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A Preliminary Study on the Etiology of Chronic Kidney Disease in Kozhikode District, Kerala, India

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ABSTRACT: Chronic Kidney Disease is one of the major health challenge among the Keralites especially in Malabar region. A preliminary study was conducted among patients suffering from CKD using questionnaire and major risk factors for their illness were noted. Personal communications with experienced nephrologists and public workers were also done. The study report found that the majority of the patients were males (75%). The different lifestyle diseases like diabetes and hypertension have principle role in damaging the kidneys. 42% of the patients were affected with hyperglycemia and 52% were hypertensive. The most susceptible age group was found to be 55-60.The disease cannot be linked to a specific etiology because multi-factorial reason can be found among the patients.

KEYWORDS: Chronic Kidney Disease, Hyperglycemia, Hypertension, Hyperuricemia,

I. INTRODUCTION

Kidney plays important role in the metabolism and regulation of our body systems. Kidneys filter wastes and excess fluids from the body which are then expelled out through the urine. They are also involved in regulating the blood pressure, production of red blood cells, maintaining acid base balance and electrolyte balance.

As Kidneys fail, unsafe levels of waste products may build up. Functions of the renal and urinary systems are essential to life. Kidney diseases destroy the nephrons suddenly or progressively which may lead to the loss of filtering capacity of the nephrons. It takes years for the damage to become apparent. The sedentary lifestyle, lack of exercise and other healthy activities, daily life stress etc. are causing a rise in the number of people suffering from kidney diseases. The major kidney disorders are Chronic Kidney Disease (CKD), kidney stones, glomerulonephritis, polycystic kidney disease, acute kidney injury, nephrosclerosis, oliguria, polyuria etc.

The term 'Chronic Kidney Disease' means lasting damage to the kidneys that can get worse over time. It describes the gradual loss of kidney function. When chronic kidney disease reaches an advanced stage, dangerous levels of wastes and fluids may accumulates in our body. Chronic Kidney Disease is a worldwide health problem which is more prevalent and with increased costs. Chronic Kidney Disease results not only in kidney failure but also cause many other complications due to decreased kidney function. This can also lead to cardiovascular diseases. Early detection and treatment can prevent development and disease progression and can also contribute to the survival of the patient. The treatment can only be done according to the disease stage.

The CKD stage can be accessed from Glomerular Filtration Rate (GFR). The best available indicator of overall kidney functioning is GFR. CKD is associated with reduced GFR and increased excretion of urinary albumin (albuminuria). GFR estimates how much blood passes through the glomeruli each minute. Glomeruli are the extremely small filters found in the kidney that filter out waste from the blood. Blood test is done to assess the creatinine level in the blood. Combining the creatinine level with several factors such as age, gender, height, weight and ethnicity, GFR can be estimated. According to the National Kidney Foundation, (USA)normal GFR levels are from 90 to 120 ml per minute per 1.73 m^2. As GFR decreases with age, older people will have lower than normal GFR values. Level below 60 ml per minute per 1.73 meter square for 3 or more months indicates CKD.GFR levels below 15 ml per minute means that the kidneys have lost almost all their functions. CKD can also be diagnosed by performing urine test for albumin. Albuminuria, the condition of having the protein albumin in urine is also a sign of CKD. ACR (albumin to creatinine ratio) is done to check the presence of albumin in urine. The normal amount of albumin in urine is less than 30 mg/g. Albumin values ranging above 30 mg/g indicate kidney

disease even if the GFR is above 60. Along with the blood and urine tests some other tests are also employed to estimate the kidney damage levels. Kidney biopsy is done to examine the kidney tissue and other imaging tests such as an ultrasound scan, MRI scan or CT scan are also so done to examine the morphology of the kidney and check for any blockages in the Kidney.

Chronic kidney disease (CKD) is emerging to be an important public health problem globally. Global disease burden report of 2015 pointed that CKD is the 12th most common cause of death with a 37.1% rise in mortality over 10 years. 37 million American adults have CKD and millions of others are at high risk. CKD also known as Chronic renal failure or Chronic kidney failure is much more

widespread than people realize. It often gets undiagnosed until a well advanced stage of the disease. Most of the people realize they have CKD only when their kidney function is down to 25% of normal GFR depending according to the survey. CKD stages can be classified in to 5 stages. In the early stages of CKD, few symptoms are observed. CKD may not become apparent until the kidney function is significantly impaired (Jacob S.R. et al (2019)). It has been recently estimated that the age adjusted incident rate of End Stage Renal Disease (ESRD) is in India is 229 per million population and more than 100000 new patients enter renal replacement programs annually in India. On the other hand, because of scarce resources, only 10% of the Indian ESRD patients receive any renal replacement therapy. (Singh et al.(2013)).

Treatment for the CKD aims at slowing down the progression of the disease. This is usually done by controlling its underlying cause. CKD can turn in to end stage kidney failure which is fatal without dialysis or kidney transplant. Anyone can be a chronic kidney patient at any time at any age. However some people are more likely than others to develop kidney disease. High risk group includes those with diabetes, high BP, people that belong to a population that has a high risk of diabetes or high blood pressure such as African Americans, Pacific Islands, American Indians etc. and people with a family history of kidney failure.

The most common cause of CKD is diabetic nephropathy and many people develop it within 10 years after being diagnosed with it diabetes. High BP is another major cause. Diabetics and hypertension are responsible up to two third of cases of CKD and the risk was many times when both was present.

Lack of community based screening programs has leads to the patients being detected with CKD at an advanced stage. Lack of both awareness and treatment facilities make diagnosis possible only at late stage of 4 or 5.

In Kerala, being the highest performing state on the basis of human development and overall health indices such as life expectancy and infant mortality as compared to other states of India, there is a very high prevalence of hypertension and type 2 diabetes mellitus which poses great risk of CKD.

Apart from premature mortality, CKD is also characterized by expensive treatment. Even in western countries, the health care cost and financial burden due to CKD is huge and unbearable. Dialysis or artificial filtering is among the most expensive commonly used life sustaining medical treatments. And in government settings, the facilities for haemodialysis and renal transplantation are limited, private sector being the major care provider in case of kidney disease management. Palliative centres serve as nongovernmental centres for treatment support.

The state government provides subsidies to public and private hospitals for dialysis cost on continuous basis. Government has provided specific financial assistance scheme namely Karuna Benevolent Fund, Rashtriya Swasthya Bhima Yojana (RSBY) and charity based supplementation of medical expenses is very common.

II. OBJECTIVES

1. To study the common etiologies of Chronic Kidney Disease in Kozhikode.
2. To study the impact of lifestyle on kidney disease in Kozhikode.
3. To find out the occurrence of CKD in different age groups.

III. METHODOLOGY

The methodology employed for the collection of the data consists of questionnaire combining qualitative and quantitative approaches. The first session dealt with the personal details of the patients and the second session contained questions regarding the health conditions and their habits. The data was collected from 100 patients, subjected to dialysis in the neighbouring dialysis centres and from some nearby houses. During the survey, the routine of the patients were recorded to analyse the major reasons behind the occurrence of chronic kidney disease. The questionnaire has also stressed on the financial status and sources of the patient and also the expenses for the dialysis and medicines were questioned (Appendix I). During the data collection, maximum care was taken to reduce the disturbances and any kind of ill feeling

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to the patients. Some personal information was also gathered from the patients during the survey that are not mentioned in the questionnaire from the patients during the talks

Interview was also been done with five doctors and two social activists in the sector of kidney disease and management. A separate questionnaire was prepared for them (Appendix II), which enabled gathering of some more information regarding the prevalence, major causes, comorbidities of CKD and also about the approximate expenditure for the treatment. Information about various private and public institutions and organisations that provide treatment for CKD were collected. Also enquired about the various programmes that aids the patients financially to cope up with the situation

IV. RESULT AND DISCUSSION

The present study mainly focused on the previous habits of the dialysing patients for the depiction of a clear picture of causes of CKD. Various habits of the patients have been recorded and tabulated to find out the major etiology behind the disease.The information gathered from professionals including Doctors and health workers are taken in to account.

The study group consisted of 100 dialysing patients, having the age ranging from 18 to 75 years. Analysing the group wise classification, the more number of dialysing patients were from group J, comprising of patients having age ranging from 55 to 60. Out of the total dialysing patients, 20 were coming under this group. The age groups falling just above and below group J consisted of more than 10 patients and thus it can be noted that the highest number of patients were from age group 45-70 (Chart. 1)

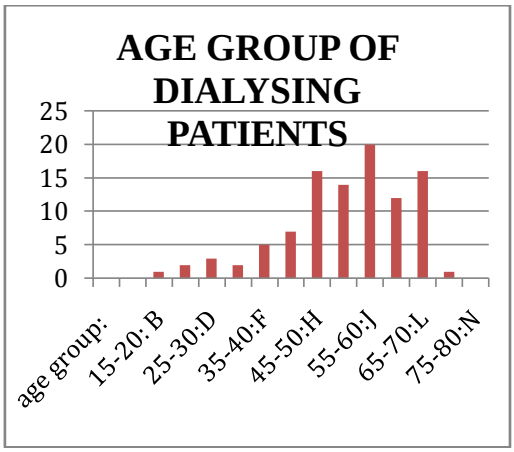

Chart 1: Number of dialysing patients in different age group

This result is supporting the study conducted by Jacob SR et al. (2019). They studied the people suffering from CKD and found out 40-60 years as the prominent age group. The group of 131 subjects with CKD majority were in age group 60-69 (24.4%) and the mean age was 52.73(Y. J. Anupama (2014)). According to the studies by N. K. Mohanty (2020), out of the 426 CKD patients, about 206 were from the age group of 51-60. The mean age group of hemodialysing patients in Kerala was recorded as 55± 13 years by C. Bradshaw (2018). The studies made by Ann M. O'Hare (2007) consisted of about 209622 patients (CKD stages 3 to CKD stage 5) and the mean age was found to be 73 years and about 47% of them were above 75 years. This may be due to the increased life expectancy or the error in sampling done by the author. S. P. Haveri (2019) recorded 47 as mean age of the population she studied and the mean age of the CKD patients as 57.8 and the study also concluded that the prevalence of kidney disease increases with age. According to United States health and human services, the 15% of the adults are estimated to have any stage of chronic kidney disease and 9 out of 10 are not aware of it. CKD is more common among people having an age of 65 years and above as compared to people of 45-64 years.

The study group was mainly consisted of male patients than the females. The survey was conducted on a random sample of 100 dialysing patients which subsisted of about 75 males and 25 female patients. (Chart. 2)

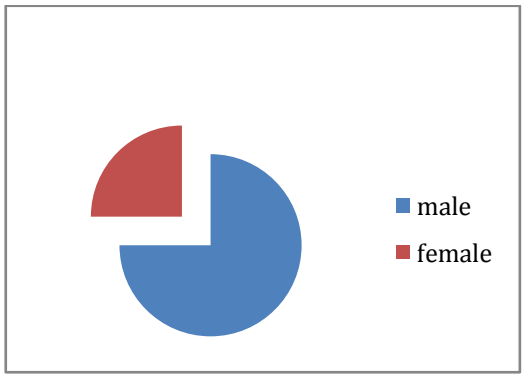

Chart 2: Number of male and female patients in the total study patients

Jacob S. R. (2010) found out that there was a male predominance of about 74% in case of CKD. The random sample of CKD patients collected by C. Bradshow (2018) and their survey results also suggests a male predominance of about 72%. The predominance of CKD was higher in males across all stages of CKD (A. K. Singh,

2013. Jacob SR (2010) also observed that female patients with CKD has significantly lesser access to all types of treatments, whether it is transplantation or haemodialysis or peritoneal dialysis. According to N.K. Mohanty (2020), out of 426 CKD patients, 54% were males. Among the total CKD patients from the population based study by YJ Anupama (2014) the 58.7% were males and 41.3% were females. In most of the studies the male predominance can be noted and it is more or less similar to our studies.). The findings of the population based studies done by S.P. Havaeri (2019) was quite different. She reported that the kidney disease makes no significant difference between males and females.

No correlation was noted between the blood group of the patients and the frequency of CKD. In the present study, about 49 patients were of "O" group, 22 "A" group, 29 "B" group and 5 "AB" group individuals. Out of them, about 96 were "Rh +Ve" and the remaining 4 were "Rh –Ve". It is nearly similar to the blood group distribution in Indian population.

According to experienced medical professionals, untreated diabetes is the major reason behind the Chronic Kidney Disease. Hyperglycemia can damage the blood vessels and damage kidneys. Most people with diabetic kidney disease are not found to have any symptoms. The only way to know if you have diabetic kidney disease is to get your kidneys checked. Having diabetes for a longer time enhances the chance of getting kidneys getting damaged. Here, in this study it has been observed that about 42% (30% male and 12% female) of the total patients studied was suffering from diabetes. (Chart. 3).

More than 10% of all diabetics finally results in death due to end stage renal disease and the renal involvement is an important complication of diabetes mellitus and is early and more predominant in type 1 diabetes mellitus (30-40%) than 2 (20%) and different clinical syndromes associated to this includes asymptomatic proteinuria, nephritic syndrome, progressive renal failure and hypertension (Textbook of Pathology, sixth edition, Harish Mohan; 2013).

A. K. Singh (2013) included diabetes under the major risk factors for CKD and in his studies, 31.6% of the diseased individuals were suffering from diabetes. The conclusions made by S. P. Havaeri (2019) suggests the need for better treatment for diabetes related kidney diseases. As per the studies of Ann M. O'Hare (2007) the prevalence of diabetes was highest among those aged from 55 to 64 years and decreased thereafter and in her studies, the precent of diabetics in different age group were 25.53% in those aged 18-44, 41.in group 45-54 , it was 61%, 47.65% in those aged 55-64,47.06% in those aged 65-74, 40.97% diabetics were in patients aging from 75 to 84 and 31.59% in those aged 85 to 100. Patients with diabetes are 2.05 times more likely to get CKD as compared to patients without diabetes (YJ Anupama, 2014). . Diabetes was present in 43.8% of participants with chronic kidney diseases and diabetes is the most common cause of end stage renal disease in United States (Samy I. McFarlane, 2011). Many reports points out diabetes as a key risk factor for chronic kidney disease (P. P. Varma. 2010; A. S. Levey. 2012; S. K. Agarwal, 2012; A. K.Singh. 2014). According to National Institute Of diabetes and digestive and kidney disease, United States, diabetes is one of the leading causes of kidney disease and 1 out of 4 individuals with diabetes have kidney disease. Personal communication with Dr. Sunil Jeorge, nephrologists, Baby memorial hospital, Kozhikode reveals that diabetes is calculated as a major risk factor and out of his patients most majority are suffering from diabetes.

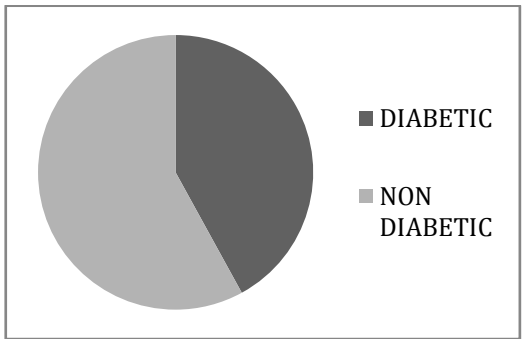

Chart. 3: Number of diabetic and non diabetic patients

India is said to be the diabetic capital of the world and it will hits the total diabetic patient number to 69.9 million by 2025 and 80 million by 2030 and in india 18% of diabetic patients are getting affected by diabetis (S. K. Pandey; 2018) and Kerala was said to be the diabetic capital of India (CADI (coronary artery disease in Asian Indians) Research Foundation, 2012)

The increased blood pressure is said to be a major life style related disease which have a great impact on the kidney failures. High blood pressure or hypertension is the state when the blood pressure increases than the healthy level. Blood pressure gives a measure of the amount of blood passing through the blood vessels. Uncontrolled hypertension for a prolonged period can cause damage in the arterial walls of renal blood vessels

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making it narrow, weaken or harden and results in decreased blood flow to the kidneys. In this study, out of the total dialysing patients, 52% (36% males and 16% females) of the patients were suffering from increased blood pressure and most of them were not having their medicines properly.

Patients with hypertension are 1.66 times more likely to get affected with Chronic Kidney disease than those without elevated blood pressure according to YJ Anupama (2014). Hypertension was depicted as a key risk factor in a number of studies. (P. P. Varma. 2010; A. S. Levey. 2012; S. K. Agarwal, 2012; A. K.Singh. 2014). The elevated blood pressure is an independent risk factor of end stage renal disease (Chi-yuan Hsu; 2015). U.S Department of health and human services included diabetes and high blood pressure as the leading causes of kidney disease. According to American Heart Association, elevated blood pressure can damage the walls of renal arteries and lead to chronic kidney disease.

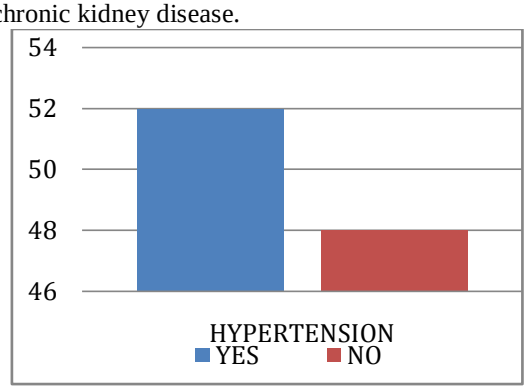

Chart. 4:Number of patients with elevated blood pressure

Out of the total patients, 21 patients were found to have both diabetes and elevated blood pressure. 31 with only hypertension and no diabetes and 21 of them with only diabetes and no hypertension. This indicates that, out of a total 73 patients with diabetes or hypertension, about 28.7% of them have both.

SYMPTOM	NUMBER OF PATIENTS
Patients with diabetes	42
Patients with hypertension	52
Patients with diabetes, no high B.P	21
Patients with high B.P, no diabetes	31
Patients with both high B.P and diabetes	21

Table 1: Comparison between number of diabetic and hypertensive patients.

Out of the interviewed 100 dialysing patients, 18 of them were suffering from cardiac problems like atherosclerosis, cardiomyopathy etc and even some of them being already subjected to bypass surgery and 9 of them were hyperuricemia. .A history of kidney stone was present among 23% of the total patients.

Uric acid is the end product of purine metabolism in humans and the 30% of it is excreted through gut and the remaining 70% through urine. Hyperuricemia significantly increases the risk of kidney failure and end stage renal disease (N. Lawrence edwards; 2008) Increased consumption of regular soft drinks was associated with prevalent hyperuricemia and CKD (Andrew S. Bomback; 2009). His findings present new but conflicting evidence as to whether sugar-sweetened sodas, and potentially the HFCS (high fructose corn syrup) used to sweeten them, are a dietary risk factor for development of hyperuricemia and CKD. Cardiovascular disease like hypercholesterolemia was announced as a risk factor of CKD by Stein I. Hallan (2014).

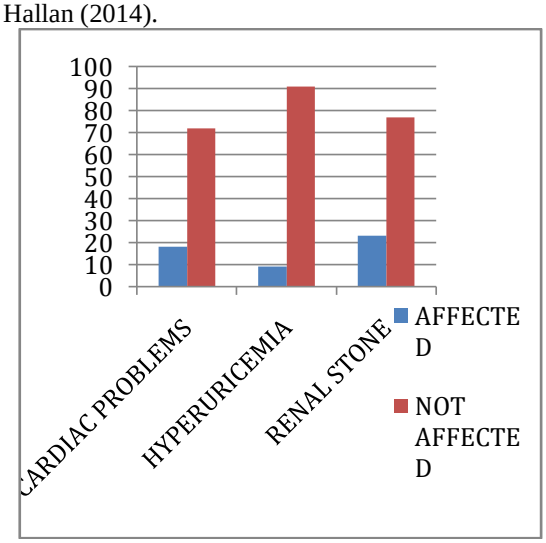

Chart 5: Number of patients with history of cardiac disease, hyperuricemia and renal stone

According to National Kidney Foundation of United States, use of analgesics with proper diagnostics and prescription is safer but heavy and long-term use of some of these medicines, such as ibuprofen, naproxen, and higher dose aspirin, can cause chronic kidney disease known as chronic interstitial nephritis. In this study 36% of the ESRD

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individuals were taking pain killers even for mild algesia by themselve without proper diagnosis or prescription from a doctor. After getting affected with kidney disease, 97% of them got strictly stick on to the treatment system along with proper medication. After personal communication with Dr. Firoz aziz, nephrologist, Iqra hospital Kozhikode, he Said that the over counted medications more than prescripted or medicines taken without prescriptions and also the failure in following the medicine correctly.

Details about medicine intake	Number of patients
Had pain killers without proper prescription from doctors	36
Strictly sticked on to the current treatment system and followed the advices from nephrologist	97

Long term use of indigenous medicine was observed in 18 patients among the group. The long term use of ayurvedic medicines have a greater influence on getting affected with kidney disease; said Dr.Shafeeque rahman K. V, Nephrologist, Govt. Medical College, Kozhikode. Herbal medicines used by different folks in different parts of the world is different. This trend of taking herbal medicines are popular among the poorer sections of the society.

There may be a variety of medicines varying with regions but the herbs and botanicals remains as the major source. The issue lies in the preparatory phase where quasi-trained herbalists and the medicines are not tested for safety. Renal injury has been reported in association with the use of several herbs. The best-known herb-induced chronic kidney disease (CKD) is aristolochic acid nephropathy (Vivekanand JHA: 2009). Many of the indigenous medicine can cause kidney disease and the drug induced nephrotoxicity contributes up to 26% of the cases of the hospital acute kidney injury (AKI) and 18% of the cases of community acquired AKI globally and flock remedies account for the 35% of AKI in the developing world (V. A. Luyckx; 2008)

Major life styles of the individuals were included in the questionnaire- smoking, alcoholism, fast food, salty food, lack of exercise and other food habits were considered. 3 person out of 10 dialysing patients were chain smokers before they got diagnosed with the disease. 9 of the total dialysing individuals were addicted to alcohol. (Chart. 6)

Many earlier works and reports supports this findings . The chance of kidney disease is higher in smokers and the chance of CKD was higher in persons who had quit smoking in recent years than who had quit smoking before 15 years (A. Shankar: 2006). Cigarette smoking is having effect on cardiovascular and renal diseases (S. R. Orth; 2008). Smoking increases the chance of CKD than non smokers in particularly and also for CKD classified as hypertensive nephropathy and diabetic nephropathy. (R. Yacoub; 2010). studies made by A. Shankar (2006), reported the relation between alcoholism and the prevalence of CKD and found out that only heavy alcoholism have an effect on CKD.

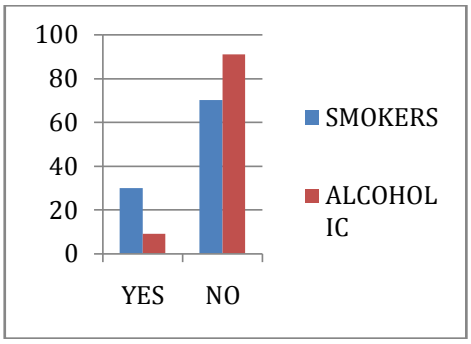

Chart. 6: Number of smokers and number of alcoholic patients.

Considering the food habits of the patients, 13 were fast food lovers, 51 individuals loved to consume salty food , 75% of them had their food on time and only 57 of them had taken enough water per day. From this observations, it is understood that only about the half had enough water on time. Having enough water is essential for the clear removal of the blood wastes through kidney . The addiction to the salty food also have a significant impact on the increased frequency of kidney disease that the half of the dialysing individuals were having salty food. Increased salt content in the body have a defect of increased hypertension too. Out of the salty food lovers, 28 of them (54.9%) were already having hypertension. Obesity was seen only in 4 patients and only 42% of them were having proper exercise. The remaining 58% were not doing any proper exercise. (Chart. 7) Compared with the very active persons, those who were having sedentary life were having twice the risk of chronic kidney disease (Bénédicte Stengel: 2003). Stein I. Hallan (2014) included obesity in CKD risk factor.

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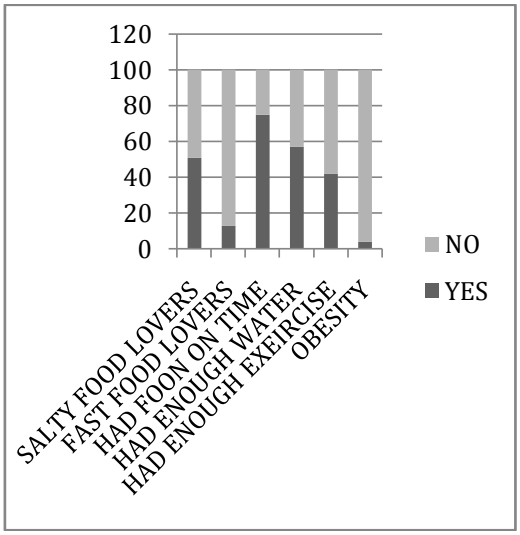

Chart. 7: Number of patients stick on to different food habits

In the present study, out of the 42 diabetic individuals, 14 of them (33%) were smokers. Similarly , 20 of the diabetic patients were not drinking water as per their body needs and it constitute about half of the total diabetic individuals. These risk factors may act cumulatively on these patients to be affected with kidney diseases and the familial analysis of the patients suggests that 15% of them were having close relatives with kidney disease and 20% of their close relatives were recorded to have a sudden death and most of their reasons was unknown.

About 29% of the kidney patients were working abroad and their working conditions were mostly dehydrating. Out of them, 15 were not consuming enough water during their work hours. Drinking of fresh and pure water have a good effect on the renal health. About 26% of the patients were not having the diabetes and hypertension and out of them 25% were having history of renal stone, 35% were taking medicines without prescription. While assessing the key risk factors, about 9 of them were not having any prominent risk factor in their previous habits. This indicates the immunological and other complicated physiological conditions.

The major reasons behind CKD aresaid to be diabetes and hypertension. Rather than it, many other patients are present those do not have the both and according to Dr.Shafeeque Rahman K.V, nephrologist, gov. medical college, Kozhikode, the disease is said to be multifactorial and the cumulative effects of different reasons can increase the chance of risk of CKD

V. CONCLUSION

The study was conducted among dialysing patients using questionnaire and major risk factors were noted. The major susceptible group was found that ageing from 55 to 60. There is a higher number of males than females among CKD patients (75%male).There is a statistically significant relationship of hyperglycemia and hypertension with CKD. Most of them were suffering from lifestyle diseases like diabetes and hypertension . Inadequate control of blood sugars and blood pressure resulted in kidney failure and need for dialysis. Here almost 74% were having one or both of it. Persons with heart problem have a risk of CKD in future due to different reasons like side effects of taking continuous medicine. Prolonged consumption of indigenous medicine can damage kidneys. The chance of CKD was higher in individuals consuming medicines like analgesics without proper consultation. Smokers were having a high risk of kidney disease and no relation with alcoholism was noted. Salt intake has a greater impact on kidney and it also affects the blood pressure of the individuals. Lack of proper exercise or the sedentary work mode along with other prominent risk factors can increase the risk of CKD. Consumptions of water in necessary for the proper working of the kidneys and those who work in dehydrated conditions and those who do not consume enough water are more having risk of CKD.

While assessing the key risk factors, a small group were having CKD with reasons that are not easy to be collected from patients and those conditions like IgA nephropathy, ADPKD, CTID etc can only be found by clinical tests.

VI. RECOMMENDATIONS AND LIMITATIONS OF THE STUDY

The study was among the dialysing patients and most of them were suffering from life style diseases like diabetes and hypertension . Inadequate control of blood sugars and blood pressure resulted in kidney failure and need for dialysis. Other risk factors like inadequate water intake , smoking , working abroad (long working hours in hot climate) , alcohol intake , high salt intake , lack of adequate exercise and renal stones were found to be high among the patients . Majority of the above mentioned risk factors were modifiable. Our major recommendation is to educate community about risk factors of CKD and to set up kidney early disease detection programs available for wide range of participants as many as possible individuals and to identify the disease as fast as possible before it turns to complete stage

after which the transplantation is the only way. Also the proper advices, classes and other means of awareness among the public is to be carried out for prevention and early detection of the disease. Increased cost of dialysis and further treatment is not easily assessable by the poorer sections of the society is an issue and rather than private sector contribution, government need to support the sections by placing more dialysis centers under the health department.

The major limitations include that the information are directly taken from patients and the correct reason behind the disease can only be found through nephrologists. The immunological reasons like IgA which is about 90% of unknown reason behind kidney disease, and other reasons like reflex nephropathy , ADPKD (Autosomal dominant polycystic kidney disease), and other auto immune disease were not able to be identified from the conversation only with patients.

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