World Journal of Research and Review (WJRR)
ISSN:2455-3956, Volume-8, Issue-6, June 2019 Pages 16-23

The Influence of Age on Body Structure and Body Compositionof Patients Undergoing Chronic Peritoneal Dialysis, And Its Relationship with The Treatment Schedules

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Abstract— **This paper studied the possible influence of age on the physical conditions and, with a secondary interest, of the dialytic treatment, of a population of 17 males and 32 females undergoing peritoneal dialysis. The influence of age was studied comparing the conditions of the patients separated in groups of different age, the first group based for males and females on the average age, the second group on the age greater and lower 60 years and the third group on the age greater and lower 67 years, this to ascertain if the progressive aging could induce different effects. The result of this research, possibly limited by an insufficient numerousness of the studied populations, showed that very probably the results obtained separating the bodily structures according to the greater and lower average age were modified with the increasing of age to 60 years and 67 years, these last groups significantly decreasing the differences between the bodily properties, when separating greater and lower age, respect to the similar separation operated in average age : that is to say that the aging beyond the basal age of the studied populations (males 58.8±16.38,females 55.1±10.52) decreases the possible differences existing in bodily properties. For what concerning the dialytic treatment,a significant difference was pointed out for males and for females about the average age, but for what concerning the differences greater versus lower of 60 years and 67 years, not significant differences resulted for males, which differently resulted for females.**

Index Terms— **age, body structure.**

I. Introduction

Premise – The increasing of age is naturally tied to a worsening of body structure, even strongly influenced by the degrees of care that the single person will give to his/her maintenance, this not only in terms of the physic conditions but also for what concerning the intellectual conditions, having attention to exercise the brain activity. The beneficial effects of all these cares may be heavy decreased in case of the coexistence of debilitating physic defects, or in case of condition of a chronic disease able to modify in depth the conditions of life of the persons. Based on the previous considerations, it seemed it could be of interest to study the influence of age in a population represented by 17 males and 32 females, affected by a terminal renal disease and for this undergoing to a dialytic treatment by chronic peritoneal dialysis. Their age was respectively for males 58.8±16.38 and for females 55.1±10.52, a not significant difference, T value = 0.84, p = 0.408.

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II. Method

The data concerning the populations of 17 males and 32 females was separated in two groups, the first considering all the data selected on base of the age greater the mean of age and the second concerning the data selected on base of age lower the mean of age. The used data are reported as it follows : resistance, resistance/BMI, reactance, reactance/BMI, height, weight, BMI, BSA DuBois, fat mass i%, fat mass kgs, extracellular water %,extracellular water kgs, cellular mass %, cellular mass%/BMI, cellular mass kgs, cellular mass kgs/BMI, creatininemia, creatininemia/BMI,BUN,BUN/BMI, total protidemia, total protidemia/BMI, albuminemia, albuminemia/BMI, cholesterolemia, triglycerides, triglycerides/BMI, Hb, Hb/BMI, hematocrit, hematocrit/BMI, transferrine, transferrine/BMI, lymphocytes, lynphocythes/BMI,C3, C3/BMI, IgG, IgG/BMI, dialyzed volume, dialyzed volume/BMI.

The results of the separation are reported for males in Table I, II,V,VI,IX,X, and for females, in Tables III,IV,IVA, VII,VIII,X,XII.

Table I - Males - Variables separated according to average age (58,8 years) resulting with significant differences

	Variables	data by greater age		data by lower age		statistics		scores
1	Age	67.83	6.53	37.,2	11.3	5.68	0.002	5
2	Height	163.3	4.87	178.6	4.67	-6.08	0.001	5
3	FMi%	24.27	6.08	17..1	4.46	2,7	0.022	3
4	FM kg	18.2	6.81	12.46	2.59	2.52	0.025	3
5	Extracellular water kgs/BMI	1,154	0.13	1.4	0.067	-5.12	0.000	7
6	Cellular mass %/BMI	1.31	0.26	1.79	0.37	-2.64	0.046	3
7	Cellular mass kgs/BMI	0.94	0.101	1.3	0.13	-5.54	0.001	5
8	Creatininemia/BMI	0,38	0.076	0.513	0.094	-2.8	0.031	3
9	Cholesterolemia	233.1	35.6	184.8	26.47	3.08	0,012	3
10	C3	95	19.8	77.72	7.58	2.6	0.021	3
11	dialyzed V/BMI	459.8	244.47	624.4	328.8	-37.8	0.000	7
							mean	4.27
							SD	1.62

Table II - Males - Variables separated according to average age (58,8 years) resulting without significant differences

Variables							
1	Resistance	12	BMI	22	Triglycerides	32	C3/BMI
2	Resistance/BMI	13	BSA DuBois	23	Triglycerides/BMI	33	IgG
3	Reactance	14	FM kg/BMI	24	Hb	34	IgG/BMI
4	Reactance/BMI	15	Extracellular water %	25	Hb/BMI	35	dialyzed V
6	Weight	16	Extracellular water kgs	26	Hematocrit		
7	Cellular mass %	17	Total protidemia	27	Hematocrit/BMI		
8	Cellular mass kgs	18	Total protidemia/BMI	28	Transferrine		
9	Creatininemia	19	Albuminemia	29	Transferrine/BMI		
10	BUN	20	Albuminemia/BMI	30	Lynphocythes		
11	BUN/BMI	21	Cholesterolemia/BMI	31	Lynphocythes/BMI		

Table III - Females - Variables separated according to average age (55,1 years) resulting with significant differences

	variables	data by greater age		data by lower age		statistics		
order	variables	mean	SD	mean	SD	T value	p	scores
1	Age	65.55	5.89	49.62	7.91	6.43	0.000	7
2	Dialyzed V	8628	993	15157	7128	-4.12	0.000	7
3	Dialyzed V/BMI	349.6	61.14	592	289.6	-3.68	0.001	5
							mean	6.33
							SD	1.15

Table IV - Females - Variables separated according to average age (55,1years) resulting without significant differences

Variables			
1	Resistance	11	FM kg/BMI
2	Resistance/BMI	12	Extracellular water kgs
3	Reactance	13	Extracellular water kgs/BMI
4	Reactance/BMI	14	cellular mass %
5	Height	15	cellular mass %/BMI
6	Weight	16	cellular mass kgs
7	BMI	17	cellular mass kgs/BMI
8	BSA DuBois	18	Creatininemia
9	FMi%	19	Creatininemia/BMI
10	FM Kg	20	BUN

Table IV A - Females - Variables separated according to average age (55,1years) resulting without significant differences

Variables			
11	BUN/BMI	22	Hematocrit
12	total protidemia	23	hematocrit/BMI
13	total protidemia/BMI	24	Transferrine
14	Albuminemia	25	Transferrine/BMI
15	Albuminemia/BMI	26	Lynphocythes
16	Cholesterol	27	Lynphocythes/BMI
17	Cholesterolemia/BMI	28	C3
18	Triglycerides	29	C3/BMI
19	Triglycerides/BMI	30	IgG
20	Hb	31	IgG/BMI
21	Hb/BMI		

Further evaluations were elaborated for males and females, concerning the possible differences between greater and lower data, based on separations between an age greater and lower 60 years and greater and lower 67 years, whose data are reported in the following Tables

Table V - Males - Variables separated according to age greater and lower 60 years resulting with significant differences

order	variables	data by greater age		data by lower age		statistics		Scores
1	Reactance/BMI	1.54	0.3	2.35	0.78	-2.76	0.025	3
2	Age	70.78	4.44	45.4	14.15	4.86	0.001	5
3	Height	162.9	5.11	173.4	8.42	-3.06	0.011	3
4	BMI	29	3.59	23.3	3.86	3,14	0.007	5
5	FMi%	25.2	6.22	18.72	5.06	2.37	0.033	3
6	FM kg	19.8	7.06	12.8	2.58	2.47	0.036	3
7	Extracellular water kgs/BMI	1.15	0.12	1.31	0.16	-2.31	0.04	3
10	Creatininemia/BMI	0.348	0.049	0.5	0.077	-4.79	0.001	5
11	Total protidemia/BMI	0.248	0.027	0.306	0.06	-2.52	0.033	3
12	Albuminemia/BMI	0.133	0.02	0.18	0.04	-3.01	0.013	3
13	Hb/BMI	0.326	0.065	0.44	0.107	-2.61	0.024	3
Table V - Males - Variables separated according to age greater and lower 60 years resulting with significant differences - following data								
14	Hematocrit/BMI	0.96	0.2	1.35	0.33	-2.9	0.014	3
15	Transferrine/BMI	7.29	1.16	8.75	1.42	-2.3	0.038	3
							Mean	3.67
							SD	0.976

Table VI- Males - Variables separated according to age greater and lower 60 years resulting without significant differences

order	variables	order	variables	order	Variables
1	Resistance	11	Creatininemia	21	Transferrine
2	Resistance/BMI	12	BUN	22	Lynphocythes
3	Reactance	13	BUN/BMI	23	Lynphocythes/BMI
4	Weight	14	Albuminemia	24	C3
5	BSA DuBois	15	Cholesterolemia	25	C3/BMI
6	FM kg/BMI	16	Cholesterolemia/BMI	26	IgG
7	Extracellular water %	17	Triglycerides	27	IgG/BMI
8	Extracellular water kgs	18	Triglycerides/BMI	28	dialyzed V
9	Cellular mass %	19	Hb	29	dialyzed V/BMI
10	Cellular mass kgs	20	hematocrit		

Table VII - Females - Variables separated according to age greater lower 60 years resulting with significant differences

order	variables	mean	SD	Mean	SD	T value	p	scores
1	Age	67.22	8.09	50.35	7.92	5.33	0.000	7
2	Extracellular water %	41.56	3.91	46.13	7.15	-2.31	0.029	3
3	Extracellular water kgs	24.6	3.88	29.32	5.94	-2.64	0.015	3
4	Dialyzed volume	8790	805	14526	7122	-3.8	0.001	5
5	Dialyzed volume/BMI	355.8	65.32	568.7	287.07	-3.34	0.003	5
							Mean	4.6
							SD	1.67

Table VIII - Females - Variables separated according to age greater lower 60 years resulting without significant differences

order	Variables	order	Variables	order	Variables	order	Variables
1	Height	11	Cellular mass kgs	21	Cholesterolemia	31	Lynphocythes
2	Weight	12	Cellular mass kgs/BMI	22	Cholesterolemia/BMI	32	Lynphocythes/BMI
3	BMI	13	Creatininemia	23	Triglycerides	33	C3
4	BSA DuBois	14	Creatininemia/BMI	24	Triglycerides/BMI	34	C3/BMI
5	FMi%	15	BUN	25	Hb	35	IgG
6	FM kg	16	BUN/BMI	26	Hb/BMI	36	IgG/BMI
7	FM kg/BMI	17	Total protidemia	27	Hematocrit		
8	Extracellular water kgs/BMI	18	Total protidemia/BMI	28	Hematocrit/BMI		
9	Cellular mass %	19	Albuminemia	29	Transferrine		
10	Cellular mass %/BMI	20	Albuminemia/BMI	30	Transferrine/BMI		

Table IX - Males - Variables separated according to age greater and lower 67 years resulting with significant differences

order	variables	data by greater age		data by lower age		T value	P	scores
1	Age	72.7	2.5	49.1	14.7	4.98	0.001	5
2	Height	162.3	5.5	171.7	8.34	-2.8	0.014	3
3	cellular mass kgs/BMI	0.92	0.06	1.14	0.22	-3.01	0.013	3
4	Creatininemia/BMI	0.35	0.06	0.47	0.1	-3.08	0.008	5
5	Albuminemia/BMI	0.135	0.02	0.17	0.043	-2.25	0.042	3

6	hematocrit/BMI	0.97	0.22	1.27	0.34	-2.21	0.044	3
7	Transferrine/BMI	7.08	1.22	8.61	1.31	-2.47	0.028	3
							Mean	3.57
							SD	0.98

Table X - Males - Variables separated according to age greater and lower 67 years resulting without significant differences

order	Variables	order	Variables	order	Variables	order	Variables
1	Resistance	11	Extracellular water %	21	Total protidemia/BMI	31	Lynphocythes
2	Resistance/BMI	12	Extracellular water kgs	22	Albuminemia	32	Lynphocythes/BMI
3	Reactance	13	Extracellular water kgs/BMI	23	Cholesterolemia	33	C3
4	Reactance/BMI	14	Cellular mass %	24	Cholesterolemia/BMI	34	C3/BMI
5	Weight	15	Cellular mass %/BMI	25	Triglycerides	35	IgG
6	BMI	16	Cellular mass kgs	26	Triglycerides/BMI	36	IgG/BMI
7	BSA DuBois	17	Creatininemia	27	Hb	37	Dialyzed volume
8	FMi%	18	BUN	28	Hb/BMI	38	Dialyzed volume/BMI
9	FM kg	19	BUN/BMI	29	Hematocrit		
10	FM kg/BMI	20	Total protidemia	30	Transferrine		

Table XI - Females - Variables separated according to age greater and lower 67 years resulting with significant differences

order	variables	data by greater age		data by lower age		T value	p	Scores
1	reactance	59.7	3.51	52.5	11.7	2.49	0.042	3
2	Reactance/BMI	2.5	0.205	2.08	0.61	2.62	0.039	3
3	age	73.67	0.58	52.68	8.79	13.21	0.000	7
4	Extracellular water %	40.33	1,53	45.36	6.96	-3.32	0.006	5
5	Extracellular water %	40.33	1.53	45.36	6.96	-3.32	0.006	5
6	Cellular mass kgs/BMI	0.901	0.053	0.789	0.179	-3.32	0.006	5
7	Dialyzed volume	8503	1526	13518	6795	-3.37	0.005	5
8	Dialyzed volume/BMI	353.7	42.76	530.6	274.2	-3.225	0.003	5
							Mean	4.75
							SD	1.28

Table XII - Females - Variables separated according to age greater and lower 67 years resulting without significant differences

order	Variables	order	Variables	order	Variables
1	Height	13	Creatininemia	25	Hb
2	Weight	14	Creatininemia/BMI	26	Hb/BMI
3	BMI	15	BUN	27	hematocrit
4	BSA DuBois	16	BUN/BMI	28	hematocrit/BMI
5	FMi%	17	Total protidemia	29	Transferrine
6	FM kg	18	Total protidemia/BMI	30	Transferrine/BMI
7	FM kg/BMI	19	Albuminemia	31	Lynphocythes

8	Extracellular water kgs	20	Albuminemia/BMI	32	Lynphocythes/BMI
9	Extracellular water kgs/BMI	21	Cholesterolemia	33	C3
10	Cellular mass %	22	Cholesterolemia/BMI	34	C3/BMI
11	Cellular mass %/BMI	23	Triglycerides	35	IgG
12	Cellular mass kgs	24	Triglycerides/BMI	36	IgG/BMI

The following Tables XIII, XIV show the comparison of scores for differences of greater values versus lower values of scores concerning average age versus 60 years age and 67 years age, and of 60 years age versus 67 years age, while Table XV shows the comparison of these differences between males and females

Table XIII - Males - Comparison of scores for differences of greater values versus lower values

average age	versus	T value	p value
	60 years	1.09	0.292
	67 years	1.14	0.271
60 years	67 years	0.22	0.827

Table XIV - Females - Comparison of scores for differences of greater values versus lower values

average age	versus	T value	p value
	60 years	1.73	0.144
	67 years	2.12	0.078
60 years	67 years	-0.17	0.869

Table XV - Males versus Females- Comparison of scores for differences of greater values versus lower values

variables	Versus	T value	p value
average age	average age	-2.5	0.067
60 years	60 years	-1.18	0.303
67 years	67 years	-2.02	0.067

Observations onthe Tables I, II, IV, IV A, V, VII, IX, XI, XII and final conclusions

Table I – Males – Differences based on average age - the variables resulting significantly dominant selected by lower age were : height, extracellular water kgs/BMI, cellular mass %/BMI,cellular mass kgs/BMI,Creatininemia/BMI, and dialyzed volume/BMI, while greater age significantly selected age, fat mass%,fat mass kgs,cholesterolemiaand C3. The variables selected by lower age all concerned physical properties typical of young age, while the variables selected by greater age are usually more enhanced in older subjects. It has to observe that many variables classified as significantly differing in Table I are present also in Table II, which includes variables without significant differences, within them including cellular mass %, cellular mass kgs, extracellular water % and extracellular water kgs that are present in Table I: these variables resulted differ from those in Table I because indexed on BMI, that is proper of each individual.

Tables I, II, II,IV and IV A – In these tables it is possible to note a relevant difference of the data from males and from females, data concerning the differences between the variables separated according to the values greater or lower the average age. These differences resulted in males to be statistically significant in 11 variables and not significant in 11 variables, while in females the significant differences concerned only three variables, age, dialyzed volume and dialyzed volume/BMI, of which age was different for default, and the not significant differences resulted to be 31 (Tables IV and IV A). An elaboration of data concerning males and females was performed to attain an explication of this relevant difference. For this purpose, it was firstly calculated the percentage difference between the greater and lower values of the variables according to greater and lower age. Successively, the calculated percentage was subtracted by the value 100, this generating positive and negative values, and for this comparison the absolute values of the final percentage differences were assumed, using the formula absolute value = square root of the square value, so that the obtained values could not be defined neither positive or

negative. The following step was to calculate the mean and the standard deviation of all the percentage differences of the 45 variables, calculated in their wool: It resulted to be for males 17.44±14.83 and 3.28±22.8 for females, this difference resulting high significant at T test for two variables, T value = -4.19, p = 0.000, this adequately explaining the very low number of significant differences between greater and lower values for females.

The same procedure was followed about the content of the Tables V, VII, IX, XI, which show the differences greater versus lower of the data concerning 60 years and 67 years. Very different results were obtained: for males, the absolute values concerning the percentage difference greater versus lower for 60 years was 9.35±31.07,and for females 64.03±738.4, a very great numerical difference, but statistically without significance, T value = – 0.17, p = 0.877. It is very relevant to point out that in males the number of significant differences between greater versus lower increased from 11 for average age to 15 differences for 60 years and, similarly for females, the number of significant differences increased from three to five differences, age, extracellular water %, extracellular water kgs. But in the case of 67 years of age, the number of significant differences for males decreased to seven (Table IX), while for females increased to eight. For 67 years, the percentage difference for males resulted 4.9±161.5 and for females 57,01±350,7, but similarly that for 60 years of age, no significant difference resulted between males and females, T value = -0.38, p = 0.714. These results differ from those concerning the different number of variables not having significant difference in males and in females: for what concerning males, for 60 years of age (Table VI) 20 variables, for 67 years (Table X) 38 variables, in females, for 60 years (Table VIII) 30 variables, and for 67 years of age, 36 variables (Table XII), therefore in males and in females the numerousness of not significant differences based on the separation of data greater versus lower age increases with the increase of age. Very different The results concerning the dialytic treatment showed a significant difference in the separation based on average age for males and females, while the separations concerning 60 years and 67 years showed no significant difference for males, but significant difference for females.

Conclusion. These final results seem driving to believe that aging should reduce the differences between greater and lower dimensions of bodily properties: this is indirectly confirmed by the research of Susanne [1], that shown the reduction of body structure with aging, an event also pointed out by Makizaco H. et Al. and by Evans WJ et Al. [2,3]. Fukumoto Y et Al. pointed out that aging can induce a loss of muscle which may be preceded by a decreased quality of muscle mass [4].

The Tables XIII and XIV show the consequences of absence of differences in the comparisons greater versus lower for what concerning average age versus 60 years and 67 years and of 60 years versus 67 years, this driving to no statistic differences of the related scores, the same for the difference between males and females (Table XV). For what concerning the dialytic treatment, a significant difference was pointed out for males and for females about the average age, but for what concerning the differences greater versus lower of 60 years and 67 years, not significant differences resulted for males, which differently resulted for females, a significant difference was pointed out for males and for females about the average age, but for what concerning the differences greater versus lower of 60 years and 67 years, not significant differences resulted for males, which differently resulted for females, notwithstanding the age should not differ males versus females, as shown in premise.

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