Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 01, 2024

Type of study: Original Research Paper

ANALYZING THE IMPACT OF BIOLOGICAL PARAMETERS AND HOMOCYSTEINE CONTENT LEVELS ON PATIENTS UNDERGOING HAEMODIALYSIS

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ABSTRACT

Background: Homocysteine levels are elevated in patients with renal disease, which causes it to be excreted in urine. Raised homocysteine levels have been linked to renal illness; this association may be explained by the possibility that elevated homocysteine causes renal disease or by the relationship between homocysteine and Glomerular Filtration Rate (GFR), where only a tiny percentage of less than 1% is discharged.

Aim: The purpose of this study was to evaluate the relationship between physiologic parameters and homocysteine levels in haemodialysis patients.

Methods: 57 controls and 63 cases were observed in 120 patients, both male and female. With a mean age of 46.6±4.22 years, these patients ranged in age from 19 to 80 years.

Using an ELISA spectrophotometer, homocysteine and vitamin B6 levels in the serum were measured; urea and creatinine levels were determined using cobasd e411 electroluminescence. The gathered information was examined statistically.

Results: Homocysteine levels in the test group research subject were 22.97±4.77 μmol/l, compared to 8.59±0.96 μmol/l in the control group ($p<0.0001$). The test individuals had considerably lower vitamin B6 levels (159.47±14.75) than the controls. Test individuals with renal illness had considerably higher amounts of urea ($p<0.0001$). Test individuals with renal dysfunction had much higher creatinine levels. The patients' creatinine value in the test was 8.04±2.07 with $p<0.000$, whereas the controls' value was 0.45±0.12. There was an inverse relationship between homocysteine and B6. Homocysteine had a positive connection (r-value of 0.187, p-value of 0.123) with creatinine levels. The urea levels showed a similar positive connection, with a p-value of 0.792 and an r-value of 0.034.

Conclusion: The current investigation shows that, in comparison to control participants without renal illness, persons with renal disease receiving hemodialysis have higher levels of homocysteine, urea, and creatinine. Additionally, hemodialysis patients with renal failure had

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 01, 2024

considerably lower levels of haemoglobin and vitamin B6 than did patients without renal illness.

Keywords: Haemodialysis, Homocysteine, Renal Disease, Renal Failure, Urea, Vitamin B6

INTRODUCTION

Haemodialysis uses an artificial machine system to remove extracorporeal waste products like creatinine and urea from people with renal failure and poor renal function. Hemodialysis works on the fundamental principle of allowing blood to travel through a thin membrane with tiny blood channels. Waste and undesired blood components diffuse past the membrane and into the dialyzing fluid. Hemodialysis can be performed three times a week in a clinical setting for four hours, or nocturnally, when people perform it while they sleep, five to six times a week.[1] Haemodialysis is regarded as a safe and efficient therapy for patients suffering from renal failure. But there are a number of side effects linked to hemodialysis, including allergy, cramping in the muscles, cardiac arrhythmia, and/or hypotension.[2]

With the earliest treatment and careful monitoring, these problems can be effectively treated or averted to a considerable degree. Additionally, in patients receiving hemodialysis for diabetic end-stage renal disease, effective glucose management increases survival. Homocysteine is a sulfur-containing amino acid that is involved in methionine metabolism.[3] It is created metabolically in most cells and tissues through a series of events mediated by the SAM (sadenosylmethionine) dependent transmethylation pathway. The liver, which produces the highest amount of homocysteine, is the most notable location for SAM-dependent transmethylation. Vitamin status and dietary intake primarily assess homocysteine levels physiologically. A lack of folate or vitamin B12 may be linked to elevated homocysteine levels. Vitamin B6 can function as a cofactor in the transsulphuration process, which converts homocysteine to cysteine.[4]

Homocysteine levels are elevated in patients with renal disease, which causes it to be excreted in urine. Raised homocysteine levels have been linked to renal illness; this association may be explained by the possibility that elevated homocysteine causes renal disease or by the relationship between homocysteine and Glomerular Filtration Rate (GFR), where only a tiny percentage of less than 1% is discharged. The absorption of homocysteine by renal tubules and its conversion to cysteine by the transsulphuration route, which is uncommon in individuals with normal renal function, is another reason that may be plausible.[5]

However, the data assessing homocysteine compound levels in hemodialysis subjects are scarce in the literature. Therefore, the goal of the current study was to evaluate the impact of biological parameters and homocysteine levels on hemodialysis patients.

MATERIALS AND METHODS

The goal of the current study was to evaluate the impact of biological parameters and homocysteine levels on hemodialysis patients. The study was conducted at Bhilai, Chhattisgarh, at the Shri Shankaracharya Institute of Medical Sciences, in the Department of General Medicine. A total of 120 volunteers were included, with 57 serving as controls and

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 01, 2024

63 as cases. There were male and female patients. These patients varied in age from 19 to 80 years, with a mean age of 46.6±4.22 years.

Subjects with renal failure who were willing to participate in the study met the inclusion criteria. Subjects who met the following exclusion criteria were not allowed to participate in the study: they had to be older than eighty years or younger than eighty years, have renal failure and Hepatitis A, or were unwilling to participate. All study participants gave their verbal and written informed permission after being fully told about the study's design.

Following the research subjects' final inclusion, each study subject's complete medical history and demographics, including gender, age, and the number of hemodialysis sessions per week, was documented. The procedure used to obtain the blood sample was aseptic and sterile. Five millilitres of venous blood were drawn and stored in tube gel. Centrifugation was used to separate the serum after this. For ten minutes, the centrifugation was carried out at 4000 rpm. Four fractions of the serum were separated after centrifugation. The eppendrof tubes containing these fractions were preserved at -200 C.

Homocysteine and vitamin B6 levels in the serum were analysed using an ELISA spectrophotometer; urea and creatinine levels were ascertained by utilising cobasd e411 electroluminescence.

Using SPSS software version 21 (Chicago, IL, USA) for statistical assessment and one-way ANOVA and t-test for result formulation, the gathered data were examined. The data were presented as a mean, standard deviation, percentage, and number. At $p<0.05$, the significance threshold was maintained.

RESULTS

This investigation was carried out to evaluate the impact of biological factors and homocysteine levels in hemodialysis patients. There were 120 participants in all, 57 of whom were controls and 63 of whom were cases. The patients were both male and female. With a mean age of 46.6±4.22 years, these patients ranged in age from 19 to 80 years.

According to the study findings, the homocysteine level in the test group study individuals was 22.97±4.77 μmol/l, whereas it was 8.59±0.96 μmol/l in the control group. With $p<0.0001$, this difference was statistically significant. These findings demonstrated that those receiving hemodialysis had somewhat elevated homocysteine levels. When comparing the test individuals' vitamin B6 levels (159.47±14.75) to the controls' vitamin B6 values (98.52±29.11), there was a significant difference. With $p<0.0001$, this difference was likewise statistically significant (Table 1).

It was seen that urea levels were significantly higher in test subjects having a renal disease where the urea levels in controls were 20.19±4.24 and in the test group was 140.75±35.50. With $p<0.0001$, this difference was statistically significant. In terms of creatinine, the study's findings demonstrated that test individuals with renal disease had noticeably higher amounts of creatinine. The test participants' creatinine levels was 8.04±2.07, whereas the controls' was 0.45±0.12. Table 2 illustrates that this difference was also statistically significant with $p<0.0001$. Upon measuring the haemoglobin in the research individuals, it was seen that the control group had a substantially higher haemoglobin level in grams/dl (14.24-5.13 g/dl) than

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE 01, 2024

the test patients with renal illness (9.69-1.85 g/dl on average). Table 3 shows that this difference was statistically significant with p<0.0001.

The correlation coefficients between homocysteine and other research factors were also evaluated in this investigation. The findings demonstrated a negative connection (r and p-values of -0.388 and 0.001, respectively) between B6 and homocysteine. Homocysteine had a positive connection (r-value of 0.187, p-value of 0.123) with creatinine levels. The urea levels showed a similar positive connection, with a p-value of 0.792 and an r-value of 0.034. As shown in Table 4, haemoglobin also exhibited a positive connection (r and p values of 0.026 and 0.825, respectively) with homocysteine levels in the research.

DISCUSSION

The purpose of the current study was to evaluate the relationship between physiologic parameters and homocysteine levels in hemodialysis patients. There were 120 participants in all, 57 of whom were controls and 63 of whom were cases. The patients were both male and female. With a mean age of 46.6±4.22 years, these patients ranged in age from 19 to 80 years. According to the study findings, the homocysteine level in the test group study individuals was 22.97±4.77 μmol/l, whereas it was 8.59±0.96 μmol/l in the control group. With p<0.0001, this difference was statistically significant. These findings demonstrated that those receiving haemodialysis had somewhat elevated homocysteine levels. The test individuals had considerably lower amounts of Vitamin B6 (159.47±14.75) than the controls, where the vitamin B6 value was higher as 98.52±29.11.
With p<0.0001, this difference was likewise statistically significant. These findings corroborated those of research by Schalinske KL et al[6] in 2009 and Smith AD et al[7] in 2016, whose authors found that participants with renal illness had lower levels of vitamin B6 and higher homocysteine readings.

In the current study, test participants with renal disease had considerably higher urea levels than controls (20.19±4.24), with test group urea levels being 140.75±35.50. With p<0.0001, this difference was statistically significant. In terms of creatinine, the study's findings demonstrated that test individuals with renal disease had noticeably higher amounts of creatinine. The test participants' creatinine levels were 8.04±2.07, whereas the controls' was 0.45±0.12.

Table 2 illustrates that this difference was also statistically significant with p<0.0001. Upon measuring the haemoglobin in the research individuals, it was seen that the control group had a substantially higher haemoglobin level in grams/dl (14.24-5.13 g/dl) than the test patients with renal illness (9.69-1.85 g/dl on average). With p<0.0001, this difference was statistically significant. The findings aligned with the research conducted by Kraus MA et al. (2016)[8] and Yeh EL et al. (2018),[9] which revealed notably elevated urea, creatinine, and haemoglobin levels in individuals with renal impairment receiving haemodialysis.

The findings demonstrated a negative connection (r and p-values of -0.388 and 0.001, respectively) between B6 and homocysteine. Homocysteine had a positive connection (r-value of 0.187, p-value of 0.123) with creatinine levels. The urea levels showed a similar

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positive connection, with a p-value of 0.792 and an r-value of 0.034. In the research, haemoglobin and homocysteine levels also exhibited a positive connection, with r and p values of 0.026 and 0.825, respectively. The present study's findings were similar to those of Ghali L10 in 2020[10] and Katko M et al. in 2018,[11] whose research also found a similar association between homocysteine and urea, creatinine, haemoglobin, and vitamin B6.

CONCLUSION

Within the bounds of its limitations, the current study suggests that people with renal illness receiving hemodialysis have higher levels of homocysteine, urea, and creatinine than control persons without renal disease. Additionally, hemodialysis patients with renal failure had considerably lower levels of haemoglobin and vitamin B6 than did patients without renal illness. The current study did, however, have several drawbacks, such as a limited sample size, a short monitoring time, and biases related to geographic areas. Therefore, further long-term research with bigger sample sizes and longer observation periods will aid in coming to a conclusive result.

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TABLES

S. No	Parameters	Number of subjects	Value (Mean±S.D)	p-value
1.	**Homocysteine**			
a)	Control	57	8.59±0.96	<0.0001
b)	Tests	63	22.97±4.77	
2.	**Vitamin B6**			
a)	Control	57	159.47±14.75	<0.0001
b)	Tests	63	98.52±29.11	

Table 1: Levels of Homocysteine and Vitamin B6 in control and cases group subjects

S. No	Parameters	Number of subjects	Value (Mean±S.D)	p-value
1.	**Urea**			
a)	Control	57	20.19±4.24	<0.0001
b)	Tests	63	140.75±35.50	
2.	**Creatinine**			
a)	Control	57	0.45±0.12	<0.0001
b)	Tests	63	8.04±2.07	

Table 2: Levels of Urea and Creatinine in control and cases group subjects

S. No	Parameters	Number of subjects	Value (Mean±S.D)	p-value
1.	**Hemoglobin**			
a)	Control	57	14.24±1.13	<0.0001
b)	Tests	63	9.69±1.85	

Table 3: Levels of Hemoglobin in control and cases group subjects

S. No	Homocysteine with	r value	p-value	Inference
1)	**B6**	-0.388	0.001	Negative correlation
2)	**Creatinine**	0.187	0.123	Positive correlation
3)	**Urea**	0.034	0.792	Positive correlation
4)	**Hemoglobin**	0.026	0.825	Positive correlation

Table 4: Correlation coefficient of Homocysteine with various other parameters of the study