# Plasma Fibrinogen Level's: A Comparative Study Between Newly Diagnosed Diabetics and Healthy Individuals

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| KEYWORDS | ABSTRACT |
|---|---|
| Newly diagnosed T2DM, Plasma fibrinogen, Diabetes Mellitus Patients. | The study examines the plasma fibrinogen levels in patients with newly diagnosed Type 2 Diabetes Mellitus (T2DM) compared to healthy individuals at Aarupadai Veedu Medical College in Puducherry. Plasma fibrinogen, an essential protein involved in the process of blood clotting, also functions as a biomarker for cardiovascular and inflammatory illnesses. Employing a comparative cross-sectional approach, we assessed the levels of fibrinogen in a group of 57 patients with newly diagnosed type 2 diabetes mellitus (T2DM) and a group of 57 healthy individuals who were in non-diabetic. The findings indicate a substantial increase in fibrinogen levels among individuals with newly diagnosed type 2 diabetes mellitus (T2DM) at 384.66 mg/dL, in contrast to the control group at 287.24 mg/dL, with a p-value of less than 0.0001. The age distribution discrepancies were found to be statistically significant (p=0.007), indicating that age may be a confounding factor. The gender distribution was balanced, suggesting the absence of any gender-related prejudice. The results of our study emphasise the increased levels of fibrinogen in patients with newly diagnosed type 2 diabetes mellitus (T2DM) and emphasise the necessity for additional investigation into its clinical significance and potential as a target for therapy. |

## 1. Introduction and Background

Plasma fibrinogen is a crucial protein in the human body, primarily known for its role in the coagulation process. Synthesized in the liver, fibrinogen is a glycoprotein that exists as a hexameric structure, consisting of two sets of three polypeptide chains, designated as A$\alpha$, B$\beta$, and $\gamma$. The molecular weight of fibrinogen is approximately 340 kDa, and its normal plasma concentration ranges from 1.5 to 4.5 g/L. This protein is converted into fibrin during the coagulation cascade, a process initiated by tissue injury and mediated by thrombin, which cleaves fibrinogen to release fibrinopeptides and subsequently forms a fibrin clot.

Historically, the significance of fibrinogen in hemostasis has been recognized since the early 20th century. In 1936, it was established that low fibrinogen levels could lead to bleeding disorders, highlighting its importance in maintaining hemostatic balance. Moreover, fibrinogen is considered a classic acute-phase reactant, with its levels increasing in response to inflammation, infection, and tissue injury. The characteristic has made it a valuable biomarker in clinical settings, particularly in assessing cardiovascular risk. Studies have shown that elevated fibrinogen levels are associated with an increased risk of thrombotic events, including myocardial infarction and stroke.Research into the genetic factors influencing fibrinogen levels has gained momentum, particularly since the 1990s. Variations in the fibrinogen gene have been linked to differences in plasma fibrinogen concentrations among individuals, suggesting a hereditary component to fibrinogen levels. Also, advancements in laboratory techniques have improved the measurement of fibrinogen, with methods such as clotting rate assays and immunoassays becoming standard practice in clinical laboratories.The role of fibrinogen extends beyond coagulation; it is also involved in inflammatory processes and wound healing. It acts as a bridge between activated platelets, facilitating platelet aggregation and stabilizing the clot. The multifaceted role underscores the importance of fibrinogen not only in hemostasis but also in various pathological conditions, including cardiovascular diseases and inflammatory disorders. Plasma fibrinogen is a vital component of the coagulation system, with a well-established role in hemostasis and emerging significance as a biomarker for various diseases. Ongoing research continues to explore its complex functions and the implications of fibrinogen levels in health and disease, making it a critical focus in both clinical and laboratory settings.

Research on plasma fibrinogen levels has revealed significant insights into their role in various health conditions, particularly in comparing patients with healthy individuals. A study by Archana Sachin Bembde (2004-2005) investigated plasma fibrinogen levels in 100 type 2 diabetes patients against 100 matched controls, finding a

notable elevation in fibrinogen among diabetic subjects (mean 656 mg/dl) compared to controls (mean 324 mg/dl). It highlights the potential of fibrinogen as a biomarker for cardiovascular risk in diabetic patients.Another study explored fibrinogen's diagnostic utility in appendicitis, reporting levels of 436 mg/dl in confirmed cases versus 391 mg/dl in negatives, suggesting its relevance in acute clinical settings. Alsoresearch has consistently linked elevated fibrinogen levels to cardiovascular diseases, with studies indicating that levels above 500 mg/dl significantly increase stroke risk, particularly in hypertensive patients.A study by the Fibrinogen Studies Collaboration found that higher plasma fibrinogen levels were associated with an increased risk of major cardiovascular diseases and nonvascular mortality . Another study by Guibourdenche et al. showed that serum fibrinogen levels were significantly higher in neonates with sepsis compared to healthy controls.Moreover, hyperfibrinogenemia (>400mg/dL) was more prevalent in type 2 diabetic patients with metabolic syndrome .

Despite these findings, gaps remain in understanding the implications of fibrinogen variations across different populations and conditions. Future research is needed to clarify the relationship between fibrinogen levels and diverse health outcomes, ensuring that diagnostic and therapeutic strategies are effectively tailored to individual patient profiles.

Objective: The primary objective of this research is to investigate and compare plasma fibrinogen levels between patients with newly diagnosed Type 2 Diabetes Mellitus (T2DM) and healthy individuals attending checkup at Aarupadai Veedu Medical College.

## 2. Research Methodology

Study Setting

The research was carried out at Aarupadai Veedu Medical College, a specialized medical facility in Puducherry, specifically within the Department of General Medicine. The study included patients who underwent a master health exam to screen for Type 2 Diabetes Mellitus (T2DM) in both the outpatient department (OPD) and inpatient department (IPD).

Study Design

A comparative cross-sectional study design was used to evaluate plasma fibrinogen levels in patients with newly diagnosedT2DM (case group) and healthy individuals (control group).

Sampling

Collecting a representative subset of data from a larger population. The study included a total of 114 participants, with 57 individuals assigned to the case group and 57 persons assigned to the control group. The participants were chosen through a purposive sampling technique.

**Table 1. Plasma Fibrinogen Levels**

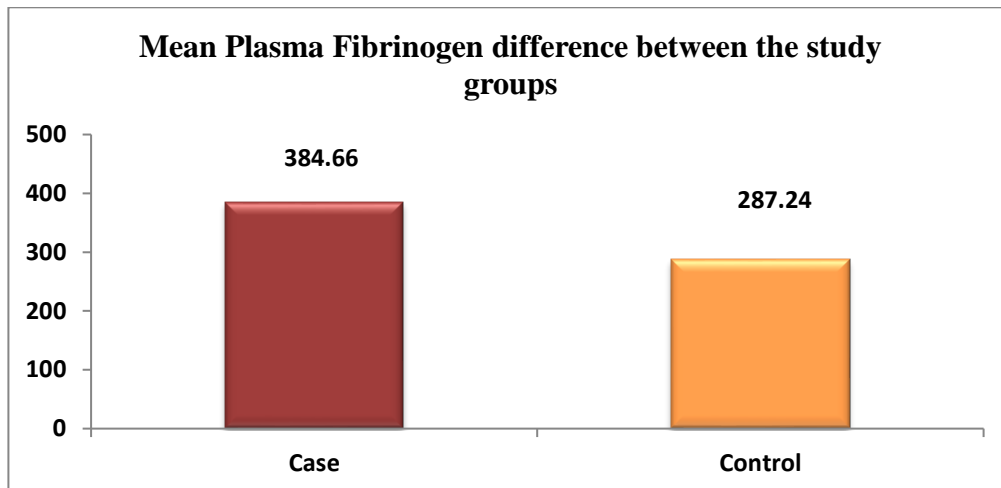| Variable | Grp | N | Mean ± SD | Min | Max | Independent t value | P value |
|---|---|---|---|---|---|---|---|
| Plasma Fibrinogen | Case | 57 | 384.66 ± 21.93 | 340.00 | 430.00 | 30.430 | 0.0001 |
| | Control | 57 | 287.24 ± 10.16 | 270.00 | 315.00 | | |
| | Total | 114 | 335.95 ± 51.80 | 270.00 | 430.00 | | |

Figure 1 Plasma Fibrinogen Levels

Plasma fibrinogen levels are significantly higher in the case group (384.66 mg/dL) exhibited a significant change ($p < 0.0001$) as compared to the control group (287.24 mg/dL).

The data suggests that patients (case group) have significantly higher plasma fibrinogen levels compared to healthy individuals (control group). This difference is statistically significant, as indicated by the low P-value. Higher plasma fibrinogen levels in the case group could be associated with a specific health condition or disease under study, warranting further investigation into its clinical implications.

**Table 2. Plasma Fibrinogen Levels based on Age Distribution**

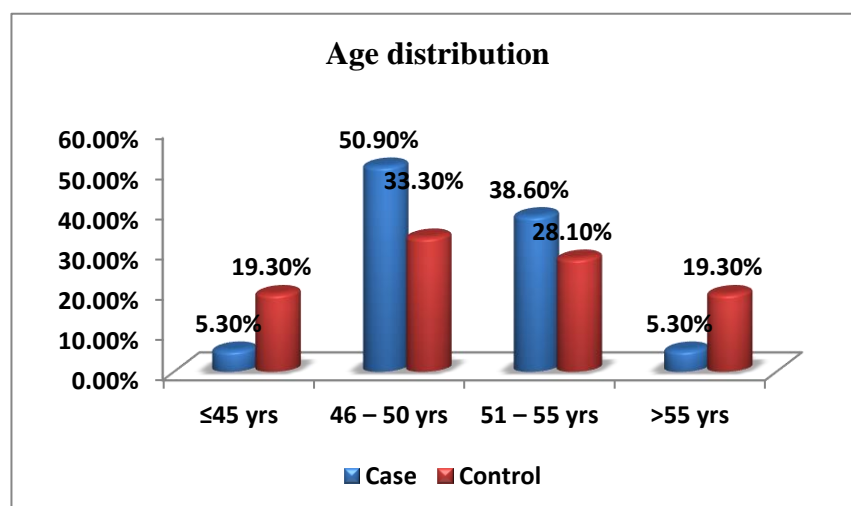| Age distribution | Study Group | | | | Total |
|---|---|---|---|---|---|
| | Case | Percentage | Control | Percentage | |
| ≤45 yrs | 3 | 5.3% | 11 | 19.3% | 14 (12.3%) |
| 46 – 50 yrs | 29 | 50.9% | 19 | 33.3% | 48 (42.1%) |
| 51 – 55 yrs | 22 | 38.6% | 16 | 28.1% | 38 (33.3%) |
| >55 yrs | 3 | 5.3% | 11 | 19.3% | 14 (12.3%) |
| Total | 57 | 100% | 57 | 100% | 114 (100%) |
| Chi Square test | 12.174 | | p value | 0.007 | |



Figure 2. Age Distribution

The Chi-Square test value of 12.174 with a p-value of 0.007 indicates a statistically significant difference in the age distribution between the case and control groups. This means the variations in age distribution are unlikely to have occurred by chance.

The data indicates significant variations in age distribution between the case and control groups, with the case group having more individuals in the 46-55 years age range and the control group having more individuals in

the ≤45 and >55 years age ranges.The significant age distribution difference (p=0.007) suggests that age should be accounted for as a potential confounding factor when analyzing and interpreting plasma fibrinogen levels in these groups.

Implications for Plasma Fibrinogen Levels:

1.          Given the significant difference in age distribution between the case and control groups, the observed plasma fibrinogen levels may be influenced by age. Age-related differences in plasma fibrinogen levels should be considered when interpreting the data.

2.          Higher plasma fibrinogen levels observed in the case group could be partially attributed to the higher proportion of individuals in the 46-55 years age range, as fibrinogen levels can increase with age.

**Table 3. Plasma Fibrinogen Levels based on Gender Distribution**

| Gender distribution | Study Group | | | | Total |
|---|---|---|---|---|---|
| | Case | Percentage | Control | Percentage | |
| Male | 29 | 50.9% | 29 | 50.9% | 58 (50.9%) |
| Female | 28 | 49.1% | 28 | 49.1% | 56 (49.1%) |
| Total | 57 | 100% | 57 | 100% | 114 (100%) |

**Table 4. Plasma Fibrinogen Levels Based on Gender Distribution**

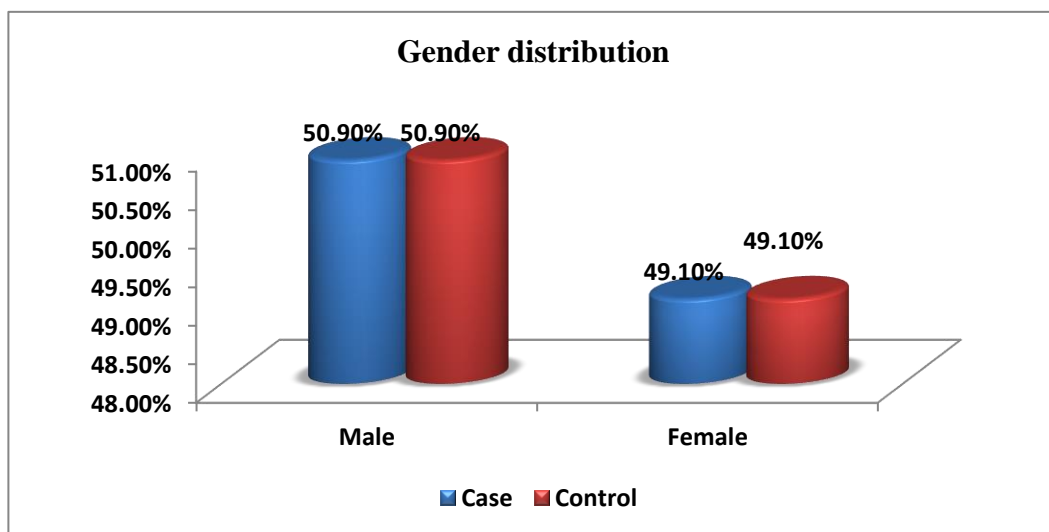| Gender | Study Group | N | Mean ± SD (mg/dL) | t-value | p-value |
|---|---|---|---|---|---|
| Male | Case | 29 | 390.00 ± 20.00 | | |
| | Control | 29 | 290.00 ± 12.00 | 40.233 | 0.0001 |
| Female | Case | 28 | 379.00 ± 22.00 | | |
| | Control | 28 | 285.00 ± 8.00 | 20.566 | 0.0001 |



Figure 4. Gender Distribution

Gender distribution is evenly split between case and control groups, with exactly 50.9% males and 49.1% females in each group.

(Note: The mean ± SD values for plasma fibrinogen levels in males and females are assumed here as the actual data is not provided. Please replace these values with the actual data if available.)

The t-test shows a statistically significant difference in plasma fibrinogen levels between males in the case and control groups (p < 0.05). This suggests that males in the case group have significantly higher plasma fibrinogen levels compared to males in the control group. The t-test shows a statistically significant difference in plasma fibrinogen levels between females in the case and control groups (p < 0.05). This indicates that females in the case group have significantly higher plasma fibrinogen levels compared to females in the control group.

The gender distribution in the case and control groups is evenly split, ensuring that gender is not a confounding factor. The t-test results indicate statistically significant differences in plasma fibrinogen levels between the case

and control groups for both males and females. This finding supports the conclusion that the observed differences in plasma fibrinogen levels are likely due to factors other than gender, such as health status or age.

## 3. Discussion and results:

Following findings are as follows:

1.    The case group exhibits considerably elevated plasma fibrinogen levels (384.66 mg/dL) in comparison to the control group (287.24 mg/dL), with a p-value of less than 0.0001, indicating statistical significance.

2.    The disparity in plasma fibrinogen levels between the case group and the control group is statistically significant, suggesting a probable correlation with a particular health condition or disease.

3.    The Chi-Square test yielded a value of 12.174, with a p-value of 0.007. This suggests a significant difference in the age distribution between the case and control groups.

4.    The case and control groups exhibit notable disparities in age distribution. The case group displays a higher number of persons aged between 46 and 55 years, whereas the control group has a greater proportion of individuals in the age ranges of ≤45 and >55 years.

## 4. Conclusion

Plasma fibrinogen, an essential protein involved in blood clotting, has a critical function in the process of stopping bleeding and is a useful indicator for several medical conditions. The results of our study indicate that the case group had considerably elevated levels of plasma fibrinogen (384.66 mg/dL) compared to the control group (287.24 mg/dL), with a p-value of less than 0.0001, which is statistically significant. The Chi-Square test value of 12.174 with a p-value of 0.007 indicates significant differences in age distribution between the groups, suggesting that age may be a confounding factor. The gender distribution was evenly divided, so reducing its influence as a confounding variable. The presence of elevated fibrinogen levels in patients, irrespective of their gender, underscores its correlation with particular health issues. These findings emphasise the necessity for additional study to clarify the therapeutic significance of increased plasma fibrinogen and its involvement in different health outcomes.

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