MICROALBUMINURIA IN DIABETES MELLITUS: ASSOCIATION WITH AGE, SEX, WEIGHT AND CREATININE CLEARANCE

Project Work By
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ID: 191-34-168

Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

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APPROVAL

This Project titled "**Microalbuminuria In Diabetes Mellitus: Association With Age, Sex, Weight And Creatinine Clearance**", submitted by **Lima Sikder** with bearing **ID: 191-34-168** to the Department of Nutrition and Food Engineering, The partial fulfilment of the criteria for the B.Sc. in Nutrition and Food Engineering degree at Daffodil International University has been acknowledged, and the style and substance of the degree have been authorised.

EXAMINING COMMITTEE

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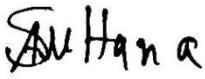
DECLARATION

We therefore declare that we completed this research under the guidance of **MS. Arifa Sultana, Lecturer**, **Department of NFE**, Daffodil International University. Additionally, we affirm that neither this project nor any portion of it has been submitted for consideration for a degree or certificate elsewhere.

Supervised by:



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Last but not least, we must respectfully appreciate our parents' unwavering help and endurance.

ABSTRACT

Microalbuminuria, which is characterised by slightly raised albumin levels in the urine, is an important indicator of early kidney failure and cardiovascular risk in a number of clinical contexts, with a particular emphasis on its function in diabetes mellitus. The first sign of diabetic nephropathy is microalbuminuria, which also serves as a predictor for higher cardiovascular morbidity and death. Because it can be detected early, intensive intervention strategies that target individual risk factors may be put in place. The frequency of microalbuminuria in hypertensive type 2 diabetes individuals is not well understood. T2DM, often known is indicated by a diagnosis of microalbuminuria, is predisposed to by impaired glucose management. In addition to hypertension, smoking, dyslipidemia, and obesity, there are a number of other risk factors that might lead to microalbuminuria. As type 2 diabetes mellitus, is a common condition all over the world. We are going to BIRDEM General Hospital with a questionnaire and collect their demographic information and the length of time they had diabetes. A Total patient 50. There are 40% were male and 60% were female. Their mean age $\pm$52.3 years. Most of the patient are female. Majority patients 41 to 50 in this age group. But in this age group, the majority were between 31 and 40. They had a high level of albumin. In addition, a large number of people have low creatinine but high albumin. A lot of people have low albumin yet excessive creatine. Additionally, it has been noted that rural residents had higher albumin levels than urban residents. Those with elevated albumin levels should limit their intake of protein and salt.

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CHAPTER 1

Introduction

The prevalence of microalbuminuria in people with Type 2 Diabetes Mellitus (T2DM) can vary based on a number of variables, including the population investigated, the length of diabetes, and the criteria used to identify microalbuminuria. Microalbuminuria is characterised by the presence of a slightly elevated quantity of albumin in the urine and is regarded as an early indicator of diabetic nephropathy (diabetic kidney disease).

In general, people with Type 2 Diabetes Mellitus tend to have more microalbuminuria than people without the condition. Nevertheless, the precise prevalence rates may vary between research and geographical areas. Here are some general trends and figures:

Varied Estimates: Studies might show a considerable range in the prevalence of microalbuminuria. According to some research, 20 to 30 percent of those with type 2 diabetes also have microalbuminuria.

Duration of Diabetes: With ongoing diabetes, the chance of developing microalbuminuria tends to rise. Microalbuminuria is more likely to occur in those with diabetes who have had the condition for a longer time.

Age: Microalbuminuria is more likely to occur in older people with Type 2 Diabetes than in younger people.

Control of Blood Glucose: Microalbuminuria and its progression to more serious renal problems are both prevented by maintaining stable blood glucose levels. People who have their blood sugar levels improperly managed are more vulnerable.

Blood Pressure Control: One of the most frequent co-morbidities among Type 2 diabetics is hypertension (high blood pressure), which can worsen kidney injury. The risk of microalbuminuria can be significantly decreased by properly managing blood pressure.

Other Risk Factors: The occurrence of microalbuminuria can also be influenced by other elements such as genetics, smoking, obesity, and a family history of kidney disease.

The most recent epidemiological research or statistics relevant to a given location or population would need to be cited in order to offer a specific prevalence rate. It's crucial to remember that treating your diabetes can help lower your risk of developing microalbuminuria and slow the development of more serious kidney damage. This includes maintaining appropriate blood pressure and glycemic control.

Cardiovascular risk factors with diabetic mellitus in type 2

A chronic metabolic condition called type 2 diabetes mellitus is characterised by insulin resistance and decreased insulin production. Numerous cardiovascular risk factors are linked to it, raising the risk of heart disease and stroke in those with diabetes. It's crucial to control these risk factors if you want to lower your chance of cardiovascular problems. Some of the main cardiovascular risk factors for type 2 diabetes include the following:

High Blood Sugar (Hyperglycemia): Blood vessels can be harmed by high blood sugar levels, which can raise the risk of atherosclerosis (arterial hardening and constriction), which can cause heart attacks and strokes.

High Blood Pressure (Hypertension): High blood pressure is common among those who have type 2 diabetes. Heart strain and the risk of cardiovascular events can both be caused by hypertension.

Dyslipidemia: This comprises abnormally high amounts of LDL cholesterol, also known as "bad" cholesterol, and triglycerides, as well as low levels of HDL cholesterol, sometimes known as "good" cholesterol, in the blood. Atherosclerosis and the risk of heart disease are both exacerbated by dyslipidemia.

Obesity: Obesity is a common risk factor for type 2 diabetes and cardiovascular disease. Abdominal obesity is especially dangerous. Hypertension, dyslipidemia, and insulin resistance are all complications of obesity.

Physical Inactivity: Sedentary behavior increases the risk of diabetes and heart disease. Regular exercise can lower blood pressure, enhance cardiovascular health generally, and assist control blood sugar.

Unhealthy Diet: Increased blood lipid levels, worsened insulin resistance, and obesity can all be results of a diet high in saturated fats, trans fats, cholesterol, and refined sweets. For treating diabetes and lowering cardiovascular risk, a balanced, heart-healthy diet is essential.

Smoking: Smoking is a significant risk factor for cardiovascular disease, and those with diabetes are even more at risk because of it. Smoking weakens already present cardiovascular risk factors and harms blood arteries.

Family History: An individual's risk can be raised by a family history of cardiovascular disease. Both diabetes and heart disease may be influenced by genetic factors.

Stress: Chronic stress may have a negative effect on cardiovascular health by raising blood pressure and causing more inflammation, as well as contributing to unhealthy behaviours (such as overeating and lack of exercise).

Sleep Apnea: Sleep apnea is more prevalent in those with type 2 diabetes and raises the risk of heart disease because it causes breathing interruptions while you sleep, which can deprive your body of oxygen and put stress on your heart.

For people with type 2 diabetes, managing these risk factors through lifestyle changes (such as diet, exercise, and quitting smoking), medications (such as insulin, oral glucose-lowering drugs, blood pressure medications, and lipid-lowering drugs), and routine medical checkups is crucial for lowering cardiovascular risk and improving general health. The therapy of diabetes should also include routine blood glucose testing to maintain goal ranges. Although the aforementioned metabolic abnormalities lead to renal impairment, there is limited indication that WHR and microalbuminuria are related in T2DM patients, as was found in one study. The current study's objectives are to determine the prevalence of microalbuminuria and evaluate the associated cardiovascular risk factors in T2DM patients in BIRDEM General Hospital, Shahbag, Dhaka.

CHAPTER 2

OBJECTIVE

Type II diabetes patients who visited the outpatient clinic for the internal medicine division at BIRDEM General Hospital, had their microalbuminuria levels with diabetes mellitus. This goal is to evaluate the prevalence of microalbuminuria in people with diabetes mellitus. The purpose of this goal is to ascertain if the development of diabetic nephropathy, a common consequence of diabetes mellitus, is correlated with the occurrence of microalbuminuria in individuals with the disease. how often and how severe microalbuminuria is in people with diabetes mellitus, taking age, gender, and length of diabetes into account. microalbuminuria and glycemic management in diabetes mellitus patients, as determined by HbA1c levels. Diabetes can eventually cause diabetic nephropathy, or kidney disease. An excessive use of salt might exacerbate renal function and cause more stress on the kidneys. Kidney issues are already more common in those with diabetes, and high salt intake might make the condition worse. Already, a significant risk factor for cardiovascular disease is diabetes. Consuming excessive amounts of salt can exacerbate this risk by raising blood pressure and accelerating the onset of atherosclerosis, or the hardening and narrowing of the arteries.

CHAPTER 3

LITARATURE REVIEW

The prevalence of microalbuminuria did not differ significantly by gender in the current investigation. Microalbuminuria is more common in males than in women, according to earlier research. However, utilising the albumin creatinine ratio to compare prevalence between genders is problematic since women excrete less creatinine than males do. Because of this, some writers set a lower bar for males than for women. Raised blood pressure and poor glycemic management are the primary risk factors for microalbuminuria. According to several research, long-term diabetes, male sex, and pre-existing retinopathy are the three main risk factors for microalbuminuria. Age, the duration of diabetes, diastolic blood pressure, and HbA1c were identified in this study as the risk variables for microalbuminuria by multiple logistic regression analysis. The prevalence of microalbuminuria varies depending on a number of variables, including demographic differences, how the condition is defined, how it is measured, how much urine is collected, etc.

Inadequate glycemic management and elevated blood pressure are the primary risk factors for microalbuminuria. According to several research, long-term diabetes, being a man, and

having retinopathy at the start of treatment are the main risk factors for microalbuminuria. A Chennai research and Iranian investigation both found lower prevalence of 20% and 18.6% respectively. In contrast to the current study held in Saudi Arabia in 2014 indicated that the prevalence of microalbuminuria was 1.2%. The prevalence of microalbuminuria in the current study was found to be 41% which can be linked to the study's setting since several other studies found a comparable frequency among the south Asian people. The results of the current study are in agreement with those of a 2007 Hong Kong study. Being male or female has no bearing on acquiring microalbuminuria, according to studies by Rani et al. in 2011 and Zakkerkrish et al. in 2013, as well as Chowta NK, Pant P, and Chowta MN in 2009. Tam TKW et al. found the exact opposite correlation, reporting that females had a twofold increased chance of developing microalbuminuria compared to males.

In the Wisconsin research, a Danish population study, and among the Pima Indians, age was included as one of the risk variables. Numerous investigations have conclusively shown that glycaemic control and microalbuminuria are related. Alcohol use, foot ulcers, and smoking have all been linked to microalbuminuria, according to reports. Additionally, generalised vascular disease has been linked to microalbuminuria. Both the Danish population and the UK population have reported corresponding relationships. This study's clinic-based design is one of its drawbacks. This could have resulted in some referral bias. The frequency of microalbuminuria is comparable to that of other research' reports, though. In both type I and type II Diabetes mellitus, the total prevalence of microalbuminuria was found to be 49.3% in research done in Saudi Arabia. The prevalence of microalbuminuria was determined to be 52.04% in all diabetes individuals, it was also noted. According to a study, individuals with known diabetes durations of 10 to 14 years had a 4.11 times greater chance of developing microalbuminuria than those with known diabetes durations of 0 to 4 years. Poor glycemic management is linked to the mean blood glucose level, treatment efficacy, and risk of potential long-term chronic problems. It was shown that diabetic subjects had considerably increased urine microalbumin and HbA1c values.

For those with diabetes mellitus, cardiovascular disease continues to be the leading cause of mortality and disability. The causes of heart failure and atherosclerosis are made severe by diabetes mellitus. When compared to people without diabetes but with identical demographic parameters, persons with type 2 diabetes mellitus die from cardiovascular disease (CVD) at rates that are 2-4 times higher. This elevated CVD risk is brought on by a complex confluence of T2DM risk factors, including insulin resistance, hyperglycemia, diabetic dyslipidemia, hypertension, hyperinsulinemia, systemic inflammation, and variables generated from adipose tissue. By simultaneously addressing the main hyperglycemia symptom, this has the potential to address a number of cardiovascular risk factors. High-throughput, unbiased screening should be the main emphasis of future research in the field of diabetes in order to elucidate the disease's biology and innovative processes. The search for CVD risk factors that may be more unique to diabetes, such as hypoglycemia or comorbidities connected to medication, should also be the main focus of study. It's possible that fulfilling these objectives will be difficult. These actions will undoubtedly lower the incidence of cardiovascular morbidity and death in a particularly high-risk population. Patients who have even minor abnormalities in any 3 of the 5 risk factors for the metabolic syndrome are more likely to develop diabetes or cardiovascular disease.

CHAPTER 4

METHODOLOGY

After receiving approval from the hospital's ethical review board, this study was carried out at BIRDEM General hospital from 3 October to 3 November 2022.This is the largest diabetes hospital in Dhaka City. All patients who satisfied the eligibility requirements and were subsequently enrolled had to give their informed consent. For all patients, we filled out a questionnaire requesting demographic information and the length of time they had diabetes. We also assessed each patient's height and weight to determine their body mass indices. Also, we are collecting their clinical Biochemistry report from hospital. In this cross-sectional study, 50 participants—20 men and 30 women, ages 20 to 80—were selected from the outpatient departments of medicine and endocrinology of a medical facility in Dhaka, Bangladesh. Serum was tested for lipid profile and fasting blood glucose (FBC), and urine was tested for albumin and creatinine. ACRs (albumin to creatinine ratio) in the urine between 30 and 300 mg/g were considered microalbuminuria. The National Education program's definition of microalbuminuria was followed. Multivariate logistic regression analysis was used to assess the relationship between microalbuminuria and MetS and its constituent parts. Here is the questionnaire sheet given below:

Daffodil International University

Daffodil Smart City (DSC), Ashulia, Dhaka

Department of Food and Nutrition Engineering

Session: ..... **Year:.....**

Case Study No. ..... **Dated: .....**

1. Information about Patient:

a) Name :

b) Address :

c) Name of the Hospital :

d) Admission date :

e) Reason of admission :

f) Word No. :

g) Bed No. :

2. Anthropometric parameters:

Age: ..... years **Sex: M/F** **Weight: ..... Kg** **Height: ..... Cm**

b / Biochemical Test (Blood) **Results**

Condition that currently exist :	Swallowing difficulties
Nausea	Constipation
Vomiting	Diet restriction
Diarrhea	Gas formation
Chewing difficulties	Test & smell perception (any change?) Y/N

	Lab / Biochemical Test (Blood) **Results**
Blood Glucose (F) ..... mmol/dl	Magnesium..... mmol/l
Blood Glucose (ABF) ..... mmol/di	Phosphate..... mmol/1
HbAlc..... %	Calcium..... mmol/l
Albumin..... mg/dl	Potassium..... mmol/1
Total protein ..... g/dl	Sodium..... mmol/l
TG..... mg/dl	Serum Chloride..... mmol/l
HDL..... mg/dl	Hb..... g/dl
LDL..... mg/dl	Hematocrit ..... %
Cholesterol, total ..... mg/dl	ESR.. ..... mml
BUN..... mg/dl	SGOT ..... IU/
Creatinine ..... mg/dl	SGPT..... U/l
Urea..... mg/dl	Alk. Phos. ..... SomU/L
Bilirubin..... mmol/dl	Amylase ..... IU/l
STCO2.....	Uric Acid ..... mg/dl
	Bicarbonate ..... mmol/l

Supplements:	Yes No			
If yes, type,	Vitamin and minerals			
	Vitamins			
	Minerals			
Appetite:	Excellent	Good	Fair	Poor

3. Socioeconomic & Culture factor:

Monthly family income:

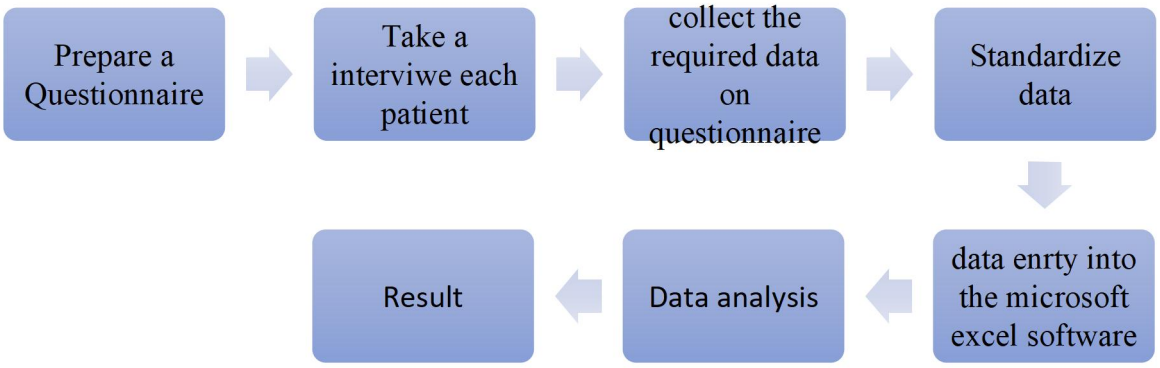
Religion :

Education :

Occupation :

Living status :

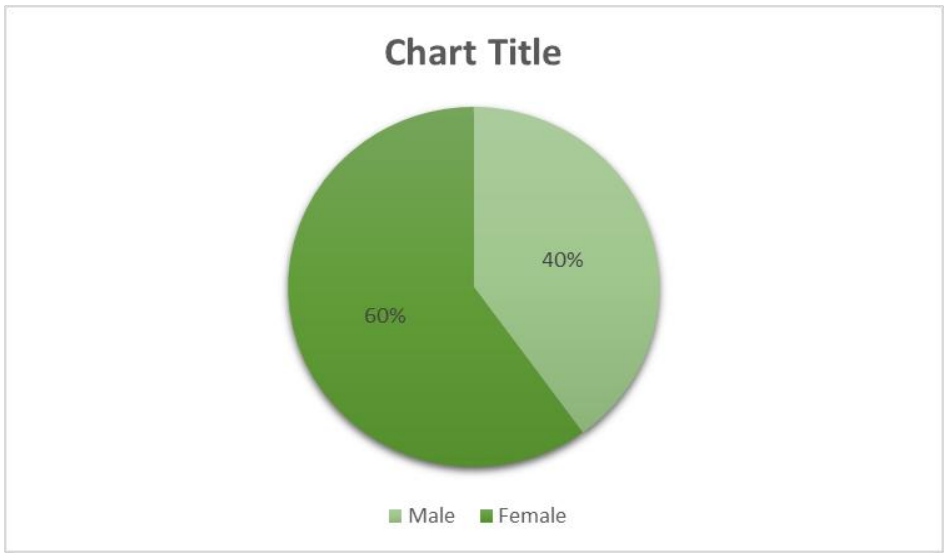
Rural/ Urban :



CHAPTER 5

DATA ANALYSIS AND RESULT

Out of total 50 patient 40% (n=20) were male and 60% (n=30) were female. Mean age was ±52.36 years. This suggests that the majority of the patients in this category are female. Male patients nevertheless account for a sizeable share of the group despite being less numerous than female patients. Most of the patient had diabetes mellitus type 2.



Age group of 21 to 30 This age group comprises 3 individuals, or 6% of the entire patient population. Age 31 to 40 12% of all patients are in this age range, which consists of 6 people. Age range from 41 to 50 16 individuals, or 32% of all patients, are in the oldest age range, making up the biggest subgroup. 61 to 80 Years of Age A total of 12 individuals, or 24% of all patients, fall into this age category. 61-70 Years of Age There are 10 patients in this age range, or 20% of all the patients. Aged between 71 and 80 Three individuals, or 6% of the overall patient population. Although there is a wide variety of ages among the patients, the majority (56% of the total) are in the 41-60 years of ages.

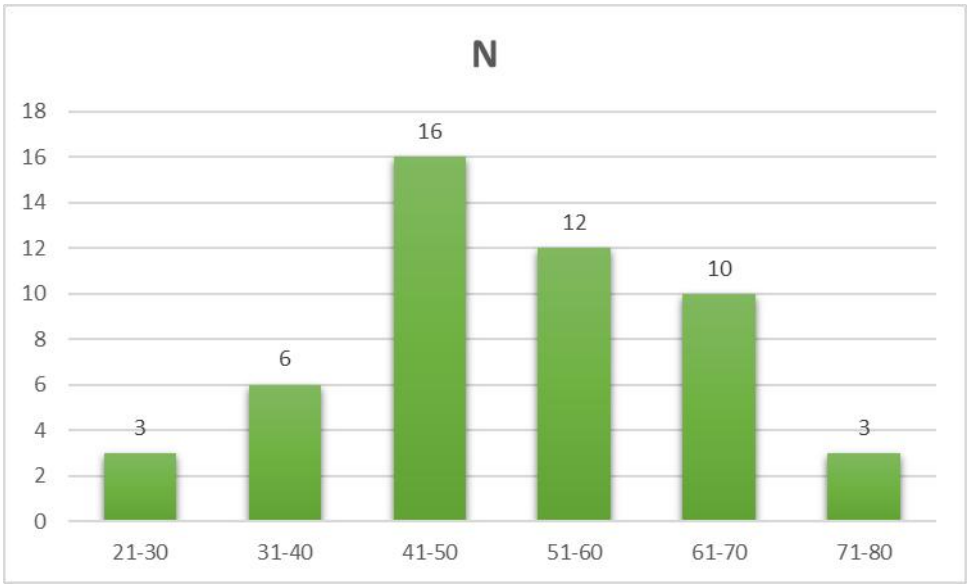


Table 1
The distribution of occupations within this patient

Occupation	N	%
Student	2	4%
Retired	3	6%
Farmer	6	12%
Housewifie	26	52%
Job Holder	7	14%
unemploy	6	12%
Total	50	100%

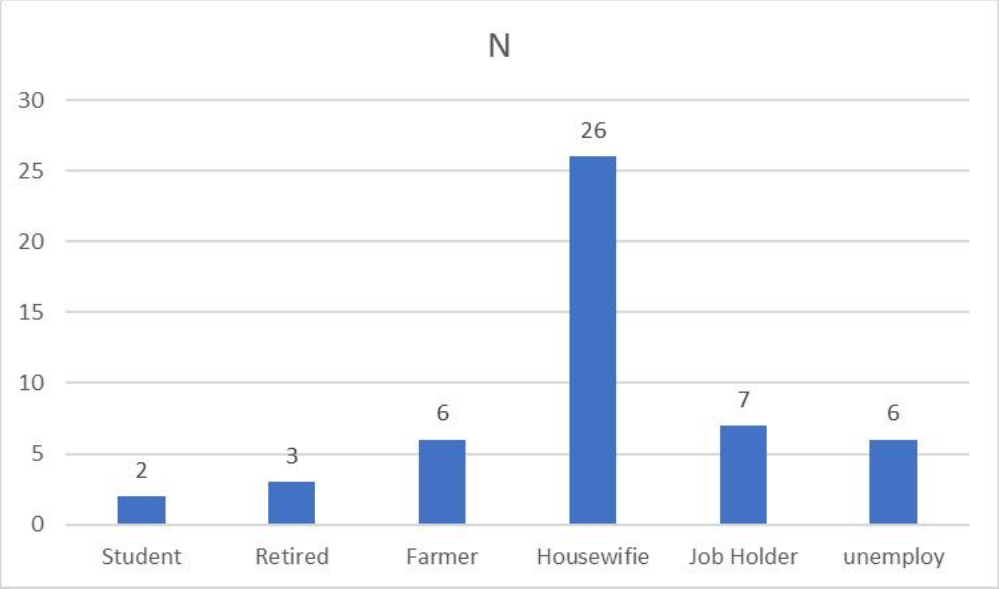


Figure 1: Number of patients on their occupation

There are 50 patients overall. The patients in this category include 2 students or 4% of the entire patient population. 3 of the patients in this category are retired, or 6% of the overall patient population. A total of 6 farmers make up the patient population, or 12% of all patients. 26 housewives, or 52% of the overall patient population, make up the largest occupational category. It makes approximately 14% of all patients that there are 7 patients that have jobs. In addition to accounting for 12% of all patients, the remaining 6 are unemployed. Most of the patient population (52%) are housewives, while there are people in a wide variety of jobs or statuses. In addition to these people, the group also consists of students, retirees, farmers, employed people, and job seekers.

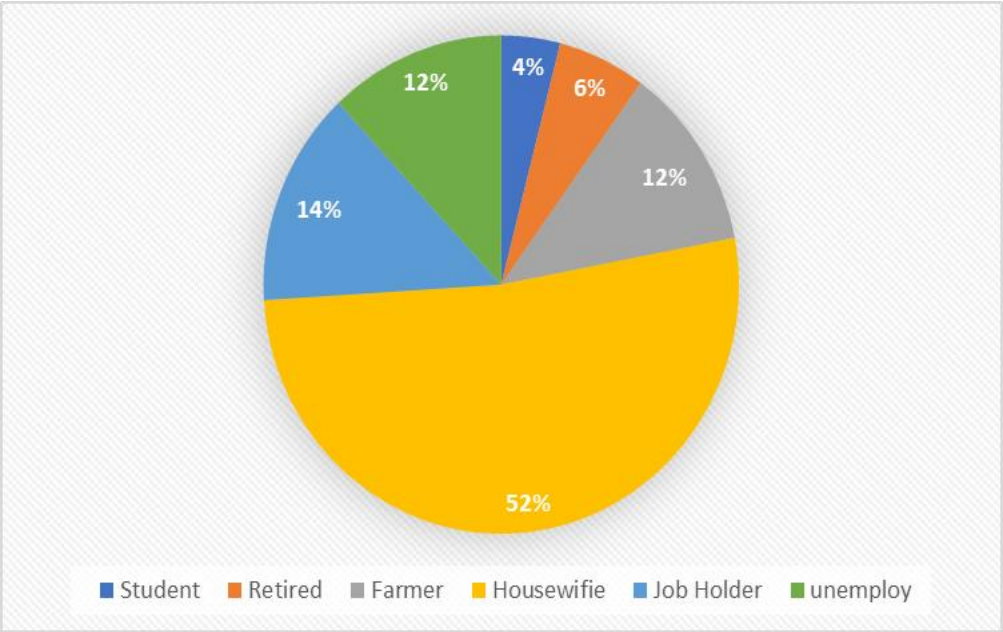


Figure 2: Percentage of the occupation

Table 2
Demographic of patient dependent on their biochemical report:

Age	HbA1c	Albumin	Sodium	Potassium	Creatinine	Serum Chloride
21-30	1	2	3	3	3	2
31-40	2	1	6	6	5	5
41-50	1	10	16	16	13	11
51-60	3	8	12	12	12	10
61-70	2	8	10	10	9	7
71-80	0	1	3	3	2	3

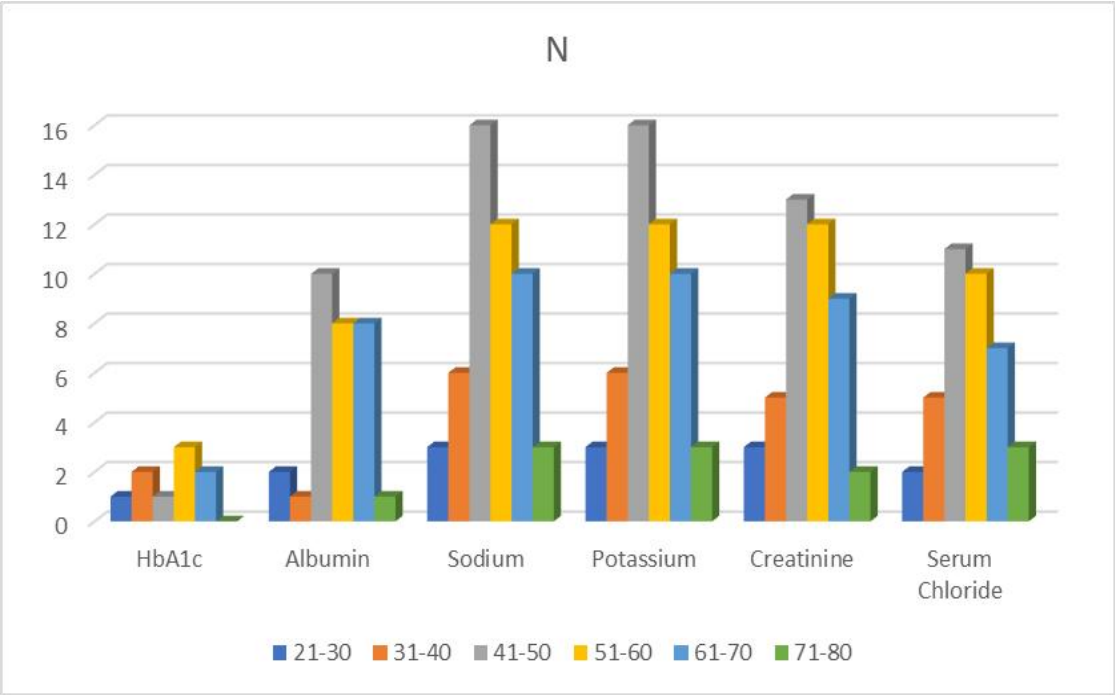


Table 3

Age	HbA1c %	Albumin
21-30	≥ 9.6 - ≤ 10.0 %	≥ 28.1 - ≤ 40.3 mg/dl
31-40	≥ 7.5 - ≤ 10.1 %	≥ 39.6 - ≤ 40.5 mg/dl
41-50	≥8.9 - ≤ 9.6 %	≥ 22.6 - ≤ 40 mg/dl
51-60	≥ 9.7 - ≤ 12.0 %	≥ 24.5 - ≤ 41.3 mg/dl
61-70	≥10.6-≤10.8%	≥24.9 -≤33.5 mg/dl
71-80	0	≥ 33.9 - ≤ 35.5 mg/dl

Table 3 displays the demographic information and related variable parameters for each of the 50 patients that were included. Total patients mean HbA1c is ±10.06% and normal range of HbA1c is 4% to 5.6% for without diabetes, 5.7% to 6.4% for pre diabetes they have higher chance of getting diabetes and 6.5% or higher that's means you have diabetes.

21 to 30 in this age group HbA1c level have ≥ 9.6 to ≤ 10.0%. Within this age group, these individuals' blood glucose management is comparatively poor. Patients in these 31 to 40 age groups had HbA1c readings between ≥7.5% and ≤10.1%. HbA1c values in these 41 to 50 age groups range from ≥8.9% to≤ 9.6%. 51 to 60 in these age group HbA1c readings vary from ≥9.7% to ≤12.0%. HbA1c readings in patients of these 61to 70 age range from ≥10.6% to ≤10.8%. There don't seem to be any patients in these 71 to 80 age ranges with HbA1c values. certain individuals' blood glucose levels are more under control, while others have less control. The risk of dementia and Alzheimer's disease in older people has been linked to higher levels of HbA1c. HbA1c levels below 6.5% were linked to a 2.8-fold greater incidence of Alzheimer's and all-cause dementia in a study of over 1.3k older people.

Normal rage of Albumin 3.5 to 5.4 mg/dl. Total patients mean albumin ±32.17 mg/dl. For people 21 to 30 in this age group, the albumin values vary from ≥28.1 to ≤40.3mg/dl. Albumin levels in these 31 to 40 age groups of patients range from≥ 39.6 to ≤40.5mg/dl. In these 41 to 50 age groups, albumin values vary from ≥22.6 to ≤40.0mg/dl. The albumin levels of patients in these 51 to 60 age groups range from ≥24.4 to ≤41.3mg/dl. Patients in these 61 to 70 age groups had albumin values between ≥24.9 and ≤33.5mg/dl. Albumin levels range from ≥ 33.9 to ≤ 35.5mg/dl in patients of these 71 to 80 age groups. Malnutrition may exist if your albumin level is low. Additionally, it might indicate that you suffer from an inflammatory illness, liver disease, or renal disease. Acute infections, burns, stress after surgery or a heart attack, and elevated albumin levels are possible causes.

Table 4

Age	Sodium	Potassium	Creatinine
21-30	≥ 132 - ≤ 138 mmol/l	≥ 2.7 -≤ 4.3 mmol/l	≥ 1.8 - ≤ 6.8 mg/dl
31-40	≥ 130 - ≤ 137 mmol/l	≥ 2.8 - ≤ 4.8 mmol/l	≥ 0.6 - ≤ 6.7 mg/dl
41-50	≥ 110 - ≤ 141 mmol/l	≥ 2.2 - ≤ 5.3 mmol/l	≥ 0.7 - ≤ 6.5 mg/dl
51-60	≥ 124 - ≤ 139 mmol/l	≥ 2.6 - ≤ 5.4 mmol/l	≥ 0.8 - ≤ 9.2 mg/dl
61-70	≥ 126 -≤ 140 mmol/l	≥ 3.1 - ≤ 6.2 mmol/l	≥ 0.7 - ≤ 8.8 mg/dl
71-80	≥ 130 - ≤ 136 mmol/l	≥ 3.4 - ≤ 5.0 mmol/l	≥ 0.7 - ≤ 1.4 mg/dl

Table 4 represent the all ages sodium, potassium and creatinine level. Total patients mean sodium level ±132.54 mmol/l, mean potassium level ±4.02 mmol/l and lastly mean creatinine level ±2.57mg/dl. Normal range of sodium 136 to 145 mmol/l, Potassium 3.6 to 5.2 mmol/l and Creatinine 0.7 to 1.3mg/dl for men and 0.6 to 1.1mg/dl for women. Previous studies have found that those with type 2 diabetes who ingested the most sodium had a more than 200 percent higher risk of developing cardiovascular illness compared to individuals who consumed the least. Compared to individuals with normal potassium levels, studies demonstrate that those with low potassium levels produce less insulin, have higher blood sugar levels, and are more likely to develop type 2 diabetes. High creatinine levels might indicate that the kidneys are not functioning as effectively as they should. Sodium, potassium and creatinine most of the patients 41to 50 in these age group. And the lowest patient 71 to 80 in these age group.

Table 5

Table of Serum Chloride:

Age	Serum Chloride
21-30	≥ 105 - ≤ 111 mmol/l
31-40	≥ 87 - ≤ 105 mmol/l
41-50	≥ 76 - ≤ 106 mmol/l
51-60	≥ 81 - ≤ 104 mmol/l
61-70	≥ 90 - ≤ 108mmol/l
71-80	≥ 97 - ≤108 mmol/l

Table 4 demographic and their Serum chloride level. Total patients meant serum chloride ±96.48 mmol/l. Normal range level of serum chloride 96 to 106 mmol/l. Majority of the patients 41 to 50 in these age group. And the lowest patients 21 to 30 In these age group. Patients with diabetes had significantly aberrant serum chloride levels, with the frequency of abnormality being greatest in older diabetic patients. In diabetic individuals, the strength of the associations between the abnormal blood electrolyte concentration level and the independent factors varied greatly.

CHAPTER 6

Conclusion

Microalbuminuria is the first clinical symptom of vascular damage in the glomerulus in type 2 diabetics, which is indicative of vascular disease throughout the body. The progression of renal impairment and cardiovascular disease are both significantly influenced by microalbuminuria. This is true for the general populace and is especially true for people who have diabetes, which is common and identifies those who are more prone to develop macrovascular disease and progressive renal impairment. The Microalbumin/Creatinine ratio should be interpreted using the following ranges, according to the American Diabetes Association: 30 to 299 mg/gm is considered to be normal, 300 mg/gm is considered to be clinical albuminuria. When the urine albumin to creatinine ratio is between 30 and 300 mg/g in two of three measurements, microalbuminuria is diagnosed, but macroalbuminuria is identified when the same ratio is greater than 300 mg/g. Total patient 50 most of the patient 41 to 50 ages in these group depend on the Biochemistry report.

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