Comparison of bioimpedance analysis scan, hemoglobin and urea reduction ratio in hemodialysis patients following and not following monitoring program for improving quality of life

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Abstract. Hemodialysis (HD) is the renal replacement therapy in end-stage renal disease (ESRD), at least 2-3 times a week, impacting substantial changes in daily life. Therefore a monitoring program is needed to improve the quality of life (QoL) of HD patients. Indicators in monitoring QoL include phase angle (PhA), muscle and fat mass, and body fluid composition through Bio Scan impedance analysis (BIA) Scan, hemoglobin level, and urea reduction ratio (URR). An analytic study with the cross-sectional design was performed in 168 patients at Klinik Spesialis Ginjal Hipertensi (KSGH) Rasyida, Medan to compare BIA Scan profiles, hemoglobin levels, and URR in HD patients who follow and do not follow the monitoring program for improving QoL {Program Pemantauan Peningkatan Kualitas Hidup (P3KH)}. Each variable was analyzed by independent T-test, it is significant if $p < 0.05$. This study showed that there were differences in BMI ($p = 0.006$), fat mass ($p = 0.010$), extracellular water / intracellular water (ECW / ICW) ($p = 0.046$), and haemoglobin $p = 0.001$). Although it was better in the program group, statistically there was no difference of PhA ($p = 0.136$), muscle mass ($p = 0.842$), and URR ($p = 0.232$).

1. Introduction

Chronic kidney disease (CKD) is now a global epidemic, and its prevalence is increasing worldwide. In the United States, the prevalence of CKD reaches 17%, whereas in Indonesia it reaches 12.5% in the adult population.[1] Although HD is one of the most prominent types of renal replacement therapy in Indonesia (80%) in addition to peritoneal dialysis and renal transplant [2], this procedure can negatively impact the lives of everyday patients because it requires regular visits to hospitals or dialysis centers, at least 2-3 times a week [3-4]. So we need a monitoring program to improve the quality of life of HD patients. There are various indicators in monitoring the quality of life among others by knowing cellular health, muscle mass and fat, and body fluid composition through examination of BIA Scan, hemoglobin level, and URR [5].

Based on this background, researchers felt compelled to compare the BIA Scan profile, hemoglobin levels, and URR in HD patients who followed and did not follow the P3KH.

2. Methods

This research is analytic with a cross-sectional design, involving 168 patients and performed in June 2016 at Klinik Spesialis Ginjal Hipertensi Rasyida, Medan. Patients divided into two based on their previous participation in P3KH; program participants and non-program. P3KH is a program in which monitoring the quality of life of HD patients by performing laboratory tests (routine blood and URR) every month and BIA Scan and electrolytes every three months. Non-program is a condition where the patient only gets the routine examination in the form of hemoglobin and URR examination every month. Then all the patients do a hemoglobin examination, URR, and BIA scan. The average comparison of each variable was analyzed by independent T-test. It is said to be significant if $p < 0.05$

3. Results

From the results of research that has been done, obtained data in the form of tables as below.

Table 1. Characteristics of hemodialysis patients in KSGH Rasyida.

Variable	n	%
Gender:		
- Male	103	61.3
- Female	65	38.7
Age		
- 20 – 39 years	18	10.7
- 40 – 59 years	96	57.1
- ≥ 60 years	54	32.2
Body Mass Index		
- < 18.5 (underweight)	6	3.6
- 18.5 – 22.9 (normoweight)	56	33.3
- 23 – 24.9 (overweight)	41	24.4
- ≥ 25 (obesity)	65	38.7
Participation of P3KH		
- Non Program	43	25.6
- Program	125	74.4

From the table above shows that most hemodialysis patients in KSGH Rashida are male (61.3%) with age group 40 - 59 years (57.1%) and have body mass index of obesity category (38.7%). Based on their participation in P3KH, most patients followed the program (74.4%).

Table 2. The average comparison between P3KH and non-program participants.

Categories	Groups				*p*
	Program		Non Program		
	Mean	**SD**	***Mean***	**SD**	
Age	55.310	11.379	49.720	11.711	**0.0348***
Body Mass Index	24.599	3.927	23.930	3.824	**0.006***
Phase Angle	4.239	0.91	3.954	1.11	**0.136**
Muscle Mass	21.569	4.711	21.400	5.020	**0.842**
Fat Mass	28.263	8.643	24.304	8.316	**0.010***
ECW / ICW	1.084	0.571	1.424	1.033	**0.046***
Hemoglobin	10.416	1.033	9.376	1.912	**0.001***
Urea Reduction Ratio	73.164	1.113	72.925	1.126	**0.232**

The above table shows that in the BMI program group ($p = 0.006$), fat mass ($p = 0.010$), ECW / ICW ($p = 0.046$) and hemoglobin ($p = 0.001$) were better than the non-program group. While in the

category, phase angle (p = 0.136), muscle mass (p = 0.842) and URR (p = 0.232), although on average better however, there was no statistically significant difference between the two groups.

4. Discussion

Hemodialysis patients who follow the program tend to be more economically capable; this is because of the additional costs that must be incurred to follow the program. Also, patients who follow the program also has a motivation for a higher healthy life. Because although it is economically capable, if the patient is less motivated to live healthy then the patient also has no desire to follow the program.

This study shows that patients following P3KH tend to be older than non-program (p = 0.006). It may be due to the need for further age and more motivation in improving the quality of life.

BMI in program group is higher than non-program group (p = 0.006). It suggests that hemodialysis patients who follow the P3KH are better monitored and better in nutritional status than those who do not follow it.

Bio-Impedance Analysis Scan is a method commonly used to find out the estimation of body composition, either liquid, muscle mass or fat mass. Phase Angle is an indicator of cellular health and its integrity [6]. From the result of the research, there is no difference of PhA between the two groups (p = 0.136). It may be due to the fact that the phase angle is influenced by many factors.

Muscle mass is a measure to assess the amount of muscle tissue in the body [6]. From the results of the study found that there is no difference between the two groups (p = 0.842). It suggests that many factors affect muscle mass, one of which is the routine physical activity to build muscle mass. Some patients have difficulty performing a regular physical activity, due to their limitations despite following the P3KH.

Fat mass is a level to assess the amount of fat tissue in the body (in percent) [6-7]. Through BIA Scan examination, the difference of fat mass between the two groups (p = 0,010). Whether the high-fat mass of P3KH participants is associated with a large BMI, further research is needed. It needs to be investigated because of the contradiction with low muscle mass.

ECW / ICW is the ratio of extracellular and intracellular water content [6]. The result of the research, there are differences between the two groups (p = 0.046), where P3KH participants are more controlled regarding water intake. It may be because the group has a clear dry weight (BB) target. As we know, it is very difficult to know how much dry BB a patient must achieve. But with BIA examination, we can know and control it.

The results showed that there was a difference of hemoglobin level between the two groups (p = 0.001). Although hemoglobin levels were monitored in both groups, there were still other contributing factors. These factors include nutritional status associated with food intake. This can be from BMI in P3KH participants is better than non-program.

Urea reduction ratio is a way of determining hemodialysis adequacy by comparing urea levels before and after hemodialysis [8]. The results show that there is no difference between the two groups (p = 0.232). It is probably due to the prescribing of hemodialysis in both groups of patients according to the standard.

5. Conclusion

HD patients who follow P3KH are more observed and better hydration status and nutritional status than patients who do not follow the program.

References

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