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Factors Associated with Hemodialysis Machine Dependency

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ABSTRACT

Introduction : Hemodialysis is one of major stresses in patients' daily lives since there is no other path for life maintenance but to accept the machine and its' related rules. **Purpose:** of this study was to explore factors associated with dependency on dialysis machine as reported by the patients. **Material and Methods:** The sample of the study included 250 patients undergoing hemodialysis. For data collection a questionnaire specially designed for the needs of the research was used. More specifically, socio-demographic and clinical characteristics as well as several other self-reported variables were collected. **Results:** Of the 250 participants, 53.2% was men while 65.2% was aged over 60 years. The study showed that 44% of the patients reported that their life depended very much on hemodialysis machine. Statistically significant association was observed between dependency on dialysis machine as reported by the patients and gender (p=0.030), education (p=0.022), job (p=0.001) and place of residence (p=0.001). Additionally, statistically significant association was observed between dependency on dialysis machine as reported by the patients and the degree of information about their problem (p=0.001) and whether patients reported adherence to treatment guidelines (p=0.001) or followed the proposed diet (p=0.001). Finally, statistically significant association was observed between dependency on dialysis machine as reported by the patients and relations with nursing staff (p=0.001), whether patients had noticed change in body image (p=0.001), whether they faced difficulties in social (p=0.001) and family environment (p=0.030), whether they hid their problem (p=0.006), whether they needed help in daily activities (p=0.001) and whether their lifestyle had changed (p=0.001). **Conclusions:** Socio-demographic and clinical characteristics as well as hemodialysis patients' beliefs are associated with machine dependency. This study contributed in outlining factors affecting dependency on dialysis machine, thus reinforcing multidisciplinary health care teams to develop interventions in order to address hemodialysis patients' needs.

Keywords: hemodialysis, machine dependency, dependency related issues.

1. INTRODUCTION

Hemodialysis consists the most common treatment method for renal failure which is at the same time an unpleasant experience. Indeed, this method is time-consuming since patients are obliged to stay in dialysis units approximately 3 or 4 hours at each session three times each week. This life-saving maintenance therapy, demands adherence to treatment regimen involving fluid and diet limitations or many daily medications that in turn may affect their family and social life (1-4).

Hemodialysis is the only choice for life maintenance. This loss of freedom in parallel with the heavy personal, family, financial and emotional burden constitute an impede for a remaining normal life. Interestingly, patients have to lead a technologically sustained life involving painful procedures thus experiencing dialysis machine dependency (1-5). Complicating the picture, there is noticed a lack of knowledge regarding dependency related issues.

The aim of this study was to explore factors associated with dependency on dialysis machine as reported by the patients.

2. METHODS

The sample of the study were 250 patients (133 men and 117 women) undergoing hemodialysis. This patient sample was a convenience sample.

The study included patients admitted to dialysis centers during the period March 2016 to December 2016. Criteria for inclusion of patients in the study were: a)good comprehension of Greek language and b) being on hemodialysis.

Ethical considerations: Patients who met the entry criteria in the

study were informed by the researcher for the purposes and the conduct of this study. Then, the researcher asked the written consent of patients to participate in the study. The study was approved by the Medical Research Ethics Committee of dialysis center and conducted in accordance with the Declaration of Helsinki (1989) of the World Medical Association.

Data collection was performed by the method of the interview using a questionnaire developed by the researchers so as to fully serve the purposes of the study. The interview lasted approximately 10-15 minutes.

Data collected for each patient included: socio-demographic characteristics (e.g. gender, age, family status, education, job, place of residence), clinical characteristics (e.g., adherence to treatment guidelines, proposed diet, etc.) and other characteristics (e.g.. relations with nursing staff, change in body image, help in daily activities, etc.)

Initially the report of machine dependency was categorized in three likert scale as following: very, enough and little/not at all. After analysis, only 28 patients (11.2%) reported that their life depended on machine little/not at all. As a result, the variable of machine dependency was divided into two groups: a) patients who reported "very" depended on machine and b) patients who reported "not at all up to enough" depended on machine.

Statistical analysis

Categorical variables are presented by absolute and relative frequencies (percentages). To test the existence of association between patient's characteristics and machine dependency X^2 test of independence was used. Multiple logistic regression was performed to estimate the effect of patient's characteristics on the machine dependency they reported (dependent variable). The results are presented with Odds Ratio (OR) and 95% confidence intervals. The level of statistical significance was set to a = 5%. The analysis was performed with the statistical package SPSS, version 20 (SPSS Inc, Chicago, Il, USA).

3. RESULTS

In total 250 patients met the inclusion criteria, of which, men constituted 53.2%, while 65.2% of the sample was aged over 60 years. 53.2% were married, 42.8% had up to primary school education, while 56.4% were pensioners. The majority of patients were leaving in Attica (45.2%) (Table A1, Appendix).

Only 7.6% were little/not at all informed about their health problem while 28.8% and 28.4% reported adherence to treatment guidelines and the proposed diet respectively (Table A2, Appendix).

The vast majority of participants reported to have good or very good relations with the nursing staff (30.4% and 62.8% respectively). Also, 32.0% reported change in body image, 22.8% concealed the problem, 63.2% reported to need help in daily activities, 56.4% had a fistula and 55.2% had insomnia. Moreover, 7.2% and 15.6% reported very/enough difficulties in social and family environment, respectively. Finally, 43.2% and 43.6% reported that their life had very or enough changed, respectively. Lastly and more importantly, 44% reported that their life depended

	Machine Dependency		
	Not at all Up to Enough	Very	
Characteristics	N(%)	N(%)	p-value
Gender			
Male	66 (49,6%)	67 (50,4%)	0,030
Female	74 (63,2%)	43 (36,8%)	
Age			
≤50	30 (63,8%)	17 (36,2%)	0,072
51-60	28 (70,0%)	12 (30,0%)	
61-70	41 (53,2%)	36 (46,8%)	
71-80	41 (47,7%)	45 (52,3%)	
Family Status			
Married/living together	70 (52,6%)	63 (47,4%)	0,298
Single	26 (66,7%)	13 (33,3%)	
Divorced/widowed	44 (56,4%)	34 (43,6%)	
Education			
Primary school	52 (48,6%)	55 (51,4%)	0,022
High school	45 (54,9%)	37 (45,1%)	
University	43 (70,5%)	18 (29,5%)	
Job			
Unemployed/Household	40 (75,5%)	13 (24,5%)	0,001
Employees	42 (75,0%)	14 (25,0%)	
Pensioners	58 (41,1%)	83 (58,9%)	
Living in			
Attica	37 (32,7%)	76 (67,3%)	0,001
City	82 (75,9%)	26 (24,1%)	
Small Town	21 (72,4%)	8 (27,6%)	

Table 1. Associations between patient's characteristics and machine dependency

very much on the hemodialysis machine, whereas only 11.2% reported that their life depend little/not at all on the hemodialysis machine (Table A3, Appendix).

Associations between patients' characteristics and machine dependency

Table 1 presents the association between patients' demographic characteristics and machine dependency as reported by patients. Statistically significant association was observed between machine dependency and gender (p=0.030), education (p=0.022), job (p=0.001) and place of residence (p=0.001). More specifically, male patients reported that their life depended very much on the machine at a statistically significant higher percentage (50.4%) than female patients. Patients with primary school level of education reported that their life depended very much on the machine at a higher percentage (51.4%) than patients with high school level of education or those who had studied in a university (45.1% and 29.5% respectively). Pensioners reported that their life depended very much on the machine at a higher percentage (58.9%) than those unemployed (24.5%) or em-

ployees (25.0%). Lastly, patients living in Attica reported that their life depended very much on the machine at a higher percentage (42.9%) than those living in cities (24.1%) or small towns (27.6%).

Table 2 presents the association between patients' clinical characteristics and machine dependency as reported by patients. Statistically significant association was observed between machine dependency and the degree of information about their problem (p=0.001), whether patients reported adherence to treatment guidelines (p=0.001) and whether they followed the proposed diet (p=0.001). More specifically, patients that were very informed about their problem reported that their life depended very much on the machine at a statistically significant higher percentage (71.6%) than patients who were enough or not at all informed (31.1% and 57.9% respectively). Furthermore, patients who reported to adhere very much to their treatment guidelines and followed very much the proposed diet reported that their life depended very much on the machine at a higher percentage (68.1% and 59.2% respectively) than patients who reported to adhere enough or not at all to treatment guidelines and proposed diet.

	Machine Dependency		
	Not at all Up to Enough	Very	
Characteristics	N(%)	N(%)	p-value
Informed about their health problem			
Very	19 (28.4%)	48 (71.6%)	0.001
Enough	113 (68.9%)	51 (31.1%)	
Little/Not at all	8 (42.1%)	11 (57.9%)	
Adherence to treatment guidelines			
Very	23 (31.9%)	49 (68.1%)	0.001
Enough	75 (62.5%)	45 (37.5%)	
Little/Not at all	42 (72.4%)	16 (27.6%)	
Follow the proposed diet			
Very	29 (40.8%)	42 (59.2%)	0.001
Enough	52 (54.2%)	44 (45.8%)	
Little/Not at all	59 (71.1%)	24 (28.9%)	
Method of Access			
Fistula	75 (53.2%)	66 (46.8%)	0.305
Graft	31 (66.0%)	16 (34.0%)	
Central catheter	34 (54.8%)	28 (45.2%)	

Table 2. Associations between clinical characteristics and machine dependency

Table 3 presents the association between other patients' characteristics and machine dependency as reported by patients. Statistically significant association was observed between machine dependency and relations with nursing staff (p=0.001), whether patients reported change in body image (p=0.001), whether they faced difficulties in social (p=0.001) and family environment

	Machine Dependency		
	Not at all Up to Enough	Very	
Characteristics	N(%)	N(%)	p-value
Relations with nursing staff			
Very good	74 (47.1%)	83 (52.9%)	0.001
Good	59 (77.6%)	17 (22.4%)	
Below moderate	7 (41.2%)	10 (58.8%)	
Change in body image			
Yes	57 (71.3%)	23 (28.8%)	0.001
No	83 (48.8%)	87 (51.2%)	
Difficulties in social environment			
Very/Enough	8 (44.4%)	10 (55.6%)	0.001
A little	97 (81.5%)	22 (18.5%)	
Not at all	35 (31.0%)	78 (69.0%)	
Difficulties in family environment			
Very/Enough	25 (64.1%)	14 (35.9%)	0.030
A little	28 (71.8%)	11 (28.2%)	
Not at all	87 (50.6%)	85 (49.4%)	
Hide problem			
Yes	41 (71.9%)	16 (28.1%)	0.006
No	99 (51.3%)	94 (48.7%)	
Help in daily activities			
Yes	101 (63.9%)	57 (36.1%)	0.001
No	39 (42.4%)	53 (57.6%)	
Lifestyle has changed			
Very	44 (40.7%)	64 (59.3%)	0.001
Enough	75 (68.8%)	34 (31.2%)	
Little/Not at all	21 (63.6%)	12 (36.4%)	
Insomnia			
Yes	76 (55.1%)	62 (44.9%)	0.743
No	64 (57.1%)	48 (42.9%)	

Table 3. Associations between other characteristics and machine dependency

(p=0.030), whether they hid their problem (p=0.006), whether they needed help in daily activities (p=0.001) and whether their lifestyle had changed (p=0.001). More specifically, patients who had below moderate relations with nursing staff reported that their life depended very much on the machine at a statistically significant higher percentage (58.8%) than patients who had good or very good relations with nursing staff (22.4% and 52.9% respectively). Patients who had not noticed any change in their body reported that their life depended very much on the machine at a statistically significant higher percentage (51.2%) than patients who believed their body had changed (28.8%). Patients who did not face any difficulties in their social and family environment reported that their life depended very much on the machine at a

Characteristics	OR (95% CI)	p-value
Gender		
Male	Ref	
Female	0.56(0.25-1.27)	0.168
Education		
Primary school	Ref	
High school	0.60(0.23-1.51)	0.279
University	0.29(0.09-0.96)	0.042
Job		
Unemployed/Household	Ref	
Employees	0.93(0.24-3.51)	0.915
Pensioners	2.70(0.91-8.04)	0.074
Living in		
Attica	Ref	
City	0.78(0.29-2.11)	0.630
Small Town	0.62(0.15-2.45)	0.493
Informed about their health problem		
Very	Ref	
Enough	0.47(0.18-1.22)	0.122
Little/Not at all	1.20(0.28-5.02)	0.802
Adherence to treatment guidelines		
Very	Ref	
Enough	0.77(0.25-2.38)	0.650
Little/Not at all	0.91(0.20-4.13)	0.905
Follow the proposed diet		
Very	Ref	
Enough	0.71(0.23-2.15)	0.540
Little/Not at all	0.78(0.21-3.02)	0.729
Relations with nursing staff		
Very good	Ref	
Good	0.54(0.17-1.66)	0.279
Below moderate	5.79(1.15-29.1)	0.033
Change in body image		
Yes	Ref	
No	2.46(0.86-7.03)	0.091
Difficulties in social environment		
Very/Enough	Ref	
A little	0.38(0.09-1.47)	0.164
Not at all	1.07(0.24-4.81)	0.921
Difficulties in family environment		
Very/Enough	Ref	
A little	1.32(0.32-5.37)	0.695
Not at all	1.17(0.29-4.71)	0.823
Hide problem		
Yes	Ref	
No	1.53(0.53-4.76)	0.404
Help in daily activities		
Yes	Ref	
No	2.15(1.01-4.62)	0.050

Table 4. Estimation of the effect of patient's characteristics on the machine dependency they reported (logistic regression)

Characteristics	N(%)
Gender	
Male	133 (53.2%)
Female	117 (46.8%)
Age	
≤50	47 (18.8%)
51-60	40 (16.0%)
61-70	77 (30.8%)
71-80	86 (34.4%)
Family Status	
Married/living together	133 (53.2%)
Single	39 (15.6%)
Divorced/widowed	78 (31.2%)
Education	
Primary school	107 (42.8%)
High school	82 (32.8%)
University	61 (24.4%)
Job	
Unemployed/Household	53 (21.2%)
Employees	56 (22.4%)
Pensioners	141 (56.4%)
Living in	
Attica	113 (45.2%)
City	108 (43.2%)
Small Town	29 (11.6%)

Table A1. Patients' characteristics (N=250)

higher percentage (69.0% and 49.4% respectively) than patients who faced a little or very difficulties. Patients who did not hide their problem or did not need help in daily activities reported that their life depended very much on the machine at a higher percentage (48.7% and 57.6% respectively) than patients who hid their problem and those who needed help in their daily activities (28.1% and 36.1%). Likewise, patients who believed that their lifestyle had changed very much reported that their life depended very much on the machine at a higher percentage (59.3%) than patients who believed that their lifestyle had changed a little (36.4%).

Estimation of the effect of patient's characteristics on the machine dependency they reported

Multiple logistic regression was applied in order to estimate the machine dependency that patients reported. Factors that were statistically significant associated with machine dependency in the univariate analysis (Tables 1-3) were entered in the model. Table 4 presents these results. We conclude that, patients studied in a university or those having high school level of education have 71% less chances to report that their life depends very much on the machine than patients having primary school level of education (OR=0.29, p=0.042). Moreover, patients who had below moderate relations with nursing staff have 5.79 more chances to report that their life depends very much on the machine than patients who reported

Characteristics	N(%)
Informed about their problem	
Very	67 (26.8%)
Enough	164 (65.6%)
Little/Not at all	19 (7.6%)
Adherence to treatment guidelines	
Very	72 (28.8%)
Enough	120 (48.0%)
Little/Not at all	58 (23.2%)
Follow the proposed diet	
Very	71 (28.4%)
Enough	96 (38.4%)
Little/Not at all	83 (33.2%)
Possession/access	
Fistula	141 (56.4%)
Graft	47 (18.8%)
Central catheter	62 (24.8%)

Table A2. Clinical characteristics

Characteristics	N(%)
Relations with nursing staff	
Very good	157 (62.8%)
Good	76 (30.4%)
Below moderate	17 (6.8%)
Change in body image	
Yes	80 (32.0%)
No	170 (68.0%)
Difficulties in social environment	
Very/Enough	18 (7.2%)
A little	119 (47.6%)
Not at all	113 (45.2%)
Difficulties in family environment	
Very/Enough	39 (15.6%)
A little	39 (15.6%)
Not at all	172 (68.8%)
Hide problem	
Yes	57 (22.8%)
No	193 (77.2%)
Help in daily activities	
Yes	158 (63.2%)
No	92 (36.8%)
Machine dependency	
Very	110 (44.0%)
Enough	112 (44.8%)
Little/Not at all	28 (11.2%)
Lifestyle has changed	
Very	108 (43.2%)
Enough	109 (43.6%)
Little/Not at all	33 (13.2%)
Insomnia	
Yes	138 (55.2%)
No	112 (44.8%)

Table A3. Other patients' characteristics

having very good relations with nursing staff (OR=5.79, p=0.033). Lastly, patients who did not need help in their daily activities have 2.15 more chances to report that their life depends very much on the machine than patients who needed help (OR=2.15, p=0.050).

4. DISCUSSION

In the present study male patients reported more dialysis machine dependency possibly because they are no longer free to fulfill their prior roles within family and society (6-8).

Patients with primary school level of education and pensioners reported that their life depended very much on the machine. Education and occupation are held to be strong socioeconomic indicators related with end-stage kidney disease through various determinants. Low socio-economic status is related with higher death rate possibly, due to low social support or limited economic resources that may in turn affect mental health (9). By contrast, high socio-economic status is related with better quality of life, higher levels of daily activities and lower levels of depression (10, 11).

Participants reporting no change in body image experienced machine dependency. Patients with no disfigurement may experience hemodialysis as a progressive and requiring life-saving maintenance therapy.

Patients who had below moderate relations with nursing staff reported more dialysis machine dependency. Due to limited available time in busy dialysis units nurses focus on treatment or on safety-related issues such as dialysis machine errors and events thus ignoring to pay adequate attention on communication (10-13). It is imperative for nephrology nurses to devote more time to hemodialysis patients on regular basis, thus understanding their deeper needs, values and perceptions about the disease (14). According to patients, nurse's skills includ-

ing technical expertise, working experience and accountability are crucial when confronting with dialysis (15).

Analysis of data also revealed that participants who did not face any difficulties in their social and family environment, those who did not hide their problem or did not need help in daily activities experienced more dependency on machine. Patients consider hemodialysis as a time-consuming procedure that keeps them away from their loved persons. On the other hand, the positive presence of family or peers during dialysis is essential so as to feel comfortable and tranquil. Comfort during dialysis is only fulfilled through the combination of competent nurses, peoples' positive presence and patients' coping mechanisms (15).

Likewise, patients who reported adherence to treatment and diet, and those who believed that their lifestyle

had changed experienced more machine dependency. After the invasion of this life-threatening disease, patients have no other choice but to follow dialysis treatment. Interestingly, both dialysis machine and vascular access have an underlying meaning for these patients. From one point of view, vascular access is a visual reminder of the disease while from the other, machine is completely necessary for survival. The prolongation of life is achieved only through artificial means and death is inevitable if treatment stops (16-19). Finally, and most strikingly, fatigue (19) and insomnia or "poor sleep" are equally important reminders of the change in their life (20, 21). It is worth noting that in the present study, 55.2% of the participants reported insomnia.

Limitations of the study

The method of the present study was a convenience sample and therefore was not representative of hemodialysis patients in Greece. More-over, it was a cross-sectional study, thus not allowing the emergence of a causal relation between machine dependency and patients' characteristics.

5. CONCLUSIONS

Dependency on dialysis machine is associated with gender, education level, job place of residence, degree of information about health problem, adherence to treatment guidelines and diet, relations with nursing staff, change in body image, difficulties in social and family environment, concealment of problem, need for help in daily activities and changes in lifestyle.

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