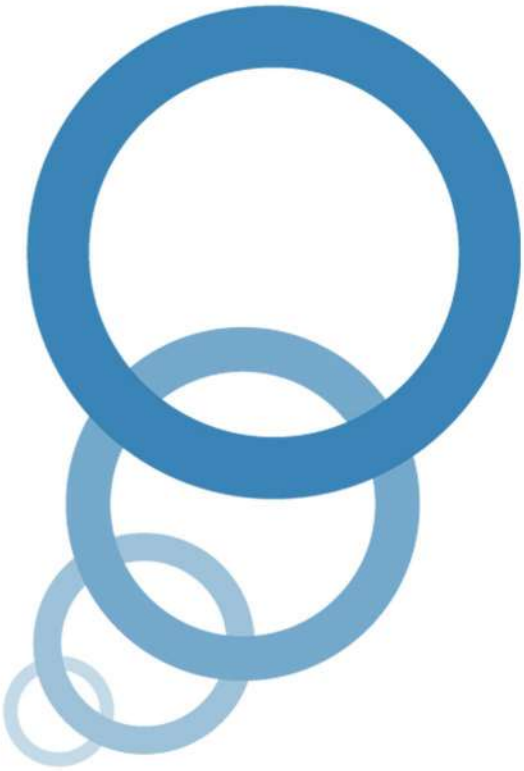
Assessment of Diabetic Mellitus Awareness:

An Empirical Analysis among the Students in Saudi Arabia



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Abeer Medical Group

Assessment of Diabetic Mellitus Awareness:

An Empirical Analysis among the Students in Saudi Arabia

Chairman
Mr. Alungal Mohammed, Chairman, Abeer Medical Group

Main Author
Dr. Jemshith Ahmed, Vice President, Strategic Planning, Abeer Medical Group

Co-Authors
Dr. Mahira, Executive Director, Abeer Medical Group
Dr. Ahmed, Executive Director, Abeer Medical Group
Dr. Ajiza, MBBS student, International Medical University, Malaysia

Principal Investigator
Mr. Rashid Gazzali, Group Consultant, Learning and Development, Abeer Medical Group

Chief Analyst and Researcher
Mr. Muhammedali K A, Director, ABN Research and Development

Data Administration
Mr. Basim Gazzali, Director, Strategic Planning, ABN Research and Development

Report Reviewers
Dr. Sayid Aboobacker, Life Care Medicines, BHMS, MD-Acu (BBHMC, Bangalore)
Dr. Dahy Sulaiman, Department of Public Health, Central University of Kerala
Mr. Najeeb K.K, Senior Research Scholar (Economics), IIT Ghorakpur
Mr. Kunhi Krishnan.V, Research Assistant, Kerala State Planning Board, Trivandrum
Mr. Jomit C.P, Research Scholar, Dept. of Economics, Central University of Kerala
Mr. Abdul Azeez K.K, Medical Care Provider, JIPMER, Pondicherry
Mr. Fasil O.K, Research Scholar, Computer Science, Central University of Kerala
Mrs. Vidya P.V, Research Scholar, Dept. of Economics, Central University of Kerala

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Mr. Md Noor Rahman Sheikh (Consul General of India in Jeddah), Mr. Mohammed Shahid Alam (Deputy Consul General of India), Mr. Sayed Masood Ahmed (Principle IISJ), Mr.Mohammed Ali (Principle JAIS), Mr. Asif Rameez Dawoodi (Former Chairman Managing Committee, IISJ), Mr. Abdul Rahman Poyakkara (BDM, Abeer Medical Group), Mr. Syed Akbar (Corporate IT Manager, Abeer Medical Group), Mr. Azeem Sait (Former CCO, Abeer Medical Group), Mr.Irshad KM (Secretary to Vice President), Mr. Nandagopal PM (Secretary to Vice President), AND Mr.Mohammed Sabith (Coordinator L&D).

Cover Image
The Blue circle representing the global voice of diabetes (known as Blue Circle Voices – BCV). It is an initiative by the International Diabetic Federation to represent the interests of people living with diabetes, through a worldwide network of members and other stakeholders.

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Alungal Mohammad,
Chairman, Abeer Medical Group

Message

At Abeer, our key mission is to expand awareness on the enhancement of healthy lifestyles intended for the early prevention and detection of diseases. In everything we do, we recognize that success is found in proper and timely awareness. With this initiative, taken up by our corporate team in association with a professional research body, we have taken every opportunity to learn the ground realities on the awareness on diabetes and thus in process lay the foundation to encouraging healthy lifestyle among the members of society in general.

We know that the mortality rate due to diabetes is on an ever increasing growth. Hence, to give awareness to the public about the health hazards of diabetes is very important, particularly in this part of the Arab world. This report showcases the understanding and beliefs on the ground about the diabetes, which I am sure will serve well to those aiming to eliminate and prevent the threat of diabetes in the society. Abeer with its mission of preventive healthcare could successfully bring out a global awareness in this matter with cooperation from people across all spheres of life. Initiatives like this one, gives us the confidence to come up with an array of health awareness events and campaigns in the near future as well.

Together with our many partners, care-seekers, and stakeholders in every part of the world, Abeer will continue to deliver distinctive health services, seeking prevention and detection of diseases

Dr. Jemshith Ahamed
Vice President, Strategic Planning, Abeer Medical Group

Preface

The Pandemic of Diabetes is spreading its tentacles into every geographical region and socioeconomic strata in the world. It is no more a disease of the affluent and no more limited to the developed countries. Current statistics state that 425 million adults are living with diabetes and the rate of new people being diagnosed is increasing by the hour. At this rate, this number is expected to reach 629 million by 2045. In addition to the above, there are about 1.1 million children diagnosed with Type 1 diabetes.

Diabetes has a bearing not only on the physical and mental aspects of a society, but it also erodes its financial capacity. Estimates show that in 2017, USD 727 Billion USD was spent for diabetes related care, which is about 12% of total spending on adults.

Medical research is progressing to discover novel therapies for the ailment, including pancreatic beta cell transplant, newer insulins and newer drugs. This will aid in better controlling the progress of the disease in an individual. What is needed to stall the steady rise in prevalence is more community-based approaches. The best place to start that is during childhood. Many of our habits, behaviors and customs are molded during our school going ages. As the saying goes “Catch them young”.

We thought about a mechanism to measure the awareness level school going kids about diabetes and its various aspects. With a carefully drafted questionnaire, we were able to confirm our assumptions. With a good program in coordination with community and state participation, educational interventions need to be given at a young age making kids aware of proper food and lifestyle standards to be adopted in their lives so as to curb the pace of spread of diabetes.

Every year World Diabetes day is celebrated on Nov 14th. This is part of an initiative to spread awareness among the public. We joined hands with students of International Indian School Jeddah to set a Guiness world record for the largest human mosaic formed. The image formed was that of the logo for the World Diabetes Day. Coincidently the Indian community observes November 14th as children’s day.

Rashid Gazzali
Group Consultant, Learning and Development, Abeer Medical Group

Forward

Abeer Medical Group is a healthcare organization providing high-end medical services across major cities in Saudi Arabia, Qatar, UAE, and India. For the last 18 years, it stands with innovative explorations and has been at the forefront of healthcare domain. In this very short span of time, Abeer has been fortunate to serve 15 healthcare centers catering to the healthcare needs of more than 4 million people every year. Besides its business endeavors, it undertakes various efforts to make universal healthcare and wellness to encompass hope and inspire the people. *Abeer Assessment of Diabetic Awareness* is an initiative by *Abeer Medical Group* as part of its social responsibility.

According to the various reports of World Health Organization and International Diabetes Federation, diabetes is a chronic health condition that affected half of a billion people and more than 4 million dies due to its complications. Undiagnosed diabetes can cause many diseases such as cardiovascular, loss of eyesight and feelings, kidney related issues, and more. Various studies have projected a tremendous increase in the number of diabetic people in near future. As many of the countries tackles deficit in developmental activities, addressing diabetes is a major challenge. Hence, the diabetes education among the people and making awareness on its cause and complications are better solutions. This study report is an initiative in this regard.

This report is a combined effort of young researchers from Indian Institute of Technologies, Central Universities, Jawaharlal Institute of Postgraduate Medical Education & Research, and Kerala Planning Board. The analysis of the report is carried out by using innovative econometric techniques such as Multinomial Logistic Regression and Pearson's Correlations. The fact and figures found in the report reminds us that there is an urgent need for collective efforts, commitment, and private-public partnership to tackle the diabetes epidemic. I hope this report would be a beginning for the same.

With Love

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Abbreviations

UN	-	United Nations
IDF	-	International Diabetic Federation
MLRA	-	Multinomial Logistic Regression Analysis
US	-	United States
mg/dl	-	Milligrams per Decilitre
mmol/L	-	Millimoles per Litre
BMI	-	Body Mass Index
DM	-	Diabetes Millet
DME	-	Diabetic Macular Edema

Executive Summary

- Diabetes is possibly a budding epidemic of 21st century. Day-to-day, the number of diabetic patients are growing with an increasing trend. Since it is the fourth leading cause of death in many countries and leads to habitual sickness, it is not just a health crisis; but a global societal devastation which drives families into poverty due to its chronic nature. As many of the world countries are still lacking resource in every aspect of the development, governments may struggle to meet the cost of diabetic care and the financial burden will continue to expand due to the growing number of diabetic people. So *'an ounce of prevention is worth a pound of cure'* in this regard. Giving diabetic awareness and educating future generation are the possible ways. Thus, there is a growing need for intervention to improve people's knowledge and awareness on diabetes. Hence, this study examines diabetes awareness, its risk factors, and complications.

- To assess the awareness among the students, a comprehensive questionnaire is prepared and collected data from the students. Statistical tools are used to validate and analyze data. For better understanding, this report categorized into four major sections, namely, Diabetes Education, Awareness on the causes of Diabetes, Awareness on symptoms of Diabetes and Awareness on complications of Diabetes. Crosstabs and Multinomial Logistic Regression Analysis were carried out in the analysis to validate the variations and differences among the categorical variables. The significance level fixed at 95 percent at a p-value less than 0.05 ($p<0.05$). The summary of the analysis are follows:

- Only 54 percent of the students are aware of the fact that the kidney is not an insulin-producing organ. This awareness is not the same among the categories such as *gender*, *age group* and *family history of diabetes*, where males, higher aged students and students whose families have diabetes have more awareness.

- Among the total students, 47 percent have awareness on diabetes cure. Still, there is a debate on diabetes cure; it is proved that the complications of diabetes can be reduced. The crosstab analysis shows a difference in awareness among the *age group* and *family history of diabetes*, however, only *family history of diabetes* is statistically

significant. It shows that this awareness is low among the students those family had diabetes.

- Healthy diet and exercise are more important than medication to control and prevent complications of diabetes. However, only 49 percent of the students know this fact. There is a remarkable difference in this awareness among *age group, gender, exercising students, gadgets using students* and among different *BMI*. However, the only *gender* is statistically significant where the lower age group have more awareness than the higher age group.

- The best way to detect diabetes is testing of sugar level in blood. There is a biological reference for lower, normal and higher blood sugar level and this is the basic awareness on diabetes. However, 55 percent of the students are not aware of it. The crosstab analysis shows that this awareness is varied among the *physical activities* and *family history of diabetes* students. But, only *family history of diabetes* is statistically significant which shows that the awareness is more among the students whose family have diabetes.

- Types of diabetes and its reasons are major aspects of diabetes educations. However, only 39 percent of the students are aware of it. This awareness varies among *age group, gender,* and *physical activities*. However, only *age group* is statistically significant. It shows that higher age group have more awareness than lower age group.

- The low blood sugar level has similar complication as high blood sugar. The lower blood sugar health condition is known as Hypoglycaemia. Only 34 students are aware of it and there is no statistically significant difference in awareness among the categorical variables except in the *physical activity*. The result shows a negative correlation between exercise and awareness.

- Eating sugar or sweet foods may not lead to diabetes if the body responds accordingly. But 81 percent of the students believe that eating sugar and sweets cause to diabetes. Moreover, 50 percent of the students wrongly believe that diabetes diet mostly consists of special foods. The crosstab result shows that this awareness is not the same among the different *age groups*, *gender,* and *BMI* where higher aged

students, males and higher BMI students are more aware of it. But, these differences are statistically not significant.

- The usual cause of diabetes is the lack of effective insulin in the body which is the basic understanding on diabetes. Among the surveyed students, 62 percent are aware of it. It is found that this awareness is high among the higher aged groups, males, normal and higher BMI students, more exercising students and among the students whose family have diabetes. All the MLRA results are statistically significant also.

- Kidney failure is a major complication of diabetes, but kidney failure does not lead to diabetes. Among the surveyed students, 44 percent of the students know about this and 22 percent believe that kidney failure has an impact on diabetes. The crosstab analysis found that this awareness is more among the higher aged groups, males, higher physical exercising students and among the students whose family have diabetes. However, the MLRA result shows that crosstab analysis is statistically significant only in the *age group*.

- The diabetes issues can be inherited and there are many studies which exclusively confirmed it. However, less than half of the students are aware of it and 25 percent believe that it will not be inherited. This awareness is almost same in all categorical variables except in *gender* and *family history of diabetes*, where males and students those family have diabetes, have higher awareness. However, this result is statistically not significant at p-value greater than 0.05.

- Physical exercise has a significant positive effect on insulin sensitivity, where higher exercise reduces the level of glucose. However, 35 percent of the surveyed students wrongly believe that regular exercise increases the need for insulin and other diabetic medications. This awareness is slightly varied among all the categories of independent variable but there is no statistical significance.

- In untreated diabetes, the amount of sugar usually increases. While students were asked about untreated diabetes and the level of sugar in the blood, 71 percent of the students responded that blood sugar level increase in undiagnosed diabetes. This awareness is slightly varied among the categorical variables, especially among the *gender*, *BMI* and *time spent on gadgets*. However, all the results are statistically not

significant except in *time spent on gadgets* and *physical activities*. It shows that awareness is more among the higher exercising and moderate gadget using students.

- The best way to check the diabetes is testing the blood, rather urine. However, 35 percent of the students wrongly believe that urine is the best way of diabetes checkup. This awareness is slightly varied among all the categories without statistical significance except in the *family history of diabetes*. The MLRA result shows that the students those families have diabetes, have more awareness on the right way of diabetes testing which is statistically significant also.

- Diabetic people should take extra care when cutting their toenails because cuts and abrasions will heal slowly. Only 46 percent of the students are aware of it. The usage of iodine or alcohol to clean and prevent bacteria can harm the tissue and delay healing. The right way to clean a minor wound is with cool running water and mild soap. However, 40 percent of the students believe that iodine and alcohol are better in cleaning the cuts and abrasions. The crosstab analysis found that this awareness is varied among the *age groups*, *gender*, *physical exercising students*, *time spent on gadgets*, *family history of diabetes* and *BMI*. The awareness is more among the higher age groups, males, more exercising students, moderate gadget using students, normal BMI students and among the students whose family have diabetes. However, the MLRA shows that the crosstab result is statistically significant only in *age groups*, *time on gadgets* and *family history of diabetes*.

- Among the surveyed students, only 18 percent have identified the sign of low blood sugar and around half of them are identified the different signs of high blood sugar. The crosstab analysis of awareness on signs of low blood sugar found a small variation among the all categorical variables. But, only the *gender category* is statistically significant where males have more awareness than females. On the other hand, the crosstab analysis of awareness on signs of high blood sugar found a higher awareness among all the categories with small variation, but all are statistically not significant except in *physical activities*.

- Among the total students, 42 percent of them have awareness regarding the relationship between diabetes and blood circulation. This awareness among the different categories is slightly varied especially in *age* and *family history of diabetes*.

The crosstab and MLRA analysis reveal that awareness is more among the low aged groups and among the students whose family have diabetes. The test is statistically significant at a p-value less than 0.05.

- There is no biologically proved evidence to the association between diabetes and cancer and the biological links between these two diseases are incompletely understood. However, 47 percent of students are not aware of this. The crosstab and MLRA result shows that there is small variation among the all categorical variables, however, the difference in the *age group* is only statistically significant. It found that the awareness more among the higher age group with exp(B) value 0.662.

- The people with diabetes can possibly affect the eye and kidney-related complications. However, less than half of the students are aware of it. The crosstab and MLRA analysis found that there is a statistically significant variation among the different *age groups*, *BMI categories* and *family history of diabetes*. The result shows that awareness is more among the higher age group, normal and higher BMI students and among the students whose families have diabetes.

- Loss of sensation in feet and hands are the most common complications of chronic diabetes. However, only 41 percent of the surveyed students are aware of it. The awareness on loss of sensation due to diabetes does not vary among the categorical variables except in *gender*. The crosstab and MLRA found that males have more awareness than females with statistical significance.

- The diabetic people need to avoid tight elastic shoes and socks and 33 percent of the students are aware of it. This awareness is not much varied among the categorical variables except in *gender* category. The crosstab analysis found that there is a small difference among the male and females where males have more awareness than female and it is statistically significant at p-value 0.025 which is less than 0.05.

Table: 1

Awareness Index among the Students in Saudi Arabia

Table: 1
Awareness Index among the Students

Marks Scored	Index	No. of Students	Percent of Students
0	0	29	0.88
1	4	20	0.61
2	8	30	0.91
3	12	39	1.19
4	16	49	1.49
5	20	86	2.62
6	24	121	3.68
7	28	205	6.23
8	32	267	8.12
9	36	330	10.04
10	40	368	11.19
11	44	366	11.13
12	48	362	11.01
13	52	307	9.34
14	56	234	7.12
15	60	161	4.90
16	64	108	3.28
17	68	95	2.89
18	72	44	1.34
19	76	37	1.13
20	80	15	0.46
21	84	10	0.30
22	88	2	0.06
23	92	2	0.06
25	100	1	0.03
Total		3288	100.00

Fig: 1
Awareness Index (%)

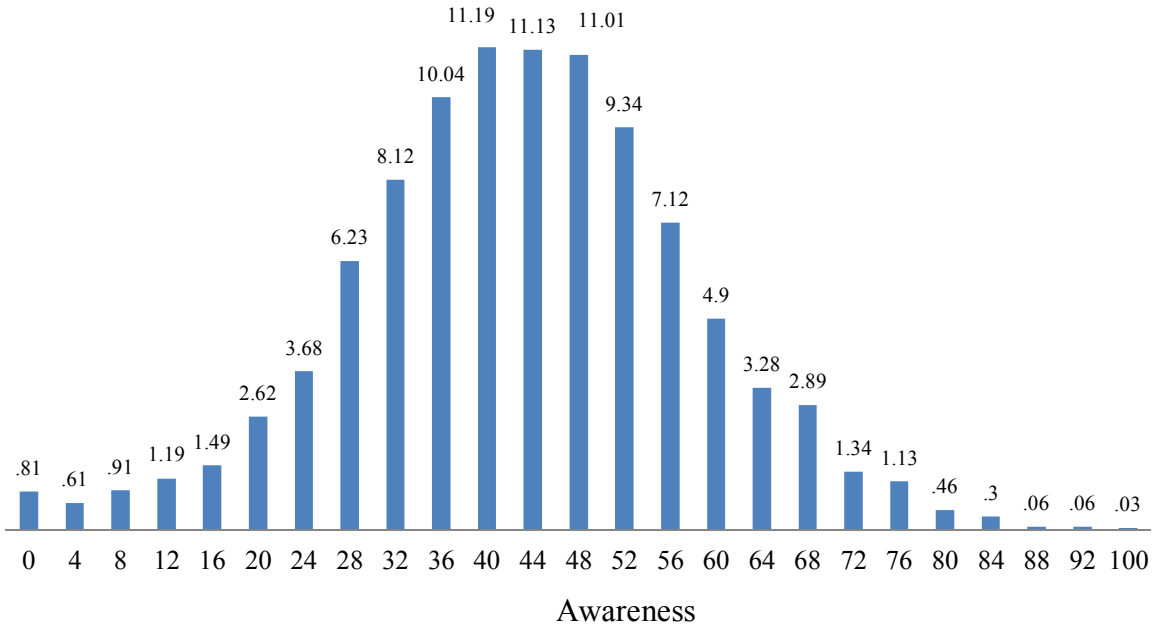


Fig: 6.1, the index of awareness is explained in X-axis and the percentage of students in Y-axis. It reveals that there are 0.030 percent of students who got an index of 100 and there are 0.81 percent of students who got 0 indexes.

Fig: 2
Awareness Index

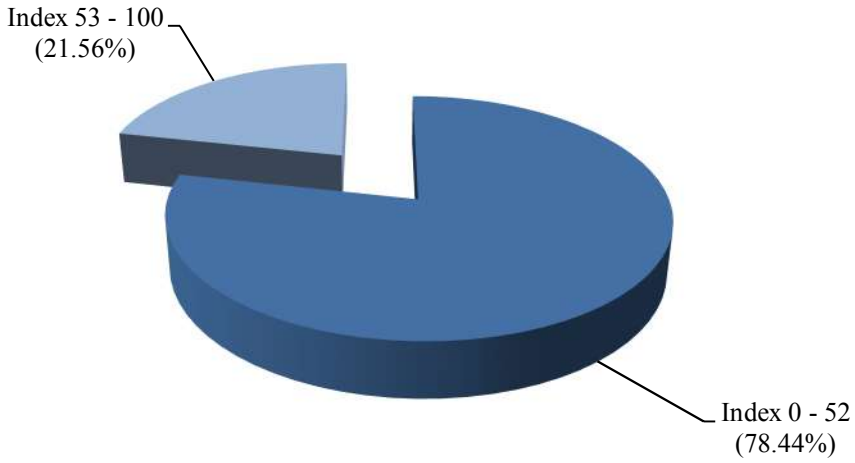
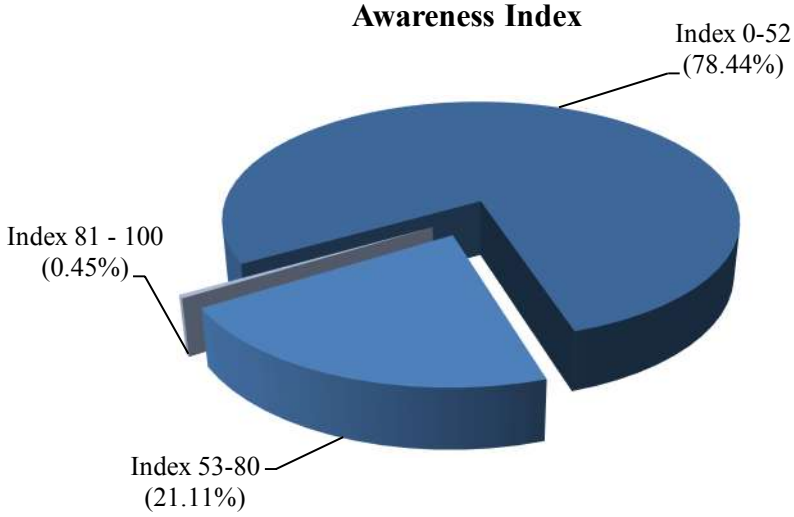


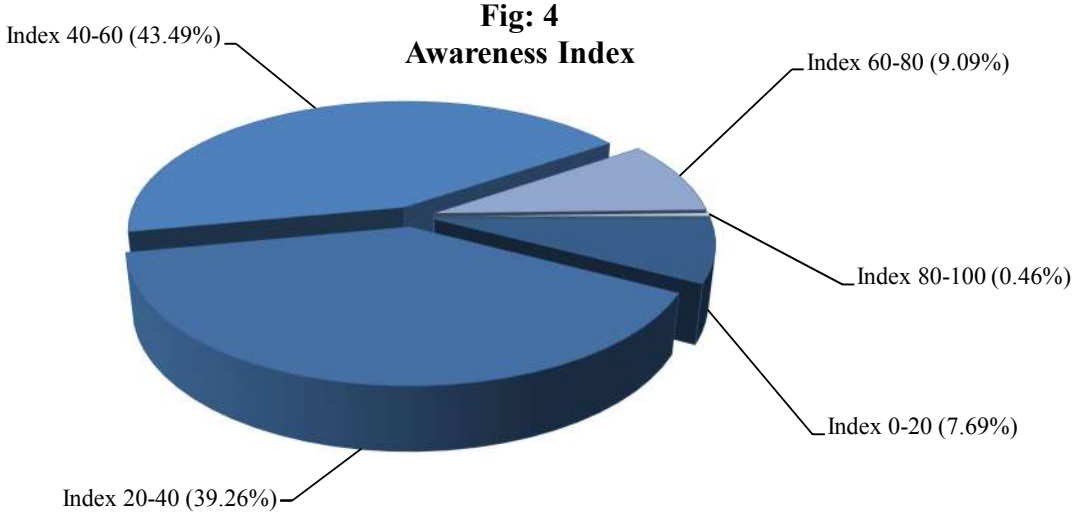
Fig: 2 shows that 78.44 percent of the students got an index below 52 and only 21.56 percent have an index above 53.

Fig: 3
Awareness Index



The Fig: 3 shows the percentage of students who got an awareness index above 80, which is less than half percentage (0.45%). The Fig: 4 shows different categories of index and its corresponding percentage of students.

Fig: 4
Awareness Index



CHAPTER 1

Assessment of Diabetic Mellitus Awareness:
An Empirical Analysis among the Students in Saudi Arabia

Chapter 1

Assessment of Diabetic Mellitus Awareness: An Empirical Analysis among the Students in Saudi Arabia

1.1 Introduction

Diabetes Mellitus or Diabetes is a chronic health condition that occurs when the human body does not produce enough insulin hormones to control an increased glucose level in the blood. It also arises when the body cannot effectively use the insulin produced[1]. Insulin is an essential hormone produced from the pancreas, which converts glucose into energy and transports into the body's cells through the blood circulatory system. The insufficient supply of insulin from pancreas or the inability of the blood cells to respond to insulin hormone leads to increased concentration of glucose in the blood. This health condition is known as hyperglycemia, more commonly, diabetes. Undiagnosed hyperglycemia over a long period can damage and disable the functioning of many organs and makes complications such as Kidney diseases, Eye diseases, and Cardiovascular diseases. According to UN and IDF reports, diabetes was the direct cause of 1.5 million deaths in 2012[2] and 4 million death in 2017[3].

Generally, *hyperglycemia* or *diabetes* is classified into two major categories; Type-1 and Type-2. There is a third type of diabetes, which is called Gestational Diabetes. Type-1 diabetes (also known as *insulin-dependent* or *juvenile diabetes* or *childhood-dependent diabetes*) is a health condition that the pancreas cannot produce sufficient insulin hormone in the body to convert blood sugar into energy. It is an autoimmune condition in which the body's immune system destroys the insulin-producing beta cells in the pancreas[4]. Abnormal thirst and dry mouth, sudden weight loss, bed wetting, frequent urination, blurred vision, constant hunger and lack of energy are the common symptoms of Type-1 diabetes. It is the less common type of diabetes and it accounts for less than 10 percent of total diabetes. According to IDF Diabetes Atlas (2018), United States is the top country with type-1 diabetic

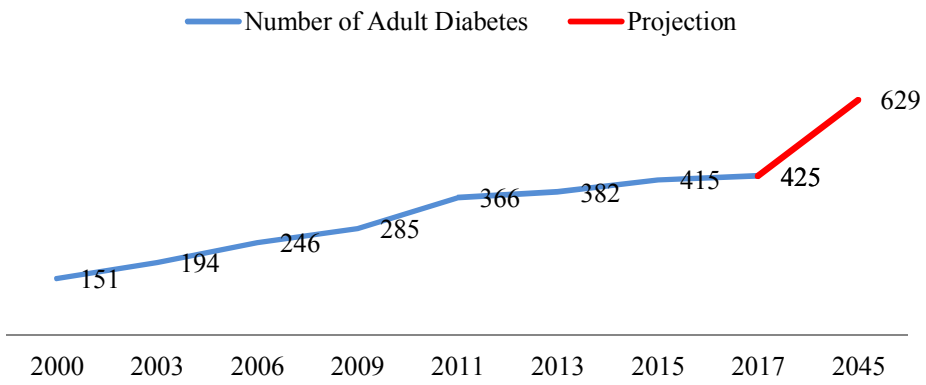
[1] http://www.un.org/en/events/diabetesday/background.shtml
[2] http://www.who.int/features/factfiles/diabetes/en/
[3] World Diabetic Federation, https://www.worlddiabetesday.org/
[4] https://www.diabetesaustralia.com.au/type-1-diabetes

issues followed by India and Brazil. Kingdom of Saudi Arabia holds 8th position in the prevalence of type-1 diabetes.

Type-2 diabetes (also known as *non-insulin dependent* or *adult-onset diabetes*) is the most common type of diabetes which accounted for more than 90 percent of diabetes cases. It caused by body's ineffective use of insulin or insufficient production of insulin which often results from inactive physical exercise, poor diet, and obesity. As a result, the level of glucose in the blood becomes too high. This condition is known as *insulin resistance* because the body cannot respond fully to the insulin hormones. Excessive thirst and dry mouth, slow healing wounds, blurred vision, frequent and abundant urination, recurrent fungal infections in the skin and lack of energy and extreme tiredness are the symptoms of type-2 diabetes.

The third type of diabetes is *Gestational Diabetes* or *Hyperglycaemia* in Pregnancy. It affects pregnant women usually during the second and third trimesters of pregnancy due to an autoimmune insulin resistance mechanism. The risk of Gestational diabetes resolves after the pregnancy, however, there is a chance of developing type-2 diabetes within 5-10 years of delivery[5].

Fig: 1.1
Growth in the Number of Adult Diabetes (Million)



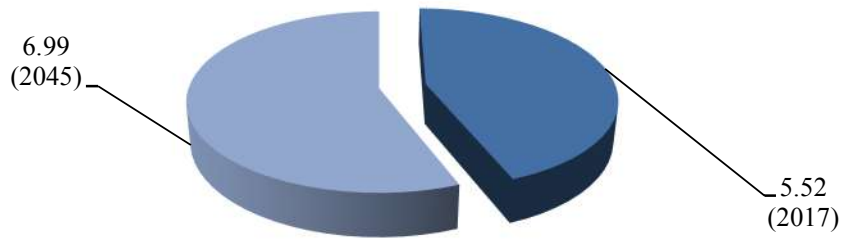
Source: IDF Diabetes, 2018

Diabetes can develop in child or adult at any stages of life, including infants and toddlers. Type-1 diabetes often develops quickly and may be life-threatening if not diagnosed early. Currently, 425 million adults suffer diabetic related issues across the world and are projected to increase to 629 million adults by 2045. The uncontrolled diabetes affects most of the body parts and lead to severe complications and death if not appropriately treated.

[5]IDF Diabetes Atlas - 8thEdition, 2018

According to International Diabetic Federation (2018) there are nearly half billion people live with diabetes and more than half of them are undiagnosed. The surprising fact is that most of them are completely unaware of the condition. The report also shows that the low- and middle-income countries carry almost 80 percent of the diabetes issues[6]. Rapid urbanization, unhealthy diets and increasing inactive lifestyles of the people, resulted in higher rates of diabetes in many countries. According to the recent reports by IDF, the proportion of diabetic people in the total population is increased extremely and it would increase by more than 25 percent in near future. So, addressing the diabetic related health problems may be the prime challenge in developing and underdeveloped countries.

Fig: 1.2
Ratio of Total Diabetes to Total Population



Source: IDF Diabetes, 2018

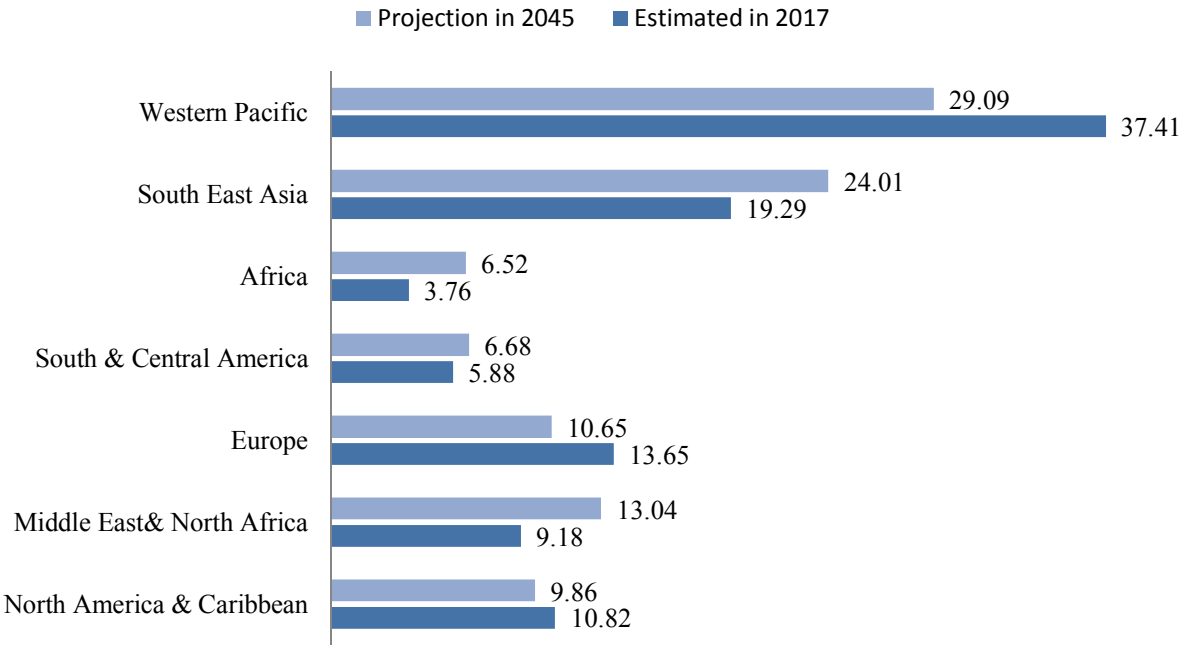
According to IDF statistics, there are 425 million diabetic patients in the world in which 37.41 percent are from the Western Pacific region (IDF, 2018). The Western Pacific region represents 22 countries including Australia, China, New Zealand, Japan, Malaysia, and Korea. South East Asia is the second largest diabetic populous region which accounts 19.29 percentage of total diabetes. This region represents 7 countries including India, Bangladesh, and Sri Lanka. Europe and North America are the third and fourth most populous diabetic regions which account 13.65 and 10.82 percent of the total diabetic cases respectively.

If diabetes is not diagnosed accordingly, it can cause serious damage to whole organs of the body. One of the major complications of uncontrolled diabetes is cardiovascular diseases. According to IDF (2018), globally, 25 percent of the diabetes patients struggle with the consequence of cardiovascular complications. In addition, Diabetes damages the blood vessels of the light-sensitive tissue at the back of the eye. This condition is called diabetic

[6]World Diabetic Federation, https://www.worlddiabetesday.org/

retinopathy and mostly seen in the working population. Moreover, the prevalence of an end-stage renal disease is up to ten times higher in people with diabetes. Pregnant women with diabetes are at increased risk of maternal and foetal complications. Hence, the International Diabetic Federation intensely draws attention to its early detection.

Fig: 1.3
Region wise number of People with Diabetes (Million)



Source: IDF, Atlas 2018

Uncontrolled sugar in the blood is the major cause of cardiovascular complications, including coronary artery diseases, heart attacks and narrowing arteries. It will damage Kidneys and nerves causing tingling, numbness, burning sensation, and body pain. Decreased flow of blood to the feet, skin problems and gastroparesis are the other major consequence of undiagnosed diabetes. According to Kue and Cameron (2000), individuals with undiagnosed diabetes had an unfavorable lipid profile, higher blood pressure, and obesity indices than normal glycemic individuals.

However, the number of undiagnosed diabetic people is increasing every year across the countries. It was one-third of all diabetic cases in 2000 which increased to more than half of

all diabetic cases[7] in 2017. The ignorance of signs of diabetes can be a prime reason for increasing number of undiagnosed diabetes.

Table: 1.1

The proportion of diabetes cases undiagnosed (in Millions)

Sl No	Region	Number of Persons with Diabetes undiagnosed
1	North America & Caribbean	30-59
2	Middle East& North Africa	30-59
3	Europe	30-59
4	South & Central America	30-59
5	Africa	<29
6	South East Asia	60-89
7	Western Pacific	>90

Source: IDF Diabetes Atlas - 8th Edition, 2018

The warning sign of diabetes includes excessive thirst, frequent urination, lack of energy, blurred vision, slow-healing wounds, and numbness in the feet and/or hands[8]. According to Nam (2018), diabetes can be easily missed or mistaken for something else and this leads people to serious health consequences. It can become a life-threatening disease and destructive complications if not diagnosed appropriately. Higher diabetic prevalence can be controlled, particularly type-2, by educating the public about the signs and symptoms of diabetes. Accordingly, they could take up a healthier lifestyle and necessary treatments. Type-1 diabetes is still a death sentence in many of the developing and underdeveloped countries. In addition, many people with type-2 diabetes are diagnosed too late when complications are present.

The lack of awareness is a major reason for ignoring the warning signs of diabetes. Globally, four-in-five adults failed to identify the warning signs of diabetes because of its milder signs in type 2 diabetes, which is the most prevalent form of diabetes and responsible for around 90 percent the diabetes issues. In addition, every four-in-five parents would have trouble in recognizing the warning signs of diabetics in their children's. Moreover, every one-in-three

[7]T. Kue Young and Cameron A. Mustard (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC80628/)& IDF(2017)
[8]World Diabetic Federation, https://www.worlddiabetesday.org/about-wdd/wdd-2018-19.html

diabetic patients would not spot them at all and 50 percent of them are undiagnosed[9] (IDF, 2018).

This situation needs to be addressed as a matter of urgency to detect and prevent early. Creating awareness at a young age will help us prepare the new generation about preventive aspects of diabetes. Schools are considered as an ideal location to act as a platform to spread knowledge about the subject.

1.2 Statement of the Research Problem

Diabetes is possibly a budding epidemic of the 21st century. Day-to-day, the number of diabetic patients is growing with an increasing trend. Since it is the fourth leading cause of death in many countries[10] and leads to habitual sickness, it is not just a health crisis; but global societal devastation which drives families into poverty due to its chronic nature. As many of the world countries are still lacking resource in every aspect of the development, governments may struggle to meet the cost of diabetes care and the financial burden will continue to expand due to the growing number of diabetic people. So *'an ounce of prevention is worth a pound of cure'* in this regard. Giving diabetic awareness and educating future generation are the possible ways. Thus, there is a growing need for intervention to improve people's knowledge and awareness of diabetes. Hence, this study examines diabetes awareness, its risk factors, and complications.

1.3 Research Questions

In order to address the above-stated problem, this study intended to respond to the following questions:

1. How many students are aware of diabetes?
2. Does the relationship between students' awareness and knowledge of diabetes vary based on age, sex, region and physical activities?
3. How to make people aware and spread knowledge about diabetes for future generation?

[9]World Diabetic Federation, https://www.worlddiabetesday.org/
[10]https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4803867/

1.4 Objectives of the Study

Considering the stated problem and questions, this study focused on three objectives:

1. To assess the level of awareness regarding diabetes among the students
2. To examine the association between knowledge and awareness of diabetes among the students and compare based on gender, age, BMI, and level of education etc.
3. To find and propose strategies to make aware and extend knowledge about diabetes among the students.

5. Methods of Analysis

The prime objective of the study is to understand diabetes awareness among the students. For the same, the study used a well-prepared questionnaire among the students from Saudi Arabia, India, Pakistan, and Egypt. Children's awareness level measured as *Yes*, *No*, and *Not Sure* (more than two categories) and calculated absolute frequencies and were reported as percentages. Summary statistics and cross-tabs were used accordingly among the categorical and analytical variables. Multinomial Nominal Logistic Regression Model also used to understand the differences in categories. The preferred significant level is 95% at p-value < 0.05 (rejecting H_0).

Multinomial Logistic Regression Model:

The basic question asks in multinomial logistic regression analysis is that how the categorical variables such as *gender, age, BMI, family history of diabetes, time spent on gadgets use* and *physical exercise* are explaining the student's awareness on diabetes.

We have three possible outcomes (K); (1) *Yes*, (2) *No*, and (3) *Not Sure*

For modeling the regression equation, we have K-1 equations. Each equation models the odds of a choice (Exp-B) relative to a baseline or reference. Here, the reference category for MLRA analysis is *'not sure'*. The tow model is explained in below:

$$\text{Log}\left(\frac{P(Respond=Yes)}{P(Respond=Not\ Sure)}\right) = b + b_1\,(gender) + b_2\,(age) + b_3\,(BMI) + b_4\,(Physical\ Activities) + b_5\,(Time\ on\ gadgets) + b_6\,(Family\ status\ of\ DM)$$

$$\text{Log}\left(\frac{P(Respond=No)}{P(Respond=Not\ Sure)}\right) = b + b_1\,(gender) + b_2\,(age) + b_3\,(BMI) + b_4\,(Physical\ Activities) + b_5\,(Time\ on\ gadgets) + b_6\,(Family\ status\ of\ DM)$$

The first model explains that a one unit change (decrease or increase) in any categorical variable (eg. gender) is associated with a change (decrease or increase, depends on wald or z-value) in the log odds of being in student's response *Yes* vs. *Not Sure* in the amount of beta value (b_2 for gender).

The second model explains that a one unit change (decrease or increase) in any categorical variable (eg. gender) is associated with a change (decrease or increase, depends on z-value) in the Log odds of being in student's response *No* vs. *Not Sure* in the amount of beta value (b_2 for gender).

It can also write as:

$$\text{Log}(P(Y=1)|x) / (P(Y=K)|x) = a_1 + b_1x$$

$$\text{Log}(P(Y=K-1)|x) / (P(Y=K)|x) = a_{(K-1)} + b_{(K-1)}x \qquad \text{- Equation (1)}$$

Here, Y is the independent variable (response of students). b_1 measures the changes in the log odds of Y=1 (reference category i.e. *not sure*) relative to Y=K (*Yes* and *No*) associated with a one unit change in x.

$\text{Exp}(b_1)$ is a relative ratio (Odds). If Exp(B)=1.5, then an increase of one unit in x multiplies the odds of Y=1 to Y=K by 1.5.

The reference category for all other categorical variables is listed in Table 1.2.

Table: 1.2

References in MLRA Analysis

Sl No	**Category**	**Reference Category**
1	Gender	*Female*
2	Age	*Higher aged Students*
3	BMI	*Obese*
4	Physical Activity	*Above 6 Hrs*
5	Time on Gadgets	*More than 2 Hrs*
6	Family History of Diabetes	*Yes*

The hypothesis of MLRA is as follows:

H_0 - Null hypothesis -> There is no statistically significant difference in awareness among the categorical variables.

$H_0 = Category_1 = Category_2 = Category_n = 0$

H_1- Alternative hypothesis-> There is a statistically significant difference in awareness among the categorical variables.

$H_1 = Category_1 \neq Category_2 \neq Category_n \neq 0$

Measurement of Awareness Index

The following equation is used to measure awareness index.

$$\text{Awareness Index} = \frac{\sum Marks\ Scored_{Q1-Q25}}{Max\ Marks} * 100$$

First part of the equation is the ratio of marks scored by a student (from Question 1 to Question 25, see appendix for questionnaire) to the maximum marks, which is multiplied by 100. So, the maximum value of awareness index will be 100 and minimum will be 0.

CHAPTER 2

Diabetic Education among the Students

Chapter 2

Diabetic Education among Students

2.1 Introduction

Diabetes education is the understanding of diabetes, its cause, symptoms, and complications. It enables knowledge about proper nutrition, importance of exercise, diabetes monitoring, medication and much more. According to Kingfit (2017)[11], in the US, more than 5000 people are diagnosed every day with type-2 diabetes and more than 90 percent of them do not have diabetic education. Furthermore, 60 percent of the total diabetic people have any formal diabetes education[12].

Diabetes education can make people more aware of diabetes, its cause, signs, and complications so that they can make necessary changes to improve their lifestyles. Therefore, this chapter examines the student's knowledge on diabetes and it focuses on student's perceptions on diabetic related issues.

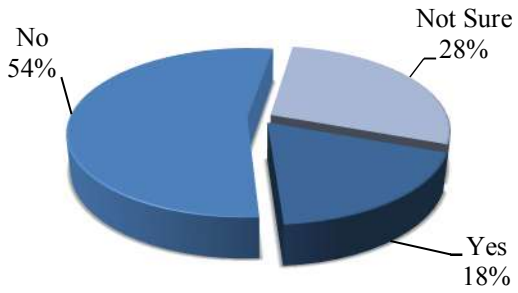
This chapter is categorized into eight different sections extensively discussing on topics: awareness on insulin production, diabetic cure, sugar level, medication, types of diabetes, insulin reaction and the final section concludes the chapter with major findings.

2.2 Awareness on Insulin Production in the Body

Insulin is a hormone produced by the pancreas that converts glucose into energy and transforms into bloodstreams. It helps to keep the body's sugar level from getting too high (Hyperglycaemia) or too low (Hypoglycaemia). If the sugar level is high in blood, insulin helps to keep the excess sugar in liver and release when blood sugar level is low. Therefore, insulin helps to balance blood sugar levels and keeps them in a normal range[13].

[11] https://kingfit.io/blogs/wellness/the-importance-of-diabetes-education
[12] https://www.diabeteseducator.org/practice/provider-resources/benefits-of-diabetes-education
[13] https://www.endocrineweb.com/conditions/type-1-diabetes/what-insulin

Fig: 2.1
Is Kidneys produce insulin in the human body?



In the diabetes awareness survey, while students were asked about insulin and its producing organ, around half of the students were not aware of it. Among the total, only 54 percent of the students were aware that the kidney is not an insulin-producing organ. Moreover, higher aged students have more awareness since there is a significant positive correlation between age and awareness. Among the gender categories, there is a statistically significant difference among males and females and males have more awareness than females.

It also noted that the awareness is higher among the students who involved in strenuous exercise more than 6 hours as compared to low physical exercising students. But MLRA is not statistically significant. The awareness and *time spent on gadgets* also do not show any significant difference among the categories, where around 50 percent of all categories have awareness regarding insulin-producing organ. In the BMI crosstab, normal and obese people have more awareness but MLRA is statistically not significant at p-value >0.05 in all categories (Appendix-4).

Table: 2.1
Kidneys produce insulin

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	21.3	48.3	30.3
	Above Age 15	9.7	69.0	21.3
Gender	Male	17.7	57.6	24.7
	Female	20.5	40.7	38.8
Physical Activity	Nil	17.1	52.6	30.3
	Up to 3 Hrs	18.5	53.6	27.9
	3-6 Hrs	20.7	53.4	25.9
	Above 6 Hrs	16.3	56.4	27.4

Table: 2.1 *(Continue)*
Kidneys produce insulin

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Time spent on Gadgets	Nil	19.6	48.0	32.4
	Below 1 Hr	20.4	53.2	26.4
	1-2 Hrs	17.6	53.7	28.6
	More than 2 Hrs	16.3	55.2	28.5
Family history of DM	No	20.2	49.7	30.1
	Yes	16.2	58.3	25.6
BMI	Under Weight	22.0	49.1	28.9
	Normal	17.1	55.5	27.3
	Over Weight	18.0	54.0	28.0
	Obese	15.4	55.0	29.6

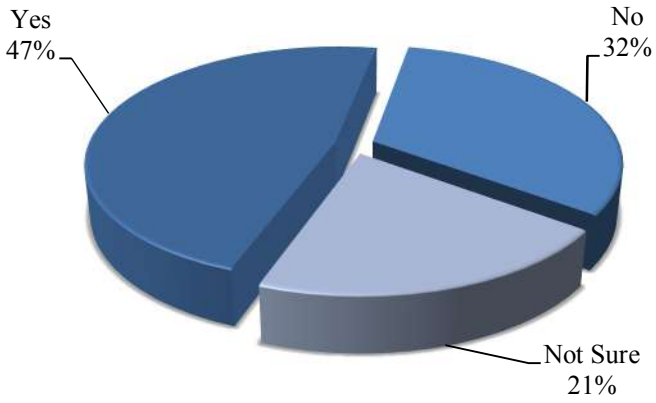
2.3 Awareness on Diabetes Cure

As we discussed earlier, diabetes is a serious health condition where the body's insulin is ineffective or insufficient to control the sugar level in the blood. To cure diabetes, the body needs to increase insulin production or it needs to respond effectively with insulin produced. According to IDF (2018), type-2 diabetes can be managed effectively by adopting a healthy lifestyle (diet and physical activity) combined with medication. But according to John Johnson (2017), medically, there is no cure for diabetes but it can go into remission[14]. The remission can be categorized into three;

a) **Partial remission:** It is when a diabetic person had less blood sugar level than that of a diabetic person at least 1 year without any diabetic medication
b) **Complete remission**: It is when a diabetic person had a normal blood sugar level at least for a year without any diabetic medication
c) **Prolonged remission**: It is when complete remission lasts for at least 5 years.

[14] https://www.medicalnewstoday.com/articles/317074.php

Fig: 2.2
Can Diabetics be cured



Here, the remission is interpreted as cure. Among the total surveyed students, 47 percent responded that diabetes can be cured. The awareness on diabetes cure do not vary among the categorical variables such as *age group*, *gender*, *physical activities*, *time spent on gadgets* and *BMI*, where all p-values are greater than 0.05 (Appendix-7). However, the students coming from diabetes family background have more diabetes awareness than the students those family do not have diabetes. Here, the MLRA is statistically significant at p-value 0.000, which is less than 0.05. In addition, the crosstab analysis shows that lower aged students and higher physical exercising students have more awareness than higher age group and lower exercising students. Moreover, this awareness is low among the students whose family had diabetes.

Table: 2.2
Diabetics can be Cured

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	48.9	29.7	21.4
	Above Age 15	42.9	39.2	18.0
Gender	Male	47.4	32.1	20.6
	Female	47.6	32.3	20.2
Physical Activity	Nil	46.1	34.9	18.9
	Up to 3 Hrs	46.8	31.9	21.3
	3-6 Hrs	50.5	32.3	17.3
	Above 6 Hrs	48.9	27.7	23.5

Table: 2.2 *(Continue)*
Diabetics can be Cured

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Time spent on Gadgets	Nil	49.3	32.4	18.2
	Below 1 Hr	43.4	34.1	22.5
	1-2 Hrs	49.5	30.7	19.8
	More than 2 Hrs	49.1	31.7	19.3
Family history of DM	No	52.6	26.7	20.7
	Yes	41.2	38.7	20.1
BMI	Under Weight	49.5	31.1	19.3
	Normal	45.6	32.7	21.7
	Over Weight	49.1	30.8	20.1
	Obese	48.9	33.6	17.5

2.4 Awareness on Diabetes Medication

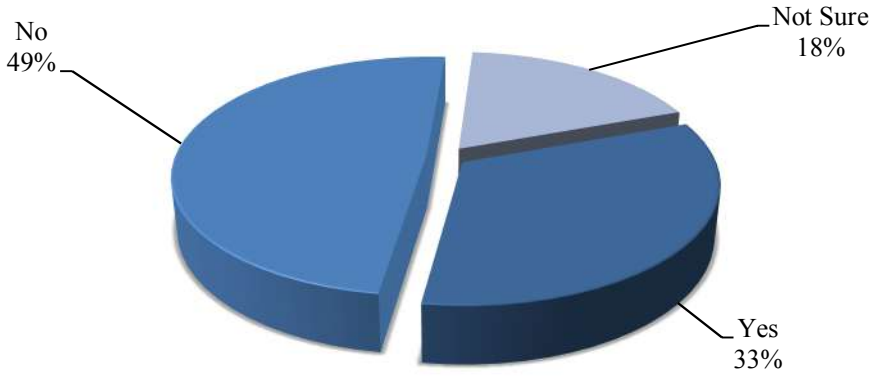
As we discussed in the previous section, diabetes can be cured or its complications can be reduced. The medication in diabetes is based on the type of diabetes. The ultimate aim of any diagnosis is to control sugar level in the blood. Type-1 diabetes needs lifelong insulin therapy since pancreas does not produce it.

Recently, the Food and Drug Administration of US approved an artificial pancreas which can produce insulin for people with type 1 diabetes. It is also known as *closed-loop insulin delivery*[15]. For this, a device will be implanted inside the body that links to a continuous glucose monitor. It will check blood sugar levels every five minutes and produces the correct amount of insulin accordingly.

On the other hand, the type 2 diabetic medication may not need any insulin therapy; however, physical activities and healthy eating diet are more important. According to Mayo Clinic (2018), type 2 diabetic can be managed through healthy eating, regular exercise, insulin therapy, and blood sugar monitoring. It also states that, contrary to popular perception, there is no specific diabetes diet; however, it is important to center the diet on high-fibre and low-fat foods such as fruits, vegetables, animal products, whole grains, and refined carbohydrates and sweets[16].

[15] https://www.mayoclinic.org/diseases-conditions/type-1-diabetes/diagnosis-treatment/drc-20353017
[16] https://www.mayoclinic.org/diseases-conditions/type-2-diabetes/diagnosis-treatment/drc-20351199

Fig: 2.3
Medication is more important than diet and exercise to control my diabetes



Among the surveyed students, around half of the students were aware of diabetes medication, importance of a healthy diet and physical exercise. 33 percent of the students stated that medication is important in diabetes diagnosis. There is a statistically significant difference in awareness among higher and lower aged students where lower aged students are more aware of it. Among the gender categories, males have more awareness than female, but it is statistically not significant. All other independent variables show a minor variation among categorical variables, however, all are statistically not significant (Appendix 13).

Table: 2.3
Medication is more important than diet and exercise to control my diabetes

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	33.4	47.7	18.8
	Above Age 15	31.3	52.1	16.6
Gender	Male	32.9	50.2	16.8
	Female	32.8	44.4	22.8
Physical Activity	Nil	36.0	42.1	21.9
	Up to 3 Hrs	33.1	50.3	16.6
	3-6 Hrs	28.2	52.5	19.3
	Above 6 Hrs	31.3	49.8	18.9
Time spent on Gadgets	Nil	33.8	42.6	23.6
	Below 1 Hr	32.1	48.2	19.7
	1-2 Hrs	33.2	50.1	16.6
	More than 2 Hrs	32.9	48.9	18.2

Table: 2.3 *(Continue)*

Medication is more important than diet and exercise to control my diabetes

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	33.3	48.0	18.7
	Yes	32.4	50.1	17.5
BMI	Under Weight	33.0	48.2	18.9
	Normal	33.3	48.2	18.5
	Over Weight	28.4	54.0	17.5
	Obese	36.8	47.1	16.1

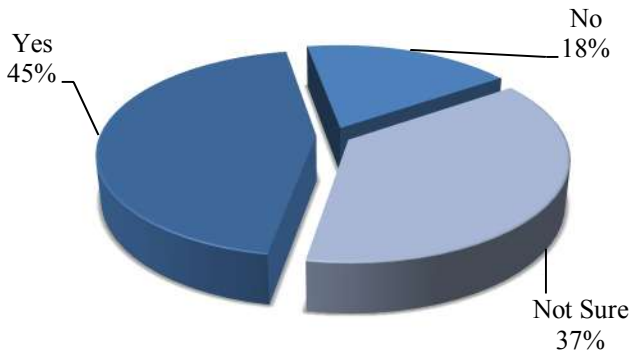
2.5 Awareness on Blood Sugar Level

Sugar level is the amount of glucose in the blood which is measured in milligrams per decilitre (mg/dl). The volume of glucose in the blood varies throughout the day and night depending upon food, physical activities, age, duration of diabetes, medicine, and pregnancy. Furthermore, a normal blood sugar level may change slightly from person to person according to their biological references. However, for recognizing and diagnosing diabetes, the normal blood sugar level is fixed as follows[17]:

Normal sugar level - 140 mg/dl (2 hours after eating food)
Fasting blood sugar level - 72 mg/dl to 99 mg/dl (8 hours of fasting)
Normal Sugar level for diabetes people- Less than 160 mg/dl (2 hours after eating food)
Fasting blood sugar level of diabetic people - 72 mg/dl to 123mg/dl (8 hours of fasting)

Fig: 2.4

A fasting blood sugar level of 210 mmol/L is too high



[17] https://www.diabetes.co.uk/diabetes_care/blood-sugar-level-ranges.html

The awareness regarding sugar level in the blood is necessary since it is the only scientific measure of diabetes. However, among the surveyed students, only 45 students were aware of sugar levels being high and low. The rest 55 percent of the students were unaware of it. The awareness regarding blood sugar level is statistically not significant among the categories such as age, gender, physical activities, time spent on gadgets and BMI. However, there is a statistically significant difference among the students with diabetic family background. The MLRA result shows that the students, whose family member had diabetes, have more awareness regarding blood sugar level than the students whose family do not have any diabetes (Appendix 8).

Table: 2.4
A fasting blood sugar level of 210 mmol/L is too high

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	44.0	18.9	37.1
	Above Age 15	45.5	16.4	38.1
Gender	Male	44.6	17.3	38.0
	Female	43.6	21.3	35.1
Physical Activity	Nil	40.2	20.0	39.8
	Up to 3 Hrs	45.4	18.0	36.6
	3-6 Hrs	45.7	18.2	36.1
	Above 6 Hrs	45.0	16.9	38.1
Time spent on Gadgets	Nil	41.9	20.9	37.2
	Below 1 Hr	43.4	21.1	35.5
	1-2 Hrs	46.3	16.2	37.5
	More than 2 Hrs	42.3	17.7	40.0
Family history of DM	No	38.9	19.7	41.4
	Yes	51.0	16.7	32.3
BMI	Under Weight	43.7	19.2	37.1
	Normal	44.6	17.5	37.9
	Over Weight	47.4	19.7	32.9
	Obese	40.7	18.2	41.1

2.6 Awareness on Types of Diabetes

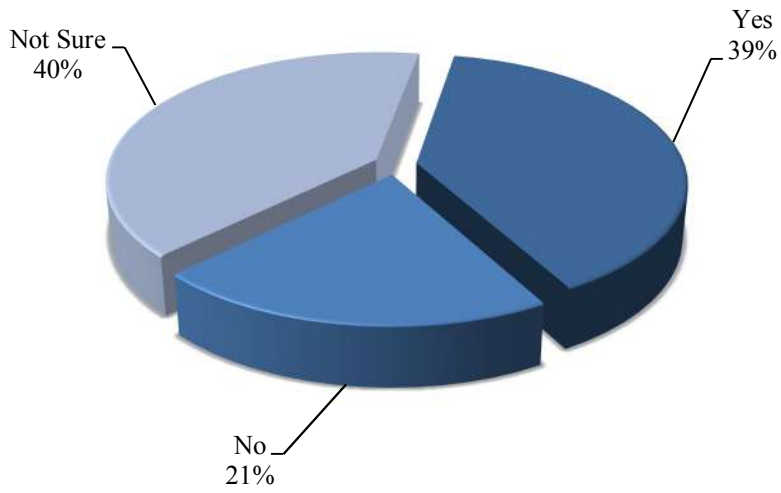
Diabetes is a set of diseases in which the body does not produce any insulin or sufficient insulin or body cannot properly respond to the insulin produced. When any of these occurs, the body is unable to convert sugar to energy which ultimately leads to high blood sugar. So,

the lack of insulin and the body's resistance to the insulin are the major causes of diabetes. Based on these facts, diabetes can be categorized into two:

1. Type -1 Diabetes
2. Type -2 Diabetes

Type-1 diabetes is an autoimmune condition where the body's immune system attacks and destroys the beta cells that produce insulin from the pancreas. On the other hand, Type -2 diabetes is the health condition where beta cell produces the inadequate insulin and body is unable to respond fully to insulin produced.

Fig: 2.5
There are two types of diabetes



However, only 39 percent of the students are aware on types of diabetes and 40 percent are not sure about it. The crosstab analysis shows that the awareness on types of diabetes is more among higher aged students and showed statistically significant at p-value 0.000 (0.000<0.05) with Exp value 0.638. It indicates that there is 63.8 percent higher awareness among the higher age group. All the other independent variables show a slight difference among categorical variables. However, all are statistically not significant (Appendix 11).

Table: 2.5
There are two types of diabetes

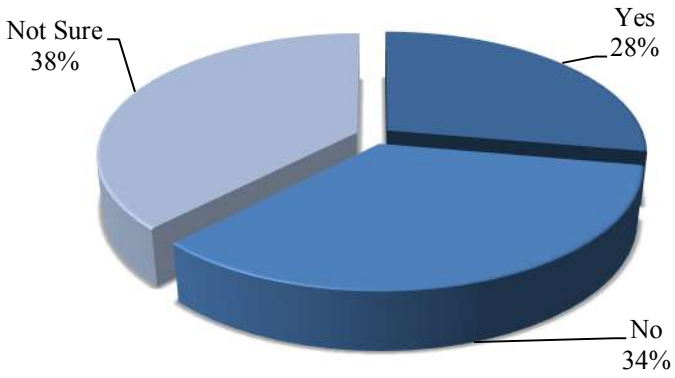
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	35.7	22.8	41.5
	Above Age 15	49.1	15.1	35.8
Gender	Male	40.4	19.9	39.7
	Female	34.9	23.9	41.2
Physical Activity	Nil	38.8	22.0	39.1
	Upto 3 Hrs	40.0	19.9	40.1
	3-6 Hrs	38.9	22.7	38.4
	Above 6 Hrs	33.9	21.5	44.6
Time spent on Gadgets	Nil	35.1	25.0	39.9
	Below 1 Hr	37.7	21.2	41.1
	1-2 Hrs	40.1	19.9	40.1
	More than 2 Hrs	39.8	21.8	38.4
Family history of DM	No	38.6	21.0	40.4
	Yes	39.5	20.7	39.8
BMI	Under Weight	38.4	22.1	39.5
	Normal	39.2	21.3	39.5
	Over Weight	41.5	17.5	41.0
	Obese	37.1	18.9	43.9

2.7 Awareness of Insulin Reaction (Hypoglycaemia)

Insulin reaction or hypoglycemia is a health condition where the blood sugar level is too low. This happens when a diabetic person has injected too much insulin, eaten less food or had a physical workout without having food[18]. It can be resolved by having glucose tablets and eating sufficient food.

[18] http://www.med.umich.edu/1info/FHP/practiceguides/diabetes/Hypoglycemia.pdf

Fig: 2.6
An insulin reaction is caused by too much food



An insulin reaction does not occur when the body has sufficient food and it occurs when there is no glucose in the blood. However, only 34 students are aware of it and 38 students are not sure about this phenomenon. The MLRA result shows that there is no statistically significant difference among the categorical variables except in *physical activity*. The crosstab also show a minor differences among the *physical activity* categories where the student who exercises little have more awareness on insulin resistance.

Table: 2.6
An insulin reaction is caused by too much food

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
School_code	IISJ	28.0	34.6	37.4
	JAIS	24.1	32.7	43.2
Age	Below Age 15	29.2	34.0	36.7
	Above Age 15	23.5	35.7	40.8
Gender	Male	28.1	34.5	37.4
	Female	26.7	34.3	39.0
Physical Activity	Nil	27.5	36.8	35.7
	Up to 3 Hrs	28.0	34.3	37.7
	3-6 Hrs	30.5	34.3	35.2
	Above 6 Hrs	22.5	31.3	46.3
Time spent on Gadgets	Nil	27.7	31.8	40.5
	Below 1 Hr	29.1	34.4	36.5
	1-2 Hrs	26.9	35.0	38.1
	More than 2 Hrs	26.8	34.6	38.6

Table: 2.6 *(Continue)*
An insulin reaction is caused by too much food

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	28.8	34.2	37.0
	Yes	26.6	35.0	38.4
BMI	Normal	27.9	34.1	38.0
	Over Weight	26.1	34.4	39.6
	Obese	25.0	36.1	38.9
	Total	27.8	34.5	37.8

2.8 Conclusion

In this chapter, we have discussed the diabetic education of students and its association between different categories of *age groups, gender, physical activities, BMI, time spent on gadgets,* and *family history of diabetes*. A cross-sectional analysis is carried out along with multinomial logistic regression.

It found that more than half of the total students are aware of insulin production and its process in the body. There is a statistically significant difference in awareness among *gender*, *physical activities* and *age,* where males, more physical exercising students and higher aged students have a positive correlation with awareness. The awareness on diabetes cure is less among the students, where less than half of the students are aware of it. There is a statistically significant difference in diabetes cure among the students whose family had diabetes. Among the students, 49 percent of the students believe that a healthy diet and physical exercise are better ways to control type-2 diabetic than medication.

There is a statistically significant difference among the *age groups* and *gender* where higher aged students and males have more awareness on diabetes diagnosis. Blood sugar level is a major sign of diabetes, however more than half of the students are not aware of it. There is a statistically significant difference in awareness among the students whose family had diabetes. It is also found that the students coming from diabetic family have more knowledge on blood sugar level than the other.

There are different types of diabetes and only 39 percent of the students know it. There is a statistically significant difference in this awareness among the different age groups. The

crosstab and multinomial logistic regression analysis result show that the diabetic education is very less among the students and there is not much difference among the categorical variables except in *age*, *gender* and *family status of diabetes*.

CHAPTER 3

Awareness on Causes of Diabetes

Chapter 3

Awareness on Causes of Diabetes

3.1 Introduction

Diabetes mellitus is a group of diseases that affect blood sugar level (Glucose). Glucose is vital because it is the major source of energy for the cells that make up muscles and tissues as well as a main source of fuel for the brain[19]. To understand the causes of diabetes, it is necessary to understand how glucose is processed in the body.

Glucose or sugar comes to our body mainly from food and liver. The produced glucose is absorbed into the bloodstream and enters the cells with the help of insulin. Insulin is a hormone produced from the pancreas (which is situated behind and below the stomach) that enables sugar to enter into cells lowers the amount of sugar in bloodstreams. Whenever the blood sugar level drops, the secretion of insulin from pancreas also drops. The insulin also converts glucose into glycogen and stored in the liver. Whenever the glucose level is low during starvation, the liver breaks down the stored glycogen into glucose. In this way, insulin controls blood glucose by signaling the liver and maintain its level within a normal range.

The Type-1 diabetes occurs when the body's immune system attacks and destroys the insulin-producing cells in the pancreas. It leads to decrease in the volume of insulin in the body. As a result, the glucose cannot enter the bloodstream and blood sugar level will increase along with food intake and it doesn't get transported into the cells. The exact cause of Type-1 diabetes is still unknown. However, a combination of genetic susceptibility and environmental factors can be considered responsible.

On the other hand, in the case of type-2 diabetes, the cells become resistant to the action of insulin and the pancreas is unable to produce sufficient insulin to overcome this resistance. So, the sugar tends to accumulate in bloodstreams instead of transporting to the cells. Although the exact reason for insulin resistance is uncertain, it is believed that genetic and environmental factors are the major reasons for developing Type-2 diabetes.

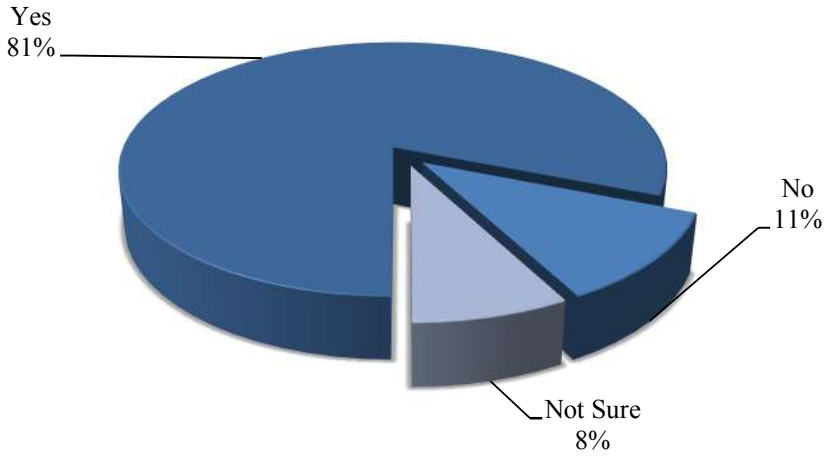
[19] https://www.mayoclinic.org/diseases-conditions/diabetes/symptoms-causes/syc-20371444

This chapter discusses the awareness of the students on the causes of diabetes. It is categorized into seven sections. From the second section to the sixth section it will discuss the causes of diabetes and in the seventh section conclude with major findings.

3.2 Awareness on Eating Sugar and Diabetes

Eating sugar or sweet foods may not lead to diabetes if the body responds accordingly. Eating sugar is not at all a concern if the body's immune system works properly and pancreas produces sufficient insulin when it is needed. It is because, if the sugar level increased in the blood, the pancreas can produce additional insulin and reduce the glucose level. However, in the case of Type-1 or Type-2 diabetes, it is advised to control eating too much sugar and sweet foods.

Fig: 3.1
Eating too much sugar and other sweet foods is a cause of diabetes



There is a general belief that eating much sugar and sweet foods lead to diabetes, but it is not true. While this was asked to students, 81 percent of the students responded that eating much sugar will lead to diabetes. Among the total, only 11 percent of the students denied this and 8 percent were *not sure* about the answer. The crosstab result shows that this awareness is not same among the different *age groups*, *gender,* and *BMI* where higher aged students, males and higher BMI students are more aware of it. But these difference are statistically not significant where all p-values are greater than 0.05 (Appendix 1).

Table: 3.1
Eating too much sugar and other sweet foods is a cause of diabetes

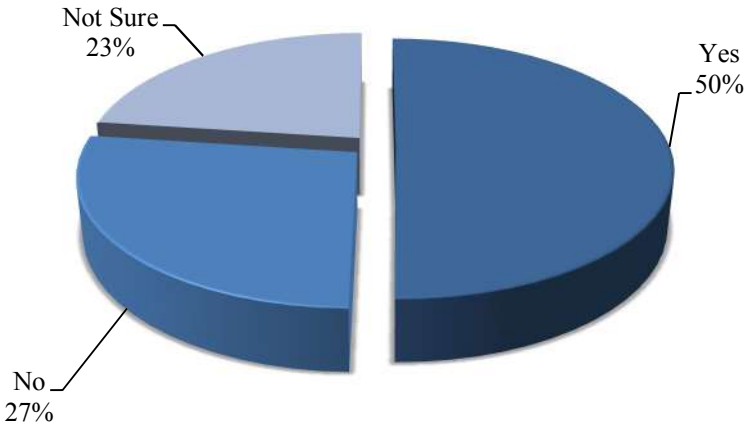
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	83.8	9.4	6.8
	Above Age 15	73.1	16.4	10.5
Gender	Male	80.1	11.7	8.2
	Female	84.2	9.4	6.4
Physical Activity	Nil	82.3	12.1	5.6
	Up to 3 Hrs	81.1	11.0	7.9
	3-6 Hrs	80.9	10.7	8.4
	Above 6 Hrs	79.8	10.1	10.1
Time spent on Gadgets	Nil	73.6	17.6	8.8
	Below 1 Hr	82.9	9.8	7.3
	1-2 Hrs	81.9	11.2	6.8
	More than 2 Hrs	78.1	11.8	10.2
Family history of DM	No	81.5	10.4	8.1
	Yes	80.6	12.1	7.3
BMI	Under Weight	83.5	9.0	7.4
	Normal	81.9	10.9	7.2
	Over Weight	78.4	13.5	8.1
	Obese	72.1	15.7	12.1

Generally, there is also a misconception that diabetic people need a special food or diet system. However, it is important to center the diet on the high-fibre, low-fat foods including fruits, vegetables, and whole grains. It is also recommended to have fewer animal products, refined carbohydrates, and sweets.

Furthermore, it is important to include low glycemic indexed foods in the diet. The glycemic index is a measure of how quickly a food causes a rise in the blood sugar. Foods with a high glycemic index quickly increase the blood sugar level and Low glycemic indexed foods may help to achieve a more stable blood sugar. Foods with a low glycemic index typically are foods that are rich in fibre.

While the surveyed students were asked about the diet of diabetic people, 50 percent of them responded that diabetic people need a special kind of diet. However, 27 percent of them have no idea about diabetic diet system.

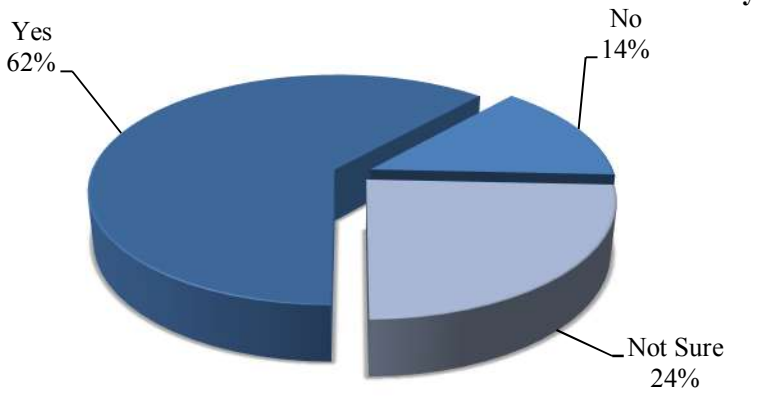
Fig: 3.2
A diabetic diet consists mostly of special foods



3.3 Awareness on Effective Insulin Deficiency

The usual cause of diabetes is the lack of effective insulin in the body. In Type-1 diabetes, the produced insulin is destroyed by the immune system of the body. On the other hand, in Type-2 diabetes, there is no sufficient insulin and the produced insulin is not effective. In both cases, the lack of effective insulin is the major cause of diabetes.

Fig: 3.3
The usual cause of diabetes is lack of effective insulin in the body



However, while it is asked to the students, 62 percent of the students have identified this fact and about 25 students are unaware. The awareness on the causes of diabetes is varied among the different categories such as *gender*, *different age groups*, *BMI*, *family status of diabetes* and *physical activities*. It is observed that awareness is high among the higher age groups, males, normal and higher BMI students, more exercising students and among the students

whose family members had diabetes. All the MLRA results are statistically significant at p-value <0.05 (Appendix 2).

Table: 3.2
The usual cause of diabetes is the lack of effective insulin in the body

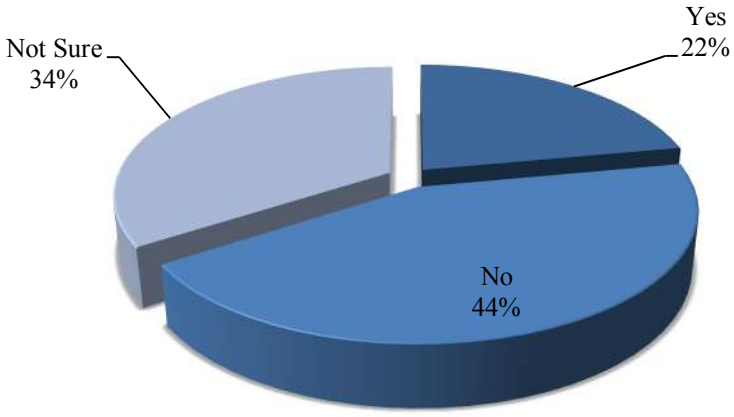
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	57.4	15.9	26.7
	Above Age 15	74.0	8.9	17.1
Gender	Male	66.1	13.7	20.2
	Female	47.4	15.3	37.2
Physical Activity	Nil	56.1	14.8	29.2
	Up to 3 Hrs	61.3	15.0	23.7
	3-6 Hrs	65.2	10.9	23.9
	Above 6 Hrs	69.7	11.4	18.9
Time spent on Gadgets	Nil	52.7	21.6	25.7
	Below 1 Hr	57.2	16.6	26.3
	1-2 Hrs	64.5	13.1	22.4
	More than 2 Hrs	64.7	10.3	24.9
Family history of DM	No	57.2	15.2	27.5
	Yes	67.0	12.7	20.4
BMI	Under Weight	58.0	13.8	28.1
	Normal	62.8	14.0	23.2
	Over Weight	66.8	12.8	20.4
	Obese	57.5	17.5	25.0

3.4 Awareness on Diabetes and Kidney Failure

The usual cause of diabetes is the lack of effective and sufficient insulin in the body. Normally, Kidney failure is not a pre-diabetic symptom and it often happens due to long years of uncontrolled diabetes. It is also noticed that Kidney failure may not cause diabetes.

Fig: 3.4

Diabetes is caused by the failure of kidneys to keep sugar out of urine



While students were asked about this, 44 percent of them identified that kidney failure does not cause diabetes. The crosstab analysis shows that this awareness is more among the higher age groups, males, higher physical exercising students, and among the students whose family members had diabetes. However, the MLRA result shows that crosstab analysis is statistically significant only in the *age group*.

Table: 3.3

Diabetes is caused by the failure of kidneys to keep sugar out of urine

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	24.3	41.8	33.9
	Above Age 15	15.6	49.6	34.9
Gender	Male	21.7	44.7	33.6
	Female	23.2	40.7	36.1
Physical Activity	Nil	20.8	40.8	38.4
	Up to 3 Hrs	22.5	44.5	33.0
	3-6 Hrs	21.8	46.4	31.8
	Above 6 Hrs	21.2	42.7	36.2
Time spent on Gadgets	Nil	23.0	41.9	35.1
	Below 1 Hr	24.5	43.0	32.5
	1-2 Hrs	20.8	43.8	35.4
	More than 2 Hrs	20.4	45.9	33.7

Table: 3.3 *(Continue)*

Diabetes is caused by the failure of kidneys to keep sugar out of urine

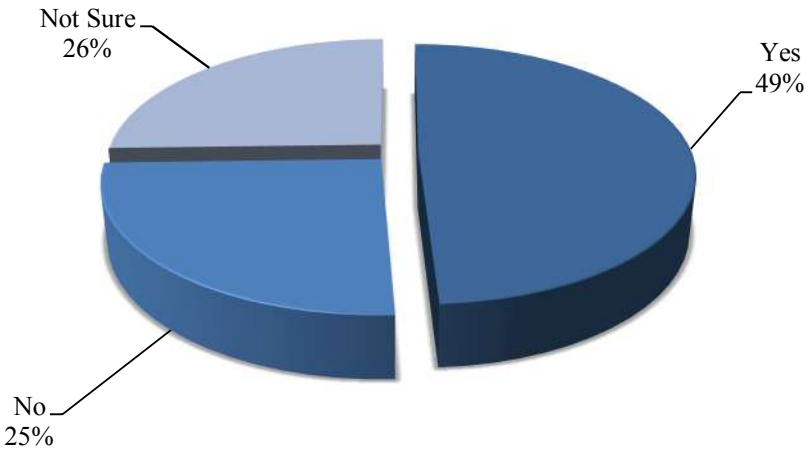
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	25.2	41.1	33.7
	Yes	18.3	47.2	34.5
BMI	Under Weight	24.8	43.8	31.4
	Normal	20.0	45.1	34.9
	Over Weight	26.8	39.3	33.9
	Obese	18.6	42.5	38.9

3.5 Awareness on Diabetes and its Inheritance

There are many studies and debates which are concentrated on the inheritance of diseases, especially diabetes. According to Warren (senior researcher in hereditary factors of diabetes), there exist 10 percent possibility to develop a Type-1 diabetes for a child with a diabetic father than a diabetic mother[20]. On the other hand, if the mother has Type-1 diabetes and is below the age 25 when the child is born, the risk is reduced to 1 in 25 (4 percent) and if the mother is over age 25, the risk drops to 1 in 100. The research report of American Society for Biochemistry and Molecular Biology also confirms the inheritance of diabetes[21].

Fig: 3.5

If I'm diabetic, my children have a higher chance for being diabetic



While the students were asked about the inheritance of diabetes, around half of them have responded correctly. Among the total, 25 percent of the students believe that diabetes does not inherit and 26 percent of students are not sure about their answer. This awareness is

[20] https://www.joslin.org/info/genetics_and_diabetes.html
[21] https://www.sciencedaily.com/releases/2008/08/080820163239.htm

almost same in all categorical variables except in *gender* and *family history of diabetes*, where males and students whose family had diabetes, have higher awareness. However, this result is statistically not significant at p-value 0.082 which is greater than 0.05.

Table: 3.4
If I'm diabetic, my children have a higher chance of being diabetic

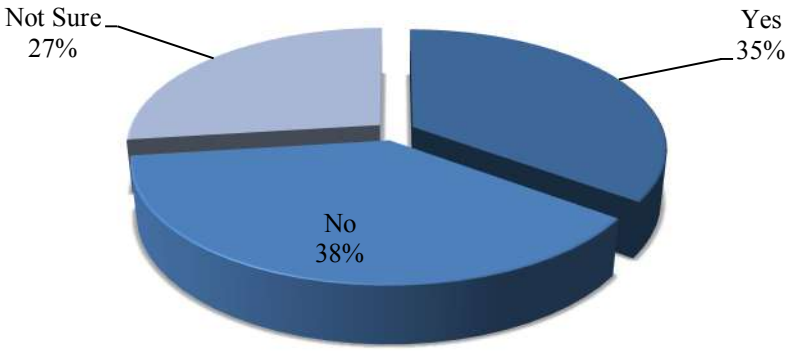
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	49.0	26.6	24.4
	Above Age 15	49.8	21.7	28.4
Gender	Male	50.3	24.9	24.8
	Female	45.8	26.9	27.3
Physical Activity	Nil	49.8	23.0	27.2
	Upto 3 Hrs	48.2	26.3	25.4
	3-6 Hrs	48.2	28.0	23.9
	Above 6 Hrs	54.7	20.8	24.4
Time spent on Gadgets	Nil	48.6	30.4	20.9
	Below 1 Hr	45.5	27.8	26.8
	1-2 Hrs	51.6	23.6	24.8
	More than 2 Hrs	50.5	23.8	25.5
Family history of DM	No	46.3	27.9	25.8
	Yes	53.0	22.2	24.8
BMI	Under Weight	47.1	28.0	24.7
	Normal	51.1	24.5	24.4
	Over Weight	50.0	25.6	24.4
	Obese	42.9	21.8	35.4

3.6 Awareness on Diabetes and Exercise

Physical exercise has a significant positive effect on insulin sensitivity, where more physical exercise reduces the level of glucose. Any type of physical exercise has the potential to burn more glucose from the bloodstreams and efficient use of insulin. Numerous studies confirm that physical activity and exercise can improve insulin sensitivity in a better way. Regardless of age, weight, physical fitness, studies have proved that exercise can improve insulin sensitivity within just one week without weight loss[22].

[22] https://www.diabetesselfmanagement.com/managing-diabetes/treatment-approaches/increasing-insulin-sensitivity/

Fig: 3.6
Regular exercise increases the need for insulin and other diabetic medication



While the students were asked about the relationship between exercise and diabetic medication, 38 percent responded that exercise can encourage insulin sensitivity. On the other hand, 35 percent of the students believe that regular exercise will lead to diabetic medication. This awareness is slightly varied among all the categories of independent variable but there are no statistical significance. The crosstab difference is more in the *age group, gender, Physical activities* and *time spent on gadgets*.

Table: 3.5
Regular exercise increases the need for insulin and other diabetic medication

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	35.9	36.9	27.2
	Above Age 15	32.5	41.3	26.2
Gender	Male	34.4	39.2	26.4
	Female	37.2	33.9	28.8
Physical Activity	Nil	36.8	33.7	29.5
	Up to 3 Hrs	34.8	39.2	26.0
	3-6 Hrs	33.9	38.9	27.3
	Above 6 Hrs	33.9	38.1	28.0
Time spent on Gadgets	Nil	37.2	29.1	33.8
	Below 1 Hr	34.8	38.3	26.9
	1-2 Hrs	36.6	38.4	25.0
	More than 2 Hrs	31.8	38.2	29.9
Family history of DM	No	35.6	37.1	27.3
	Yes	34.3	39.2	26.5

Table: 3.5 *(Continue)*

Regular exercise increases the need for insulin and other diabetic medication

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
BMI	Under Weight	36.4	36.2	27.5
	Normal	35.3	38.4	26.2
	Over Weight	34.8	38.6	26.5
	Obese	29.3	40.0	30.7

3.7 Conclusion

This chapter examined the major causes of diabetes. It looked into the process of Type-1 and Type-2 diabetes and how it becomes problematic. The crosstab and Multinomial Logistic Regression Analysis result show that there is a misconception about the cause of diabetes. There is less awareness on the diabetic diet that varies among the different categories with positive statistical difference. More than half of the students are aware of the concept of effective insulin. This awareness varies among the categorical variables such as age, gender, and family status of diabetes. Less than half of the students are aware that kidney failure is not the reason for the development of diabetes. According to many studies, diabetes can be inherited but less than half of the students have the idea about. Diabetes and exercise have a negative relationship where higher exercise reduces diabetic complications. However, only 38 percent of the students know this fact.

The cross-section and multinomial logistic regression analysis result show that the awareness on the cause of diabetes is very less among the students and there is no much difference among the categorical variables except in age, gender and family history of diabetes.

CHAPTER 4

Awareness on Symptoms of Diabetes

Chapter 4

Awareness on the Symptoms of Diabetes

4.1 Introduction

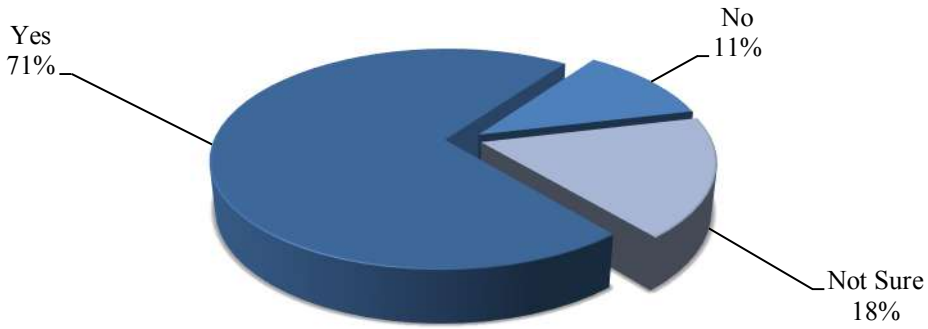
Diabetes is a health risk that reduces a person's ability to produce and convert insulin to glucose and finally into energy. This condition appears in different forms and each type has different symptoms. Some types may not produce any symptom, making them harder to detect such as Type-2 diabetes. The symptoms of diabetes occur as a result of the struggle of the body to convert glucose into energy with limited insulin. The symptom of Type-1 diabetes often develops faster than Type-2 diabetes. The common symptoms of diabetes include blurred vision, fatigue, increased hunger and thirst, frequent urination, numbness, and unexplained weight loss.

This chapter examines the awareness of students on different symptoms and signs of diabetes. It is categorized into six sections. Followed by the introduction, second to fifth sections analyses the awareness of students on different symptoms of diabetes. The sixth section concludes the chapter with the major findings of the study.

4.2 Awareness on Diabetes and Blood Sugar Level

Diabetes is a health condition in which the sugar level in the bloodstream is increased abnormally. Usually, the sugar level is controlled by insulin hormone which is produced by the pancreas. When the pancreas produces insufficient insulin or if the body does not respond to the insulin produced, the level of sugar in the bloodstream will increase. This mechanism is usually observed in the diabetic person. So, in untreated diabetes, the amount of sugar in the blood is usually increases.

Fig: 4.1
In untreated diabetes, the amount of sugar in the blood usually increases



In the survey, while students were asked about untreated diabetes and the level of sugar in the blood, 71 percent of the students responded that blood sugar level will increase in undiagnosed diabetes. However, the rest of 29 percent were unaware about it. The awareness slightly varied among the categorical variables, especially among the *gender*, *BMI* and time spent on *gadgets*. However, all the values are statistically not significant except in *time spent on gadgets* and *physical activities*. It is observed that awareness is more among the higher exercising and moderate gadget using students.

Table: 4.1
In untreated diabetes, the amount of sugar in the blood usually increases

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	71.0	12.1	16.8
	Above Age 15	70.9	9.2	19.9
Gender	Male	70.5	11.1	18.4
	Female	72.4	12.4	15.2
Physical Activity	Nil	67.2	11.8	21.0
	Up to 3 Hrs	72.3	11.4	16.2
	3-6 Hrs	73.6	12.0	14.3
	Above 6 Hrs	67.8	9.8	22.5
Time spent on Gadgets	Nil	63.5	15.5	20.9
	Below 1 Hr	70.2	12.5	17.3
	1-2 Hrs	74.8	10.6	14.5
	More than 2 Hrs	65.5	10.5	24.0

Table: 4.1 *(Continue)*

In untreated diabetes, the amount of sugar in the blood usually increases

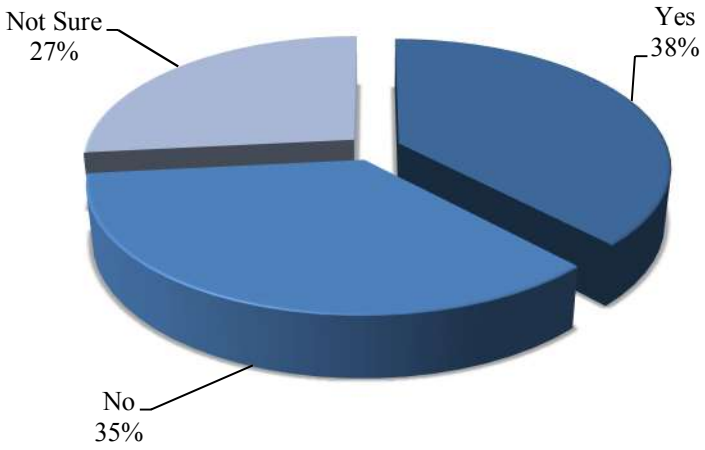
Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	70.2	11.7	18.1
	Yes	72.2	11.2	16.6
BMI	Under Weight	71.6	11.0	17.4
	Normal	72.0	11.7	16.4
	Over Weight	67.5	11.8	20.6
	Obese	68.2	10.4	21.4

4.3 Awareness on Diabetes Detection

Diabetes can be identified by understanding the symptoms and monitoring the blood glucose level. The symptoms of diabetes can be mild and often unnoticed. The mild signs of diabetes are more prevalent in Type-2 diabetes and many people do not realize that they have diabetes until serious complications come out. On the other hand, symptoms of Type-1 diabetes usually appear quickly. Hence, the best way to check diabetes in a person is testing blood sugar level.

Fig: 4.2

The best way to check my diabetes is by testing my urine



However, while the surveyed students were asked about a proper test for identifying diabetes, 38 percent responded that the urine test is the best test to detect diabetes. Only 35 percent of students were aware of proper diabetes testing. This awareness slightly varies among all the

categories without statistical significance except in the *family history of diabetes*. The MLRA result shows that the students with family having diabetes have more awareness on the diagnostic test of diabetes and it is statistically significant.

Table: 4.2
The best way to check my diabetes is by testing my urine

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	38.4	34.1	27.5
	Above Age 15	36.6	39.2	24.2
Gender	Male	37.7	35.5	26.8
	Female	38.8	35.1	26.1
Physical Activity	Nil	37.6	33.7	28.7
	Up to 3 Hrs	38.4	36.3	25.3
	3-6 Hrs	38.9	35.0	26.1
	Above 6 Hrs	34.9	33.9	31.3
Time spent on Gadgets	Nil	38.5	35.1	26.4
	Below 1 Hr	37.7	36.5	25.8
	1-2 Hrs	37.8	34.8	27.4
	More than 2 Hrs	38.4	35.1	26.5
Family history of DM	No	41.5	30.0	28.4
	Yes	33.9	41.8	24.3
BMI	Under Weight	40.2	33.2	26.7
	Normal	37.6	36.3	26.2
	Over Weight	37.4	37.2	25.4
	Obese	34.3	34.3	31.4

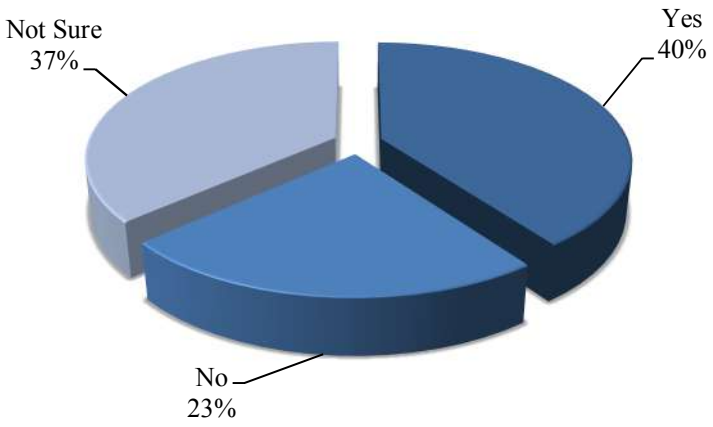
4.4 Awareness on Diabetes; Cuts and Abrasions

The cuts and abrasions in diabetic people is a serious health concern which requires careful attention. As diabetes can cause wounds to heal more duration, small skin cuts and burn often go unnoticed until they become more complicated to heal. According to Villines (2018), diabetic foot ulcers affect 15 percent of diabetic people which can ultimately lead to foot amputation[23].

[23] https://www.medicalnewstoday.com/articles/320739.php

Fig: 4.3

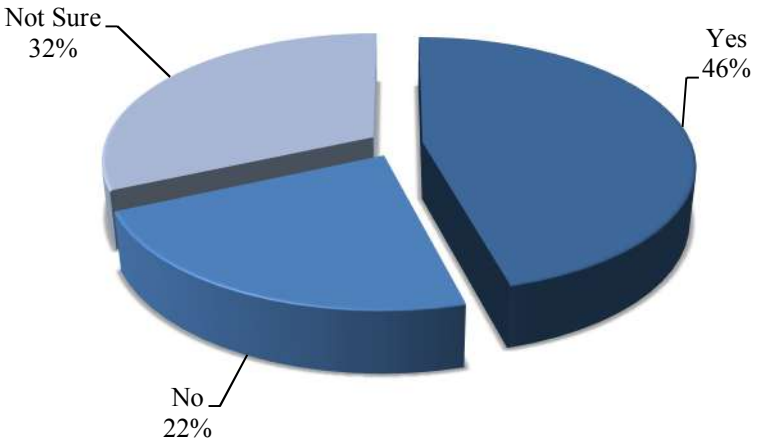
A diabetic should cleanse a cut on his body with iodine and alcohol



Why does diabetes affect healing problem? It is because, with diabetes, it is more difficult to manage blood sugar level. When blood glucose remains constantly high, it will damage the functions of white blood cells which will consequently result in the inability to fight bacteria. Furthermore, in diabetic people, the movement of red blood cells are very slow because of slow blood circulation. This makes more difficult to deliver nutrients to the wounded area and subsequently it leads to slow healing of cuts and abrasions. So, diabetic people should take extra care while cutting their toenails.

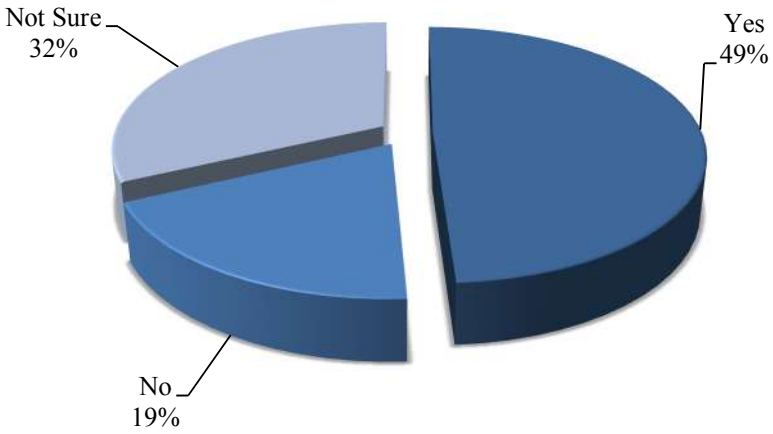
However, when it was asked to surveyed students, 46 percent of the students responded that diabetic people need more care while they are cutting their toenails. This awareness is not significantly varied among the categorical variables except in family history of diabetes. The MLRA result shows that there is a statistically significant difference in awareness among the students whose family members had diabetes than the students with no history of family diabetes (Appendix 17).

Fig: 4.4
Diabetics should take extra care when cutting their toenails



Conversely, the use of iodine or alcohol to clean and prevent bacteria can harm the tissue and delay healing. The best way to clean a minor wound is with cold running water and mild soap. However, 40 percent of the students believe that iodine and alcohol are better in cleaning the cuts and abrasions.

Fig: 4.5
Cuts and abrasions in diabetics heal more slowly



While surveyed students were asked about diabetes and healing of cuts and abrasions, less than half of the students responded that cut and abrasions heal slowly among the diabetic people. The crosstab analysis shows that this awareness varies among the age groups, gender, *physical exercising students*, *time spent on gadgets*, *family history of diabetes* and *BMI*. The awareness is more among the higher aged groups, males, more exercising students, moderate gadget using students, normal BMI students, and among the students whose family had

diabetes. However, the MLRA shows that the crosstab result is statistically significant only in *age groups*, *time on gadgets* and *family history of diabetes*.

Table: 4.3
Cuts and abrasions in diabetics heal more slowly

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	46.9	19.6	33.4
	Above Age 15	55.6	16.6	27.8
Gender	Male	50.2	18.3	31.5
	Female	45.8	20.5	33.7
Physical Activity	Nil	46.7	19.6	33.7
	Up to 3 Hrs	48.5	19.1	32.4
	3-6 Hrs	53.2	17.7	29.1
	Above 6 Hrs	51.5	17.9	30.6
Time spent on Gadgets	Nil	45.3	24.3	30.4
	Below 1 Hr	51.2	17.7	31.2
	1-2 Hrs	49.9	19.0	31.2
	More than 2 Hrs	44.8	19.4	35.7
Family history of DM	No	46.3	20.0	33.6
	Yes	52.3	17.6	30.1
BMI	Under Weight	48.5	17.8	33.6
	Normal	50.9	18.0	31.1
	Over Weight	47.4	20.6	32.0
	Obese	42.5	25.0	32.5

4.5 Awareness on Diabetes and its Signs

One of the major challenges in managing diabetes is maintaining a balanced blood sugar level. Diabetes can cause high blood sugar as well as low blood sugar. So it is important to know the risks and warning signs of both high and low blood sugar levels. The common signs of high blood sugar include frequent urination, fatigue, dry or itchy skin, feeling thirsty, and more frequent infections. The signs of low blood sugar include sweating, rapid heartbeat, headache, hunger, weakness, fatigue, impaired vision, anxiety, irritability, and dizziness.

Fig: 4.6
Shivering and sweating are signs of high blood sugar

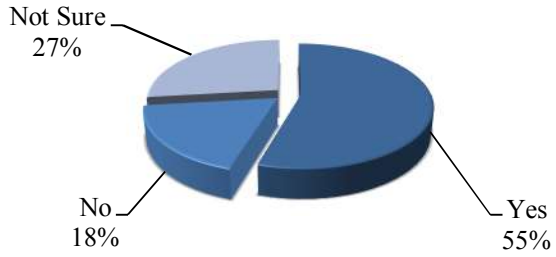
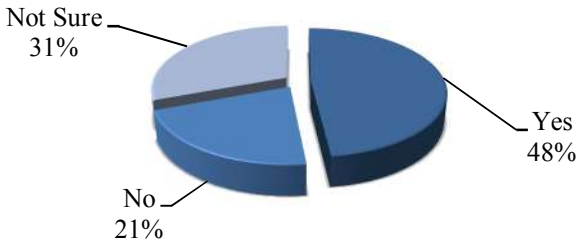


Fig: 4.7
Frequent urination and sweating are signs of high blood sugar



However, while the surveyed students were asked about the signs such as shivering and sweating, only 18 percent of them identified that it is not a sign of high blood sugar. On the other hand, frequent urination is a sign of high blood sugar, and it is identified by 48 percent of the students. The crosstab analysis of awareness on signs of low blood sugar shows a small variation among all categorical variables. But, only the *gender category* is statistically significant where males have more awareness than females (Appendix 22). The crosstab analysis of awareness on signs of high blood sugar show higher awareness among all the categories with small variation, but all are statistically not significant except in *physical activities* (Appendix 23).

4.6 Conclusion

This chapter examined awareness of students on signs and symptoms of diabetes. It is found that the awareness on signs and symptoms of diabetes are very low and it varies in different categories. The awareness on blood sugar level and its minimum and maximum levels are familiar among the students. However, there is a misconception among the students on the healing of cuts, abrasions, and its treatment. Among the total, around half of the students are aware of the sign and the symptoms of high and low blood sugar levels.

Table: 4.4

Shivering and sweating are signs of high blood sugar

Name of the Category	Awareness of Signs - low Blood Sugar				Awareness of Signs - high Blood Sugar		
	Sub Category	Yes (%)	No (%)	Not Sure (%)	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	54.10	18.90	27.00	46.70	22.20	31.10
	Above Age 15	56.60	17.00	26.30	52.80	17.80	29.30
Gender	Male	55.30	17.30	27.30	49.20	19.90	30.90
	Female	52.90	21.80	25.30	45.50	24.60	29.80
Physical Activity	Nil	57.50	17.70	24.80	52.80	18.50	28.70
	Up to 3 Hrs	55.90	18.40	25.70	46.80	22.10	31.10
	3-6 Hrs	52.00	18.60	29.30	49.80	23.40	26.80
	Above 6 Hrs	45.60	19.90	34.50	46.60	16.90	36.50
Time spent on Gadgets	Nil	52.70	18.20	29.10	43.20	23.60	33.10
	Below 1 Hr	54.90	21.00	24.10	46.30	24.30	29.40
	1-2 Hrs	55.40	17.20	27.40	48.90	19.70	31.30
	More than 2 Hrs	53.30	16.90	29.80	50.90	18.00	31.00
Family history of DM	No	53.70	19.30	27.10	46.40	22.50	31.10
	Yes	56.20	17.30	26.60	50.80	19.20	30.10
BMI	Under Weight	55.30	17.50	27.20	45.00	20.70	34.30
	Normal	55.10	19.50	25.50	49.20	21.50	29.30
	Over Weight	56.40	17.10	26.50	51.90	19.20	28.90
	Obese	48.20	17.10	34.60	47.50	22.50	30.00

CHAPTER 5

Awareness on the Complications of Diabetes

Chapter 5

Awareness on the Complications of Diabetes

5.1 Introduction

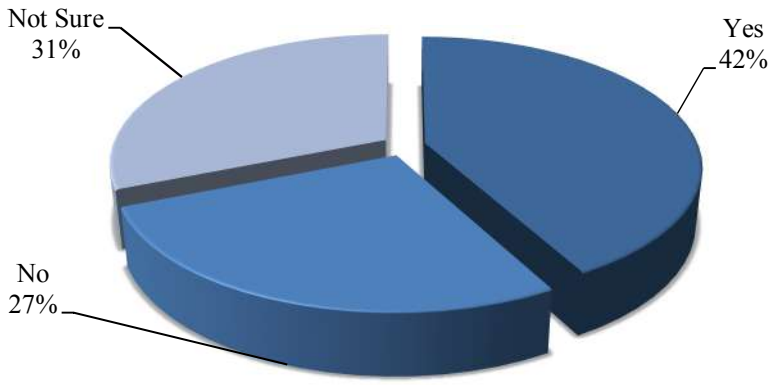
Diabetes increases the risk of many serious health problems unless it treated and adopted recommended lifestyle. There will be a higher risk of complication with longer and uncontrolled blood sugar. The possible complications include cardiovascular diseases, nerve diseases, kidney damages, eye blindness, foot damages, skin problems, hearing impairment, Alzheimer's and depression.

This chapter examines the awareness of students on major complications of diabetes. It is categorized into six sections. The awareness of students in major complications of diabetes is explained in second to fifth sections. The sixth section concludes the chapter with the major findings of the study.

5.2 Awareness on Diabetes and Blood Circulation

One of the major complications of the uncontrolled diabetes is the lower circulation of blood. It affects the movement of red and white blood cells across the body and prevents the healing of cuts and abrasions. Foot-related complications are very important due to neuropathic issues. The most common symptoms of poor blood circulation include tingling, numbness, pain and muscle cramps.

Fig: 5.1
Diabetes causes poor circulation of blood



The survey result reveals that 42 percent of the surveyed students are aware of diabetes and blood circulation. Only 27 percent of the total students think that diabetes may not affect blood circulation while other 31 percent of students are not aware of it. This awareness slightly varies among the different categories especially in *age* and *family history of diabetes*. The crosstab and MLRA analysis reveal that awareness is more among the lower aged students and the students whose family have diabetes. The test is statistically significant at a p-value less than 0.05.

Table: 5.1

Diabetes causes poor circulation of blood

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	43.6	26.0	30.4
	Above Age 15	37.5	29.3	33.2
Gender	Male	42.6	26.9	30.6
	Female	40.4	26.8	32.8
Physical Activity	Nil	42.9	23.4	33.7
	Up to 3 Hrs	42.6	28.2	29.2
	3-6 Hrs	40.7	27.5	31.8
	Above 6 Hrs	39.4	25.4	35.2
Time spent on Gadgets	Nil	45.3	31.1	23.6
	Below 1 Hr	39.7	28.4	31.9
	1-2 Hrs	43.5	26.0	30.5
	More than 2 Hrs	42.2	25.1	32.8

Table: 5.1 ***(Continue)***

Diabetes causes poor circulation of blood

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	44.3	26.1	29.6
	Yes	39.6	27.7	32.7
BMI	Under Weight	46.7	24.7	28.6
	Normal	40.7	27.2	32.1
	Over Weight	37.9	29.1	32.9
	Obese	41.8	27.9	30.4

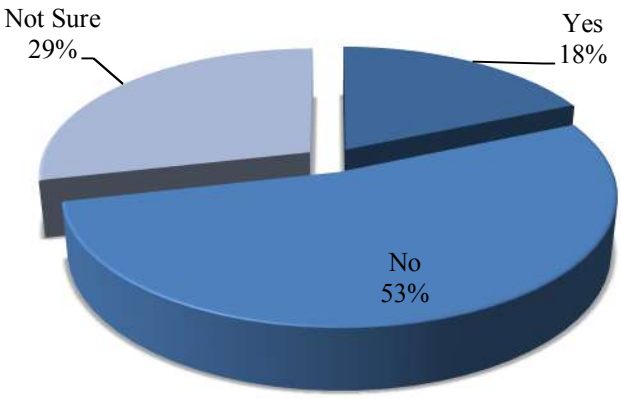
5.3 Awareness on Diabetes and Cancer

Diabetes is a devastating condition caused by lack of sufficient and effective insulin hormone to control blood sugar level. On the other hand, Cancer is a type of diseases characterized by uncontrolled cell growth in the body. It harms the body when altered cells divide uncontrollably to form lumps or masses of tissue called tumors[24]. There is no biologically proved evidence to associate diabetes and cancer and the biologic links between these two diseases are hardly understood. However, evidence from observational studies suggests that some medications used to treat diabetes are associated with either increased or reduced risk of cancer[25].

According to Giovannucci et al (2010), the epidemiologic evidence suggests that people with diabetes are at significantly higher risk for many forms of cancer. Their studies found that Type-2 diabetes is associated with increased risk of some cancers such as liver, pancreas, colon, and rectum, breast and bladder. The association between diabetes and some cancers may be partly due to shared risk factors between the two diseases, such as aging, obesity, diet, and physical inactivity.

[24] https://www.cancer.net/navigating-cancer-care/cancer-basics/what-cancer
[25] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2890380/

Fig: 5.2
Diabetes can cause cancer?



As there is no valid evidence and scientific studies on the complication of diabetes on cancer, this awareness assessment study assumes that there is no association between diabetes and cancer. While it was asked to students, more than 50 percent of the students responded that there is no association between diabetes and cancer. In the total, 29 percent of the students are unaware of it. The crosstab and MLRA result shows that there is a small variation among all categorical variables; however, the difference in the *age group* is only statistically significant. It shows that awareness is more among the higher age group with exp(B) value 0.662.

Table: 5.2
Diabetes can cause cancer

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	20.3	49.9	29.8
	Above Age 15	13.3	61.8	24.9
Gender	Male	18.3	53.7	28.0
	Female	19.5	50.3	30.2
Physical Activity	Nil	16.9	55.0	28.1
	Up to 3 Hrs	19.0	52.7	28.4
	3-6 Hrs	21.6	50.7	27.7
	Above 6 Hrs	15.0	55.0	30.0
Time spent on Gadgets	Nil	20.3	53.4	26.4
	Below 1 Hr	19.9	49.5	30.6
	1-2 Hrs	18.0	55.4	26.6
	More than 2 Hrs	17.2	52.7	30.1

Table: 5.2 *(Continue)*
Diabetes can cause cancer

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Family history of DM	No	20.1	51.3	28.6
	Yes	16.7	55.0	28.3
BMI	Under Weight	20.6	50.2	29.2
	Normal	18.4	53.6	28.0
	Over Weight	18.5	54.3	27.3
	Obese	13.2	54.6	32.1

5.4 Awareness on Diabetes and its Complications on Eyesight and Kidney

The people with diabetes can possibly affect a group of eye-related complications. It includes diabetic retinopathy, Diabetic Macular Edema (DME), cataract, and glaucoma[26]. These problems can cause blindness. Diabetic retinopathy is the most common eye disease among diabetic people which is caused by changes in the retinal blood vessels. Spots and dark strings, blurred, fluctuating and impaired color vision and dark or empty areas in the vision are major signs of diabetic retinopathy.

The kidney related diseases are the major complications of diabetes. According to US National Kidney Association, about 30 percent of patients with Type-1 diabetes and 10 to 40 percent of with Type-2 diabetes have chances of kidney failure[27]. Diabetes affects kidney in such a way that, with long and uncontrolled diabetes the small blood vessels get injured. When the blood vessels in the kidneys are injured, the kidneys cannot clean blood properly. Then the body will retain more water and salt than it should, which will result in weight gain and swelling in the ankles. As a result, the protein level in the urine will increase and waste materials will accumulate in the blood. The initial sign of diabetic kidney diseases is the presence of high albumin in the urine, weight gain and ankle swelling.

[26] https://nei.nih.gov/health/diabetic/retinopathy
[27] https://www.kidney.org/atoz/content/diabetes

Fig: 5.3
Diabetes can damage my eyesight

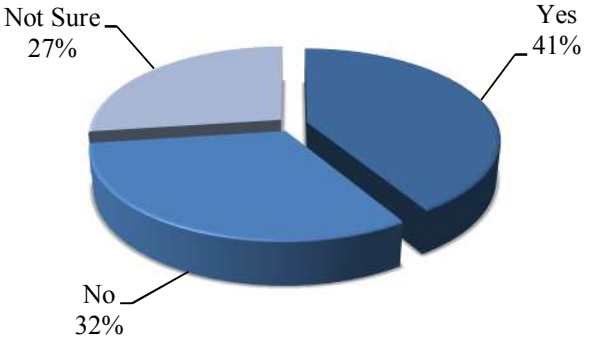
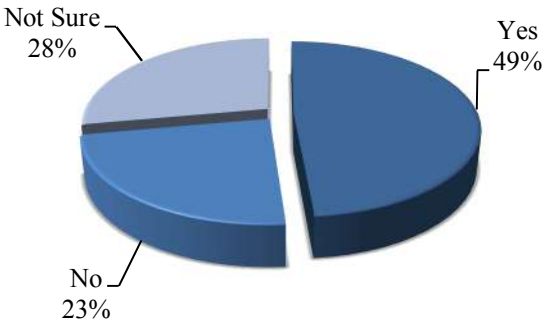


Fig: 5.4
Diabetes can damage my kidneys



Among the surveyed students, less than half of the students were aware of eye and kidney-related complications. The students were more aware of kidney-related complications than the eye-related complications. The crosstab and MLRA analysis of awareness on eye-related complications reveal that there is statistically significant variation among the different *age groups*, *BMI categories* and *family history of diabetes*. The result shows that awareness is more among the higher aged students, normal and higher BMI students and among the students coming from diabetic family. On the other hand, the awareness of kidney-related complications varies only under *gender* where males have more awareness than a female with statistical significance at EXP (B) value 1.242.

Table: 5.3
Diabetes can damage my Eyesight

Name of the Category	Sub Category	Diabetes and Eyesight (%)			Diabetes and Kidney (%)		
		Yes	No	Not Sure	Yes	No	Not Sure
Age	Below Age 15	38.80	33.50	27.70	48.20	23.40	28.40
	Above Age 15	48.50	26.20	25.30	50.30	23.20	26.50
Gender	Male	41.80	31.80	26.40	50.70	22.20	27.10
	Female	39.50	31.10	29.30	42.60	27.00	30.40
Physical Activity	Nil	40.40	27.20	32.50	47.20	21.70	31.10
	Up to 3 Hrs	42.50	32.30	25.20	48.30	23.50	28.20
	3-6 Hrs	41.40	32.50	26.10	50.00	26.80	23.20
	Above 6 Hrs	35.80	36.80	27.40	51.10	22.10	26.70

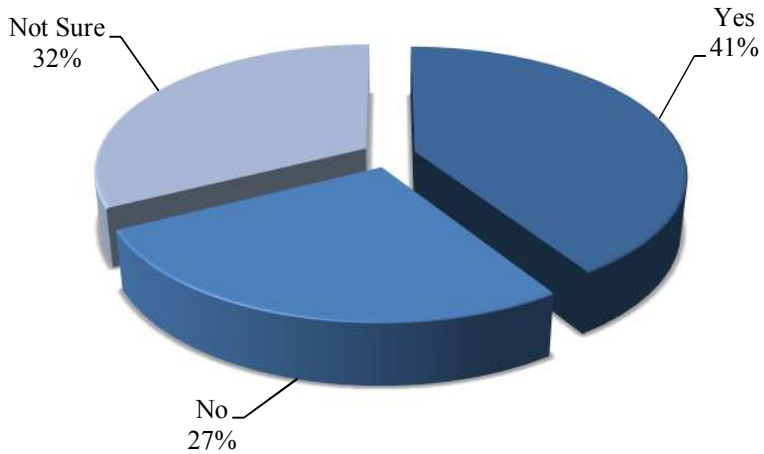
Table: 5.3 *(Continue)*
Diabetes can damage my Eyesight

Name of the Category	Sub Category	Diabetes and Eyesight (%)			Diabetes and Kidney (%)		
Time spent on Gadgets	Nil	39.90	29.70	30.40	41.20	26.40	32.40
	Below 1 Hr	38.50	32.50	29.00	46.90	22.50	30.60
	1-2 Hrs	42.50	32.70	24.80	49.90	23.90	26.20
	More than 2 Hrs	43.60	28.20	28.20	50.60	23.00	26.30
Family history of DM	No	36.20	34.70	29.10	49.20	22.90	27.90
	Yes	47.40	28.00	24.60	48.10	23.90	28.10
BMI	Under Weight	38.80	34.00	27.20	47.70	24.70	27.60
	Normal	41.50	31.40	27.10	48.90	22.50	28.60
	Over Weight	46.90	29.90	23.20	52.60	21.60	25.80
	Obese	39.30	28.20	32.50	44.60	27.50	27.90

5.5 Awareness on Diabetes and its Complications on the Loss of Sensation

Loss of sensation in feet and hands are the most common complications of chronic diabetes. The diabetic people lose their sensation due to damage in the nerves which is known as Peripheral Neuropathy[28]. The loss of sensation found almost 60 to 70 percent of the diabetic people. This problem can be solved by keeping their blood sugar level in a normal range.

Fig: 5.5
Diabetes can cause loss of feeling in my hands and feet



[28] https://www.webmd.com/diabetes/peripheral-neuropathy-risk-factors-symptoms#1

Among the surveyed students, 41 percent have awareness about diabetes and loss of sensation. More than half of the students have no idea about the complication of diabetes, particularly on the loss of sensation and only 41 percent of them are aware of it. More than half of the students were unaware that loss of sensation is a complication of diabetes. The awareness on the loss of feelings due to diabetes is not varied among the categorical variables except in *gender*. The crosstab and MLRA shows that males have more awareness than females with statistical significance.

Table: 5.4

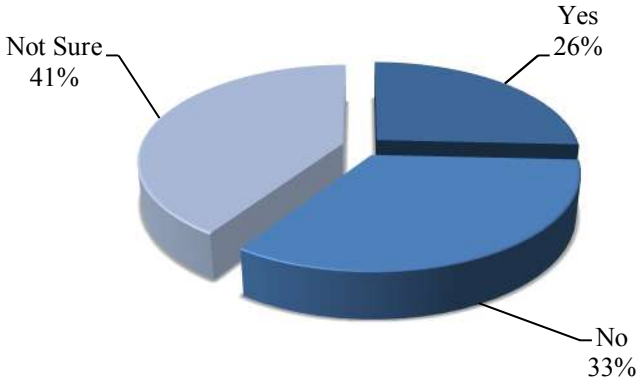
Diabetes can cause loss of feeling in my hands and feet

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	40.7	26.9	32.4
	Above Age 15	41.6	25.7	32.7
Gender	Male	42.5	26.0	31.5
	Female	35.8	28.4	35.7
Physical Activity	Nil	44.6	25.9	29.5
	Up to 3 Hrs	41.0	25.9	33.1
	3-6 Hrs	37.5	31.6	30.9
	Above 6 Hrs	36.8	26.1	37.1
Time spent on Gadgets	Nil	40.5	31.1	28.4
	Below 1 Hr	41.3	24.5	34.2
	1-2 Hrs	40.7	27.3	32.0
	More than 2 Hrs	40.9	27.3	31.8
Family history of DM	No	39.4	28.0	32.6
	Yes	42.7	24.9	32.4
BMI	Under Weight	40.3	26.7	33.1
	Normal	40.2	26.3	33.4
	Over Weight	42.4	28.4	29.1
	Obese	44.6	25.4	30.0

Moreover, people with diabetes need to avoid tight elastic shoes and socks, since there is a chance of getting injured due to diabetic neuropathy which finally leads to numbness. Even small ulcers could cause complications if persons have diabetic neuropathy. Eventually, these injuries produce ravaging effects and finally infected. So it is recommended not to wear tight elastic shoes or socks.

Fig: 5.6

Tight elastic shoes or socks are not bad for diabetics



However, only 33 percent of the students are aware about these facts. This awareness is not much varied among the categorical variables except in *gender*. The crosstab shows that there is a small difference among the male and females where males have more awareness than female and it is statistically significant at p-value 0.25 which is less than 0.05.

Table: 5.5

Tight elastic shoes or socks are not bad for diabetics

Name of the Category	Sub Category	Yes (%)	No (%)	Not Sure (%)
Age	Below Age 15	25.2	34.8	40.1
	Above Age 15	27.5	29.9	42.5
Gender	Male	25.6	31.8	42.6
	Female	26.3	39.2	34.6
Physical Activity	Nil	25.0	34.9	40.1
	Up to 3 Hrs	25.8	32.7	41.5
	3-6 Hrs	28.0	36.4	35.7
	Above 6 Hrs	24.1	32.6	43.3
Time spent on Gadgets	Nil	24.3	30.4	45.3
	Below 1 Hr	24.9	34.6	40.5
	1-2 Hrs	26.8	33.3	39.9
	More than 2 Hrs	25.1	33.5	41.4
Family history of DM	No	26.3	33.4	40.3
	Yes	25.1	33.8	41.1
BMI	Under Weight	25.6	33.8	40.6
	Normal	25.8	33.5	40.8
	Over Weight	25.4	34.8	39.8
	Obese	26.8	31.4	41.8

5.6 Conclusion

This chapter examined the awareness of students on various complications of diabetes. The analyses were carried out by crosstabs and MLRA. The result shows that the awareness on various complications of diabetes is very low among the students. It also reveals that less than half of the students are unaware of diabetes and its association between blood circulation, cancer, eye-related problems, kidney failures and loss of feeling in hand and foot. In many aspects, the crosstab analysis shows differences among the categorical variables, but MLRA confirmed that the differences are statistically not significant. However, the awareness of the complications of diabetes has significant statistical difference among the gender, age and family history of diabetes.

CHAPTER 6

Major Findings and Implications of the Study

Chapter 6

Major Findings and Implications of the Study

6.1 Introduction

Diabetes is a chronic disease that causes serious health complications such as cardiovascular, kidney failures, blindness and much more. The major cause of diabetes is the insufficient and ineffective insulin in the body. Currently, there are 425 million people with diabetes in the world which is projected to 629 million in 2045. In 2017, 4 million deaths were reported due to severe complications of diabetes. The proportion of diabetic people to total population also has increased drastically over the period and it is projected to increase by 25 percent in 2045.

The undiagnosed diabetes is the major challenge in the developing and underdeveloped countries. The number of diabetic people is also drastically increasing in these countries in recent period. The lack of diabetes education and ignorance of diabetes causes, symptoms and complications are the major challenges to overcome. Health education and awareness about diabetes among the students and the public is the only possible way out. Hence, this study is intended to assess the awareness of students on diabetes, its causes, signs, and complications.

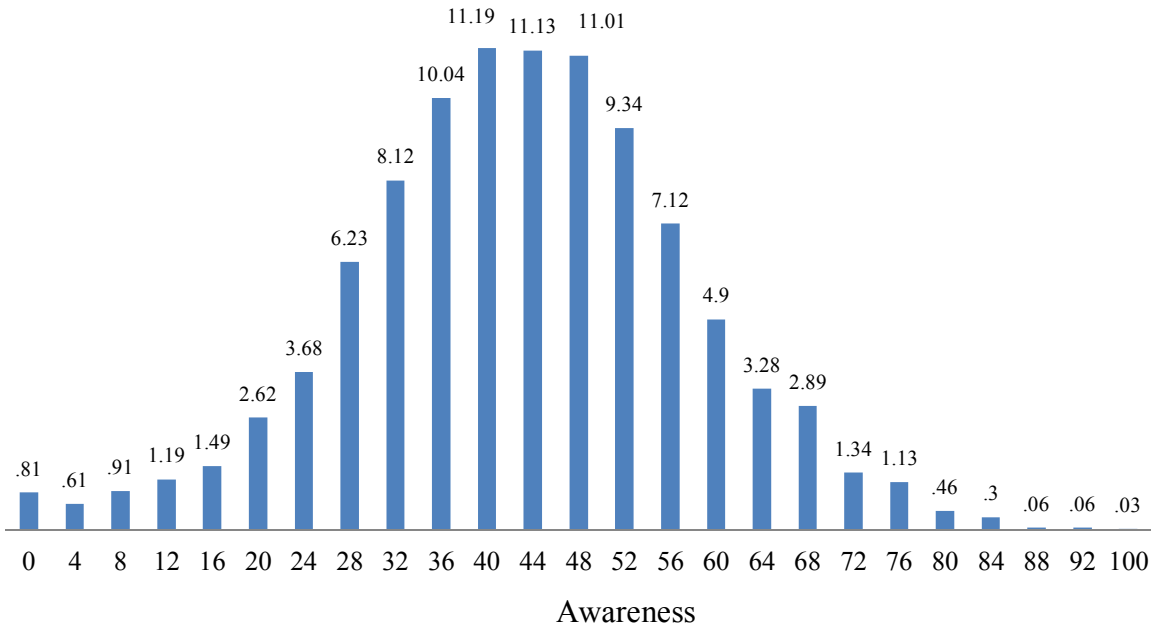
To assess the awareness among the students, a comprehensive questionnaire is prepared and collected data from the students. Statistical applications are used to validate and analyse data. The total awareness assessment is categorized into four major sections, namely, diabetes education, awareness on the causes of diabetes, awareness on symptoms of diabetes and awareness on the complications of diabetes. Crosstabs and Multinomial Logistic Regression Analysis were carried out in the analysis to validate the variations and differences among the categorical variables. The significance level fixed at 95 percent at a p-value less than 0.05 ($p<0.05$). The major findings of the analysis are as follows.

In the diabetes awareness survey, the students were asked 25 different questions on the concepts, symptoms, detection, and complications of diabetes. The responses of students were measured as *Yes, No, and Not sure basis,* then calculated absolute frequencies and were reported as percentages. It also measured individual score of students and converted into the awareness index by using an equation which is well explained in the methodology part. The detailed account of awareness index among the students is explained in Table: 6.1 and in Fig: 6.1.

Table: 6.1
Awareness Index

Marks Scored	Index	No. of Students	Percent
0	0	29	0.88
1	4	20	0.61
2	8	30	0.91
3	12	39	1.19
4	16	49	1.49
5	20	86	2.62
6	24	121	3.68
7	28	205	6.23
8	32	267	8.12
9	36	330	10.04
10	40	368	11.19
11	44	366	11.13
12	48	362	11.01
13	52	307	9.34
14	56	234	7.12
15	60	161	4.90
16	64	108	3.28
17	68	95	2.89
18	72	44	1.34
19	76	37	1.13
20	80	15	0.46
21	84	10	0.30
22	88	2	0.06
23	92	2	0.06
25	100	1	0.03
Total		3288	100.00

Fig: 6.1
Awareness Index (%)



In Fig: 6.1, the index of awareness is explained in X-axis and the percentage of students in Y-axis. It reveals that there are 0.030 percent of students who got an index of 100 and there are 0.81 percent of students who got 0 indexes.

6.2 Major Findings

- Only 54 percent of the students are aware of the fact that the kidney is not an insulin-producing organ. This awareness is not the same among the categories such as *gender*, *age group* and *family history of diabetes*, where males, higher aged students and students whose families have diabetes have more awareness.

- Among the total students, 47 percent have awareness on diabetes cure. Still, there is a debate on diabetes cure; it is proved that the complications of diabetes can be reduced. The crosstab analysis shows a difference in awareness among the *age group* and *family history of diabetes*, however, only *family history of diabetes* is statistically significant. It shows that this awareness is low among the students those family had diabetes.

- Healthy diet and exercise are more important than medication to control and prevent complications of diabetes. However, only 49 percent of the students know this fact. There is a remarkable difference in this awareness among *age group, gender, exercising students, gadgets using students* and among different *BMI*. However, the only *gender* is statistically significant where the lower age group have more awareness than the higher age group.

- The best way to detect diabetes is testing of blood sugar. There is a biological reference for lower, normal and higher blood sugar level and this is the basic awareness on diabetes. However, 55 percent of the students are not aware of it. The crosstab analysis shows that this awareness is varied among the *physical activities* and *family history of diabetes* students. But, only *family history of diabetes* is statistically significant which shows that the awareness is more among the students whose family have diabetes.

- Types of diabetes and its reasons are major aspects of diabetes educations. However, only 39 percent of the students are aware of it. This awareness varies among *age group, gender,* and *physical activities*. However, only *age group* is statistically significant. It shows that higher age group have more awareness than lower age group.

- The low blood sugar level has similar complication as high blood sugar. The lower blood sugar health condition is known as Hypoglycaemia. Only 34 students are aware of it. It also found that there is no statistically significant difference in awareness among the categorical variables except in the *physical activity*. The result shows a negative correlation between exercise and awareness.

- Eating sugar or sweet foods may not lead to diabetes if the body responds accordingly. But 81 percent of the students believe that eating sugar and sweets cause to diabetes. Moreover, 50 percent of the students wrongly believe that diabetes diet mostly consists of special foods. The crosstab result shows that this awareness is not the same among the different *age groups*, *gender,* and *BMI* where higher aged students, males and higher BMI students are more aware of it. But, these differences are statistically not significant.

- The usual cause of diabetes is the lack of effective insulin in the body which is the basic understanding on diabetes. Among the surveyed students, 62 percent are aware of it. It is found that this awareness is high among the higher aged groups, males, normal and higher BMI students, more exercising students and among the students whose family have diabetes. All the MLRA results are statistically significant also.

- Kidney failure is a major complication of diabetes, but kidney failure does not lead to diabetes. A 44 percent of the students know about this and 22 percent believe that kidney failure has an impact on diabetes. The crosstab analysis found that this awareness is more among the higher aged groups, males, higher physical exercising students and among the students whose family have diabetes. However, the MLRA result shows that crosstab analysis is statistically significant only in the *age group*.

- The diabetes issues can be inherited. There are many studies which exclusively confirmed it. However, less than half of the students are aware of it and 25 percent believe that it will not be inherited. This awareness is almost same in all categorical variables except in *gender* and *family history of diabetes*, where males and students those family have diabetes, have higher awareness. However, this result is statistically not significant at p-value greater than 0.05.

- Physical exercise has a significant positive effect on insulin sensitivity, where higher exercise reduces the level of glucose. However, 35 percent of the surveyed students wrongly believe that regular exercise increases the need for insulin and other diabetic medications. This awareness is slightly varied among all the categories of independent variable but there is no statistical significance.

- In untreated diabetes, the amount of sugar usually increases. While students were asked about untreated diabetes and the level of sugar in the blood, 71 percent of the students responded that blood sugar level increase in undiagnosed diabetes. This awareness is slightly varied among the categorical variables, especially among the *gender*, *BMI* and *time spent on gadgets*. However, all the results are statistically not significant except in *time spent on gadgets* and *physical activities*. It shows that awareness is more among the higher exercising and moderate gadget using students.

- The best way to check the diabetes is testing the blood, rather than urine. However, 35 percent of the students wrongly believe that urine is the best way of diabetes checkup. This awareness is slightly varied among all the categories without statistical significance except in the *family history of diabetes*. The MLRA result shows that the students those family have diabetes, have more awareness on the right way of diabetes testing which is statistically significant also.

- Diabetic people should take extra care when cutting their toenails, because, cuts and abrasions will heal slowly. Only 46 percent of the students are aware of it. The usage of iodine or alcohol to clean and prevent bacteria can harm the tissue and delay healing. The right way to clean a minor wound is with cool running water and mild soap. However, 40 percent of the students believe that iodine and alcohol are better in cleaning the cuts and abrasions. The crosstab analysis found that this awareness is varied among the *age groups*, *gender*, *physical exercising students*, *time spent on gadgets*, *family history of diabetes* and *BMI*. The awareness is more among the higher age groups, males, more exercising students, moderate gadget using students, normal BMI students and among the students whose family have diabetes. However, the MLRA shows that the crosstab result is statistically significant only in *age groups*, *time on gadgets* and *family history of diabetes*.

- It is found that the surveyed students are not aware of all the signs and symptoms of diabetes. Among the surveyed students, only 18 percent have identified the sign of low blood sugar and around half of them are identified the different signs of high blood sugar. The crosstab analysis of awareness on signs of low blood sugar found a small variation among the all categorical variables. But, only the *gender category* is statistically significant where males have more awareness than females. On the other hand, the crosstab analysis of awareness on signs of high blood sugar found a higher awareness among all the categories with small variation, but all are statistically not significant except in *physical activities*.

- Among the total students, 42 percent of them have awareness regarding the relationship between diabetes and blood circulation. This awareness among the different categories is slightly varied especially in *age* and *family history of diabetes*. The crosstab and MLRA analysis reveal that awareness is more among the low aged

groups and among the students whose family have diabetes. The test is statistically significant at a p-value less than 0.05.

- There is no biologically proved evidence to the association between diabetes and cancer and the biologic links between these two diseases are incompletely understood. However, 47 percent of students are not aware of this. The crosstab and MLRA result shows that there is small variation among the all categorical variables, however, the difference in the *age group* is only statistically significant. It found that the awareness more among the higher age group with exp(B) value 0.662.

- The people with diabetes can possibly affect the eye and kidney-related complications. However, less than half of the students are aware of it. The crosstab and MLRA analysis found that there is a statistically significant variation among the different *age groups*, *BMI categories* and *family history of diabetes*. The result shows that awareness is more among the higher age group, normal and higher BMI students and among the students whose families have diabetes.

- Loss of sensation in feet and hands are the most common complications of chronic diabetes. However, only 41 percent of the surveyed students are aware of it. The awareness on loss of sensation due to diabetes does not vary among the categorical variables except in *gender*. The crosstab and MLRA found that males have more awareness than females with statistical significance.

- The diabetic people need to avoid tight elastic shoes and socks and 33 percent of the students are aware of it. This awareness is not much varied among the categorical variables except in *gender* category. The crosstab analysis found that there is a small difference among the male and females where males have more awareness than female and it is statistically significant at p-value 0.025 which is less than 0.05.

6.3 Implications of the Study

Diabetes is probably a growing concern of the 21st century. Since it is the fourth leading cause of death in many countries and leads to habitual sickness, it is not just a health crisis; but global societal devastation which drives families into poverty due to its chronic nature. Access to essential medicines and technologies in order to detect diabetes is the major challenge of diabetes management. The lack of awareness and access to diagnosis remains an emergency situation in several countries. Currently, many organizations works to overcome the situation. The International Diabetes Federation (IDF) has set up *'IDF Life for a Child'* programme to provide sufficient insulin, medical equipment, and diabetes education together with technical support for health professionals. They also provide essential toolkits for children, teachers, and parents.

To ameliorate the burden of diabetes, it is recommended to scaling up access to insulin and other diabetes medicines along with proper education and awareness. There must be private-public collaborations to take global leadership on efficient procurement and distribution of medicines. The extensive researches and evidence-based guidelines for diagnosis are highly required.

Therefore, this study emphasizes the need for implementing effective programmes for improving diabetes knowledge and awareness among the people in order to achieve prevention and better control of diabetes risk factors, complications, and its management. It also urges a periodical assessment of diabetes awareness to validate the effectiveness of diabetes awareness programmes.

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APPENDIX

Appendix - Parameter Estimates

APPENDIX 1[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.345	0.000			
	[Gender=1]	0.173	0.212	0.806	0.575	1.131
	[Gender=2]					
	[Age_Cat=1.00]	0.145	0.000	1.720	1.296	2.284
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.236	0.048	1.595	1.004	2.536
	[BMI_Cat=2.00]	0.216	0.018	1.663	1.089	2.538
	[BMI_Cat=3.00]	0.264	0.105	1.535	0.914	2.578
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.264	0.064	1.630	0.972	2.736
	[Physical_activity=2]	0.216	0.591	1.123	0.736	1.713
	[Physical_activity=3]	0.261	0.784	1.074	0.644	1.792
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.326	0.913	0.965	0.509	1.828
	[Time_on_gadgets=2]	0.183	0.136	1.313	0.918	1.880
	[Time_on_gadgets=3]	0.174	0.025	1.476	1.050	2.074
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.135	0.357	1.132	0.869	1.475
	[Family_history_of_DM=2]					
No	Intercept	0.436	0.392			
	[Gender=1]	0.214	0.809	1.053	0.692	1.602
	[Gender=2]					
	[Age_Cat=1.00]	0.176	0.657	0.925	0.654	1.307
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.294	0.901	0.964	0.542	1.716
	[BMI_Cat=2.00]	0.264	0.634	1.134	0.676	1.902
	[BMI_Cat=3.00]	0.321	0.483	1.252	0.668	2.347
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.332	0.026	2.090	1.091	4.002
	[Physical_activity=2]	0.282	0.320	1.324	0.762	2.301
	[Physical_activity=3]	0.339	0.548	1.226	0.631	2.384
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.385	0.219	1.607	0.755	3.420
	[Time_on_gadgets=2]	0.233	0.531	1.157	0.734	1.825
	[Time_on_gadgets=3]	0.218	0.086	1.453	0.948	2.225
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.167	0.148	1.273	0.918	1.764
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 2[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.253	0.095			
	[Gender=1]	0.098	0.000	2.446	2.017	2.967
	[Gender=2]					
	[Age_Cat=1.00]	0.109	0.000	0.523	0.422	0.647
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.173	0.456	1.137	0.811	1.595
	[BMI_Cat=2.00]	0.163	0.053	1.370	0.995	1.885
	[BMI_Cat=3.00]	0.197	0.045	1.485	1.010	2.185
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.181	0.030	0.675	0.473	0.964
	[Physical_activity=2]	0.165	0.203	0.811	0.587	1.120
	[Physical_activity=3]	0.193	0.327	0.828	0.568	1.208
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.227	0.890	0.969	0.621	1.512
	[Time_on_gadgets=2]	0.125	0.680	1.053	0.824	1.345
	[Time_on_gadgets=3]	0.120	0.023	1.314	1.039	1.661
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.089	0.000	1.559	1.311	1.855
	[Family_history_of_DM=2]					
No	Intercept	0.355	0.000			
	[Gender=1]	0.134	0.000	1.731	1.332	2.251
	[Gender=2]					
	[Age_Cat=1.00]	0.162	0.199	1.232	0.896	1.693
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.224	0.084	0.679	0.437	1.054
	[BMI_Cat=2.00]	0.209	0.488	0.865	0.574	1.304
	[BMI_Cat=3.00]	0.260	0.675	0.897	0.539	1.492
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.257	0.886	0.964	0.583	1.594
	[Physical_activity=2]	0.234	0.685	1.100	0.695	1.741
	[Physical_activity=3]	0.281	0.372	0.778	0.449	1.349
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.287	0.008	2.142	1.222	3.756
	[Time_on_gadgets=2]	0.180	0.006	1.635	1.148	2.327
	[Time_on_gadgets=3]	0.177	0.026	1.481	1.048	2.093
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.122	0.341	1.123	0.885	1.425
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 3[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.285	0.000			
	[Gender=1]	0.115	0.905	1.014	0.810	1.269
	[Gender=2]					
	[Age_Cat=1.00]	0.123	0.000	1.567	1.230	1.996
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.200	0.040	1.507	1.019	2.228
	[BMI_Cat=2.00]	0.189	0.312	1.210	0.836	1.752
	[BMI_Cat=3.00]	0.217	0.008	1.777	1.162	2.718
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.196	0.770	0.944	0.643	1.386
	[Physical_activity=2]	0.174	0.349	1.177	0.837	1.654
	[Physical_activity=3]	0.208	0.463	1.165	0.775	1.752
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.251	0.813	1.061	0.649	1.735
	[Time_on_gadgets=2]	0.143	0.274	1.169	0.884	1.546
	[Time_on_gadgets=3]	0.137	0.520	0.916	0.701	1.197
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.099	0.001	0.723	0.595	0.878
	[Family_history_of_DM=2]					
No	Intercept	0.227	0.961			
	[Gender=1]	0.097	0.130	1.159	0.958	1.402
	[Gender=2]					
	[Age_Cat=1.00]	0.093	0.031	0.819	0.683	0.982
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.158	0.077	1.324	0.971	1.806
	[BMI_Cat=2.00]	0.146	0.199	1.206	0.906	1.606
	[BMI_Cat=3.00]	0.177	0.748	1.059	0.748	1.499
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.161	0.755	0.951	0.693	1.304
	[Physical_activity=2]	0.143	0.253	1.178	0.890	1.559
	[Physical_activity=3]	0.171	0.185	1.255	0.897	1.757
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.212	0.634	0.904	0.597	1.369
	[Time_on_gadgets=2]	0.118	0.904	0.986	0.782	1.243
	[Time_on_gadgets=3]	0.111	0.378	0.907	0.730	1.127
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.081	0.133	1.129	0.964	1.324
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 4[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.324	0.000			
	[Gender=1]	0.120	0.009	1.368	1.080	1.732
	[Gender=2]					
	[Age_Cat=1.00]	0.152	0.003	1.568	1.165	2.111
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.221	0.071	1.489	0.966	2.297
	[BMI_Cat=2.00]	0.211	0.218	1.298	0.857	1.964
	[BMI_Cat=3.00]	0.246	0.173	1.399	0.863	2.267
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.221	0.853	1.042	0.676	1.606
	[Physical_activity=2]	0.196	0.489	1.145	0.779	1.683
	[Physical_activity=3]	0.230	0.194	1.349	0.859	2.117
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.268	0.791	1.074	0.635	1.816
	[Time_on_gadgets=2]	0.157	0.064	1.337	0.983	1.820
	[Time_on_gadgets=3]	0.150	0.659	1.069	0.796	1.434
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.108	0.734	0.964	0.779	1.192
	[Family_history_of_DM=2]					
No	Intercept	0.237	0.664			
	[Gender=1]	0.099	0.000	2.250	1.855	2.729
	[Gender=2]					
	[Age_Cat=1.00]	0.102	0.000	0.494	0.405	0.602
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.165	0.493	1.120	0.810	1.547
	[BMI_Cat=2.00]	0.153	0.165	1.237	0.916	1.672
	[BMI_Cat=3.00]	0.184	0.758	1.058	0.738	1.516
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.168	0.626	1.086	0.781	1.510
	[Physical_activity=2]	0.149	0.677	1.064	0.794	1.426
	[Physical_activity=3]	0.180	0.592	1.101	0.774	1.567
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.215	0.521	0.871	0.571	1.328
	[Time_on_gadgets=2]	0.123	0.059	1.262	0.992	1.606
	[Time_on_gadgets=3]	0.115	0.404	1.101	0.879	1.379
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.085	0.000	1.351	1.144	1.595
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 5[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.257	0.003			
	[Gender=1]	0.119	0.088	0.816	0.646	1.030
	[Gender=2]					
	[Age_Cat=1.00]	0.109	0.405	1.095	0.885	1.354
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.181	0.338	1.190	0.834	1.698
	[BMI_Cat=2.00]	0.169	0.176	1.256	0.903	1.749
	[BMI_Cat=3.00]	0.198	0.998	1.000	0.678	1.474
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.177	0.577	0.906	0.641	1.281
	[Physical_activity=2]	0.158	0.139	1.263	0.927	1.721
	[Physical_activity=3]	0.199	0.049	1.479	1.002	2.184
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.233	0.733	1.083	0.686	1.708
	[Time_on_gadgets=2]	0.130	0.010	1.395	1.082	1.799
	[Time_on_gadgets=3]	0.124	0.000	1.746	1.368	2.227
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.096	0.105	1.169	0.968	1.411
	[Family_history_of_DM=2]					
No	Intercept	0.386	0.001			
	[Gender=1]	0.163	0.136	0.785	0.570	1.080
	[Gender=2]					
	[Age_Cat=1.00]	0.163	0.022	1.451	1.055	1.996
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.268	0.812	1.066	0.630	1.803
	[BMI_Cat=2.00]	0.249	0.327	1.277	0.783	2.081
	[BMI_Cat=3.00]	0.292	0.740	1.102	0.621	1.954
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.269	0.788	1.075	0.635	1.821
	[Physical_activity=2]	0.242	0.198	1.366	0.850	2.195
	[Physical_activity=3]	0.291	0.078	1.669	0.944	2.951
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.316	0.133	1.609	0.865	2.993
	[Time_on_gadgets=2]	0.191	0.038	1.488	1.023	2.163
	[Time_on_gadgets=3]	0.185	0.027	1.506	1.047	2.164
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.136	0.484	1.100	0.843	1.436
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 6[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	421.477	0.947			
	[Gender=1]	0.103	0.082	0.835	0.682	1.023
	[Gender=2]					
	[Age_Cat=1.00]	405.748	0.973	966601.512	0.000	.[c]
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	421.478	0.974	0.000	0.000	.[c]
	[BMI_Cat=2.00]	0.152	0.000	0.576	0.428	0.775
	[BMI_Cat=3.00]	1012.933	1.000	1.299	0.000	.[c]
	[BMI_Cat=4.00]					
	[Physical_activity=1]	586.254	1.000	0.826	0.000	.[c]
	[Physical_activity=2]	0.154	0.000	0.000	0.000	0.000
	[Physical_activity=3]	765.520	0.999	0.573	0.000	.[c]
	[Physical_activity=4]					
	[Time_on_gadgets=1]	1758.968	0.994	1524834.290	0.000	.[c]
	[Time_on_gadgets=2]	0.125	0.000	747521.409	584561.727	955909.754
	[Time_on_gadgets=3]	592.120	0.982	796559.116	0.000	.[c]
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	413.043	0.976	291110.233	0.000	.[c]
	[Family_history_of_DM=2]					
No	Intercept	421.477	0.948			
	[Gender=1]	0.117	0.006	0.724	0.575	0.910
	[Gender=2]					
	[Age_Cat=1.00]	405.748	0.973	1157353.491	0.000	.[c]
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	421.478	0.974	0.000	0.000	.[c]
	[BMI_Cat=2.00]	0.180	0.000	0.509	0.357	0.724
	[BMI_Cat=3.00]	1012.933	1.000	1.274	0.000	.[c]
	[BMI_Cat=4.00]					
	[Physical_activity=1]	586.254	1.000	0.951	0.000	.[c]
	[Physical_activity=2]	0.187	0.000	0.000	0.000	0.000
	[Physical_activity=3]	765.520	1.000	0.874	0.000	.[c]
	[Physical_activity=4]					
	[Time_on_gadgets=1]	1758.968	0.993	1889312.859	0.000	.[c]
	[Time_on_gadgets=2]	0.144	0.000	895860.921	674921.277	1189126.522
	[Time_on_gadgets=3]	592.120	0.982	723641.763	0.000	.[c]
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	413.043	0.976	206776.597	0.000	.[c]
	[Family_history_of_DM=2]					

a. The reference category is: 4.

b. This parameter is set to zero because it is redundant.

c. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

Appendix - Parameter Estimates

APPENDIX 8[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.225	0.258			
	[Gender=1]	0.096	0.324	0.909	0.753	1.098
	[Gender=2]					
	[Age_Cat=1.00]	0.092	0.762	1.028	0.859	1.231
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.158	0.221	1.213	0.890	1.653
	[BMI_Cat=2.00]	0.147	0.342	1.150	0.862	1.533
	[BMI_Cat=3.00]	0.176	0.052	1.408	0.997	1.988
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.159	0.186	0.811	0.594	1.107
	[Physical_activity=2]	0.140	0.893	0.981	0.746	1.291
	[Physical_activity=3]	0.167	0.805	1.042	0.751	1.447
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.209	0.726	1.076	0.714	1.621
	[Time_on_gadgets=2]	0.115	0.227	1.150	0.917	1.441
	[Time_on_gadgets=3]	0.108	0.138	1.174	0.950	1.451
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.080	0.000	1.685	1.442	1.970
	[Family_history_of_DM=2]					
No	Intercept	0.288	0.006			
	[Gender=1]	0.118	0.022	0.763	0.605	0.962
	[Gender=2]					
	[Age_Cat=1.00]	0.121	0.139	1.196	0.943	1.516
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.197	0.814	1.047	0.711	1.542
	[BMI_Cat=2.00]	0.185	0.727	0.938	0.653	1.347
	[BMI_Cat=3.00]	0.220	0.300	1.256	0.816	1.933
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.204	0.943	1.015	0.680	1.514
	[Physical_activity=2]	0.184	0.906	1.022	0.713	1.465
	[Physical_activity=3]	0.218	0.684	1.093	0.713	1.676
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.254	0.424	1.225	0.744	2.017
	[Time_on_gadgets=2]	0.145	0.101	1.268	0.955	1.685
	[Time_on_gadgets=3]	0.141	0.711	0.949	0.721	1.251
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.103	0.280	1.118	0.914	1.367
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 9[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.252	0.836			
	[Gender=1]	0.107	0.601	0.945	0.766	1.167
	[Gender=2]					
	[Age_Cat=1.00]	0.107	0.259	0.886	0.718	1.093
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.175	0.053	1.403	0.996	1.976
	[BMI_Cat=2.00]	0.163	0.079	1.333	0.968	1.837
	[BMI_Cat=3.00]	0.196	0.116	1.360	0.926	1.998
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.176	0.397	1.161	0.822	1.639
	[Physical_activity=2]	0.156	0.047	1.364	1.004	1.853
	[Physical_activity=3]	0.187	0.111	1.349	0.934	1.948
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.234	0.973	0.992	0.627	1.569
	[Time_on_gadgets=2]	0.131	0.720	0.954	0.739	1.232
	[Time_on_gadgets=3]	0.123	0.417	0.905	0.712	1.151
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.091	0.476	0.937	0.784	1.120
	[Family_history_of_DM=2]					
No	Intercept	0.255	0.704			
	[Gender=1]	0.110	0.775	0.969	0.781	1.203
	[Gender=2]					
	[Age_Cat=1.00]	0.107	0.012	0.763	0.618	0.942
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.178	0.269	1.217	0.859	1.724
	[BMI_Cat=2.00]	0.164	0.134	1.279	0.927	1.766
	[BMI_Cat=3.00]	0.197	0.214	1.278	0.868	1.882
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.179	0.848	1.035	0.728	1.471
	[Physical_activity=2]	0.158	0.132	1.270	0.931	1.732
	[Physical_activity=3]	0.191	0.257	1.242	0.854	1.805
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.240	0.928	1.022	0.639	1.635
	[Time_on_gadgets=2]	0.133	0.654	1.062	0.817	1.379
	[Time_on_gadgets=3]	0.126	0.725	0.957	0.748	1.224
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.092	0.000	1.595	1.333	1.909
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 10[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.259	0.256			
	[Gender=1]	0.107	0.833	1.023	0.830	1.261
	[Gender=2]					
	[Age_Cat=1.00]	0.108	0.501	1.075	0.871	1.328
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.181	0.141	1.306	0.915	1.863
	[BMI_Cat=2.00]	0.170	0.092	1.331	0.954	1.857
	[BMI_Cat=3.00]	0.201	0.157	1.330	0.896	1.973
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.180	0.972	1.006	0.707	1.432
	[Physical_activity=2]	0.161	0.726	1.058	0.771	1.452
	[Physical_activity=3]	0.193	0.946	0.987	0.677	1.440
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.222	0.972	1.008	0.652	1.558
	[Time_on_gadgets=2]	0.131	0.213	1.178	0.910	1.523
	[Time_on_gadgets=3]	0.125	0.015	1.355	1.062	1.731
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.091	0.862	1.016	0.850	1.215
	[Family_history_of_DM=2]					
No	Intercept	0.249	0.933			
	[Gender=1]	0.108	0.063	1.221	0.989	1.507
	[Gender=2]					
	[Age_Cat=1.00]	0.104	0.189	0.873	0.712	1.069
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.173	0.818	1.040	0.742	1.459
	[BMI_Cat=2.00]	0.160	0.532	1.105	0.808	1.513
	[BMI_Cat=3.00]	0.192	0.696	1.078	0.740	1.571
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.178	0.493	0.885	0.624	1.255
	[Physical_activity=2]	0.157	0.443	1.128	0.829	1.536
	[Physical_activity=3]	0.188	0.723	1.069	0.740	1.544
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.232	0.098	0.681	0.432	1.074
	[Time_on_gadgets=2]	0.127	0.362	1.123	0.875	1.441
	[Time_on_gadgets=3]	0.121	0.128	1.202	0.949	1.524
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.090	0.370	1.084	0.909	1.292
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 11[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.229	0.128			
	[Gender=1]	0.097	0.064	1.198	0.990	1.449
	[Gender=2]					
	[Age_Cat=1.00]	0.092	0.000	0.638	0.533	0.764
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.159	0.058	1.353	0.990	1.848
	[BMI_Cat=2.00]	0.148	0.110	1.267	0.948	1.694
	[BMI_Cat=3.00]	0.175	0.216	1.241	0.881	1.748
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.163	0.027	1.432	1.041	1.970
	[Physical_activity=2]	0.144	0.016	1.414	1.067	1.875
	[Physical_activity=3]	0.172	0.038	1.430	1.021	2.003
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.213	0.448	0.851	0.560	1.292
	[Time_on_gadgets=2]	0.117	0.328	0.892	0.710	1.122
	[Time_on_gadgets=3]	0.110	0.895	0.986	0.794	1.223
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.080	0.843	1.016	0.868	1.189
	[Family_history_of_DM=2]					
No	Intercept	0.273	0.003			
	[Gender=1]	0.111	0.182	0.862	0.693	1.072
	[Gender=2]					
	[Age_Cat=1.00]	0.121	0.061	1.254	0.989	1.590
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.192	0.275	1.233	0.847	1.794
	[BMI_Cat=2.00]	0.180	0.285	1.212	0.852	1.723
	[BMI_Cat=3.00]	0.218	0.871	0.965	0.630	1.479
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.188	0.554	1.118	0.773	1.616
	[Physical_activity=2]	0.167	0.970	1.006	0.726	1.396
	[Physical_activity=3]	0.198	0.329	1.213	0.823	1.789
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.239	0.890	1.034	0.647	1.650
	[Time_on_gadgets=2]	0.138	0.265	0.857	0.654	1.124
	[Time_on_gadgets=3]	0.132	0.213	0.849	0.656	1.099
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.096	0.902	1.012	0.838	1.221
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 12[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.260	0.000			
	[Gender=1]	0.107	0.153	1.165	0.945	1.435
	[Gender=2]					
	[Age_Cat=1.00]	0.106	0.007	1.332	1.082	1.641
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.182	0.279	1.217	0.853	1.738
	[BMI_Cat=2.00]	0.170	0.403	1.153	0.826	1.610
	[BMI_Cat=3.00]	0.201	0.591	1.114	0.751	1.652
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.182	0.008	1.621	1.134	2.318
	[Physical_activity=2]	0.161	0.006	1.559	1.137	2.139
	[Physical_activity=3]	0.190	0.002	1.780	1.225	2.585
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.229	0.792	0.941	0.602	1.473
	[Time_on_gadgets=2]	0.129	0.518	1.087	0.844	1.400
	[Time_on_gadgets=3]	0.123	0.730	0.958	0.753	1.219
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.089	0.282	0.908	0.763	1.082
	[Family_history_of_DM=2]					
No	Intercept	0.234	0.047			
	[Gender=1]	0.100	0.331	1.102	0.906	1.339
	[Gender=2]					
	[Age_Cat=1.00]	0.096	0.801	1.024	0.849	1.236
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.163	0.991	1.002	0.727	1.380
	[BMI_Cat=2.00]	0.152	0.685	0.940	0.699	1.265
	[BMI_Cat=3.00]	0.181	0.739	0.942	0.661	1.342
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.166	0.006	1.576	1.139	2.181
	[Physical_activity=2]	0.146	0.033	1.367	1.026	1.821
	[Physical_activity=3]	0.177	0.034	1.454	1.028	2.055
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.219	0.424	0.839	0.546	1.289
	[Time_on_gadgets=2]	0.121	0.774	1.035	0.816	1.314
	[Time_on_gadgets=3]	0.114	0.903	1.014	0.811	1.268
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.084	0.973	1.003	0.851	1.181
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 13[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.298	0.132			
	[Gender=1]	0.119	0.010	1.361	1.077	1.719
	[Gender=2]					
	[Age_Cat=1.00]	0.124	0.927	1.011	0.793	1.290
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.212	0.231	0.776	0.513	1.175
	[BMI_Cat=2.00]	0.198	0.197	0.774	0.525	1.142
	[BMI_Cat=3.00]	0.237	0.120	0.692	0.435	1.101
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.204	0.653	1.096	0.735	1.636
	[Physical_activity=2]	0.185	0.217	1.257	0.874	1.809
	[Physical_activity=3]	0.221	0.650	0.905	0.586	1.395
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.255	0.536	0.854	0.518	1.407
	[Time_on_gadgets=2]	0.150	0.534	0.911	0.680	1.222
	[Time_on_gadgets=3]	0.144	0.429	1.120	0.845	1.486
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.104	0.797	1.027	0.837	1.260
	[Family_history_of_DM=2]					
No	Intercept	0.282	0.007			
	[Gender=1]	0.113	0.001	1.451	1.164	1.810
	[Gender=2]					
	[Age_Cat=1.00]	0.116	0.143	0.844	0.673	1.059
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.204	0.666	0.916	0.615	1.365
	[BMI_Cat=2.00]	0.191	0.515	0.883	0.607	1.285
	[BMI_Cat=3.00]	0.224	0.980	1.006	0.649	1.560
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.192	0.320	0.826	0.566	1.204
	[Physical_activity=2]	0.173	0.235	1.228	0.875	1.723
	[Physical_activity=3]	0.203	0.690	1.084	0.728	1.615
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.244	0.252	0.757	0.469	1.220
	[Time_on_gadgets=2]	0.141	0.723	0.951	0.722	1.253
	[Time_on_gadgets=3]	0.136	0.294	1.153	0.884	1.504
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.098	0.308	1.105	0.912	1.340
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 14[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.239	0.884			
	[Gender=1]	0.100	0.134	1.162	0.955	1.415
	[Gender=2]					
	[Age_Cat=1.00]	0.099	0.047	1.216	1.002	1.476
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.169	0.633	1.084	0.778	1.510
	[BMI_Cat=2.00]	0.158	0.457	0.889	0.653	1.212
	[BMI_Cat=3.00]	0.187	0.281	0.817	0.566	1.180
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.165	0.331	1.175	0.849	1.625
	[Physical_activity=2]	0.147	0.053	1.330	0.996	1.776
	[Physical_activity=3]	0.176	0.463	1.138	0.805	1.608
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.232	0.085	1.490	0.946	2.347
	[Time_on_gadgets=2]	0.121	0.657	0.948	0.747	1.202
	[Time_on_gadgets=3]	0.114	0.606	1.061	0.848	1.326
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.084	0.018	0.820	0.695	0.967
	[Family_history_of_DM=2]					
No	Intercept	0.265	0.219			
	[Gender=1]	0.111	0.494	1.079	0.868	1.342
	[Gender=2]					
	[Age_Cat=1.00]	0.107	0.649	0.953	0.773	1.174
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.188	0.475	0.874	0.605	1.264
	[BMI_Cat=2.00]	0.173	0.523	0.895	0.638	1.257
	[BMI_Cat=3.00]	0.203	0.725	0.931	0.625	1.387
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.188	0.774	0.948	0.656	1.369
	[Physical_activity=2]	0.165	0.105	1.306	0.946	1.803
	[Physical_activity=3]	0.196	0.389	1.184	0.806	1.738
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.252	0.025	1.760	1.074	2.886
	[Time_on_gadgets=2]	0.136	0.222	1.180	0.905	1.540
	[Time_on_gadgets=3]	0.130	0.460	1.100	0.854	1.419
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.094	0.597	0.952	0.792	1.143
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 15[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.321	0.000			
	[Gender=1]	0.124	0.739	1.042	0.817	1.330
	[Gender=2]					
	[Age_Cat=1.00]	0.135	0.178	1.200	0.920	1.564
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.224	0.042	1.578	1.018	2.447
	[BMI_Cat=2.00]	0.213	0.036	1.562	1.030	2.369
	[BMI_Cat=3.00]	0.248	0.037	1.676	1.031	2.723
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.224	0.352	1.232	0.794	1.909
	[Physical_activity=2]	0.198	0.116	1.366	0.926	2.015
	[Physical_activity=3]	0.230	0.049	1.573	1.002	2.469
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.275	0.425	1.245	0.726	2.134
	[Time_on_gadgets=2]	0.153	0.564	1.092	0.810	1.473
	[Time_on_gadgets=3]	0.147	0.435	1.122	0.840	1.498
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.107	0.121	0.847	0.687	1.045
	[Family_history_of_DM=2]					
No	Intercept	0.230	0.026			
	[Gender=1]	0.099	0.126	1.163	0.958	1.411
	[Gender=2]					
	[Age_Cat=1.00]	0.098	0.000	0.662	0.547	0.803
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.160	0.475	1.121	0.820	1.533
	[BMI_Cat=2.00]	0.148	0.259	1.182	0.884	1.582
	[BMI_Cat=3.00]	0.179	0.374	1.172	0.825	1.665
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.163	0.565	1.099	0.797	1.513
	[Physical_activity=2]	0.144	0.852	1.027	0.774	1.363
	[Physical_activity=3]	0.174	0.949	1.011	0.719	1.423
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.218	0.393	1.205	0.786	1.847
	[Time_on_gadgets=2]	0.118	0.929	1.011	0.801	1.275
	[Time_on_gadgets=3]	0.113	0.042	1.258	1.008	1.569
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.083	0.550	1.051	0.893	1.236
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 16[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.233	0.442			
	[Gender=1]	0.097	0.146	1.151	0.952	1.392
	[Gender=2]					
	[Age_Cat=1.00]	0.096	0.000	0.704	0.584	0.849
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.164	0.367	1.160	0.841	1.599
	[BMI_Cat=2.00]	0.154	0.159	1.242	0.919	1.679
	[BMI_Cat=3.00]	0.182	0.672	1.080	0.756	1.543
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.163	0.206	0.814	0.592	1.120
	[Physical_activity=2]	0.144	0.239	0.844	0.636	1.120
	[Physical_activity=3]	0.173	0.714	1.066	0.759	1.496
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.215	0.296	1.253	0.821	1.911
	[Time_on_gadgets=2]	0.117	0.003	1.422	1.131	1.787
	[Time_on_gadgets=3]	0.110	0.007	1.348	1.086	1.673
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.081	0.003	1.272	1.085	1.491
	[Family_history_of_DM=2]					
No	Intercept	0.286	0.363			
	[Gender=1]	0.120	0.560	0.932	0.736	1.180
	[Gender=2]					
	[Age_Cat=1.00]	0.125	0.766	1.038	0.812	1.327
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.193	0.033	0.663	0.454	0.968
	[BMI_Cat=2.00]	0.178	0.078	0.730	0.515	1.036
	[BMI_Cat=3.00]	0.213	0.336	0.815	0.537	1.237
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.209	0.746	0.935	0.621	1.407
	[Physical_activity=2]	0.186	0.884	0.973	0.675	1.402
	[Physical_activity=3]	0.225	0.897	1.030	0.663	1.599
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.252	0.124	1.473	0.899	2.413
	[Time_on_gadgets=2]	0.148	0.734	1.052	0.787	1.406
	[Time_on_gadgets=3]	0.139	0.466	1.106	0.843	1.451
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.104	0.878	0.984	0.803	1.206
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 17[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.236	0.990			
	[Gender=1]	0.101	0.278	0.896	0.735	1.092
	[Gender=2]					
	[Age_Cat=1.00]	0.096	0.084	0.848	0.703	1.022
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.168	0.025	1.457	1.048	2.025
	[BMI_Cat=2.00]	0.158	0.012	1.487	1.091	2.026
	[BMI_Cat=3.00]	0.184	0.202	1.265	0.882	1.816
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.162	0.640	1.079	0.785	1.483
	[Physical_activity=2]	0.143	0.770	1.043	0.788	1.379
	[Physical_activity=3]	0.173	0.801	0.957	0.682	1.344
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.219	0.312	1.249	0.812	1.919
	[Time_on_gadgets=2]	0.119	0.263	1.142	0.905	1.441
	[Time_on_gadgets=3]	0.112	0.477	1.083	0.869	1.349
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.082	0.003	1.275	1.085	1.499
	[Family_history_of_DM=2]					
No	Intercept	0.272	0.864			
	[Gender=1]	0.116	0.000	0.662	0.527	0.830
	[Gender=2]					
	[Age_Cat=1.00]	0.117	0.272	1.138	0.904	1.432
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.182	0.029	0.673	0.471	0.961
	[BMI_Cat=2.00]	0.167	0.107	0.764	0.551	1.060
	[BMI_Cat=3.00]	0.204	0.054	0.675	0.453	1.007
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.201	0.656	1.093	0.738	1.620
	[Physical_activity=2]	0.178	0.472	1.136	0.802	1.610
	[Physical_activity=3]	0.207	0.100	1.405	0.937	2.107
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.253	0.391	1.243	0.756	2.042
	[Time_on_gadgets=2]	0.142	0.883	0.979	0.742	1.293
	[Time_on_gadgets=3]	0.133	0.897	0.983	0.757	1.276
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.099	0.640	0.955	0.787	1.159
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 18[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.241	0.320			
	[Gender=1]	0.099	0.017	1.266	1.042	1.538
	[Gender=2]					
	[Age_Cat=1.00]	0.094	0.351	0.916	0.763	1.101
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.173	0.288	1.201	0.857	1.684
	[BMI_Cat=2.00]	0.162	0.073	1.336	0.974	1.834
	[BMI_Cat=3.00]	0.187	0.539	1.121	0.778	1.617
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.164	0.689	0.936	0.679	1.292
	[Physical_activity=2]	0.147	0.607	1.078	0.809	1.438
	[Physical_activity=3]	0.175	0.604	1.095	0.777	1.543
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.220	0.687	0.915	0.594	1.409
	[Time_on_gadgets=2]	0.118	0.655	0.949	0.752	1.196
	[Time_on_gadgets=3]	0.111	0.174	0.860	0.692	1.069
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.081	0.310	1.086	0.926	1.274
	[Family_history_of_DM=2]					
No	Intercept	0.258	0.163			
	[Gender=1]	0.109	0.027	0.785	0.634	0.972
	[Gender=2]					
	[Age_Cat=1.00]	0.114	0.070	1.229	0.983	1.536
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.174	0.006	0.618	0.439	0.869
	[BMI_Cat=2.00]	0.162	0.000	0.554	0.403	0.761
	[BMI_Cat=3.00]	0.200	0.000	0.456	0.308	0.675
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.188	0.005	0.591	0.409	0.855
	[Physical_activity=2]	0.164	0.203	0.811	0.588	1.119
	[Physical_activity=3]	0.196	0.657	0.917	0.624	1.346
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.236	0.114	1.451	0.914	2.303
	[Time_on_gadgets=2]	0.138	0.231	1.179	0.900	1.544
	[Time_on_gadgets=3]	0.132	0.167	0.833	0.643	1.079
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.095	0.689	0.963	0.800	1.159
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 19[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.249	0.601			
	[Gender=1]	0.105	0.287	1.118	0.910	1.373
	[Gender=2]					
	[Age_Cat=1.00]	0.103	0.004	0.746	0.610	0.912
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.172	0.087	1.341	0.958	1.878
	[BMI_Cat=2.00]	0.159	0.081	1.319	0.966	1.802
	[BMI_Cat=3.00]	0.192	0.007	1.674	1.149	2.441
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.178	0.996	1.001	0.706	1.418
	[Physical_activity=2]	0.161	0.071	1.336	0.975	1.831
	[Physical_activity=3]	0.191	0.194	1.281	0.881	1.863
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.223	0.527	0.868	0.560	1.345
	[Time_on_gadgets=2]	0.126	0.354	0.890	0.695	1.139
	[Time_on_gadgets=3]	0.120	0.278	1.139	0.900	1.442
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.089	0.000	1.507	1.266	1.793
	[Family_history_of_DM=2]					
No	Intercept	0.261	0.377			
	[Gender=1]	0.110	0.462	1.085	0.874	1.346
	[Gender=2]					
	[Age_Cat=1.00]	0.113	0.316	1.120	0.897	1.398
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.181	0.111	1.335	0.936	1.905
	[BMI_Cat=2.00]	0.169	0.154	1.273	0.914	1.775
	[BMI_Cat=3.00]	0.207	0.108	1.395	0.929	2.093
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.182	0.009	0.621	0.435	0.886
	[Physical_activity=2]	0.160	0.648	0.929	0.679	1.273
	[Physical_activity=3]	0.193	0.604	0.905	0.620	1.321
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.240	0.983	0.995	0.621	1.593
	[Time_on_gadgets=2]	0.135	0.368	1.129	0.866	1.472
	[Time_on_gadgets=3]	0.130	0.028	1.329	1.031	1.714
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.094	0.690	0.963	0.800	1.159
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 20[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.242	0.091			
	[Gender=1]	0.101	0.032	1.242	1.019	1.513
	[Gender=2]					
	[Age_Cat=1.00]	0.099	0.496	0.935	0.770	1.135
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.170	0.369	1.165	0.835	1.625
	[BMI_Cat=2.00]	0.158	0.447	1.128	0.827	1.538
	[BMI_Cat=3.00]	0.188	0.137	1.323	0.915	1.914
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.168	0.428	0.875	0.629	1.217
	[Physical_activity=2]	0.150	0.805	0.964	0.718	1.293
	[Physical_activity=3]	0.183	0.327	1.197	0.835	1.715
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.217	0.096	0.697	0.456	1.067
	[Time_on_gadgets=2]	0.122	0.103	0.819	0.645	1.041
	[Time_on_gadgets=3]	0.117	0.827	1.026	0.815	1.291
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.085	0.682	0.966	0.818	1.140
	[Family_history_of_DM=2]					
No	Intercept	0.280	0.574			
	[Gender=1]	0.115	0.142	0.845	0.674	1.058
	[Gender=2]					
	[Age_Cat=1.00]	0.117	0.543	0.931	0.741	1.171
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.191	0.772	0.946	0.651	1.375
	[BMI_Cat=2.00]	0.178	0.234	0.810	0.572	1.147
	[BMI_Cat=3.00]	0.217	0.496	0.863	0.564	1.320
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.203	0.337	0.823	0.552	1.226
	[Physical_activity=2]	0.181	0.991	1.002	0.703	1.429
	[Physical_activity=3]	0.215	0.097	1.430	0.937	2.180
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.248	0.621	0.884	0.544	1.439
	[Time_on_gadgets=2]	0.145	0.194	0.828	0.623	1.101
	[Time_on_gadgets=3]	0.139	0.738	1.047	0.798	1.374
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.100	0.607	1.053	0.866	1.279
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 21[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.238	0.225			
	[Gender=1]	0.100	0.000	1.431	1.175	1.743
	[Gender=2]					
	[Age_Cat=1.00]	0.097	0.640	1.047	0.865	1.266
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.167	0.254	0.827	0.596	1.147
	[BMI_Cat=2.00]	0.156	0.188	0.815	0.600	1.106
	[BMI_Cat=3.00]	0.187	0.976	1.006	0.697	1.450
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.167	0.001	1.737	1.252	2.410
	[Physical_activity=2]	0.147	0.039	1.355	1.016	1.808
	[Physical_activity=3]	0.178	0.130	1.310	0.923	1.858
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.225	0.726	1.082	0.696	1.683
	[Time_on_gadgets=2]	0.121	0.896	0.984	0.776	1.248
	[Time_on_gadgets=3]	0.115	0.828	1.025	0.818	1.285
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.084	0.312	1.088	0.924	1.282
	[Family_history_of_DM=2]					
No	Intercept	0.264	0.232			
	[Gender=1]	0.109	0.797	1.028	0.831	1.272
	[Gender=2]					
	[Age_Cat=1.00]	0.109	0.520	1.072	0.867	1.327
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.188	0.645	0.917	0.634	1.326
	[BMI_Cat=2.00]	0.176	0.618	0.916	0.648	1.294
	[BMI_Cat=3.00]	0.209	0.490	1.155	0.767	1.740
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.186	0.183	1.280	0.890	1.842
	[Physical_activity=2]	0.162	0.391	1.149	0.837	1.578
	[Physical_activity=3]	0.191	0.033	1.504	1.034	2.189
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.239	0.316	1.271	0.795	2.030
	[Time_on_gadgets=2]	0.135	0.211	0.844	0.648	1.101
	[Time_on_gadgets=3]	0.127	0.974	1.004	0.783	1.289
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.093	0.225	0.893	0.744	1.072
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 22[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.231	0.386			
	[Gender=1]	0.102	0.627	1.051	0.860	1.284
	[Gender=2]					
	[Age_Cat=1.00]	0.098	0.292	0.902	0.745	1.093
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.160	0.010	1.510	1.104	2.064
	[BMI_Cat=2.00]	0.148	0.002	1.574	1.177	2.105
	[BMI_Cat=3.00]	0.178	0.009	1.593	1.123	2.260
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.164	0.001	1.730	1.254	2.387
	[Physical_activity=2]	0.143	0.001	1.616	1.220	2.140
	[Physical_activity=3]	0.171	0.093	1.333	0.953	1.866
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.213	0.834	0.956	0.630	1.452
	[Time_on_gadgets=2]	0.121	0.106	1.216	0.959	1.542
	[Time_on_gadgets=3]	0.113	0.395	1.101	0.883	1.372
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.084	0.491	1.060	0.899	1.249
	[Family_history_of_DM=2]					
No	Intercept	0.297	0.021			
	[Gender=1]	0.126	0.036	0.767	0.599	0.983
	[Gender=2]					
	[Age_Cat=1.00]	0.128	0.622	1.065	0.829	1.370
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.210	0.367	1.208	0.801	1.823
	[BMI_Cat=2.00]	0.194	0.057	1.448	0.989	2.119
	[BMI_Cat=3.00]	0.236	0.308	1.272	0.801	2.019
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.209	0.625	1.108	0.735	1.668
	[Physical_activity=2]	0.181	0.508	1.128	0.790	1.609
	[Physical_activity=3]	0.217	0.821	1.051	0.686	1.609
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.278	0.977	0.992	0.575	1.712
	[Time_on_gadgets=2]	0.156	0.041	1.374	1.013	1.865
	[Time_on_gadgets=3]	0.149	0.820	1.034	0.773	1.384
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.108	0.437	0.919	0.744	1.137
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 23[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.231	0.243			
	[Gender=1]	0.100	0.564	1.059	0.871	1.288
	[Gender=2]					
	[Age_Cat=1.00]	0.095	0.132	0.866	0.718	1.044
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.163	0.422	0.877	0.637	1.208
	[BMI_Cat=2.00]	0.153	0.629	1.077	0.797	1.454
	[BMI_Cat=3.00]	0.182	0.502	1.130	0.791	1.613
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.160	0.019	1.456	1.064	1.994
	[Physical_activity=2]	0.141	0.214	1.191	0.904	1.569
	[Physical_activity=3]	0.172	0.021	1.489	1.062	2.087
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.214	0.352	0.819	0.539	1.246
	[Time_on_gadgets=2]	0.119	0.814	0.972	0.770	1.228
	[Time_on_gadgets=3]	0.111	0.713	0.960	0.772	1.194
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.082	0.264	1.096	0.933	1.288
	[Family_history_of_DM=2]					
No	Intercept	0.290	0.051			
	[Gender=1]	0.117	0.051	0.795	0.632	1.001
	[Gender=2]					
	[Age_Cat=1.00]	0.123	0.149	1.193	0.938	1.517
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.198	0.136	0.744	0.505	1.097
	[BMI_Cat=2.00]	0.185	0.743	0.941	0.655	1.353
	[BMI_Cat=3.00]	0.224	0.630	0.898	0.579	1.392
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.211	0.378	1.204	0.797	1.820
	[Physical_activity=2]	0.184	0.076	1.386	0.966	1.988
	[Physical_activity=3]	0.218	0.008	1.777	1.159	2.723
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.255	0.485	1.195	0.725	1.968
	[Time_on_gadgets=2]	0.149	0.093	1.284	0.959	1.718
	[Time_on_gadgets=3]	0.143	0.981	1.003	0.758	1.328
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.102	0.233	0.886	0.726	1.081
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 24[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.254	0.193			
	[Gender=1]	0.109	0.025	0.783	0.632	0.969
	[Gender=2]					
	[Age_Cat=1.00]	0.102	0.597	0.947	0.775	1.158
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.176	0.868	1.030	0.729	1.455
	[BMI_Cat=2.00]	0.164	0.894	1.022	0.741	1.410
	[BMI_Cat=3.00]	0.196	0.820	1.046	0.712	1.536
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.181	0.838	1.038	0.728	1.479
	[Physical_activity=2]	0.160	0.675	1.069	0.782	1.462
	[Physical_activity=3]	0.190	0.100	1.367	0.942	1.986
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.232	0.602	0.886	0.562	1.397
	[Time_on_gadgets=2]	0.130	0.932	0.989	0.766	1.277
	[Time_on_gadgets=3]	0.123	0.507	1.085	0.853	1.380
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.090	0.495	0.941	0.789	1.121
	[Family_history_of_DM=2]					
No	Intercept	0.237	0.844			
	[Gender=1]	0.099	0.000	0.649	0.534	0.788
	[Gender=2]					
	[Age_Cat=1.00]	0.098	0.063	1.200	0.990	1.455
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.166	0.772	1.049	0.758	1.452
	[BMI_Cat=2.00]	0.155	0.781	1.044	0.771	1.415
	[BMI_Cat=3.00]	0.183	0.435	1.154	0.805	1.653
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.165	0.994	1.001	0.724	1.385
	[Physical_activity=2]	0.147	0.788	0.961	0.721	1.281
	[Physical_activity=3]	0.176	0.148	1.290	0.914	1.820
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.217	0.297	0.798	0.521	1.220
	[Time_on_gadgets=2]	0.120	0.901	0.985	0.779	1.246
	[Time_on_gadgets=3]	0.114	0.901	0.986	0.789	1.232
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.083	0.840	1.017	0.864	1.197
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - Parameter Estimates

APPENDIX 25[a]		Std. Error	Sig.	Exp(B)	Lower Bound	Upper Bound
Yes	Intercept	0.248	0.918			
	[Gender=1]	0.108	0.303	1.117	0.905	1.380
	[Gender=2]					
	[Age_Cat=1.00]	0.104	0.225	0.881	0.718	1.081
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.172	0.001	1.770	1.264	2.478
	[BMI_Cat=2.00]	0.157	0.023	1.431	1.051	1.948
	[BMI_Cat=3.00]	0.190	0.017	1.573	1.083	2.283
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.177	0.296	1.203	0.851	1.702
	[Physical_activity=2]	0.158	0.180	1.236	0.907	1.683
	[Physical_activity=3]	0.190	0.460	1.151	0.793	1.671
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.237	0.076	1.523	0.957	2.425
	[Time_on_gadgets=2]	0.128	0.012	1.379	1.072	1.773
	[Time_on_gadgets=3]	0.120	0.013	1.346	1.063	1.703
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.090	0.989	1.001	0.839	1.194
	[Family_history_of_DM=2]					
No	Intercept	0.276	0.521			
	[Gender=1]	0.120	0.418	0.907	0.717	1.148
	[Gender=2]					
	[Age_Cat=1.00]	0.119	0.713	1.045	0.827	1.320
	[Age_Cat=2.00]					
	[BMI_Cat=1.00]	0.194	0.032	1.517	1.037	2.220
	[BMI_Cat=2.00]	0.178	0.119	1.320	0.931	1.873
	[BMI_Cat=3.00]	0.217	0.255	1.280	0.837	1.959
	[BMI_Cat=4.00]					
	[Physical_activity=1]	0.198	0.140	0.746	0.506	1.101
	[Physical_activity=2]	0.173	0.835	0.965	0.688	1.353
	[Physical_activity=3]	0.206	0.562	1.127	0.752	1.689
	[Physical_activity=4]					
	[Time_on_gadgets=1]	0.269	0.452	1.224	0.723	2.074
	[Time_on_gadgets=2]	0.143	0.139	1.236	0.934	1.636
	[Time_on_gadgets=3]	0.135	0.560	1.082	0.830	1.409
	[Time_on_gadgets=4]					
	[Family_history_of_DM=1]	0.101	0.321	1.106	0.907	1.348
	[Family_history_of_DM=2]					

a. The reference category is: Not Sure. b. This parameter is set to zero because it is redundant.

c. 95% Confidence Interval for Exp(B)

Appendix - 26

Summery Statistics

Table:1
Name of the School

Sl No	School	Freq.	Percent
1	IISJ	3089	93.95
2	JAIS	199	6.05
3	Missing Value	0	0.00
	Total	3288	100.00

Table:2
Gender

Sl No	School	Freq.	Percent
1	Male	2502	76.09
2	Female	784	23.84
3	Missing Value	2	0.06
	Total	3288	100.00

Table:3
Nationality

Sl No	School	Freq.	Percent
1	IND	3233	98.33
2	PAK	19	0.58
3	SRI	3	0.09
4	OTHR	25	0.76
5	Missing Value	0	0.00
	Total	3288	100.00

Table:4
Age Structure

Sl No		Frequency	Percent
1	10	9	.3
2	11	130	4.0
3	12	471	14.3
4	13	525	16.0
5	14	659	20.0
6	15	660	20.1
7	16	411	12.5
8	17	312	9.5
9	18	91	2.8
10	19	20	.56
14	Missing Values	0	.0
	Total	3288	100.0

Table:5
Summary of Age Structure in the Sample

1	N	3288
2	Mean	14.30
3	Std. Error of Mean	.031
4	Median	14.00
5	Mode	14
6	Std. Deviation	1.789
7	Variance	3.199
8	Skewness	.150
9	Std. Error of Skewness	.043
10	Kurtosis	-.601
11	Std. Error of Kurtosis	.085
12	Range	9
13	Minimum	10
14	Maximum	19

Table:6
Physical Activities

Sl No		Frequency	Percent
1	Nil	644	19.6
2	Up to 3 Hrs	1872	56.9
3	3-6 Hrs	440	13.4
4	Above 6 Hrs	307	9.3
5	Missing Values	25	.8
	Total	3288	100.0

Table:7
Time Spent on Gadgets

Sl No		Frequency	Percent
1	Nil	148	4.5
2	Below 1 Hr	1069	32.5
3	1-2 Hrs	1418	43.1
4	More than 2 Hrs	638	19.4
5	Missing Values	15	.5
	Total	3288	100.0

Table:8
Family History of Diabetes

Sl No		Frequency	Percent
1	Yes	1483	45.1
2	No	1781	54.2
3	Missing Values	24	.7
	Total	3288	100.0

Table:9
BMI of Respondents

Sl No		Frequency	Percent	BMI Value
1	Under Weight	874	26.6	<18.5
2	Normal	1712	52.1	18.5-25
3	Over Weight	422	12.8	25-30
4	Obese	280	8.5	>30
	Total	3288	100.0	