Lampiran 1

KARTU KONSULTASI SKRIPSI

Nama Mahasiswa : Whyngky Oktira

Judul Skripsi : Pengaruh Hemodialisa Terhadap Kadar Kalium Pada Penderita Gagal Ginjal Kronik

Pembimbing Utama : Mimi Sugiarti, S.Pd., M.Kes

No	Kegiatan	Paraf
1.	10 Desember 2020, Bimbingan Bab 1,2,3	
2.	21 Desember 2020. Bimbingan Bab 1,2,3	
3.	01 Januari 2021, Bimbingan Bab 1,2,3	
4.	09 Januari 2021, Bimbingan Bab 1,2,3	
5.	14 Januari 2021, Bimbingan Bab 1,2,3	
6.	25 Januari 2021, Bimbingan Bab 1,2,3	
7.	02 Februari 2021, ACC Seminar Proposal	
8.	20 April 2021, Bimbingan Bab 1 - 5	
9.	03 Mei 2021, Bimbingan Bab 1 - 5	
10.	24 Mei 2021, Bimbingan Bab 1 - 5	
11.	07 Juni 2021, Bimbingan Bab 1 - 5	
12.	10 Juni 2021, Bimbingan Bab 1 - 5	
13.	15 Juni 2021, Bimbingan Bab 1 - 5	
14.	22 Juni 2021, Acc Seminar Hasil	
15.	04 Agustus 2021, Bimbingan Cetak	
16.	05 Agustus 2021, Acc Cetak	

Ketua Prodi TLM Program Sarjana Terapan

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Lampiran 2

KARTU KONSULTASI SKRIPSI

Nama Mahasiswa : Whyngky Oktira

Judul Skripsi : Pengaruh Hemodialisa Terhadap Kadar Kalium Pada penderita Gagal Ginjal Kronik

Pembimbing Pendamping : Lendawati, SKM.,MM.,M.Si

No.	Kegiatan	Paraf
1.	25 November 2020, Bimbingan Bab 1, 2 dan 3	
2.	19 Desember 2020, Bimbingan Bab 1, 2 dan 3	
3.	29 Desember 2020, Bimbingan Bab 1, 2 dan 3	
4.	13 Januari 2021, Bimbingan Bab 1, 2 dan 3	
5.	17 Januari 2021, Perbaikan Kata Pengantar	
6.	25 Januari 2021, ACC Seminar Proposal	
7.	04 Mei 2021, Bimbingan Bab 1 - 5	
8.	27 Mei 2021, Bimbingan Bab 1 - 5	
9.	04 Juni 2021, Bimbingan Bab 1 - 5	
10.	16 Juni 2021, Bimbingan Bab 1 - 5	
11.	22 Juni 2021, Bimbingan Bab 1 - 5	
12.	25 Juni 2021, ACC Seminar Hasil	
13.	13 Juli 2021, Bimbingan Cetak	
14.	10 Agustus 2021, ACC Cetak	

Ketua Prodi TLM Program Sarjana Terapan

Sri Ujiani, S.Pd.,M.Biomed

NIP.197301031996032001

Lampiran 3

LEMBAR KEGIATAN

Nama Mahasiswa : Whyngky Oktira

Judul Skripsi : Pengaruh Hemodialisa Terhadap Kadar Kalium Pada Penderita Gagal Ginjal Kronik

Dosen Pembimbing : Mimi Sugiarti, S.Pd., M.Kes
Lendawati, SKM,MM,S.Si

No	Hari/Tanggal Bimbingan	Kegiatan	Paraf
1.	10 November 2020	Mencari literatur	
2.	16 November 2020	Penyusunan Proposal	
3.	12 Januari 2021	Penyusunan Proposal	
4.	10 Februari 2021	Seminar Proposal	
5.	30 Maret 2021	Revisi Sempro	
6.	22 Mei 2021	Penyusunan Skripsi	
7.	04 Juni 2021	Penyusunan Skripsi	
8.	17 Juni 2021	Penyusunan Skripsi	
9.	05 Juli 2021	Seminar Hasil	

Ketua Prodi TLM Program Sarjana Terapan

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Lampiran 4

Pemeriksaan Kalium

Alat : Fotometer

Metode : Turbidimetri Fotometer

Prinsip : Ion kalium dalam suasana basa bebas protein bereaksi dengan sodium tetraphenylboron menghasilkan suspensi kalium tetraphenylboron yang berupa kekeruhan. Kekeruhan yang terbentuk sebanding dengan kadar potasium dalam serum atau plasma.

Cara Kerja :

1. Disiapkan alat dan bahan yang akan digunakan
2. Dilakukan pembuatan reagen kerja

   TPB (Tetraphenylboron) NaOH
   1 : 1

3. Dilakukan pembuatan sampel, dipipet:

	Semi mikro
Serum	50 ul
Reagen presipitat	500 ul

   Dihomogenkan lalu disentrifuge selama 5-10 menit

4. Dilakukan pemeriksaan sampel, dipipet masing-masing:

	Standar	Sampel
Reagen Kerja	1000 ul	1000 ul
Standar	100 ul	
Supernatan sampel		100 ul

5. Dihomogenkan, lalu diamkan dalam suhu ruang selama 5 menit
6. Dibaca absorbansi pada fotometer dengan panjang gelombang 578 nm

Nilai normal: 3,5-5,0 mmol/L

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Original Research Article

Comparative study of biochemical parameters before and after dialysis in patients with chronic renal failure

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ABSTRACT

Chronic kidney failure is a disease characterized by progressive loss of kidney function over months and years, and can lead to any of the recognized complications such as anemia, cardiovascular disease and end-stage kidney disease. Hemodialysis is a method used to achieve the removal of extracorporeal waste products such as creatinine, urea, free water from the blood by an artificial kidney machine, when the kidney is in a state of kidney failure. The purpose of this study was to evaluate and compare serum urea, creatinine, sodium, potassium chloride levels in chronic renal failure patients before and after dialysis. Serum urea level, creatinine, was found to be significantly lower in patients after receiving hemodialysis, while electrolytes became normal.

1. Introduction

Chronic kidney disease (CRD) is a pathophysiological process with multiple etiologies, resulting in an irreversible loss of nephron number and function and often leading to end-stage renal disease (ESRD). [1]

In turn ESRD represents a state or clinical condition in which there is an irreversible endogenous loss of renal function of a level sufficient to render the patient permanently dependent on renal replacement therapy. (dialysis or transplant) to avoid life-threatening uremia.

Uremia is a clinical and laboratory syndrome, reflecting dysfunction of all organ systems as a result of untreated or untreated chronic renal failure.

By the time the plasma creatinine concentration is even slightly elevated, substantial chronic nephron injury has occurred.

The pathophysiology of uremic syndrome can be divided into two types: disorder group:

1. Due to the accumulation of protein metabolism products.
2. Due to loss of other kidney function
   such as fluid and electrolyte homeostasis and abnormalities hormones. [2]

Kidneys play a central role in body regulation
fluid, electrolyte and acid-base balance.

CKD and ESRD result in several disorders including hyperkalemia, metabolic acidosis and hyperphosphatemia. [3]

Which in turn leads to serious complications such as muscle wasting, bone mineral disorders, vascular calcification, and death.

Unlike acute kidney failure, which occurs quickly and suddenly, chronic kidney failure occurs gradually — over weeks, months, or years as the kidneys slowly stop working, leading to end-stage kidney disease (ESRD). [4]

With the widespread availability of dialysis, the lives of hundreds of thousands of patients with end-stage kidney disease have been extended.

Commonly accepted criteria for placing a patient on dialysis include the presence of uremia, hyperkalemia unresponsive to conservative measures, acidosis refractory to medical treatment, creatinine clearance 10 ml/min/1.73

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Evaluation of Serum Electrolyte Changes in Chronic Renal Failure Before and After Dialysis

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Abstract

Background: The kidneys play an important role in the regulation of electrolytes and acid-base balance. With progressive loss of renal function, electrolyte and acid-base disturbances inevitably occur and contribute to poor patient outcomes.

Objective: The aim of this study was to assess the effect of hemodialysis (HD) on serum electrolyte levels compared to a healthy control group; also to assess the correlation of serum electrolytes before and after hemodialysis.

Materials and Methods: The study was conducted on 40 patients (25 male and 15 female) all patients with chronic kidney disease, age 25-65 years. All patients were admitted to the dialysis department at Merjan teaching hospital and matched with 30 people as controls. Results: Comparative study between patients before and after hemodialysis, significant differences in serum urea and creatinine levels between before and after dialysis, and significant effect of hemodialysis on serum electrolytes, especially serum potassium levels. K+ before hemodialysis was 4.48±0.83 mmol/L and post-hemodialysis K+ was 3.69±0.65 mmol/L (P<0.001). Na+ before hemodialysis was 136.5±4.14 and Na+ after hemodialysis was 138.6±4.41 (P = 0.

36). Cl- before hemodialysis was 106.12 ± 4.02 and post-hemodialysis Cl- was 107.12 ± 4.11 (P= 0.38 NS).

Conclusion: There is a decrease in s. urea in addition to creatinine levels between the period before and after hemodialysis. Serum K+ levels decrease after hemodialysis. Although serum sodium and chloride levels had no significant effect after hemodialysis.

Keywords: *Chronic renal failure, hemodialysis, serum electrolytes.*

introduction

Chronic kidney failure is a worldwide complication, a major cause of gh mortality in developed countries. Patients are at higher risk for rdiovascular disease (CVD) and hyperkalemia is a common problem in tients with progressive kidney disease.[1].

Chronic renal failure induces a slow and progressive process decreased kidney function. This is usually a consequence of complications from other serious medical conditions[2].

The main causes of CRF include chronic glomerulonephritis, progressive nephritic syndrome, diabetes mellitus, chronic hypertension, polycystic kidney and chronic pyelonephritis.[3].

Dialysis is a process that removes excess fluid and toxic metabolic end products such as urea from plasma and improves electrolyte balance by dialysis of the patient's blood to a fluid that does not contain urea which contains minerals such as potassium and calcium similar to the original. concentration in healthy blood[4].

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ORIGINAL ARTICLE

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Perbedaan kadar ureum, natrium, kalium dan klorida pra dan pasca hemodialisa pada pasien dengan penyakit ginjal kronik

Syaiful Anwar[1*], Ariosta[2]

ABSTRACT

Background: Chronic Kidney Disease (CKD) is a progressive and irreversible damage to kidney function (GFR < 60 ml / minute / 1.73 m2). The function of the kidneys is to maintain stability, electrolyte level, osmolarity of extracellular fluid and excrete products such as urea, uric acid, and creatinine. CKD disrupts electrolyte fluid balance and uremia, thus requiring renal replacement therapy in the form of dialysis or kidney transplantation. Different levels of urea, sodium, potassium, and chloride pre- and post-hemodialysis can be a consideration for the management of hemodialysis in CKD patients. This study aimed to determine the difference in urea, sodium, potassium, and chloride pre- and post-hemodialysis in CKD patients.

Method: This was a cross-sectional analytical observational study of pre- and post hemodialysis conducted from September to October 2018. Normally distributed data were analyzed using the paired t-test, while data that were not normally distributed were analyzed using the Wilcoxon test. It was considered significant when the p-value was < 0.05.

Results: There was a total of 50 patients consisting of 30 males (60.0%) and 20 females (40.0%). The mean age of the patients was 51.10 ± 7.48 years. The level of pre-hemodialysis urea (161.96 ± 53.80 mg / dL) was significantly different from post-hemodialysis (120.70 ± 40.84 mg / dL). The level of pre-hemodialysis sodium (134.5 mmol / L) was significantly different from post-hemodialysis (140 mmol / L). The level of pre-hemodialysis potassium (5.6 mmol / L) was significantly different from post-hemodialysis (4.6 mmol / L). The level of pre-hemodialysis chloride (100 mmol / L) was significantly different from post-hemodialysis (96 mmol / L).

Conclusion: There was a significant difference in urea, sodium, potassium, and chloride between pre- and post-hemodialysis (p < 0.05).

Keywords: Chloride, chronic renal failure, hemodialysis, potassium, sodium, urea

Cite This Article: Anwar, S., Ariosta. 2019. Perbedaan kadar ureum, natrium, kalium dan klorida pra dan pasca hemodialisa pada pasien dengan penyakit ginjal kronik. *Intisari Sains Medis* 10 (1): 223-226. DOI: 10.1556/ism.v10i1.346

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ABSTRAK

Pendahuluan: Penyakit Ginjal Kronik (PGK) merupakan kerusakan fungsi ginjal yang progresif dan ireversibel (LFG < 60 ml / menit / 1.73 m^2). Ginjal memiliki peran mempertahankan stabilitas volume, komposisi elektrolit, osmolaritas cairan ekstraseluler serta mengekskresikan produk seperti urea, asam urat dan kreatinin. PGK menyebabkan gangguan keseimbangan cairan elektrolit dan uremia, sehingga memerlukan terapi pengganti ginjal berupa dialisis atau transplantasi ginjal. Perbedaan kadar ureum, natrium, kalium, dan klorida pra dan paska hemodialisa dapat menjadi pertimbangan untuk pengelolaan pelayanan hemodialisa pada pasien PGK. Tujuan dari penelitian ini adalah mengetahui perbedaan kadar ureum, natrium, kalium, dan klorida pra dan paska hemodialisa pada pasien dengan PGK.

Metode: Ini merupakan penelitian observasional analitik potong lintang (*cross sectional*) pra dan paska hemodialisa pada periode September - Oktober 2018. Data dengan distribusi normal dilakukan uji t berpasangan. Data dengan distribusi tidak normal menggunakan uji Wilcoxon. Dikatakan bermakna apabila p < 0.05.

Hasil: Total jumlah sampel sebanyak 50 pasien dengan laki-laki 30 orang (60.0%) dan perempuan 20 orang (40.0%). Rerata usia adalah 51.10 ± 7.48. Kadar ureum pra hemodialisa (161.96 ± 53.80 mg/dL) berbeda signifikan dengan paska hemodialisa (120.70 ± 40.84 mg/dL). Kadar natrium pra hemodialisa (134.5 mmol/L) berbeda signifikan dengan paska hemodialisa (140 mmol/L). Kadar kalium pra hemodialisa (5.6 mmol/L) berbeda signifikan dengan paska hemodialisa (4.6 mmol/L). Kadar klorida pra hemodialisa (100 mmol/L) berbeda signifikan dengan paska hemodialisa (96 mmol/L).

Simpulan: Terdapat perbedaan yang signifikan dari kadar ureum, natrium, kalium, dan klorida antara pra dan paska hemodialisa (p < 0.05).

Kata Kunci: Gagal ginjal kronik, hemodialisa, kalium, klorida, natrium, ureum

Site Pasal Ini: Anwar, S., Ariosta. 2019. Perbedaan kadar ureum, natrium, kalium dan klorida pra dan pasca hemodialisa pada pasien dengan penyakit ginjal kronik. *Intisari Sains Medis* 10 (1): 223-226. DOI: 10.1556/ism.v10i1.346

PERBEDAAN KADAR KALIUM PADA PENDERITA GAGAL GINJAL KRONIK SEBELUM DAN SESUDAH HEMODIALISA DI RSUP Dr.SARDJITO YOGYAKARTA

Ana Uliyanah[1] , Andri Sukeksi[2] , Zulfikar Husni Faruq[2]

1. *Program Studi D IV Analis Kesehatan Fakultas Ilmu Keperawatan dan Kesehatan Universitas Muhammadiyah Semarang*
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Info Artikel

Abstrak

Pemeriksaan kalium sebelum dan sesudah hemodialisa pada pasien gagal ginjal kronik dilakukan untuk mengetahui keadaan tubuh penderita, jika kadar kalium dalam tubuh penderita meningkat atau tinggi penderita akan mengalami hiperkalemia yaitu masalah pada gagal ginjal lanjut dan dalam keadaan tersebut asupan kalium harus dikurangi. Untuk itu dilakukan hemodialisa agar kadar kalium yang tinggi akan mengalami penurunan karena fungsi hemodialisa itu sendiri adalah sebagai upaya membersihkan sisa-sisa yang ada didalam metabolisme serta zat-zat toksik yang lainnya yang berada didalam darah yang kemudian disaring melalui membran *semipermeabel* lalu kemudian dibuang. Bahan pemeriksaan adalah sampel serum yang tidak hemolisis. Tujuan penelitian ini adalah untuk mengetahui perbedaan kadar kalium sebelum dan sesudah hemodialisa. Jenis penelitian analitik dengan pendekatan cross sectional. Populasi sampel sebanyak 28 sampel yang memenuhi kriteria inklusi, yaitu pasien HD dengan data lengkap yang diperiksa kadar kaliumnya. Pemeriksaan kadar kalium sebelun dan sesudah HD dilakukan dengan *cobbas 6000*. Hasil penelitian diperoleh kadar kalium sebelum HD rerata 4,5664mmol/L, standar deviasi 1,37103. Kadar kalium sesudah HD rerata 3,4979mmol/L, standar deviasi 0.89636. Hasil uji paried t Test disimpulkan terdapat perbedaan bermakna pada kadar kalium sebelum dan sesudah HD < α (0,05). Hasil penelitian kadar kalium sebelum HD lebih tinggi dibanding sesudah HD. Terdapat perbedaan bermakna pada kadar kalium sebelum dan sesudah HD.

Keywords:

Kadar Kalium, Sebelum HD, Sesudah HD

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Effect of Dialysis on Certain Biochemical Parameters in Chronic Renal Failure Patients

Gonella Geetha Meenakshi[1]

ABSTRACT

Introduction: One of the slowly progressive diseases of the kidney functions is chronic renal failure (CRF) and is characterized by low glomerular filtration rates (GFR). Special replacement therapy of renal system is required for its treatment. One such line of treatment is dialysis which involves removal of excessive toxic fluids and metabolic end products from the body. Hence; we evaluated the pre-dialysis and post-dialysis mean values of serum renal biochemical markers in CRF patients undergoing dialysis to elucidate the effect of dialysis on CRF patients

Material and methods: The present study was conducted in renal failure patients who were on dialysis in the age group of 18 to 65 years consisting of males and females. 18 normal individuals whose renal parameters were within normal limits and with no history of renal impairment in the past were also selected between the comparable age group. Within one week to 10 days of sample collection, serum copper and zinc were estimated by atomic absorption spectrophotometer (AAS). Other biochemical tests were done on the same day or next day. Measurement of blood urea was done by Diacetyl monoxime method. Serum creatinine was estimated by colorimeter using Jaffe's alkaline picrate method. Serum sodium and potassium were estimated by flame photometer. Serum calcium was estimated by titration method using ethylene diamine tetracetic acid. Serum phosphate was estimated by colorimeter using Fiske and Subbarow method. All the data were collected, summarized and analyzed by SPSSs software.

Results: The blood urea values in pre-dialysis group were significantly higher. The blood urea level in post-dialysis group was significantly lower. Serum copper value in both the pre-dialysis and post-dialysis group was significantly lower in comparison with the control group. However, the mean values in post-dialysis group were lower in comparison with the pre-dialysis group. Serum calcium levels in post-dialysis group were higher than in pre-dialysis group. Serum calcium levels in pre-dialysis group were lower. Serum phosphorus levels in pre-dialysis group were statistical significantly higher in comparison with the post-dialysis group.

Conclusion: The post-dialysis serum concentration of sodium and calcium depend upon the dialysate composition of these elements and also serum which is available for ultra-filtration

Key words: Biochemical, Dialysis, Renal

INTRODUCTION

A slowly progressive disease of the kidney function progressing over a period of months and years to chronic renal failure (CRF).[1] It is characterized by low glomerular filtration rates (GFR). Severe illness is characterized in CRF and special replacement therapy of renal system such as dialysis is required for its treatment.[2] The incidence rate of CRF included 1 of every 5000 and affects mostly middle-ages and older people. Mostly irreversible, it might eventually leads to total kidney failure.[3,4] Physiologic function of kidney involves removal of waste products and fluids from the blood stream and disposing them through the urine route.[5] In patients who have suddenly lost their renal function or who have reached end stage renal stage, one line of treatment involves dialysis which involves removal of excessive toxic fluids and metabolism's end products from the body.[6] Hence; we evaluated the pre-dialysis and post-dialysis mean values of serum renal biochemical markers in CRF patients undergoing dialysis to elucidate the effect of dialysis on CRF patients.

MATERIAL AND METHODS

The present study was conducted in renal failure patients who were on dialysis in the age group of 18 to 65 years consisting of males and females. Study was conducted before and four hours after haemolysis. Samples were collected from the Satya Kidney institute in Hyderabad. 18 normal individuals whose renal parameters were within normal limits and with no history of renal impairment in the past were also selected between the comparable age group. Ethical approval was taken from the ethical committee and written consent was obtained after explaining them the entire research protocol. About 10 ml of venous blood without any anticoagulant was collected into sterile clean and dry polypropylene tubes to avoid contamination. Haemolysis is avoided, blood was allowed to clot. The serum after separation was centrifuged and transferred into sterile, clean and dry polypropylene tubes. The tubes were labelled and stored in refrigerator at – 20 degree centigrade. Within one week to 10 days of sample collection, serum copper and zinc were estimated by atomic absorption spectrophotometer (AAS). Other biochemical tests were done on the same day or next day. Measurement of blood urea was done by Diacetyl monoxime method. Serum creatinine was estimated by colorimeter using Jaffe's alkaline picrate method. Serum sodium and potassium were estimated by flame photometer. Serum calcium was estimated by titration method using ethylene diamine tetracetic acid. Serum phosphate was estimated by colorimeter using Fiske and Subbarow method. Assessment of the results were done with SPSS software. Chi square test and one way ANOVA were used for the assessment of level of significance.

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PERBEDAAN KADAR KALIUM SERUM PADA PASIEN GAGAL GINJAL KRONIK (GGK) ANTARA PRE HEMODIALISA DENGAN POST HEMODIALISA

Rizqi Tahta Ayuni, Edy Haryanto, Sjamsul Arifin

ABSTRACT

Hemodialysis is a therapy for end-stage renal failure patients. Hemodialysis was used for blood from the waste of metabolism, toxic substances, and spending water in the body. The purpose of this research is to analyze the difference in levels of serum potassium in patients sufferers of Chronic renal failure between the pre hemodialisa and post hemodialisa. The research is descriptive analytic study was study at the Hospital of Delta Surya Sidoarjo, patient before and after hemodialisa as much us 30 blood samples. This result was obtained patient who post hemodialisa, serum potassium levels lower than normal range 3.3-5 mmol/L. Patient who pre hemodialisa, serum potassium levels above than normal range which can be more than 5 mmol/L. Statistical analysis of the sign test (p) 0000 < 0.05, concluded that hemodialisa affects the levels of serum potassium in patients pre-and post hemodialisa.

Keywords: Chronic Renal Failure, Potassium Levels, Pre Hemodialisa, Post Hemodialisa

PENDAHULUAN

Hemodialisis (HD) melalui mesin sudah dilakukan sejak tahun 1960-an. Di Indonesia, hemodialisis telah dijumpai pada beberapa rumah sakit baik rumah sakit pemerintah maupun swasta.Saat ini, pengguna hemodialisis menunjukkan peningkatan, sehingga menambah daftar tunggu pelaksanaannya.Data statistik terkini menunjukkan bahwa setiap harinya tidak kurang dari 3.700 orang menjalani cuci darah.Hemodialisis berfungsi serupa layaknya kerja ginjal, namun tindakan ini hanya mampu menggantikan sekitar 10% kapasitas ginjal normal.Hemodialisis merupakan terapi untuk pasien gagal ginjal tahap akhir.Metode ini menggantikan kerja yang biasanya dijalankan ginjal, yaitu pembersihan darah dari sisa metabolisme, zat toksik, dan pengeluaran timbunan air dalam tubuh.Pilihan terapi lainnya adalah transplantasi ginjal (Agoes dkk, 2010).

Penderita GGK semakin meningkat jumlahnya, di Amerika pada tahun 2009 diperkirakan terdapat 116.395 orang penderita GGK yang baru. Lebih dari 380.000 penderita GGK menjalani hemodialisis reguler. Pada tahun 2011, di Indonesia terdapat 15.353 pasien yang baru menjalani HD pada tahun 2012 terjadi peningkatan pasien yang menjalani HD sebanyak 4.268 orang sehingga keseluruhan terdapat 19.621 pasien yang baru menjalani HD. Sampai akhir tahun 2012 terdapat 244 unit hemodialisis di Indonesia (Kandarini, 2012).

Kalium adalah kation intraseluler utama.Gradien K^+di kedua sisi membran sel sangat menentukan potensial listrik membran tersebut. Karena potensial listrik ini mempengaruhi eksitabilitas listrik pada jaringan seperti saraf dan otot termasuk otot jantung, maka kadar kalium harus dikontrol ketat dalam batas yang aman (O'Callaghan, 2007).

Konsentrasi kalium dalam serum normalnya terjaga dalam kisaran sempit 3,5-5 mmol/L. Di Inggris, asupan kalium bervariasi antara 30-100 mmol/hari dan kehilangan kalium melalui ginjal biasanya mencerminkan asupan. Sejumlah kecil kalium hilang lewat saluran cerna.Keseimbangan kalium dapat terganggu jika salah satu fluks ini berubah. Faktor lain yang sering mengimplikasikan hiperkalemia dan hipokalemia adalah *redistribusi* kalium. Hampir seluruh kalium total dalam tubuh 98% berada di dalam sel. Seperti halnya, jika ada kerusakan jaringan yang signifikan pada kandungan sel, termasuk kalium dapat bocor ke dalam kompatemen ekstraseluler, sehingga menyebabkan peningkatan kalium dalam serum yang berpotensi berbahaya (Gaw, 2011). Cara terbaik untuk membuang kalium dari tubuh adalah dengan hemodialisis, yang berfungsi untuk mengobati penderita gagal ginjal dan hiperkalemia kronik untuk mempertahankan kadar kalium serum dalam kisaran yang dapat diterima (Price, 2005).

Kondisi hiperkalemia erat kaitannya dengan asidosis, karena pada saat asidosis tubuh melakukan mekanisme hemostasis memindahkan ion H^+ yang berlebih dalam darah menuju intrasel.Untuk mempertahankan *electrical neutrality* maka

Original Article

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Biochemistry Section

Correlation of Serum and Salivary Biochemical Parameters in end Stage Renal Disease Patients Undergoing Hemodialysis in Pre and Post-Dialysis State

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ABSTRACT

Aim: The aim of this study is to compare the salivary urea, creatine, sodium, potassium and phosphate in pre dialysis and post dialysis state in end stage renal disease patients and compare with the serum counterpart.

Materials and Methods: The study group was selected from patients undergoing hemodialysis due renal failure of any cause, who are undergoing dialysis for at least one year duration in a private hospital in Chennai. The total number of subjects was 30. The venous blood was collected from the study group just prior to the dialysis and after the dialysis from the venous catheter which is placed for the purpose of hemodialysis. The collected samples were immediately (within 15 min) submitted to the laboratory for the biochemical examination of urea, creatinine, sodium, potassium and phosphate by an automated biochemical analyser. Unstimulated whole saliva was collected by spitting method from study group both before and after dialysis. The collected samples were immediately submitted to the laboratory for the biochemical examination of urea, creatinine, sodium, potassium and phosphate by an automated biochemical analyser.

Result: The paired t-test analysis was done in pre and post blood urea, creatinine, potassium and phosphate which was significant with a p-value of < 0.0001 and the same analysis was done in salivary urea in pre and post-dialysis state which also gave a significant reduction in the parameters with a p-value of < 0.0001.

Keywords: Biochemical analysis, End stage renal disease, Kidney disease, Salivary diagnostics

INTRODUCTION

Chronic renal failure is defined as the progressive and usually irreversible decline of the glomerular filtration rate, leading to an increase of serum creatinine and blood urea nitrogen levels. The most frequent causes of chronic renal failure are hypertension, diabetes mellitus, chronic glomerulonephritis, uropathy and autoimmune diseases [1]. Because of its usual irreversible and progressive nature, the evolution to the end stage renal disease (ESRD) occurs where glomerular filtration rate is around 5-10% and there is a high level of uremia. Most of the signs and symptoms of the disease reflect this biochemical changes in the blood [1].

Saliva has hundreds of components that may serve to detect systemic diseases or as evidence of exposure to various harmful substances, as well as provide biomarkers of health and disease status. Nowadays, the saliva research field is rapidly advancing due to the use of novel approaches including metabolomics, genomics, proteomics and bioinformatics [2]. With the aim of deriving multiple markers in the saliva as a diagnostic tool, we selected end stage renal disease as suitable disease state, because its effect on blood composition is a well known factor. Owing to the contribution of serum-derived components to whole saliva, we hypothesized that changes in serum composition caused by hemodialysis would be reflected in saliva.

MATERIALS AND METHODS

This study was conducted in the year 2011, in a private hospital in Chennai where the study group was selected from patients undergoing hemodialysis for at least one year duration and who are above 20 y of age with a mean age of 50.33y including, both males and females in almost equal ratio 16 males and 14 females with a total of 30 patients. The exclusion criteria was, the duration of the disease was not standardized within certain limits, all patients above one year duration of ESRD was taken for the study and also the medication which the patients consuming was not altered during the study period and also with no other systemic illness other than renal failure with a cause of diabetes and hypertension. Thirty end stage renal disease patients were selected from whom the venous blood was collected from the venous catheter prior to and after the dialysis procedure with informed consent. Unstimulated whole saliva of about 5ml using spitting method was also collected in the same time in a sterilized container. Both the samples were processed immediately (within 15 min) to evaluate the serum and salivary urea, creatinine, sodium, potassium and phosphate using the automatic analyser(colorimetric method). Both the samples were evaluated and statistically analysed using paired t-test analysis.

RESULTS

The mean age value for the study group is 50.33 y, with almost equal gender distribution (16 males and 14 females). The mean values of pre and post blood urea, creatinine, sodium, potassium and phosphate is given in the [Table/Fig-1] respectively. The mean values of pre and post salivary urea, creatinine, sodium, potassium and phosphate are given in the [Table/Fig-2] respectively.

The paired t-test analysis was done in pre and post-blood urea, creatinine, potassium and phosphate which was significant with a p-value of < 0.0001 and the same analysis was done in salivary urea in pre and post dialysis state which also gave a significant reduction in the parameters with a p-value of < 0.0001. The values were not significant for both serum and salivary sodium levels.

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RESEARCH ARTICLES

CAPACITY TO PRODUCE EFFECT OF HEAMODIALYSIS ON ACUTE AND CHRONIC RIDNEY PATIENT

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Abstract

Kidney failure occurs when the kidneys lose their functional capacity. But when an unhealthy kidney is diagnosed, the subject or patient is allowed to undergo the necessary hemodialysis as part of the treatment as well as the procedure to keep the patient in good condition until a permanent solution is taken for the cure. Patients with renal complications visit the CMC Hospital Nephrology Department and are appointed to u. Blood samples were taken from them under the most sterile conditions using vacutainers, by on duty staff, the day before the dialysis procedure in the Nephrology Department at the hospital. Without any disturbance or disruption to the normal exemplary routine of the Hospital, and certain Nephrology units, samples were taken for biochemical analysis by the Clinical Biochemistry section. Undergoing Renal Hemodialysis were identified and individuals were randomly selected. All relevant blood parameters are analysed, in an Autoanalyzer such as HITACHI 912 which is available at the Hospital Clinical Biochemistry Department. The parameters observed in this study were sodium, potassium, creatinine urea, calcium, phosphorus, uric acid, total protein, albumin bicarbonate, total and direct bilirubin, SGOT, SGPT, and alkaline phosphatase.

Keywords: renal failure, hemodialysis, renal hemodialysis, blood parameters.

introduction

The kidney system is a group of organs in the body whose job it is to filter excess fluid and other substances from the bloodstream. Kidneys are the main organs of homeostasis because they maintain acid-base balance and water balance in the blood. The number of people with chronic kidney disease as well as kidney replacement treatment continues to increase. Every second time in the UK, 400 -800 people per one million population need
renal replacement in the form of dialysis. The prevalence of dialysis in the UK is highly age dependent - for adults aged 70 - 80 years between 1600 and 2000 people per million.

The two main types of dialysis are hemodialysis and peritoneal dialysis. The main factors determining dialysis with chronic kidney disease are patients' preferences about which treatment best suits their lifestyle,

availability of options in service and clinical contraindications, factors that patients and carriers may need to consider about peritoneal dialysis. Ability to perform self-dialysis.

The support services they need to perform dialysis work, school, office, social and family activity opportunities to maintain social contact are possible modifications in their home. Distance and travel time to hospital, flexibility of daily care, death and treatment regiments and possible changes in body image and physical activity due to dialysis access points.

Kidney illness

Pyelonephritis is an infection of the kidney with bacteria. Acute pyelonephritis is often accompanied by fever, chills, pain on the affected side, often

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Renal Data from the Arab World

Assessment of Adequacy of Hemodialysis Dose at a Palestinian Hospital

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ABSTRACT. Adequacy of hemodialysis improves patient survival, quality of life and biochemical outcomes and minimizes disease complications and hospitalizations. This study was an observational cross-sectional study that was conducted in July 2012. Blood tests, weight and blood pressure were measured before and after hemodialysis. Single-pool Kt/V and urea reduction ratio (URR) were calculated. The targets based on the National Kidney Foundation Disease Outcomes Quality Initiative (KDOQI) Clinical Practice Guidelines were Kt/V 1.2 and URR 65%. Of the 64 patients, 41 (64.1%) were males. The mean age of the patients was 58.13 ± 17.2 years. The mean body mass index (BMI) was 25.04 ± 5.01 kg/m^2. The mean Kt/V and URR were 1.06 ± 0.05 and 54.4 ± 19.3, respectively. There was no significant difference between men and women (1.06 ± 0.47 versus 1.04 ± 0.55, P = 0.863) and (54.7 ± 19.59 versus 53.81 ± 19.17, P = 0.296). Only 25 (39.1%) patients achieved the Kt/V goal and only 22 (34.4%) had target URR, and there was no significant association between hemodialysis adequacy and any of the variables such as sex, age, presence of chronic diseases or BMI. Serum potassium levels post-dialysis were significantly lower in patients who reached the target Kt/V (mean = 3.44 ± 0.48 versus 3.88 ± 0.48, P = 0.001). Most patients were inadequately dialyzed and a large percentage of the patients did not attain the targets. Attempts to achieve the desired goals are necessary. It is important to calculate Kt/V or URR and individualize the dialysis doses for each patient.

Introduction

Adequacy of hemodialysis is very important as it can improve patient survival,[1,2] quality of life, biochemical outcomes[3] and minimize disease complications and hospitalizations.[4] Individualizing the hemodialysis prescription based on monthly assessment of single-pool Kt/V would be a useful and practical tool to provide a safe and cost-effective hemodialysis treatment. The National Kidney Foundation Disease Outcomes Quality Initiative (KDOQI) guidelines recommend that the minimum adequate dose of hemodialysis given three times per week to patients with Kr less than 2 mL/min/1.73 m^2 should be a single-pool Kt/V of 1.2 per dialysis. For treatment times less than 5

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Original Article

Changes in QT interval before and after hemodialysis

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Abstract

Background: Cardiovascular mortality and morbidity are high in chronic renal failure (CRF) patients. Increased dispersion of QT intervals is known to predispose to ventricular arrhythmias and sudden cardiac death. This study was conducted to assess the effect of hemodialysis (HD) on corrected QT (QTc) intervals and their dispersions (QTd) in chronic hemodialyzed patients.

Methods: Fifty-eight patients (mean age 54.2±15.8 years) with chronic renal disease on chronic hemodialysis (HD) were assessed by standard examination including blood pressure, body weight, heart rate, 12–lead electrocardiography and laboratory tests like electrolytes (Na^+, K^+, Ca^{++}, phosphate), urea, and creatinine 30 minutes before and after HD. The QT intervals and QTc QTc= QT $\sqrt{R\text{-}R}$/ (in milli seconds [ms]) for each lead were measured manually by one observer using calipers. The difference between the maximum and the minimum of QT interval was noted as QT dispersion (QT d).

Results: The mean of pre and post dialysis R-R intervals was 859.22±96.85 ms and 870.43±91.45 ms, respectively ($p>0.05$). The mean of corrected QT_{cmax} intervals increased significantly from 423.45±24.10 to 454.41±30.25 ms ($p<0.05$). The mean of QT dispersions and the corrected QT interval dispersions changed from 51.56±12.45 to 63.21±14.43 ms ($p<0.05$) from 59.40±13.58 to 68.33±14.55 ms ($p<0.05$), respectively. The changes in serum potassium and calcium levels were related with QT interval prolongation.

Conclusion: QT and QTc interval and dispersion increase in HD patients. Prolonged QT interval indices had relation with K^+ and Ca^{++} ions before but not after HD.

Keywords: Chronic renal disease, Hemodialysis, QT interval, Arrhythmia

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Cardiovascular diseases represent the main causes of death (especially sudden cardiac death) in patients affected by renal failure and chronic hemodialysis (1, 2). The reasons for great incidences of arrhythmia and death are complex and multifactorial (3). Dialytic treatment per se can be considered as an arrhythmogenic stimulus, moreover, uremic patients are characterized by a pro-arrhythmic substrate because of the high prevalence of ischaemic heart disease, left ventricular hypertrophy and autonomic neuropathy, myocardial dysfunction, changes in electrolyte concentration like calcium and potassium (1, 4-8). Among the noninvasive techniques which can be useful for predicting the patients at risk for sudden death is the measurement of QT interval changes with 12-lead surface electrocardiogram (9).

QT dispersion (QTd) defined as maximum QT interval minus minimum QT interval for a given set of electrocardiogram lead, was proposed as an approximation for repolarization abnormalities and measured for regional heterogeneity of myocardial refractoriness (10, 11). Prognostic value of QTd was evaluated in patients with end stage renal disease patients requiring hemodialysis and in patients with diabetes mellitus (12). The purpose of this study was to assess the effect of hemodialysis (HD) on QT and corrected QT (QTc) intervals and dispersion.

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Original Paper

QT Interval and QT Dispersion in Patients Undergoing Hemodialysis: Revisiting the Old Theory

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Key Words
QT interval · QT dispersion · Hemodialysis

Abstract
Aims: We sought to explore the response of the corrected QT (QTc) interval duration and QT dispersion (QTD) to hemodialysis. ***Methods:*** We enrolled 50 patients with end-stage renal disease undergoing regular hemodialysis. Blood samples were drawn for measurement of serum electrolytes, and a 12-lead ECG was performed to measure the QTc interval duration and QTD, immediately before and just after dialysis sessions. ***Results:*** The mean age of the cohort was 42.8 ± 12.2 years (58% males). Both the QTc duration and QTD showed marked variability after hemodialysis. A significant correlation was found between the decrease of both serum potassium and magnesium levels after dialysis and the post-dialysis QTc interval duration, with Pearson's correlation coefficients $r = -0.43$ and $r = -0.34$, $p = 0.002$ and $p = 0.01$, respectively. Patients with a post-dialysis increase of QTc interval duration had a significantly higher percentage of reduction of serum potassium ($p = 0.029$), whereas patients with a post-dialysis increase of QTD had a significantly higher percentage of reduction of serum magnesium ($p = 0.03$). ***Conclusion:*** Our findings suggest a highly variable response of the QTc interval duration and QTD to hemodialysis. The post-dialysis QTc interval duration inversely correlated with the decrease of both serum potassium and magnesium levels after dialysis.

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Original Article

Changes in QT Intervals in Patients with End-Stage Renal Disease Before and After Hemodialysis

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ABSTRACT. Increased dispersion of QT intervals is known to predispose to ventricular arrhythmias and sudden cardiac death. To assess the effect of hemodialysis (HD) on QT and corrected QT (QTc) intervals and their dispersions in chronic hemodialyzed patients we studied 85 patients (male/female = 48/37; mean age 44 ± 17 year) on chronic hemodialysis. Simultaneous 12-lead ECG was recorded before and after HD in a standard setting. The QT intervals for each lead were measured manually by one observer using calipers. Each QT interval was corrected for heart rate: $QTc = QT / \sqrt{R-R}$ (in milliseconds [ms]). ECG parameters, body weight, blood pressure, heart rate, electrolytes (Na^+, K^+, Ca^{++}, phosphate), urea, and creatinine were measured before and after HD. The mean of pre and post dialysis cycle intervals was 828 ± 132 ms and 798 ± 122 ms respectively; the difference was not significant. The mean of QT_{max} intervals changed significantly from 446 ± 47 to 465 ± 72 ms ($P< 0.05$). The mean of corrected QT_{cmax} intervals increased significantly from 472 ± 38 to 492 ± 58 ms ($P< 0.05$). The mean of QT dispersions and the corrected QT interval dispersions changed from 60 ± 29 to 76 ± 32 ms ($P< 0.05$) from 72 ± 46 to 98 ± 56 ms ($P< 0.05$), respectively. During HD, the serum potassium and phosphate levels decreased whereas the calcium levels increased. We conclude that QT and QTc interval and dispersion increase in HD patients.

Introduction

Despite improvements in dialysis therapy, patients with end-stage renal disease (ESRD) have a significantly decreased life expectancy. Mortality on dialysis averages 28% within the first year regardless of dialysis modality, and median survival without transplantation is only five to six years.[1] Although this marked decrease in life expectancy may be explained partially by concomitant malnutrition, impaired immunity, bleeding diathesis, and comorbid diseases [2] such as cardiac disease.

The QT interval is a measure of the duration of ventricular depolarization and repolarization, and prolongation of the QT interval can predict cardiovascular death.[3,4] QT dispersion

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Original article

Electrocardiography and Serum Potassium before and after Hemodialysis Session

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ABSTRACT. This study was conducted to assess changes in potassium levels and electrocardiographic (ECG) after hemodialysis and whether decreased potassium levels during dialysis can trigger cardiac arrhythmias. We studied 21 chronic hemodialysis (HD) patients whose serum electrolytes were measured before and immediately after the dialysis session, and the ECG was performed at the same time. Patients included 14 women and 7 men with a mean age of 53.1 ± 15.6 years and ranged from 26 to 81 years; 9 (43%) patients were diabetic. All patients had been on dialysis for at least 6 months each Pre-HD serum potassium level had no correlation with ECG parameters except negative correlation with T wave amplitude r = -0.5, p = 0.021. ECG parameters changed significantly after HD; The amplitude of the T wave decreases, and the amplitude of the R wave increases. The relatively taller R wave significantly decreased the T to R wave ratio after dialysis. QRS duration and QTc interval were also significantly increased. Patients with post-HD . serum potassium3.5

- compared with patients with levels >3.5 mmol/L -had a higher R wave amplitude and significantly less T to R wave ratio (11.8 ± 9.7 vs 6.4 ± 5.1, p = 0.045 and 0.4 ± 0.38 vs 1.0 ± 0.97, p =
0.049, respectively. In patients with a decrease in serum potassium >2.0 mmol/L, the T-to-R wave ratio decreased significantly, 0.32 ± 0.21 vs. 0.85 ± 0.26, p = 0.023; The amplitude of the T wave decreased more than the increase in the R wave. Multiple regression analysis did not show any association between ECG changes before or after HD and serum potassium, serum calcium or net changes in post-HD serum potassium. We conclude that the post-HD decrease in serum potassium results in a decrease in the ratio of T to R waves on the ECG; these changes may have arrhythmogenic potential.

Keywords: Hemodialysis, hyperkalemia, hypokalemia, electrocardiography.

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introduction

Hyperkalemia is a common complication in patients with end-stage renal disease (ESRD). [1] In fact, pre-Hemodialysis (HD) potassium levels were usually >5.0 mmol/L and 19% of patients had serum potassium levels.

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Relationship between P-wave dispersion and Effective Hemodialysis in Chronic Hemodialysis Patients

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Keywords

Hemodialysis P wave dispersion dry weight Dry

Abstract

Objective: To find out whether P-wave dispersion (PWD) can be used as a good indicator for effective hemodialysis. Subjects and Methods: This study involved 35 patients (20 males, 15 females, mean age 61 years). 8-10 years) who routinely undergo hemodialysis treatment due to chronic kidney failure. After hemodialysis, patients whose hemodynamic parameters were maintained and who achieved dry body weight were included. A twelve-lead resting electrocardiogram (ECG) at a speed of 25-50 mm/s, total body fluid values (TBF) and bioelectrical impedance using a bipedal bioelectrical impedance apparatus were obtained before and immediately after hemodialysis. Blood samples were also taken for examination of blood electrolytes, urea and creatinine. PWD was defined as the difference between maximum and minimum P wave duration calculated on a standard 12 lead ECG before and after dialysis. Results: The following parameters were obtained before and after hemodialysis: blood pressure 132 8 21 vs. 130 8 10 mm Hg (p 1

0.05), TBF 33.986 vs 3285.6 liters (p = 0.001), impedance

4998110 vs. 5968136 (p = 0.001), P-max 103.188.9 vs. 106,3812.7 ms (p1 0.05), P-min 70.2811 vs 72.587.9ms (p 1 0.05), PD 32,2811.9 vs 33,8813,4 ms (p 1 0.05). Although a statistically significant decrease was observed in the level of urea and creatinine after hemodialysis, in the blood electrolyte parameters, the P value of sodium (p=0.69), potassium (p=0.50), calcium (p=0.89) and phosphate (p=0.08). Conclusion: P-max and PWD did not change significantly after hemodialysis, so these two parameters can be used as an effective indicator of hemodialysis.

introduction

A number of studies have shown a correlation between the dose of hemodialysis administered and patient mortality and morbidity. Evidence suggests that mortality among patients with end-stage renal disease (ESRD) is lower when appropriate minimal doses of hemodialysis are administered. To ensure that ESRD patients treated with chronic hemodialysis receive adequate care, the dose of hemodialysis administered needs to be measured. Clinical signs and symptoms alone are not reliable indicators of the adequacy of dialysis [1-5].

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Improved P-Wave Dispersion and Maximum P-Wave Duration after Hemodialysis

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Background: Atrial fibrillation is a common arrhythmia in patients undergoing hemodialysis. The consequences of hemodialysis on P wave duration and P wave dispersion are not yet fully understood

understand. The purpose of this study was to study the effect of dialysis on the maximum P wave (P_{max}),

Minimum P wave (P_{min}), and P wave dispersion (P_{d}) in chronic renal failure.

Method: We study P_{max}, P_{min}, and P_{d} in 32 patients (17 men and 15 women, mean age 54 years ± 18 years) with chronic renal failure undergoing hemodialysis. The difference between the maximum and the minimum P wave duration is calculated and defined as the P wave dispersion ($P_d = P_{max} - P_{min}$).

Results: There is a significant increase in P_{max} at the end of dialysis compared with baseline (98 ± 13 ms vs. 125 ± 12 ms, P < 0.001).

P_{min} showed no significant change (71 ± 11 md

vs. 73 ±10 ms, P= 0.42). P_d significantly increased at the end of dialysis (27 ± 9 ms vs. 52 ± 11 ms, P < 0.001). There is a negative correlation between serum potassium, magnesium, phate, blood urea nitrogen, and creatinine at the end of dialysis and P_{max} and P_d respectively (P<0.05) A weak positive correlation was found between serum calcium, bicarbonate at the end

dialysis and P_{max} and P_d P<0.05).

Conclusion: Hemodialysis ended with a significant increase in the maximum duration of the P and waves

P wave dispersion, which may be responsible for the increased incidence of atrial fibrillation in this group of patients.

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atrial fibrillation; P wave dispersion; hemodialysis

The prevalence of atrial fibrillation (AF) in patients with chronic renal insufficiency on hemodialysis programs is three times more common than in the general population. AF has been shown to increase mortality (23% with AF vs. 6% in sinus rhythm) and morbidity in these patients on hemodialysis. Approximately one in three hemodialysis patients with AF has thromboembolic complications within 1 year of follow-up. [1] Risk factors for AF may be more common in dialysis patients including age, heart, and abnormal calcium-phosphorus metabolism. [1-4] Hemodialysis was also associated with a significantly higher risk of AF compared to peritoneal dialysis. [1] The majority of arrhythmic episodes during hemodialysis have reported to occur between the third and fourth hours of hemodialysis. [4]

There are several electrophysiological abnormalities detected in the atria that are prone to fibrillation. Intraatrial and interatrial conduction times tend to be longer than inhomogeneous propagation of sinus impulses. Previously, this condition has been assessed with simple electrocardiographic markers, including Pmaximum . waves

duration (P_{max}) and P wave dispersion (P_d) [7-15] However, hemodialysis has an effect on this P wave parameters have not been studied much.

The aim of our study was to evaluate the effect of hemodialysis on P wave duration and P wave dispersion.

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