BASAL PHYSICAL ACTIVITY IN PACIENTS IN HEMODIALYSIS. CORRELATIONS WITH BIOCHEMICAL PARAMETERS AND WITH BODY COMPOSITION ASSESED BY BIOIMPENDANCE.

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OBJECTIVES

The benefits of regular physical activity (PA) are well know in general population. Patients with CKD are less active compare with general population.

The objectives of this study were to measure the level of PA in hemodyalisis (HD) patients by the use of pedometers and to determine the relationship between physical activity with body composition and biochemical parameters.

METHODS

In a cross-sectional study including 78 HD patients we analize: physical activity with a geonaute onstep- 400 pedometer, body composition using bioelectric impedance measures (BIS) and general biochemical parameters. Patients with physical limitations (amputation), neurological impairment or recent hospitalization were excluded. For the measure of PA patients were asked to use the pedometer during 6 days (2 HD days, 2 non-HD midweek days and 2 non-HD weekend days). The information of the realized activity was obtained of the memory of the device. It was necessary to have a minimum of 4 days measured for considering the registration as valid. In addition to the number of steps taken, the device also provides the time of active walking (expressed in minutes (min) which is estimate based on an algorithm that uses the weight and height of each person.

Pearson or Spearman correlation was performed depending on the nature of the variable to determine the relations between PA and the different biochemical and bioimpedance body composition parameters. Finally, we carried out a linear regression steps forward to assess the parameters that influence the degree of PA.

RESULTS

Table 1. Main characteristics of the population

78 patients	
Age (years)	63 ± 12
Male (%)	51 (65%)
Time in dialysis (months)	32 (2-240)
IMC (kg/m^2)	25.44 ± 4.06
TAS (mmHg)	134.92 ± 15.56
TAD (mmHg)	70,93 ± 11.15
Charlson Comorbidity Index/age	6.64 ± 2.49
Isquemic heart disease (%)	13 (16.7%)
Diabetes Mellitus (%)	28 (35.9%)
Peripheral Arteriopathy (%)	30 (39%)
Mean daily steps (steps)	3100 ± 2573
Daily active walking time (minutes)	30 ± 25

Figure 1. Difference of physical activity by sex.

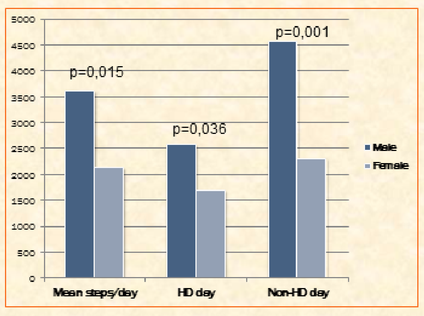


Figure 2. Comparison of physical activity in patients with history of diabetes and ischemic heart disease.

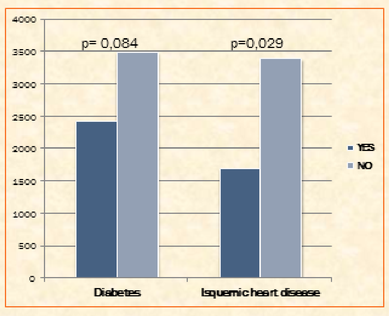


Table 2. Biochemical parameters according to physical activity above or below 3,000 steps/day

	<3000 steps	>3000 steps	p
Glucose	135,60 ± 66,26	137,36 ± 75,92	0,913
Urea	112,56 ± 29,78	131,52 ± 27,74	**0,005**
Creatinin	7,41 ± 2,05	9,20 ± 2,12	**<0,001**
Uric Acid	5,69 ± 1,16	6,53 ± 1,67	**0,011**
Cholesterol	153,91 ± 40,38	154,70 ± 31,31	0,926
Triglycerid	190,70 ± 118,55	162,62 ± 81,45	0,483
Total proteins	6,66 ± 0,58	6,88 ± 0,59	0,100
Albumin	3,91 ± 0,37	4,01 ± 0,29	0,205
Phosphorus	4,53 ± 1,21	4,94 ± 1,56	0,193
Sodium	137,58 ± 2,19	138,70 ± 2,94	0,058
Potassium	5,01 ± 0,89	4,93 ± 0,79	0,699
pH	7,238 ± 0,89	7,381 ± 0,06	0,366
Hb	11,89 ± 1,12	12,60 ± 1,15	**0,007**
Prealbumin	26,16 ± 5,74	28,47 ± 5,79	0,091
CPR	14,60 ± 17,48	7,79 ± 9,95	**0,033**
Testosteron	192,07 ± 190,51	277,39 ± 191,86	0,060

Table 3. Body composition parameters according to physical activity above or below 3,000 steps/day

	<3000 steps	>3000 steps	p
OH	1,08 ± 1,00	0,83 ± 1,44	0,421
TBW	34,50 ± 7,06	30,27 ± 4,83	**0,006**
ECW	15,01 ± 2,32	16,33 ± 3,26	0,066
ICW	15,25 ± 2,79	18,17 ± 4,02	**0,001**
ECW/ICW	1,00 ± 0,13	0,91 ± 0,11	**0,005**
LTI	10,85 ± 2,27	12,60 ± 3,32	**0,016**
LTM%	41,30 ± 9,12	49,77 ± 11,30	**0,002**
FTI	15,19 ± 4,23	13,13 ± 4,49	0,066
FAT%	41,37 ± 6,63	35,53 ± 8,22	**0,003**
ATM	39,56 ± 10,93	36,01 ± 12,36	0,231
BCM	14,51 ± 4,55	19,70 ± 5,76	**<0,001**
Phase angle	4,36 ± 0,84	5,12 ± 1,01	**0,002**

Figure 3. Distribution of physical activity in the population

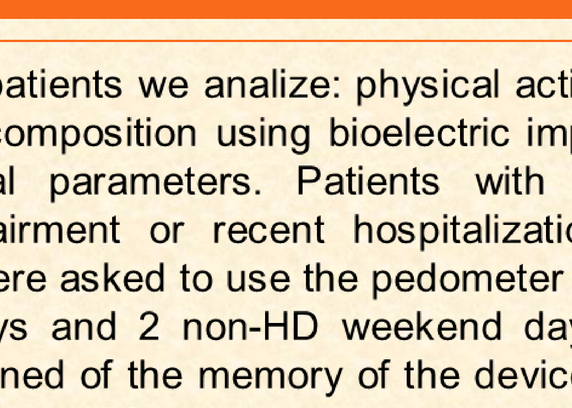


Figure 4. Correlation between number of steps per day with serum urea (A), serum creatinine (B), total proteins (C) and serum albumin (D).

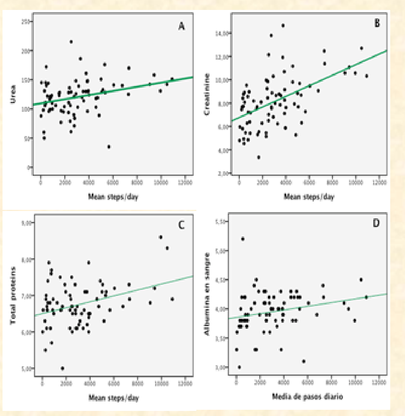
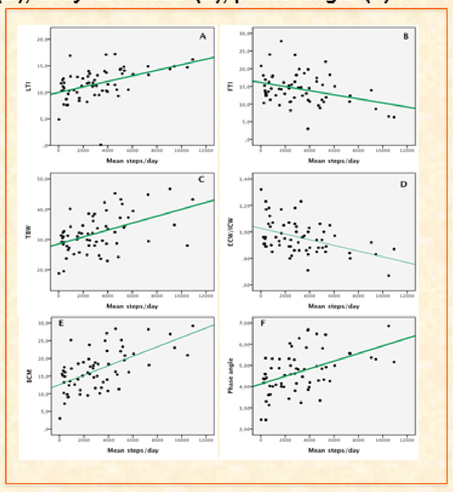


Figure 5. Correlation between number of steps per day with lean body mass (A), fat body mass (B), total body water (C), ECW/ICW (D), body cell mass (E), phase angle (F) .



The main characteristics of our population are described in **Table 1**. Mean PA was 3100 ± 2573 steps/day, being greater in the non-HD days (3722 ± 3178 steps) compared to HD days (2274 ± 2048 steps); p<0.001. The same ocurrs with the active walking time (mean: 30.20±24.60 min, Non-HD: 37.26±31.41 min, HD: 22.29±19.72 min; p<0.001). The degree of PA recorded was lower in women, diabetics and patients with history of isquemic heart disease. **Figure 1** and **Figure 2.** **Table 2** and **Table 3** show the different biochemical and body composition parameters divided in two groups of PA: above or below 3000 steps per day.

We found a significant negative correlation between the Charlson Index adjusted to age and the degree of PA measured by both number of steps (p<0.001) and with the active walking time (p=0.001). Also a positive relationship was found between PA and biochemical parameters like urea (p=0.007), creatinine (p<0.001), total proteins (p=0.001), albumin (p=0.032), sodium (p=0.033), hemoglobin (p=0.036), **Figure 4**, and a negative correlation with CRP (p=0.05) and the rate of EPO resistance (p<0.001). There was no association between PA and adequacy of dialysis, although there was a good correlation with protein intake estimated value measured by NPCR (p=0.013). In regard to the relationship between PA and body composition, higher levels of PA were associated with higher lean mass (p<0.001), lower fat mass (p=0.007), lower ratio ECW/ICW (p<0.001), higher phase angle (p<0.001), and higher body cell mass (BCM)(p<0.001). **Figure 5**. In multivariate analysis only the BCM was predictive of PA (p<0.001).

CONCLUSIONS

Based on the results of our study we can conclude that hemodialysis patients have a reduced level of physical activity. It has been shown that there is a correlation between the degree of physical activity with nutritional biochemical parameters as well as a negative correlation with inflammatory parameters. The degree of physical activity is strongly associated with body composition in these patients, bearing a relation to increased lean mass, decreased fat mass and better hydration status.

The use of pedometer is useful for estimating physical activity in HD patients.

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