Patients with CKD exhibit abnormalities in androgen production. In males, uremia impairs gonadal steroidogenesis. The serum total and free testosterone concentrations are typically reduced.)
- Steroid myopathy (Glucocorticoid-induced myopathy)

We know that our dialysis patients are generally very physically inactive and that reduces their functional capacity and quality of life. Causes of deconditioning among patients with CKD are known as uraemic myopathy and neuropathy, anaemia, recurrent hospitalisation, dialysis-related L-carnitine disorder, secondary hyperparathyroidism, androgen abnormalities and steroid myopathy.

slide 5

**Muscle catabolism and wasting is common among these patients and leads to reduced muscle strength, declines in physical function and low levels of physical activity.**

**This cycle of disease and disability greatly reduces the quality of life (QOL) and increases mortality rates in hemodialysis patients.**

**Exercising on hemodialysis aims to improve prognosis and health related quality of life in patients with end stage renal disease through exercise training.**

Painter P. Physical functioning in end-stage renal disease patients: update 2005. Hemodial Int 2005; 9: 218-235.

In all these things muscle metabolism and wasting is common among these dialysis patients and leads to reduced muscle strength, declines in physical function and low levels of physical activity. This cycle of disease and disability greatly reduces the quality of life of our patients and increases mortality rates in haemodialysis patients. Exercise on haemodialysis aims to improve prognosis and health related quality of life in patients with ESRD through exercise training.

### Evidence of Muscle Dysfunction in CKD

1. Exercise intolerance and low physical fitness
  - ↳ Indicators of aerobic capacity (VO<sub>2</sub> peak) are impaired even after correction of anemia with EPO
  - ↳ Hypervolemia in CKD could lead to some degree of heart failure further impairing aerobic capacity
  - ↳ Inflammatory state (CRP) is associated with aerobic capacity independently of comorbidity index
  - ↳ Muscle blood flow rises significantly less than in control subjects during both submaximal and maximal exercise

Kobayashi et al., 2003; Schenck et al., 2004; Strazich et al., 2012; Yamashita et al., 2003

2. Muscle Fatigue – possible causes
  - ↳ Substrate Availability is impaired in CKD patients
    - Decreased capillary density – capillary to mitochondrial oxygen transfer is low
    - Increased vascular resistance
    - Reduced uptake and utilization of fatty acids – carnitine depletion
    - Insulin resistance – low glucose availability
  - ↳ Mitochondrial Function is impaired
    - Low cytochrome C activity
    - Normal resting muscle PCr levels but delayed PCr recovery after exercise
    - Low pH after exercise fatigue protocol

Sarkis et al., 2003; Sala et al., 2003; Johnson, Sarkis et al., 2005; Harris & Yank, 2005

There are a lot of studies about exercise on dialysis and some of the studies have published evidence of muscle dysfunction for example, in patients with CKD as we see. Exercise intolerance and low physical fitness in this study said that indicators of aerobic capacity at the peak of oxygen intake are impaired even after correction of anaemia. Also, hypervolemia in CKD patients could lead to some degree of heart failure further impairing aerobic capacity. Inflammatory state is associated with aerobic capacity independently of the comorbidity index and also, muscle blood flow, which improves with exercise, rises significantly less than in control subjects during both submaximal and maximal exercise. There can also be muscle fatigue causes.

### NKF KDOQI RECOMMENDATIONS (1)

- Many dialysis patients are severely deconditioned and therefore may need a referral for physical therapy to increase strength and endurance to the point where they are able to adopt the recommended levels of physical activity.
- The goal for activity should be for cardiovascular exercise at a moderate intensity for 30 minutes most, if not all, days per week.
- Patients who are not currently physically active should start at very low levels and durations, and gradually progress to this recommended level. (C)

20 years ago exercise started to be implemented in different dialysis centres, mostly in Scandinavian countries and one of the first guidelines was published in 2005 that was a KDOQI recommendation and that recommended that patients who are not currently physically active,

dialysis patients, should start at very low levels and durations and gradually progress to this recommended level but this was a recommendation level C.

slide 8

NKF KDOQI Guidelines 14, 2005

## NKF KDOQI RECOMMENDATIONS (2)

- All dialysis patients should be counseled and regularly encouraged by nephrology and dialysis staff to increase their level of physical activity. (B)
- Measurement of physical functioning:
  - Evaluation of physical functioning and re-evaluation of the physical activity program should be done at least every 6 months. (C)
  - Physical functioning can be measured using physical performance testing or questionnaires (e.g., SF-36). (C)
  - Potential barriers to participation in physical activity should be assessed in every patient. (C)

What is important is that all dialysis patients should be counselled and regularly encouraged by nephrology, which is very important and dialysis staff to increase their level of physical activity. Measurement of physical functioning can be evaluated. Evaluation of physical functioning and re-evaluation of the physical activity program should be done at least every 6 months. Physical functioning can be measured using physical performance testing or questionnaires filled in by those who do exercise. Potential barriers to participation in physical activities should be assessed in every patient and therapy must be individualised.

slide 9

# KDIGO Clinical Practice Guideline for the Management of Blood Pressure in Chronic Kidney Disease

<http://www.kidney-international.org>  
© 2012 KDIGO

## Summary of Recommendation Statements

Kidney International Supplements (2012) 2, 341-342, doi:10.1038/sup.2012.50

### Chapter 2: Lifestyle and pharmacological treatments for lowering blood pressure in CKD ND patients

#### GENERAL STRATEGIES

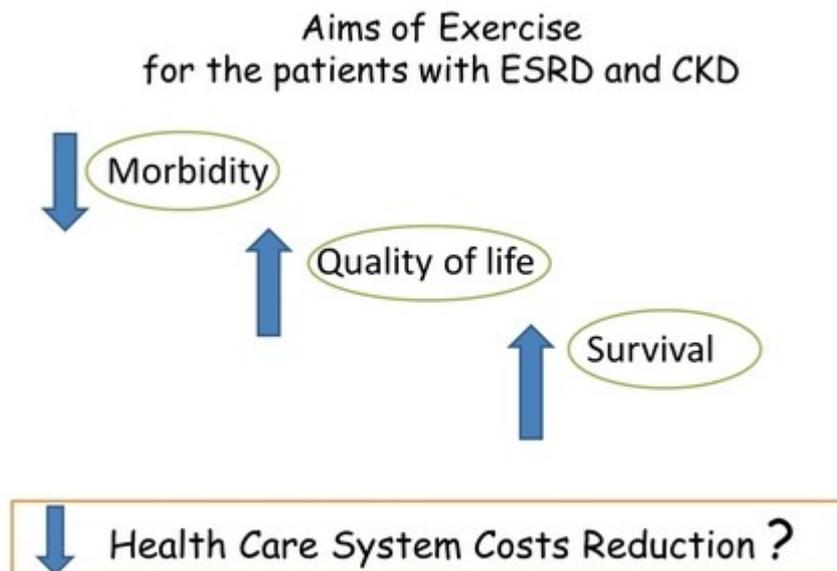
- 2.1: Individualize BP targets and agents according to age, co-existent cardiovascular disease and other co-morbidities, risk of progression of CKD, presence or absence of retinopathy (in CKD patients with diabetes) and tolerance of treatment. (Not Graded)
- 2.2: Inquire about postural dizziness and check for postural hypotension regularly when treating CKD patients with BP-lowering drugs. (Not Graded)

#### LIFESTYLE MODIFICATION

- 2.3: Encourage lifestyle modification in patients with CKD to lower BP and improve long-term cardiovascular and other outcomes:
  - 2.3.1: We recommend achieving or maintaining a healthy weight (BMI 20 to 25). (1D)
  - 2.3.2: We recommend lowering salt intake to <90 mmol (<2 g) per day of sodium (corresponding to 5 g of sodium chloride), unless contraindicated. (1C)
  - 2.3.3: We recommend undertaking an exercise program compatible with cardiovascular health and tolerance, aiming for at least 30 minutes 5 times per week. (1D)
  - 2.3.4: We suggest limiting alcohol intake to no more than two standard drinks per day for men and no more than one standard drink per day for women. (2D)

Also a new KDIGO guideline in Hypertension recommends as we see, undertaking an exercise programme compatible with the cardiovascular health and tolerance and aiming for at least 30 minutes, five times a week and that guideline says and recommends that hypertension with exercise can be better controlled in the patient with CKD.

slide 10



What are the aims of exercise? We also want to improve the quality of life of our patients and the aims of exercise are to improve quality of life, to decline the morbidity of our patients. We know that cardiovascular morbidity is the main cause of death in dialysis patients and to survive better. All these things can lead to a reduction in health care system costs.

slide 11

## Exercise in older ESRD patients....

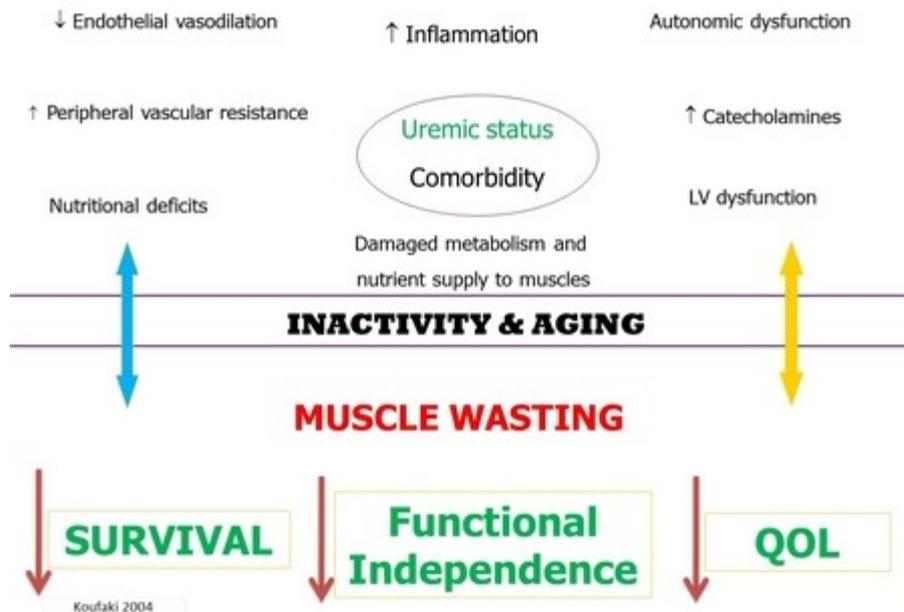
QOL shows moderate levels of responsiveness.

Larger studies are needed to demonstrate whether intra-dialysis exercise, with or without home exercise, can lead to improved outcomes in this population.

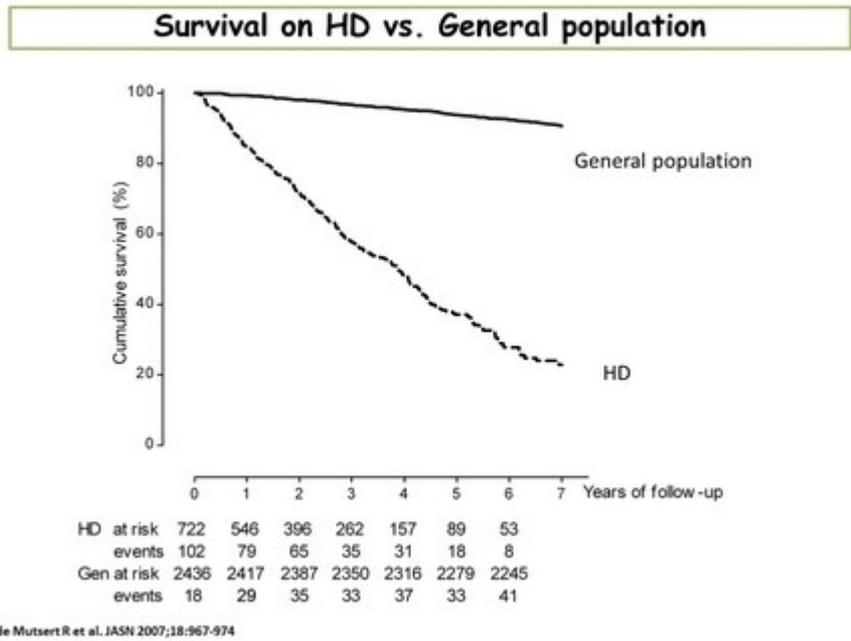
Mika L. Et al; Exercise Program to Enhance Physical Performance and Quality of Life of Older Hemodialysis Patients: A Feasibility Study; Int Urol Nephrol. 2010 December ; 42(4): 1125-1130. doi:10.1007/s11255-010-9718-7.

We know that over the last few years ESRD and the age of patients are older than 65 years and quality of life shows moderate levels of responsiveness in those patients. Larger studies are needed to demonstrate whether intra-dialysis exercise with or without home exercise can lead to improved outcomes in that population.

slide 12



As I said, inactivity and ageing and we know from the ERA-EDTA Registry how a great percent of patients over 75 years in inactivity and that ageing and inactivity in uremic status and with different comorbidities can lead to muscle wasting and that muscle wasting can decline survival, functional independence and also quality of life.

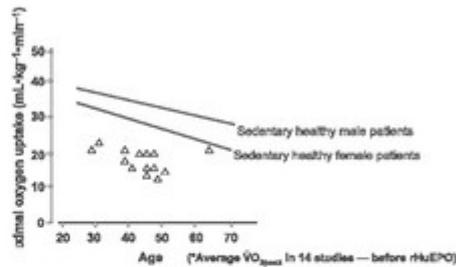


You know that in that slide, we can see that survival on haemodialysis patients compared with the general population

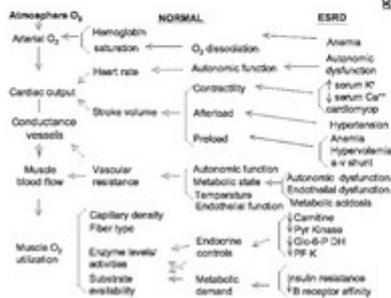
### LEVELS OF VO<sub>2</sub>peak IN ESRD PATIENTS

**VO<sub>2</sub> - peak oxygen uptake**  
or maximal aerobic capacity

Maximum capacity of an individual's body to transport and use oxygen during incremental exercise, which reflects the physical fitness of the individual.



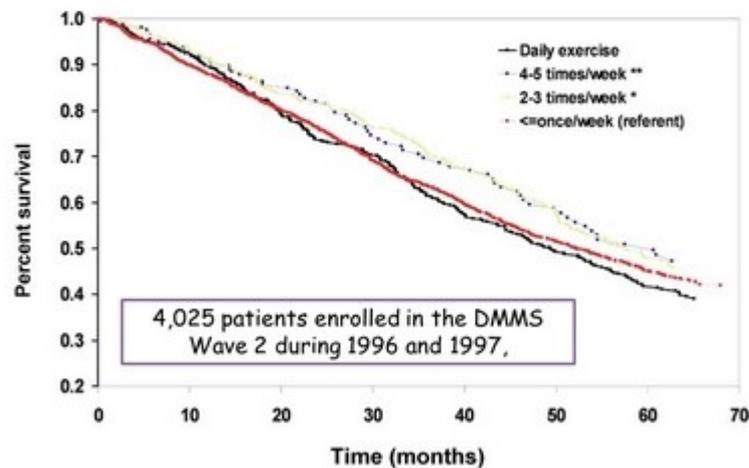
Painter P. Exerc Sport Sci Rev 2008; 36(2):83-90.



and as we know, there are many studies that evaluate the effect of exercise on the levels of aerobic capacity and that aerobic capacity improves with exercise and maximum capacity of an individual's body to transport oxygen during incremental exercise. We see that the sedentary healthy male population and sedentary healthy female population have better oxygen aerobic capacity than the dialysis patients.

slide 15

The Dialysis Morbidity and Mortality Study (DMMS) Wave 2, a special study of the US Renal Data System (USRDS) showed reduced peak oxygen consumption (VO<sub>2</sub> peak) and poor quality of life are associated with increased mortality risk in hemodialysis (HD) patients.



In one study done in the United States by the United States Renal Data System, the Dialysis Morbidity AND Mortality Study, a special study that showed reduced peak oxygen consumption and poor quality of life associated with increased mortality risk in haemodialysis patients. That study included 4025 patients and lasted from 1996 to 1997. They saw that the patient who has daily exercise has a better percent of survival than patients who do it once a week.

slide 16

#### CONTRAINDICATIONS FOR PARTICIPATION IN AN REHABILITATION PROGRAM (ESRD)

Recent myocardial infarction  
Unstable hypertension  
Congestive heart failure (>II class of NYHA)  
Cardiac arrhythmias (>II class of Lown)  
Unstable angina  
Significant cerebral or peripheral vascular disease

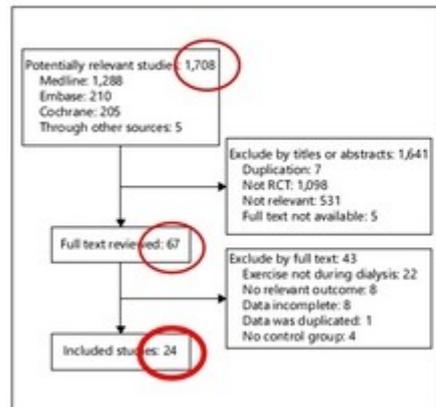
Uncontrolled diabetes mellitus  
Active liver disease  
Persistent hyperkalemia before dialysis  
Severe orthopaedic limitation  
Non-compliant patients

What are the contraindications for participation in a rehabilitation programme? That is recent myocardial infarction, unstable hypertension, congestive heart failure, cardiac arrhythmia, unstable angina, significant cerebral or peripheral vascular disease. Also uncontrolled diabetes

mellitus, active liver disease, persistent hyperkalaemia before dialysis, severe orthopaedic limitation and non-compliant patients is a very important thing.

slide 17

Meta analysis of the published randomized controlled trials spanned through Medline, Embase, and Cochrane Central Register of controlled trials up to February 2014.... 24 studies.....997 patients

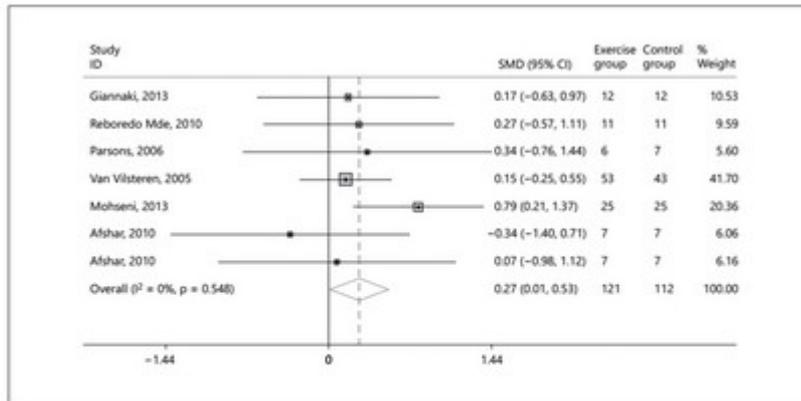


1. Assessment of Studies Quality
2. The Baseline Similarity
3. Effects on Dialysis Efficacy (Kt/V)
4. Effects on VO<sub>2</sub> peak
5. Effects on Health-Related Quality of Life
6. Adverse Events
7. Secondary outcomes
8. Publication bias

Kaikiang S et al; Intradialytic Exercise in Hemodialysis Patients: A Systematic Review and Meta-Analysis; Am J Nephrol 2014;40:478-490.

In this analysis, we know that there are many studies on exercise and to evaluate efficacy and safety of exercise that a group of authors made one meta-analysis that was published in Nephrology 2014 and that meta-analysis potentially included 1.708 studies. Full text reviewed 67 but included only 24 randomised trials studies. In those randomised trial studies, they assessed study quality, the baseline similarity, effects of the dialysis efficacy, effects of the peak uptake of oxygen, effects on health-related quality of life, adverse events, secondary outcomes and publication bias.

slide 18

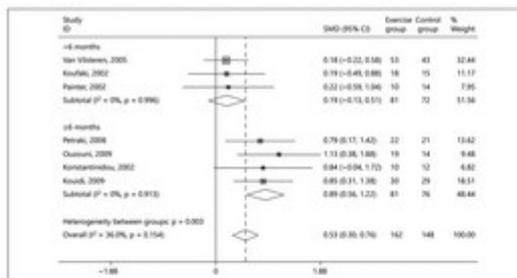


Six RCT's (233 pts) assessed the change in dialysis efficacy (Kt/V).....Intradialytic exercise had **higher dialysis efficacy** compared with control groups (The pooled risk ratio for dialysis efficacy was 0.27 and was statistically significant (95% CI 0.01-0.53,  $p = 0.04$ ).

Kaikiang S et al; Intradialytic Exercise in Hemodialysis Patients: A Systematic Review and Meta-Analysis; Am J Nephrol 2014;40:478-490.

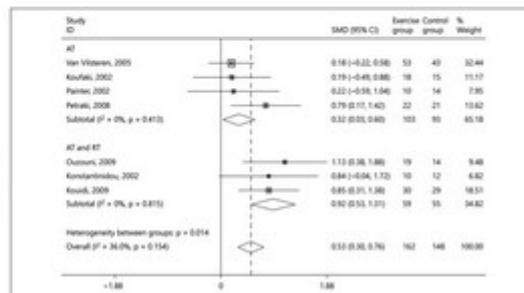
From those 24 studies, six studies assessed the change in dialysis efficacy Kt/V and they found that intradialytic exercise had higher dialysis efficacy that can be explained by the fact that muscle blood flow improves during exercise and the capillary surface may remove more urea. So the Kt/V improved during exercise. That is confirmed in this study.

slide 19



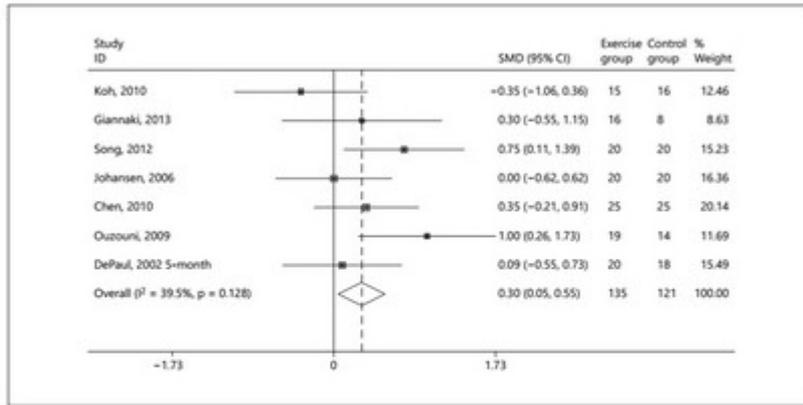
- Seven RCT's (310 pts)
- Significant improvement in **VO<sub>2</sub> peak** (SMD = 0.53, 95% CI = 0.30-0.76,  $p < 0.001$ ).

- The subgroup analysis showed that the trial duration had an influence on the results of VO<sub>2</sub> peak.
- Trial duration for **>6 months**, had significant effects on VO<sub>2</sub> peak (SMD = 0.89, 95% CI 0.56-1.22,  $p < 0.001$ ).
- However, if trial duration was **<6 months**, the change of VO<sub>2</sub> peak was not significant (SMD = 0.19, 95% CI -0.13 to 0.51,  $p = 0.24$ ).



Kaikiang S et al; Intradialytic Exercise in Hemodialysis Patients: A Systematic Review and Meta-Analysis; Am J Nephrol 2014;40:478-490.

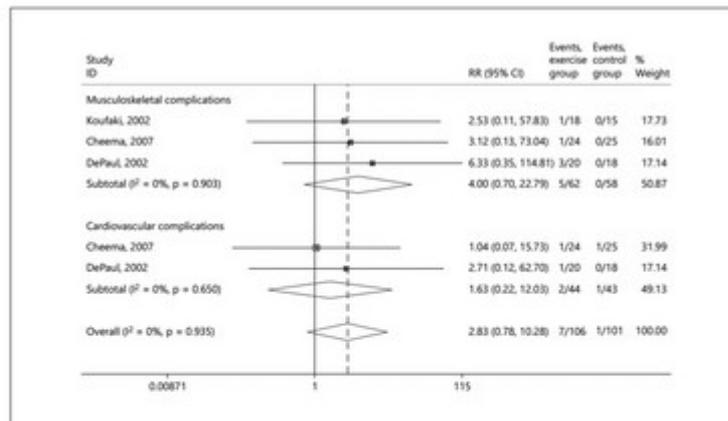
Also, seven randomised clinical trials found that significant improvement of oxygen aerobic capacity was better but that was a trial and the duration of the study was from two years to ten years, so they did a subgroup analysis showing that the trial duration had an influence the peak of oxygen capacity. Trial duration of more than 6 months had significant effects of death but trial duration less than 6 months had no change in those things.



Seven studies (256 pts).....SF-36 (PCS) used.....Intradialytic exercise had significant effects on the physical function of life (95% CI 0.05-0.55,  $p = 0.02$ ), but there was no significant difference in the mental function.

Kaikiang S et al/Am J Nephrol 2014;40:478-490.

Seven out of the 24 studies on 265 patients had significant effects of physical function on life but there was no significant difference in the mental function.

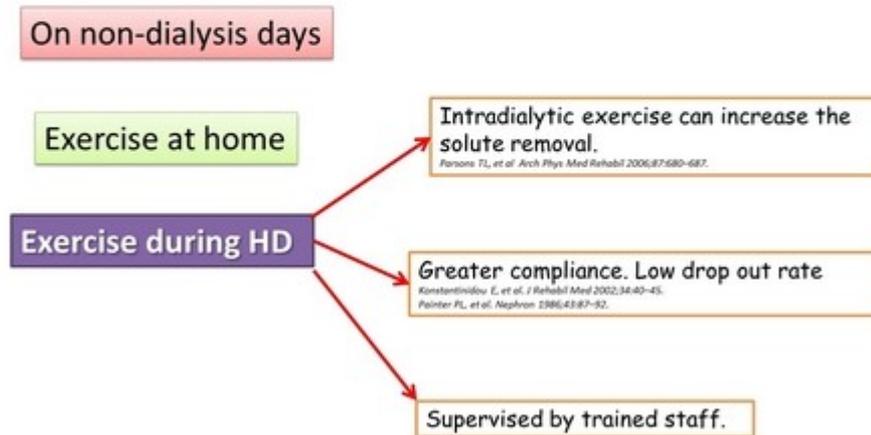


There was no significant difference between the intradialytic exercise groups and control groups with respect to musculoskeletal and cardiovascular complications (RR = 2.83, 95% CI 0.78-10.28,  $p = 0.11$ ).

Kaikiang S et al/Am J Nephrol 2014;40:478-490.

Also, there was no significant difference between the intradialytic exercise group and control groups with respect to musculoskeletal and cardiovascular complications. I must emphasise that these studies they saw adverse events during exercise and those adverse events were hypertension in the three patients.

## Dialysis patients have three (3) choices how-where to exercise.....



Dialysis patients have three choices on how or where to exercise. On non-dialysis days, exercise at home but the best was exercise during haemodialysis. Intradialytic exercise can increase the solute removal and as we said, Kt/V can be better. Greater compliance and low dropout rate and also supervised by trained staff that is very important.

slide 23

## Fitness components in patients on HD



Fitness components in patients on haemodialysis are coordination, strength, endurance,

slide 24

# Flexibility

stamina and flexibility.

slide 25

- The possibility of performing the movement with as large a radius in the joint as possible.

The possibility of performing the movement with as large a radius

slide 26



in the joint as possible and it is in our centre and I must emphasise that according to the CME course in Holland and Professor – in Sarajevo to make exercise.

slide 27

## Co-ordination

This in our centre where we started two years ago.

slide 28

- **Co-ordination is the interaction between the central nervous system and skeletal muscles in order to target the flow of action.**
- **Good co-ordination is the ability to perform movements quickly and automatically without losing the balance of the body or the stability of the joints**

Coordination is the interaction between the central nervous system and skeletal muscles in order to target the flow of action. Good coordination is the ability to perform movements quickly and automatically without losing balance of the body

slide 29



or stability of the joints.

slide 30

# Strength

That is also that patients

slide 31

- Is structured according to the function:
- **Dynamic power** - muscle contraction and visibility of the movement.
- **Static power** - muscles develop tension but no change in the length. The movement is not visible.

and as for strength, it is the dynamic power

slide 32



and statistic power.

slide 33

## Endurance - Stamina

Endurance

slide 34



in our dialysis centre every day 50 patients

slide 35

## Our data....

did exercise.

slide 36

# Introduction

Exercising was first introduced our Clinic for Hemodialysis, Clinical Center University of Sarajevo as a pilot study in co-operation with Clinic for physical medicine and rehabilitation in January 2013.

Also, we are the first Center in Bosnia and Herzegovina to start adopting this program.

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

Our data, very briefly I will say that we are the first centre in Bosnia and Herzegovina and in the region that started exercise in a Clinical Centre University of Sarajevo

slide 37

## Aim

Aim of this study was to evaluate improvement in quality of life in hemodialysis patients.

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

in 2014 and the aim of this study was to evaluate

slide 38

# Methods

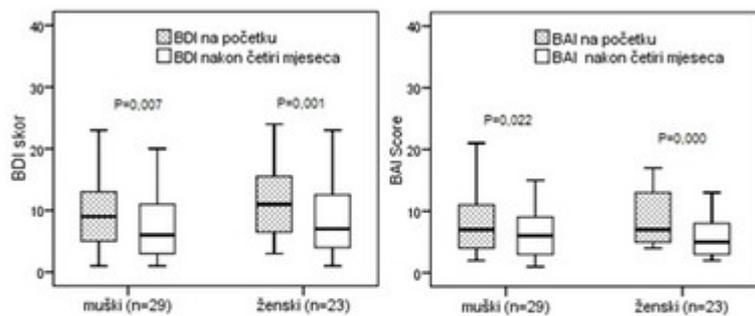
- Fifty two (52) chronic hemodialysis patients were placed on exercise program performed on hemodialysis, three time a week, for 16 weeks.
- All patients were on HD for 6 months and more.
- Mean age of patients was  $57,40 \pm 14,364$  years and mean duration of hemodialysis was  $4,28 \pm 3,494$  years.
- Individual program of exercises was made up for each patient, including aerobic, flexibility, strength, and patient education.
- Exercises are performed on hemodialysis and last for about half an hour.

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

the improvement of quality of life in haemodialysis patients. We have 52 patients and all patients were on haemodialysis 6 months and more. Exercise were performed on haemodialysis and lasted for about half an hour in the first hours of dialysis.

slide 39

Level of depression (BDI score) and anxiety (BAI score) in males and females (n=52)



Level of depression in males was significantly lowered, 33% ( $p < 0,01$ )

Level of anxiety in males was significantly lowered 14%, ( $p < 0,05$ )

Level of depression in females was significantly lowered 36%, ( $p < 0,01$ )

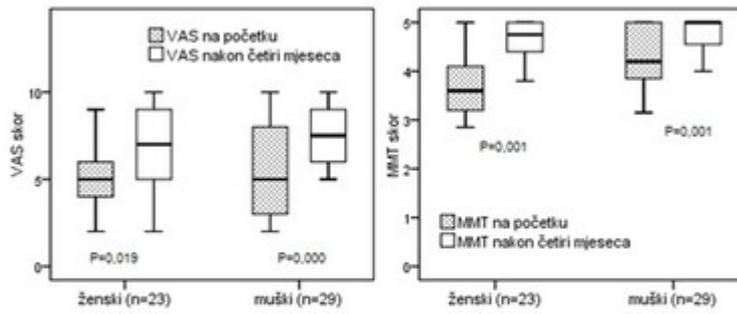
Level of anxiety in females was significantly lowered 28%, ( $p < 0,001$ )

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

These are our results and we found that the level of depression in males was significantly lower and in females and males also. Levels of anxiety too. Different studies show that they do not influence mental capacity but may be this Bosnia and Herzegovina dialysis population is different from the European ones. So they have improved mental capacity.

slide 40

Subjective assessment of physical fitness (VAS score) and muscle strength (MMT score) in males and females (n=52)



Subjective assessment of physical fitness in males was significantly higher, 50% (p<0.001).

Muscle strength in males was significantly higher, 19%, P<0,01

Subjective assessment of physical fitness in females was significantly higher, 40% (p<0.05).

Muscle strength in females was significantly higher, 33%, P<0,01

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

Subjective assessment of physical fitness in males was significantly higher

slide 41

- Our study find significant changes in subscales:
  - Role of functioning/emotional,
  - Energy/fatigue and
  - Social functioning.
- Similar results finded by Painter et al and Oh-Park et al.

H. Resić, et al, Acta Med Croatica, 68 (2014) 79-84.

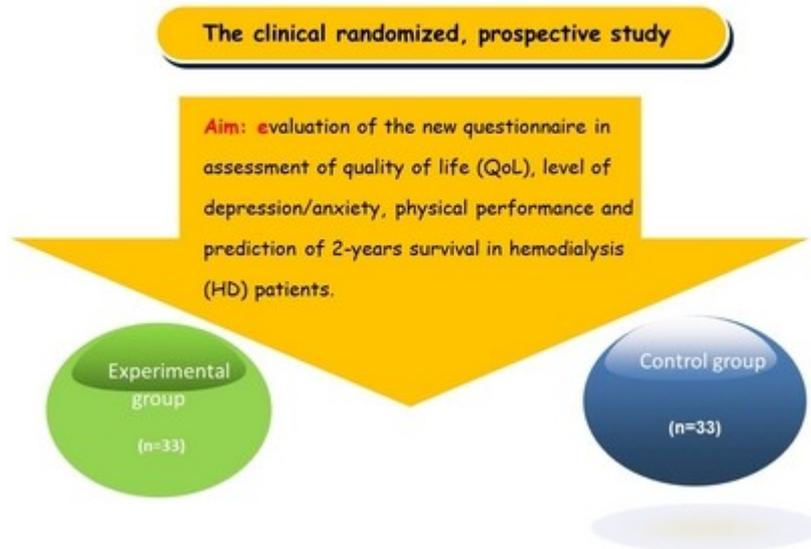
Painter P, Am J Kidney Dis 2000;35:482-92.

Oh-Park M, Am J Phys Med Rehabil 2002;31:314-21.

as in females and also males. Our study found significant changes in subscales of role of functioning and emotional, energy, fatigue and social functioning. Similar results were found by Painter and Oh-Park that were published in Acta Med Croatica.

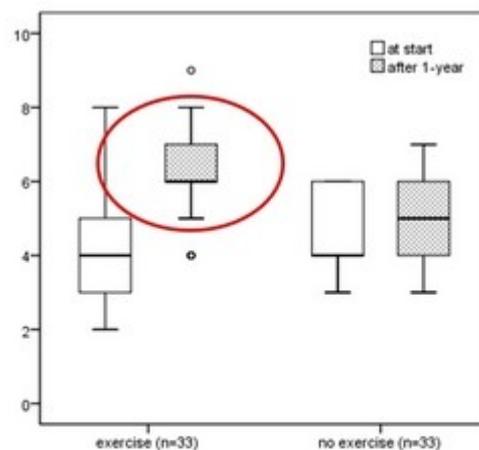
slide 42

## Preliminary results of the new study:



These are preliminary results because we are following up our patients and that is one clinical randomised prospective study and the aim was re-evaluation of a new questionnaire in the assessment of the quality of life, level of depression and anxiety, physical performance, prediction of two-year survival in haemodialysis patients. We had two experimental groups and control groups, the group who did exercise and the group who didn't.

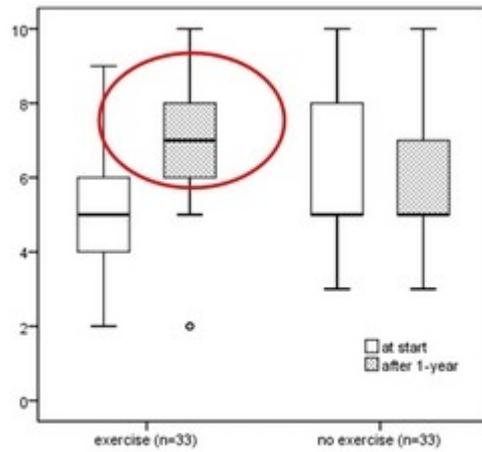
slide 43



**Figure 1.** Self – assessment of general health (scale 0-low to 10-high). Patients included in intradialytic exercise programme had higher median of general health self assessment after 1-year (median difference = 3, IQR = 1 to 4) compared with patients who did not included in exercise programme (median difference = 0, IQR = 0 to 3) U = 266.000; z = -3.946; p < .001.

You have here these preliminary results that a general patient included in an intradialytic exercise programme had a higher median of general health self-assessment after one year.

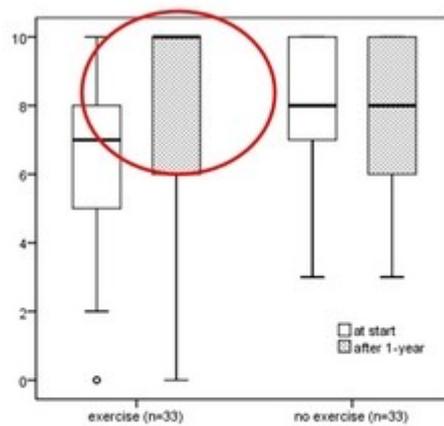
slide 44



**Figure 2.** Self – assessment of emotional well-being (scale 0-low to 10-high). Patients included in intradialytic exercise programme had higher median of emotional well-being self assessment after 1-year (median difference = 2, IQR = 2 to 4) compared with patients who did not included in exercise programme (median difference = 0, IQR = 0 to 0.6) U = 135.00; z = -5.614; p < .001.

Also, patients included had a higher median of emotional well-being self-assessment after a one-year programme.

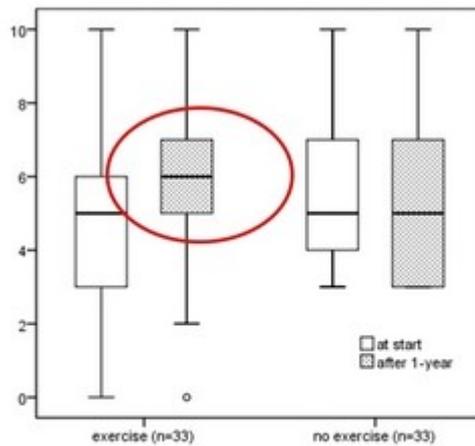
slide 45



**Figure 3.** Self – assessment of social functioning (scale 0-low to 10-high). Patients included in intradialytic exercise programme had higher median of social functioning self assessment after 1-year (median difference = 3, IQR = 2 to 4) compared with patients who did not included in exercise programme (median difference = 0, IQR = 0 to 1.8) U = 175.500; z = -5.043; p < .001.

Patients included in intradialytic programme had a higher median of social functioning self-assessment after one year.

slide 46



**Figure 4.** Self – assessment of physical functioning (scale 0-low to 10-high). Patients included in intradialytic exercise programme had higher median of physical functioning self assessment after 1-year (median difference = 2, IQR = 2 to 3.6) compared with patients who did not included in exercise programme (median difference = 0, IQR = 0 to 0) U = 238.000; z = -4.429; p < .001.

Patients included in this study also had a higher median in physical function of self-assessment after one year.

slide 47

## Conclusion

- Exercising on hemodialysis may have a great impact on health in chronic hemodialysis patients, improving overall health and quality of life.
- Patients in our Study were all very motivated and some of them also exercise at home.
- Our study has showed benefits of exercising in our population of hemodialysis patients in the period of 6 months.

We used different questionnaires. So, in the end, we can conclude that exercise on hemodialysis may have a great impact for health in chronic haemodialysis patients, improving overall health and quality of life, patients in our study were all very motivated and some of them also exercised at home. Our study showed benefits of exercising in our population of haemodialysis patients in the period of 6 months and more.

slide 48

## Conclusion

- Intradialytic exercise can improve Kt/V, VO<sub>2</sub>peak, and overall quality of life.
- Intradialytic exercise is safe for HD patients.

Intradialytic exercise can improve Kt/V, intake of aerobic capacity and quality of life and intradialytic exercise is safe for haemodialysis patients.

slide 49



But the question is why is intradialytic exercise not applied widely in dialysis centres? That is because maybe there is a lack of education and motivation of patients, a lack of randomised trials about the survival and benefits of exercise.

slide 50



Less pills



More exercises and better QoL



<http://www.wadleyhealth.com/services/cardiac-rehabilitation/>

But I hope in the future there will be more exercise and better quality of life for our dialysis patients and less pills.

slide 51

# Thank You

Thank you very much.

slide 52

# Questions

Chairman: Thank you very much Halima. We have three minutes for questions dear colleagues. Halima, your results for your exercise programme are very important for our patients. What do you think about mental health and exercise programmes in everyday dialysis practice? Our results from the last five years in niche clinical centres and niche centres of the Fresenius Health Care show us, we have published this data, that in patients that do exercise activity during the day during dialysis and after dialysis have a much better mental health score using the most important mental health questionnaires like -- 36 and others. What do you think? What are your results on mental health?

Prof. Resic: Yes, we had results really that depression and other things through that questionnaire improved and I think that exercise really has an influence on mental health. We know our patients have depression, cannot sleep and other things like anxiety and so on. But the results of our meta-analyses of randomised trials found that they don't have that such significant influence on mental health but in our population, I think the key point is that you have coordination with an interdisciplinary approach and you must have physiotherapists, as you know to do that. We do exercise every day on dialysis for half an hour and patients are not depressed. They want that and are motivated excluding only when they are transplanted. So, I think we need to implement that idea and I --- here to have maybe update some guidelines in that field because exercise is always controversial about whether it has some benefits or not whether it's risky for morbidity or not.

Chairman: Definitely, we need guidelines because, dear colleagues, we should always think about health-related quality of life. What is emotional rehabilitation of our patients? What is physical rehabilitation? What is social rehabilitation of our patients? We can do much better for these patients and for their rehabilitation if we support everyday physical training and improve mental health in our patients.

Prof. Resic: When we started dialysis, patients didn't believe, they thought something was not right with doctors. How can dialysis patients do exercise? That is strange between nephrologists and between medical staff. You know but now that is practice.

Chairman: Ok next question please.

Question: My name – I come from Beijing, Chinese Rehabilitation Researcher ---. I'm very interested in renal rehabilitation. So I have a question to ask you. In my haemodialysis centre, I have done some renal rehabilitation including intradialytic exercise but I find there is a high dropout so I want to know in your centre how do you treat these questions?

Prof. Resic: When you start exercise, you must always supervise the exercise. You know when one

patient tells the other in the – for example, 'I'm not doing that', we have such things you know, one patient was unsatisfied and the other says 'it's not good'. But when you speak with patients when the physiotherapist comes and when you have supervised with doctors and nurses, we have very young professional doctors and they supervise the patients, they will not dropout. We have a problem because other patients we are – dialysis 350 patients and we work on four shifts. We are the biggest centre in the region. The other patients, why do we not do exercise because they know we have a problem with the staff. So, I think you need to have supervised and motivated patients. We have psychologists and they speak with patients and they give us feedback when patients don't want to do exercise. But patients tell us while we're watching TV. We stand and sit, ok? So I think education and motivation of patients is very important.

Question: I totally agree with you. A very important question is how do we motivate patients to take on exercise during dialysis and also to maintain a programme? But I think that will become apparent as we go through the other talks. So we'll come back to that question that I think is a very important question.

Prof. Resic: Yes, it's very important.

Chairman: Unfortunately, we don't have much time for discussion.

Prof. Resic: Ok. Thank you very much.

Chairman: Halima thank you very much for your excellent presentation. You have opened a new – about rehabilitation and definitely, we need guidelines on how to do that in our patients.

Prof. Resic: Thank you.