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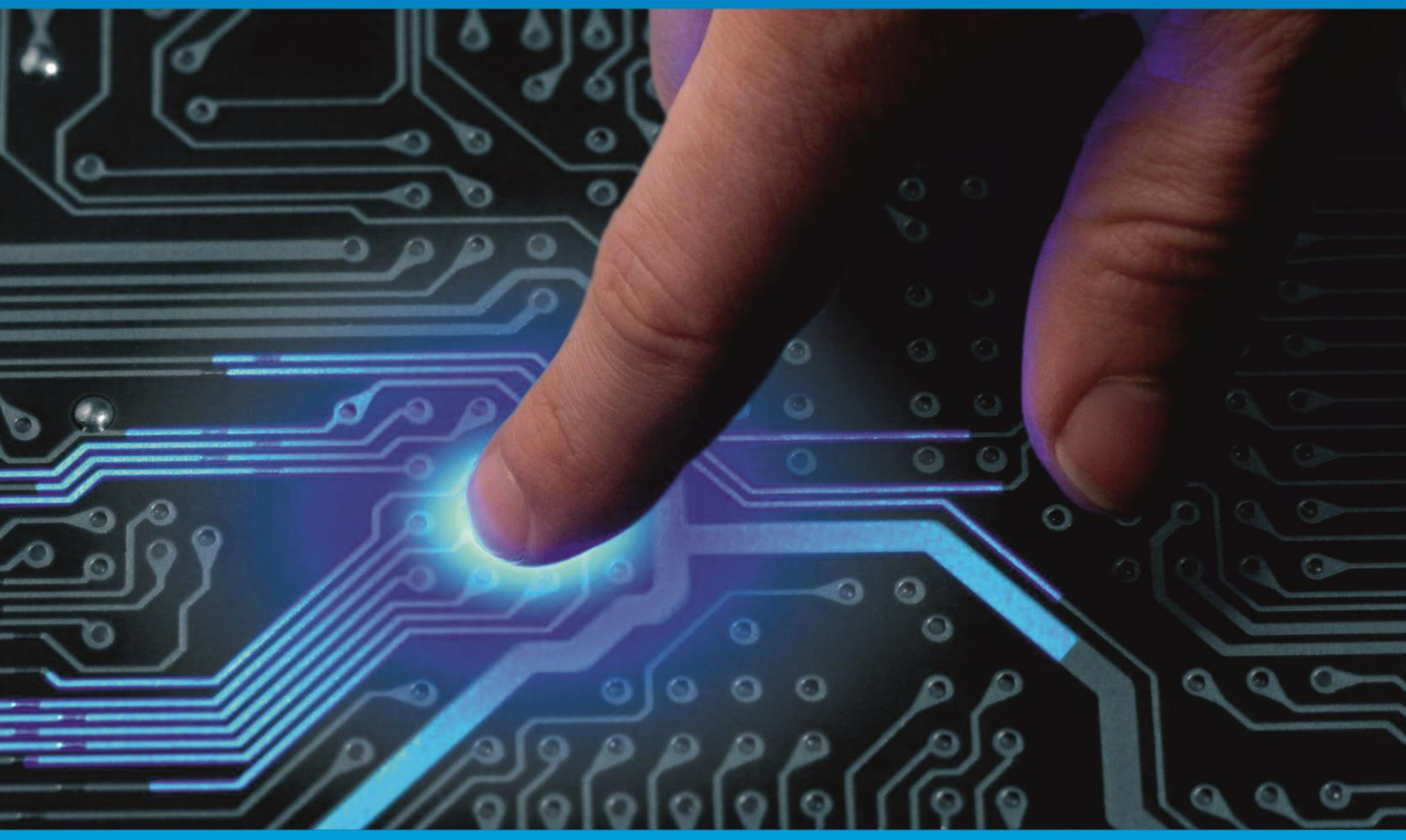

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A Novel Study and Analysis on Glucose Level in Diabetes

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ABSTRACT : This paper focuses on finding out the glucose level range which can lead to a person getting detected as diabetic. In this paper we find out the Glucose level of people who are shown to be diabetic. Then we sample out some people using systematic sampling and figure out a confidence interval of the mean glucose level of the population of diabetic people using a Z-test. We also discuss some impacts of diabetes on human body and how Artificial Intelligence will be involved in monitoring and recording blood glucose levels in the future.

KEYWORDS: Systematic Sampling, Confidence Interval, Z-test, Artificial Intelligence

I. INTRODUCTION

At the point when someone has diabetes, their glucose (otherwise known as blood glucose) levels might be reliably high. Over the long haul, this can harm your body and lead to numerous different issues. Any sugar levels higher than ordinary are undesirable. Levels that are higher than typical, however not arriving at the place of out and out diabetes, are called prediabetes.

In this paper, we will discuss a range of blood glucose level which if recorded in a person, they can be considered diabetic.

Glucose is valuable fuel for all the cells in your body when it's present at ordinary levels. In any case, it can carry on like a lethargic acting toxin. High sugar levels gradually disintegrate the capacity of cells in your pancreas to make insulin. The organ overcompensates and insulin levels stay excessively high. After some time, the pancreas is forever harmed. Undeniable degrees of glucose can cause changes that lead to solidifying of the veins, what specialists call atherosclerosis.

To avoid these things people should monitor their glucose levels and if it records in a particular range, which we will be concluding in this paper should consult a medical practitioner.

II. LITERATURE SURVEY

[1] Collateral Damage: Insulin-Dependent Diabetes Induced With Checkpoint Inhibitors

Angeliki, Zoe, et. al. have recognized highlights of CPI-incited diabetes, the acknowledgment of which is expanding with more extensive utilization of these medications to treat diseases. Glucose levels and, in patients with known sort 2 diabetes, A1C levels ought to be followed cautiously in disease patients treated with CPIs and proper references organized as proposed. The suppliers ought to be frightened and check pattern glucose earlier to the commencement of treatment taking all things together patients, as recommended in the agreement proposals for the executives of CPI-incited diabetes by the Society for Immunotherapy of Cancer Toxicity Management Working Group.

[2] Immune checkpoint inhibitors: an emerging cause of insulin-dependent diabetes

Kotwal , Haddox ewt. al. have distinguished new-beginning insulin-subordinate diabetes incited by PD-1 inhibitors with a recurrence of 1%. This type of diabetes is described by more quick movement to serious insulin insufficiency as contrasted and unconstrained type 1 diabetes, oftentimes gives DKA what's more, doesn't seem to go through reduction.

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[3] Driving Safety and Real-Time Glucose Monitoring in Insulin-Dependent Diabetes

Merickel , Smit, et. al. have addressed the requirement for driver-state discovery utilizing wearable and in-vehicle sensor estimations of driver physiology and wellbeing. To address this objective, they sent in-vehicle frameworks, wearable sensors, and strategies fit for measuring certifiable driving conduct and execution in danger drivers with insulin-subordinate sort 1 diabetes mellitus (DM).

[4] Postprandial Dosing of Bolus Insulin in Patients with type 1 Diabetes: a Cross-sectional Study Using Data From the T1d Exchange Registry

Peters, et. al. studied that a huge extent of patients portion bolus insulin PostP. Regardless of the utilization of current quick acting insulin analogs, patients who portion PostP are described by more unfortunate glycemic control on the whole patients and a more prominent commonness of history of extreme hypoglycemia and diabetic ketoacidosis in kids.

[5] Mechanisms of Insulin Action and Insulin Resistance

Petersen, et. al. discussed that despite its physiological provenance, insulin obstruction is maladaptive in the setting of ongoing over nutrition. Understanding insulin activity and opposition all the more totally will encourage the clever utilization of existing antidiabetic treatments, empower the improvement of new therapeutics, furthermore, maybe in particular, advise avoidance systems to stem the tide of type 2 diabetes.

[6] How Good a Marker Is Insulin Level for Insulin Resistance?

Laakso estimated insulin reaction to an oral glucose load and quantitated insulin obstruction utilizing the euglycemic hyperinsulinemic clip procedure to assess the connection between insulin level and the level of insulin opposition in people with fluctuating levels of glucose resistance.

[7] Insulin Action and the Insulin Signaling Network

Cheatham, et. al. showed that insulin advances various other cell occasions including guideline of particle and amino corrosive vehicle, lipid digestion, glycogen combination, quality record and mRNA turnover, protein union and corruption, and DNA amalgamation. In this manner the activities of insulin assume key parts in the ordinary stockpiling of ingested energizes and in typical cell development and separation.

[8] Inflammation: the link between insulin resistance, obesity and diabetes

Dandona et. al. explained that diabetes and being overweight are proinflammatory states in which fiery systems could add to insulin opposition. Macronutrient admission may add to irritation. Insulin opposition may itself advance irritation by weakening the mitigating impact of insulin. Insulin and insulin sensitisers of the thiazolidinedione class may along these lines have a likely use as calming drugs not withstanding their present use as hostile to diabetic medications.

[9] Insulin resistance versus insulin deficiency in non-insulin-dependent diabetes mellitus: problems and prospects

Ferrannini, et. al. have addressed that insulin opposition is a bigger issue than hyperglycemia in the populace; for intricacy and suggestions, it will along these lines stay a danger to the patient, a worry to the clinician, and a test to the examiner.

[10] Increased incidence of non-insulin-dependent diabetes mellitus among adolescents

Pinhas-Hamiel, et. al. report a striking and clearly proceeding expansion in the quantity of analyses of NIDDM among teenagers in Greater Cincinnati. Patients are corpulent and pubertal and have a solid family background of NIDDM. Regardless of whether a comparable expansion in NIDDM cases is happening broadly stays to be resolved.

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III. PROPOSED ANALYSIS APPROACH

- **Systematic Sampling:**

I have used systematic sampling to sample out 274 elements from the population to conduct the analysis and reach to the conclusion.

Procedure:

Step 1: Organizing the population: Saved the population data (678 elements) on an excel file, and ordered it according the glucose levels of the patients.

Step 2: Fixing the ideal sample size: According to the population size and confidence level, we would need 230 elements in the same to accurately judge the population.

Step 3: Checking the interval of the sample through the following formula:

Nn=interval size

678230=2.9

Step 4: Take out every 3rd sample to get the sample size of 227

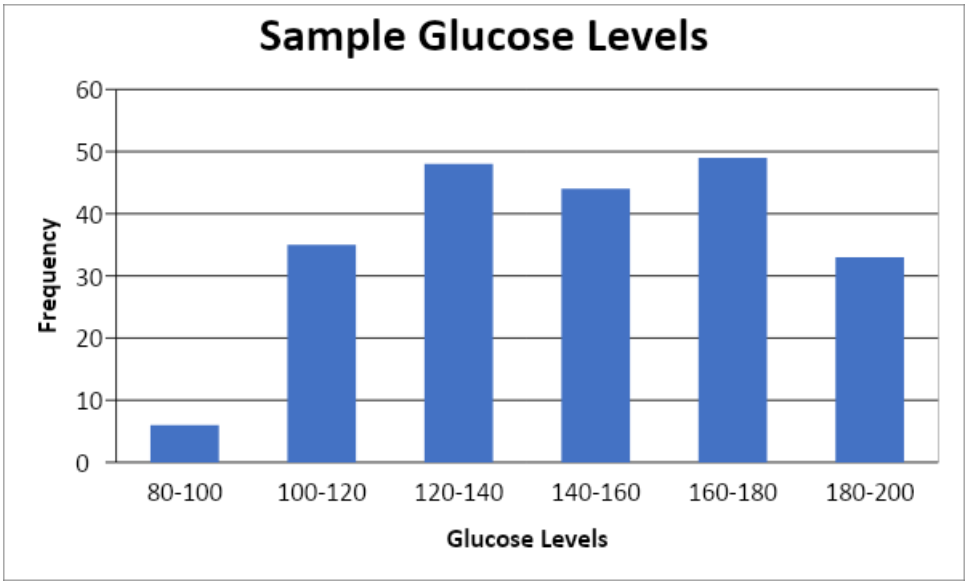

Fig 1: Frequency of the Glucose level

- **Estimate a population parameter**

The sample mean, x= (xi)/n is:

x= 32945/227

x= 145.1 mmol/L

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- **Estimate population variance:**

  Sample variance,

  $s^2 = \Sigma (x - mean)^2 / (n - 1)$

  $s^2 = 183416/226$

  $s^2 = 811.5$

- **Compute standard error:**

  SE = σ/n

  SE= 28.48/227

  SE=1.89

- **Specify a confidence level**

  We will be using the Z test to analyze the population parameters as the sample size is large. (>30)

  A z-test is a statistical test to determine whether two population means are different when the variances are known and the sample size is large.

  A confidence level refers to the percentage of all possible samples that can be expected to include the true population parameter.

  We will be using 95% confidence level to analyze the population.

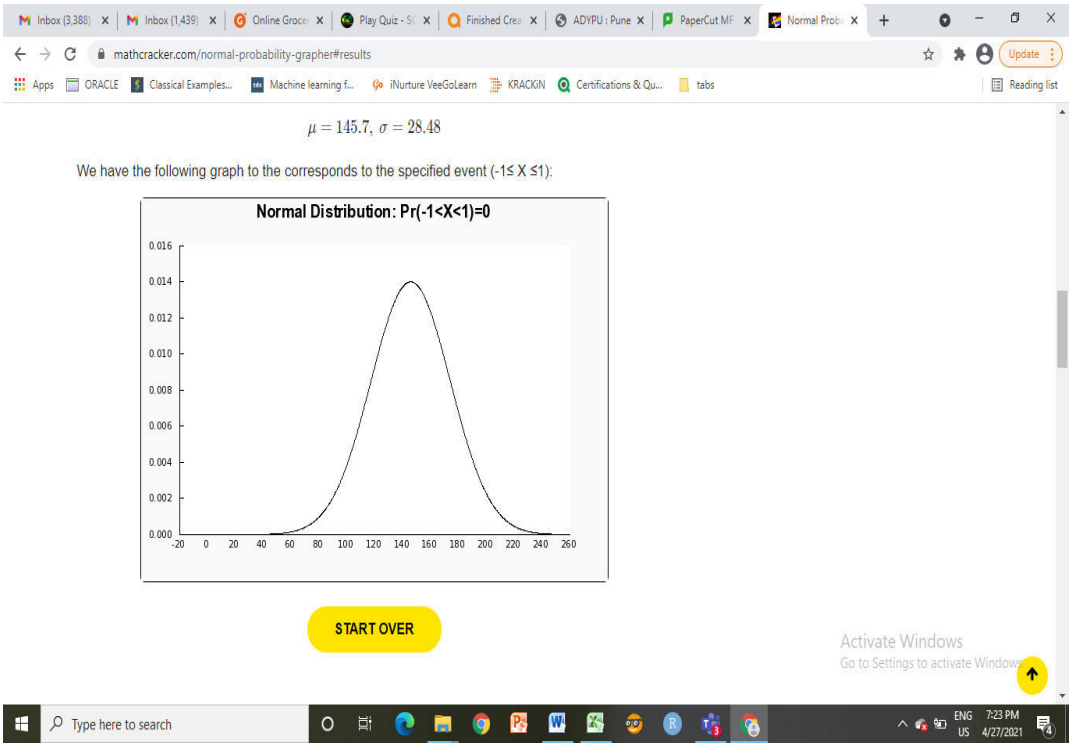

Fig 2: Normal Distribution of the Sample

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- **Find the critical value**

Alpha(α):

α = 1-(confidence level/100)
α = 1-(95/100)
= 0.05

Critical Probability (p*) :

p*= 1- (α/2)
= 1-(0.05/2)
= 0.975

The Z Score (z^*) at 95% confidence interval through the z table using the above calculated value is 1.96

- **Compute margin of error**

Margin of error = z^* * SE

M.E= 1.96*1.89

M.E.=3.70

- **Define confidence interval:**

$\mu = x \pm z * (\sigma/n)$

$\mu = 145.7 \pm 1.96 * (28.48/227)$

$\mu = 145.7 \pm 3.70$

$142 < \mu < 149.4$

The confidence interval for the population mean with 95% confidence level is [142 mmol/L,149.4 mmol/L]

Glucose level	Frequency
80-142	100
142-149.4	17
149.4-200	105

Table 1: Glucose level frequency in the mean range

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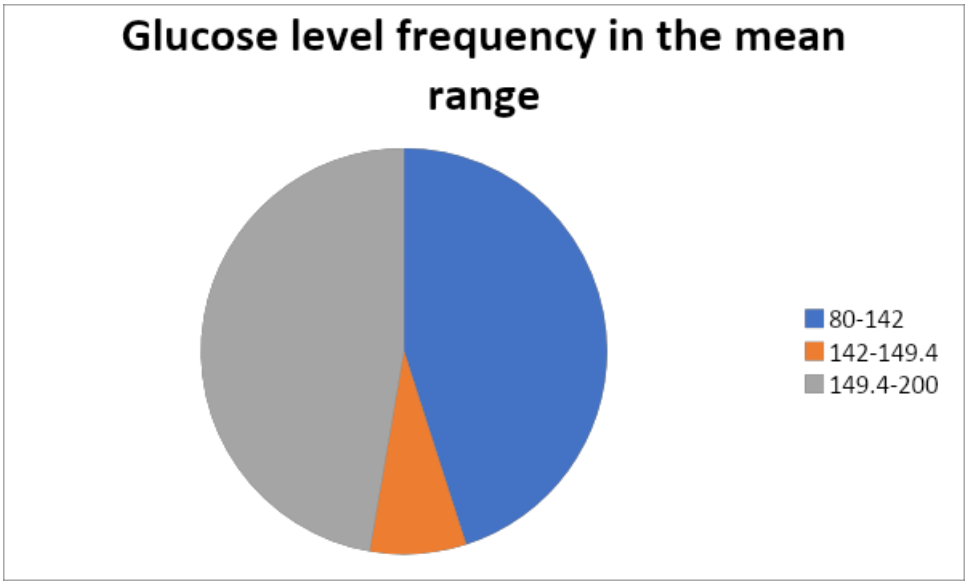

Fig 3: Glucose level frequency in the mean range

IV. FUTURE SCOPE & DISCUSSION

As we are advancing in technology as well as in the field of healthcare, we are seeing the rise of new tools getting developed for recording the glucose levels. As we are not aware of what future holds for us, there is a scope of more new devices getting built for checking and monitoring our blood glucose levels and alarming us if the levels reach a set boundary.

Artificial Intelligence (AI) will find far and wide use in four key zones in diabetes care, including mechanized retinal screening, clinical choice help, prescient populace hazard delineation, and patient self-administration instruments

V. CONCLUSION

We conclude by saying that the average of the Blood Glucose level of diabetic people lies between the range of 142 mmol/L to 149.4 mmol/L.

Practically any piece of your body can be hurt by a lot sugar. Harmed veins cause issues, for example, Kidney sickness, requiring dialysis, Strokes, Coronary failures, Vision misfortune or visual impairment, Debilitated invulnerable framework, with a more serious danger of contaminations, Nerve harm, additionally called neuropathy, that causes shivering, torment, or less sensation in your feet, legs, and hands, Helpless dissemination to the legs and feet, Moderate injury recuperating and the potential for removal in uncommon cases. Keep your glucose levels near typical to evade a large number of these difficulties.

We should monitor our diet and exercise regularly to keep our glucose levels controlled. If your glucose levels reach a certain value which lies in the above mentioned range, you should consult a medical practitioner.

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