

A Survey Study on Relation of Diabetes with People's Lifestyle in Small Cities of Bangladesh

By

Sabbir Shahabuddin
13346047

A project submitted to the Department of Pharmacy in partial fulfillment of the requirements for the degree of Bachelor of Pharmacy (Hons.)

Department of Pharmacy
BRAC University
January 2020

© 2020. BRAC University
All rights reserved.

Declaration

It is hereby declared that

1. The thesis submitted is my own original work while completing degree at BRAC University.
2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

Student's Full Name & Signature:

Sabbir Shahabuddin

13346047

Approval

The project titled “A Survey Study On Relation of Diabetes with People’s Lifestyle in Small Cities of Bangladesh” submitted by Sabbir Shahabuddin (13346047) of Summer, 2013 has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Pharmacy on 23 January, 2020.

Examining Committee:

Supervisor:

(Member)

Imon Rahman
Senior Lecturer, Department of Pharmacy
BRAC University

Program Coordinator:

(Member)

Dr. Hasina Yasmin
Professor, Department of Pharmacy
BRAC University

Departmental Head:

(Chair)

Professor Dr. Eva Rahman Kabir
Chairperson, Department of Pharmacy
BRAC University

Ethics Statement

The study does not involve any kind of animal trial and human trial. All the data was collected only with the permission of the people surveyed.

Abstract

Diabetes makes a person life miserable if it is not controlled like urban people are most venerable because of their unhealthy lifestyle. Rural people especially people in outside city life are less likely to have high blood glucose because of their continuous physical movement, consumption of organic food and less intake of beverages. But due to the awareness lacking about diabetes and its etiology there is a raise of high blood sugar level even in the small city areas. This study has found 82.2% of the people of three remote areas of Nilfamari, Noakhali and Chandpur about the knowledge gap on the symptoms, complications and side effects of diabetes. 84.8% people are lacking of healthy diet and consumption of carbohydrate intake is higher. Study revealed 83.2% people they have dental disease due to high consumption of betel leaf which makes them more prone to diabetes. This survey is a small footstep to take necessary action from the government and non-government sectors to mitigate the risk of diabetes from this area. Organizations like BIRDEM and BADAS are working hard to make this possible but working station has to be enhanced among all over the country.

Keywords: Type two diabetes, high carbohydrate food, blood glucose level, sugar added food.

Acknowledgement

First of all, my deepest grace is to Almighty Allah for giving me the strength and courage to complete my project successfully. I am truly grateful to the honorable faculties of BRAC University for providing me all the ideas and help I required and help me go through the whole project.

I would like to express my deepest respect to my honorable supervisor “Imon Rahman” for always inspiring words and valuable guidance always helped me to overcome my challenges and problems and providing me guidance and suggestions. The project would not be possible without his support.

Lastly, I would like to thank my family members for always helping and supporting me all the times. Besides, credit is also going to the respondents who gave their valuable time and energy for conducting the survey.

I would like to emphasize at the end that the limitations of this thesis are entirely mine.

Table of Contents

Declaration.....	ii
Approval	iii
Ethics Statement.....	iv
Abstract.....	v
Acknowledgement	vi
Table of Contents	vii
List of Tables	x
List of Figures.....	xi
List of Acronyms	xii
Chapter 1	1
Introduction.....	1
1.1 Background	1
1.2 Types of diabetes	2
1.2.1 Type one diabetes	2
1.2.2 Type two diabetes	2
1.2.3 Gestational diabetes (GDM)	3
1.3 Diabetes relationship with people’s lifestyle	3
1.3.1 Healthy eating	3
1.3.2 Exercise.....	4
1.3.3 Regular checkups	4

1.3.4 Stress management with diabetes	5
1.3.5 Alcohol intake with diabetes.....	5
1.3.6 Smoking with diabetes	6
1.4 Causes of diabetes.....	7
1.4.1 Insulin absence.....	7
1.4.2 Insulin resistance.....	8
1.5 Treatment of diabetes.....	10
1.5.1 Drugs used for the treatment of diabetes	11
1.6 Condition of diabetic patients in Bangladesh	12
1.7 Diabetic concerns worldwide.....	14
1.8 Diseases correlate with diabetes	15
1.8.1 Nerve pain with diabetes (Neuropathy)	15
1.8.2 Eye problems with diabetics	16
1.8.3 Cardiovascular disease and diabetes	17
1.8.4 Kidney Damage (Nephropathy).....	18
1.8.5 Diabetes and foot problem.....	19
1.8.6 Diabetes and skin condition	19
1.8.7 Diabetes with gangrene.....	21
1.8.8 Diabetics with Alzheimer’s disease	21
1.9 Diabetes treatment opportunity in Bangladesh.....	21
1.10 Rationale of the study	23

1.11 Objective of the study	24
Chapter 2	25
Methodology	25
2.1 Research Design.....	25
2.2 Research Questions	25
2.3 Method of Data Analysis	26
Chapter 3	27
Results and Discussion.....	27
3.1 Results and Findings	27
Chapter 4	46
Recommendations.....	46
Chapter 5	48
Future prospects.....	48
Chapter 6	49
Conclusion	49
Reference	50
ANNEX	56
Questionnaire for Survey	56

List of Tables

Table 1: People do exercise regularly	27
Table 2: Type of exercise people do	28
Table 3: People who consume sugar contained food.....	29
Table 4: frequency of having sugar added food weekly	30
Table 5: people’s history of admitted into hospital before	32
Table 6: Number of people considers eating vegetable over other food	34
Table 7: People with diabetic family history	35
Table 8: list of people attended with a dietitian before.....	36
Table 9: Type of diet people usually follows.....	37
Table 10: Peoples knowledge about diabetes	38
Table 11: Amount of smoker among survey people.....	39
Table 12: people with eye problem.....	40
Table 13: People who have done urine test for kidney problem.....	41
Table 14: Peoples Heart condition.....	42
Table 15: List of teeth and gum condition	43
Table 16: Type of medication	44
Table 17: Number of people who takes medication time to time	45

List of Figures

Figure 1: Age-specific and standardized prevalence of diabetes and prediabetes in Bangladesh.....	13
Figure 2: People who exercise regularly.....	27
Figure 3: Type of exercise people do.....	28
Figure 4: People who consume sugar contained food	29
Figure 5: frequency of having sugar added food weekly.....	31
Figure 6: people’s history of admitted into hospital before.....	33
Figure 7: Number of people considers eating vegetable over other food	34
Figure 8: People with diabetic family history	35
Figure 9: list of people attended with a dietitian before	36
Figure 10: Type of diet people usually follows	37
Figure 11: Peoples knowledge about diabetes	38
Figure 12: Amount of smoker among survey people.....	39
Figure 13: People with eye problem	40
Figure 14: People who have done urine test for kidney problem	41
Figure 15: Peoples Heart condition.....	42
Figure 16: List of teeth and gum condition.....	43
Figure 17: Type of medication.....	44
Figure 18: Number of people who takes medication time to time.....	45

List of Acronyms

HbA1c	Glycated hemoglobin
T2D	Type two diabetes
A1c	Form of hemoglobin
OGTT	Oral glucose tolerance test
GDM	Gestational diabetes

Chapter 1

Introduction

1.1 Background

Diabetes represents an autoimmune, metabolic and also genetic disorder which shares a common trait hyperglycemia. It happens when the pancreas is unable to produce insulin or the body cannot make the proper use of the insulin that the pancreas produces (“International Diabetes Federation - What is diabetes,” n.d.).

Insulin is a hormone produced in the pancreas which is responsible for letting glucose generated from carbohydrate through blood to cells so that the body can use it for making energy. All the carbohydrate we consume is broken down into smaller pieces and goes into the blood and insulin lets these glucose molecules get absorbed into cells so that they can be used for generating energy (“International Diabetes Federation - What is diabetes,” n.d.).

If the body has more sugar than it requires, insulin accumulates the sugar in the liver and unfettered it when blood sugar levels fluctuate and become low or the times when more sugar is needed in the body. As a consequence, it balances blood sugar levels and maintains a normal range. The pancreas can generate insulin according to the body's needs; it generates more when it is required. When the body is unable to produce enough insulin or cells become immune to the response to insulin, then the body may establish hyperglycemia, which in the long term causes several complications and also may result in diabetes (“What is Insulin? - Important hormone allows your body to use sugar (glucose),” n.d.).

A person is considered diabetic when he or she has over the limit of blood sugar. It is normal to read less than 100 mg / dL (5.6 mmol / L). Prediabetes is considered to be a level of 100 to 125 mg / dL (5.6 to 6.9 mmol / L). If a person's blood sugar in two separate tests in fasting

mode is 126 mg / dL (7 mmol / L) or higher, he or she have diabetes (“Type 2 diabetes - Diagnosis and treatment - Mayo Clinic,” n.d.)

This survey has shown the correlation between lifestyle and diabetes in the people of two remote areas of Bangladesh.

1.2 Types of diabetes

There are mainly three types of diabetes

1.2.1 Type one diabetes

Type one diabetes occurs by an autoimmune reaction which is responsible for attacking body's cells which produces insulin (“INTERNATIONAL DIABETES FEDERATION,” 1955). This results in low or no insulin production. Type 1 diabetes is generally precipitated by an immune-associated disorder it is not directly related to immune-mediated destruction of insulin-producing pancreatic β cells. Also, a characteristic of type One diabetes is an imminent need for exogenous insulin replacement, which needs lifetime care. Type one diabetes has been widely regarded as a disease in children and young adults, but this view is no longer the same. So symptomatic age is not a limiting variable anymore. Although type one diabetes can be detected at any stage of life, it is one of childhoods most prominent chronic condition (Knip, 2011).

1.2.2 Type two diabetes

Type Two diabetes is indeed a permanent disease that prevents insulin from being used as it should. Type Two diabetes mellitus refers to the process by which the body's response is reduced despite insulin production and sufficient blood sugar control is not achieved (David, Rubio, Luces, Zabala, & Roberto, 2010). Middle-aged or older people are most likely to get

diabetes of this type, and it used to be labeled adult-onset diabetes. Yet type two diabetes also occurs to children and adolescents, mostly due to obesity in children (Kayyali et al., 2019).

1.2.3 Gestational diabetes (GDM)

Gestational diabetes is a temporary high blood sugar level condition that occurs during pregnancy and disappears after birth. It may occur at any time in pregnancy but in the second or third trimester it is more common. It happens when mothers body is unable to produce sufficient insulin to fulfill extra needs during pregnancy (“Gestational diabetes - NHS,” n.d.).

1.3 Diabetes relationship with people’s lifestyle

1.3.1 Healthy eating

This is crucial because what you eat has an effect on blood sugar. Every food is strictly off-limited. People should Concentrate on eating just as much as body needs. Getting plenty of whole grains, fruits and vegetables. Using milk and lean meats that are not fat. Fat rich foods and carbohydrates should be in limit. Carbohydrates turns into sugar and sugar is the main catalyst for raising diabetes. Smaller and high frequent meal intake will help maintain blood sugar level in a safe parameter. This is a must if the patient is having insulin treatment or other forms of medication related to controlling blood sugar (“6 Lifestyle Changes to Help Control Your Diabetes,” n.d.). the people living in rural area intakes al lot of vegetable-based diet and they consume lest amount of trans fat containing food so they have more controlled blood sugar level comparing with the urban people who consumes a lot of sugar-based food, trans fat containing foods and also a lot of sugary drinks. Furthermore, most of the people in urban areas consumes comparatively less vegetables so they are more susceptible to uncontrolled blood sugar. Thus, controlling the food people ingest they can easily control their blood sugar level.

1.3.2 Exercise

If a person is not active enough, it is high time to start. It is not necessary that one should join a gym and do heavy weight lifting, cross fit or do calisthenics; just simple walk in the morning or evening, riding bike to playing active games should do the magic. The goal is just to stay active for thirty minutes which is enough to make one breath harder and loose some sweat. Through bringing down blood sugar, an active lifestyle helps you regulate diabetes. It also reduces the chances of contracting heart disease. Meanwhile it helps loose extra weight and reduce stress as well (“6 Lifestyle Changes to Help Control Your Diabetes,” n.d.). people in urban areas does fewer physical activities compared with the people of rural areas so they are more at risk of diabetes.

1.3.3 Regular checkups

People with diabetes should always be under regular checkups. Perhaps at least twice a year. Diabetes raises the chances of heart diseases. People should have knowledge about their diagnostic test reports and the numbers so they can easily understand about their body condition. There are a lot of diseases which can occur in body if a person suffers from diabetes like Cardiovascular disease, Nerve damage (neuropathy), Kidney damage (nephropathy), Eye damage (retinopathy), Foot damage, Skin conditions, Hearing impairment, Alzheimer's disease, Depression, heart disease and kidney problem as well (“Diabetes - Symptoms and causes - Mayo Clinic,” n.d.). So people should always be under checkup so if there is chance of starting any new problem it will be find out and be treated at the very fast stage so little or no damage will be done.(“Diabetes - Symptoms and causes - Mayo Clinic,” n.d.)

1.3.4 Stress management with diabetes

The stress people face every day, both major and minor, will take a toll on people's health. Together with your blood sugar, stress levels can rise ("8 Tips to Ease the Stress of Diabetes Management | Everyday Health," n.d.). According to American Diabetes Association(ADA) stress does not directly plays roll over diabetes but it puts a person's mind in such a position that it thinks that it is in danger so body undergoes a lot of effort to rush blood into the brain so it takes a toll on the arteries and as diabetic patients have those complications as co-related with their disease so stress plays an important role in the elevation or fluctuation of diabetes. Though it seems like a minor problem but it is one of the main causes of diabetic complications because a sound Mind helps keep a sound body. People can easily manage stress by setting some goals like meditation & breathing practice, prescribed medication, being busy with hobbies like cooking or reading positive novels and most importantly find ways to let the worry roll off the back ("8 Tips to Ease the Stress of Diabetes Management | Everyday Health," n.d.).

1.3.5 Alcohol intake with diabetes

Some research show that ingesting average in amount of alcohol may elevate blood sugar level ("Diabetes: Does alcohol and tobacco use increase my risk? - Mayo Clinic," n.d.).excess amount of alcohol can actually lessen blood sugar levels, in some case it fluctuates into a dangerous level specially for type one diabetic people ("Diabetes and Alcohol | Effects of Alcohol on Diabetes," n.d.).Beers, mead, sweet wine contains sugar and so these alcohol increases blood glucose level. Huge amount of alcohol intake has a tendency to cause chronic inflammation in pancreas which is also known as pancreatitis resulting to secrete insulin and so it may cause diabetes ("Diabetes: Does alcohol and tobacco use increase my risk? - Mayo Clinic," n.d.) Alcohol creates a stimulation in the nervous system which increases appetite resulting people to over eat so it is one of the main factors to gain

weight and results in increased blood sugar. Alcoholic beverages have a lot of calories so it makes it very difficult to lose excess weight. Alcohol also effects the judgement of people so they make poor decision while judging food quality so end up consuming the prohibited foods their doctor suggest. Alcohol can also interfere with the medications for diabetes.

1.3.6 Smoking with diabetes

Smoking is bad for everybody. It does not have to be a diabetic patient to be affected by it. Although smoking is bad in all case it is worse if the person is diabetic. it is already in our concern that smoking is one of the criteria for type two diabetes. certainly, smokers are 30–40% more likely than non-smokers to develop type 2 diabetes. And people with diabetes who smoke are more likely to have problems with insulin dosage and management of their disease than non-smokers (“Type 2 diabetes - Diagnosis and treatment - Mayo Clinic,” n.d.). Smoking is directly related with elevation of bold pressure which gives stress to heart and it works like a catalyst if the person is a smoker. Poor blood flow across the whole body can lead to infection, ulcer and may resulting amputation. It can also cause blindness or retinopathy and also cause damage to nerves in arms, legs or other parts of the body resulting poor coordination, numbness or weakness (“Type 2 diabetes - Diagnosis and treatment - Mayo Clinic,” n.d.). So, people who does not smoke is already in an advantage because they do not have to deal with such problems. If a person is a smoker with diabetes, He or he will immediately be benefited from quitting smoking. Blood sugar levels are best controlled by people with diabetes who do not smoke or have quit before the damages are done.

Alcohol has effect on bodies triglyceride levels as well. Furthermore, it can also increase blood pressure which takes a toll on heart (“Diabetes: Does alcohol and tobacco use increase my risk? - Mayo Clinic,” n.d.). For these reasons excess amount of alcohol is harmful for

people specially for the people with diabetes. To maintain a healthy life alcohol intake should be controlled. Peoples lifestyle can make a great change for living a sound and healthy life.

1.4 Causes of diabetes

Glucose is a primary source of energy for all our body's cells. It is largely derived from the food we consume (digestion and absorption) and is also provided by the liver-either through breakdown of glycogen stores (glycogenolysis) or using other building blocks (gluconeogenesis) to synthesize glucose. Insulin causes blood sugar to absorb skeletal muscle and lipid cells in our body. Another hormone, glucagon, prevents the action of insulin and promotes the production of glucose during times of hunger.

Absolute lack, insufficient supply and poor insulin regulation are amongst the major causes of diabetes

Diabetes factors are also used to identify diabetes types

1.4.1 Insulin absence

An autoimmune reaction systematically kills pancreatic cells that produce insulin, escalating to type One diabetes.

This is unclear the precise cause of type 1 diabetes. Usually, body's own immune system, which usually destroys hazardous bacteria and viruses — wrongly kills the cells in the pancreas that produce insulin (“Type 1 diabetes - Symptoms and causes - Mayo Clinic,” n.d.). There are other factors which include:

1. Genetics.
2. Environmental factors.

There are some risk factors for diabetes

1. **Family history:** Anyone with a family person with type one diabetes has risk of getting type one diabetes.
2. **Genetics:** Certain genes are responsible for developing type one diabetes
3. **Geography:** Further going away from equator will increase the rate of diabetic patients.
4. **Age:** There is no certain age when type one diabetes will develop but there is a perk where it occurs in the children's age between 4-7 and the next in children between 10-14 years old ("Type 1 diabetes - Symptoms and causes - Mayo Clinic," n.d.).

1.4.2 Insulin resistance

People might either have insulin inadequacies in the system or insulin functioning issues, all contributing to type two diabetes.

1. Insufficient supply of insulin: obesity and weight gain can contribute to an insulin imbalance in relation to the cells sensitivity to insulin ("PDB-101: Global Health: Diabetes Mellitus: About: Causes of Diabetes," n.d.).
2. Improper insulin function: Insulin attaches to its receptor resulting cell signals that ultimately leads to glucose uptake. Absence of proteins or damaged proteins in the signaling cascade (because of genetic disorders or mutations) or shifts in metabolites or signaling molecules (such as high concentrations of free fatty acids) can disrupt the metabolic balance, which leads to diabetes ("Causes of diabetes," 2009).

Type Two diabetes occurs when the body is insulin resistant or when there is not enough insulin released by the pancreas but the exact reason behind this phenomenon is unknown. Although genetics and lifestyle factors appear to be contributing factors, such as being overweight and inactive (Mayo, 2019).

All the factors that include in the development of type two diabetes are:

Weight: Overweight is one of the main causes behind diabetes. Although it does not necessarily mean that all the overweight people will develop diabetes.

Fat distribution: If fat is stored specially in the abdomen region rate of developing type two diabetes will increase than if fat is stored elsewhere like hips or thighs. The risk increases if the person is a man with a waist above 40 inches or a woman with a waist more than 35 inches.

Inactivity: The less the person's activity the higher the risk of developing type two diabetes. Active lifestyle will control maintain a person's weight by using up cells glucose as energy and makes the cell more responsive to insulin.

Family history: Type two diabetes risk increases if a person has type 2 diabetes his or her parent or sibling.

Race: While it is unclear why people of certain races — including black, Hispanic, American Indian, and Asian-American people are more likely than white people to establish type Two diabetes.

Age. Type Two diabetes risk goes up as a person age, particularly after 45 years of age. This is possibly because, as a person age, people are more likely to workout less, lose muscle mass and put on weight. But there is also a sharp increase in type 2 diabetes among children, teens and younger adults (Mayo, 2019).

The emergence of prediabetes: Prediabetes is a disorder in which blood sugar levels are higher than usual, but not too high to be listed as diabetes. Prediabetes, left untreated, frequently progresses to type two diabetes.

Gestational diabetes: When a woman becomes pregnant with gestational diabetes, the chance of developing type Two diabetes rises. When other give birth to a baby weighing higher than 9 lbs. (4 kilograms), they are also at a possibility of type Two diabetes.

Polycystic ovarian syndrome: The risk of diabetes rises in women with polycystic ovarian syndrome — a common condition defined by prolonged menstrual periods, excess hair growth and obesity.

Dark patches: Darkened skin regions, usually in the neck and arms. This disorder also suggests resistance to insulin (Mayo, 2019).

1.5 Treatment of diabetes

The main goal of controlling diabetes is to control blood sugar level. The treatment varies with the type of diabetes. Type one diabetes can be treated with insulin and also make a change in dietary habits as well as exercise.

Type two diabetes can be treated with non-insulin medication, weight loss, dietary changes and insulin as well.

Medications for type two diabetes can act in several ways like increasing sensitivity of insulin, increasing of glucose excretion, minimize absorption of carbohydrates in GI tract or some other means as well (“Diabetes & Treatment, Type 1 & 2: Medications, Guidelines & Diet,” n.d.)

These methods can also be used in merger. Proper nutrition diet is a huge aspect in any diabetes care plan. The plan does not represent all the plans for diabetic patient because it varies from individual to individual. The main plan is to cut down the total major meals into smaller amount but more frequent thought the day. All the food plan is balanced with medication and body condition. Consumption of limited carbohydrate with plenty of low

fructose containing fruits, vegetables, beans, lean meats, vegetable substitutes, fishes or poultries.

There is another research which is currently going on which is pancreatic transplantation, which is under active study.

Diabetic medication is prescribed only when diabetes cannot be controlled with just change in lifestyle. Insulin is prescribed when oral medication is insufficient for maintaining a healthy blood glucose level.

When planning for the diet for people with type one diabetics meal timing and insulin administration is a must thing to be under consideration (“Diabetes & Treatment, Type 1 & 2: Medications, Guidelines & Diet,” n.d.).

For people with type two diabetics exercise can play a great role in the treatment of diabetes. If a person stays fit it will be lot easier to control diabetes by maintaining a correct glucose level it is also responsible for maintaining other complications related with diabetes (“Type 2 Diabetes and Exercise - Exercise Makes It Easier to Control Your Diabetes,” n.d.). there should be minimum 150 minutes of workout per seven days. The workout can be of moderate intensity like walking, strength training, all kinds of aerobic or anaerobic exercises, doctor recommends the perfect exercise for a patient.

1.5.1 Drugs used for the treatment of diabetes

- Biguanides, the most widely used metformin in obese and overweight patients, inhibits the production of hepatic glucose.
- Sulfonylureas, which are usually well tolerated, but they carry a risk of hypoglycemia as they promote endogenous insulin secretion.

- Thiazolidinediones, also known as insulin sensitizer because they are among the first drugs to identify the basic insulin resistant problem.
- There are some unorthodox drugs which include Alpha-glucosidase inhibitors Acarbose, Voglibose and Miglitol. They are rarely used because they are not compatible with patient with renal impairment. They have huge side effects including diarrhea.
- Incretin-Based Therapies Glucagon, they being used as monotherapy, it is an adjunct with diet, exercise or in combination along with some oral hypoglycemic agents.
- Insulin therapy, it is a subcutaneous way of delivering insulin inside body.it is used when changing in lifestyle and oral medications are not enough to control blood glucose level.
- Recently, rapid-release bromocriptine has been developed for type Two diabetes treatment. However, it is not yet sure what is the actual mechanism of its action.(Dunger & Ahmed, 2007)

1.6 Condition of diabetic patients in Bangladesh

In Bangladesh there are there are around million diabetic patients (Mohiuddin, 2019). Bangladesh is a country where only one fourth people lives in the urban area who have little or no healthcare access (Mohiuddin, 2019). Diabetes is a major international health condition that affects 382 million people, with 5.3 million lives lost in 2013. Around 80% of people with diabetes live in areas with low and medium incomes (Islam et al., 2013) Many studies have also shown that frequency of diabetes is growing, particularly in high- and middle-income countries, but diagnosis, care and control are quite poor (M. M. Rahman, Akter, Jung, Rahman, & Sultana, 2017). A recent study done in several countries found that people in significantly poor income countries and those with a low socioeconomic profile were less likely to be diagnosed and treated promptly for their diseases specially diabetes (Di Cesare et al., 2013) In urban residents, the age-standardized diabetes prevalence was higher than

those people living in rural areas. Furthermore, the frequency of diabetes and also diseases correlated with diabetes have been increased with the development of socio economic status. An age specific table has been shown below which shows age specific diabetic and prediabetes frequency among Bangladeshi adults aged 35 years or older.

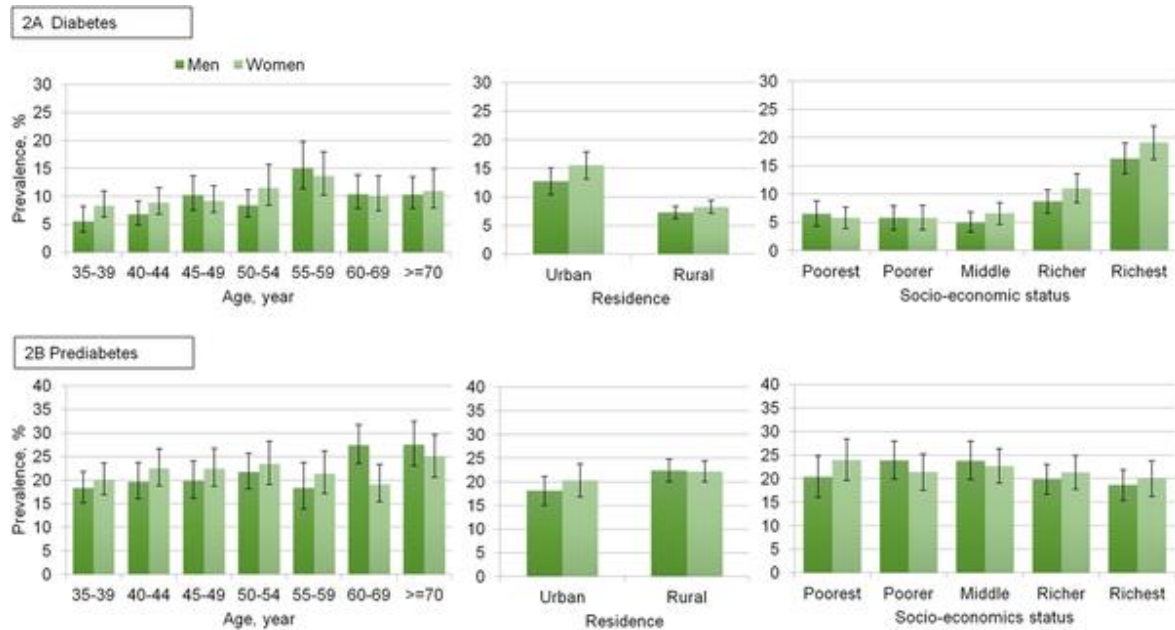


Figure 1: Age-specific and standardized prevalence of diabetes and prediabetes in Bangladesh (M. S.

Rahman et al., 2015)

The current study observed that approximately one in ten adults in Bangladesh has diabetes (9.2%). Results are confirmed with many other low- as well as middle-income people's survey research among our neighboring countries like India about 8.6% (Anjana et al., 2011) and Sri-lanka around 8.0% (Katulanda et al., 2008). It shows Bangladesh has significantly higher rate of diabetic people comparative to the neighboring countries which has significantly similar genetics, environmental factors and rural living quality and also diet and social believes. The pooled frequency of type two diabetes was 13.7% (12.1% - 15.3%) Diseases showed a growing pattern between 1995 and 2010 at 5-year intervals (3.8%, 5.3%, 9.0%). Type two diabetes frequency has been found greater in male about 7% compared with female person which is about 6.2%. type two diabetes was significantly

greater among people with high quality living standards compared with people with low quality living standards(Saquib, Saquib, Ahmed, Khanam, & Cullen, 2012) In 2013, about half of South Asians with diabetes were unaware of their disease, according to the International Diabetes Federation (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.). The knowledge of diabetes among subjects with no schooling, lesser socio-economic status, and those living in rural areas and poor neighborhoods were also quite small. Ultimately, diabetes treatment remains overwhelmingly and significantly weak in the general population of Bangladesh, which might raise concerns about higher mortality rates and disability in the coming years (M. S. Rahman et al., 2015).

1.7 Diabetic concerns worldwide

- Around 463 million adults have diabetes, up to 700 million by 2045 (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- In most countries, the percentage of people having type Two diabetes.
- In middle and lower-income regions, 79% of adults with diabetic patients live.
- most of the diabetic patients are between 40 to 59 years old. (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- One in two people with type two diabetes remains undiagnosed (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- Around 4.2 million deaths have been reported because of diabetes (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).

- Around 760 billion U.S dollars have already spent because of diabetes (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- Greater than 1.1 million underage people have type one diabetes (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- Diabetics affects one in six childbirths the number is around 20 million.
- The risk of developing type 2 diabetes is raised by 374 million people (“International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01],” n.d.).
- Before the age of 70, roughly half among all fatalities due to high glucose in the blood occur (“Medication Management | ADA,” n.d.).
- The worldwide incidence of diabetes in people over the age of 18 has grown from 4.7% in 1980 to 8.5% in 2014 (“Medication Management | ADA,” n.d.).

1.8 Diseases correlate with diabetes

Diabetes is not a disease itself (David et al., 2010) but it is the reason behind a lot of disease and complex body condition. A lot of people suffer and die each and every year due to diabetes and the disease correlate with diabetes.

1.8.1 Nerve pain with diabetes (Neuropathy)

Diabetic neuropathy is indeed an extreme and serious diabetes complication. It is a kind of nerve damage associated with high blood glucose levels in the long run. Typically, the disorder progresses gradually, sometimes over many decades. There are multiple types of diabetic neuropathy that impact on various areas of body. For example, peripheral neuropathy, autonomic neuropathy, proximal neuropathy, focal neuropathy (“Diabetic Neuropathy: Treatment, Symptoms, Causes,” n.d.). The main reasons behind diabetic

neuropathy are blood vessels damage caused by high cholesterol levels. Mechanical injury caused by tunnel syndrome and most importantly lack of vitamin B-12 because consumption of metformin in a long term can cause decrease vitamin B-12 level in our body (Simpson et al., 2017).

1.8.2 Eye problems with diabetics

Diabetes causes different types of eye disease. These diseases include retinopathy with diabetes, diabetic macular edema, glaucoma and cataracts. Diabetes can damage our eyes, leading to poor vision or blindness. High blood sugar level damages blood vessels in the back side of diabetic patients eye these damages begin in the early stages of diabetics or prediabetes. There is always a chance for damaged blood vessels to leak fluid which can cause swelling new blood vessels will grow eventually but these new blood vessels are weak and may bleed in the middle part of the eye which results in scarification or lead to dangerous high pressure inside eye (“Diabetic Eye Disease | NIDDK,” n.d.). The macula is the part of your retina we need to read, move, and see faces. In the macula, which is named diabetic macular edema, diabetes can proceed to swelling resulting destroying sharp vision of eye furthermore results in blindness. Commonly it occurs among the people who is already suffering from diabetic retinopathy. Type two diabetes is a principal open-angle glaucoma causative factor. Neovascular glaucoma is a form of glaucoma which is at greater risk for diabetic patients. Patients usually have a serious case of diabetic retinopathy among this form of glaucoma. Another type of glaucoma is steroid induced glaucoma. People who have diabetes tends to develop diabetic molecular edema which is known cause behind eye blood vessels damaging resulting fluid leaking in the eye. Several treatment has been developed to stop this like laser treatment to the damaged area, surgery or eye drops which can cause steroid induced glaucoma (“Glaucoma and Diabetes | BrightFocus Foundation,” n.d.). Another eye problem associated with diabetes is cataracts. In the developing country like

Bangladesh it is one of the major causes of blindness. The pathogenesis of the development of diabetic cataracts is not yet completely understood. Compared to nondiabetics, diabetic patients also have a greater risk of side effects after cataract surgical procedure done in the patient named phacoemulsification (Pollreis & Schmidt-Erfurth, 2010).

1.8.3 Cardiovascular disease and diabetes

- At least 68% of diabetic patients age 65 or above die out of some type of heart disease; and 16% concussion from stroke.
- Diabetic adults are at two to four times at risk of death than patients with cardiovascular disease compared with people with no diabetes.
- American Heart Association believes that diabetes is one of the seven major things to be controllable factor which can be maintain to get rid of cardiovascular disease.

High blood pressure is a major factor behind cardiovascular disease. There is a positive relation between insulin resistance and diabetes and hypertension. Patient with both of them has a combined complication can serve as a double risk of developing cardiovascular disease. Besides that, Diabetes patients also report unhealthy cholesterol levels particularly high amount of low density lipoprotein, high triglycerides and comparatively low high-density lipoprotein. A lipid imbalance consistent with insulin resistance is also recognized as atherogenic dyslipidemia which is also known as diabetic dyslipidemia among people who have been suffering from diabetes. Obesity, another major concern associated with diabetes which closely related to insulin resistance. Weight loss can contribute to both insulin resistance and obesity but it is hard to achieve if the patient has high blood sugar level. Combination of high amount of insulin and obesity can lead to other complication most likely high blood pressure. So, in the sum up we can see that insulin resistance is closely related

with cardiovascular diseases and combination of these two can yield even more devastating result along with development of other complications. However, managing both of them can result in a balanced life with fewer complication (“Cardiovascular Disease and Diabetes | American Heart Association,” n.d.).

1.8.4 Kidney Damage (Nephropathy)

Our kidney has millions of thin blood vessels named glomeruli which filters out waste from our blood. High blood sugar level can hamper this sophisticated filtering system (Mayo, 2019) When we consume protein and our body processes it, it results in generating a lot of waste products. These waste products are squeezed through these tiny blood vessels and excretes via urinary tract and the good particles which are necessary for body gets reabsorbed and stays in the blood. High blood sugar makes the kidney to do too much work and so excess pressure is given on kidney as it has to work hard to filter too much blood. After many years of exhausted work, they start leaking useful particles mostly useful protein in urine. This condition is termed as microalbuminuria. If the condition is diagnosed at an early stage (during microalbuminuria) there are several treatments available so the condition can be kept getting worse. If the condition is left untreated. microalbuminuria will turn into macro albuminuria end stage renal disease has a great tendency to occur. Due to overwork and stress gradually, kidney starts losing their ability to filter. This results in producing and accumulating waste products in blood. When this happens a person needs to go through hemodialysis or has to go through kidney transplantation through surgical procedure (“Kidney Disease (Nephropathy) | ADA,” n.d.). This can be avoided if diabetic patients blood sugar level and high blood pressure are controlled at an early stage. In fact, in the United States The main reason behind kidney failure is uncontrollable high blood sugar level (“Diabetic Nephropathy | Diabetic Kidney Disease | MedlinePlus,” n.d.).

1.8.5 Diabetes and foot problem

Diabetes can cause nerve damage a term known as diabetic neuropathy. It can cause pain and tingling sensation on the patients' foot. It can also result in lose feeling and when this happens at pebble inside the shoe or a blister can be felt. It may further lead to sores and cut which later on can be infected easily with microscopic organisms. Diabetes can also reduce the feet's blood flow. Without having enough blood flow in the patients' feet and leg usually makes sore or infection harder to heal. In case of diabetic patient sometimes healing procedure is never happening and the infection turns to gangrene.

These gangrene and foot sores that never heal causes amputation of the infectious parts. A surgeon performs amputation in the infected area (mostly toe, foot or part of leg) to prevent spreading of the infection to other part of the patient's body.

Another rare case which can also happen due to high blood sugar is Charcot's foot. It causes change in the shape of patients' foot. This condition reveals as redness, swelling and warmth in foot. Furthermore, bones start shift or break in foot or toe which results in an odd shape termed as "rocker bottom" ("Diabetes and Foot Problems | NIDDK," n.d.)

1.8.6 Diabetes and skin condition

Diabetes can affect any place of our body, Skin is no exception. In addition, often these problems are the first sign of a person having diabetes. Like any other skin condition this can be avoided or easily treated if caught early. This condition are common but diabetic people have the possibility to acquire these skin conditions. Most likely people with diabetes is affected with bacterial and fungal infections. There are some skin problems which are only associated with the people with diabetes which includes Diabetic dermopathy, diabetic blisters, necrobiosis lipoidica diabetorum and eruptive xanthomatoses. Diabetic patents in most cases has poor blood circulation and sometimes it is the main cause of itching, when it

happens the itchiest part is the legs (“Skin Complications | ADA,” n.d.). This problem can be easily treated by day to day bathing and use of moisturizers during dry weather when the moisturizers are pretty low. Next problem is Acanthosis nigricans, this is a condition where tan or brown raised areas visualizes in the neck side, groin and armpit. It also occurs on elbows, hands and knees. This can be cured by losing weight and using specialized creams to make spots look better. Diabetic dermopathy another condition caused by changings in small blood vessels caused by diabetes. Dermopathy often has the appearance of scaly patches with light brown color. Such patches can be circular or oval in shape and can easily be mistaken as age spots. These patches have no extra sensation on them so these are in most cases harmless. Necrobiosis lipoidica diabetorum is another condition that may be caused by changes in the blood vessels. This is similar to demopathy but smaller in number bigger in shape and deeper this in the long term turns into shiny scar with a violet border and the blood vessels can become easier to see under the skin. This condition is more common with older women and this is not going under treatment unless the sores opens. Diabetic blisters are another skin problem. Although rare it can happen on back of fingers toes legs, feet hands or even forearms. Such sores look like burning blisters and often happen in people with diabetes neuropathy. Sometimes they are large but painless and have no redness around them. Only treatment is reducing blood sugar level. Another condition caused by diabetes which is out of control is eruptive xanthomatosis. It is composed of solid, yellow, pea-like skin enlargements. The condition most often occurs on the back of patient’s hands feet, neck, legs and buttocks. This is more associated with high fat and cholesterol in blood, these marks disappear when blood sugar level is under control. People with diabetes also grow compact, waxy, dense skin on the backside of their hands this condition is termed as digital sclerosis. It can cause the finger joints to become stiff and they lose mobility so that it becomes harder to move the

joints. This happens with 33% people with type one diabetes (“Skin Complications | ADA,” n.d.).

1.8.7 Diabetes with gangrene

Gangrene is a disease that happens when the tissue in patient’s body dies. This happens if the blood supply to a part of the body is disrupted. Gangrene is often the consequence of an infection in soft tissue. Gangrene usually affects the feet, fingers and extremities. The disorder is usually characterized by discolored skin, feelings of numbness and irregular discharge or pus formation. High levels of blood sugar will damage patient’s nerves which can cause sensation loss in the area affected so it makes easier for patients to develop injury. High blood sugar makes the blood vessels thin so it hampers normal blood flow to the area as a result fewer infection fighting cells can reach to the effected site so the wounds do not heal. Any damage or wound can be a good candidate for developing gangrene to a diabetic patient (“Gangrene and Diabetes: Understanding the Link,” n.d.).

1.8.8 Diabetics with Alzheimer’s disease

Diabetes is a proven risk factor for Alzheimer's disease.(“Diabetes and Alzheimer’s: What’s the link?,” n.d.)New research has proven that insulin signaling is impaired in the brain. Also characteristic of diabetes can have a negative impact on memory, mood and metabolism all of which are linked with diabetes. Main mechanism is not proven yet about how they truly linked. however, it is shown in several studies that higher the blood sugar level higher the intensity and risk of Alzheimer’s disease (Mayo, 2019).

1.9 Diabetes treatment opportunity in Bangladesh

Bangladesh is a country where a lot of people lives under privilege. Bangladesh has always worked to help diabetes patients improve through participating in different programs and lots

of campaigns. A lot of organizations are arranging these programs and campaigns to minimize the effects diabetes is conducting. These includes cost free glucose screening and hbA1c testing, In the centers, an automated patient registration system is developed to maintain complete patient data, Insulin help desk corner is implemented in partnership with diabetes management centers to support the new insulin users, these programs include care hubs for patients, physicians and diabetes from three viewpoints, in the selected areas different awareness programs are being held to raise awareness, describing them about complications regarding diabetes, training on diabetes management and lifestyle changes (“Changing Diabetes Barometer In Bangladesh - Assignment Point,” n.d.).

Here a lot of medical organizations provide diabetic cares among them BIRDEM General Hospital, Bangladesh Diabetic Somiti, Diabetic Association of Bangladesh (BADAS), Ibrahim Memorial Diabetes Center, NHN (Diabetic Association of Bangladesh) are some big names besides these organizations a lot of diagnostic centers are providing quality test service for identification and determination body components. There are lots of test available for people to find out they are diabetic or not.

The test includes: A1C test: This indicates average blood glucose level for the past three months. There are a lot of synonyms for this test. It is also known as HbA1C, glycosylated hemoglobin, test, hemoglobin A1C, glycated hemoglobin test. This test does not require fasting. The main drawback is that this test does not gives accurate result for the patient with anemia.

Fasting plasma glucose (FPG) test: The blood test FPG tests the blood glucose level at a single time point. The best outcome can be achieved if the test is done in the morning with at least eight hours of hardcore fasting which means only a sip of water is allowed for the best result.

Random Plasma Glucose Test (RPG): This is a very rapid test only done by the physician when it is almost assured that the patients have diabetes. No fasting is required for this testing and this can be done anytime.

Glucose challenge test: this is mainly for the pregnant woman for checking gestational diabetes. It is also known as glucose screening test. This test is done after giving the person a sugary drink and after one-hour blood glucose level is checked.

Oral glucose tolerance test (OGTT): this test is done after eight hours fasting first a professional will take the blood then the test subject will be given a sugary drink and every hour a blood sample is taken three times.

All of the above tests are available in Bangladesh which can be done at a reasonable price and sometimes free during different campaign in Bangladesh.

1.10 Rationale of the study

Diabetes is a major concern of human life all over the world and Bangladesh is no exception. It affects a person's life in so many aspects. It has so many complications and if untreated it can turn into serious problem. Urban people's lifestyle includes a lot of junk foods which contains saturated fat and trans-fat which is the major aspects of people's life regarding diabetes. Moreover, urban people consume a lot of sugar via soft beverages. Combination of these and lack of exercise makes the urban people more susceptible to diabetes. On the other hand, rural people do not consume such large amount of junk food and sugary beverages they should have fewer diabetic patients but the real-life scenario indicates differently. Poor lifestyle choices and little knowledge on the topics makes them more vulnerable. Just some simple changes in their life can bring a harmony in the rural people's body. In three different districts of Bangladesh which includes a lot of remote areas which includes Nilfamari-Kachukata, Noakhali-Sonaimuri and Chandpur-Taltola. We wanted to find out about the current

stage of diabetic people's lifestyle their knowledge and their complications regarding diabetes.

1.11 Objective of the study

The main objective of the research is to find out overall diabetic people's current situation of three remote areas of Bangladesh as these are some remote areas there should be minimum diabetic people. The specific objectives are:

- Identify the current situation of diabetes of three remote areas of Bangladesh.
- Raising awareness among them about diabetes and correlated diseases regarding diabetes.

Chapter 2

Methodology

2.1 Research Design

The research done following three steps. Firstly, literature review was done to understand all the aspects regarding diabetes and the condition of diabetic people in Bangladesh as there are a lot of people in this country who are suffering from this disease. Here there are a lot of rural areas where they have low or no concern about the disease and its co related complications. I have considered three remote areas in Nilfamari, Noakhali and Chandpur as there are many places where the number of underprivileged is comparatively high and little significant research were done in these places. Secondly, Identification of families were done through GPS tracking where there are people who have been suffering from diabetes or any diabetic related complication. Finally, a detailed questioner was prepared to get the whole idea of people who are suffering from diabetes which describes their lifestyles correlation with diabetes. A total of 312 participants done the survey questioner and 309 data found validated. The data I have collected was analyzed by using SPSS V 21.

2.2 Research Questions

Total 15 questions were selected for analysis

RQ 1: I exercise regularly

RQ 2: If I do, what type of exercise?

RQ 3: I consume high sugar added foods?

RQ 4: How many times in a week

RQ 5: Have I been hospitalized for any complication before?

RQ 6: I consider eating vegetables over other food?

RQ 7: Do I have diabetic patient in your family?

RQ 8: Have I ever attended a session with a dietitian?

RQ 9: What type of diet I follow

RQ 10: My knowledge about diabetes

RQ 11: Am I a smoker?

RQ 12: I have eye problem

RQ 13: I have had a urine test for diabetic kidney complication.

RQ 13: My heart condition

RQ 14: My teeth and gum condition

RQ 15: What type of medication do I use?

RQ 16: I take my medication time to time

2.3 Method of Data Analysis

The collected data was analyzed using qualitative and quantitative method. As the research was done in mixed method so both qualitative and quantitative data was ensured. Quantitative data was analyzed using SPSS, MS Excel etc. the combination ensured high data accuracy and find convenient and understandable charts and graphs. Both pie and bar chart were used and the result were accurate. By using the questionnaire, the internal perception of the people had been found out.

Chapter 3

Results and Discussion

3.1 Results and Findings

The analysis reports were done among the people of three districts of Bangladesh which includes Nilfamari, Noakhali and Chandpur.

The first questions were asked was how often they exercise and although it was among underprivileged people only 83.7% people said they do not undergo regular exercise but they do exercise most often. Table one shows the percentages of people who exercise regularly.

Table 1: People do exercise regularly

	Frequency	Percent	Cumulative Percent
Yes	49	15.7	15.8
No	261	84.3	100.0
Total	309	100.0	

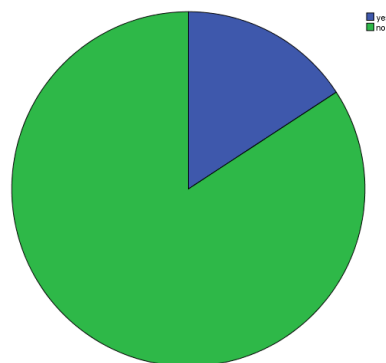


Figure 2: People who exercise regularly

Second question asked was, what type of exercise they do. From table 2 we can see that 59% of people said they do not exercise because they do not have any knowledge about doing regular exercise. About 24.7% people among the survey candidates said their work has high physical activities and 6.4% people said they do cycling although cycling not as a part of exercise but to commute.

Table 2: Type of exercise people do

	Frequency	Percent	Cumulative Percent
Cardio	3	1.0	1.0
Outdoor Play	1	.3	1.3
Cycling	20	6.4	7.8
My Work Has Physical Activities	77	24.7	32.7
I Don't Exercise Because	184	59.0	92.2
I Am Not Able to Exercise Because	1	.3	92.6
I Exercise Sometimes	21	7.7	99.4
Total	309	100	

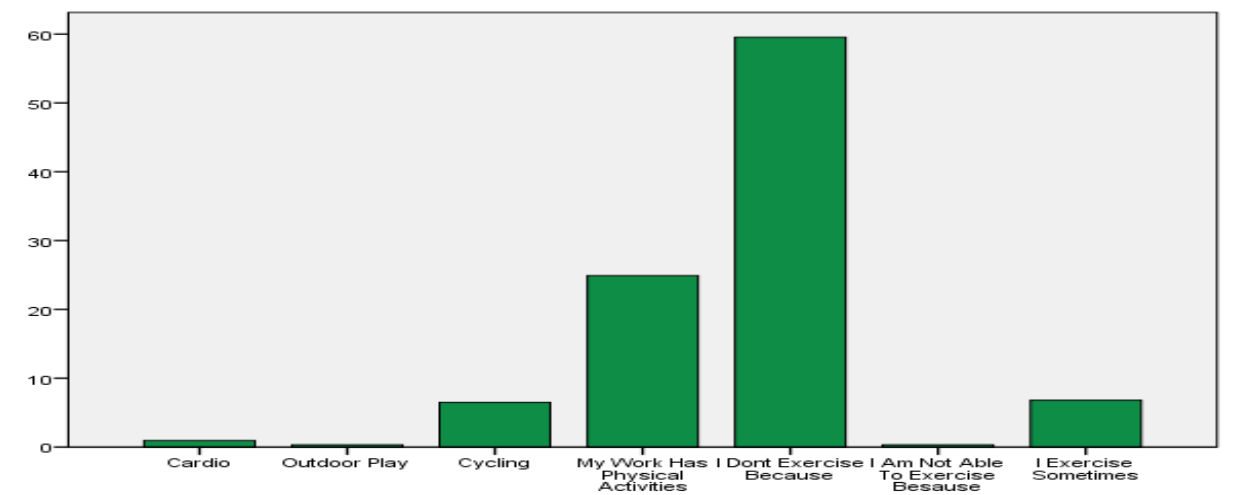


Figure 3: Type of exercise people do

Third question was about their sugar consumption. Table 3 shows 31.1% of the people consume high sugar contained food most of their sugar contained food includes regular having tea with sugar and cake. 61.2% of the people admitted they do not consume sugar mostly the people with diabetes said they try their best to have sugar on daily basis and 7.1% said they sometimes have sugar containing foods.

Table 3: People who consume sugar contained food

	Frequency	Percent	Cumulative Percent
yes	97	31.1	31.3
No	190	61.8	92.9
Sometimes	22	7.1	100.0
Total	309	100	

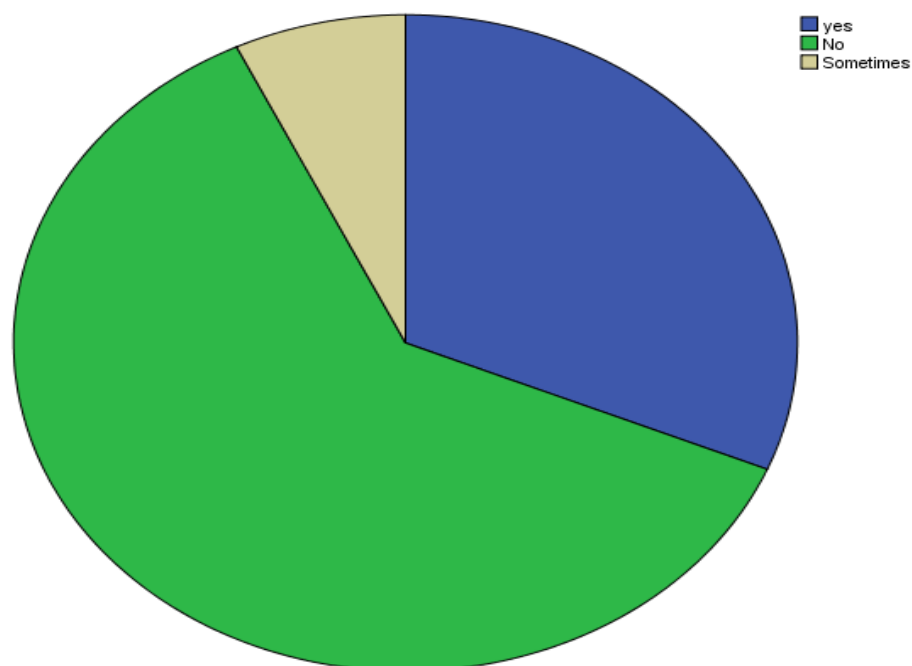


Figure 4: People who consume sugar contained food

In addition, the candidates were asked how many times a week they consume sugar. Significant result was not significant because none of them gave sure answer and most of them (about 9.9 and 9.3) said they consume sugar added foods 5-6 and 7-8 times a week. Here all the results were similar but altogether it is showed that their consumption frequency do not exceed 10-12 times a week which is approximately once a day so we can take it as they do not consume that much sugar. Table four shows exact percentages of the sugar consumption frequency.

Table 4: frequency of having sugar added food weekly

	Frequency	Percent	Cumulative Percent
3-4	1	.3	98.4
4-5	3	1.0	97.6
5-6	31	9.9	88.0
5-7	4	1.3	95.2
6-7	13	4.2	22.4
7-8	29	9.3	63.2
8-9	5	1.6	92.0
8-10	22	7.1	40.0
9-10	11	3.5	8.8
10	4	1.3	12.0
10-12	1	.3	99.2
Do not exercise	184	59.9	
Total	309	100.0	

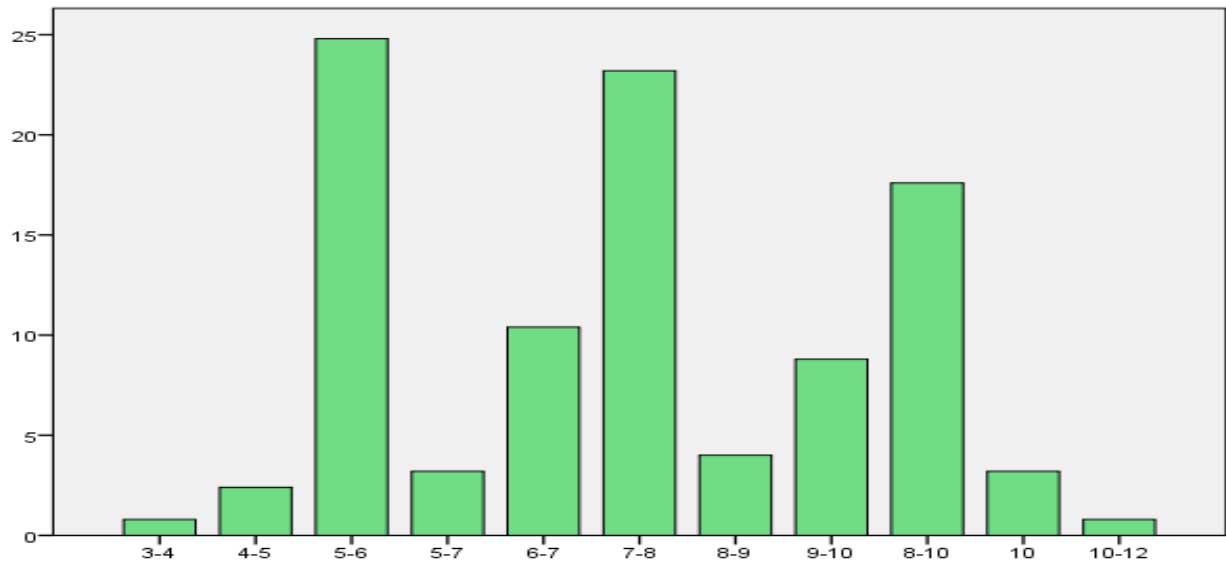


Figure 5: frequency of having sugar added food weekly

From table 5 we can see that 87.7% were positive and among them 35.2% was because of high pressure and 23.2% was because of shortness of breath and 0.3% was because of both of the complication. 5.2% was because of diarrhea but it is not an uncommon problem among people.

Table 5: people's history of admitted into hospital before

	Frequency	Percent	Cumulative Percent
Diabetes	6	1.9	2.2
High pressure	108	35.2	42.3
Shortness of breath	72	23.2	68.8
GI problem	1	.3	69.1
Heart problem	8	2.6	72.1
Diarrhea	16	5.2	77.9
heart problem	1	.3	78.3
stone in gallbladder	5	1.6	80.1
Heart problem and diabetes	1	.3	80.5
Diabetes and High pressure	9	2.9	83.8
Shortness of breath and Diarrhea	2	.6	89.0
High pressure and Diabetes	6	1.9	91.2
Diarrhea and shortness of breath	6	1.9	93.4
Diarrhea and heart problem	12	3.9	98.2
High pressure and Caught cold	1	.3	98.5
High pressure and shortness of breath	1	.3	98.9
Diabetes and caught cold	3	1.0	100.0
No history before	38	12.3	
Total	309	100.0	

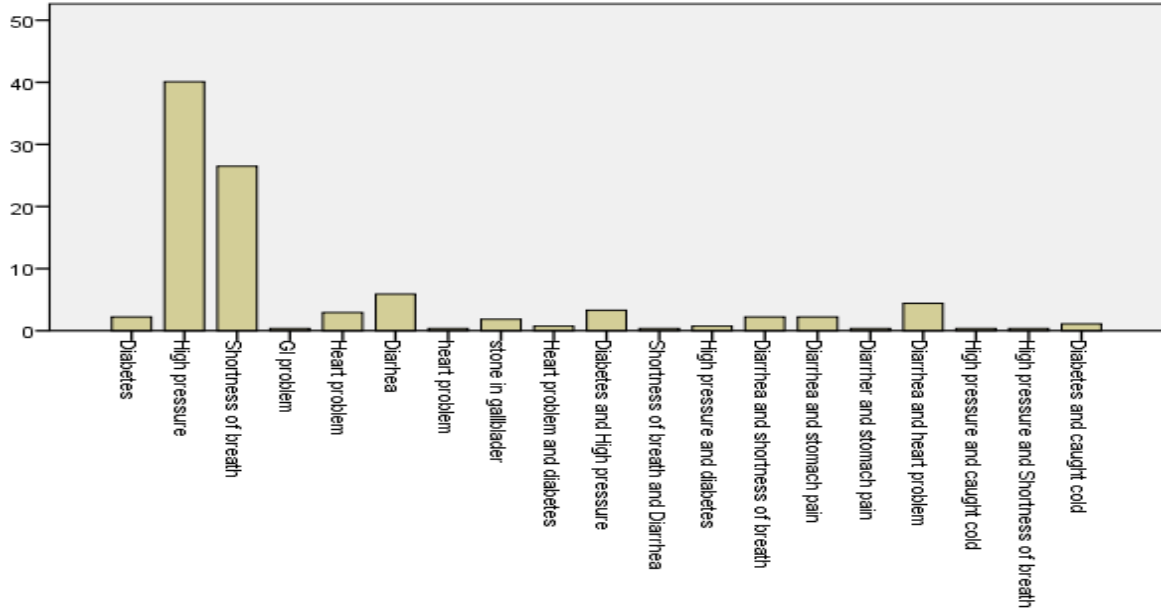


Figure 6: people's history of admitted into hospital before

After that the question asked how often the people consider consuming vegetable over other foods. From table 6 it is seen that 37.2% was positive and 62.2% were negative. It was said they do not consider eating vegetable but most of them said they have to have vegetable-based diet most often. Most of the people said they do not consider it as they do not know the necessity of having vegetable regularly.

Table 6: Number of people considers eating vegetable over other food

	Frequency	Percent	Cumulative Percent
Yes	116	37.2	37.4
No	194	62.2	100.0
Total	309	100.0	

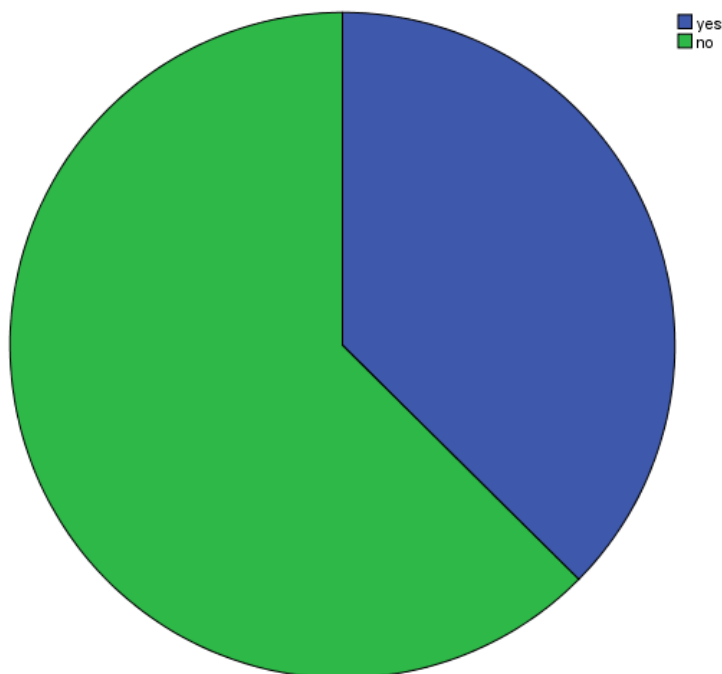


Figure 7: Number of people considers eating vegetable over other food

After that the question was about family history with diabetes. From table 7 we can say that 50.6% people said either their father or mother had diabetes. Most of the people with diabetes had this positive answer. 48.7% said they do not have any family history with diabetes or they do not know as it was never tested before.

Table 7: People with diabetic family history

	Frequency	Percent	Cumulative Percent
Yes	158	50.6	51.0
No	149	49.3	100.0
Total	309	100	

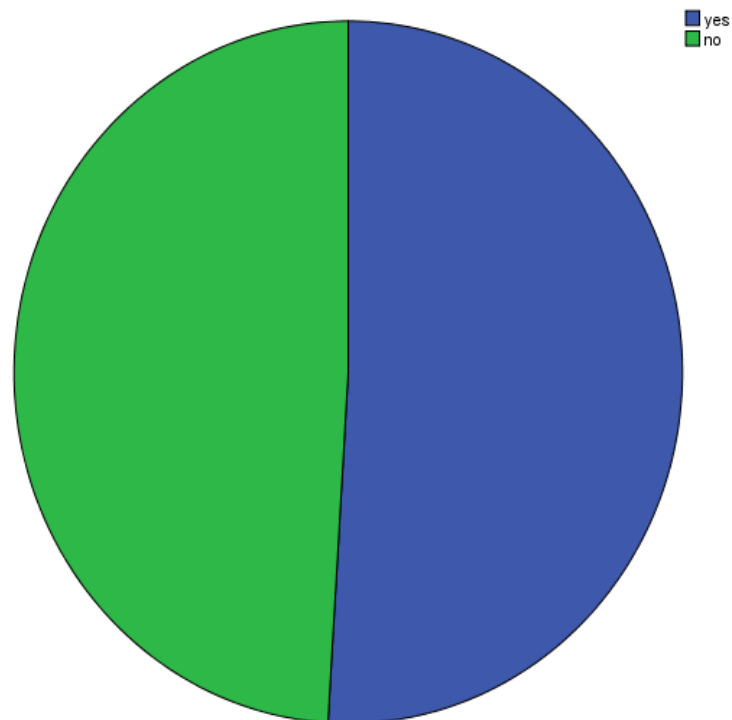


Figure 8: People with diabetic family history

Next the people were asked if they ever attended a session with a dietitian. From Table 8 it can be said that 92.9% of them answered in negative and said they do not have any idea of it. 6.8% said they had to visit dietitian but after clinically diagnosed.

Table 8: list of people attended session with a dietitian before

	Frequency	Percent	Cumulative Percent
yes	21	6.8	6.8
No	287	92.9	100
Total	309	100.0	

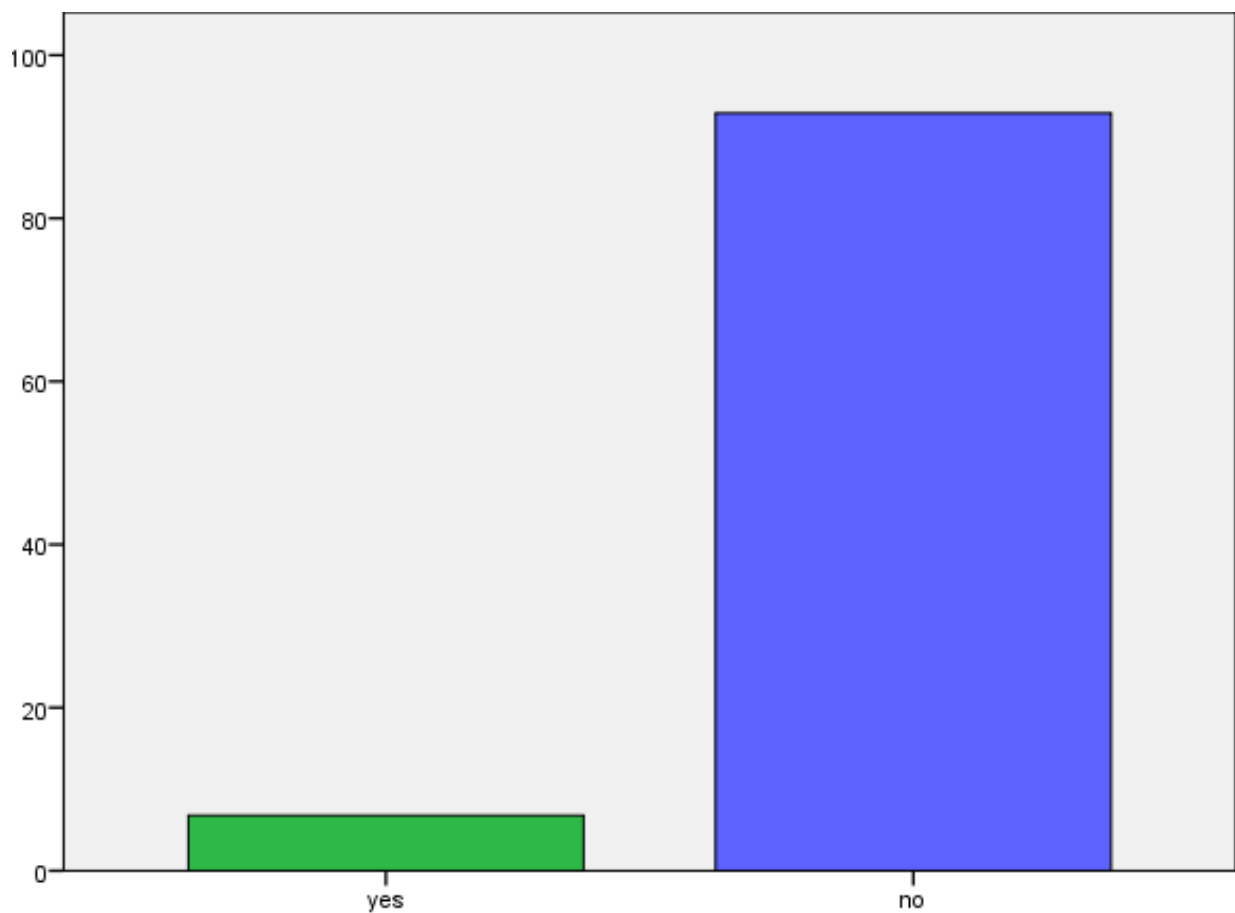


Figure 9: list of people attended with a dietitian before

Next the people were asked about the type of diet do they follow. From table 9 we can see that Among them 84.8% said they do not follow ant particular diet. 9.7% said they have rich food with high in fat. The people in this group said main source of their diet consumes a lot of animal fat as they often store animal fat and use it instead of cooking oil.

Table 9: Type of diet people usually follows

	Frequency	Percent	Cumulative Percent
No particular diet	262	84.8	84.8
Strict carbohydrate diet counting	13	4.2	89.0
Rich foods with high fat	30	9.7	98.7
Too much sugary food	4	1.3	100.0
Total	309	100.0	

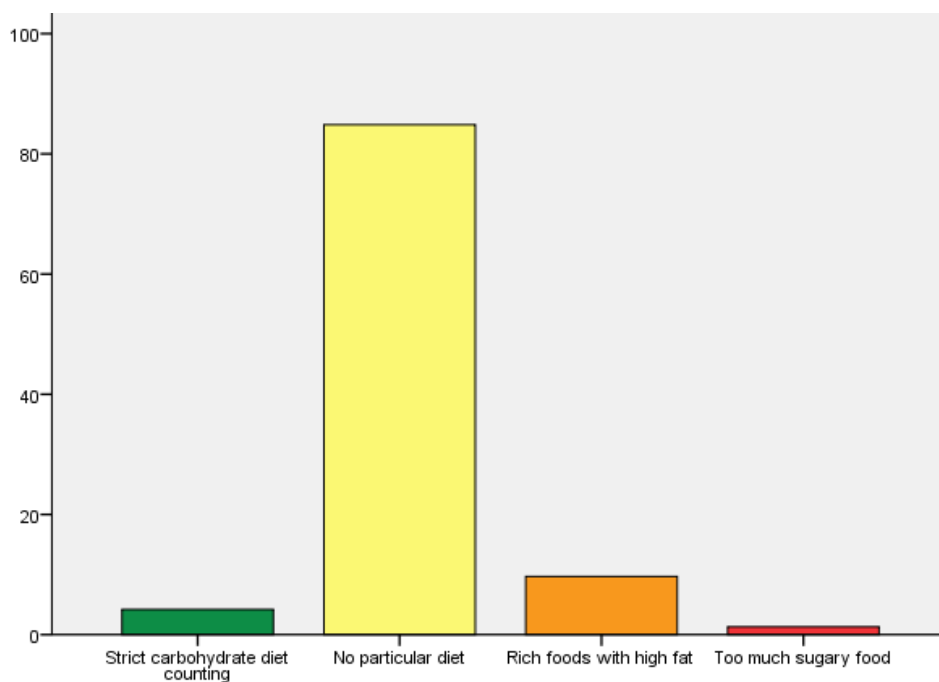


Figure 10: Type of diet people usually follows

Next question asked was about the knowledge regarding diabetes. 57.4% said they do not have any knowledge over it they just know they have to avoid sugar and it is the only parameter regarding diabetes. 24.8% said they just don't know about any complications which are closely related with diabetes. 14.2% said they know about the complication but they just do not want to do anything about it and ignores the necessity sadly only 3.5% of them gave positive answer. Table 10 indicates all the percentages.

Table 10: Peoples knowledge about diabetes

	Frequency	Percent	Cumulative Percent
I do not know what it is	177	57.4	57.4
I do not know complications regarding diabetes	77	24.8	82.3
I know but do not care	44	14.2	96.5
Diet/exercise can help us maintain diabetes. I agree	11	3.5	100.0
Total	309	100.0	

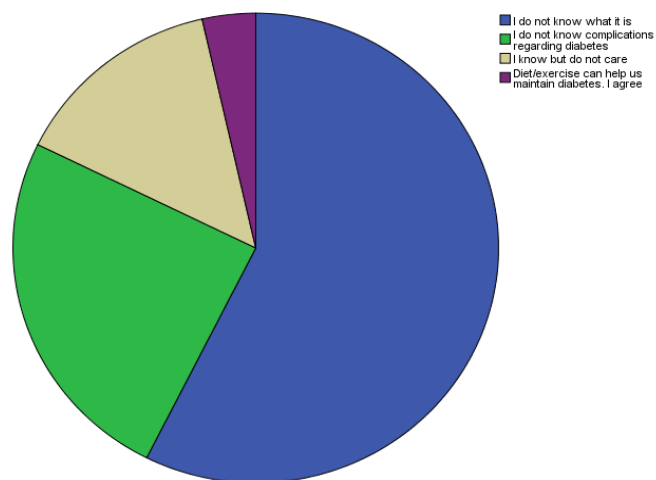


Figure 11: Peoples knowledge about diabetes

Table 11 shows that among all the candidates about 71.6% of them was a smoker. Among them there were hardly any male member who is not a smoker or ever been one.

Table 11: Amount of smoker among survey people

	Frequency	Percent	Cumulative Percent
yes	221	71.6	71.6
No	88	28.4	100.0
Total	309	100.0	

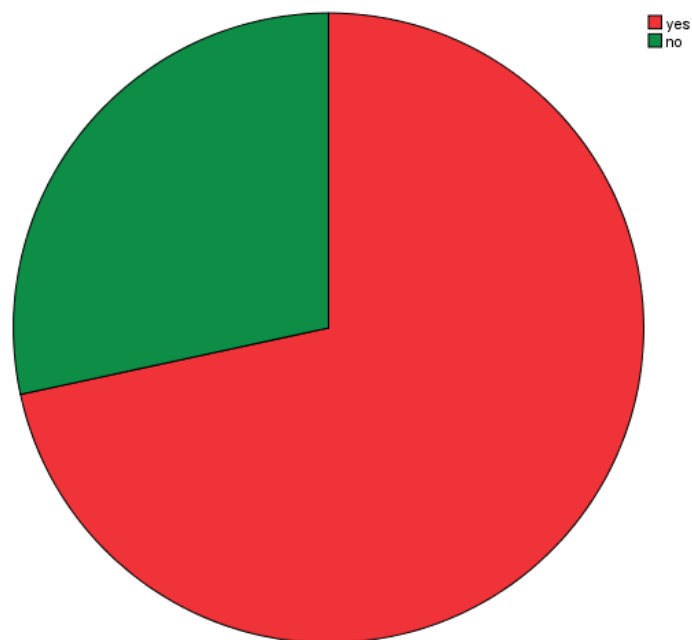


Figure 12: Amount of smoker among survey people

About 61.6% of the people have some sort of eye problem with diabetes. People who said they have it are suffering from diabetes for a long time. Table 12 gives the percentages.

Table 12: people with eye problem

	Frequency	Percent	Cumulative Percent
yes	190	61.6	61.6
no	119	38.4	100.0
Total	309	100.0	

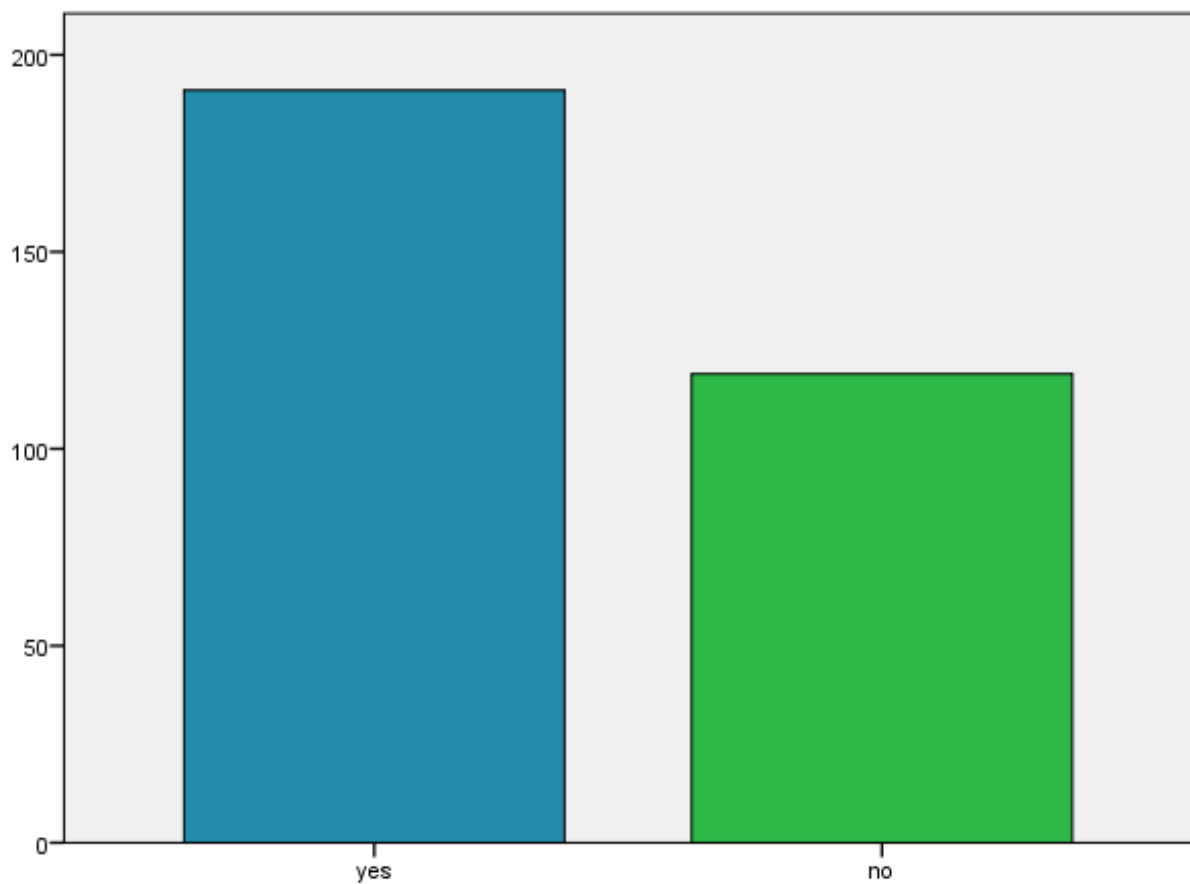


Figure 13: People with eye problem

From table 13 we can say that most of the people about 94.2% had not have to go under any sort of kidney test as they did not have any complication which can indicate a kidney malfunction.

Table 13: People who have done urine test for kidney problem

	Frequency	Percent	Cumulative Percent
Yes	16	5.2	5.5
No	293	94.8	100
Total	309	100.0	

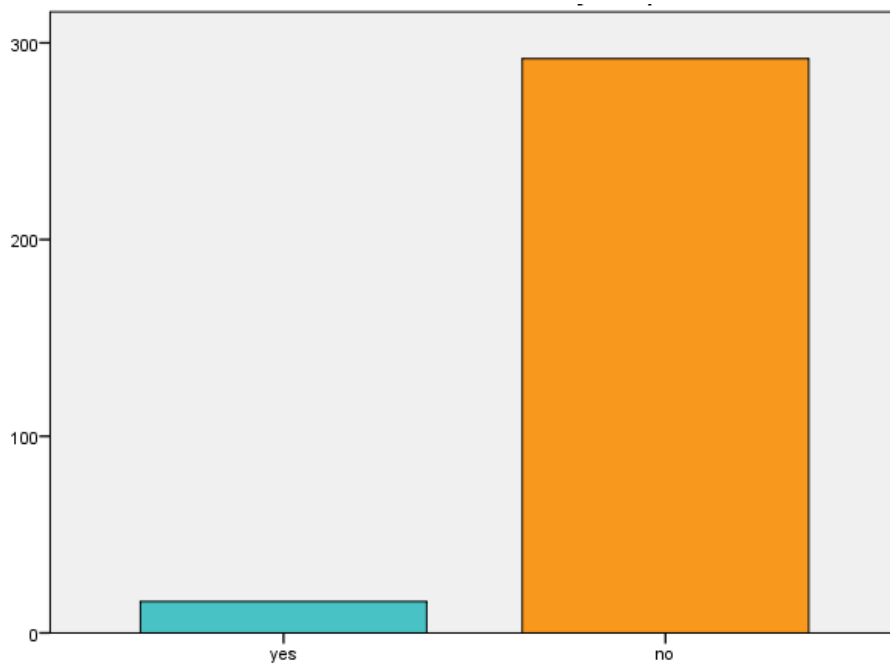


Figure 14: People who have done urine test for kidney problem

Among the people 29.5% admitted that they have high cholesterol level 12.2% said they have had heart attack and about 10.3% said they have high blood pressure. Table 14 indicates all the percentages of peoples' heart condition.

Table 14: Peoples Heart condition

	Frequency	Percent	Cumulative Percent
I have had heart attack	37	12.2	22.1
I have high cholesterol	91	29.5	75.6
I have high blood pressure	31	10.3	94.2
High cholesterol and high blood pressure	5	1.6	97.1
High blood pressure and family history of high blood pressure	5	1.6	100.0
No	140	44.9	
total	309	100.0	

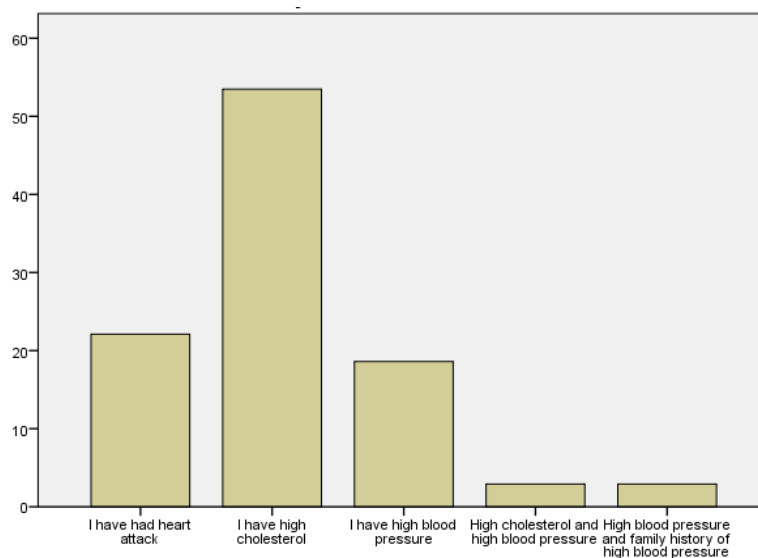


Figure 15: Peoples Heart condition

Next question asked was about their teeth and gum problem. Surprisingly, 81.3% of the people said they have teeth and gum problem this is mostly due to chewing of betel leaf and betel nut. Table 15 indicates all the percentages.

Table 15: List of teeth and gum condition

	Frequency	Percent	Cumulative Percent
Go to dentist time to time	2	.6	.7
I have teeth and gum problem	252	83.2	83.6
No	50	16.1	100.0
Total	309	100	

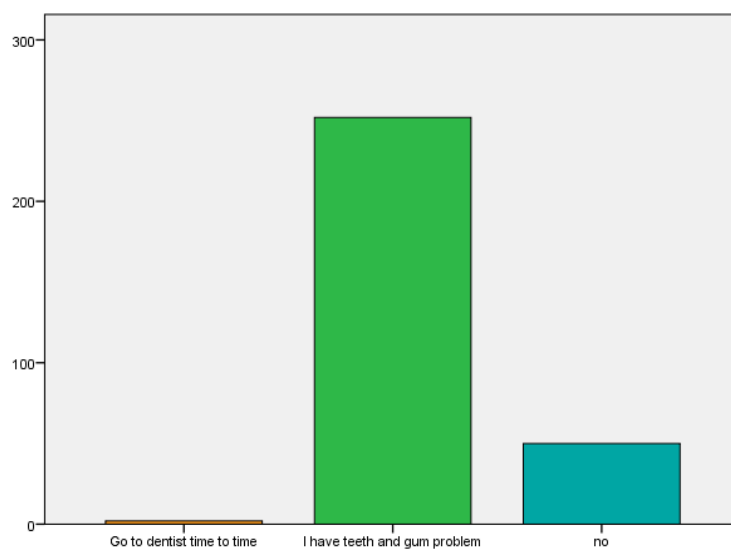


Figure 16: List of teeth and gum condition

Among the people 46.1% takes oral medication and only 4.8% takes insulin in subcutaneous dosage form.

Table 16: Type of medication

	Frequency	Percent	Cumulative Percent
Oral	143	46.1	88.8
Subcutaneous	15	4.8	98.7
Others	2	.6	100
No medication	149	48.1	
Total	309	100.0	

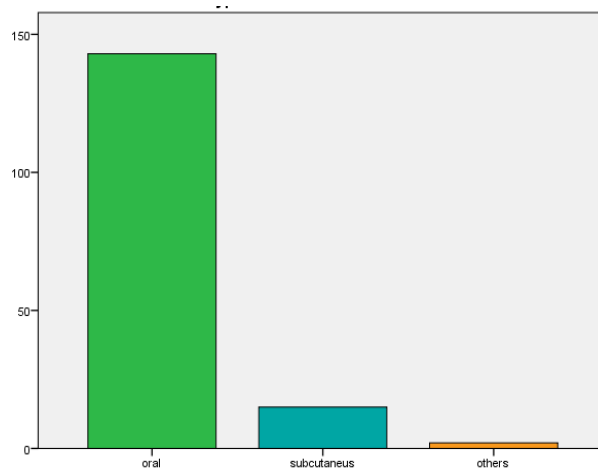


Figure 17: Type of medication

From table 17 we can see that among all of them 46.5% takes their medication with responsibility without forgetting them.

Table 17: Number of people who takes medication time to time

	Frequency	Percent	Cumulative Percent
Yes	144	46.5	89.4
No	17	5.5	100.0
Do not take medication	149	48.1	
Total	309	100.0	

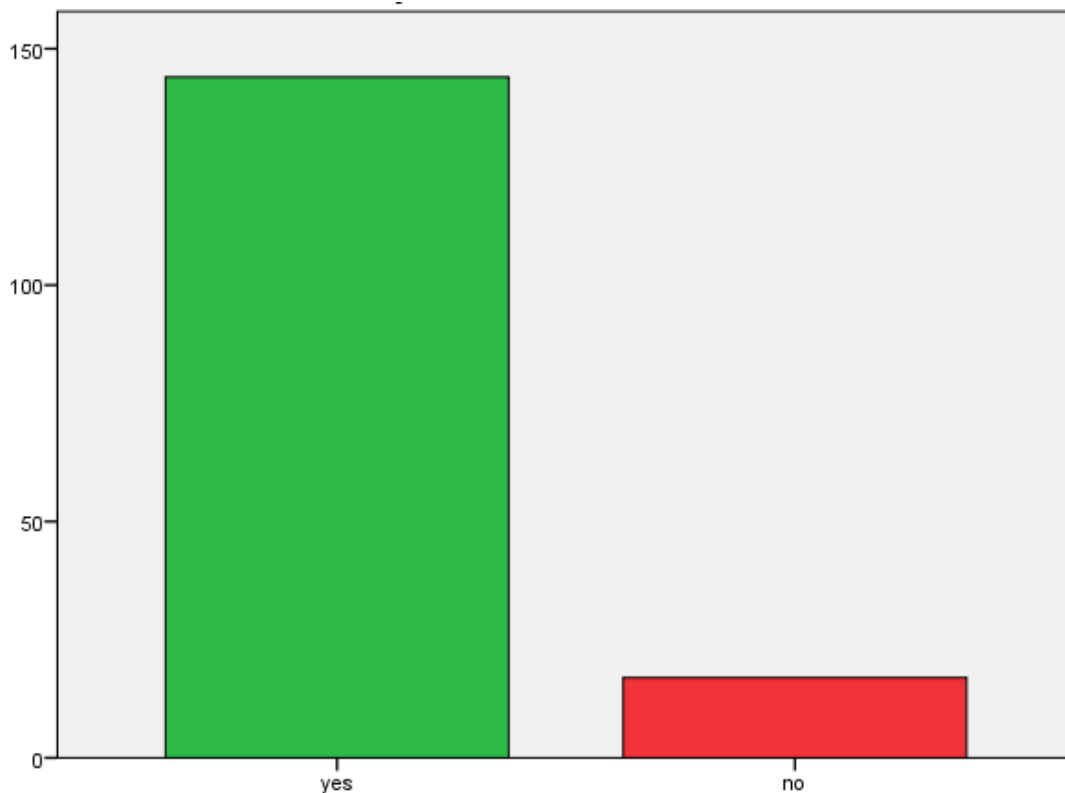


Figure 18: Number of people who takes medication time to time

Chapter 4

Recommendations

Diabetes is sometimes inevitable but it can be kept under control by simple lifestyle change. If people, consider healthy and active life there is a high chance the person will never face it or if so at a later age. In order to build up a society where diabetes is not a big concern the whole world will become a better place. Here is some recommendation for the people to get rid of this social epidemic.

- First thing is to have a healthy diet. Low carb high protein diet can reduce the body fat as well as help build up muscle. In addition, consuming less sugar added foods and a lot of vegetable-based diet can help achieve a healthy diet.
- Next point is to have an active life by doing regular exercise or do activities which requires a high physical activity. A simple walk in the morning can be very good both for body and soul. It can also reduce stress which is correlated with diabetes.
- People who already have diabetes has to go through regular check up to be updated about own body condition. It is necessary for determining the diet plan and physical activities as well. Moreover, it can help in determination any further complication regarding diabetes.
- Drinking plenty of water is recommended as it helps flushing out body toxin. People who have diabetes as a high chance of kidney disorder and consuming proper amount can help reducing the chance
- Bad habits like smoking and drinking should be avoided as these factors works like catalyst to have high blood sugar and also other complications which are influenced by diabetes.

- Another point comes which is to have proper sleep. Having proper sleep helps recover the body after all days of work. If a person does not have proper sleep his or her body components will go through much stress which will attract diabetes or diabetes related problems.
- People with diabetes has to be cautious about cuts and burns because it is more dangerous for a person with diabetes compared to healthy people. If it happens medical attention is recommended.
- Lastly, being stress free is the best way of dealing with diabetes. Whatever happens it happens for a reason and if a person becomes stress it will only bring more harm than good.

Chapter 5

Future prospects

The outcome of the research shows that in the remote areas of Nilfamari, Noakhali and Chandpur are almost deprived of the knowledge of diabetes and its effects. Remote areas like this three districts are present all over the country where there is a high possibility that the result would be the similar. Diabetes takes great toll on people's life as well as their family members life. Government and other non-government organizations in most cases works with the people of the major cities specially in capital city Dhaka. This research opens a scope to determine all the remote areas and compare it with the people of major cities and a new project can be conducted. The future project may show results about the changing of the rate of diabetic people who leads a healthy life. The current research purpose was not only to find out the relation about lifestyle and diabetes but also to raise awareness so that the rate of diabetes can be minimized and the complications related to diabetes can be tackled. As new places can be included under survey more and more awareness can be raised.

Chapter 6

Conclusion

According to some researchers' diabetes is not a disease itself but it is the root of other major diseases. High blood sugar also triggers heart problem and kidney problem which are other two vital organs. There is almost no body part which cannot be hampered due to excessive blood sugar. There are so many criteria's which can make people avoid diabetes or minimize the effect of it. If people become a little bit concern about the fact it can be achieved. A lot of things and habits should be changed like smoking cigarettes and chewing betel leaf and also drinking tea without condensed milk and custom like having high carbohydrate meal three times a day should be minimized and replace it with whole grain carbohydrates. Although it is not hard to maintain it, the knowledge is not widely spread all over the country especially rural areas. Government can take necessary steps to organize several campaigns all over the country so that the impact can be minimized. A healthy body makes a person effect which can play vital role for the betterment of the human kind. All the developed countries are some steps ahead of us as they conduct a lot of campaigns so the people are aware of it. Almost all the participants were almost unaware of the factors symptoms and awareness in this research so it has to be changed as Bangladesh is immerging to be a more advanced country.

Reference

Six Lifestyle Changes to Help Control Your Diabetes. (n.d.). Retrieved December 3, 2019, from <https://www.webmd.com/diabetes/diabetes-lifestyle-tips>

Eight Tips to Ease the Stress of Diabetes Management | Everyday Health. (n.d.). Retrieved December 4, 2019, from <https://www.everydayhealth.com/hs/type-2-diabetes-live-better-guide/ease-the-stress-of-diabetes-management/>

Anjana, R. M., Pradeepa, R., Deepa, M., Datta, M., Sudha, V., Unnikrishnan, R., ... Mohan, V. (2011). Prevalence of diabetes and prediabetes (impaired fasting glucose and/or impaired glucose tolerance) in urban and rural India: Phase i results of the Indian Council of Medical Research-India DIABetes (ICMR-INDIAB) study. *Diabetologia*, *54*(12), 3022–3027. <https://doi.org/10.1007/s00125-011-2291-5>

Cardiovascular Disease and Diabetes | American Heart Association. (n.d.). Retrieved January 4, 2020, from <https://www.heart.org/en/health-topics/diabetes/why-diabetes-matters/cardiovascular-disease--diabetes>

Causes of diabetes. (2009, May 15). *Practitioner*. CMP Information Ltd. https://doi.org/10.2210/rcsb_pdb/gh/dm/about/causes-of-diabetes

Changing Diabetes Barometer In Bangladesh - Assignment Point. (n.d.). Retrieved January 18, 2020, from <https://www.assignmentpoint.com/science/health/changing-diabetes-barometer-in-bangladesh.html>

David, A. M., Rubio, J. M. C., Luces, P. S., Zabala, R. V, & Roberto, J. P. (2010). Getting the patients' perspective: a survey of diabetes services on Guam. *Hawaii Medical Journal*, *69*(6 Suppl 3), 45–49. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/20540002>

Di Cesare, M., Khang, Y. H., Asaria, P., Blakely, T., Cowan, M. J., Farzadfar, F., ... Ezzati, M. (2013). Inequalities in non-communicable diseases and effective responses. *The Lancet*. Lancet Publishing Group. [https://doi.org/10.1016/S0140-6736\(12\)61851-0](https://doi.org/10.1016/S0140-6736(12)61851-0)

Diabetes: Does alcohol and tobacco use increase my risk? - Mayo Clinic. (n.d.). Retrieved December 5, 2019, from <https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/expert-answers/diabetes/faq-20058540>

Diabetes - Symptoms and causes - Mayo Clinic. (n.d.). Retrieved December 4, 2019, from <https://www.mayoclinic.org/diseases-conditions/diabetes/symptoms-causes/syc-20371444>

Diabetes & Treatment, Type 1 & 2: Medications, Guidelines & Diet. (n.d.). Retrieved December 5, 2019, from https://www.medicinenet.com/diabetes_treatment/article.htm#diabetes_type_1_and_type_2_definition_and_facts

Diabetes and Alcohol | Effects of Alcohol on Diabetes. (n.d.). Retrieved December 5, 2019, from <https://www.webmd.com/diabetes/guide/drinking-alcohol>

Diabetes and Alzheimer's: What's the link? (n.d.). Retrieved January 17, 2020, from <https://www.medicalnewstoday.com/articles/324458.php#5>

Diabetes and Foot Problems | NIDDK. (n.d.). Retrieved January 5, 2020, from <https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/foot-problems>

Diabetic Eye Disease | NIDDK. (n.d.). Retrieved January 4, 2020, from <https://www.niddk.nih.gov/health-information/diabetes/overview/preventing-problems/diabetic-eye-disease>

Diabetic Nephropathy | Diabetic Kidney Disease | MedlinePlus. (n.d.). Retrieved January 5, 2020, from <https://medlineplus.gov/diabetickidneyproblems.html>

Diabetic Neuropathy: Treatment, Symptoms, Causes. (n.d.). Retrieved December 27, 2019, from <https://www.healthline.com/health/type-2-diabetes/diabetic-neuropathy#causes>

Dunger, D. B., & Ahmed, M. L. (2007). Diabetes. In *Growth Disorders, Second Edition*. <https://doi.org/10.7748/ns.31.19.64.s46>

Gangrene and Diabetes: Understanding the Link. (n.d.). Retrieved January 17, 2020, from <https://www.healthline.com/health/gangrene-diabetes>

Gestational diabetes - NHS. (n.d.). Retrieved November 29, 2019, from <https://www.nhs.uk/conditions/gestational-diabetes/>

Glaucoma and Diabetes | BrightFocus Foundation. (n.d.). Retrieved January 4, 2020, from <https://www.brightfocus.org/glaucoma/article/glaucoma-and-diabetes>

International Diabetes Federation. (1955). In *The Lancet* (Vol. 266, pp. 134–137). [https://doi.org/10.1016/S0140-6736\(55\)92135-8](https://doi.org/10.1016/S0140-6736(55)92135-8)

International Diabetes Federation - What is diabetes. (n.d.). Retrieved November 22, 2019, from https://www.idf.org/aboutdiabetes/what-is-diabetes.html?gclid=Cj0KCQIAiNnuBRD3ARIsAM8Kmlsj8HP2kkVbdohiTLUE13txaOjx0PuTbWHDUXK5gkb1QX2uRL5GHsaAjzeEALw_wcB

International Diabetes Federation (IDF). IDF Diabetes Atlas 6th Edition. 2013 [cited 2014 March 01]. (n.d.). Retrieved December 27, 2019, from https://www.idf.org/sites/default/files/EN_6E_Atlas_Full_0.pdf

Islam, M. R., Arslan, I., Attia, J., McEvoy, M., McElduff, P., Basher, A., ... Milton, A. H. (2013). Is Serum Zinc Level Associated with Prediabetes and Diabetes?: A Cross-

Sectional Study from Bangladesh. *PLoS ONE*, 8(4), e61776.
<https://doi.org/10.1371/journal.pone.0061776>

Katulanda, P., Constantine, G. R., Mahesh, J. G., Sheriff, R., Seneviratne, R. D. A., Wijeratne, S., ... Matthews, D. R. (2008). Prevalence and projections of diabetes and pre-diabetes in adults in Sri Lanka - Sri Lanka Diabetes, Cardiovascular Study (SLDCS). *Diabetic Medicine*, 25(9), 1062–1069. <https://doi.org/10.1111/j.1464-5491.2008.02523.x>

Kayyali, R., Slater, N., Sahi, A., Mepani, D., Lalji, K., & Abdallah, A. (2019). Type 2 Diabetes: how informed are the general public? A cross-sectional study investigating disease awareness and barriers to communicating knowledge in high-risk populations in London. *BMC Public Health*, 19(1), 138. <https://doi.org/10.1186/s12889-019-6460-7>

Kidney Disease (Nephropathy) | ADA. (n.d.). Retrieved January 5, 2020, from <https://www.diabetes.org/diabetes/complications/kidney-disease-nephropathy>

Knip, M. (2011). Pathogenesis of type 1 diabetes: Implications for incidence trends. In *Hormone Research in Paediatrics* (Vol. 76, pp. 57–64). <https://doi.org/10.1159/000329169>

Mayo, C. (2019). Type 2 diabetes - Symptoms and causes - Mayo Clinic. Retrieved from <https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/symptoms-causes/syc-20351193>

Medication Management | ADA. (n.d.). Retrieved December 5, 2019, from <https://www.diabetes.org/diabetes/medication-management>

Mohiuddin, A. (2019). Diabetes Fact: Bangladesh Perspective. *International Journal of Diabetes Research*, 2(1), 14–20. <https://doi.org/10.17554/IJDR.V2I1.2457>

PDB-101: Global Health: Diabetes Mellitus: About: Causes of Diabetes. (n.d.). Retrieved December 5, 2019, from <http://pdb101.rcsb.org/global-health/diabetes-mellitus/about/causes-of-diabetes>

Pollreisz, A., & Schmidt-Erfurth, U. (2010). Diabetic Cataract—Pathogenesis, Epidemiology and Treatment. *Journal of Ophthalmology*, 2010, 1–8. <https://doi.org/10.1155/2010/608751>

Rahman, M. M., Akter, S., Jung, J., Rahman, M. S., & Sultana, P. (2017). Trend, projection, and appropriate body mass index cut-off point for diabetes and hypertension in Bangladesh. *Diabetes Research and Clinical Practice*, 126, 43–53. <https://doi.org/10.1016/j.diabres.2017.01.008>

Rahman, M. S., Akter, S., Abe, S. K., Islam, M. R., Mondal, M. N. I., Rahman, J. A. M. S., & Rahman, M. M. (2015). Awareness, Treatment, and Control of Diabetes in Bangladesh: A Nationwide Population-Based Study. *PLOS ONE*, 10(2), e0118365. <https://doi.org/10.1371/journal.pone.0118365>

Saquib, N., Saquib, J., Ahmed, T., Khanam, M. A., & Cullen, M. R. (2012). Cardiovascular diseases and Type 2 Diabetes in Bangladesh: A systematic review and meta-analysis of studies between 1995 and 2010. *BMC Public Health*, 12(1). <https://doi.org/10.1186/1471-2458-12-434>

Simpson, D. M., Robinson-Papp, J., Van, J., Stoker, M., Jacobs, H., Snijder, R. J., ... Katz, N. (2017). Capsaicin 8% Patch in Painful Diabetic Peripheral Neuropathy: A Randomized, Double-Blind, Placebo-Controlled Study. *Journal of Pain*, 18(1), 42–53. <https://doi.org/10.1016/j.jpain.2016.09.008>

Skin Complications | ADA. (n.d.). Retrieved January 15, 2020, from <https://www.diabetes.org/diabetes/complications/skin-complications>

Type 1 diabetes - Symptoms and causes - Mayo Clinic. (n.d.). Retrieved December 5, 2019, from <https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/symptoms-causes/syc-20353011>

Type 2 diabetes - Diagnosis and treatment - Mayo Clinic. (n.d.). Retrieved December 5, 2019, from <https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/diagnosis-treatment/drc-20351199>

Type 2 Diabetes and Exercise - Exercise Makes It Easier to Control Your Diabetes. (n.d.). Retrieved December 5, 2019, from <https://www.endocrineweb.com/conditions/type-2-diabetes/type-2-diabetes-exercise>

What is Insulin? - Important hormone allows your body to use sugar (glucose). (n.d.). Retrieved November 22, 2019, from <https://www.endocrineweb.com/conditions/type-1-diabetes/what-insulin>

ANNEX

Questionnaire for Survey

Diabetes Relation with People's Lifestyle

Name:
Age:
Educational Background:
Occupation:

1. I exercise regularly?

- Yes
- No

2. If I do, what type of exercise?

- Gym
- Jog
- Cardio
- Calisthenics
- Outdoor play
- Swimming
- Cycling
- My work has high physical activities

- I don't exercise regularly because.....
- I am not able to exercise because.....
- I exercise sometimes.....

3. I consume high sugar added foods?

- Yes
- No
- Sometimes

4. How many times in a week

-

5. Have I been hospitalized for any complication before?

- Diabetes
- High pressure
- Shortness of breath
- GI problem
- Others.....

6. I consider eating vegetables over other food?

- Yes
- No

7. Do I have diabetic patient in your family?

- Yes
- No

8. Have I ever attended a session with a dietitian?

- Yes
- No

9. What type of diet I follow

- No particular diet
- Strict carbohydrate diet counting
- Rich foods with high fat
- Too much sugary food

10. My knowledge about diabetes.

- I do not know what it is
- I do not know complications regarding diabetes
- I know but do not care
- Diet/exercise can help us maintain diabetes. I agree

11. Am I a smoker?

- Yes
- no

Side Effects

1. I have eye problem

- Yes
- No

2. I have had a urine test for diabetic kidney complication.

- Yes
- No

3. I have had problem with my feet

- Sores
- Ingrown toenail
- Numbness
- Fungus
- Loss of feelings
- Others
- I cut my toenails without trouble
- I cut my toenails with trouble
- Someone else cut my toenails

4. My heart conditions

- I have had heart attack
- I have high cholesterol
- I have high blood pressure
- I have family history of high blood pressure

5. My teeth and gum condition

- Go to dentist time to time
- I have teeth and gum problem

6. I have other side effects

.....

MEDICATION

1. What type of medication do I use?
 - Oral
 - Subcutaneous
 - Others.....
2. I take my medication time to time
 - Yes
 - No
3. I frequently forget to take medication
 - Yes
 - No
4. For insulin users only

Shots given at the following location

- Abdomen
- Arm
- Hip
- Thigh