A Cross-Sectional Study to Assess the Association of Irregular Meal Patterns with Psychological Distress and Glycemic Status in Patients with Type 2 Diabetes

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ABSTRACT

Introduction:

Type 2 diabetes mellitus (T2DM) requires regular dietary practices and stable psychological health for effective glycemic management. However, irregular meal patterns and psychological distress are commonly observed among patients with T2DM and may influence glycemic outcomes. This study aimed to determine the prevalence and characteristics of irregular meal patterns, assess levels of psychological distress using validated tools, and evaluate their association with glycemic status among patients with T2DM.

Methodology:

A cross-sectional observational study was conducted among 154 adults with type 2 diabetes attending a tertiary care hospital in Hyderabad. Meal patterns were assessed using a structured questionnaire, psychological distress using PHQ-9 and GAD-7, and glycemic status using recent HbA1c values from medical records. Descriptive and inferential analyses were performed to examine associations among these variables.

Results:

Irregular meal patterns were prevalent among the study participants. While 61% reported consuming all three major meals daily, 39% demonstrated inconsistent meal intake. Meal skipping was reported by 59.1%, with 14.9% skipping meals daily and 20.8% weekly. Snacks (37%) and breakfast (31.8%) were the most frequently skipped meals. Consistent meal timing was reported by only 27.9%, whereas 18.2% never followed fixed meal timings. Common reasons for irregular eating included lack of appetite (36.5%), lack of time (35.1%), and busy work schedules (33.8%).

Symptoms reported during meal skipping included dizziness (53.4%), extreme hunger (43.8%), fatigue (43.2%), headache (25.3%), and feelings of depression (14.4%). Psychological assessment revealed varying levels of distress. PHQ-9 findings showed that

moderate depression was most prevalent, while GAD-7 assessment indicated the presence of mild to severe anxiety symptoms among participants.Glycemic control was suboptimal in most participants: 31.2% had poor glycemic control (HbA1c 7.1–8%), and 29.9% had very poor control (HbA1c >8%). Only 21.4% achieved good glycemic control, while 6.5% had normal HbA1c levels. Statistically significant associations were observed between HbA1c levels and anxiety ($p = 0.010$).

Conclusion:

The study demonstrates a high prevalence of irregular meal patterns, psychological distress, and poor glycemic control among patients with type 2 diabetes. The findings highlight the coexistence of dietary irregularity and psychological distress across different levels of glycemic control. Integrating nutritional counseling with routine psychological assessment may strengthen comprehensive diabetes care and support improved glycemic management.

Keywords:

Diabetes mellitus , Hyperglycemia, HbA1c levels, Diabetic related distress, psychological distress , PHQ ,GAD , skipping meals, insulin sensitivity.

INTRODUCTION

Diabetes Mellitus :

Diabetes is considered one of the chronic disorders that is recognised in the fast growing world with significant social, health, and economic ramifications .It is thought that in 2010, 285 million people worldwide have this disorder.Primarily due to the rise in the major factors like ageing population , obesity and lack of prevention goals to control or treat diabetes . The estimate has been predicted to reach 430 million in the future .Moreover in such a disorder many individuals are reluctant to diagnose for about 10 years ,even though the condition has been manifested earlier .Due to this the actual range worldwide may not be accurate and the ranges can be extremely.

Diabetes is often referred as a roller coaster ride for being complicated,long lasting illness or a condition that requires continuous along with multifactorial risk-reduction techniques that go beyond glycemic control .In order to empower individuals and treat acute to chronic consequences,hereby lowering the long term crisis , a self monitoring technique is mandatory.There is strong evidence supporting a variety of measures to enhance diabetes outcomes.The American Diabetes Association (ADA) “Standards of Care in Diabetes,” referred to here as the Standards of Care, is intended to provide clinicians, researchers, policy

makers, and other interested individuals with the components of diabetes care, general treatment goals, and tools to evaluate the quality of care.(Nuha Ali ElSayed et.al 2024).

American Diabetes Association on diabetes:

."Diabetes mellitus is distinguished by persistent hyperglycemia and is strongly related to a number of significant health problems, such as neuropathy, nephropathy, and retinopathy". In Asians, the prevalence of 2 diabetes worldwide has increased from 8. 1% to 9. 6%. (Takahiro Iwasaki et.al 2019).

WHO states , diabetes is a chronic metabolic disease characterized by high blood glucose levels, occurring when the pancreas doesn't produce enough insulin or the body can't effectively use it.The majority of people living in low income countries all over the globe , ranging about 830 million, have diabetes.

Hemoglobin A1c (HbA1c) is a marker for diabetes testing and monitoring because it indicates glycemic state over time.(Takahiro Iwasaki et.al 2019).

In 2011, HbA1C glycated haemoglobin was taken into account to measure the blood glucose levels ,and the WHO began recommending it . .Based on the previous research the glycemic control has been noted as unsatisfactory in most of the developed countries such as Brazil, the prevalence of untreated

diabetes was 47. 3%, while it was 50%. 2% in Japan and 76% in Thailand and it is ranked fifth among Western Pacific nations for the number of DM cases, according to Saudi Arabia .There are 64. 4% of DM cases are poorly controlled in the two nations . The majority of the cases in Northern Thailand are caused by the prevalence of poor glycemic control among DM cases was 54. 8%.(Shuang Li et.al 2019).

One of the cornerstones of diabetes treatment is medical nutrition therapy .Besides these maintenance of mental and physical health is essential to cope up with the psychological distress . The significance of individual nutrients and foods for the management of diabetes, but the impact of diet in reaching the suggested therapeutic goals has not been completely understood .(Roberta Aguiar Sarmento et.al 2017).

Depression:

Emotional and mental health is one of the indispensable needs that all human beings require. Though mental well-being is overlooked throughout one's life ,it should be considered the primary aspect to lead a healthy and energetic life . Meanwhile,in case of chronic metabolic

disorders namely diabetes which demand self monitoring and encouragement to deal with the everyday consequences,where psychological trauma builds its base by deteriorating the individual's confidence and strength to manage and proceed with the new demands of the body .This framework leads to stress which is termed as depression .
Depression is termed as the psychological issue linked with many aspects of social and mental disruption .But in case of metabolic disorders like diabetes,it does not specify the social component of life , which is important for the diabetes care preventing the diabetes related distress among the major group of people experiencing such a condition.
In contrast to depression, DRD includes a larger range of emotional states since it encompasses both psychological and physical Symptoms like worries , concerns,fear, anxiety,grief arising due to diabetes related distress.Diabetic individuals feel overwhelmed by the demands of managing the various episodes of illness and having negative feelings to monitor such illnesses .(Li S et. al 2021).

Based on the recent studies, the rate of individuals diagnosed with diabetes are more inclined towards mental illness in contrast to those without diabetes. It clearly states the association of diabetes with psychological distress and this link can be reciprocal.(Amani Busili et.al 2024). Depression is such a condition consisting of both mental health issues and eating disorders .People dealing with it require support and care to lessen psychological discomfort.

Eating disorders in Diabetes:

Due to their possible consequences on human health, particularly metabolic-related disorders, dietary habits such as meal timing, breakfast skipping, irregular meals,binge eating,loss of appetite and eating pace have gained increasing attention. Skipping meals was also linked with increased risk of developing type 2 diabetes.(Xiaowen Wang et.al 2021).
Lifestyle modifications , intake of a regular and a balanced diet is necessary to prevent illness . According to recent studies people have missed meals due to erratic changes like lack of time , stress, busy work schedule,lack of appetite and many more,or the nature of this developing world .
According to the National Health and Nutrition Survey of 2019, the percentage of obese persons is higher as per the BMI .Furthermore, 15.5% of men and 9.1% of women skipped breakfast.According to National Health and Nutrition Survey, Adults having dinner after 9 p.m. were 28.6% for males in their 20s, 33.9% in their 30s, 29.8% in their 40s, and 17.4% for females in their 20s.In addition, according to the 2011 Basic Survey on Social Life,

10.6% of the participants had dinner after 9 p.m., indicating lack of improvement in late dinner time.(Mika Shimizu et.al 2024).

Diabetes associated with weight fluctuations:

Diabetes(type 2) and obesity are linked to erratic eating patterns. Past research has demonstrated that skipping breakfast results in a large rise in blood glucose levels. The maximum blood glucose level following lunch, and that late night dinner is linked to bad glucose levels in T2D.The connection between eating patterns and obesity in individuals with T2D has been the subject of a number of studies, but very few have looked at the link between diet and glucose metabolism. Research on dietary habits in people with T2D that take into account glycemic and weight management. Furthermore, there are not many studies that have examined the relationship between dietary choices and glycemic management or increased body fat in those with type 1 diabetes (T1D).. As a result, In individuals with T1D and T2D, the association between weight, glycemic control, and irregular eating patterns (missing breakfast, eating late dinner, and inconsistent mealtimes).(Mika shimizu et.al l 2024).

Centers for Disease Control and Prevention (CDC), National Institutes of Health (NIH), addresses the need to avoid skipping of meals as it , in turn causes episodes of hypoglycemia or increase blood sugar levels.Maintaining a regular meal schedule is beneficial in controlling blood sugar levels,especially for people taking antidiabetes medications that might induce hypoglycemia. Lack of food intake and regular consumption of medication or insulin shots raises the risk of hypoglycemia.(Amani Busili et.al 2024).

The balance between diet and medications are important to reduce the risk of hypoglycemia .As per the studies the irregular meal patterns are associated with hypoglycemia in women and obesity in men . Late night dinners and irregular meal patterns have contributed to increased BMI and HbA1C levels in both the sexes .Consumption of healthy and a balanced diet along with the medication administration is the necessity of diabetes but majorly the unhealthy eating behaviour is at a higher rate in type 2 diabetes experiencing many complications.(Mika Shimizu et.al 2025).

Based on the public health records more than 500 million people encompassing all age groups including men , women and children are highly affected with diabetes and project at

an even higher risk as much as twice , reaching at about 1.3 billion individuals contributing to the major public health problem worldwide .
In addition,it has been predicted that the prevalence of diabetes will carry on further by 55% in 2035.(Fariba et.al 2024).

Irregular meal patterns:

Irregular meal patterns or skipping of meals is related to a elevated risk of obesity and diabetes mellitus.Prior references states that , specifically skipping of breakfast and late night dinners put up to the poor glycemic control and maximum hikes were observed in the second meal phenomenon referring to lunch .Numerous researchers emphasizes the connection between eating patterns and glucose metabolism .Obesity in type 2 has been a major subject of the research but there is still a contradiction between dietary habits and weight gain this has been focusing on the sex difference.There has been an erratic difference in the relationship between dietary habits (skipping breakfast, having dinner late, and having meals at unpredictable hours), glycemic management and weight control. (Yuichiro konda et.al 2024).

Depression:

Depression being the major health concern . People dealing with schizophrenia and significant mood disorders or mental illness are two or three times more likely to be diagnosed with type 2 diabetes . Based on studies conducted worldwide and the range depicted between 10-25% is more in diabetic patients than in a general population of about 3-9%.As there is a persistent increase in anxiety ,which in turn adds on to the elevated sugar levels after undergoing a diagnosis ,which further results in diabetic complications .
Individuals with type 2 diabetes have an inclination to lose 10 to 15 life-years due to premature mortality caused by diabetes-related problems . Besides lifestyle behaviour like busy schedules , improper diets or lack of physical activity are known as the independent and modifiable factors that have a progression on the onset of type 2 diabetes which is linked with psychological distress .The succession of mental distress has led to bipolar disorders ,psychosis , major depression , schizophrenia in a few cases.(Adriana Cimo et.al 2018).

The World Health Organization characterizes , “depression as a common, serious illness distinguished by continuous sadness and a lack of interest in items one usually likes. It spans at least two weeks, during which a person is unable to carry on their everyday activities

unlike typical mood swings. Signs of despair include loss of energy, changes in hunger or sleep, thoughts of self-harm or suicide, feelings of worthlessness, and diminished attention." Studies conducted earlier indicate ,around 332 million people suffer from depression all over the world and yet are not considered important for treatment.Approximately 4% of people experience sadness , 4.9% of men and 6.9% of women ,10% of pregnant and new mothers . Depression is much more common in women than in men ,due to various reasons .The survey conducted in the year 2021 claims ,around 727,000 individuals committed suicide due to depression. As Diabetic patients experience failure in managing the condition ,they are also at a greater prevalence of depression .There is often a conflict whether diabetes leads to depression or vice versa .A major square depicts that people engrossed in grief have a cut out on self monitoring of glucose levels .(Eveline P C J Janssen et.al 2016).

Validated scales - PHQ-9 and GAD-7 :

To prevent and treat depression a few scales have been formulated to analyse the complexity of an individual's mind . The scales include Ruffs scale , Diabetes distress scale , Hospital anxiety and depression scale ,Patient health questionnaire -9 , Generalized anxiety disorder -7 . In this study , the emphasis is made on the PHQ -9 and GAD -7 scale .

The PHQ -9 scale includes nine elements or statements .If two ,three or four symptoms are present on majority of the days in the past 2 weeks, it is termed as low mood or anhedonia or gives a positive result in depression.(Sverre Urnes Johnson et.al 2019)

The GAD -7 Scale , was created as a screening tool for generalized anxiety disorder in primary health services .GAD-7 is also utilized in the treatment of additional anxiety disorders.Based on the criteria for GAD in the Diagnostic and Statistical Manual for Mental Disorders, the creation of the GAD-7 initially began with 13 items.(Sverre Urnes Johnson et.al 2019).

Novelty of the study:

Majority of the studies focused on dietary quality and caloric intake, meal timing,binge eating,late night food consumption and changing food patterns before and after pandemic but regularity have received comparatively less focus, despite growing evidence suggesting their influence on metabolic and mental health outcomes.There is a lack of comprehensive studies

that investigate the combined association of irregular meal patterns with both psychological distress and glycemic control specifically in patients with type 2 Diabetes .
Although existing studies have independently examined dietary behaviors, psychological distress, and glycemic control in patients with T2DM, there is limited evidence exploring the association between irregular meal patterns and both psychological distress and glycemic status simultaneously
This study provides new insights into how irregular meal patterns simultaneously impact mental health and blood glucose levels .

Review of literature:

1..Anupama JS et.al (2025) conducted a study assessing diabetes distress and factors influencing glycemic control in type 2 diabetes mellitus (T2DM) patients in an urban health centre in Nagpur from February to June 2024. Among 380 T2DM outpatients screened diabetic distress screening scale (DDS), patients with distress were evaluated using the DDS-17 questionnaire. Moderate to severe distress affecting individuals .

2.Guiseppe Fanelli et.al (2025), examines how depression and diabetes influence each other , the factors related to genetics, lifestyle, and psychology. Factors like diet, exercise, and sleep affect both conditions, indicating that treatment must be integrated. Traditional strategies may not work well on their own. . It also highlights barriers patients face, such as stigma and lack of knowledge.

3.Mika Shimizu et.al (2025) examined how eating habits affect HbA1c and BMI in people with diabetes aged 20–74 years. Participants filled out mealtime questionnaires, having type 1 diabetes (T1D). Results showed that irregular mealtimes and late dinners (LD) were linked to higher HbA1c levels compared to regular eating habits, particularly in T1D women. In type 2 diabetes (T2D), late dinners also led to higher HbA1c, while irregular habits raised BMI levels. Irregular mealtimes were connected to poor control in T1D women, and late dinners related to higher HbA1c and BMI in T2D.

4.Saba Poolaie et.al (2025) explores how mental well-being affects diabetes self-management in 238 type 2 diabetes patients from Shahid Sayyad Shirazi Hospital. Using the Ryff Scale and DSMQ for assessments, the study found that education, income, and occupation relate to

psychological well-being and self-management. The average psychological well-being score was , and it had a strong connection to the average self-management score . The findings indicate that demographic factors influence both psychological well-being and self-management in diabetes patients.

5.Sendekie AK et.al (2025) conducted a study at hospitals in Northwest Ethiopia. Psychological distress was measured using the Kessler 10 questionnaire. Glycemic levels were categorized as poor or better based on records. Logistic and linear regression examined associations between variables. BMI, monthly salary, healthcare cost source, SMBG practicing, lifestyle modifications, medical conditions, medications, hypoglycaemia perception, and consequences were significantly associated with psychological distress severity remains unclear,defining late-night-dinner .

6.Roja Baskaran et.al (2025)focused on medication adherence and its link to diabetes distress of diabetic patients in the Nilgiris. Researchers used a questionnaire to assess diabetes-related distress and medication adherence among participants in Ooty. Data was collected from 406 patients, revealing that they had mild distress, a few had moderate distress, and the majority had experienced severe distress. Results showed a significant link between distress and medication .

7.Amani Busil et.al (2024) examined 11 systematic reviews covering approximately half a million individuals and 26 variables. There were significant relationships between six variables: obesity, diabetes complications, neuropathy, levels of specific blood indicators, social support, and being female. The complicated link between type 2 diabetes and mental health problems is brought out by these results.

8.Filip Mustac et .al(2024) aims to highlight the role of psychotherapy and to study the psychological eating patterns linked to diabetes .Mental health today goes beyond just treating psychiatric disorders. Conditions like metabolic syndrome and type 2 diabetes require lifestyle changes, which makes mental health important. The review of literature on emotional and compulsive eating stresses, the need for a multidisciplinary approach in treatment.

9.Mika Shimizu et.al (2024) examined how irregular eating habits affect HbA1c and BMI in diabetic people .It included 4,421 participants aged 20–74, having type 1 diabetes (T1D). Researchers compared HbA1c and BMI levels between those with irregular eating habits, such as skipping breakfast and having late dinners, to those with regular habits. Results showed higher HbA1c in both sexes for those with irregular habits, especially for women with late dinners. In type 2 diabetes (T2D), irregular eating was linked to higher BMI, especially for men with late dinners ,which raised HbA1c levels.

10.Polyxeni Mangoulia et.al (2024) discusses the psychological effects of diabetes and how emotional disorders impact those living with it. Managing diabetes involves daily tasks like blood testing, medication, and diet, which can be stressful. Coexisting mental health issues can make diabetes harder to manage, leading to medication noncompliance and poorer health outcomes. It is important to assess mental health in diabetes patients.

11.Navpreet kaur et.al (2024) conducted to find out how common this distress is and how it relates to factors like age, treatment, and blood sugar levels in adults with type 2 diabetes. Patients with this condition can face psychological issues, such as diabetes-related distress, which can affect their blood sugar control .The study found that 18% of participants experienced distress, with a higher rate in urban areas compared to rural ones. Distress was linked to poor treatment, high blood sugar, and diabetes.

Methodology

1.PHQ-9 (Patient Health Questionnaire) for depression.
2.GAD-7 (General Anxiety Disorder scale) for anxiety.
3. Structured questionnaire to assess meal patterns (meal timing, frequency, breakfast skipping, late-night eating).
4. Medical records for glycemic data (FBS or HbA1c).

t- TEST :

It comprises average mean , which states that they are different from each other or shows significant difference i.e it indicates whether these differences have happened by chance . For example, the two independent samples drawn from the sample population are having the same mean. Let X1,X2,X3.....Xn and Y1,Y2,Y3.....Yn be two independent random samples

from the given estimated population. The null hypothesis HO; μx =μy i.e. the samples have been drawn from given population with the means under the HO the statistical test to compute the test statistics under HO and compare it with the value for t for (n1+n2-2)df at certain rate of significance if calculated value is greater than or equal to tabulated t is said to be significant and Ho is rejected and it is resulted that two sample means differ significantly. If calculated ItI is less than tabulated ItI , Ho may be accepted at the desired level of significance**.**

CHI SQUARE TEST :

In statistics, the chi square test is used to find whether two or more attributes are associated or not .It is given by Karl Pearson. It assesses whether the differences that arise between the two are genuine or merely a result of random error. When there is a categorical variable from a random sample, the chi-square test is applied.

STATISTICAL ANALYSIS

Descriptive analysis has been performed where means and standard deviations are calculated.Data will also be Presented in the form of appropriate diagrams like bar diagram, pie diagram .The mean differences along with their 95% CI will be presented.Independent sample t-test/ ANOVA will be used to assess statistical significance. The association between explanatory variables and categorical outcomes will be assessed by frequency tabulation and comparison of percentages. Odds ratio along with 95% CI will be presented. Chi square test/ Fisher's will be used to test statistical significance. Univariate Binary logistic regression analysis will be performed to test the association between the explanatory variables and outcome variables. Unadjusted Odds ratio along with 95% CI will be presented. Variables with statistical significance in univariate analysis will be used to compute multivariate regression analysis. Adjusted odds ratio along with their 95% CI will be presented. P value < 0.05 will be considered statistically significant. Data will be analysed by using SPSS software.

Table 1: Descriptive analysis of Age (years) in the study population (N=154)

Name	Means	Maximum	Minimum
Age	53.3±13.91	30	90

The descriptive analysis from Table 1 demonstrates the age group in years of the study population, consisting of 154 type 2 diabetic patients.Among them the minimum age group seen in patients is 30 years old and the maximum age group observed is 90 years.

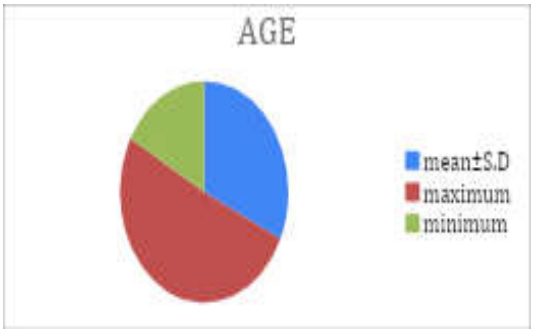


Table 2: Descriptive analysis of Height (cm) in the study population (N=154)

Name	Mean	St.deviation	Maximum	Minimum
Height	163.62	9.235	188	145

The descriptive analysis from the Table 2 reveals the height in cm of the study population, consisting of 154 type 2 diabetic patients.Among them the minimum height observed was 145cm and the maximum height observed was 188cm.

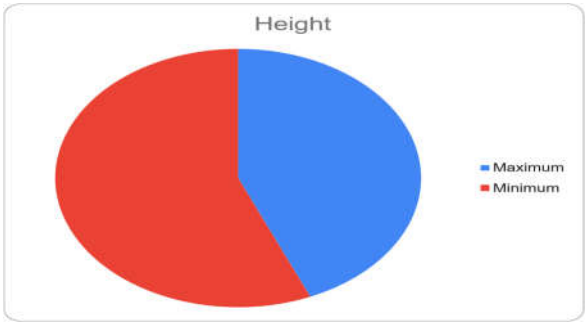


Table 3 :Descriptive analysis of weight (kg) in the study population (N=154)

Name	Means	St.deviation	Maximum	Minimum
Weight	73.36	15.96	160	40

The descriptive analysis from Table 3 reveals the weight in kgs of the study population, consisting of 154 type 2 diabetic patients.Among them the minimum weight observed was kg and the maximum height observed was 160 kg.

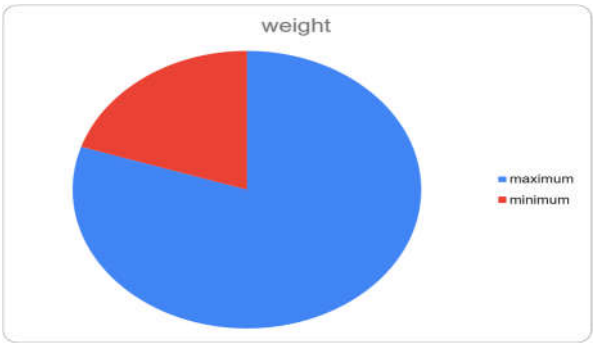


Table 4: Descriptive analysis of gender in the study population (N=154)

Gender	Frequency	Percentage (%)
Male	78	50.6
Female	76	49.4

The descriptive analysis from Table 4 reveals the gender of the study population, consisting of type 2 diabetic patients.Among them 50% patients are males and 49% patients are females

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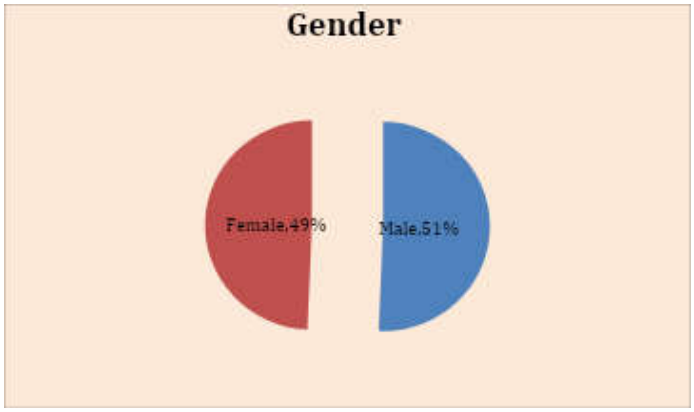


Table 5: Descriptive analysis on type of medications in the study population (N=154)

Type of treatment	Frequency	Percentage (%)
Diet only	3	1.9
Oral antidiabetic medication	78	50.6
Insulin	34	22.1
Oral medication and insulin	39	25.3

The descriptive analysis from Table 5 reveals the type of treatment used by type 2 Diabetic patients of the study population. Among them maximum individuals are dependent on the oral medication by 50% ,while the combination drugs i.e (oral medication and insulin administration)is used by 25% of individuals, whereas insulin administration is reported in 22% of patients and the management of Diabetes by diets is about 1% only referring to the minimum treatment strategy .

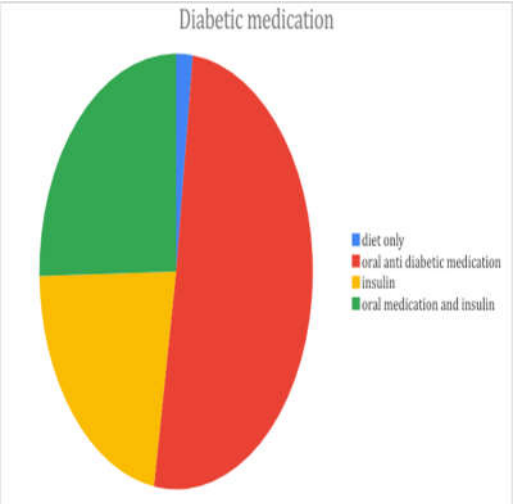


Table 6 : Descriptive analysis on most recent HbA1c levels in the study population (N=154)

HbA1c level	Frequency	Percentage (%)
5.7 [normal]	10	6.5
5.7- 6.4 (prediabetic)	17	11
6.5-7 (Good control)	33	21.4
7.1- 8 (poor control))	48	31.2
8 (very poor control)	46	29.9

The descriptive analysis from Table 6 reveals the HbA1c levels among the type 2 Diabetic patients of the study population.The maximum individuals had poor control of the blood glucose levels by 31% ,while very poor control was around 29% , Good control was observed among 21% of individuals , whereas prediabetics was 11% , the normal levels glucose levels was 6.5% in both the sexes.

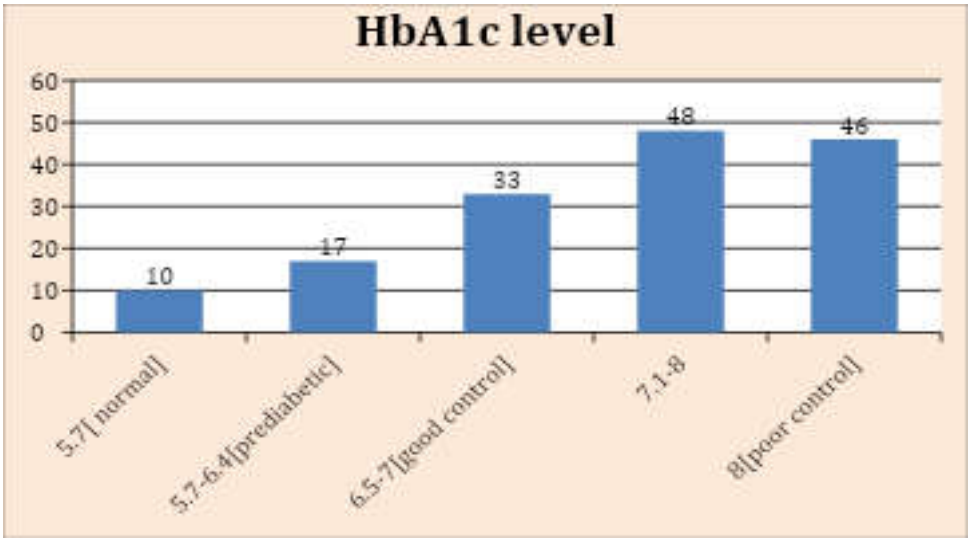


Table 7:Descriptive analysis on when there was spike in blood sugar levels,what symptoms do you experience ,in the study population (N=154)

Symptoms of high sugar levels	**Frequency**	**Percentage** (%)
Headache	56	36.40
Increased thirst	50	32.50
Increased urination	66	42.90
Fatigue/tiredness	40	26.00
Anxiety/irritability	36	23.40
Blurred vision	30	19.50

The descriptive analysis from Table 7 reveals the symptoms during hyperglycemia in the type 2 Diabetic patients of the study population.Among them maximum individuals have reported increased urination by 23% ,20% had headache ,18% had increased thirst,14% had fatigue/ tiredness,12% had anxiety/ irritability,10% had blurred vision.

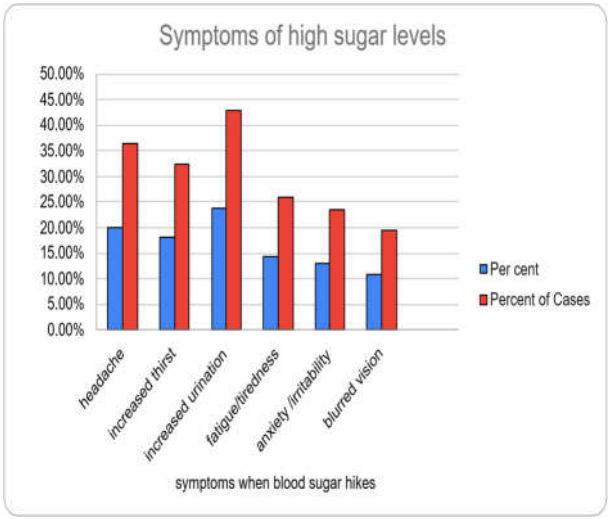


Table 8:: Descriptive analysis on How often do you consume all the three major meals ina a day ,in the study population (N=154)

Options	Frequency	Percentage (%)
Daily	94	61
Weekly	23	14.9
Monthly	17	11
Rarely	12	7.8
Never	8	5.2

The descriptive analysis from Table 8 reveals the frequency of Meal consumption in the type 2 Diabetic patients of the study population.Among them maximum individuals consumed meals on daily basis by 61% ,14.9% consumed all meals weekly ,11% consumed all meals monthly ,7.8% consumed all meals rarely, 5.2% individuals never consumed all the meals .

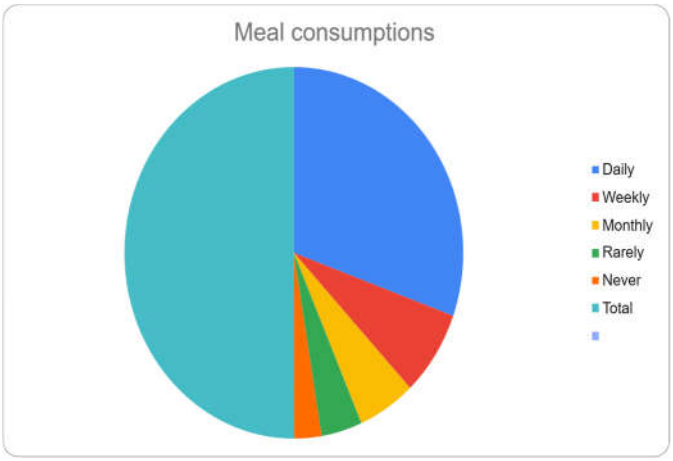


Table 9:: Descriptive analysis on How often do you skip meals ,in the study population (N=154)

Options	Frequency	Percentage (%)
Daily	23	14.9
Weekly	32	20.8
Monthly	9	5.8
Rarely	27	17.5
Never	63	40.9

The descriptive analysis from Table 9 reveals the frequency of skipping Meals in the type 2 Diabetic patients of the study population.Among them maximum individuals around 40% never skipped meals, 32% skipped meals weekly , 27% rarely, 23% daily and 9% monthly.



Table 10 : Descriptive analysis on which meals do you skip most often ,in the study population (N=154)

Options	Frequency	Percentage (%)
Breakfast	49	31.8
Lunch	36	23.4
Dinner	12	7.8
Snacks	57	37

The descriptive analysis from Table 10 reveals that any meal that is less likely to be eaten in the type 2 Diabetic patients of the study population.Among them maximum individuals i.e 37% skipped snacks ,31% skipped breakfast, 23% skipped lunch and 12% skipped dinner .

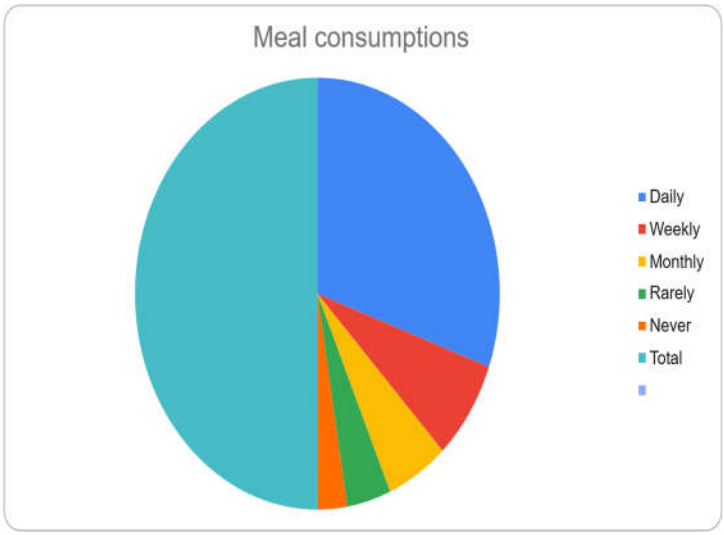


Table 11:: Descriptive analysis on what happens when you skip meals in the study population (N=154)

Options	**Frequency**	**Percentage (%)**
Headache	37	25.30
Fatigue	63	43.20
Anxiety	22	15.10
Feeling depressed	21	14.40
Extreme hunger	64	43.80
Dizziness	78	53.40

The descriptive analysis from Table 11 reveals the symptoms observed when meals are skipped in the type 2 Diabetic patients of the study population.Among them 27.40% experience dizziness, 22.50 % had fatigue ,22.10% extreme hunger ,13% had headache,7.40% had anxiety and 7.70% feeling depressed .



Table 12 :Descriptive analysis on what are the reasons for skipping meals or irregular eating.in the study population (N=154)

Options	**Frequency**	**Percentage (%)**
Lack of time	52	35 10
Busy work schedule	50	33..80
Job or academic pressure	20	13.50
Lack of appetite	54	36.50
Financial constraints	15	10.10
Cultural or religious fasting	12	8.10
Forgetfulness	20	13.50
Medication side effects	21	14.20

The descriptive analysis from Table 12 reveals the reasons for skipping Meals in the type 2 Diabetic patients of the study population.Among them 22.10% individuals do not consume meals due to lack of appetite, 21.30% due to lack of time , 20.50% due to busy work schedule, 8.60% due to medication side effects, 8.60% forgetfulness, 8.20% academic pressure, 6.10% financial constraints , 4.90% religious fasting .

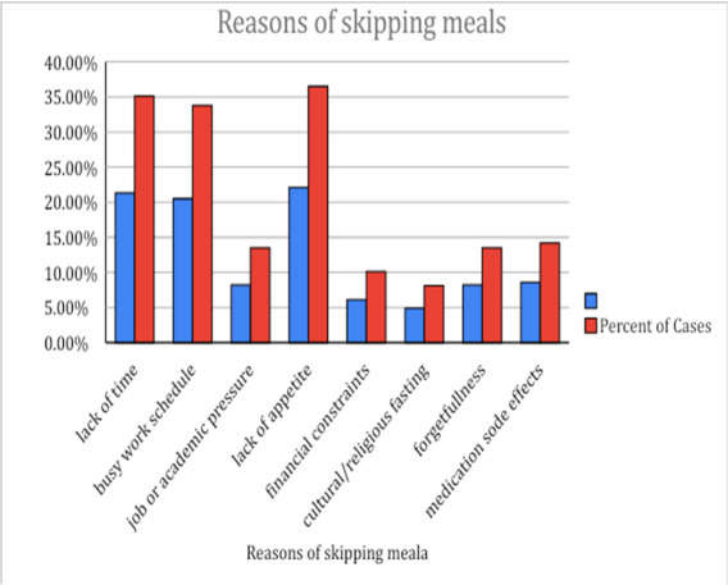


Table 13 :Descriptive analysis on How often do you eat your meals at consistent times in a day ,in the study population (N=154)

Options	**Frequency**	**Percentage (%)**
Always	43	27.9
Often	40	26
Sometimes	23	14.9
Rarely	20	13
Never	28	18.2

The descriptive analysis from Table 13 reveals whether the timings at which meals are consumed are consisted or not in the type 2 Diabetic patients of the study population.Among them 27.9% individuals always consume meals on consisted timings, 26% consume meals often , 18.2% never have meals on time , 14.9% have it sometimes and 13% rarely eat on a specific timing.



Table 14: Descriptive analysis on How often do you consume snacks between meals ,in the study population (N=154)

Options	Frequency	Percentage (%)
Once daily	26	16.9
More than once	56	36.4
Rarely	42	27.3
Never	30	19.5

The descriptive analysis from Table 14 reveals the consumption of snacks in between meals in the type 2 Diabetic patients of the study population.Among them 36.4% take snacks more than once in a day , 27.3% rarely , 19.5% never ,16.9% once daily.

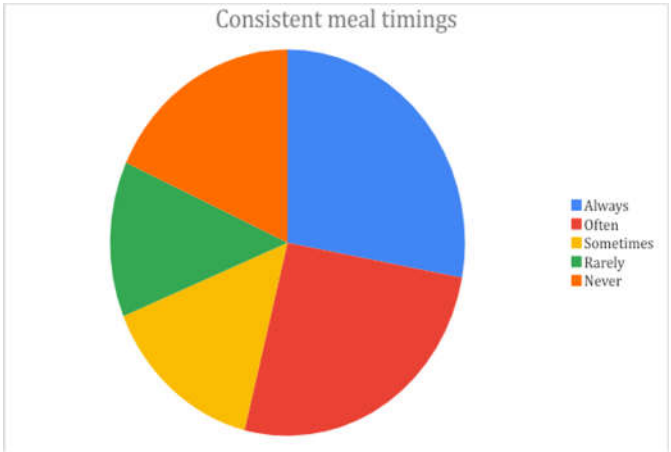


Table 15: Descriptive analysis on How often do you consume snacks between meals ,in the study population (N=154)

Options	Frequency	Percentage (%)
Once daily	26	16.9
More than once	56	36.4
Rarely	42	27.3
Never	30	19.5

The descriptive analysis from Table 15 reveals the consumption of snacks in between meals in the type 2 Diabetic patients of the study population.Among them 36.4% take snacks more than once in a day , 27.3% rarely , 19.5% never ,16.9% once daily.

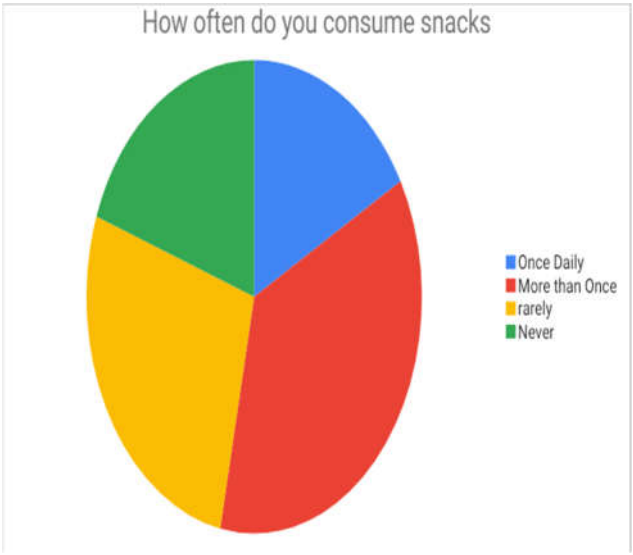


Table 16: Descriptive analysis on what type of snacks do you usually consume in the study population (N=154)

Options	**Frequency**	**Percentage (%)**
Fruits	50	35.50
Nuts/seeds	37	26.20

Biscuits/cookies/cakes	63	44.70
Fried snacks	32	22.70
Sweet items	21	14.90
Packaged snacks	49	34.80

The descriptive analysis from Table 16 reveals the type of snacks eaten in between meals in the type 2 Diabetic patients of the study population. Among them maximum of 25% individuals eat biscuits/ cookies/ cakes , 19.80% fruits , 19.40% packages snacks /chips/ namkeen ,14.70% nuts and seeds ,12.70% fried foods /pakora/ samosa etc and 8.30% sweet items /mithai /chocolate etc .

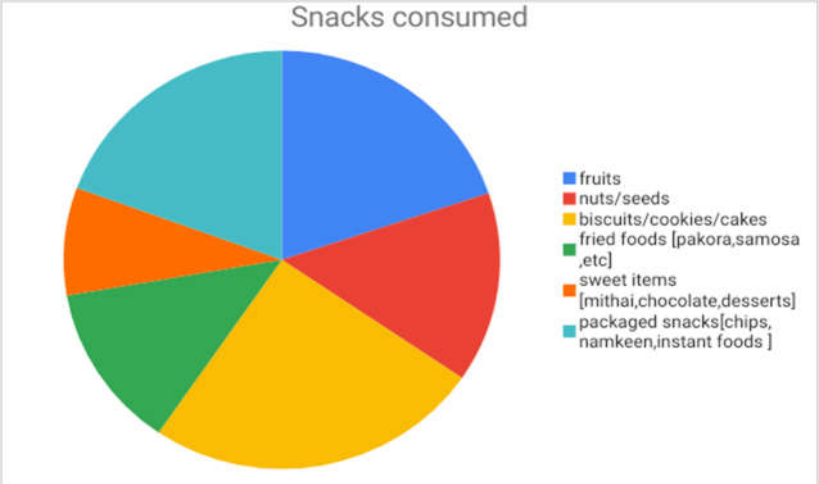


Table 17: Descriptive analysis on do you engage in fasting , in the study population (N=154)

Options	**Frequency**	**Percentage (%)**
Weekly	9	5.8
Occasionally	46	29.9
Rarely	9	5.8
Never	90	58.4

The descriptive analysis from Table 17 reveals whether the patients are engaged in fasting in the type 2 Diabetic individuals of the study population. Among them maximum individuals around 58.4% never fast , 29.9% fast occasionally, 5.8% rarely and 5.8% weekly .

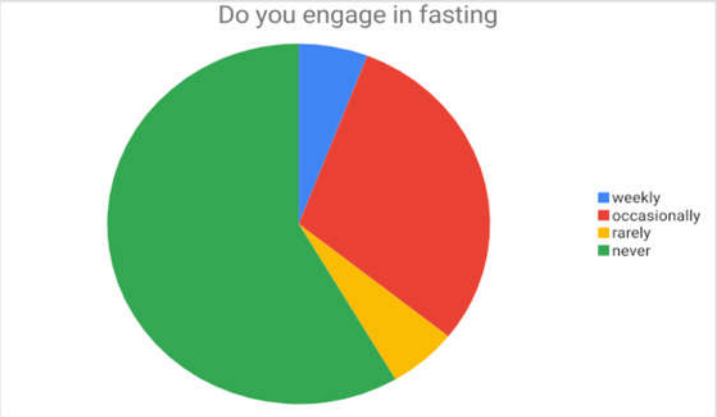


Table 18: Descriptive analysis on dietary frequency, in the study population (N=154)

Food item	Never	Rarely	Sometimes	Often	Always
Rice/ wheat	10	9	9	22	104
Millets	40	19	30	22	43
Fruits	6	16	31	46	55
Vegetables	14	12	15	46	67
Milk / dairy products	31	11	24	31	57
Pulses/ legumes	24	9	18	34	69
Eggs /Meat/Fish	27	31	36	35	25
Fried/processed food	52	33	32	23	14
Sugary/starchy foods	61	35	24	22	12
Sweetened beverages	49	33	28	25	19

The descriptive analysis from Table 17 reveals the frequency of food eaten regularly or rarely in the type 2 Diabetic individuals of the study population. Among them the frequency of eating rice /wheat on a regular basis is around 67.5% , 14.3% often ,5.8% sometimes, 5.8 % rarely .

The frequency of consuming millets on a daily basis is 27.9% , 14.3% often , 19.5%

sometimes ,12.3% rarely , 26 % never . Among them, the maximum intake of fruits is 35.7 % on a daily basis , 29.9% often , 20.1% sometimes , 10.4% rarely and 3.9% never eat fruits.

Among them, the maximum intake of vegetables is around 43.5% included in every meal , while 29.9% intake is often, 9.7% sometimes , 7.8% rarely and 9.1% is the minimum intake. Among them Maximum Intake of Milk / dairy products is 37% , 20.1% individuals consume often , 15.6% sometimes , 7.1% rarely and 20.1 % never Among them the maximum Intake of Pulses / legumes is 44.8% , often consumed by 22.7 % ,sometimes by 11.7% , rarely by 5.8% and never consumed by 15.6% individuals .Among them 16.2 individuals always considered egg /meat / fish ,while 22.7% preferred it often , 23.4% sometimes ate it , 20.1% rarely and 17.5% never consumed it .Among them the intake of fried / processed food regularly is 9.1% , whereas 14.9% often 20.8% sometimes, 21.4% consume rarely and maximum individuals i e 33.8% never prefer processed foods .Among them, the lack of intake of sugary/starchy foods is 39.6% , 22.7% rarely, 15.6% sometimes , 14.3% often and 7.8% always .Among them the lack of intake of sweetened beverages is 31.8% , 21.4% rarely , 18.2% sometimes , 16.2 % often and 12.3 % individuals consume such drinks always.

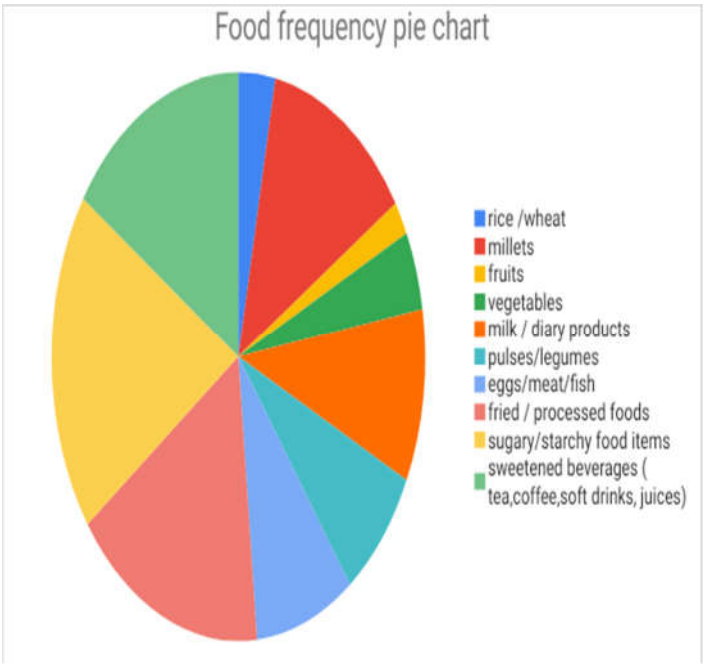


Table 18 : Descriptive analysis on Depression level, in the study population (N=154)

Depression level	Frequency	Percentage (%)
Minimal depression	26	16.9
Mild depression	41	26.6
Moderate depression	53	34.4
Moderately severe depression	21	13.6
Severe depression	13	8.4

The descriptive analysis from Table 18 reveals the level of depression in the type 2 Diabetic individuals of the study population.Among them maximum individuals experience moderate depression by 34%, mild depression by 26.6%, 16.9% no depression, moderately severe depression by 13.6% ,8.4% severe depression.

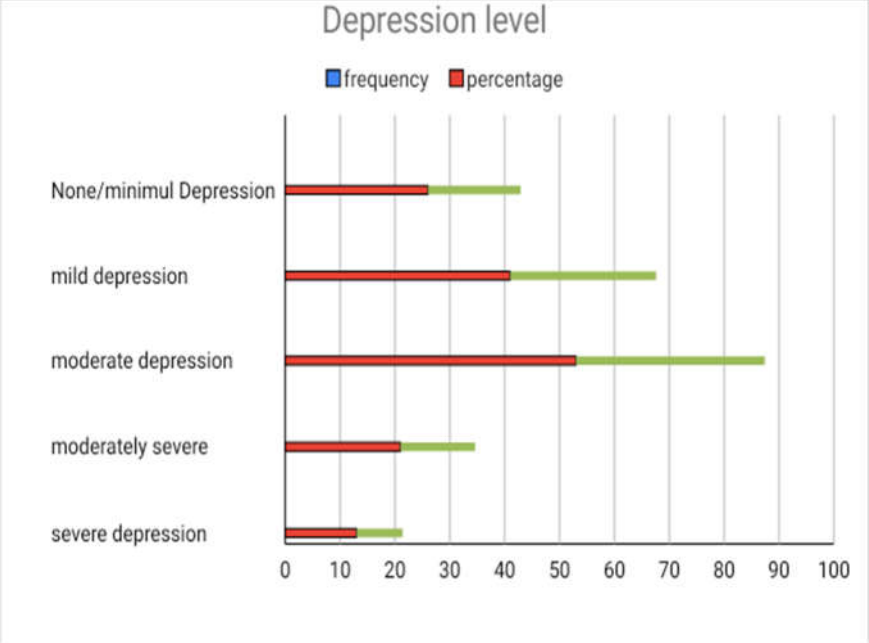


Table 19: Descriptive analysis on Anxiety level, in the study population (N=154)

Anxiety level	Frequency	Percentage (%)
Minimal Anxiety	44	28.6
Mild Anxiety	33	21.4
Moderate Anxiety	53	34.4

Severe Anxiety	24	15.6

The descriptive analysis from Table 19 reveals the level of anxiety in the type 2 Diabetic individuals of the study population.Among them 34.4% individuals experience moderate anxiety, 28.6% minimal depression, 21.4% mild anxiety, 15.6% severe depression.

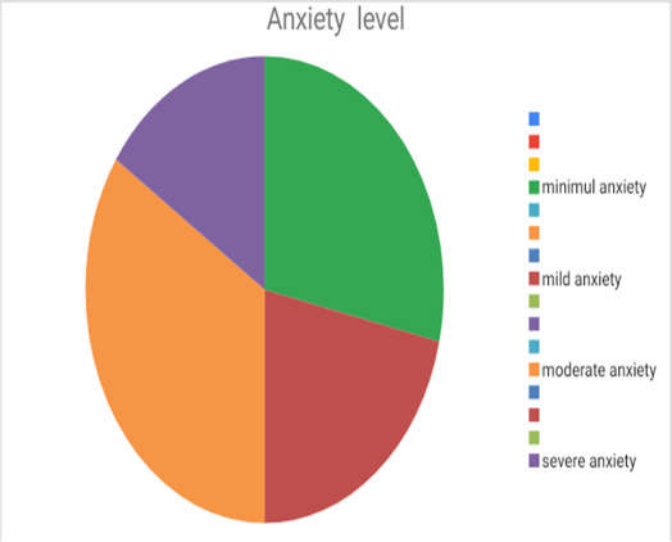


Table 20 : Descriptive analysis on Patient health questionnaire ,in the study population (N=154)

HbA1c	**Minimal**	**Mild**	**Moderate**	**Moderately severe**	**Severe**
5.7 (normal)	0	2	7	1	0
5.7-6.4(prediabetics)	3	4	8	2	0
6.5-7(good control)	5	4	12	6	6
7.1-8(Good control)	14	12	10	8	4

8(very poor control)	4	19	16	4	3

The descriptive analysis from Table 20 reveals the patient health questionnaire based on the level of depression and HbA1c level in the type 2 Diabetic individuals of the study population. Among them individuals having the HbA1c levels as 5.7 (normal) , 5.7 - 6.4 (prediabetics) , 6.5-7 (good control) experience moderate depression , while the values between 7.1- 8 (poor control) experience minimal depression and 8 (very poor control) experience mild depression.The Overall estimation provided with the help of chi - square test states that if the value of 'p' is less than .05 indicates the level of depression and in this study the value illustrated ,exhibits the association between HbA1c levels and the depression by .021 .

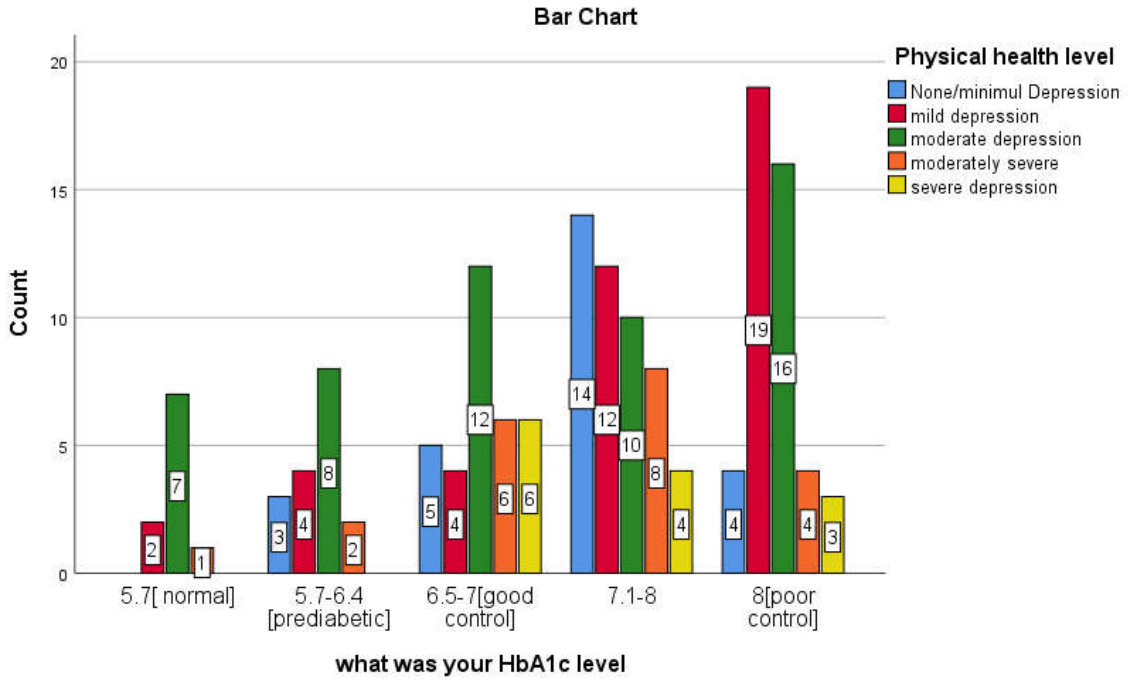
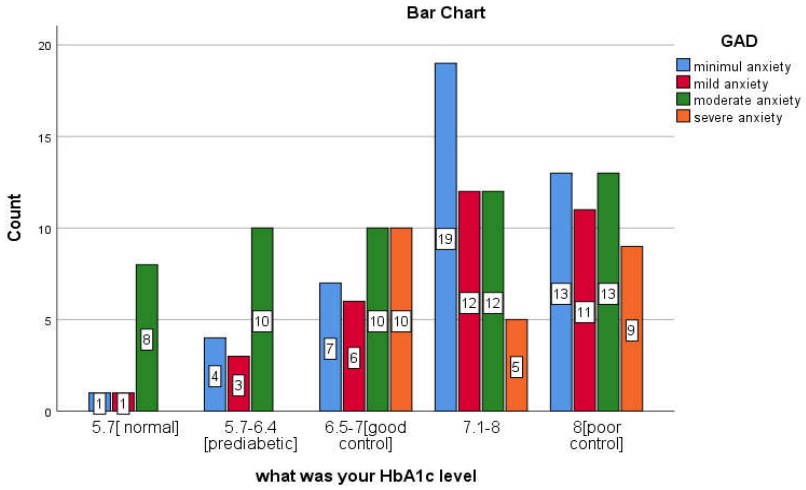


Table 21 : Descriptive analysis on Generalized anxiety disorder ,in the study population (N=154)

HbA1c	Minimal	Mild	Moderate	Severe
5.7(normal)	1	1	8	0

5.7-6.4(prediabetics)	4	3	10	0
6.5-7(good control)	7	6	10	10
7.1-8(poor control)	19	12	12	5
8(good control)	13	11	13	9

The descriptive analysis from Table 21 reveals the Generalized anxiety in the type 2 Diabetic individuals of the study population. Among them individuals having the HbA1c levels as 5.7 (normal) , 5.7 - 6.4 (prediabetics) experience moderate anxiety , 6.5-7 (good control) suffer from moderate to severe anxiety, whereas 7.1- 8 (poor control) experience minimal depression , 8 (very poor control) experience minimal to moderate anxiety.The Overall estimation provided with the help of chi - square test states that if the value of 'p' is less than .05 then it indicates the level of anxiety and in this study the value illustrated ,exhibits the association between HbA1c levels and the anxiety by p=.010 .



CONCLUSION :

The study highlights the increased occurrence of depression and anxiety , where the value of p is .021 and p-.010 demonstrating the association between HbA1c levels and psychological distress . The majority of the participants relied on oral medications and even though all the participants were dependent on medications , many of them had poor glycemic control . Hyperglycemic symptoms were observed when glucose levels were elevated , such symptoms contribute to exalted levels of depression.

Irregular meal patterns , inconsistent meal timing, meal skipping , frequent consumption of unhealthy or junk food were common lifestyle behaviours that caused fluctuations in the blood glucose levels.

When the assessment of depression and anxiety had taken place ,which reflected in PHQ-9 and GAD-7 scales . The level of anxiety and depression was moderate or severe affecting the day to day activities. Depression affects the other major organs of the body contributing to its complications.

The frequency of food or the intake of meals at unusual timing has given a negative impact on the blood glucose levels . The symptoms observed when meals are skipped are most likely to be dizziness , leading to hypoglycemia that can affect the steadiness of an individual's mind and body therefore causing psychological distress .It can also affect medication adherence, dietary habits, food consumption and so on . Psychological distress is a major issue influencing HbA1c levels or the HbA1c levels causing psychological distress.

RECOMMENDATIONS:

1.Encourage people for dietary counselling and consumption of consistent meal timing.

2.Provide structured Nutritional counselling and the importance of consuming foods with low glycemic index.

3.Improve awareness and management strategies on hyperglycemic and hypoglycemia symptoms.

4. Promoting self management of blood glucose levels .

5.Encourage regular mental health screening as a part of diabetic care .

6.Conduct community counselling for the management of psychological distress

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