

TO STUDY THE ROLE OF GLYCOSYLATED HEMOGLOBIN IN DIABETIC PATIENTS IN OF JAMSHEDPUR

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ABSTRACTS

Glycosylated hemoglobin assay offers information about the degree of long-term control of the blood glucose that is otherwise obtainable in the normal outpatients setting. The study will help in determining the diabetic control index that efficiently combines blood glucose concentrations over several weeks, and this study offers new insights into metabolic abnormalities that are characterized by huge fluctuations. Due to Rapid changes in Science and the various practices of medicine, it has created a better place at a breath-taking speed. The most important of science is that it retained health and disease. It also creates a new concept which is careful control of glucose in the blood helps avoid or postpones the dreaded complication of Angioplasty and neuropathy in the course of diabetes mellitus. The study is useful to determine the diabetic control that efficiently combines the blood glucose concentration and the study also offer new insight into metabolic abnormalities that are characteristic by huge fluctuations. The main aim of the study is to determine the significance of glycosylated hemoglobin in patients with diabetes in Jamshedpur. It also determines the use of glycosylated hemoglobin to determine the pattern of glycemic control in patients with diabetes. In addition to this, the study also determines the relationship between glycosylated hemoglobin and plasma glucose course in a diabetic patient in Jamshedpur. This section mainly described the various Research and findings which are collected from the previous data collection chapter. It may be in the form of statistical and thematic data analysis. In addition to this, the study also defines the discussion and conclusion chapter under which the study mainly identifies the major findings.

INTRODUCTION

Hemoglobin population of normal human red blood cells are covalently linked to glucose, that result in the formation of a minor components designated as hemoglobin A1c (Hb A1c) by Allen et al, (1958). Interest in Hb A1c was considerably augmented by the scholars as there was two to threefold increase in the glycoprotein in patients with diabetes mellitus (Vogel & Waterbolk, 1973). It was the formation of condensation in glucose and hemoglobin that indicated the structural analysis of hemoglobin A1c. Other minor component is Hemoglobin A2 ($\alpha_2\delta_2$) and Hb F ($\alpha_2-\gamma_2$) that comprises about 2.5 percent and 0.2 percent of the total hemoglobin content present in the human body. These two minor components are synthesized that are controlled by two other globin chain genes (δ and γ). Other minor hemoglobin content is post-translational

modifications of hemoglobin A (Bunn, Gabbay & Gallop, 1978). HbA1c reflects average plasma glucose from previous eight to twelve weeks in human body (Nathan, Turgeon & Regan, 2007).

The advancement and breakthroughs in treating patients has observed meteoritic changes in recent years due to the practice of medicine along with science and its applications. The significant aspect is the use science concerning to health and disease. One such new concept was the cautious control of blood glucose levels that would assist in preventing or delaying the dread complications of angioplasty and neuropathy in the course of diabetes mellitus. The restraints faced to a greater acceptance of this is lack in controlling the blood sugar level in human body. There were various prospective studies that stated that there is a positive correlation between the frequency and extent of late complications with the degree of metabolic control of diabetes mellitus (Ronald, 1987). The term diabetes mellitus recounts a metabolic disorder with diverse etiologies that are characterized by chronic hyperglycemia and disturbance of carbohydrate, fat and protein metabolism that is a result from defects in secreting insulin, action of insulin or both (WHO, 1999).

The diabetes mellitus has elevated dramatically over the two decades and could keep on increasing for the next 20 years at a global scale. This has thus become a pressing issue that needs immediate attentions of scholars in research with an aim for controlling or preventing complications that are faced by the diabetic patients, the one in question could be specifically prevented or at least have observed delayed effect of diabetes mellitus. Diabetes mellitus incorporates a group of metabolic diseases that result in hyperglycemia. This could occur either because the body doesn't create enough insulin, or the cells are not responding to the produced insulin or both. Further results in acute and/or chronic complications Occurrence of recurrent hyperglycemia is one of the diagnostic features of diabetes mellitus. Speaking precisely, the patients demonstrate any one among the following diagnosis when having diabetes that have been stated by the WHO articles from 2006 & 2011 are; symptoms of diabetes plus random blood sugar ≥ 200 mg/dL (11.1 mmol/L) or fasting blood sugar ≥ 126 mg/dL (7 mmol/L) or 2-h plasma glucose during glucose tolerance test (GTT) ≥ 200 mg/dL (11.1 mmol/L) or glycated hemoglobin (Hb A1) $\geq 6.5\%$. Therefore, diagnosis and monitoring the diabetes mellitus patients could be done by their glycated hemoglobin (Hb A1) and/or by blood glucose level testing. Long term hyperglycemia can be assessed by Hb A1 in their last 2-3 months period and can predict the risk of diabetic complications; however, the use of glycated hemoglobin test in the country, specifically, in the study area is almost none. Hence, the present study aims in describing the risk of complications among diabetic patients as well as assessing the glycosylated hemoglobin and its glycemic control using glycated hemoglobin of the diabetic patients.

Causes of Diabetic mellitus:

Harvey (1869) remarked that, "There is no better way to advance the proper practice of medicine than to give our minds to the discovery of the unusual law of nature by the careful investigation of cases of rarer forms of disease". There are various causes that lead to diabetes mellitus as a result of which they have been broadly divided into three conditions. First is type 1 diabetes

where the body is unable to produce the required insulin in the human body; second is type 2 diabetes wherein the body is unable to use the produced insulin in the body and third is gestational diabetes a condition that leads to very high blood sugar levels in women during pregnancy. Type 1 diabetes is caused due to the lack of ability by the body to produce insulin (Lal, 2016). It is also known as insulin-dependent diabetes, early-onset of diabetes or juvenile diabetes type. Type 1 diabetes mellitus is observed before the age of 40 years in people. Type 1 and type 2 diabetes both have vast difference in their mechanism and metabolism action. About 10% of the population from all the diabetes cases is of type 1. Patients that suffer from juvenile diabetes require to take insulin injections throughout the period of their life. Type 1 diabetes mellitus (T1DM) is a disorder caused due to glucose homeostasis that is characterized by an autoimmune destruction of the β-cell present in the pancreas for insulin-production, that causes in insulin deficiency and results in hyperglycemic conditions (Gregory, Noore & Simmons, 2013). If neglected would cause insulin deficiency to progressive metabolic derangement accompanied with aggravating hyperglycemia, ketoacidosis, starvation and death. These patients must ensure blood-glucose levels by performing regular blood tests and special diet. Genetic defects associated with insulin secretion have become acknowledged progressively. Type 2 diabetes is a state where the quantity or amount of insulin produced is not used significantly as it does in a healthy human body. It's observed over the period of time that the excess of sugar present in the blood starts affecting the pancreas causing them to produce less of insulin thereby making difficult to control the blood glucose level in the body. About 90% of the people that have type 2 diabetes are either obese or overweight. Another less common form called as gestational diabetes is a temporary condition that is observed when a women is undergoing pregnancy. It is presumed that people that acquired gestational diabetes have a high chance to develop type-2 diabetes later in their life.

Treatment and Management of Diabetic mellitus:

A number of complications including coronary heart disease, retinopathy, and neuropathy amongst many are associated with a person suffering with diabetes mellitus (Kramer, Nguyen, Curhan, & Hsu, 2003; Nathan, 1993). Also, a significant amount of risk complications accompanied with diabetes is reduced by tight control of blood glucose (Gailliot, & Baumeister, 2018). Hence, multidisciplinary approach that involves endocrinologist/diabetologists, dieticians, nephrologist, cardiologists, and ophthalmologists are needed for an effective management of diabetes mellitus. Patients that are sustaining with type 1 diabetes have insulin as the only available therapy for effective management (Beck, Riddlesworth, Ruedy, Ahmann, Bergenstal, Haller, Kollman, Kruger, McGill, Polonsky, Toschi, Wolpert, & Price, 2017). Whilst, a complete reproduction of insulin secretion in a normal physiological pattern into the portal vein has not been possible, eventually leading to a less than optimal chances for insulin replacement in patients with type 1 diabetes. Even with the present state of technology the primary complication in achieving optimal insulin delivery has remained unsolved (Ganie & Kotwal, 2012).

Contribution of the Research

The current study seeks to determine the connection between glycosylated hemoglobin to the control diabetes mellitus patients. Further estimating the level of significance that is imparted by glycosylated hemoglobin has on the patients with diabetes mellitus. The study will also integrate the views of the existing research on the theoretical foundations of glycosylated hemoglobin, its impact on varied levels and diversities that occurs on diabetic mellitus patients. Further, will present methods and approaches by which diabetes mellitus can be prevented and/or controlled and delayed if possible by estimating the values of the glycosylated hemoglobin present in diabetes mellitus patients to that with normal healthy person not suffering with diabetes mellitus of Jamshedpur and Jharkhand. For this purpose, the current research will comprehend and evaluate the glycosylated hemoglobin and its values that can be used to estimate the diabetes mellitus in patients. Further provide any control or remedy to patients that are observed with diabetes mellitus and determine the best and effective approaches that can be used to improve health status of such patients.

Trends in diagnostics of Diabetic mellitus:

Diabetes mellitus is considered as a chronic hyperglycemic condition accompanied with variation in the metabolism of fat, proteins and carbohydrates caused by the defects in insulin action, insulin secretion, or both (Ganie & Kotwal, 2012). There are two etiopathogenetic categories based on the majority of the cases observed in diabetes that are T1DM & T2DM. This classification was recommended in the year 1997 by the World Health Organization (WHO) and the American Diabetes Association (ADA). T1DM is a condition that results from insulin deficiency causing destruction of insulin-producing pancreatic β cells. It is present most commonly in childhood however one-fourth of the cases that are diagnosed include adults. There are various factors that cause T1DM such as family history, age and environmental factors. There are several different ways presented by T1DM (Haller, Atkinson & Schatz, 2005). It's the classic new onset in diabetes that is considered to be diabetic ketoacidosis or as asymptomatic incidentally discovered diabetes. Classic new onset represents a condition wherein the hyperglycemia is without acidosis. There are symptoms caused by hyperglycemia including polydipsia, polyuria and loss of weight despite the initial increase in appetite. Diabetic ketoacidosis is exhibited more often in children with T1DM. In the year 2007, International Society for Pediatric and Adolescent Diabetes (ISPAD) defined the biochemical criteria for the diagnosis of diabetic ketoacidosis (Jolobe, 2004). As per Ganie & Kotwal (2012) hyperglycemia, blood glucose is of >200 mg/dL (11 mmol/L) a metabolic acidosis, defined as a venous pH <7.3 and/or plasma bicarbonate <15 meq/L (15 mmol/L). It's these complications followed by hyperosmolality and hyperkeratosis where the concentration of the to talk etonebodiesis >5 mmol/L. T2DM is one of the most common form of diabetes that is characterized by the insulin action and secretion of insulin disorders. The risk of attaining T2D Mescalates with age, obesity and physical inactivity.

RESEARCH METHODOLOGY

Data collection approach

The data collection approach has been subdivided into the quantitative or the qualitative approach. Quantitative methods emphasize on the objective estimations and the mathematical, statistical or numerical analysis of data solicited through polls, surveys, and questionnaires or by moulding pre-existing statistical data using computational methods. Quantitative research is centered towards numeric and stable data and comprehensive, convergent reasoning rather than divergent reasoning, that is, the formation of a class of ideas about a research problem in a casual or free-flowing way. The qualitative research is also termed as the subjective research approach, which is comprehensive and resulting in some discovery. While the quantitative research methods can be adopted to ascertain the number of people undertaking particular behaviors, the qualitative methods can help researchers to interpret how and why such reactions take place (Austin & Sutton, 2015). The study focuses on the qualitative approach for the present study of research by conducting interview and medical records examination for a sample size of 200 respondents.

Data collection approach selected

For estimating the glycosylated hemoglobin and its value in the estimation of the control of patients of Diabetes Mellitus of Jamshedpur, the researcher adopted a qualitative study approach to carry out his investigation. Consequently, researcher employed the case study approach when the aim of the study is to answer the how and why questions and when the aim is to cover all the contextual conditions since they are relevant to the event under the study. Additionally the case study approach is selected when the behavior of the participants cannot be manipulated (Baxter and Susan, p. 545). The research was conducted in Jamshedpur using sample collection of patients with Diabetes Mellitus and also from the physicians treating diabetes from Jamshedpur. In addition to this, the interviews were conducted. Here, the qualitative data collection approach conducted and examined the doctor's reports on these patients fixing the in-depth interviews with them. The idea behind the research is to investigate the glycosylated hemoglobin assay information. From the collection of samples, the FBG, HbA1c and PPBS were taken and recorded. The reason for the selection of the qualitative approach determined the meaning of the event through description and thereby aimed at developing concepts subsequently helping in understanding the natural phenomenon by emphasizing the meaning, experiences and participants 'views.

Primary Data Collection

This is said to be the significant form of data collection technique where the major information is collected using various methods. The researcher collects the raw data using this technique which is later analyzed to meet the research aim (Miller, Birch, Mauthner, & Jessop, 2012). The primary data collection techniques are bifurcated into qualitative and quantitative research methods as presented in the sections prior to this. The researcher has to conduct online or face to face surveys to collect quantitative data using the set of questionnaires (Neuman, & Robson, 2012). The Kothari (2012) regard questionnaires, direct observations and interviews as the most significant way of data collection. Highlighted the questionnaire as a very helpful data collection tool that is purposeful, a structured organization of questions that can be used to obtain the opinions of a large number of respondents in writing, with no requirement of making a connection with target groups.

Secondary Data Collection

Secondary data implies the second-hand information which is already collected and recorded by any person other than the user for a purpose, not relating to the current research problem. Thereby, it is the readily available form of data collected from various sources like censuses, government publications and internal records of the organization, reports, books, journal articles, and websites and so on. Secondary data offer several advantages as it is easily available, saves time and cost of the researcher. A study conducted by Grinnel and Unrau (2008) asserts that the secondary information data are not essentially gathered in any event at first with the end goal of information. Secondary data collection technique is the vast array of evidence which is collected from the different secondary resources. This type of information is gathered depending on the previous research works performed by the scholars. The main aim of accumulating this data is to gather detailed knowledge depending on the selected topic (Padgett, 2016).

RESULTS AND DISCUSSION

Current treatment

From the following table, we can observe that 46% of the respondents take combined treatment such as Injectables & Oral. The following bar chart also shows the taller bar corresponding to the same.

Table 1 Current treatment

	Frequency	Percent	Valid Percent	Cumulative Percent
Injectables	72	36.0	36.0	36.0
Oral	36	18.0	18.0	54.0
Combination of both	92	46.0	46.0	100.0
Total	200	100.0	100.0	

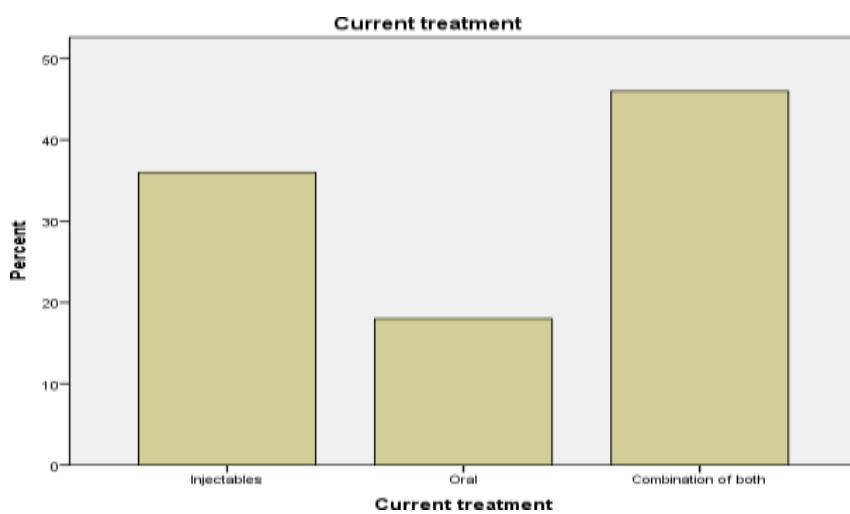


Figure 1 Current treatment

Q1. How often do you check your glycosylated hemoglobin?

From the following table, we can observe that 46.5% of the respondents check their glycosylated hemoglobin twice a year. The following bar chart also shows the taller bar corresponding to the same.

Table 2 Q1. How often do you check your glycosylated hemoglobin?

	Frequency	Percent	Valid Percent	Cumulative Percent
Every three months	48	24.0	24.0	24.0
Twice a year	93	46.5	46.5	70.5
Once a year				
Other	47	23.5	23.5	94.0
Total	12	6.0	6.0	100.0
	200	100.0	100.0	

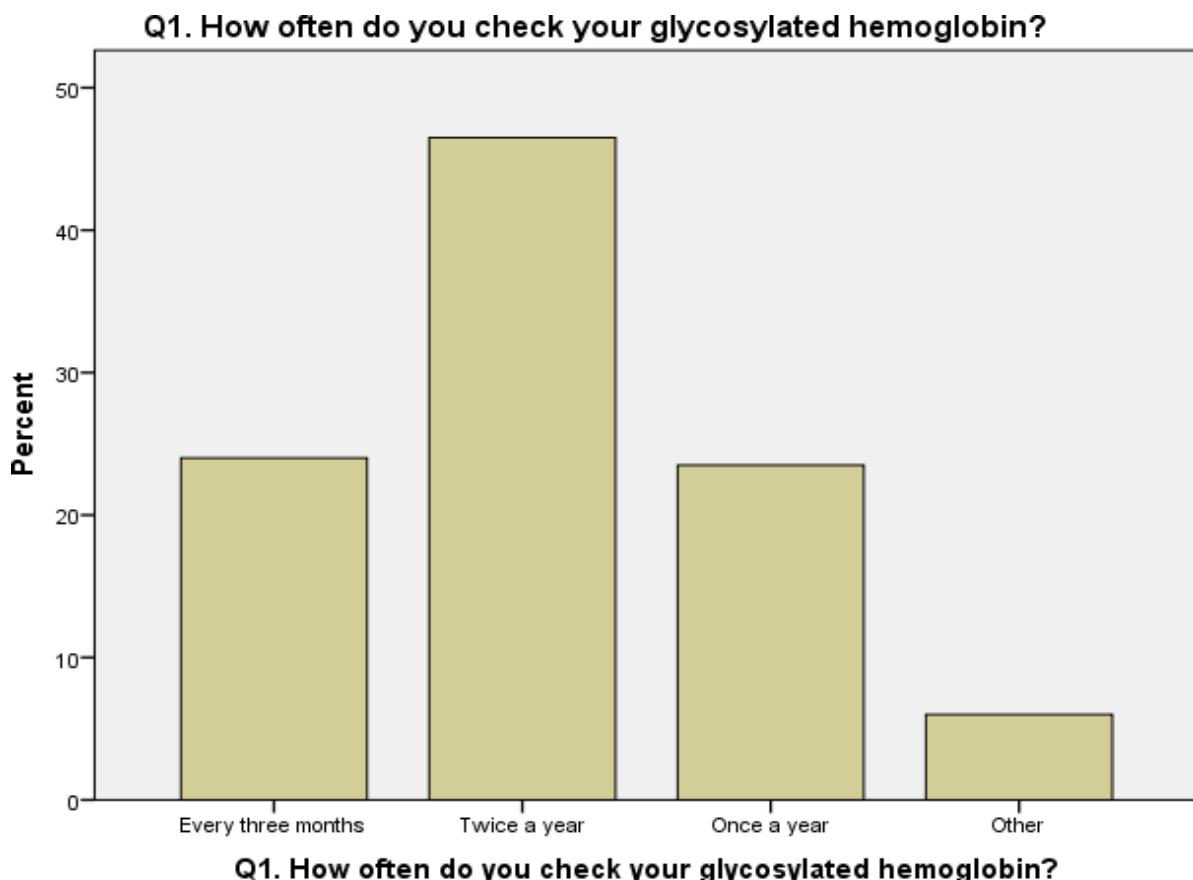


Figure 2 Q1. How often do you check your glycosylated hemoglobin?

Q2. What do you think is the normal range of glycosylated hemoglobin?

From the following table, we can observe that 54% of the respondents think that the normal range of glycosylated hemoglobin is between 4% and 6%. The following bar chart also shows the taller bar corresponding to the same.

Table 3 Q2. *What do you think is the normal range of glycosylated hemoglobin?*

Q2. What do you think is the normal range of glycosylated hemoglobin?

	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 7%	60	30.0	30.0	30.0
More than 7%	32	16.0	16.0	46.0
Between 4 and 6%	108	54.0	54.0	100.0
Total	200	100.0	100.0	

Q2. What do you think is the normal range of glycosylated hemoglobin?

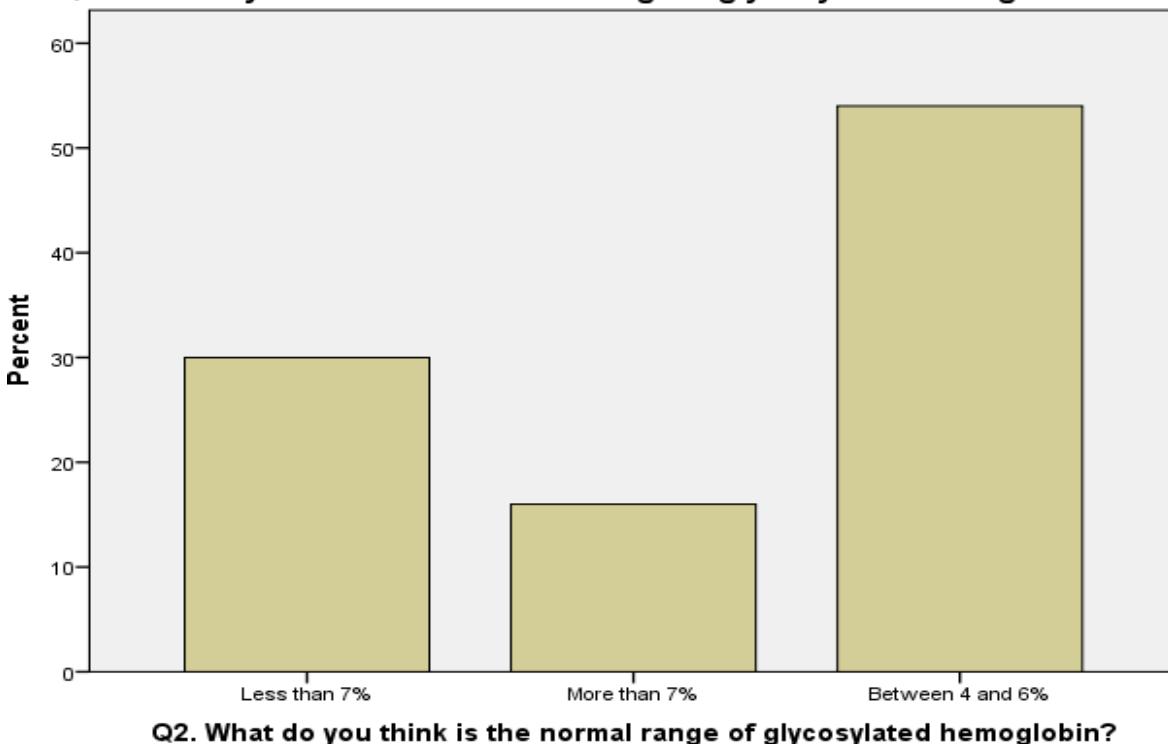


Figure 3 Q2. What do you think is the normal range of glycosylated hemoglobin?

Q3. What is the level of your glycosylated hemoglobin over the past 3 months?

From the following table, we can observe that 60% of the respondents believed over the past 3 months, the level of their glycosylated hemoglobin is between 5.7% - 6.4%. The following bar chart also shows the taller bar corresponding to the same.

Table 4 *Q3. What is the level of your glycosylated hemoglobin over the past 3 months?*

	Frequency	Percent	Valid Percent	Cumulative Percent
Between 4% - 5.6%	51	25.5	25.5	25.5
Between 5.7% - 6.4%	120	60.0	60.0	85.5
Above 6.5%	29	14.5	14.5	100.0
Total	200	100.0	100.0	

Q3. What is the level of your glycosylated hemoglobin over the past 3 months?

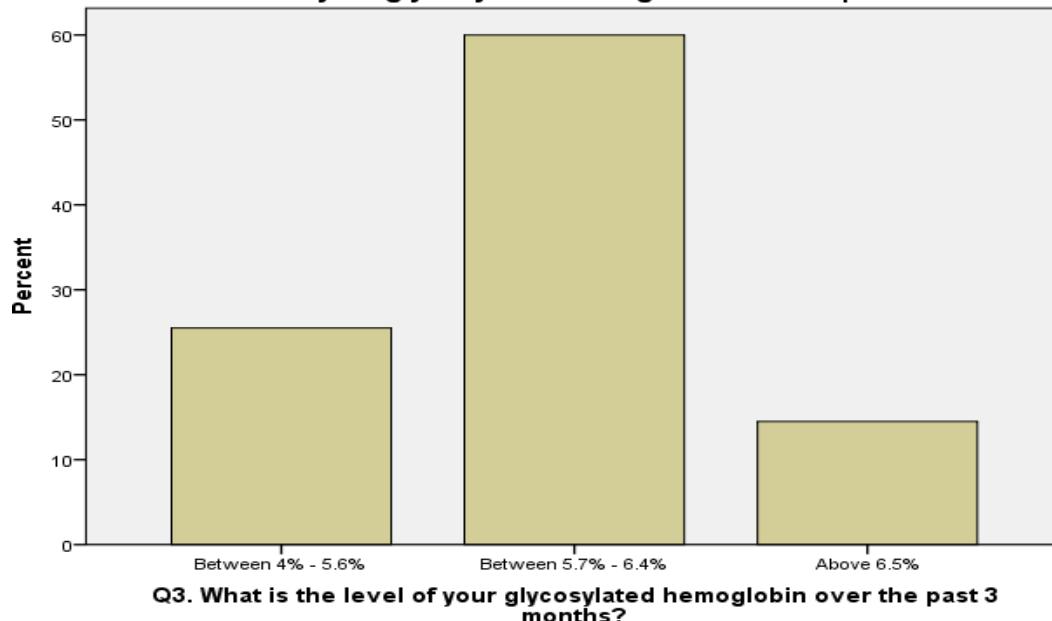


Figure 4 Q3. What is the level of your glycosylated hemoglobin over the past 3 months?

Q4. Is glycosylated hemoglobin curable?

From the following table, we can observe that 74.5% of the respondents believe that glycosylated hemoglobin is not curable. The following bar chart also shows the taller bar corresponding to the same.

Table 5 Q4. Is glycosylated hemoglobin curable?

Frequency		Percent	Valid Percent	Cumulative Percent
Yes	51	25.5	25.5	25.5
No Total	149	74.5	74.5	100.0
	200	100.0	100.0	

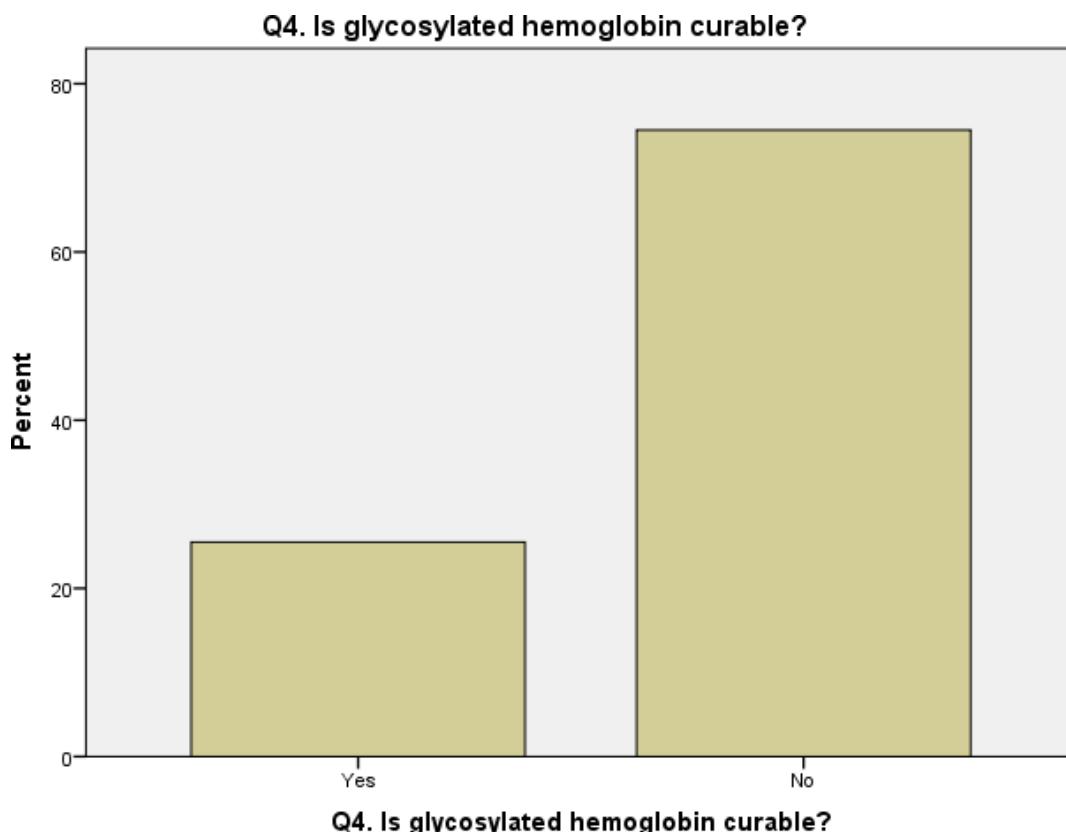


Figure 5 Q4. Is glycosylated hemoglobin curable?

CONCLUSION

Glycosylated hemoglobin assay offers information about the degree of long-term control of the blood glucose that is otherwise obtainable in the normal outpatients setting. The study will help in determining the diabetic control index that efficiently combines blood glucose concentrations over several weeks, and this study offers new insights into metabolic abnormalities that are characterized by huge fluctuations. As per the detailed information, it can be concluded that the study mainly focuses on determining the significance of glycosylated hemoglobin in patients with diabetes in Jamshedpur. In addition to this, the study also examined whether the levels of glycosylated hemoglobin of diabetics in Jamshedpur are in good control or poor control. In addition to this, the study also defines the use of glycosylated hemoglobin to determine patterns of glycemic control in patients with diabetes by determining the relationship between glycosylated hemoglobin and plasma glucose in diabetic patients in Jamshedpur. In order to conduct the study, the researcher mainly focuses on the case study approach which mainly focuses on to answer how and why question by covering all the contextual conditions since they are relevant to the event under study. The research is also done in Jamshedpur by using a sample of Diabetics, where their FBG, HbA1c, and PPBS will be taken and recorded (Al-Busaidi, p. 11).

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