

# Physical activity in Sahara Moroccan hemodialysis patients

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## Research article

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# Abstract

**Background:** The evaluation of physical activity for chronic hemodialysis patients is a new approach for the patient global care. The objective of this work is to evaluate the physical activity in chronic hemodialysis patients and identify the risk factors associated with reduced physical activity.

**Methods:** This is a prospective study during 6 months including 150 chronic hemodialysis patients in the Guelmim-Oued Noun Region in Moroccan Sahara. We use Baecke's survey, translated and validated in Arabic local language. The socio-demographic, Clinical and biological data were completed during the interrogation and from the medical records of the patients.

**Results:** The mean age of our patients was 54.6 +/- 16.4 years, with male predominance (59%). Most patients have a low education level and 60% were illiterate. Hypertension was found in 54% of our patients, diabetes in 39% and cardiovascular disease in 10% of patients. Low Physical activity was associated with gender (OR=4.05), age (OR=1.03) and education level (OR=0.2).

**Conclusions:** Our work has met the various pre-established objectives, however other more specific studies must be conducted to better characterize the profile of physical activity in chronic hemodialysis patients.

## Background:

The prevalence of end-stage renal disease (ESRD) treated with hemodialysis (HD) is increasing dramatically worldwide. In Morocco the number of hemodialysis patients was around 7000 patients in 2008 while in December 2018 this number reached 30,000 patients according to the Moroccan society of nephrology [1, 2]. HD has completely transformed the course of chronic renal failure by improving patient quality of life and survival. However, HD is still associated with high morbidity and mortality, including the reduction of autonomy and physical activity. In this context, several studies have shown the benefit of maintaining or resuming physical activity on health of chronic hemodialysis patients.

Physical activity is defined by World Health Organisation as any bodily movement produced by skeletal muscles that require energy expenditure [3]. Popular ways to be active are through walking, cycling, sports and recreation, and can be done at any level of skill and for enjoyment. This includes movements made while working, playing, doing household chores, moving around and during leisure activities. It is often reduced in HD patients. Baecke's survey is a PA assessment tool which is relevant because it allows the calculation of three representative indices: the work activity index, the sports activity index and the index leisure activity.

The objective of our study was to analyze the level of physical activity chronic hemodialysis patients in Moroccan Sahara and to identify the risk factors for reduced physical activity in this area. The region Guelmim has 433,757 inhabitants, 65% of whom are urban with 9.4 inhabitants / km<sup>2</sup> of density and it contains four provinces: Guelmim, Sidi Ifni, Tan-Tan and Assa Zag,

## Methods:

It is a prospective descriptive analytical study spread over 6 months, from April 2019 to October 2019. This study involved a cohort of 150 hemodialysis patients in all hemodialysis centers in the Guelmim Oued Noun region:

- Tan-Tan hemodialysis center (6 patients)
- Assa Hemodialysis Center (5 patients)
- Sidi Ifni hemodialysis center (20 patients)
- Guelmim private hemodialysis center (32 patients)
- Hemodialysis center of the Guelmim regional hospital (60 patients)
- Hemodialysis Center of the Military Hospital at Guelmim (27 patients)

### **Inclusion criteria: we included**

- Patients on hemodialysis in the Guelmim Oued Noun region
- On hemodialysis for more than six months
- Clinically stable patients
- Absence of a major handicap reducing mobility (limb amputation, paraplegic, or requiring a wheelchair to move)

### **Exclusion criteria:**

- Patient with hearing impairment
- Acute renal failure
- Patient not consenting

### **Data collection:**

The parameters likely to influence physical activity (PA) in chronic hemodialysis patients were studied. Social - demographic data were completed during the interrogation and clinical – biological data of patients were collected from the patients' medical files:

- Demographic data: age, sex, level of study (illiterate, primary, middle school, high school, higher education)
- Socioprofessional categories: 1- Active military, 2- Craftsman, trader or business manager, 3- Farmer, 4- Employer, 5- Worker, 6- Retired or retired military, 7- Inactive other than retired, 8- Unemployed having never worked, 9- Student or educated.
- Clinical data: Medical history (Stroke, Arteriopathy), Surgical history (fracture, amputation, etc), nephropathy, Comorbidities: High blood pressure (hypertension) defined by a systolic blood pressure > 140 mmhg and / or a diastolic blood pressure > 90mmhg; Diabetes; Heart disease ; Neoplasia; Evolutionary system disease; Body mass index (BMI) defined by the WHO: being

overweight corresponds to a BMI equal to or greater than 25, just as obesity corresponds to a BMI equal to or greater than 30 in progress: anti hypertensive treatment, erythropoiesis stimulating agent, iron supplementation, calcium, phosphorus chelator, vitamin D analog

- Biological parameters: Hemoglobin (Hb) (anemia is defined by an Hb <11g / dl); Phospho-calcium balance: calcemia, phosphoremia, intact PTH, 25 OH vitamin D; Lipid: total cholesterol, triglycerides; Inflammatory tests: VS, CRP; Alkaline reserves.
- Dialysis data: Our patients are all treated with hemodialysis machines in accordance with current recommendations. The bath used is a standard bath, the buffer used is bicarbonate, with a calcium content of 1.5 mmol / l, potassium at 3mmol / l, and glucose at 1g / l. We noted the following dialytic data: - Seniority in chronic hemodialysis HDC (clinical history) - Number of sessions per week - Quality of dialysis kt / v - Vascular approach

## **Physical activity:**

We assessed the physical activity of our patients using the Baecke Questionnaire. Baecke's original questionnaire (1982) consists of 16 questions. It is self-administered, and allows in its initial form, to determine a work activity index (WAI, eight questions), a sport activity index (SAI, four questions), and a leisure activity index (LAI, four questions). An adaptation was made, which reduced the questionnaire to five questions. This modification does not take into account the WAI. The answers to the first two questions determine the SAI: the combination of the intensity of the sport, its frequency of practice per week and over the year, makes it possible to calculate the SAI. The average of the answers to the other three questions on a five-point scale allows the calculation of the leisure activity index (WAI). [11] In our study we studied the leisure activity of our patients (WAI). The development of the target questionnaire involved several stages in order to adapt it to our Moroccan cultural context. The adaptation methodology we followed can be summarized as follows:

- Independent translations (from French to Moroccan Dialectal), prior to the summary translation which was carried out by a group of professionals representing skills in different disciplines (Nephrologists, Professors of the French language...)
- Modification of the questionnaire according to the equivalence of the Arabic Dialectal version compared to the original questionnaire on the one hand, and according to the remarks and misunderstandings of the patients who participated in the pre-test on the other hand.
- Counter-translation into French.

The descriptive analysis of clinical, socio-demographic and biological data allowed the calculation of the absolute and relative frequencies for the qualitative variables, and the positioning and dispersion parameters for the quantitative variables (mean, standard deviation).

- The normal distribution of variables was studied by the Kolmogorov-Smirnov test.

- In bivariate analysis, the comparison of continuous variables used the Student test, the Mann Whitney test, the ANOVA test and the Friedman test. In multivariate analysis we used binary logistic regression
- The significance threshold was retained for a  $p < 0.05$
- The statistical analysis was performed using IBM SPSS version 20.0 software.

The study was conducted with respect for patient anonymity and the confidentiality of medical information.

## Results:

The 150 chronic hemodialysis patients who participated in our study are distributed as follows: Military Hospital of Guelmim: 27 patients (18%); Guelmim Regional Hospital: 60 patients (40%); Guelmim private hemodialysis center: 32 patients (21%); Sidi Ifni hemodialysis center: 20 patients (13%); Assa hemodialysis center: 05 patients (3%); Tan-Tan hemodialysis center: 06 patients (4%).

The average age of all of our patients was 54.6 +/- 16.4 years, with extremes ranging from 18 to 85 years, a male predominance was noted with a sex ratio of 89H / 61F. The demographics of our study population are summarized in Table I.

Most patients have a low level of education and 38% of patients have no job. 65% of patients live at urban location, 30% are retired and 18% are students. The ministry of health payed hemodialysis for up 61% of patients and other were covered by a social security system (employees, military...)

### ▪ Clinical data:

12% of patients have an arteriopathy and 7% have a lower limb fracture. For comorbidities, we found hypertension in 54%, diabetes in 39% and cardiopathy in 10%

### ▪ Physical activity:

In order to assess the physical activity of our HD patients, we opted for the Baecke questionnaire that we adapted to our Moroccan socio-cultural context. This questionnaire was therefore administered orally by medical staff to consenting patients during HD sessions. Of all our HD patients, 19% of patients report having no physical activity. These are mainly patients assisted in their daily activities by a third person. 63% of cases report difficulty performing significant physical efforts (running, lifting a heavy object). Only 19% of patients report having regular physical and / or sporting activity (walking, football). Regarding the means of transport used to get to hemodialysis centers, most of our patients (88%) used a vehicle (car, motorbike, etc.) while only 11% came on foot.

The calculation of physical activity indices as part of the Baecke questionnaire revealed the following information: in patients who practice sports, the mean sports activity index (SAI) is: 0.79 +/- 0.7.

Moreover, the average leisure activity index (LAI) is 2.45 +/- 1.2. The average of these 2 indices is equal to 1.62 +/- 0.8 which corresponds to a limited physical activity, and this in the different aspects of the daily life of our HD patients.

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## ▪ **Low Physical activity risk factors:**

To search risk factors of low activity, we compare two groups: group A with low physical activity defined by a global activity index (GAI) less than 5 and group B with intermediate or high physical activity (Table 2). In univariate analysis we found that low activity is associated to age, female, living in rural area, diabetes, 2 dialysis sessions by week, use of anti-hypertension drugs and car for coming at hemodialysis center. However, after including all factors in a multivariate model only three risk factors still significant: elderly patients (OR = 1,03), female (OR = 4,05) and low education level (illiterate and primary school).

Table 1

## Characteristics of patients at inclusion

<b>Characteristics</b>	<b>N = 150</b>
Age (mean $\pm$ Sd) years	54,6 $\pm$ 16,4
Male n (%)	89 (59,3)
Co-morbidities	
• Hypertension	82 (54,7)
• Diabetes	59 (39,3)
• Arteriopathy	19 (12,7)
• Cardiopathy	15 (10)
• Low limb fracture	11 (7,3)
• Obesity	10 (6,7)
• Blind	6 (4)
• Depression	4 (2,7)
• Neoplasm	4 (2,7)
Educational status	
• Illiterate	91 (60,7)
• Primary school	22 (14,7)
• High school	33 (22)
• University	4 (2,7)
Treatment	
• Erythropoietin	74 (49,3)
• Antihypertensive drug	80 (53,3)
• Calcium	101 (67,3)
Dialysis data	
• Months on hemodialysis (median; quartiles)	48 [24–96]
• 2 Sessions per week	84 (56)
• KT/V	1,33 $\pm$ 0,15
Biologic data:	

<b>Characteristics</b>	<b>N = 150</b>
• Haemoglobin (mean ± ET ) g/dl	10,2 ± 2
• Calcium (mean ± ET ) mg/l	87,8 ± 17,6
• Phosphore (median; quartiles)	40 [17,9–51,8]
• PTHi (median; quartiles) pg/ml	434 [240–675]
• 25-OH vit D2 (mean ± ET ) ng/ml	39,8 ± 14,5
• C Reactive Protein (median; quartiles) mg/l	2 [1–6, 5]

Table 2

Risk factors of low physical activity in univariate and multivariate analysis

Factor	Univariate analysis			Multivariate analysis		
	Low activity n = 97	OthersN = 53	p	OR	IC	p
Age (mean) years	59,6	45,4	< <b>0.001</b>	<b>1.03</b>	<b>1–1,06</b>	<b>0.019</b>
Female n(%)	46 (47,4)	15 (28,3)	<b>0.025</b>	<b>4.05</b>	<b>1.36-12</b>	<b>0.012</b>
Assurance n(%)	44 (45,4)	14 (26,4)	<b>0.024</b>	4.8	0.27-84	0.27
Rural area n(%)	38 (39,2)	30 (56,6)	<b>0.017</b>	0.32	0.07– 1.38	0.12
Education <sup>a</sup> n(%)	19 (19,6)	18 (34)	0.051	<b>0.2</b>	<b>0.04– 0.87</b>	<b>0.032</b>
Hypertension n(%)	54 (55,7)	28 (52,8)	0.8			
Diabetes n(%)	48 (49,5)	11 (20,8)	<b>0.001</b>	1.82	0.63– 5.18	0.26
BMI < 25	82 (84,5)	15 (28,3)	<b>0.01</b>	5.7	0.57-57	0.137
Months on HD	69,2	58,4	0.39			
2 sessions/ W n(%)	46 (47,4)	38 (71,7)	<b>0.004</b>	0.15	0.01-2,14	0.16
KT/V	1,33	1,33	0,9			
AntiHT drugs n(%)	58 (59,8)	22 (41,5)	<b>0.04</b>	1.71	0.61– 4.77	0.3
Depression n(%)	2 (2,1)	2 (3,8)	0.6			
Neoplasm n(%)	3 (3,1)	1 (1,9)	0.6			
Erythropoietin n(%)	48 (49,5)	26 (49,1)	0,9			
Iron drug n(%)	57 (58,8)	22 (41,5)	0.06	1.67	0.64– 4.35	0.28
Calcium (mean) mg.l	89,9	83,9	0,07	1.02	0.99– 1.05	0.07
Haemoglobin (mean) g.dl	10,3	9,9	0.3			

<sup>a</sup>: Education defined by college level and upper; <sup>b</sup>: patients using car for going to hemodialysis unit

Factor	Univariate analysis			Multivariate analysis		
	Low activity n = 97	OthersN = 53	p	OR	IC	p
Phosphore (mean) mg.l	41,6	59	0.38			
PTHi (mean) pg.ml	527	515	0.8			
25OH vitD	39,8	39,8	0,9			
CRP (mean) mg.l	8,1	16,3	0,19			
Anemia n(%)	61 (62,9)	36 (67,9)	0.14			
Car Use <sup>b</sup> n(%)	93 (95,9)	40 (75,5)	< <b>0.001</b>	2.01	0.41– 9.79	0.38

<sup>a</sup>: Education defined by college level and upper; <sup>b</sup>: patients using car for going to hemodialysis unit

## Discussion:

The "physical activity assessment in chronic hemodialysis patients" was chosen as the subject of our work, on the one hand in view of the importance of physical activity in all people in general, and in hemodialysis patients in particular. On the other hand, given the number of chronic hemodialysis patients in our country, in whom very few such studies have been carried out. This also to underline the impact of hemodialysis on PA which is an important variable in the care of these patients

It is a prospective descriptive analytical study which required field work and a trip between all the centers in the GUELMIM-OUED NOUN region. The distance traveled during the completion of this work is estimated at 648 km. The distances between Guelmim and the different cities in the region are as follows: Guelmim - Assa: 106 km, Guelmim - Sidi Ifni: 88 km, Guelmim - Tan tan: 130 km.

The PA assessment was carried out using the Beacke survey and has been the focus of several studies. Different means have been entrusted to quantify it. According to the data in the literature, two types of measures are devoted to the study of PA, objective measures and declarative measures: Objective measures include indirect measures of energy expenditure (indirect calorimetry in general), heart rate monitoring and movement sensors (mainly pedometers and accelerometers). The most widely used declarative measurement tools are surveys. They represent the most frequently used assessment method. There are around forty models. Their method varies: some focus on physical activity from the day before, the previous week or even the past 12 months. The duration of the survey is also variable: from 5 to 60 minutes. The survey is chosen according to the type of subject. Some questionnaires are specific to children, adults, the elderly, pregnant women, etc.

The first version of the baecke survey is Dutch (1982) but a French version was validated in 1991. It is a self-administered questionnaire which recalls physical activity from 16 items exploring 3 aspects of physical activity: physical activity at work, sporting activity or sport and finally leisure-time physical activity (apart from sport). In 1991 an adaptation was made, making it possible to reduce the questionnaire to five questions. This modification makes it possible to ignore the WAI. Baecke's questionnaire is considered to be one of the most reproducible [4, 7].

The average age of hemodialysis patients differs from series to series. According to the series in the literature, the average age varies between 51.6 and 69 years. The results of our series showed an average age of 54.6 years, with extremes ranging from 18 to 85 years [4, 7]. Several series in the literature report a predominance of men, notably a local Moroccan study carried out by Karimi [8] at the Al Fârâbî hospital in Oujda with a sex ratio of 45H / 38F, that of Fiaccadorie [9] carried out in Italy with a percentage of 67% male, and that of Matsuzawa [10] in Japan had a male predominance of 55%. This joins our study where the male sex is predominant with a percentage of 60%.

During our study, it turned out that the majority of our patients had a low socioeconomic level, with a thatching rate of 38%. Although the illiterate rate has decreased in Morocco thanks to programs to combat illiteracy, our population was unfortunately the majority: 91 patients or 61%. The same results were reported by Karimi's study [8], where the majority of patients were unemployed and illiterate.

Diabetes, hypertension and cardiovascular disease are the most prevalent chronic diseases according to the data in the literature. They were also found in our patients (diabetes 39%, hypertension 54%). This is explained by the micro and macro angiopathic complications of these conditions. In particular, diabetes, which was the leading cause of chronic kidney disease (46%) in our patients, followed by hypertension (25%).

The mean duration of hemodialysis in our study was 65.41 months. The majority of our patients are on dialysis twice a week, joining the study by Karimi [8], where most of the patients were also dialyzed twice a week, with an average duration of hemodialysis of  $102.4 \pm 41, 9$  months. In other studies, notably that of Panaye [5], 88% of the study population benefited from three sessions per week, while 5% had four sessions, while 0.6% had five sessions, with an average duration 36 month hemodialysis.

## ▪ Risk factors of low activity:

During our study, it turned out that only 19% of patients had regular physical activity. This is due to the following factors:

### - Female:

we found that females hemodialysis in Moroccan sahara are at high risk of low physical activity (OR 4.05). This result is supported by some studies showing that men are more active than women[11].. This

can be explained by the sedentary style of life in sahari women and by lake of adherence to recommended physical activity wich is significantly more frequent in women as found by Hornick and al [12].

## **- Age:**

Our study shows us that the elderly subjects have a decreased AP compared to the youngest subjects, which joins Karimi's study. This can be explained by the lack of energy and fatigue reported by several elderly respondents, in addition to the chronic pain experienced by these patients. The impact of chronic pain on the quality of life of patients is currently proven by several authors [13]. Pain is responsible for discomfort in daily activity in 67% of cases [14]. This pain can be explained by amyloidosis b2 microglobulin. The presence of amyloid deposits mainly in articular and para-articular tissues (synovial membranes, tendons, ligaments) and in bones, clinically causes the appearance of joint and peri-articular pain syndromes and ductal syndromes [15]

## **- Instruction level:**

The majority of our hemodialysis patients are illiterate (61%). The correlation of illiteracy with decreased PA can be explained in part by ignorance of the importance of regular physical activity in these patients. The study by Capitanini [16] carried out in Italy in 2014, showed that the lack of specific advice concerning physical exercise in nephrology establishments, favored a sedentary lifestyle. This element should be taken into account especially when it comes to a low educated population.

The originality of this work is due to the fact that this is the first time that a study of this kind has interested all hemodialysis patients from an entire region of Morocco with no bias of selection. Moreover, it is a prospective study that required travel between the various hemodialysis centers in the region and the distance traveled is estimated at 648 km, for a period of more than 6 months.

However, we use a subjective means to quantify the PA of patients and The lack of financial support did not allow us to buy pedometers to better quantify the PA of our patients. We therefore used the Baecke survey as a tool to assess PA. We also had Incomplete biological data in some files: During operation, KT / V was mentioned in only 32 files. Only 75 files were complete. In the 75 remaining files, the phosphocalcic balance was incomplete or completely absent.

## **Recommendations:**

Physical activity in general is reduced in our chronic hemodialysis patients. Improving the level of PA in these patients is a challenge for all health personnel (doctors, nurses, etc.). To achieve this, and at the end of our study and the review of the literature, we recommend:

## - For medical staff:

- Devote more time to counseling patients: Lack of time for exercise advice was one of the most common barriers reported by doctors and nurses in the literature review.
- Increase awareness among HD patients of the importance of regular PA:

A lack of motivation or willingness of patients or caregivers is a risk factor for sedentary behavior.

- Prescribe an individual exercise program for each patient: Since the hemodialysis population is quite heterogeneous in terms of physical capabilities and comorbidities. Exercise is not the same for everyone, and an individual prescription is necessary for the correct and safe implementation of physical activity.
- Add a physical activity sheet with curve in the file of each patient: To monitor changes in patients' PA levels over time, and to identify factors influencing any acute changes in PA levels.

## - For patients:

Creation of groups to do a physical activity in a collective way (walking for example): To increase motivation and willingness to practice physical activity.

## Conclusions:

Physical activity (PA) is defined as any movement produced by the skeletal muscles, responsible for an increase in energy expenditure. This includes movements performed while working, playing, doing household chores, moving around and during leisure activities. It is a very important element in the quality of life for any person. It is gaining more interest in patients with end-stage renal disease on hemodialysis. It must be regular to improve morbidity, mortality and quality of life. There is some evidence that patients on sedentary dialysis have a higher risk of death compared to non-sedentary patients. Conversely, regular physical exercise can promote rehabilitation and the correction of several cardiovascular, metabolic and nutritional abnormalities. Our study shows that physical activity is often reduced in our chronic hemodialysis patients, whose physical capacities are greatly reduced compared to healthy subjects. This is due to several factors: cardiovascular disease, diabetes, advanced age, certain financial problems, wasted time caused by the high number of hemodialysis sessions, which limits their ability to exercise. There are multiple measures that need to be taken into consideration to improve the level of physical activity in these patients. By acting on the modifiable risk factors of reduced activity.

## Abbreviations:

**ESRD:** end stage renal disease; **HD:** hemodialysis; **PA:** physical activity; **Hb:** haemoglobin; **PTH:** parathormone; **CRP:** C reactive protein; **WAI:** work activity index; **SAI:** Sport activity index; **LAI:** leisure activity index; **GAI:** Global activity index; **OR:** odds ratio

## **Declarations**

### **Ethics approval and consent to participate:**

The study was carried out with respect for patient anonymity and the confidentiality of medical information. The study was approved by the Moroccan ministry of health at September the 3<sup>rd</sup> 2019 with a written consent of all participants.

### **Consent for publication:**

All co-autors consent for publication

### **Availability of data and material:**

Data are available any time for control

### **Competing interests:**

Authors declare no competing interest

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### **Authors' contributions:**

- AB: writing and literature revue
- HL: data collection
- SB: data collection
- YZ: statistic analysis
- DE: manuscript correction
- NZ: conception of study and correction

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