# RELATIONSHIP BETWEEN HbA1C AND FASTING SUGAR LEVELS AND TWO HOURS AFTER 75 G ORAL GLUCOSE IN DIABETES MELLITUS

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**ABSTRACT:**

**Background:** The primary screening for diabetes mellitus detection is the fasting blood glucose (FBS) test, considered the best and most common method with a cutoff point >126 mg/dl. However, challenges arise, such as requiring an 8-hour fasting period and limited applicability in the afternoon. In centralized screening with laboratory facilities, the oral 75 gm glucose test and HbA1c test (percentage of glycated hemoglobin) are recommended to detect true incidence or prevalence. **Material & Methods:** The present cross sectional, prospective study was carried out at department of General Medicine, at our tertiary care hospital. The study duration was of six months from January 2014 to June 2014. A sample size of 100 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.3. In this prospective study patients of age of both the genders were enrolled for the study. **Results:.** In the present study, out of total study participants the mean HbA1c (%) levels were 8.1 ± 1.6, mean value of fasting blood glucose was 149.7 ± 17.9 mg/dl and the blood glucose 2 hours after 75 g oral glucose (mg/dl) was 208.2 ± 13.4. Majority of study participants were on oral hypoglycemic drugs. On applying Pearsons correlation parametric statistics it was found that the values of fasting blood glucose were positively correlated with HbA1c levels (r = 0.67). it was also found that the values of blood glucose 2 hours after 75 g oral glucose (mg/dl) were also positively correlated with HbA1c levels (r = 0.69). **Conclusion:** We concluded from the present study that the both fasting blood glucose and oral 75gm glucose test were positively correlated with HbA1c levels however 2 hours after 75 g oral glucose had a better correlation with HbA1c than fasting blood glucose level.

Key words: glycated hemoglobin, fasting blood glucose, oral 75 gm glucose test.

## INTRODUCTION:

The prevalence of diabetes mellitus is on the rise globally, posing a growing burden. In 1995, approximately 150 million people worldwide were estimated to have diabetes, a number expected to reach 300 million by 2025 **(1)**. Developing countries, particularly in Southeast Asia, are witnessing a rapid increase in prevalence of diabetes mellitus **(2).** Existing literature emphasizes the significance of early diagnosis to mitigate diabetes-related complications **(3).**

Alarmingly, about one-third of individuals with diabetes mellitus may remain undiagnosed until complications arise. Thus, implementing effective screening test to identify undiagnosed cases becomes essential **(4).** The effectiveness of a screening test and their relationship is studied

and compared in present study. The primary screening for diabetes mellitus detection is the fasting blood glucose (FBS) test, considered the best and most common method with a cutoff point >126 mg/dl **(5)**. However, challenges arise, such as requiring an 8-hour fasting period and limited applicability in the afternoon **(6).**

In centralized screening with laboratory facilities, the oral 75 gm glucose test and HbA1c test (percentage of glycated hemoglobin) are recommended to detect true incidence or prevalence. Despite efficacy of these screening test in detecting diabetes and assessing microvascular complications and plasma glucose, controversy surrounds its suitability for routine screening (**7**). Issues such as standardization problems, variations in testing styles, and external factors like abnormal hemoglobin, anemia, and certain medications can impact HbA1c results. Demographic factors, including race and gender, further contribute to the complexity **(8).**

Major primary studies on diabetes aim to establish HbA1c ranges in diabetic individuals, examining complications and diabetes control. While some research has explored HbA1c cutoff values for screening, these studies often focus on selective samples, particularly high-risk groups (9). This present study conducted to address existing gaps by investigating the relationship between HbA1c, FBS, and the oral 75 gm glucose test in the population attending our tertiary care hospital.

## MATERIALS & METHODS

The present cross sectional, prospective study was carried out at department of General Medicine, at our tertiary care hospital. The study duration was of six months from January 2014 to June 2014. A sample size of 100 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.3. In this prospective study patients of age of both the genders were enrolled for the study. All patients who were diagnosed with diabetes mellitus were enrolled from outdoor department and from ward by simple random sampling. Institutional Ethics Committee Clearance was obtained before start of study and written and informed consent for the procedure was obtained from all the patients. Strict confidentiality was maintained with patient identity and data and not revealed, at any point of time.

Detailed clinical history was taken from all the study participants along with general physical examinations. All study participants were subjected to routine blood investigation along with fasting blood sugar, oral 75gm glucose test and HbA1c levels. All data were entered in the MS office 2010 spread sheet and Epi Info v7. Data analysis was carried out using SPSS v22. Qualitative data was expressed as percentage (%) and Pearson's chi square test was used to find out statistical differences between the study groups and sensitivity, specificity, positive predictive value and negative predictive value were calculated. If the expected cell count was < 5 in more than 20% of the cells then Fisher's exact test was used. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05 and highly significant if p value less than 0.01.

## RESULTS

In the present study, we enrolled 100 patients who were diagnosed with diabetes mellitus and attending outpatient department of General Medicine of our tertiary care hospital during the

study duration. Out of the total 59% were males and 41% were females. Study participants were aged from 27 years to 74 years of age with the mean age of the Study participants was 42.1 ± 4.8 years. Out of the total study participants mean HbA1c (%) levels were 8.1 ± 1.6.  (Table 1)

**Table 1: Distribution of study participants according to study parameters.**

| Parameters | No. of patients |
|---|---|
| **Male** | 59% |
| **Female** | 41% |
| **Mean age** | 42.1 ± 4.8 years |
| **Mean HbA1c (%)** | 8.1 ± 1.6 |

In the present study, out of total study participants the mean value of fasting blood glucose was 149.7 ± 17.9 mg/dl and the blood glucose 2 hours after 75 g oral glucose (mg/dl) was 208.2 ± 13.4. (Table 2) Majority of study participants were on oral hypoglycemic drugs.

**Table 2: Mean values of study parameters among participants.**

| Parameters | Mean values |
|---|---|
| **FBG (mg/dl)** | 149.7 ± 17.9 |
| **Blood glucose 2 hours after 75 g oral glucose (mg/dl)** | 208.2 ± 13.4 |

In the present study, on applying pearsons correlation parametric statistics it was found that the values of fasting blood glucose were positively correlated with HbA1c levels (r = 0.67). It was also found that the values of blood glucose 2 hours after 75 g oral glucose (mg/dl) were also positively correlated with HbA1c levels (r = 0.69).(Table 3)

**Table 3: Correlation values of study parameters among participants.**

| Parameters | HbA1c |
|---|---|
| **FBG (mg/dl)** | **r= 0.67** |
| **Blood glucose 2 hours after 75 g oral glucose (mg/dl)** | **r= 0.69** |

**DISCUSSION**

In the present study, we enrolled 100 patients who were diagnosed with diabetes mellitus and attending outpatient department of General Medicine of our tertiary care hospital during the study duration. Out of the total 59% were males and 41% were females. Study participants were aged from 27 years to 74 years of age with the mean age of the Study participants was 42.1 ± 4.8 years. Similar findings were reported in a study conducted by Zahra Ghazanfari et al among patients with diabetes mellitus and found similar results to present study. They conducted random sample sampling study of population in Kerman city. 604 people were enrolled for HbA1c and fasting blood sugar (FBS). The association between HbA1c levels and mean FBS levels were determined. Their correlation was found to be strong and positive **(10).**

In the present study, Out of the total study participants mean HbA1c (%) levels were 8.1 ±

1.6. Similar findings were reported in a study conducted by Shahram Haddadinezhad et al investigates the relationship between fasting plasma glucose (FPG) and two-hour postprandial plasma glucose (2hpp) levels with hemoglobin A1c (HbA1c) in diabetic patients. The research involved 300 patients with type 1 or type 2 diabetes. Results indicate that postprandial plasma glucose has a closer association with glycosylated hemoglobin than fasting plasma glucose. The study suggests that evaluating postprandial plasma glucose levels should be a focus for effective diabetes management.**(11).**

In the present study, out of total study participants the mean value of fasting blood glucose was 149.7 ± 17.9 mg/dl and the blood glucose 2 hours after 75 g oral glucose (mg/dl) was 208.2 ± 13.4. Majority of study participants were on oral hypoglycemic drugs. Similar findings were reported in a study conducted by David M Nathan et al among patients with diabetes mellitus and found similar results to present study. 507 patients were enrolled for HbA1c and fasting blood sugar (FBS) and oral 75gm glucose test. Linear regression analysis between the HbA1c and blood glucose 2 hours after 75 g oral glucose provided the tightest correlations (AG(mg/dl) = 28.7 x A1C - 46.7, R(2) = 0.84 ( positive), P < 0.0001) **(12).**

In the present study, on applying pearsons correlation parametric statistics it was found that the values of fasting blood glucose were positively correlated with HbA1c levels (r = 0.67). It was also found that the values of blood glucose 2 hours after 75 g oral glucose (mg/dl) were also positively correlated with HbA1c levels (r = 0.69). Similar findings were reported in a study conducted by Curt L Rohlfing et al among patients with diabetes mellitus and found similar results to present study. 1439 patients were enrolled for HbA1c and fasting blood sugar (FBS) and oral 75gm glucose test. Linear regression analysis, using mean plasma glucose and HbA1c levels were summarized as, r = 0.82. this was indicative of strong and positive correlation **(13).**

## CONCLUSION

We concluded from the present study that the both fasting blood glucose and oral 75gm glucose test were positively correlated with HbA1c levels.However 2 hours after 75 g oral glucose had a better correlation with HbA1c than fasting blood glucose level. The results of present study cannot be generalized on general population because of small sample size. Further elaborative studies needed to explore the topic.

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