Int. j. adv. multidisc. res. stud. 2026; 6(5):804-810

Received: 04-08-2026
Accepted: 14-09-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Comparative Assessment of Hemostatic Profiles and Their Association with Anthropometric Indices among Adults with Type 1 and Type 2 Diabetes Mellitus in Garki Abuja, Nigeria

[1] Simon Paul, [2] Haruna Muhammad Adamu, [3] Ukwubile Cletus Annes, [4] Susan Simon Agbo, [5] Oluwafemi Ayodeji Idowu, [6] Olawale Oniya

[1] Department of Public Health, National Open University of Nigeria, Abuja, Nigeria
[2] Department of Public Health, National Open University of Nigeria, Nigeria
[3] Department of Pharmacognosy, Faculty of Pharmacy, University of Maiduguri, Maiduguri, Nigeria
[4] Department of Biological Sciences, National Open University of Nigeria, Abuja, Nigeria
[5] Department of Environmental Health Science, National Open University of Nigeria, Nigeria
[6] National Health Service, England

DOI: https://doi.org/10.62225/2583049X.2026.6.5.6927
Corresponding Author: **Simon Paul**

Abstract

Diabetes mellitus is associated with hemostatic abnormalities that increase thrombotic risk. This study compared hemostatic parameters (prothrombin time [PT], activated partial thromboplastin time [APTT], platelet count) and their correlations with anthropometric measures in Type 1 (T1D) and Type 2 (T2D) diabetic patients. A cross-sectional study of 230 participants (54 T1D, 176 T2D) at Garki Abuja assessed sociodemographics, anthropometrics, medical history, and hemostatic parameters. Data were analyzed using descriptive statistics and Pearson correlations ($p < 0.05$ significant). T2D participants exhibited significantly prolonged PT (20.35 ± 3.38 s vs. 14.43 ± 1.48 s) and APTT (43.00 ± 3.13 s vs. 33.98 ± 6.74 s) but higher platelet counts (210.47 ± 67.67 vs. 186.94 ± 15.01) compared to T1D. Most T1D patients (53.7%) had >15 years diabetes duration versus 2.8% in T2D. Weak correlations existed between hemostatic and anthropometric parameters (e.g., PT vs. BMI: $r = -0.884$ in T1D; $r = -0.025$ in T2D), with no significant associations between disease duration and hemostatic changes in either group (all $p > 0.05$). T2D patients demonstrated greater coagulation abnormalities than T1D, independent of disease duration or anthropometric measures, suggesting distinct pathophysiological mechanisms. These findings underscore the need for tailored thromboprophylaxis strategies in diabetes management.

Keywords: Diabetes Mellitus, Coagulation, Prothrombin Time, APTT, Platelet Count

Introduction

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by hyperglycemia, resulting from defects in insulin secretion, action, or both (ADA, 2023) [3]. Globally, it affects over 537 million adults, with projections estimating 783 million by 2045 (International Diabetes Federation [IDF], 2021) [7]. In Nigeria, the prevalence is approximately 5.8%, contributing to significant morbidity and mortality through complications like cardiovascular disease (CVD) and thrombosis (Uloko *et al*., 2018) [31]. Type 1 DM (T1DM) and Type 2 DM (T2DM) differ in etiology: T1DM involves autoimmune β-cell destruction, while T2DM features insulin resistance and progressive β-cell dysfunction (Eizirik *et al*., 2020) [5].

DM induces a prothrombotic state via endothelial dysfunction, increased platelet aggregation, and altered coagulation factors, elevating CVD risk (Carr, 2021) [4]. Hemostatic parameters such as PT, APTT, and platelet count are critical indicators of coagulopathy. Prolonged PT and APTT may suggest hypocoagulability or liver involvement, while elevated platelets indicate hypercoagulability (Jabeen *et al*., 2022; Santilli *et al*., 2020) [8, 13]. Anthropometric measures like body mass index (BMI) correlate with these changes, as obesity promotes inflammation and thrombosis (Mertens & Van Gaal, 2002) [25]. Disease duration further modulates these risks, with chronic hyperglycemia exacerbating vascular damage (Wannamethee *et al*., 2022) [14].

Despite extensive research, comparative studies in sub-Saharan Africa, particularly Nigeria, are limited, often focusing on T2DM alone (Ogbera *et al*., 2012) [27]. This gap hinders tailored interventions in resource-limited settings. The study objectives were: (1) to compare sociodemographic, anthropometric, and medical profiles between T1DM and T2DM patients; (2) to evaluate differences in hemostatic parameters; and (3) to assess correlations between hemostatic parameters, anthropometrics, and disease duration. We hypothesized that T2DM patients would exhibit more pronounced hemostatic abnormalities due to metabolic factors.

Methodology

Study Design

This was a cross-sectional observational study comparing hemostatic and anthropometric parameters between T1DM and T2DM patients.

Setting

The study was conducted in Garki, Abuja, Nigeria. Data collection was done from January to June 2023, during routine outpatient visits. Abuja's urban setting features a tropical climate with high diabetes prevalence due to lifestyle factors (Adeloye *et al*., 2017).

Participants

Eligible participants were adults (≥18 years) diagnosed with T1DM or T2DM per ADA criteria (ADA, 2023) [3], attending outpatient clinic for at least one year. Exclusion criteria included pregnancy, acute illness, anticoagulant use, or incomplete records. Convenience sampling recruited 230 patients (54 T1DM, 176 T2DM) from clinic registers. No matching was applied, but groups were compared for baseline differences.

Variables

Outcomes included hemostatic parameters: PT (seconds), APTT (seconds), and platelet count (×10^3/μL). Exposures/predictors were anthropometrics (height [m], weight [kg], BMI [kg/m²]) and disease duration (years). Potential confounders included age, gender, ethnicity, alcohol intake, smoking, and medication type. Diagnostic criteria: T1DM (autoantibody-positive or insulin-dependent from diagnosis); T2DM (insulin resistance with possible oral agents). BMI categories followed WHO standards: underweight (<18.5), normal (18.5–24.9), overweight (25.0–29.9), obese (≥30.0).

Data Sources/Measurement

Sociodemographic and medical data were collected via structured questionnaires administered by trained research assistant, with reliability tested (Cronbach's α = 0.82). Anthropometrics used standardized scales (height: stadiometer; weight: digital scale; BMI calculated as weight/height²). Hemostatic tests involved venipuncture samples analyzed using automated coagulometers (PT/APTT: Sysmex CA-1500; platelets: Sysmex XN-1000). Measurements were comparable across groups, performed by certified lab technicians blinded to diabetes type.

Bias

Selection bias was minimized by consecutive recruitment. Information bias was addressed through standardized tools and double data entry. Confounding was controlled via multivariate analysis adjusting for age and gender.

Study Size

Sample size was calculated using G*Power 3.1 for t-tests (effect size = 0.5, α = 0.05, power = 0.80), yielding 176 per group; we recruited 230 accounting for 20% attrition.

Quantitative Variables

Continuous variables (e.g., PT, APTT, platelets, BMI) were analyzed as means ± SD. Categorical variables (e.g., BMI groups, duration) used frequencies/percentages. Groupings: age (18–30, 31–43, 44 – 56, 57 – 69 and 70 – 82); duration (1–5, 6–10years, 11 – 15 years >15 years.); BMI as per WHO.

Statistical Methods

Descriptive statistics summarized data. Independent t-tests compared means between groups; chi-square tests for categorical variables. Pearson correlations assessed associations (hemostatic vs. anthropometrics/duration). Significance: $p < 0.05$. No subgroups/interactions examined due to sample size. Missing data (<5%) handled via listwise deletion. Analyses used SPSS v26. Sensitivity analyses tested outliers' impact.

Ethical Considerations

Approval was obtained from the Federal Capital Territory Health Research Ethics Committee (Approval No. FHREC/2024/01/44/22-02-2024). Informed consent was secured before data collection; confidentiality maintained via anonymized data. Study subjects were assured that no harm is expected to occur in the study.

Results

Participants

Of 250 eligible patients, 230 participated (92% response rate); 20 declined due to time constraints. T1DM: n=54 (mean age 42.3 ± 12.1 years); T2DM: n=176 (mean age 55.7 ± 10.4 years). No loss to follow-up as cross-sectional.

Descriptive Data

Sociodemographic distribution of the study participants

Table 1 presents the sociodemographic distribution of patients with Type 1 and Type 2 diabetes. The data provides insights into the gender, age, and ethnic group characteristics of the two diabetes types. The majority of patients in both Type 1 (51.9%) and Type 2 (55.7%) diabetes are male. The proportion of female patients is slightly higher in Type 1 (48.1%) compared to Type 2 (44.3%) diabetes. Type 1 diabetes is more prevalent in the younger age groups, with 18.5% of patients being 18-30 years old and 24.1% being 31-43 years old. Type 2 diabetes is more common in the older age groups, with 32.4% of patients being 57-69 years old and 15.3% being 70-82 years old. The largest age group for Type 1 diabetes is 44-56 years (51.9%), while for Type 2 diabetes, it is also 44-56 years (43.8%). The Yoruba ethnic group has the highest representation in both Type 1 (42.6%) and Type 2 (39.2%) diabetes. The Hausa ethnic group has the second-highest representation in Type 1 (33.3%) and Type 2 (24.4%) diabetes. The Igbo ethnic group accounts for 24.1% of Type 1 and 25.6% of Type 2 diabetes patients. The "Other ethnic groupS makes up 10.8% of Type 2 diabetes patients, but

there are no patients from this group in the Type 1 diabetes category (Table 1).

Table 1: Sociodemographic distribution of the Type 1 and Type 2 Diabetic patients

Variables	Type 1	Type 2
Gender		
Male	28 (51.9%)	98 (55.7%)
Female	26 (48.1%)	78 (44.3
Age group		
18 – 30	10 (18.5%)	0 (0.0%)
31 – 43	13 (24.1%)	15 (8.5%)
44 – 56	28 (51.9%)	77 (43.8%)
57 – 69	3 (5.6%)	57 (32.4%)
70 – 82	0 (0.0%)	27 (15.3%)
Ethnic group		
Hausa	18 (33.3%)	43 (24.4%)
Yoruba	23 (42.6%)	69 (39.2%)
Igbo	13 (24.1%)	45 (25.6%)
Others	0 (0.0%)	19 (10.8%)

Source: Field Survey (2024)

Anthropometric parameters of Type 1 and Type 2 Diabetic patients

Table 2 presents the anthropometric parameters of individuals with Type 1 and Type 2 diabetes. Anthropometric measurements, such as height, weight, and body mass index (BMI), provide important insights into the physical characteristics and health status of these patient populations. The mean height for individuals with Type 1 diabetes is 1.55 ± 0.15 meters. The mean height for individuals with Type 2 diabetes is 1.53 ± 0.17 meters. The slightly higher mean height in the Type 1 diabetes group suggests that there may be some differences in the physical characteristics between the two groups. The mean weight for individuals with Type 1 diabetes is 57.99 ± 4.63 kilograms. The mean weight for individuals with Type 2 diabetes is 59.04 ± 5.18 kilograms. The slightly higher mean weight in the Type 2 diabetes group may be related to the higher prevalence of overweight and obesity in this group. The table provides the distribution of BMI categories for both Type 1 and Type 2 diabetes groups. In the Type 1 diabetes group: 11.1% are underweight (BMI < 18.0), 44.4% are in the normal BMI range (18.5 - 24.9), 25.8% are overweight (BMI 25.0 - 29.9), 18.5% are obese (BMI ≥ 30.0) In the Type 2 diabetes group: 11.9% are underweight (BMI < 18.0), 38.6% are in the normal BMI range (18.5 - 24.9), 23.9% are overweight (BMI 25.0 - 29.9), 25.6% are obese (BMI ≥ 30.0) (Table 2).

Table 2: Anthropometric parameters of Type 1 and Type 2 Diabetic patients

Variables	Type 1	Type 2
Height	1.55 ± 0.15	1.53 ± 0.17
Weight	57.99 ± 4.63	59.04 ± 5.18
BMI group		
Underweight (< 18.0)	6 (11.1%)	21 (11.9%)
Normal (18.5 – 24.9)	24 (44.4%)	68 (38.6%)
Overweight (25.0 – 29.0)	14 (25.8%)	42 (23.9%)
Obese (≥30.0)	10 (18.5%)	45 (25.6%)

Key: BMI = Body mass Index

Medical history of the Type 1 and Type 2 Diabetic patients

Table 3 presents the Medical history of individuals with Type 1 and Type 2 diabetes. The majority of Type 1 diabetic patients have had diabetes for more than 15 years (53.7%), followed by 11-15 years (18.5%), 6-10 years (16.7%), and 1-5 years (11.1%). In contrast, the distribution of diabetes duration among Type 2 diabetic patients shows a higher percentage in the 1-5 years category (64.85%), followed by 6-10 years (25.6%), 11-15 years (6.8%), and more than 15 years (2.8%). All Type 1 diabetic patients are on insulin therapy (100%), with no patients using oral drugs, diet modification, or engaging in physical activity for management. The majority of Type 2 diabetic patients rely on oral drugs (77.8%), while a smaller percentage use diet modification (13.6%) and engage in physical activity (17.4%). Only a minimal percentage use insulin (1.1%). About 24.1% of Type 1 diabetic patients report alcohol intake, while 75.1% do not. A higher percentage of Type 2 diabetic patients (50.6%) report alcohol intake compared to Type 1 patients, with 49.4% abstaining from alcohol. About 20.4% of Type 1 diabetic patient's smoke, while 79.6% do not. A similar pattern is observed in Type 2 diabetic patients, with 23.9% reporting smoking and 76.1% being non-smokers (Table 3).

Table 3: Medical history of the Type 1 and Type 2 Diabetic patients

Variables	Type 1	Type 2
Duration of diabetes diagnosis		
1 – 5 years	6 (11.1%)	114 (64.85)
6 – 10 years	9 (16.7%)	45 (25.6%)
11 – 15 years	10 (18.5%)	12 (6.8%)
More than 15 years	29 (53.7%)	5 (2.8%)
Medication		
Insulin	54 (100%)	2 (1.1%)
Oral drugs	0 (0.0%)	137 (77.8%)
Diet modification	0 (0.0%)	24 (13.6%)
Physical activity	0 (0.0%)	13 (17.4%)
Alcohol intake		
Yes	13 (24.1%)	89 (50.6%)
No	41 (75.1%)	87 (49.4%)
Smoking		
Yes	11 (20.4%)	42 (23.9%
No	43 (79.6%)	134 (76.1%)

Key: % = percentage

Outcome Data

Comparison of Hemostatic parameters between Type I diabetes patients and Type II diabetic patients at Garki Abuja

The Table 4 provided compares hemostatic parameters between Type I and Type II diabetic patients at the Garki Clinic Abuja.

For Type I Diabetic Patients: The average PT is 14.43 seconds with a standard deviation of 1.48. For Type II Diabetic Patients: The average PT is 20.35 seconds with a standard deviation of 3.38. Type II diabetic patients at the Garki Clinic in Abuja have a longer PT compared to Type I diabetic patients, indicating a delay in the blood clotting process.

For Type I Diabetic Patients: The average APTT is 33.98 seconds with a standard deviation of 6.74. Type II Diabetic Patients: The average APTT is 43.00 seconds with a standard deviation of 3.13. Type II diabetic patients exhibit a prolonged APTT compared to Type I diabetic patients, suggesting potential abnormalities in the intrinsic pathway of blood clotting.

For Type I Diabetic Patients: The average platelet count is 186.94 with a standard deviation of 15.01. Type II Diabetic Patients: The average platelet count is 210.47 with a standard deviation of 67.67. Type II diabetic patients have a higher platelet count than Type I diabetic patients, which could indicate a higher risk of thrombotic events due to increased platelet aggregation (Table 4).

Table 4: Comparison of Prothrombin Time, Activated Partial Thromboplastin Time, and Platelet Count Between Type I and Type II Diabetes Patients

Variables	Type 1	Type 2
PT	14.43 ± 1.48	20.35 ± 3.38
APTT	33.98 ± 6.74	43.00 ± 3.13
Platelet count	186.94 ± 15.01	210.47 ± 67.67

Key: Mean ± SD, PT = Prothrombin time, APTT = Activated Partial Thromboplastin Time

Main Results

Correlations between specific hemostatic parameters (PT, APTT, plate count) and Anthropometric Measures in both Type I and Type II diabetic patient groups at Garki Abuja

The Table 5 presents correlations (r) between specific hemostatic parameters (PT, APTT, platelet count) and anthropometric parameters in both Type I and Type II diabetic patient groups. For Type 1 Diabetic Patients: PT (Prothrombin Time) shows a weak positive correlation with Height (r=0.037, p=0.791) and Weight (r=0.156, p=0.261), while it has a negative correlation with BMI (Body Mass Index) (r=-0.884, p=0.966). APTT (Activated Partial Thromboplastin Time) has weak negative correlations with Height (r=-0.063, p=0.651) and Weight (r=-0.021, p=0.881), and a weak positive correlation with BMI (r=0.025, p=0.860). Platelet count shows weak negative correlations with Height (r=-0.041, p=0.768), Weight (r=-0.207, p=0.134), and BMI (r=-0.026, p=0.853).

For Type 2 Diabetic Patients: PT has weak correlations with Height (r=0.013, p=0.860), Weight (r=-0.073, p=0.334), and BMI (r=-0.025, p=0.741). APTT shows weak negative correlations with Height (r=-0.128, p=0.092) and Weight (r=-0.021, p=0.778), and a weak positive correlation with BMI (r=0.115, p=0.128). Platelet count has weak correlations with Height (r=0.010, p=0.896), Weight (r=-0.065, p=0.391), and BMI (r=-0.044, p=0.560).

These correlations indicate the relationship between hemostatic parameters and anthropometric measurements in diabetic patients, providing insights into how these factors may interplay in the context of diabetes and its associated hemostatic abnormalities (Table 5).

Table 5: Correlation Between Coagulation Parameters and Anthropometric Measures in Type I and II Diabetes Patients

Variables	Type 1		Type 2	
	R	P value	r	P value
PT vs Height	0.037	0.791	0.013	0.860
PT vs Weight	0.156	0.261	-0.073	0.334
PT vs BMI	-0.884	0.966	-0.025	0.741
APTT vs Height	-0.063	0.651	-0.128	0.092
APTT vs Weight	-0.021	0.881	-0.021	0.778
APTT vs BMI	0.025	0.860	0.115	0.128
Platelet vs Height	-0.041	0.768	0.010	0.896
Platelet vs Weight	-0.207	0.134	-0.065	0.391
Platelet vs BMI	-0.026	0.853	-0.044	0.560

Key: PT = Prothrombin time, APTT = Activated Partial Thromboplastin Time, r = Pearson correlation coefficient, P value ≤ 0.05 is statistically considered significant

Potential Associations between the duration of diabetes diagnosis and the observed variations in hemostatic parameters within Type I and Type II diabetic patients

The following table (Table 6) presents potential associations between the duration of diabetes diagnosis (DD) and variations in hemostatic parameters within Type I and Type II diabetic patients.

For Type I diabetic patients: There is a weak negative correlation between PT and DD (r = -0.067, p = 0.632), indicating a slight decrease in PT as the duration of diabetes diagnosis increases, although this relationship is not statistically significant. Similarly, APTT shows a weak negative correlation with DD (r = -0.058, p = 0.677), but again, this correlation is not statistically significant. Platelet count demonstrates a weak positive correlation with DD (r = 0.056, p = 0.690), suggesting a slight increase in platelet count with longer duration of diabetes, though not statistically significant.

For Type II diabetic patients: There is a negligible negative correlation between PT and DD (r = -0.025, p = 0.739), indicating a very slight decrease in PT with longer duration of diabetes, but this relationship is not statistically significant. APTT exhibits a negligible positive correlation with DD (r = 0.027, p = 0.725), suggesting a slight increase in APTT with longer diabetes duration, though again, this correlation lacks statistical significance. Interestingly, there is a weak negative correlation between Platelet count and DD (r = -0.118, p = 0.118), indicating a slight decrease in platelet count as diabetes duration increases, but this relationship falls just short of statistical significance. While there are some trends suggesting potential associations between diabetes duration and hemostatic parameters in both Type I and Type II diabetic patients, these correlations are generally weak and often lack statistical significance (Table 6).

Table 6: Correlation Analysis Between Coagulation Parameters and Disease Duration in Type I and Type II Diabetes Patients

Variables	Type 1		Type 2	
	R	P value	R	P value
PT vs DD	-0.067	0.632	-0.025	0.739
APTT vs DD	-0.058	0.677	0.027	0.725
Platelet vs DD	0.056	0.690	-0.118	0.118

Key: Duration of Diabetes Diagnosis (DD), PT = Prothrombin time, APTT = Activated Partial Thromboplastin Time, r = Pearson correlation coefficient, P value ≤ 0.05 is statistically considered significant

Discussion

The findings from this study provide valuable insights into the sociodemographic, anthropometric, medical, and hemostatic profiles of Type 1 and Type 2 diabetes mellitus (T1DM and T2DM) patients at Garki, Abuja, Nigeria.

The sociodemographic distribution revealed a male predominance in both T1DM (51.9%) and T2DM (55.7%) groups, with T1DM patients generally younger (e.g., 51.9% aged 44–56 years) and T2DM patients older (32.4% aged 57–69 years). The Yoruba ethnic group was most represented (42.6% in T1DM, 39.2% in T2DM), followed by Hausa and Igbo. These patterns align with epidemiological trends in Nigeria, where T2DM is more prevalent in older adults due to lifestyle factors and metabolic changes with age (Chinenye *et al*., 2012) [19]. Similar male dominance has been reported in other Nigerian studies, potentially reflecting gender disparities in health-seeking behavior or occupational exposures in urban settings like Abuja (Uloko *et al*., 2018) [31]. However, global studies often show a female preponderance in T2DM, attributed to hormonal and socioeconomic factors (Wild *et al*., 2004) [32], suggesting that our findings may be influenced by the clinic's demographic, which serves primarily civil servants. These sociodemographic insights underscore the need for targeted interventions, as age and ethnicity can influence diabetes management and complication risks (Adeloye *et al*., 2017).

Anthropometric data indicated similar mean heights (1.55 m in T1DM vs. 1.53 m in T2DM) and weights (57.99 kg in T1DM vs. 59.04 kg in T2DM), but higher obesity rates in T2DM (25.6%) compared to T1DM (18.5%). Underweight and normal BMI were more common in T1DM (11.1% and 44.4%, respectively) than T2DM (11.9% and 38.6%). These results are consistent with the insulin-resistant pathophysiology of T2DM, which often co-occurs with central obesity and metabolic syndrome (American Diabetes Association, 2020). Comparable findings from Ethiopian studies show higher BMI in T2DM patients, linking it to increased visceral fat and cardiovascular risks (Asmelash *et al*., 2021) [17]. In Nigeria, Ogbera *et al*. (2012) [27] reported similar obesity prevalence in T2DM (around 25%), attributing it to urbanization and dietary shifts. However, our lower underweight rates contrast with rural Nigerian cohorts, where malnutrition exacerbates T1DM (Uloko *et al*., 2018) [31]. The slight weight difference may reflect better nutritional status in our urban sample, but the higher obesity in T2DM highlights the need for weight management programs to mitigate hemostatic alterations, as obesity promotes prothrombotic states (Mertens & Van Gaal, 2002) [25].

Medical history showed longer diabetes duration in T1DM (>15 years: 53.7%) versus T2DM (1–5 years: 64.8%), with all T1DM patients on insulin and most T2DM on oral drugs (77.8%). Alcohol intake was higher in T2DM (50.6%) than T1DM (24.1%), while smoking rates were similar (20.4% in T1DM, 23.9% in T2DM). These align with T1DM's early onset and insulin dependency, contrasting T2DM's later diagnosis and initial oral therapy (American Diabetes Association, 2020). Nigerian studies corroborate shorter T2DM durations due to delayed screening (Chinenye *et al*., 2012) [19], and higher alcohol/smoking in T2DM, linked to lifestyle risks (Uloko *et al*., 2018) [31]. Globally, prolonged duration in T1DM correlates with complications, as seen in the Diabetes Control and Complications Trial (DCCT Research Group, 1993) [20]. Discrepancies with Western studies, where T2DM durations are longer, may stem from Nigeria's diagnostic delays (Adeloye *et al*., 2017). Lifestyle factors like alcohol could exacerbate hemostatic imbalances, as ethanol impairs fibrinolysis (Booyse *et al*., 2007) [18], emphasizing integrated management.

Hemostatic profiles revealed longer mean PT (20.35 s vs. 14.43 s) and APTT (43.00 s vs. 33.98 s) in T2DM compared to T1DM, alongside higher platelet counts (210.47 vs. 186.94). These suggest a hypocoagulable state in T2DM, contrasting with many studies indicating hypercoagulability. For instance, Asmelash *et al*. (2021) [17] found reduced PT/INR in T2DM versus T1DM in Ethiopia, attributing it to prothrombotic shifts. Similarly, Ephraim *et al*. (2019) [22] reported shortened APTT in untreated T2DM in Ghana, linking it to increased clotting factors. In Nigeria, Ebrahim *et al*. (2020) [21] observed shortened PT/APTT in T2DM, with 16.7% prevalence of shortened PT. Global meta-analyses, like those by Ambelu *et al*. (2024) [16], show no significant PT/APTT differences overall but prolonged APTT in T1DM (SMD=0.86) versus shortened in T2DM (SMD=-0.42), partially aligning with our APTT findings but contradicting PT. Higher platelets in T2DM echo Karim *et al*. (2018) [24] in Bangladesh and Sapkota *et al*. (2013) [29] in Nepal, indicating thrombotic risk despite prolonged clotting times. Discrepancies may arise from our sample's urban, employed population with better control (e.g., shorter T2DM duration), reducing hypercoagulability seen in uncontrolled cohorts (Pan *et al*., 2018) [28]. Methodological variations, like anticoagulant use or comorbidities, could also influence results (Thukral *et al*., 2015) [30]. The study demonstrated that T2DM patients may have delayed clotting, potentially increasing bleeding risks, warranting routine monitoring.

Correlations between hemostatic parameters and anthropometrics were weak and non-significant in both groups (e.g., PT vs. BMI: r=-0.884 in T1DM, r=-0.025 in T2DM). Similarly, associations with duration were negligible (e.g., PT vs. DD: r=-0.067 in T1DM, r=-0.025 in T2DM). These contrast with studies showing stronger links; for example, Asmelash *et al*. (2021) [17] found negative correlations between fasting blood glucose (FBG) and PT/INR in T1DM, and with APTT in T2DM, implying hyperglycemia drives coagulopathy. In China, Pan *et al*. (2018) [28] reported APTT and platelet associations with T2DM progression. Nigerian research by Ifeanyi *et al*. (2019) [23] noted prolonged PT/APTT with duration, linking it to chronic inflammation. Our non-significant findings may reflect the sample's controlled status or smaller T1DM cohort, reducing power to detect associations (Ephraim *et al*., 2019) [22]. Weak negative PT/DD correlations suggest mild hypocoagulability with duration, possibly from

endothelial dysfunction (Mertens & Van Gaal, 2002) [25]. These results imply anthropometrics and duration have limited direct influence on hemostasis in this population, but larger studies are needed.

Conclusion

Type 2 diabetic patients demonstrated significantly greater coagulation abnormalities than Type 1 diabetic patients, with prolonged prothrombin time (20.35 ± 3.38s vs. 14.43 ± 1.48s), prolonged activated partial thromboplastin time (43.00 ± 3.13s vs. 33.98 ± 6.74s), and higher platelet counts (210.47 ± 67.67 vs. 186.94 ± 15.01). These hemostatic alterations occurred independently of disease duration and anthropometric measures, as correlations between coagulation parameters and height, weight, and body mass index were weak and largely non-significant in both groups. Similarly, no significant associations were found between diabetes duration and hemostatic changes. These findings suggest that the prothrombotic state in Type 2 diabetes may be driven by distinct pathophysiological mechanisms, possibly related to insulin resistance, obesity-related inflammation, and metabolic dysregulation, rather than duration of disease or body size alone.

Recommendation

There is need to integrate routine coagulation monitoring (PT, APTT, and platelet count) into diabetes care, particularly for Type 2 patients which showed greater abnormalities. Tailored thromboprophylaxis strategies and larger longitudinal studies are needed to clarify mechanisms and guide risk stratification in Nigerian diabetic populations.

Data Availability

The data used in this study is available only upon request by this journal for privacy purpose.

Declaration of Interests

Conflicts of interest the authors have no financial or even relevant non-financial interests in the material presented here.

Conflict of Interest Statement

The authors have no conflicts of interest for this study.

Disclosure of Conflict of Interest

This study is self-funded and there is no conflict of interest whatsoever. None of the researcher influenced the results or decision to publish.

Ethics Approval and Informed Consent

Ethical approval for this study was obtained from the ethical review board of the Federal Capital Territory (FCTA), Ministry of Health with reference number FHREC/2025/01/106/16-04-25. All participants were duly informed of the objectives of the study and the protocol for sample collection. All participants signed an informed consent form were signed. Participation was voluntary.

Disclosure of Funding

The study did not receive any external funding.

Acknowledgement

We are grateful to the study participants for their voluntary cooperation and willingness to provide the required information. Our appreciation also goes to the laboratory personnel for their technical support, and to all authors and research assistants whose contributions made this study successful.

Authors Contribution

Paul Simon and Adamu Mohammad conceptualized the study.
Paul Simon and Adamu Mohammad designed the study.
Paul Simon, Adamu Mohammad and Agbo, Susan Simon. participated in fieldwork and data collection.
Paul Simon and Ukwubile, C.Annes performed the data analysis.
Paul Simon and Ukwubile, C. Annes interpreted the data.
Olawale Oniya: Participated in the first review of this article National Health Service, England.
Paul Simon, Agbo, Susan Simon, Oniya. Olawale., Oluwafemi Ayodeji Idowu prepared the first draft of the manuscript, reviewed by and Ukwubile, C.A All authors contributed to the development of the final manuscript and approved its submission.

References

1. Adeloye D, Ige JO, Aderemi AV, Adeleye N, Amoo EO. Estimating the prevalence, hospitalisation and mortality from type 2 diabetes mellitus in Nigeria: A systematic review and meta-analysis. BMJ Open. 2021; 11(5):e046259.
2. Alzahrani SH, Ajjan RA, Price JF. Coagulation and fibrinolysis in diabetes. Diabetes and Vascular Disease Research. 2022; 19(1):1-12.
3. American Diabetes Association. 2. Classification and diagnosis of diabetes: Standards of medical care in diabetes-2023. Diabetes Care. 2023; 46(Suppl. 1):S19-S40.
4. Carr ME. Diabetes mellitus: A hypercoagulable state. Journal of Diabetes and its Complications. 2021; 35(1):107618.
5. Eizirik DL, Pasquali L, Cnop M. Pancreatic β-cells in type 1 and type 2 diabetes mellitus: Different pathways to failure. Nature Reviews Endocrinology. 2020; 16(7):349-362.
6. Ejike CE, Ezeanyika LU, Olayemi AT. Glycemic control among Nigerian adults with type 2 diabetes: A multicenter study. African Health Sciences. 2022; 22(1):112-120.
7. International Diabetes Federation. IDF diabetes atlas. 10th ed. Brussels: IDF, 2021.
8. Jabeen F, Rizvi SF, Ahmed B. Evaluation of coagulation profile in type 2 diabetes mellitus. Journal of the Pakistan Medical Association. 2022; 72(1):45-49.
9. Khan RMM, Chua ZJY, Tan JC, Yang Y, Liao Z, Zhao Y. From pre-diabetes to diabetes: Diagnosis, treatments and translational research. Medicina. 2023; 59(2):290.
10. Mbanya JC, Aschner P, Gagliardino JJ. Diabetes in sub-Saharan Africa: Challenges and opportunities. Lancet Diabetes & Endocrinology. 2022; 10(8):574-576.
11. Olamoyegun MA, Oluyombo R, Iwuala SO. Anthropometric parameters and their associations with glycemic control in Nigerians with type 2 diabetes. Ethnicity & Disease. 2021; 31(1):33-40.
12. Papatheodorou K, Banach M, Bekiari E, Rizzo M, Edmonds M. Complications of diabetes 2021. Journal of Diabetes Research, 2021, 1-3.

13. Santilli F, Vazzana N, Liani R, Guagnano MT, Davì G. Platelet activation in obesity and metabolic syndrome. Obesity Reviews. 2020; 13(1):27-42.
14. Wannamethee SG, Whincup PH, Lennon L, Papacosta O, Lowe G. Associations between haemostatic markers and incident type 2 diabetes: The British Regional Heart Study. Diabetologia. 2022; 65(1):77-86.
15. World Health Organization. Diabetes. Geneva: WHO, 2023.
16. Ambelu T, Fekadu G, Getnet M. The evaluation of prothrombin time and activated partial thromboplastin time among diabetic and healthy controls in Africa: Systematic review and meta-analysis. Frontiers in Medicine. 2024; 11:1445031.
17. Asmelash D, Asmelash Y, Niguse W. Basic coagulation profiles and platelet parameters among adult type 1 and type 2 diabetes patients at Dessie Referral Hospital, Northeast Ethiopia: Comparative cross-sectional study. Journal of Blood Medicine. 2021; 12:33-42.
18. Booyse FM, Aikens ML, Grenett HE. Endothelial cell fibrinolysis: Transcriptional regulation of fibrinolytic protein genes by ethanol. Journal of Thrombosis and Haemostasis. 2007; 5(Suppl. 1):74-83.
19. Chinenye S, Uloko AE, Ogbera AO, Fasanmade OA, Fasanmade AA, Ofoegbu EN, *et al*. Profile of Nigerians with diabetes mellitus - Diabcare Nigeria study group (2008): Results of a multicenter study. Indian Journal of Endocrinology and Metabolism. 2012; 16(4):558-564.
20. DCCT Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. New England Journal of Medicine. 1993; 329(14):977-986.
21. Ebrahim H, Asrie F, Getnet M. Prothrombin time, activated partial thromboplastin time and platelet counts of type II diabetes mellitus: A comparative study. Journal of Diabetes and Metabolic Disorders. 2020; 19(1):393-399.
22. Ephraim RKD, Armah J, Sakyi SA, Antoh EO, Agbodzakey H, Biekpe S, *et al*. Prothrombin time, activated partial thromboplastin time and platelet counts of type II diabetes mellitus: A comparative study. Journal of Medical and Biomedical Sciences. 2019; 8(1):1-8.
23. Ifeanyi OE, Uzoma GO, Kalu OA. Estimation of prothrombin time, activated partial thromboplastin time and thrombocytes among Sudanese patients with diabetes. GSC Biological and Pharmaceutical Sciences. 2019; 9(3):1-6.
24. Karim F, Choe SJ, Khan S, Jahan N. Prothrombin time, activated partial thromboplastin time and platelet count in patients with type 2 diabetes mellitus. Journal of Dhaka Medical College. 2018; 27(1):31-35.
25. Mertens I, Van Gaal LF. Obesity, haemostasis and the fibrinolytic system. Obesity Reviews. 2002; 3(2):85-101.
26. National Population Commission. Nigeria population census 2006. Abuja: Federal Republic of Nigeria, 2006.
27. Ogbera AO, Fasanmade OA, Chinenye S, Akinlade A. Characterization of lipid parameters in diabetes mellitus - A Nigerian report. International Archives of Medicine. 2012; 2(1):19.
28. Pan J, Zou J, Bao Y, Zhang L, Han J, Huang G. Clinical significance of hemostatic parameters in the prediction for type 2 diabetes mellitus and diabetic nephropathy. Disease Markers, 2018, 5214376.
29. Sapkota B, Shrestha SK, Poudel S. Association of activated partial thromboplastin time and fibrinogen level in patients with type II diabetes mellitus. BMC Research Notes. 2013; 6:485.
30. Thukral S, Kaur P, Gupta M. Assessment of coagulation profile in patients suffering from diabetes mellitus. International Journal of Advances in Medicine. 2015; 2(3):197-201.
31. Uloko AE, Musa BM, Ramalan MA, Gezawa ID, Puepet FH, Uloko AT, *et al*. Prevalence and risk factors for diabetes mellitus in Nigeria: A systematic review and meta-analysis. Diabetes Therapy. 2018; 9(3):1307-1316.
32. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: Estimates for the year 2000 and projections for 2030. Diabetes Care. 2004; 27(5):1047-1053.
33. Abdulkadir UI. Coagulation profile in diabetes mellitus and its association with microvascular complications in uncontrolled and controlled diabetes at Edo Specialist Hospital, Benin-City, South-South, Nigeria [Master's thesis]. Benin City: University of Benin, 2023.
34. Fadairo JK, Atere AD, Odunayo TA, Ogidiolu, Abiodun OP. Assessment of some coagulation indices among type II diabetic subjects in a tertiary facility in South West Region, Nigeria. Semantic Scholar, 2016.
35. Mwambungu A. Haemostatic profiles of type 2 Diabetes Mellitus patients at Ndola Central Hospital-Ndola, Zambia [Master's thesis]. Ndola: University of Zambia, 2014.
36. Ogunbusuyi BE, Oyegue KO, Fasoiro O, Adeyanju K, Akpor OB. Haemostatic and haematological parameters among type 2 diabetes patients in a tertiary health facility in Ondo State, Nigeria: A cross-sectional study. The Open Biomarkers Journal. 2024; 14(1).