Project Title

"A Survey on Exploring the Regional and Lifestyle Factors Contributing to Kidney Disease in Bangladesh."

[In the partial fulfilment of the requirements for the degree of Bachelor of Pharmacy.]

Submitted By:
Md. Mostafizur Rahman
Batch: 21(D)
Student Id: 191-29-1540
Department of Pharmacy
Daffodil International University.

April 2023

©Daffodil International University

Approval

This project paper, **"A Survey on Exploring the Regional and Lifestyle Factors Contributing to Kidney Disease in Bangladesh."** submitted to the Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Pharmacy and approved as to its style and contents.

Board of Examiners

……

Professor Dr. Muniruddin Ahmed

Professor & Head Department of Pharmacy

Faculty of Allied Health Sciences

Daffodil International University.

…… **Internal Examiner 1**

…… **Internal Examiner 2**

…… **External Examiner**

Md. A.K. Azad

Assistant Professor & M. Pharm Program Coordinator

Department of Pharmacy

Daffodil International University

©Daffodil International University

Declaration

I hereby declare that this project report Survey is done by me under the supervision of Md. A.K. Azad, Assistant Professor, Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University. I am declaring that this Project is my original work. I also declare that neither this project nor any part thereof has been submitted elsewhere for the award of a Bachelor's or any degree.

Supervised By,

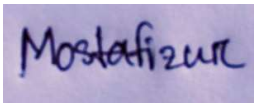
Md. A.K. Azad

Assistant Professor & M. Pharm Program Coordinator.

Department of Pharmacy

Daffodil International University

Submitted By,



Md. Mostafizur Rahman

Student Id: 191-29-1540

Department of Pharmacy

Daffodil International University.

©Daffodil International University

Acknowledgement

Firstly, I would like to express all my gratitude to Almighty Allah, who has granted me courage and the strength to complete this project.

A project is never the work of an individual. It is more than a combination of folk ideas, suggestion, reviews, contributions and work. A project's achievement and final outcome required a lot of guidance and support from many people, and I am extremely privileged to have acquired this all along until my paper is finished.

I feel obliged to take this opportunity to express my sincere thanks to Professor Dr. Muniruddin Ahmed, Head of Department of Pharmacy at Daffodil International University. My heartfelt thanks to my Supervisor Md. A.K. Azad, Assistant Professor & M. Pharm Program Coordinator, Department of Pharmacy, Faculty of Allied Health Sciences, Daffodil International University, who cared intensively for my project work and guide me throughout. I would like to express my heartfelt gratitude to my supervisor for allowing me to work under him, for his precious time in spite of his busy schedule, for his academic and administrative support and for the motivation and care as well.

©Daffodil International University

Dedication

Dedicated

To

My Parents and Supervisor...

©Daffodil International University

Abstract

Kidney disease is a predominant public health concern, with an overall frequency in Bangladeshi people of 22.48%, which is higher than the global frequency of kidney diseases patients. In Bangladesh, renal disease affects over than two crore individuals, according to a 2019 research. Two lakh persons experience renal illness each year. The study's objective was to understand the present prospective and regional causes of kidney diseases. A questionnaire-based in-person survey was conducted where 110 individual representatives from different socio demographic characteristics participated in the survey from January 9 to April 30, 2023. All the participants were from 1 years to above 70 years old. Among the participants, 55% were female and 45% were male. Most of them are from rural areas (58%). Of the respondents, most of them (56%) is suffering from different kidney diseases for more than 1 year. For this problem 52% of respondents took allopathy and 39% of respondents took homeopathy medicines. Form all the respondents 41% people have diabetes mellitus. Of them 67% have type 1 diabetes and 32% respondents have high blood pressure. One of the most shocking result is 70% of the respondents are suffering from kidney failure of different stages. Only 15% of total respondents drink water more than 2 liters in a day. Drinking water less than requirement is a major reason for development of kidney diseases and also the higher percentage of kidney failure patient suggest that the treatment pattern of most of the patient having kidney diseases is not convenient.

©Daffodil International University

Table of Contents

©Daffodil International University

©Daffodil International University

CHAPTER 1

INTRODUCTION

©Daffodil International University

1. Introduction:

The kidneys are two organs that resemble beans. Each kidney measures approximately the equivalent of a fist. Your kidneys filter extra water as well as waste from human blood while also producing urine. When you have renal disease, your kidneys are injured and unable to effectively filter blood. Renal disease is more likely to occur when you have high blood pressure or diabetes. Renal failure is a condition that can be treated with kidney transplantation or dialysis. Acute renal damage, kidney cysts, kidney stones, and kidney infections are a few other kidney issues [1].Doctors refer to any abnormalities of the kidneys as having renal disease, even if there is just very minor damage. The term "chronic" renal disease is frequently used. Chronic refers to a medical condition that does not fully improve within a few days. Chronic kidney disease is not a kidney issue, such as a simple urine infection that clears itself without doing any lasting harm [2].One in ten people, according to recent studies, may have mild renal disease. Compared to youthful people, the elderly experience this far more frequently. Kidney illness is typically not symptomless; instead, it is discovered when tests reveal abnormalities. This could include urine tests for protein or blood [3].Chronic kidney disease is a degenerative condition that has no known treatment and a high rate of morbidity and mortality. It is particularly common in adults with diabetes and high blood pressure. Maintaining kidney function can improve outcomes and can be accomplished by non-pharmacological techniques (such as dietary and lifestyle changes) as well as pharmaceutical therapies that are focused at chronic renal disease and kidney disease-specific [4]. A diet high in plants, low in protein, and low in salt may aid to reduce glomerular hyper filtration and prolong the function of the kidneys, possibly as well as causing favorable changes in acid-base homoeostasis and the gut flora [5].Pharmacotherapies that change intrarenal hemodynamics, such as SGLT2 [SLC5A2] inhibitors and renin-angiotensin-aldosterone pathway modulators, can preserve kidney function by lowering intraglomerular pressure independently of blood pressure and glucose control, whereas other novel agents, such as non-steroidal mineralocorticoid receptor antagonists, may shield the kidney through anti-inflammatory or antifibrotic mechanisms [6]. Disease-specific treatments may be helpful for some kidney conditions such glomerulonephritis and cystic nephritis. Given the high burden of complications, associated morbidity and mortality, and the role of non-conventional risk factors in chronic kidney disease, managing the cardiovascular risk associated with chronic kidney disease, minimizing the risk of infection, and preventing acute kidney injury are crucial interventions for these patients [7]. An incremental switch to dialysis can be explored when

©Daffodil International University

renal replacement treatment becomes unavoidable and has been suggested as a way to potentially prolong the preservation of remaining kidney function [8].

1.1 Types of kidney diseases

1.1.1 Chronic kidney disease

The most common kind of kidney illness is chronic renal disease. Chronic renal disease's long-term prognosis does not improve with time. It frequently results from excessive blood pressure. A high blood pressure level is bad for the kidneys because it could place greater strain on the glomeruli. The globule are the minuscule blood arteries in the kidneys that purify the blood. The increasing pressure destroys these veins over time, which leads to a reduction in kidney function [9].With time, kidney function will decline to the point where the kidneys are unable to operate effectively. A person would have to undergo dialysis in this situation. With dialysis, excess fluid and waste are removed from the blood. Dialysis can aid in the treatment of renal disease but cannot reverse it [10].Depending on your situation, a kidney transplant may be an additional option for treatment [11].Chronic renal disease has a strong link to diabetes. A category of illnesses known as diabetes raises blood sugar levels. The high blood sugar level damages the kidneys' blood vessels over time. As a result, the kidneys are unable to effectively clear the blood. As your body becomes saturated with pollutants, kidney failure can happen [12].

1.1.2 Kidney Stone

Another frequent issue with the kidneys is kidney stones. They develop when minerals and other substances found in blood solidify to form solid masses in the kidneys (stones). Kidney stones often pass from the body through urine. Although passing kidney stones can be excruciatingly painful, they rarely result in serious issues [13]. Diverse wastes are dissolved in urine. When there is an excessive amount of wastes in too little liquid, crystals begin to form. The crystals draw in additional substances and combine to form a solid that will only grow unless it is eliminated from the body through urination. The kidney, the body's chief chemist, often eliminates these compounds in the urine [14]. Most people's kidney stones are either washed out by enough liquid or prevented from forming by other chemicals in urine. Calcium, oxalate, urate, cystine, xanthine, and phosphate are the substances that cause stones to develop [15].The stone may remain in the kidney after it forms or it may move through the ureter and into the bladder. Even little stones can occasionally pass and through urine without hurting too

©Daffodil International University

much. The urethra, bladder, kidney, and ureter can all experience a pee backup as a result of immovable stones. The pain is brought on by this [16].

1.1.3 Glomerulonephritis

The blood-filtering part of the kidney is affected by a group of ailments known as glomerulonephritis (called glomeruli). You may hear terms like nephrotic syndrome and nephritis. When the kidney is damaged, the body's excess fluid and waste products cannot be eliminated [17]. Kidney failure could occur if the sickness persists and the kidneys entirely stop functioning. The glomeruli become inflamed in glomerulonephritis. The exceedingly small kidney structures known as glomeruli filter blood. Glomerulonephritis may result from diseases, drugs, or situations that appear during pregnancy or shortly thereafter (congenital abnormalities).Often, things get better on their own [18].

1.1.4 Polycystic kidney disease

End-stage renal failure is most commonly brought on by polycystic kidney disease, which is also a frequent reason for dialysis as well as renal transplantation. Current research has provided fresh insights into the processes behind these illnesses' etiology and prognosis as well as suggested new possibilities for therapy [19].Although polycystic kidney disease can occasionally occur as a developmental anomaly or might be acquired later in life, the majority of cases are inherited. Simple cysts can form in the kidneys as people age, multicystic illness can be brought on by hormones, medications, and dialysis, and renal cysts are frequently secondary symptoms of hereditary proliferative syndromes [20]. Nephronophthisis, medullary cystic illnesses, autosomal dominant or unilaterally dominant polycystic kidney disease, and germ-line alterations in single genes are the causes of the hereditary polycystic kidney disorders, which are passed down as mendelian features. With this category of illnesses, there are significant variations in the onset age, the severity of the signs, and the chances of progression to final renal failure or death [21].

1.1.5 Urinary tract infections

The phrase Urinary tract infection (UTI) is the term used to describe an infection of a urinary bladder .A condition known as urethritis, pyelonephritis, or bladder infection can all result from this sort of illness (a condition called cystitis).Normally, bacteria are not present in your urine (germs). Urine is a result of our kidneys' filtering process. Urine is produced when the kidneys eliminate extra fluid and waste products from your bloodstream. Your urinary system normally

©Daffodil International University

allows uncontaminated urine to flow through it.Nevertheless, bacteria from the outside of the body can enter the urinary system and cause issues including infection and inflammation. Urinary tract infection that is (UTI) [22].Bacterial infections of any region of the urinary system are known as urinary tract infections (UTIs). The most frequent infections are those of the urethra and bladder. They are easy to cure and hardly ever result in extra health problems. These infections can, however, travel to the kidneys and result in renal failure if they are not treated [23].

1.2 Sign and symptoms

It is quite easy for kidney disease to go untreated unless the symptoms are severe. Early warning indications of kidney disease include the following signs and symptoms:

- Weariness
- Difficulties focusing
- Difficulty sleeping
- Muscle cramps
- A lack of appetite
- Swollen ankles and feet
- Puffy eyes in the morning
- Dry, Rough skin
- Urinating on a regular basis, especially late at night [24].

Significant signs that renal disease is developing to kidney failure include:

- Nausea \vomiting
- Appetite loss
- Variations in urine production
- Hypertension
- Anemia (a reduction in red blood cells)
- Abrupt reduction in sex desire
- Elevated potassium levels (hyperkalemia)
- Pericardial periosteal inflammation (fluid-filled sac that covers the heart) [25].

1.3 Different Stages of kidney failure

©Daffodil International University

There are different stages of kidney disease based on your estimated glomerular filtration rate (eGFR).

The efficiency with which your kidneys filter substances is measured by your eGFR. The eGFR is typically 100. The lowest eGFR is 0, which denotes complete renal failure.

Any kidney disease has various stages, including:

Stage I. Your GFR is above 90 but under 100. Your kidneys suffer some damage but are still able to operate normally at this point.

Stage II. Your GFR might be 60 or 89, respectively. Compared to stage I, your kidneys have greater damage, but they are still in good shape.

Stage III. The range of your GFR is between 30 and 59. Your kidney function may be severely impaired or only somewhat.

Stage IV. Your GFR might be as high as 29 or as low as 15. Your renal function has significantly declined.

Stage V. GFR is less than 15. Your kidneys are failing completely or are close to it [26].

1.4 Diagnosis

1.4.1 Blood test: eGFR

The estimated glomerular filtration rate, or eGFR, is a gauge of kidney function. In order to calculate your eGFR, a blood test is used to assess your blood's amount of creatinine, a waste product. In addition, your age, gender, stature, and color are taken into consideration. Chronic kidney disease is indicated by an eGFR below 60 for three months or more, or by an eGFR above 60 with kidney impairment (shown by high levels of albumin in the urine). In order to help plan your therapy, your medical team will try to determine the origin of your kidney illness and keep checking your kidney function [27].Please be aware that the eGFR often decreases as people age. Even if the eGFR is below 60, a low eGFR in an older person does not usually indicate CKD [28].A quick urine test called the uACR will be performed along with an eGFR test to check for blood or albumin, a kind of protein, in the urine. Albuminuria is the medical term for when albumin is found in the urine. An early indicator of renal disease may be the presence of blood or protein in the urine [29].

1.4.2 Blood test: Serum creatinine test

©Daffodil International University

A waste product from your muscles, creatinine is found in your blood. Your urine is filtered by healthy kidneys to remove creatinine from your blood. Based on a blood test that gauges the level of creatinine in your body, your serum creatinine level is determined. It reveals the efficiency of your kidneys' function. Your serum creatinine level rises when your kidneys are not functioning correctly [30]. Milligrams per deciliter (mg/dL) are used to express the findings of serum creatinine tests. Your sex, age, and level of muscle mass all affect your normal creatinine levels. A normal level is typically:

0.7 to 1.3 mg/dL in men

0.6 to 1.1 mg/dL in women

A blood creatinine level that is greater than normal could indicate that your kidneys are not functioning properly. To determine the best course of action, your doctor will compare the findings of your blood urea nitrogen (BUN) test with those of your serum creatinine test. Your doctor might order additional tests if the serum creatinine level is greater than usual [31].Your doctor can estimate your eGFR (estimated glomerular filtration rate), a measurement of how well your kidneys filter waste from your blood, using the serum creatinine result [32].

1.4.3 Blood urea nitrogen (BUN) test

Your blood's level of urea nitrogen is determined by a bloodstream urea nitrogen (BUN) test.Urea nitrogen is a waste product. It manifests when your body digests the protein in your diet. Your kidneys then remove it from your blood when it produces in your liver and circulates through your blood to them. It is eliminated from your body through urine (pee) [33]. One indication that enables healthcare professionals to gauge how effectively your kidneys are functioning is the level of urea nitrogen in your blood. It’s normal to have a modest level of urea nitrogen in your blood. Your kidneys aren't properly filtering your blood if it contains an excessive amount of urea nitrogen. Your kidneys' health may be being impacted by a problem you have [34].

Your age and sex affect the normal blood urea nitrogen level.

Age and Sex	BUN Level (mg/dL) Normally
Children between the ages of 1 and 17.	Ranging from 7 and 20 mg/dL.
Mature females and those born with a gender assignment.	Ranging from 6 to 21 mg/dL.

©Daffodil International University

Mature men and those born with a male gender identity. Ranging from 8 to 24 mg/dL [35].

1.4.4 Urine test

In urine testing, a little sample of your pee is examined by a doctor to look for indications of kidney disease and other health issues. Urinalysis or urine analysis are other names for a urine test [36].

Your doctor can benefit from urine tests in the following ways.

- Check the health of your kidneys.
- Identify the stage of renal illness you are experiencing.
- Keep an eye out for conditions like diabetes that might lead to renal damage.
- Examine for kidney disease complications (issues), such as anemia and metabolic acidosis.
- Verify for further issues like a kidney infection or a urinary tract infection (UTI)

One of the earliest signs of kidney damage is often protein in the urine. Before your kidneys suffer significant damage, a urine test can detect kidney disease early on. Your doctor can determine if the harm to your kidneys is worsening over time by repeating urine tests [37].

1.4.5 Kidney ultrasound

A noninvasive, quick, and secure imaging test called an ultrasound (US) can be repeated as often as required. As a result, it is the main imaging technique used to assess kidneys. We carried conducted a literature evaluation of information concerning ultrasonography for doctors, notably nephrologists. 2019 saw searches for US usage with numerous dimensions, including length, width, depth, and volume, from fetal development to adulthood. 90% of fetal kidneys are found in the US by 20 weeks of gestation. At birth, the kidneys are only around 10% of their mature size and volume [38]. Throughout the first few weeks of life, kidney growth is the fastest; in full-term newborns, kidney length can increase by as much as 20%. The relative volume calculated from sonography and the relative function revealed by scintigraphy are well correlated. Kidney volume, which correlates with a subject's height, weight, and total body area, provides the most precise measurement of kidney size. The most reproducible dimension is kidney length. The kidney's form varies greatly, therefore measuring kidney volume requires four measurements in two distinct planes, which is more difficult technically [39]. However, kidney volume provides a more accurate estimate of size than

©Daffodil International University

measuring kidney length. It has been demonstrated that in 95% of the cases, regardless of whether the measurements are carried out by the same or by other sonographers, the kidney length measured by sonography differs by values between approximately 1 cm and 1.85 cm. A unique technique to evaluate fetal kidney development and forecast future renal function is to use ultrasound to measure the renal parenchyma [40].

1.4.6 Kidney biopsy

Kidney tissue can be sampled safely and effectively via percutaneous renal biopsy (PRB). Other techniques for kidney biopsy may be necessary in some situations. The literature has questioned traditional PRB contraindications include bleeding diathesis, morbid obesity, and solitary kidney. We evaluate the research on PRB and the advantages and disadvantages of other options [41].The majority of kidney units can evaluate medical renal disease safely and effectively with percutaneous renal biopsy. Bleeding rates range from 0.3% to 7.4%, while nephrectomy rates are extremely low (between 0.1% and 0.5%). In both open and laparoscopic procedures, bleeding rates are comparable and range from 0% to 7.0%, with significant complications occurring in 0.0% to 6.1% of cases [42].The effectiveness of percutaneous techniques has challenged long-held restrictions such a single kidney, bleeding diathesis, and morbid obesity. Other procedures can be appropriate in some circumstances. We review the literature for the various methods and the rates of complications that go along with them [43].

1.5 Pathophysiology of kidney disease

First off, compared to other fully perfused vascular beds like the heart, liver, and brain, the rate of renal blood flow—approximately 400 ml/100g of tissue per minute—is significantly higher. As a result, renal tissue may come into contact with a sizable amount of any potentially dangerous circulating agents or compounds [44]. Second, unlike other capillary beds, glomerular filtration is dependent on relatively high intra- and trans glomerular pressure (even under physiological settings). As a result, the glomerular capillaries are more susceptible to hemodynamic damage. Therefore, Brenner and colleagues identified glomerular hypertension and hyper filtration as the two main factors accelerating the development of chronic renal illness. Thirdly, anionic macromolecules are resisted by negatively charged molecules in the glomerular filtration membrane, which act as a barrier [45]. Plasma protein enters the glomerular filtrate through the rupture of this electrostatic barrier, which occurs in many types of glomerular damage. Fourthly, the glomerular convolute as well as the peritubular capillary system are arranged in the nephron's microvasculature in sequential order, and the tubuli are

©Daffodil International University

positioned downstream of the glomeruli [46]. This arrangement not only helps to maintain the glomerulus-tubular balancing act but also makes it easier for glomerular injury to spread to the renal tubular compartment in disease, revealing tubular epithelial cells to unusual ultra-filtrate. As peritubular vasculature forms the foundation of glomerular circulation, some agents of glomerular acute inflammation may spill into the peritubular circulation, leading towards the interstitial inflammatory reactivity typically observed in glomerular illness [47]. Furthermore, any drop in peritubular blood flow leads to a reduction in preglomerular as well as glomerular perfusion, which, depending on the severity of the hypoxia, results in tubulointerstitial damage and tissue remodeling. Hence, the idea of the nephron as a functional unit applies to both the pathophysiology of renal disorders as well as renal physiology. Fifth, the glomerulus should be seen as a functional unit in and of itself, with each of its constituents—the endothothelial, mesangial, visceral, and parietal epithelial cells—and their extracellular matrix playing a crucial role in its regular operation. Injury to one will partially impact the other by several methods, including direct cell-cell interactions (such as gap junctions), soluble mediators including chemokines, cytokines, and growth factors, as well as changes in the composition of the matrix and basement membrane [48].Immunologic reaction's (started via immune complexes or immune cells) tissue hypoxia and ischemia, exogenic substances like medicines, endogenous chemicals like glucose or Para proteins, among others, and genetic abnormalities are the main causes of renal injury. Glomerulosclerosis or tubulointerstitial fibrosis are prevalent to CKD regardless of the underlying etiology [49].

1.6 Mechanism of glomerular impairment

The majority of immune-mediated damage, metabolic stress, and mechanical stress are what cause acquired glomerular disease. The following three group's best describe glomerular disorders from a pathological and pathogenetic perspective: Non-proliferative (non-proliferative) glomerular disease (minimal change disease, idiopathic focal and segmental glomerulosclerosis [FSGS]) without glomerular inflammation and without immunoglobulin deposition, or with immunoglobulin deposition but without glomerular inflammation, possibly due to sub epithelial localization of immunoglobulin (e.g., membranous nephropathy) [50].Lupus nephritis, IgA nephropathy, anti-GBM, and post-infectious GN are examples of proliferative glomerular diseases that have immunoglobulin deposition that increases cellularity (proliferative glomerulonephritis), while other proliferative glomerular diseases without immunoglobulin deposition but with severe glomerular injury and inflammation (e.g., pauci-immune glomerulonephritis).Systemic illnesses such as diabetes, amyloidosis, and

©Daffodil International University

paraproteinemia all include a heterogeneous collection of glomerular disorders. On-immunologic glomerular injury. Glomerular dysfunction can be brought on by immunological mechanisms alone or in combination with hemodynamic, metabolic, and toxic damage [51].Glomerular injury may result from localized changes in glomerular hemodynamics, systemic hypertension that affects the glomeruli, and glomerular hypertension. High blood pressure can overwhelm the kidney's normal autoregulation, which means that systemic hypertension directly damages the glomerular filtration barrier and prevents it from protecting the kidney from systemic hypertension[52][53]. Chronic hypertension results in secondary sclerosis, glomerular and tubulointerstitial atrophy, and arteriolar vasoconstriction and sclerosis. High blood pressure is linked to my intimal proliferation and vessel wall sclerosis by a number of growth factors, including angiotensin II, EGF, PDGF, and CSGF, TGF-ß, stretch-activated ion channel activation, and early response gene [54].Whatever the source, glomerular hypertension is often a nephron's way of adapting to the increased workload brought on by nephron loss. By accumulating extracellular matrix (ECM), this persistent intraglomerular hypertension raises mesangial matrix manufacturing and causes glomerulosclerosis. TGF-ß is the primary mediator of the process, with contributions from angiotensin II, PDGF, CSGF, and endothelin's [53].

1.7 Mechanism of tubulointerstitial impairment

Chronic kidney disease is marked by renal fibrosis, including glomerulosclerosis and tubulointerstitial fibrosis, regardless of the etiology. At least equally significant to the impairment of the glomeruli is that of the tubulointerstitium (tubulointerstitial fibrosis as well as tubular atrophy) (glomerulosclerosis) [55]. There is broad agreement that the degree of tubulointerstitial injury strongly (and higher than glomerular injury) correlates with long-term renal function decline. This is not unexpected given that the kidney's tubules and interstitial take up more than 90% of its volume [56].

Renal fibro genesis

The initial injury triggers an inflammatory response that includes the production and local secretion of soluble factors, an increase in regional tissue perfusion, activation of endothelial cells, exudation of leukocytes all along endothelium, and subsequent secretion of different mediators by trying to infiltrate leukocytes as well as tubulointerstitial cells, as well as activation of profibrotic cells [57]. As a result, a viscous circle of cell stress is set in motion,

©Daffodil International University

producing mediators that promote fibrosis and inflammation in addition to leukocyte infiltration with fibrosis [58].

Induction and development of the inflammatory response

Following gradients of chemotactic factors and chemokines, leukocytes move from the circulation into the interstitial via post capillary venules as well as peritubular capillaries. When driven by hypoxia, ischemia, viral diseases, medications, endogenous toxins such lipids, excessive glucose, par proteins, or genetic factors just like in cystic renal disorders, all tubular cells can produce soluble mediators. Since tubular cells are subjected to proteins that are typically not filtered, glomerular illness is typically accompanied by varying degrees of tubulointerstitial damage and inflammation [55][56]. Proteinuria, immunological deposits, chemokines, cytokines, calcium phosphate, metabolic acidosis, uric acid, lipids, hypoxia, and reactive oxygen species all contribute to the development of tubulointerstitial inflammatory infiltrates [59].

The inflammatory infiltrate

Lymphocytes, particularly T lymphocytes, and monocytes/macrophages make up infiltrating inflammatory mononuclear cells. Renal function is tightly linked to CD4+ T cells and CD3 T cells that express the chemokine sensors CCR5 and CxCR3. These inflammatory cells release cytokines that promote fibrosis [60].In various animal experiments, renal fibrosis with fairly mild levels of fibrosis was shown to be reversible. In this regard, substantial research has been done on BMP-7, which offers a technique to stop the course of renal illness and perhaps even reverse fibrosis. Only Fioretto, however, has provided evidence of tubulointerstitial fibrosis for humans being reversible in a small number of type 1 diabetes patients who had pancreas transplantation [61].

©Daffodil International University

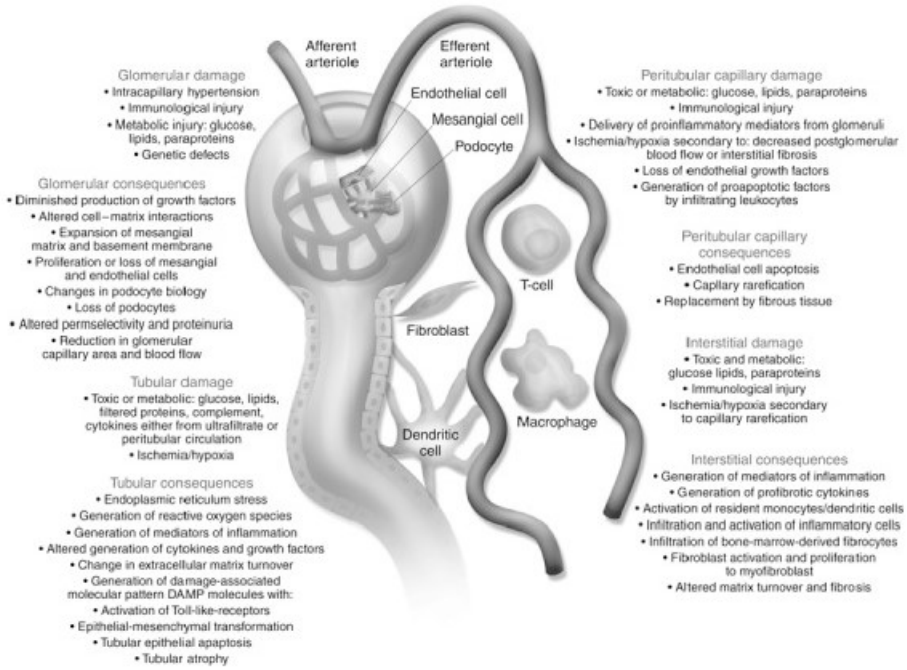


Figure 1: Pathophysiology of kidney disease [62].

1.8 Management of kidney diseases

There is information available to help primary care doctors and specialists refer patients with chronic renal disease to nephrologist's .The majority of non-progressive persistent kidney disease cases can be handled without a nephrologist being consulted [63]. Patients with acute kidney damage, persistent estimated renal filtration percentage just under 30 mL/min/1.73 m2, gradual decline of renal function, percentage of urinary protein to creatinine higher than 100 mg/mmol (about 900 mg/24 h) or urinary albumin to creatinine percentage higher than 60 mg/mmol (about 500 mg/24 h), failure to achieve treatment goals, or rapid changes in kidney function are typically recommended for referral to a nephrologist [64].

1.7.1 Hypertension

Chronic renal disease frequently has an association with hypertension. Over than 75% of people with chronic renal disease experience it at some point. 10 It both contributes to and results from chronic renal disease. The therapy of hypertension in individuals with chronic renal disease is discussed in this portion of the guidelines. Target blood pressure, the first round of medication therapy for both protein uric and non-protein uric persistent kidney disease, and the management of hypertension in combination with diabetes with large-vessel renal vascular illness are some of these elements [65][66].

©Daffodil International University

1.7.2 Diabetes

Diabetes patients are more likely to experience cardiovascular problems and persistent renal failure. Due to increased or changed sensitivity to standard regimens, shifting dietary recommendations, and compliance concerns caused by the level of care necessary, controlling blood sugar levels in individuals with chronic renal disease may be challenging. So, it's critical for clinicians to understand how crucial glycemic management is for these patients. There is currently little data to support recommendations for diabetic management in people with chronic renal disease. The claims are therefore constrained in their application [67].

1.7.3 Dyslipidemia

Every stage of chronic renal disease patients has a significant prevalence of dyslipidemia. Thus, screening, assessment, and therapeutic interventions are crucial for controlling dyslipidemia. Unfortunately, the evidence base is weak since patients with chronic renal illness were typically excluded from clinical trials. However, the recommendations make an effort to answer important queries about hyperlipidemia in people who have ongoing renal disease [68]. Due to the lack of information regarding the ideal timing of lipid measures in patients with chronic renal disease, the working group advises adhering to current recommendations for the general population. Statin therapy lowers the cardiovascular event risk in patients who stage 1-3 chronic renal disease, according to subgroup analysis from important trials. We advise doctors to use the current lipid guidelines when prescribing statin medication. Serum creatine kinase and aspartate transaminase serial monitoring in chronic renal disease patients taking low- to modest statin therapy is not supported by any data [69].

1.7.4 Lifestyle management

The guidelines' emphasis on lifestyle modification in treating individuals with decreased renal function can be seen in this section. Since that diabetes, cardiovascular disease, and chronic renal disease all have similar risk factors, changing one's diet, exercise routine, or drinking habits is crucial. Intake of dietary protein has been the subject of numerous studies [70]. Unfortunately, there is little proof to support the claim that a long-term protein consumption limitation (0.70 g/kg/day) slows the development of chronic renal disease. As a result, a diet low in protein (0.8–1.0 g/kg/day) is advised. Studies on the relationship between diet restriction and the onset or development of chronic renal disease are lacking. Nonetheless, the benefits of reducing salt as they relate to the onset and management of hypertension are known and covered in the recommendations [71].

©Daffodil International University

CHAPTER 2

PURPOSE OF THE STUDY

©Daffodil International University

2. Purpose of the study

- To find out the present scenario of kidney diseases patients in Bangladesh.
- To find out the reasons of kidney diseases in urban and rural areas of Bangladesh.
- To increases the awareness among the people of Bangladesh about kidney diseases and its common causes.
- To find out their daily routine, diet and lifestyle to understand the main reason of kidney diseases.
- To help in the management of kidney diseases patients life.
- To understand the major reasons of kidney diseases and make people aware about this problem.

This study aims to understand the daily routine, diet and lifestyle of kidney diseases patient and make an outcome of reasons of their problem for which reason they are suffering from kidney diseases and other people aware about this reasons.

©Daffodil International University

CHAPTER 3

LITERATURE REVIEW

©Daffodil International University

3. Literature review

Proteomics and Metabolomics in Kidney Disease, including Insights into Etiology, Treatment, and Prevention

Abstract

We examine essential ideas, highlight concrete cases, and discuss future prospects in this overview of how to employ proteomics and metabolomics in renal disease research. In along with genetic coding, the proteome & metabolome show the impact of environmental exposures. Proteins and metabolites in the blood are dynamic and tunable, making therapeutic targeting possible. Proteomics and metabolomics investigations should be adapted to the objectives of the investigator in terms of design and analytical concerns. Strict significance criteria and normalization for all possible confounding variables, including GFR, are required for the discovery of clinical biomarkers. Given the high level of intercorrelation throughout the proteome and metabolome, this technique, however, has the potential to mask biological signals and can be unduly cautious. Mass spectrometry is a key tool in both proteomics and metabolomics, and it is frequently used in conjunction with up-front chromatographic separation methods. Proteomic technologies based on high-throughput antibodies and aptamers have become additional, effective methods for measuring the proteome. Machine learning algorithms and pathway analyses can assist choose the molecules of highest interest and group them in various biologic themes as the scope of coverage for such methodologies continues to grow. Studies have already had a significant impact, expounding target antigens through membranous nephrotic syndrome, trying to identify a fingerprint of urinary peptides which adds prognosis to urinary albumin throughout CKD, implying flowing inflammatory proteins as possible moderators of diabetic nephropathy, trying to highlight kidney bioenergetics as just a modifiable factor in AKI, and more. It will need more research to confirm and build on such findings in distinct cohorts. Also, more study is required to comprehend the longitudinal trajectories of certain proteins and metabolite markers, carry out transomics studies within combined datasets, and include more research based on kidney tissue [72].

National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification

Abstract

©Daffodil International University

An international public health issue, chronic kidney disease has a rising prevalence and incidence, poor prognoses, and significant costs. In addition to renal failure, consequences of diminished renal function and heart disease can also result from chronic kidney disease. Recent studies suggest that early detection and treatment could be able to prevent or postpone some of these adverse consequences. Regrettably, there is a lack of consensus on the description and categorization of the phases of development of chronic kidney disease, which contributes to underdiagnoses and under treatment of the condition. the National Kidney Foundation's most recent clinical practice recommendations Regardless of the underlying cause, it is important to: 1) define chronic kidney disease and categorize its stages; 2) assess laboratory data for clinical evaluation of kidney disease; 3) link kidney function to health problems of chronic kidney disease; and 4) stratify the risk for kidney function loss and the onset of cardiovascular disease. The Institute for Health Research and Quality's recommended technique served as the basis for the methodology used to generate the guidelines. The concept of chronic renal failure and its five-stage categorization system are presented in this essay, along with an overview of the main suggestions for adult early identification. The recommendations include identifying people who are more vulnerable (such as those with diabetes, hypertension, a family background of chronic kidney disease, those older than 60, or people who identify as members of a U.S. racial or ethnic minority), detecting kidney damage by calculating the albumin-creatinine proportion in untimed ("spot") urine samples, and calculating the filtration rate of the kidney from serum creatinine measurements using prediction equations. This knowledge is crucial for general internists and specialists, given the significant frequency of early severe kidney illness among the general population (around 11% of individuals) [73].

The views of patients and carers in treatment decision making for chronic kidney disease: systematic review and thematic synthesis of qualitative studies.

Abstract

To compile the opinions of patients and caregivers in order to make judgments about the management of chronic renal disease and to determine which variables influence those decisions. a comprehensive evaluation of qualitative studies on judgment and choices about dialysis, organ donation, or palliative care, along with a theme synthesis of those studies. Line after line coding of both the core study data and the creation of analytical and descriptive themes comprised thematic synthesis. There were 18 papers that detailed the opinions of 375 patients as well as 87 caregivers. 14 studies, three on donation, and one regarding palliative

©Daffodil International University

care centered on choices for dialysis mode. Facing mortality (having to choose between living and dying, being a burden, and existing in limbo), and having no other options studying the possibilities (peer influence, timing of information), and going to weigh alternatives are the four main themes that were found to be crucial to treatment decisions. Patients and caregivers' decisions were highly impacted by the experiences of many other patients. Hemodialysis appeared to be predetermined by the poor timing providing information about available therapies and the simultaneous development of vascular access while preventing the use of alternative therapies, including palliative care. Why patients frequently stick with their initial therapy might be explained by a wish to keep things as they are [74].

©Daffodil International University

CHAPTER 4

METHODOLOGY

©Daffodil International University

4. Methodology

4.1 Methods

This section will look into the methodology and approach that will be utilized to collect the survey's data. This survey aimed to understand the present prospective and regional causes of kidney diseases. This part is crucial because it examines the survey methodology and techniques that will be applied to gather data for the survey.

4.2 Study design

This questionnaire-based in-person study of kidney diseases patients who resided in both urban and rural areas was conducted from January 9 to April 30, 2023. I physically collected the data for this investigation. To ensure the data's authenticity and dependability, a good rapport with the participants must be established. The points and objectives of the review were presented to the members before the meeting. A wise approach has been used in handling, resuming, and settling the information that has been obtained.

4.3 Content of the survey

The structured questionnaires were created by the researcher themselves after analyzing earlier research from a variety of sources, including online journals, newspapers, scholarly databases, and google searches. These sources were selected based on necessity. It took about 8 to 10 minutes to finish the 25 closed-ended questions in the review. Approximately 110 people are interested in this. A physical sample of this survey was taken from different dedicated kidney hospitals in Bangladesh. The survey consists of several different components, including (1) socioeconomic data (welcome, name, age, occupation status, and previous health information) and (2) an analysis of the adult population of Bangladesh's knowledge about kidney diseases and the major reasons of this diseases 110 participants participated for a month and replied to the survey.

4.4 Inclusion criteria

The responders had to be kidney diseases patient who lived anywhere in Bangladesh in order to qualify.

4.5 Exclusion criteria

The exclusion criteria were that the children could not participate the survey and individuals who were not ready to take an interest were additionally avoided from the review.

©Daffodil International University

4.6 Data Analysis

All data of this survey was entered into the MS Excel sheet. Each problem has been cultivated in particularly. The inventions are exhibited with the different factors in proportion and relation and percentage of the attitude and cultivate of information.

©Daffodil International University

CHAPTER 5

RESULT AND DISCUSSION

©Daffodil International University

5 Result and discussion

5.1 Result

5.1.1 General characteristic of respondent:

Gender

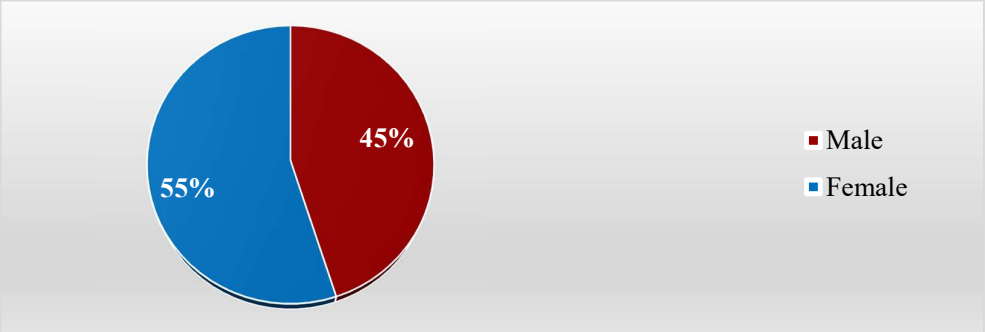


Figure 2: Gender ratio

Survey data was taken from 110 people. They were responded to the question about their salutation, with 55% of them were female and 45% of them were male.

Age

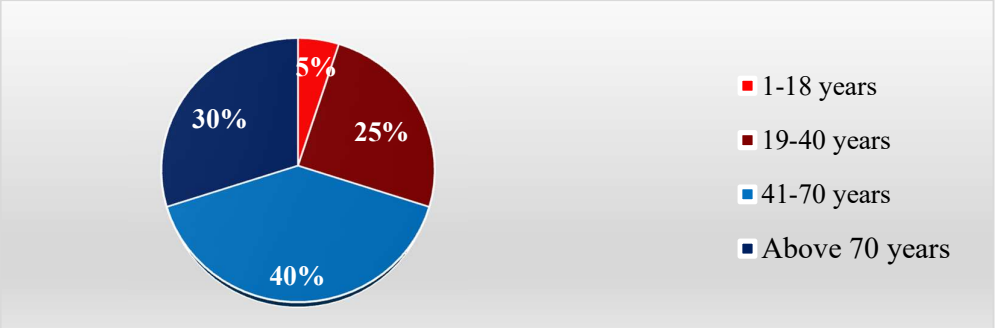


Figure 3: Age

The responder's average age was between 19-70 years 65%. 41-70 years old peoples are most prone to develop kidney diseases. Above 70 years are also very risky in this scenario. As the age increases the chance of developing kidney diseases increases.

©Daffodil International University

Residence

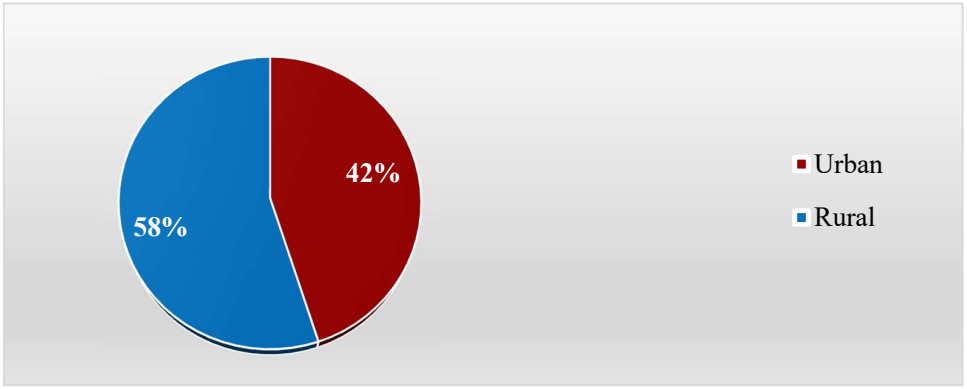


Figure 4: Residence ratio

The majority of respondents lived in rural areas (58%), Followed by urban areas (42%)

Residence time in Dhaka

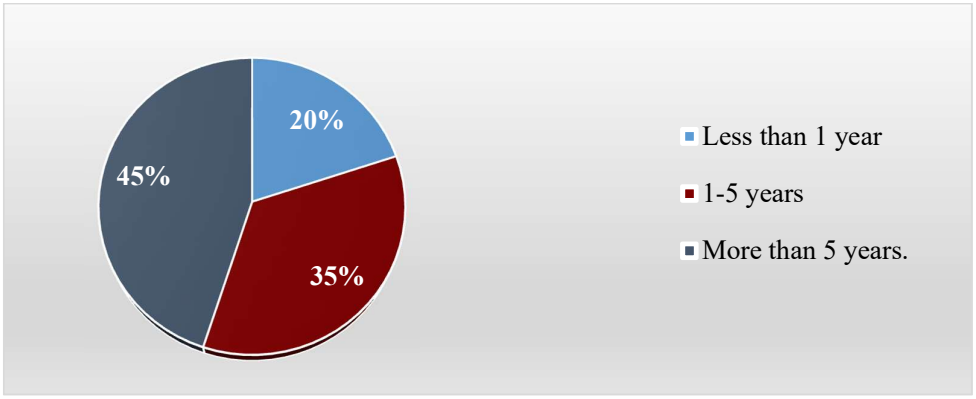
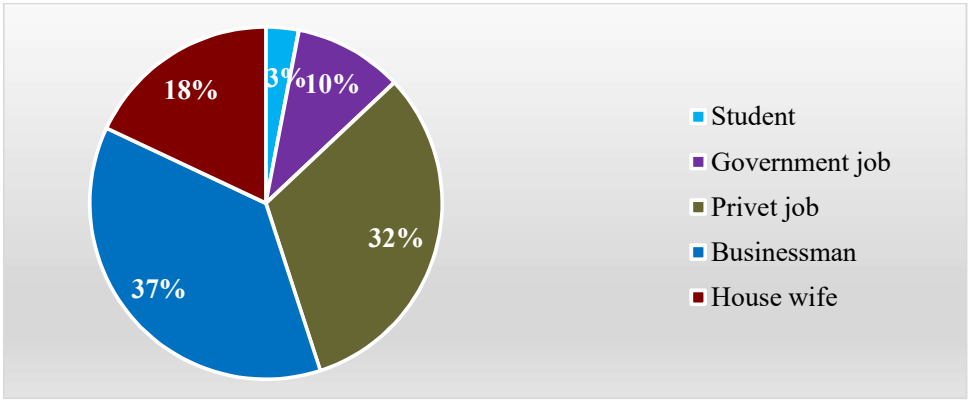


Figure 5: Residence time

Dhaka residence are mostly staying in Dhaka more than 5 years their ratio shows 45%. Also the 35% of Dhaka residence stay in Dhaka almost 5 years (35%).

Occupation



©Daffodil International University

Figure 6: Respondents Occupation

According to the survey, the majority of respondents were privet job holders and business man (69%).

5.1.2 Questionnaire about lifestyle and food habit

Types of water consumed

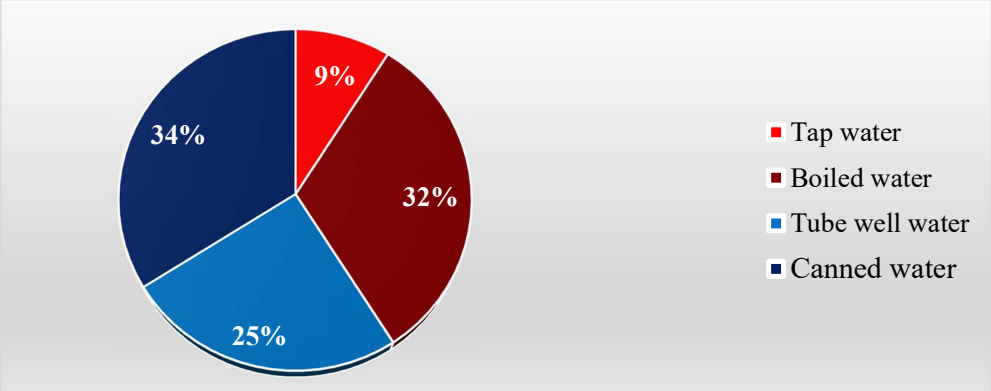


Figure 7: Type of water intake ratio

In this survey, I found that 59% respondents shared that they confirmed that they intake tube well water and canned water which is common in rural areas. Canned water is also common in urban areas. Another 32% said that they confirmed that intake water by boiling it. Only 9% of respondents consume tap water.

How many times water consumed in a day

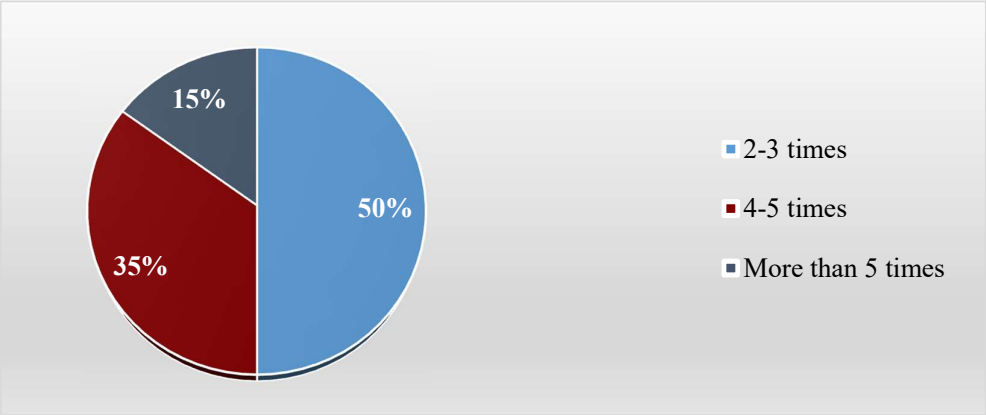


Figure 8: Water consumption time in a day

Water is a very important element of human body 60% are made by water to maintain the normal balance of the body drinking water is essential. According to the survey response, a

©Daffodil International University

percentage of 50% respondents confirmed that they consume water 2-3 times a day. Other 35% consume water 4-5 times a day .Only 15% respondent's drink water more than 5 times a day.

The amount of water consumed in a day

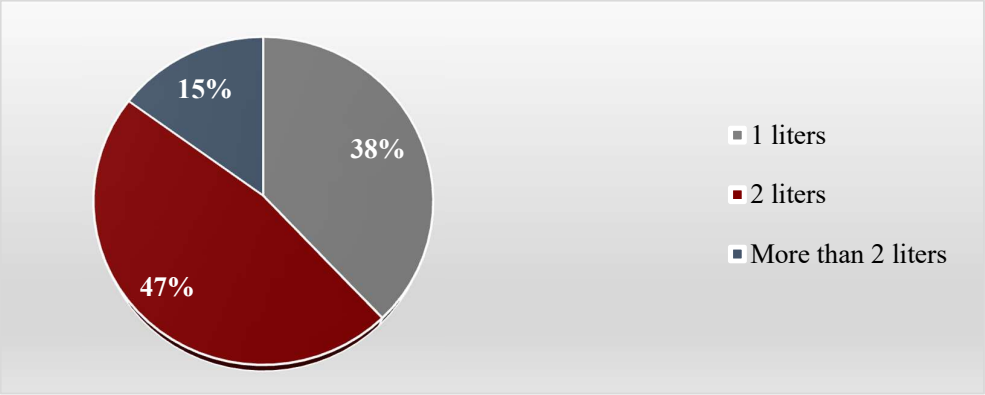


Figure 9: The amount of water consumed in a day

Water is an important element in our body to filter out the waste material from our body. A normal and healthy human being need to drink at least 2 liters of water in a day. In this survey, we can see 47% of respondents drink 2 liters of water daily and other 38% drink around 1 liters. The amount is very less form people who drink higher than 2 liters daily (15%).

Types of food preferred eating the most

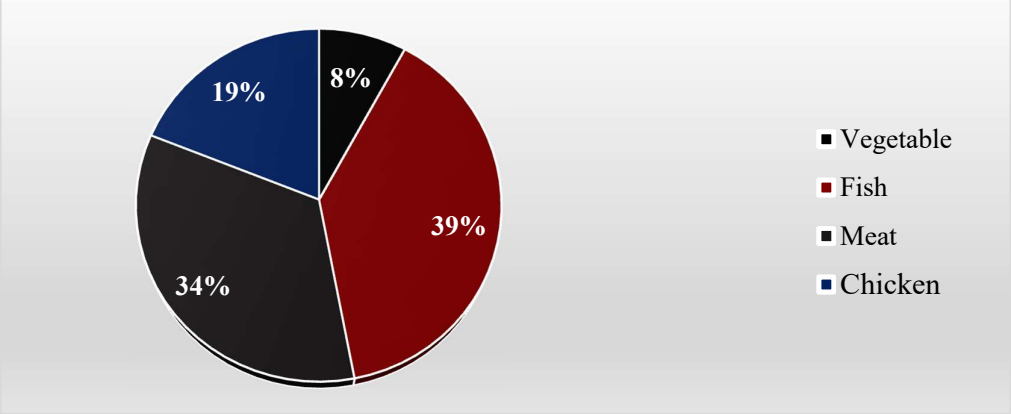


Figure 10: Most preferred food

According to this survey, the highest 53% of respondents preferred eating chicken or meat. Fish is the most chosen item form them with 39% respondents like to eat fish.

©Daffodil International University

Types of meat eat the most

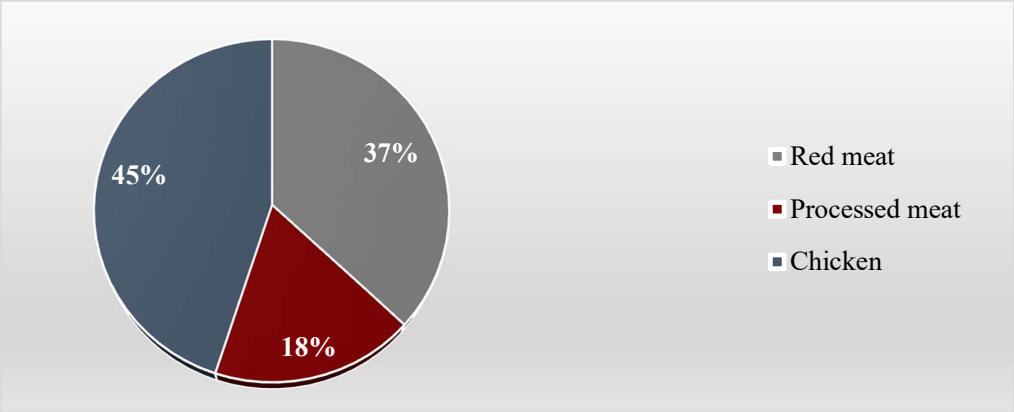


Figure 11: Types of meat

In this survey, 45% respondents confirmed that they like to eat red meat in their daily diet.

Different eating habit

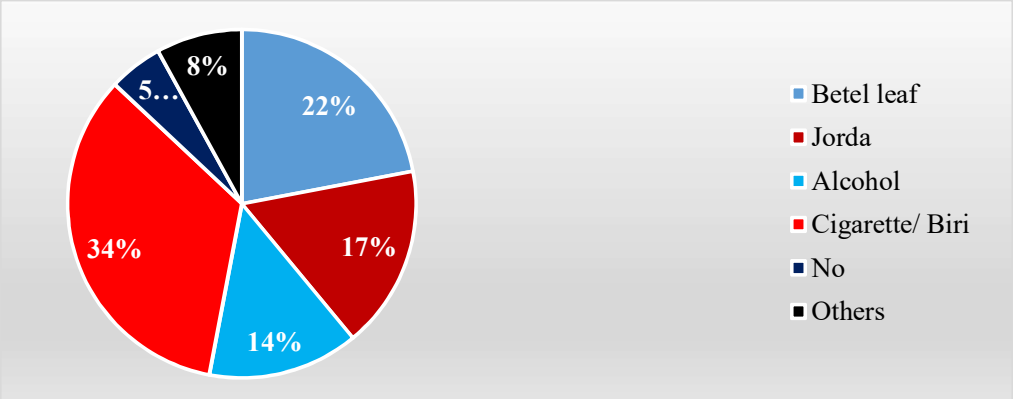
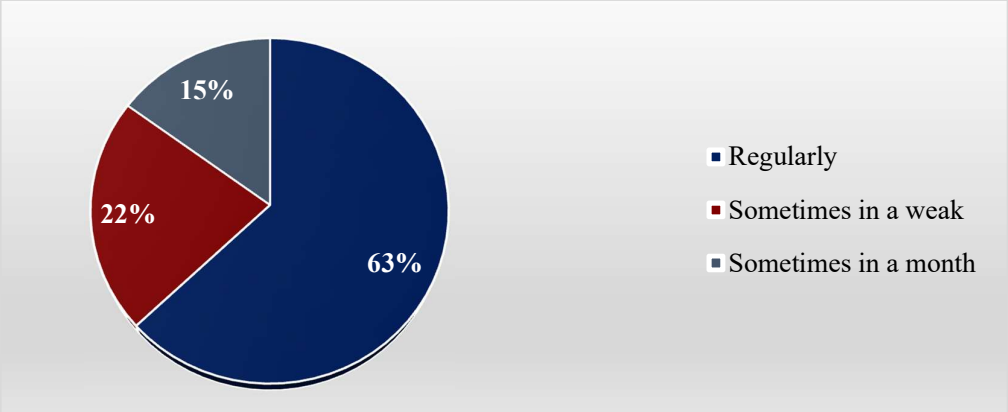


Figure 12: Eating habit

According to the survey response, 34% respondents have the habit of smoking cigarette.

How often do you smoke or consume alcohol?



©Daffodil International University

Figure 13: Frequency of smoking and drinking

In this survey, 63% respondents confirmed that they smoke regularly along with alcohol sometimes.

5.1.3 Questionnaire about kidney diseases

Do you feel stressed (daily life/ professional) very often?

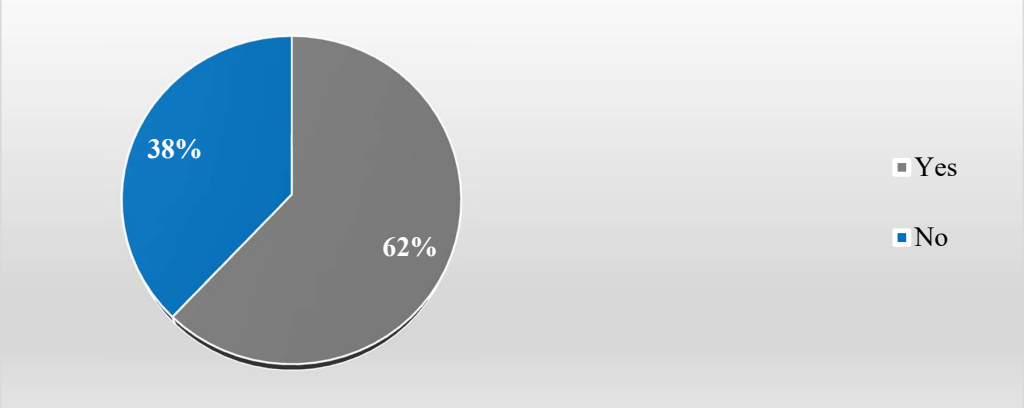


Figure 14: Stress ratio

According to the survey response, 62% respondents feel stressed in their daily life because of their work or family pressure.

Does your family members have past kidney diseases record?

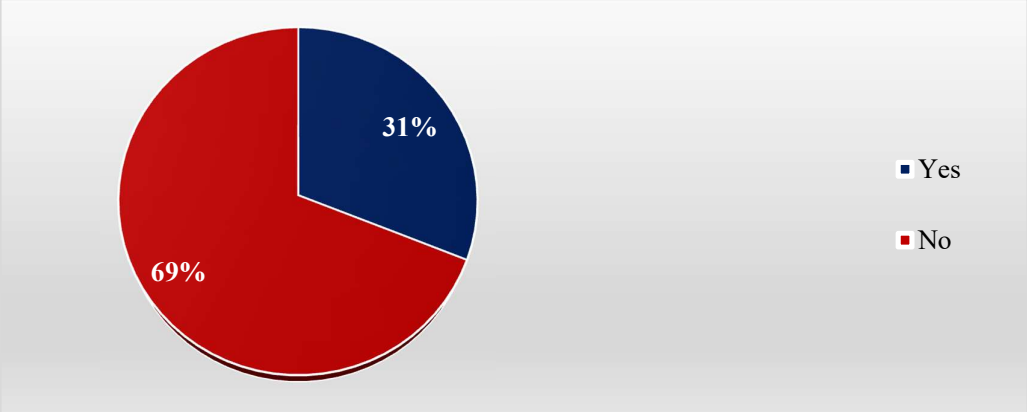


Figure 15: Family history

According to the survey response, 69% of respondents don't have past kidney diseases in their family history.

©Daffodil International University

Which of the medicine do consume frequently?

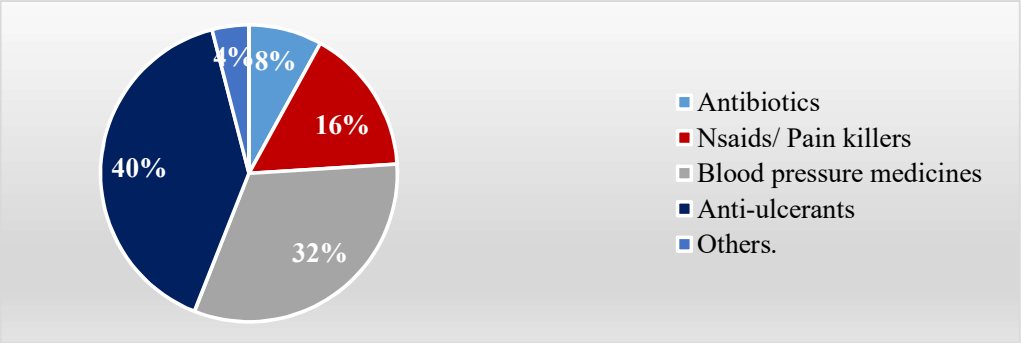


Figure 16: Medicine use frequently

In this survey, 40% respondents use to take anti – ulcerant daily and 32% respondents take blood pressure medicine.

Do you have the tendency of Urinary retention quit often?

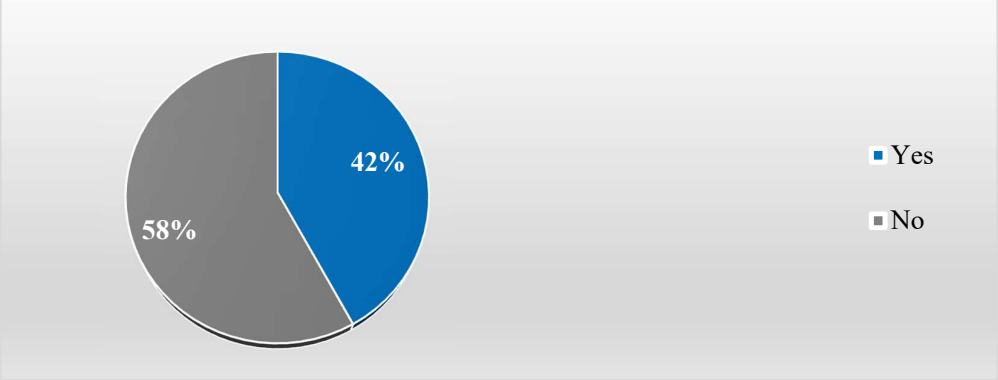
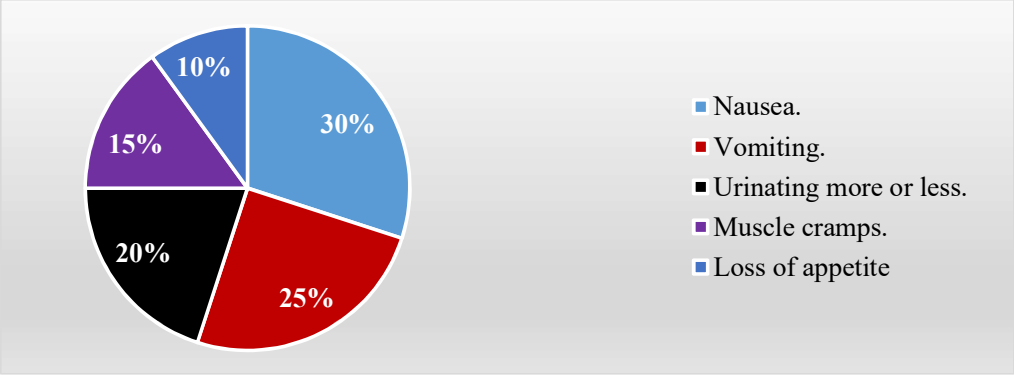


Figure 17: Urinary retention ratio

According to the survey response, 58% of respondents don't have the tendency of urinary retention.

What kind of symptoms do you face after this problem?



©Daffodil International University

Figure 18: Symptoms faced

In this survey response, the majority of respondents (30%) had nausea as side effects. 25% respondents are facing vomiting as side effect and another 20% had been urinating more or less as side effect. 15% respondents confirmed that they had muscle cramps sometimes as a side effect. 10% mentioned that they faced loss of appetite others problem also.

Did you have kidney stone or any kind kidney of problems?

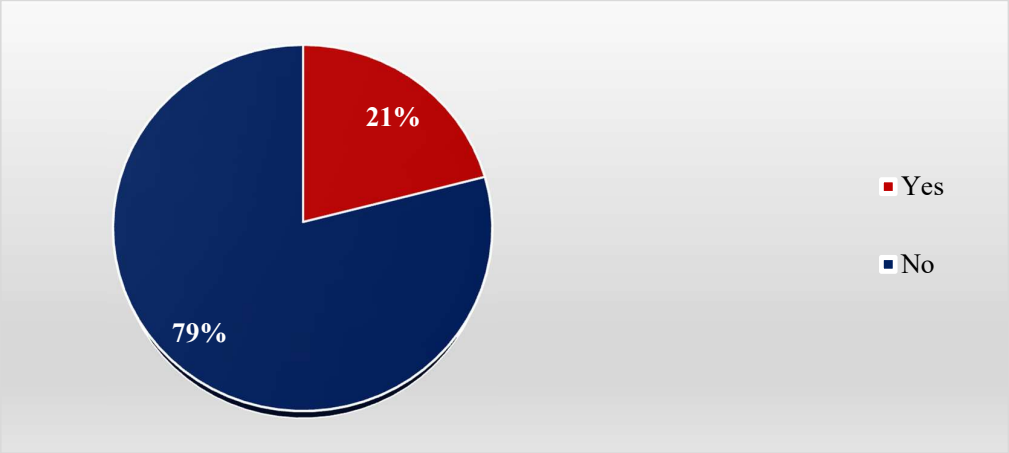


Figure 19: kidney problems

According to the survey response, 79% of respondents don't have kidney stone or any other kidney problem.

If yes, how long have you facing this problem?

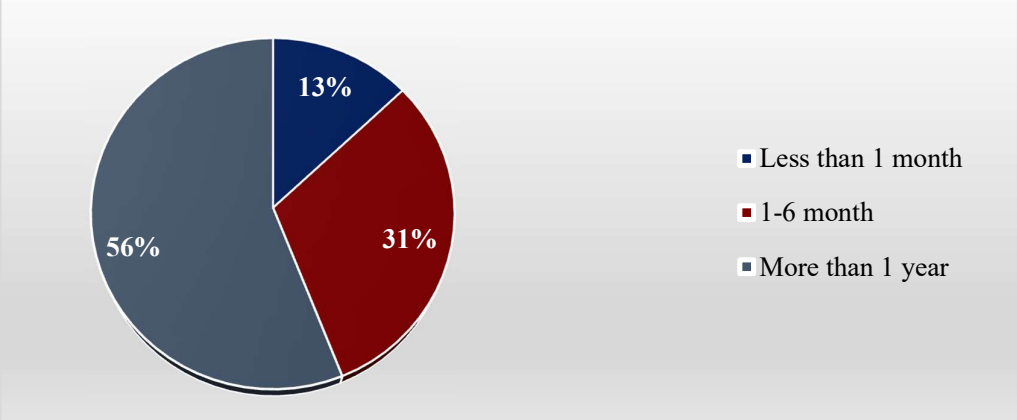


Figure 20: Problem facing time

In this survey response, majority of 56% respondents confirmed that they are facing this problem for more than 1 years.

©Daffodil International University

Have you visited any doctor or self-medicated before this about this problem?

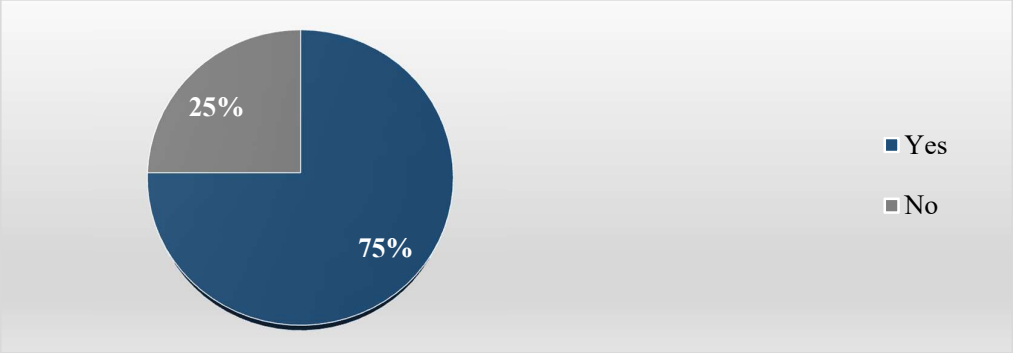


Figure 21: Doctor Visit

In this survey response, the majority of respondents (75%) had visited a doctor for diagnose and treatment.

Have you ever used this kind of medicines of your kidney problem?

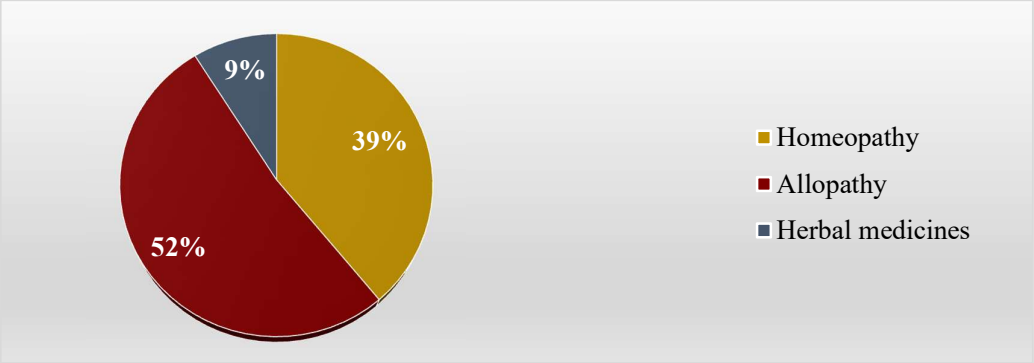


Figure 22: Medication

According to the survey response, 52% of respondents take Allopathy medicine for their treatment and 39% respondents take homeopathy medicine for their treatment.

Do you have Diabetes Mellitus?

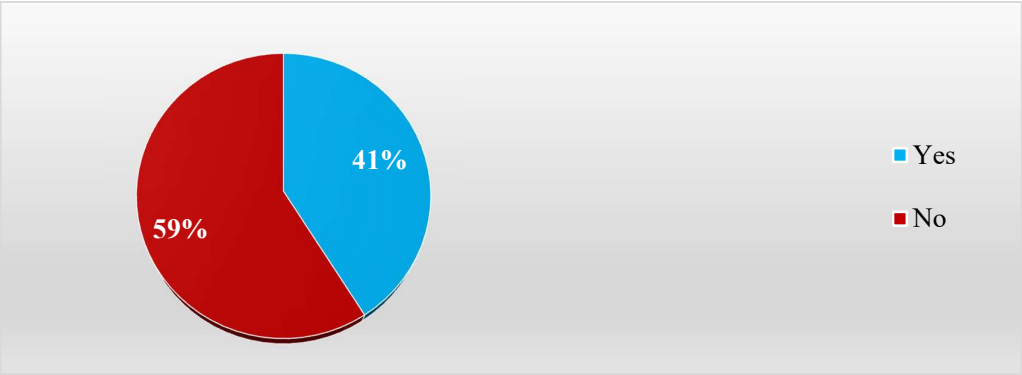


Figure 23: Diabetes mellitus ratio

©Daffodil International University

In this survey, almost 59% of the respondents don't have diabetes mellitus but 41% of the respondents are suffering from different types of diabetes mellitus.

If yes, which type of Diabetes Mellitus do you have?

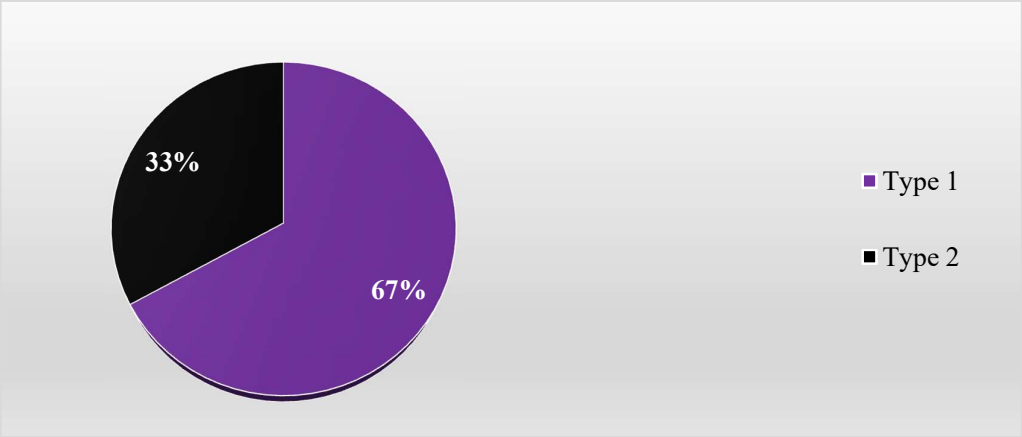


Figure 24: Diabetes types

According to the survey response, 67% of respondents have type 1 diabetes and 33% respondents have type 2 diabetes mellitus.

What kind of kidney problem do you have?

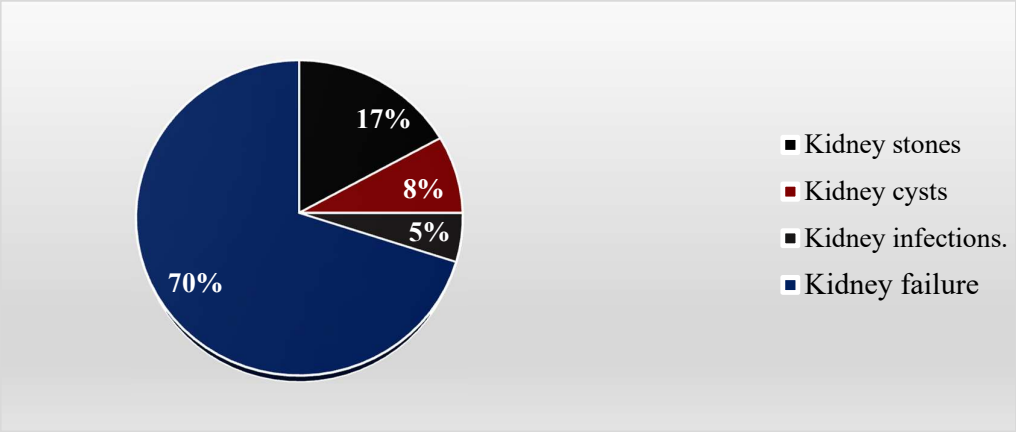


Figure 25: Different types of kidney diseases ratio

In this survey response, the majority of respondents (70%) was suffering from kidney failure. 17% respondents were suffering from kidney stone other than that 8% respondents was suffering from kidney cysts and 5% respondents was suffering from kidney infection.

©Daffodil International University

How do you confirm that you have this kidney problem?

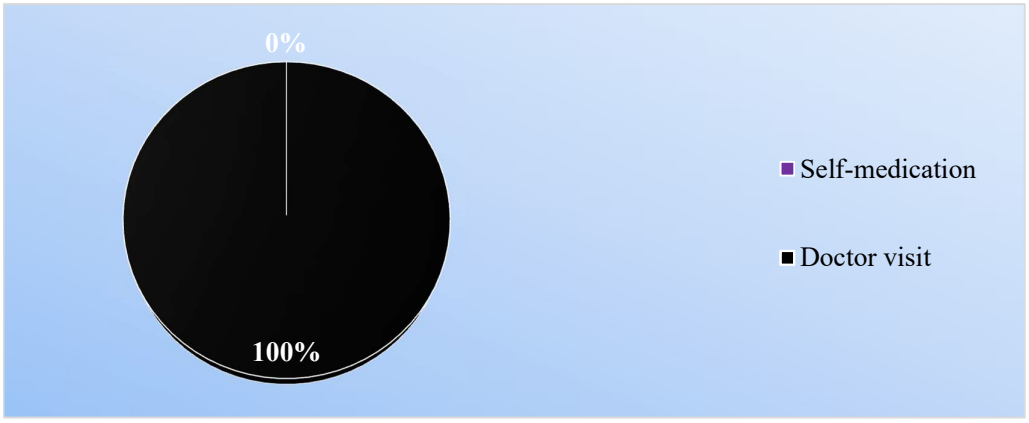


Figure 26: Diagnosis of kidney diseases

In this survey, all respondents (100%) confirmed that they had to visit a doctor to confirm that they are suffering from kidney diseases.

5.2 Discussion

The fact that there are greater than 850 million individuals suffering from renal disease, which is on the rise every year, is underscored by the figure 850 million. Which is almost twice as many as the 422 million people who have diabetes and 20 times as many as the 42 million people who have cancer globally or the 20 million people who have AIDS/HIV (36.7 million) [74]. More than 800 million people, or 10% of the world's population, are affected with chronic kidney disease, a degenerative ailment [75]. The patients suffering from kidney diseases had to suffer a lot mostly chronic kidney diseases patients. Also the family members of chronic kidney patients also face very tough times because they had to go through dialysis process twice a week which an expensive and painful process for both the patients and their family.

To understand the actual perception of the local people this survey was conducted January 9 to April 30, 2023. A total of 110 kidney diseases patients were interviewed and from them 55% patients were female and other 45% patients were male. Their age ranged from 1 years to above 70 years. Most of the patients were from rural areas 58%. From those respondents, privet job holders and business persons respond mostly. According to the survey response, 67% respondents have diabetes mellitus type 1 and 32% have been suffering from high blood pressure this is one of the major reasons of development of kidney diseases. Another important factor that can effects the kidney function is type of water consume and the amount. Only 15% of the respondents consume water more than 2 liters in a day which the majorly the kidney function and develop kidney diseases in the patients.

©Daffodil International University

CHAPTER 6

CONCLUSION

©Daffodil International University

6. Conclusion

Kidney diseases is becoming a major public health concern in Bangladesh. Survey was done to understand the regional causes of kidney diseases. Some finding from the survey was very shocking the urban and rural people ratio of kidney disease was almost similar but the cause of the diseases was different. Like lack of water consumption daily is effecting mostly for both urban and rural people. High blood pressure and diabetes is another reason for development of kidney diseases. The high blood pressure rate in kidney diseases can even cause heart diseases and stroke. If kidney disease left untreated in the first stage this can lead to the formation of kidney failure. Kidney diseases has a long development time. As most of the respondents suffering from kidney failure suggest that the treatment pattern in the early stage of kidney diseases is not convenient. The result suggest that the rural peoples approach to the diseases and the treatment they are getting should have some changes and for urban people their lifestyle management and daily diet should be maintained. So, Patient's understanding of the disease causes, symptoms and prevention, as well as accompanying myths, must be tracked in order to manage and prevent it. Health awareness, educating the people, strictly monitor the patients, and diet should be needed for proper treatment.

©Daffodil International University

CHAPTER 7

REFERENCES

©Daffodil International University

Reference

1. Levey, A. S., & Coresh, J. (2012). Chronic kidney disease. *The lancet*, *379*(9811), 165-180.
2. Thomas, R., Kanso, A., & Sedor, J. R. (2008). Chronic kidney disease and its complications. *Primary care: Clinics in office practice*, *35*(2), 329-344.
3. Yang, H. C., Zuo, Y., & Fogo, A. B. (2010). Models of chronic kidney disease. *Drug Discovery Today: Disease Models*, *7*(1-2), 13-19.
4. El Nahas, A. M., & Bello, A. K. (2005). Chronic kidney disease: the global challenge. *The lancet*, *365*(9456), 331-340.
5. Anders, H. J., & Muruve, D. A. (2011). The inflammasomes in kidney disease. *Journal of the American Society of Nephrology*, *22*(6), 1007-1018.
6. Jain, N., & Reilly, R. F. (2019). Clinical pharmacology of oral anticoagulants in patients with kidney disease. *Clinical Journal of the American Society of Nephrology*, *14*(2), 278-287.
7. Schiffer, M., Teng, B., Gu, C., Shchedrina, V. A., Kasaikina, M., Pham, V. A., ... & Sever, S. (2015). Pharmacological targeting of actin-dependent dynamin oligomerization ameliorates chronic kidney disease in diverse animal models. *Nature medicine*, *21*(6), 601-609.
8. Kalantar-Zadeh, K., Jafar, T. H., Nitsch, D., Neuen, B. L., & Perkovic, V. (2021). Chronic kidney disease. *The lancet*, *398*(10302), 786-802.
9. Menon, V., Gul, A., & Sarnak, M. J. (2005). Cardiovascular risk factors in chronic kidney disease. *Kidney international*, *68*(4), 1413-1418.
10. Turner, J. M., Bauer, C., Abramowitz, M. K., Melamed, M. L., & Hostetter, T. H. (2012). Treatment of chronic kidney disease. *Kidney international*, *81*(4), 351-362.
11. Toto, R. D. (2005, November). Treatment of hypertension in chronic kidney disease. In *Seminars in nephrology* (Vol. 25, No. 6, pp. 435-439). WB Saunders.
12. Martin, W. P., White, J., López-Hernández, F. J., Docherty, N. G., & Le Roux, C. W. (2020). Metabolic surgery to treat obesity in diabetic kidney disease, chronic kidney disease, and end-stage kidney disease; what are the unanswered questions?. *Frontiers in Endocrinology*, *11*, 289.
13. Uribarri, J., Oh, M. S., & Carroll, H. J. (1989). The first kidney stone. *Annals of internal medicine*, *111*(12), 1006-1009.

©Daffodil International University

14. Coe, F. L., Evan, A. P., Worcester, E. M., & Lingeman, J. E. (2010). Three pathways for human kidney stone formation. *Urological research*, *38*, 147-160.
15. Rule, A. D., Bergstralh, E. J., Melton, L. J., Li, X., Weaver, A. L., & Lieske, J. C. (2009). Kidney stones and the risk for chronic kidney disease. *Clinical Journal of the American Society of Nephrology*, *4*(4), 804-811.
16. Miller, N. L., & Lingeman, J. E. (2007). Management of kidney stones. *Bmj*, *334*(7591), 468-472.
17. Chadban, S. J., & Atkins, R. C. (2005). Glomerulonephritis. *The Lancet*, *365*(9473), 1797-1806.
18. Weening, J. J., D'agati, V. D., Schwartz, M. M., Seshan, S. V., Alpers, C. E., Appel, G. B., ... & Nagata, M. (2004). The classification of glomerulonephritis in systemic lupus erythematosus revisited. *Kidney international*, *65*(2), 521-530.
19. Bergmann, C., Guay-Woodford, L. M., Harris, P. C., Horie, S., Peters, D. J., & Torres, V. E. (2018). Polycystic kidney disease. *Nature reviews Disease primers*, *4*(1), 50.
20. Gabow, P. A. (1993). Autosomal dominant polycystic kidney disease. *New England Journal of Medicine*, *329*(5), 332-342.
21. Torres, V. E., Harris, P. C., & Pirson, Y. (2007). Autosomal dominant polycystic kidney disease. *The Lancet*, *369*(9569), 1287-1301.
22. Flores-Mireles, A. L., Walker, J. N., Caparon, M., & Hultgren, S. J. (2015). Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature reviews microbiology*, *13*(5), 269-284.
23. Jepson, R. G., Williams, G., & Craig, J. C. (2012). Cranberries for preventing urinary tract infections. *Cochrane database of systematic reviews*, (10).
24. Khalil, A., & Abdalrahim, M. (2014). Knowledge, attitudes, and practices towards prevention and early detection of chronic kidney disease. *International nursing review*, *61*(2), 237-245.
25. Chmielewski, C., & Filippone, E. J. (1999). Kidney Disease in Primary Care. ANNA Journal, 26(5), 529-529.
26. Harris, D. C., Davies, S. J., Finkelstein, F. O., Jha, V., Bello, A. K., Brown, M., ... & Zuniga, C. (2020). Strategic plan for integrated care of patients with kidney failure. *Kidney international*, *98*(5), S117-S134.
27. Wu YL, Lee V, Liam CK, Lu S, Park K, Srimuninnimit V, Wang J, Zhou C, Appius A, Button P, Hooper G, Palma JF, Schulze K, Scudder S, Shames DS, Yin AY, Zhang G, Mok T; ENSURE FASTACT-2 and ASPIRATION Investigators. Clinical utility of

©Daffodil International University

a blood-based EGFR mutation test in patients receiving first-line erlotinib therapy in the ENSURE, FASTACT-2, and ASPIRATION studies. Lung Cancer. 2018 Dec;126:1-8. doi: 10.1016/j.lungcan.2018.10.004. Epub 2018 Oct 9. PMID: 30527172.

28. Mclean A, Nath M, Sawhney S. Population Epidemiology of Hyperkalemia: Cardiac and Kidney Long-term Health Outcomes. Am J Kidney Dis. 2022 Apr;79(4):527-538.e1. doi: 10.1053/j.ajkd.2021.07.008. Epub 2021 Aug 20. PMID: 34419518.
29. Wang, J., Hu, B., Li, T., Miao, J., Zhang, W., Chen, S., ... & Li, H. (2019). The EGFR-rearranged adenocarcinoma is associated with a high rate of venous thromboembolism. *Annals of Translational Medicine*, *7*(23).
30. Skurup, A., Kristensen, T., & Wennecke, G. (2008). New creatinine sensor for point-of-care testing of creatinine meets the National Kidney Disease Education Program guidelines. *Clinical chemistry and laboratory medicine*, *46*(1), 3-8.
31. Ferguson TW, Komenda P, Tangri N. Cystatin C as a biomarker for estimating glomerular filtration rate. Curr Opin Nephrol Hypertens. 2015 May;24(3):295-300. doi: 10.1097/MNH.0000000000000115. PMID: 26066476.
32. Edwards, K. D. G., & Whyte, H. M. (1959). Plasma creatinine level and creatinine clearance as tests of renal function. *Australasian Annals of Medicine*, *8*(3), 218-224.
33. Wu, B. U., Bakker, O. J., Papachristou, G. I., Besselink, M. G., Repas, K., van Santvoort, H. C., ... & Banks, P. A. (2011). Blood urea nitrogen in the early assessment of acute pancreatitis: an international validation study. *Archives of internal medicine*, *171*(7), 669-676.
34. Lyman, J. L. (1986). Blood urea nitrogen and creatinine. *Emergency medicine clinics of North America*, *4*(2), 223-233.
35. Hester, R. L., Curry, E., & Bower, J. (1992). The determination of hemodialysis blood recirculation using blood urea nitrogen measurements. *American journal of kidney diseases*, *20*(6), 598-602.
36. Vaidya, V. S., Ford, G. M., Waikar, S. S., Wang, Y., Clement, M. B., Ramirez, V., ... & Bonventre, J. V. (2009). A rapid urine test for early detection of kidney injury. *Kidney international*, *76*(1), 108-114.
37. Eskridge, K. D., & Guthrie, S. K. (1997). Clinical issues associated with urine testing of substances of abuse. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, *17*(3), 497-510.
38. Platt, J. F. (1997, February). Doppler ultrasound of the kidney. In *Seminars in Ultrasound, CT and MRI* (Vol. 18, No. 1, pp. 22-32). WB Saunders.

©Daffodil International University

39. Abdurakhmanovich, K. O., Amandullaevich, A. Y., Khurshedovna, A. S., & Servetovna, A. A. (2021). Role of Kidney Ultrasound in the Choice of Tactics for Treatment of Acute Renal Failure. *Central Asian Journal of Medical and Natural Science*, *2*(4), 132-134.
40. Reisinger N, Ahmed N. The Ultrasound-Augmented Physical Exam for Nephrologists: Beyond the Kidney. Adv Chronic Kidney Dis. 2021 May;28(3):191-192. doi: 10.1053/j.ackd.2021.10.005. PMID: 34906302.
41. Poggio, E. D., McClelland, R. L., Blank, K. N., Hansen, S., Bansal, S., Bomback, A. S., ... & Rovin, B. H. (2020). Systematic review and meta-analysis of native kidney biopsy complications. *Clinical Journal of the American Society of Nephrology*, *15*(11), 1595-1602.
42. Moledina, D. G., Luciano, R. L., Kukova, L., Chan, L., Saha, A., Nadkarni, G., ... & Parikh, C. R. (2018). Kidney biopsy–related complications in hospitalized patients with acute kidney disease. *Clinical Journal of the American Society of Nephrology*, *13*(11), 1633-1640.
43. Bandari J, Fuller TW, Turner Ii RM, D'Agostino LA. Renal biopsy for medical renal disease: indications and contraindications. Can J Urol. 2016 Feb;23(1):8121-6. PMID: 26892051.
44. Tracz, M. J., Alam, J., & Nath, K. A. (2007). Physiology and pathophysiology of heme: implications for kidney disease. *Journal of the American Society of Nephrology*, *18*(2), 414-420.
45. Yang, L., Humphreys, B. D., & Bonventre, J. V. (2011). Pathophysiology of acute kidney injury to chronic kidney disease: maladaptive repair. *Controversies in acute kidney injury*, *174*, 149-155.
46. Cravedi, P., & Remuzzi, G. (2013). Pathophysiology of proteinuria and its value as an outcome measure in chronic kidney disease. *British journal of clinical pharmacology*, *76*(4), 516-523.
47. Sugahara, M., Pak, W. L. W., Tanaka, T., Tang, S. C., & Nangaku, M. (2021). Update on diagnosis, pathophysiology, and management of diabetic kidney disease. *Nephrology*, *26*(6), 491-500.
48. Ding, W. Y., Gupta, D., Wong, C. F., & Lip, G. Y. (2021). Pathophysiology of atrial fibrillation and chronic kidney disease. *Cardiovascular Research*, *117*(4), 1046-1059.
49. Himmelfarb, J. (2005). Relevance of oxidative pathways in the pathophysiology of chronic kidney disease. *Cardiology clinics*, *23*(3), 319-330.

©Daffodil International University

50. Klahr, S. (1991). New insights into the consequences and mechanisms of renal impairment in obstructive nephropathy. *American journal of kidney diseases*, *18*(6), 689-699.
51. Granqvist, A., Nilsson, U. A., Ebefors, K., Haraldsson, B., & Nyström, J. (2010). Impaired glomerular and tubular antioxidative defense mechanisms in nephrotic syndrome. *American Journal of Physiology-Renal Physiology*, *299*(4), F898-F904.
52. Nagy II, Xu Q, Naillat F, Ali N, Miinalainen I, Samoylenko A, Vainio SJ. Impairment of Wnt11 function leads to kidney tubular abnormalities and secondary glomerular cystogenesis. BMC Dev Biol. 2016 Aug 31;16(1):30. doi: 10.1186/s12861-016-0131-z. PMID: 27582005; PMCID: PMC5007805.
53. Liu, E., Morimoto, M., Kitajima, S., Koike, T., Yu, Y., Shiiki, H., ... & Fan, J. (2007). Increased expression of vascular endothelial growth factor in kidney leads to progressive impairment of glomerular functions. *Journal of the American Society of Nephrology*, *18*(7), 2094-2104.
54. Oliver 3rd, J. D., Simons, J. L., Troy, J. L., Provoost, A. P., Brenner, B. M., & Deen, W. M. (1994). Proteinuria and impaired glomerular permselectivity in uninephrectomized fawn-hooded rats. *American Journal of Physiology-Renal Physiology*, *267*(6), F917-F925.
55. Gupta N, Buffa JA, Roberts AB, Sangwan N, Skye SM, Li L, Ho KJ, Varga J, DiDonato JA, Tang WHW, Hazen SL. Targeted Inhibition of Gut Microbial Trimethylamine N-Oxide Production Reduces Renal Tubulointerstitial Fibrosis and Functional Impairment in a Murine Model of Chronic Kidney Disease. Arterioscler Thromb Vasc Biol. 2020 May;40(5):1239-1255. doi: 10.1161/ATVBAHA.120.314139. Epub 2020 Mar 26. PMID: 32212854; PMCID: PMC7203662.
56. Rodríguez-Iturbe, B., Johnson, R. R., & Herrera-Acosta, J. (2005). Tubulointerstitial damage and progression of renal failure. Kidney international, 68, S82-S86.
57. Yu, L., Border, W. A., Huang, Y., & Noble, N. A. (2003). TGF-β isoforms in renal fibrogenesis. *Kidney international*, *64*(3), 844-856.
58. Humphreys, B. D. (2018). Mechanisms of renal fibrosis. *Annual review of physiology*, *80*, 309-326.
59. Adams, D. (1976). The granulomatous inflammatory response. A review. *The American journal of pathology*, *84*(1), 164.
60. Cardoso, C. R., Garlet, G. P., Moreira, A. P., Junior, W. M., Rossi, M. A., & Silva, J. S. (2008). Characterization of CD4+ CD25+ natural regulatory T cells in the

©Daffodil International University

inflammatory infiltrate of human chronic periodontitis. *Journal of leukocyte biology*, *84*(1), 311-318.

61. Sont, J. K., Han, J., Van Krieken, J. M., Evertse, C. E., Hooijer, R., Willems, L. N., & Sterk, P. J. (1996). Relationship between the inflammatory infiltrate in bronchial biopsy specimens and clinical severity of asthma in patients treated with inhaled steroids. *Thorax*, *51*(5), 496-502.
62. Matovinović, M.S. (2009). 1. Pathophysiology and Classification of Kidney Diseases. *EJIFCC, 20*, 2 - 11.
63. Cavanaugh, C., & Perazella, M. A. (2019). Urine sediment examination in the diagnosis and management of kidney disease: core curriculum 2019. *American Journal of Kidney Diseases*, *73*(2), 258-272.
64. Chen, T. K., Knicely, D. H., & Grams, M. E. (2019). Chronic kidney disease diagnosis and management: a review. *Jama*, *322*(13), 1294-1304.
65. Botdorf, J., Chaudhary, K., & Whaley-Connell, A. (2011). Hypertension in cardiovascular and kidney disease. *Cardiorenal medicine*, *1*(3), 183-192.
66. Rahbari-Oskoui, F., Williams, O., & Chapman, A. (2014). Mechanisms and management of hypertension in autosomal dominant polycystic kidney disease. *Nephrology Dialysis Transplantation*, *29*(12), 2194-2201.
67. Lin, Y. C., Chang, Y. H., Yang, S. Y., Wu, K. D., & Chu, T. S. (2018). Update of pathophysiology and management of diabetic kidney disease. *Journal of the formosan Medical Association*, *117*(8), 662-675.
68. Attman, P. O., & Samuelsson, O. (2009). Dyslipidemia of kidney disease. *Current opinion in lipidology*, *20*(4), 293-299.
69. Nitta, K. (2012). Clinical assessment and management of dyslipidemia in patients with chronic kidney disease. *Clinical and experimental nephrology*, *16*, 522-529.
70. Chan, M., & Johnson, D. (2012). Modification of lifestyle and nutrition interventions for management of early chronic kidney disease. *Westmead, Australia: Kidney Health Australia–Caring for Australasians with Renal Impairment (KHA-CARI)*.
71. Peng, S., Shen, F., Wen, A., Wang, L., Fan, Y., Liu, X., & Liu, H. (2019). Detecting lifestyle risk factors for chronic kidney disease with comorbidities: association rule mining analysis of web-based survey data. *Journal of medical Internet research*, *21*(12), e14204.

©Daffodil International University

72. Dubin, R. F., & Rhee, E. P. (2020). Proteomics and metabolomics in kidney disease, including insights into etiology, treatment, and prevention. *Clinical Journal of the American Society of Nephrology*, *15*(3), 404-411.
73. Levey AS, Coresh J, Balk E, Kausz AT, Levin A, Steffes MW, Hogg RJ, Perrone RD, Lau J, Eknoyan G; National Kidney Foundation. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Ann Intern Med. 2003 Jul 15;139(2):137-47. doi: 10.7326/0003-4819-139-2-200307150-00013. Erratum in: Ann Intern Med. 2003 Oct 7;139(7):605. PMID: 12859163.
74. Morton, R. L., Tong, A., Howard, K., Snelling, P., & Webster, A. C. (2010). The views of patients and carers in treatment decision making for chronic kidney disease: systematic review and thematic synthesis of qualitative studies. *BmJ*, *340*.
75. https://www.theisn.org/blog/2020/11/27/more-than-850-million-worldwide-have-some-form-of-kidney-disease-help-raise-awareness/
76. Kovesdy CP. Epidemiology of chronic kidney disease: an update 2022. Kidney Int Suppl (2011). 2022 Apr;12(1):7-11. doi: 10.1016/j.kisu.2021.11.003. Epub 2022 Mar 18. PMID: 35529086; PMCID: PMC9073222.

©Daffodil International University