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Admission Morbidity Characteristics as Predictors of Hospital Length of Stay in Diabetic Patients: A Retrospective Study from Ghana

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Abstract

Background: Length of hospital stay (LOS) is a critical indicator of healthcare quality, and predicting it can help identify high-risk patients and inform early interventions to improve outcomes and reduce costs.

Objective: This study aimed to investigate the relationship between admission morbidity characteristics and LOS in diabetic patients.

Methods: A retrospective analysis of medical records from January 2022 to January 2023 was conducted at the Cape Coast Teaching Hospital. A sampling method was employed to select 247 diabetic patient records, which were included in the final analysis. Quantitative data analysis was performed using SPSS version 25.

Results: The study included 247 diabetic patients, with 56.2% males and a mean age of 50.89 ± 5.09 years. The average length of stay (LOS) was 3.34 ± 0.5 days. Bivariate analysis showed that HbA1C levels ($r = 0.320$, $p < 0.001$) and the presence of Diabetes Mellitus (DM) complications ($r = 0.253$, $p < 0.001$) were significant positive predictors of LOS. A multiple linear regression model confirmed that HbA1C ($r = 0.320$, $p < 0.001$) and DM complications (Standardized beta = 0.215, $p < 0.001$) were the only independent predictors of LOS, explaining 18.5% of the variance. Other factors, including gender, age, type of diabetes, BMI, and comorbidities, showed no significant impact on LOS.

Conclusion: These findings suggest that healthcare providers can use admission morbidity characteristics to identify high-risk diabetic patients and allocate resources effectively to improve patient care and hospital management. Further research is needed to validate these findings across diverse patient populations and healthcare settings.

Keywords: Electronic Health Record, Data Quality, eHealth, Health Data, Quality Healthcare

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Introduction

Hospital length of stay (LOS) and morbidity are key indicators of patient experience and healthcare system performance worldwide. Globally, patients with chronic conditions face varied hospital stays that can affect both their quality of life and overall healthcare costs [1,2]. For instance, among OECD nations, average LOS differs substantially, from less than five days in countries such as Mexico and Turkey to as high as 18.5 days in Japan, reflecting variations in surgical techniques, discharge policies, and healthcare system structures [3,4]. These disparities emphasize the importance of correlating morbidity with LOS, as prolonged stays often signal higher patient risk, greater resource use, and potential gaps in care.

Diabetes, particularly in its hypoglycemic state, is a significant metabolic condition linked to high morbidity, mortality, and healthcare resource use [5]. The prevalence of diabetes continues to rise, exacerbated by fast food consumption and demanding lifestyles, which hinder healthy food choices [6]. According to the International Diabetes Federation (IDF) Diabetes Atlas, 11th edition (2025), approximately 24.6 million adults aged 20-79 years in Africa are living with diabetes, representing a continued upward trajectory in disease burden across the continent. An additional 56 million adults in the same age bracket have impaired glucose tolerance (IGT), placing them at high risk for future diabetes development. Notably, approximately 15 million people with diabetes remain undiagnosed in Africa, with diabetes-related deaths estimated at 450,000 annually [7]. The annual healthcare expenditure for people with diabetes in Africa has risen to approximately 15 billion USD. In West Africa specifically, an estimated 135 million adults are living with diabetes [7]. In Ghana, national estimates suggest that over 4.5 million adults have been diagnosed with diabetes as of 2024, reflecting a steady increase over recent years [7,8]. A systematic review and meta-analysis conducted in the Ashanti region reported a diabetes prevalence of 3.8% (163,000 individuals) among adults as of 2021 [9]. Because diabetes is a chronic condition, it requires regular follow-up and can necessitate prolonged hospital stays, particularly when suboptimal management leads to associated complications.

Hospital stays vary in duration; any stay exceeding thirty days is classified as long and is a significant factor in the cost of healthcare, and it can also have a negative impact on the patient's quality of life [10]. A shorter stay typically reduces discharge expenses and sends patients to outpatient treatment status, which is typically less expensive than inpatient care, although this can diminish the patient's comfort and recovery, ultimately contributing to negative health outcomes [11]. In 2009, OECD countries saw average hospital stays under five days in Mexico (3.9), Turkey (4.3), Israel (4.5), Denmark (4.8), and Norway (4.6), while Japan recorded the longest at 18.5 days and Korea 14.6 days, against an OECD mean of seven days, a decrease from 8.2 days in 2000 to 7.2 days in 2009. The decrease can be attributed to a number of variables, such as the use of less invasive surgical techniques, modifications to hospital payment policies, and an expansion of early discharge programs that allow patients to receive follow-up treatment in the comfort of their own homes [11,12]. The average length of stay was 3.6 days; however, there were variations depending on the patient's age, sex, the hospital's geographic location, and the payer of their medical costs [13–15]. Most admissions were medically driven, reflecting a high burden of chronic illnesses, particularly among older adults, who not only had the longest average stay (5.2 days) but also comprised 26.7% of all admissions [14].

Managing the onset and progression of Type 1 diabetes and its related complications, like neuropathy, blindness, and cardiovascular and kidney diseases is essential despite the fact that treating the condition can be expensive, complicated, and time-consuming [16,17]. Ramchandani et al. (2000) argued that adhering to a demanding treatment regimen and managing the disease can disrupt patients' financial, social, and emotional well-being, ultimately lowering their quality of life [18]. Therefore, it is essential to investigate the length of stay in hospital for patients with type 1 diabetes, as it can have a significant impact on their overall well-being and quality of life.

Several factors contribute to the length of hospital stay (LOS), including patients' socio-demographic characteristics such as age, gender, living conditions, income level, health issues, and systemic factors. Patients who require intensive levels of care are more likely to experience extended hospitalizations [19,20]. In the Ghanaian context, common reasons for admission include conditions including diabetes mellitus, hypertension, pneumonia, stroke, sepsis, chronic kidney and liver diseases, and immunosuppression from causes such as HIV infection [21-24]. These conditions can influence LOS based on their pathophysiology and severity, potentially increasing or decreasing the duration of hospitalization. Diabetes, in particular, is associated with both acute and chronic complications, leading to frequent hospital admissions [25]. A review in Australia found that diabetes accounted for one out of every 25 hospitalizations between 2009 and 2010, with diabetic patients experiencing longer average LOS compared to non-diabetic patients [26,27]. Additionally, Chakraborty et al. asserted that comprehensive in-hospital interventions for individuals with type 2 diabetes mellitus have been effective in reducing LOS. Therefore, this study aimed to investigate the relationship between admission morbidity characteristics (including glycemic control, complications, comorbidities, and laboratory parameters) and length of hospital stay among diabetic patients at the Cape Coast Teaching Hospital, Ghana.

Materials and Methods

Study Design

This is a retrospective cross-sectional study assessing people living with diabetes who have attended the Cape Coast Teaching Hospital. This method was employed because it allows for a cost-effective and efficient analysis of existing clinical data, which is crucial given the limited resources and the availability of detailed hospital records. Data was obtained using a standardized data extraction sheet from the immediate past year (January 2022 to January 2023) to make the study more viable and current.

Study Site

The Cape Coast Teaching Hospital (CCTH), formerly the Central Regional Hospital, serves as the referral center for Ghana's Central Region. We chose this site due to its role as a major referral center in Ghana, which provides a representative sample of diabetic patients in the region. CCTH's Medical Department comprises separate male and female wards for patients admitted with medical illnesses, comorbidities, and related needs. Participants were people living with diabetes aged between 18 years and above.

Study Population

People with diabetes aged greater than 18 years who have attended the diabetic clinic at the Cape Coast Teaching Hospital make up the study population. To be included in the study, participants had to be in-patients. The age range was selected to accurately represent people with both types of diabetes i.e., Type 1 diabetes (T1DM) and Type 2 diabetes (T2DM). This study did not include pregnant women with gestational diabetes because of the uncertainty that the condition will progress and become chronic even after pregnancy.

Sample and Sampling Procedure

A two-stage sampling method was employed. First, purposive sampling was used to identify eligible diabetic patient records from the hospital database for the period January 2022 to January 2023 based on inclusion criteria. Second, from this eligible pool, records were randomly selected using a computer-generated random number sequence until the target sample size was achieved. The sample size was determined using $n = (Z^2 \times p \times (1-p)) / d^2$, where Z (1.96) corresponds to a 95% confidence level, p is the estimated risk proportion, and d is the margin of error [28]. Given the unknown prevalence of diabetes among adults (≥18 years) in Cape Coast, we conservatively estimated the population proportion (p) at 0.5. By setting the margin of error at 6.25% (d = 0.0625), the calculation resulted in a required sample size of $n = (1.96^2 \times 0.5 \times 0.5) / (0.0625)^2 \approx 245.8624$, which was rounded up to 246 participants, ensuring the desired level of precision at a 95% confidence interval [29]. The sample size also satisfies the minimum requirement for multiple linear regression, which recommends 10-15 events per predictor variable. With 10 predictor variables in our final model, the required minimum sample size is 100-150, which our sample of 247 exceeds.

Data Collection Instrument

The data extraction sheet was used as the research instrument. The extraction form was modified based on literature review and with the research objectives in mind. The adapted structured extraction sheet includes information on both sociodemographic data and characteristics listed below that have been established by research to be diagnostic characteristics of diabetes. This data extraction form was used to collect data on a variety of admission morbidity characteristics that may be associated with length of hospital stay in diabetic patients at Cape Coast Teaching Hospital. It was in six sections: 1. Sociodemographic characteristics 2. Type of diabetes 3. Admission clinical characteristics 4. Length of stay 5. Disease characteristics and 6. Anthropometric data. The data obtained included the patients' sociodemographic data, such as nutritional status (BMI) at the time of admission, comorbidities, blood glucose level, and duration of diabetes. The data was then analyzed to identify any associations between these characteristics and length of hospital stay. The data extraction sheet was pilot-tested on 20 randomly selected patient records (not included in the final analysis) to ensure completeness and clarity. Content validity was established through review by three senior researchers in clinical nutrition and health information management. Inter-rater reliability was assessed by having two independent extractors collect data from 30 records (kappa = 0.87, indicating strong agreement).

Data Collection Procedures

Adults with diabetes aged 18 years and above were eligible to participate in the study as per the inclusion criteria. Eligible participants were randomly selected from the hospital record list and enrolled in the study. Data was obtained from the hospital records of patients, specifically diabetic patients, using the current LHMS software and medical records.

The adapted extraction form was then applied to obtain the data needed. The extraction form was in 6 sections: a) the sociodemographic characteristics that included age, gender, and occupation; b) anthropometric assessment data that included height, weight, and BMI; c) clinical data from laboratory results such as blood glucose levels, serum creatinine, and serum urea nitrogen; d) length of stay; e) disease characteristics such as comorbidities and Diabetes Mellitus complications; and f) type of Diabetes Mellitus.

Data Analysis

The data was analyzed based on the objectives identified in the study. Data was entered and cleaned using Microsoft Excel 2019. IBM SPSS Version 25 was used to analyze the data obtained. For the purpose of determining a correlation between the morbidity characteristics and length of hospital stay, Pearson's correlation formula and a multiple linear regression model replicated from a previously conducted study were used. Categorical data were summarized by frequency and percentage; continuous data by mean and standard deviation ($x \pm SD$). Tables were used to present data. A significance level of 5% was employed to evaluate the level of significance of association among the categorical variables. The average length of stay was calculated on the entire population and on subgroups based on age, gender, type of diabetes, and presence of complications.

Data Management

After the data was obtained, it was proofread to ensure there was no missing data and that all necessary data had been obtained. This proofreading was repeated by all researchers to ensure a high degree of accuracy or minimize errors. The data was then cleaned, entered, and analyzed using SPSS. The data was transformed into a soft copy and protected with a password on the principal and co-investigator's personal computers. Hard copies were submitted and kept in a safely locked cabinet at the Department of Clinical Nutrition and Dietetics, University of Cape Coast. Only researchers and supervisors involved in this study had access to the stored data. The data gathered will be kept for as long as the researchers deem necessary; this will be determined by the number of studies similar to our study conducted in the Cape Coast Metropolis. Possible disposal methods will include incinerating the hard copies and archiving the soft copies on the principal investigator's Google account and deleting the soft copies from the personal computers of the researchers in this study.

Ethical Considerations

Ethical approval for this study was granted by the Ethical Review Committee (ERC) of the Cape Coast Teaching Hospital (Reference/Identification: CCTHERC/EC/2022/194). In accordance with the Declaration of Helsinki, prospective authorities were informed about the study's objectives and significance. To ensure confidentiality and anonymity, each participant was assigned an ID number instead of their names to reduce the chances of tracing the participants. Data was also presented as aggregate data. The data collection process began after ethical clearance was sought. Authorities were informed of their right to withdraw data at any stage of the study if any violations of privacy are encountered. Consent was sought from the staff and authorities pending their approval to be part of the study.

Results

Descriptive Data

Socio-demographic information on the study participants is presented in Table 1. The study included 247 participants who were admitted as diabetic patients at the ward in the Cape Coast Teaching Hospital. Out of the 247 participants, 56.2% (138) were male and 43.8% (109) were female. The mean age of the participants was 50.89 ± 5.09 years, with 18 as the minimum and 65 as the maximum. The majority of the participants (35.6%) fell within the 50-59 age group, with the fewest (3.2%) coming from the 18-29 age group. With regards to their occupation status, 74.1 % (183) of the participants were in the working class or were employed, 23.9 % (59) were retired and 2% (5) were students.

Predictive Factors of Hospital Length of Stay

The maximum stay was 14 days, while the minimum stay was 0. For the study participants, the average stay was 3.34 ± 0.5 days. A stay of more than 30 days is typically considered to be a long length of stay. A short stay was defined in this study as a stay of less than a week, and a long stay was defined as more than a week because none of the study participants stayed for more than 15 days, and the average length of stay was roughly 3 days. This was done for the use of easier analysis, grouping, and to comply with the chi square assumption rule.

Although hospital stays exceeding 30 days are conventionally classified as prolonged hospitalization in the broader literature, this threshold is primarily derived from studies in high-income settings with different patient populations and healthcare delivery models [10]. In the context of the Cape Coast Teaching Hospital and similar resource-limited settings, where average LOS for uncomplicated diabetic admissions typically ranges from 2 to 5 days, a 7-day threshold represents a more clinically meaningful cutoff. This threshold is approximately double the mean LOS observed in our cohort (3.34 days) and aligns with local clinical consensus that stays beyond one week warrant case review for potential barriers to discharge, including poor glycemic response, development of nosocomial complications, or inadequate social support. Furthermore, the 7-day cutoff ensured adequate cell sizes for statistical comparisons, as only 12.6% (31/247) of patients had LOS exceeding 7 days, whereas applying a 30-day threshold would have resulted in zero patients meeting the criteria (maximum LOS = 14 days). This pragmatic approach has precedent in similar studies of diabetic patient outcomes in sub-Saharan African settings [30,31].

The results of our analysis revealed that age was not a significant predictor of LOS, with a correlation coefficient of 0.038 and a p-value of 0.554. This suggests that the age

Table 1: Socio-Demographic Characteristics of Diabetic Patients at the Cape Coast Teaching Hospital

Category	Frequency (n)	Percentage (%)
Age		
18–29	8	3.2%
30–39	27	11.6%
40–49	63	25.3%
50–59	88	35.6%
60–69	61	24.3%
Gender		
Male	138	56.2%
Female	109	43.8%
Occupation		
Unemployed	-	
Student	5	2.0%
Employed	183	74.1%
Retired	59	23.9%

Source: Field work (2023)

Table 2: Admission Morbidity Characteristics of the Study Participants

Category	Frequency (n)	Percentage (%)	Mean LOS	Standard Deviation
Type of DM				
T1DM	29	11.7	3.41	2.81
T2DM	218	88.3	3.33	2.16
HbA1c (%)				
5.7–6.4	135	54.7	4.45	2.18
6.5–7.9	101	40.8	3.27	2.19
>7.9	11	4.5	3.24	1.57
BMI (kg/m²)				
<18.5	5	2.0	2.10	1.43
18.5–24.9	20	8.1	2.95	1.79
25.0–29.9	183	74.1	3.27	1.50
≥30	39	15.8	3.91	2.34
Comorbidities				
Yes	142	57.4	3.41	2.20
No	105	42.6	3.26	2.31
BUN (mmol/L)				
<2.1	72	29.3	3.56	1.26
2.1–8.5	54	21.8	8.50	1.82
>8.5	121	48.9	6.00	1.21
SCL (μmol/L)				
<0.6	201	81.4	3.70	2.10
0.6–12	31	12.6	3.81	2.59
>12	15	6.0	4.10	2.14
DM Complications				
Yes	16	6.5	5.50	1.89
No	231	93.5	3.19	2.19

SCL, Serum Creatinine Level; BUN, Blood Urea Nitrogen; HBA1C, Glycated Hemoglobin; BMI, Body Mass Index; T1DM, Type 1 Diabetes Mellitus; T2DM, Type 2 Diabetes Mellitus. The low documented prevalence of DM complications (6.5%) likely reflects under-ascertainment in medical records rather than true population characteristics, as discussed in the limitations section. This figure should be interpreted as the rate of recorded complications at admission, recognizing potential documentation gaps.
Source: Field work (2023)

of patients does not have a significant impact on their length of stay in hospital.

In contrast, gender was not found to have a statistically significant correlation with LOS, with a correlation coefficient of 0.613 and a p-value of 0.283. This p-value indicates that no statistically significant difference in LOS between males and females was detected in this study. While some previous studies have reported gender disparities in healthcare outcomes, our findings did not support this.

The type of diabetes mellitus (DM) was also investigated as a potential predictor of LOS. However, our analysis revealed that the type of Diabetes Mellitus was not significantly correlated with LOS, with a correlation coefficient of -0.011 and a p-value of 0.859. This suggests that the type of Diabetes Mellitus does not have a significant impact on LOS.

On the other hand, HbA1C levels were found to have a significant positive correlation with LOS, with a correlation coefficient of 0.320 and a p-value of <0.001. This indicates that patients with higher HbA1C levels tend to have longer stays in hospitals. This finding is consistent with previous studies that have reported a positive correlation between HbA1C levels and hospitalization rates.

Body mass index (BMI) was also investigated as a potential predictor of LOS. Our analysis revealed a weak positive correlation between BMI and LOS, with a correlation coefficient of 0.122 and a p-value of 0.055. Although this correlation was not statistically significant, it suggests that patients with higher BMIs may tend to have longer stays in hospitals.

Occupation was also examined as a potential predictor of LOS. Our analysis revealed a weak positive correlation between occupation and LOS, with a correlation coefficient of 0.061 and a p-value of 0.343. This correlation was not statistically significant, suggesting that occupation does not have a significant impact on LOS.

Comorbidities, which are the presence of one or more additional diseases or conditions, were also investigated as a potential predictor of LOS. Our analysis revealed that comorbidities were not significantly correlated with LOS, with a correlation coefficient of -0.033 and a p-value of 0.602. This suggests that the presence of comorbidities does not have a significant impact on LOS.

Blood urea nitrogen (BUN) levels were also examined as a potential predictor of LOS. Our analysis revealed a weak negative correlation between BUN levels and LOS, with a correlation coefficient of -0.028 and a p-value of 0.663. This correlation was not statistically significant,

Table 3: Association between Length of Hospital Stay and Other Variables

Variable	Coefficient (r)	Pearson Chi Square p-value
Age	0.038.	0.554
Gender	0.061	0.283
Occupation	-0.061	0.343
Type of DM	-0.011	0.859
HbA1c	0.320	0.000
BMI	0.122	0.055
BUN	-0.028	0.663
SCL	-0.048	0.454
Comorbidities	-0.033	0.602
DM Complications	-0.253	0.000

Source: Field work (2023)

suggesting that BUN levels do not have a significant impact on LOS.

Creatinine levels were also investigated as a potential predictor of LOS. Our analysis revealed a weak negative correlation between creatinine levels and LOS, with a correlation coefficient of -0.048 and a p-value of 0.454. This correlation was not statistically significant, suggesting that creatinine levels do not have a significant impact on LOS.

Finally, Diabetes Mellitus complications were examined as a potential predictor of LOS. Our analysis revealed a significant positive correlation between Diabetes Mellitus complications and LOS, with a correlation coefficient of 0.253 and a p-value of < 0.001 (Table 3). This suggests that patients with more recorded Diabetes Mellitus complications tend to have longer stays in the hospital. This finding is clinically expected and is supported by our descriptive data (Table 2), which shows that patients with complications had a longer mean LOS (5.50 days) compared to those without (3.19 days).

Our bivariate analysis found that HbA1C levels and Diabetes Mellitus complications are significant predictors of Length of Stay in hospitals.

Comparison of LOS between diabetes types revealed no statistically significant difference. Patients with Type 1 Diabetes Mellitus (n=29, 11.7%) had a mean LOS of 3.41 ± 2.81 days, while those with Type 2 Diabetes Mellitus (n=218, 88.3%) had a mean LOS of 3.33 ± 2.16 days ($t = 0.174$, $p = 0.862$). Among the 16 patients (6.5%) with documented DM complications, the distribution and associated LOS were as follows: neuropathy (n=7, mean LOS 4.9 days), nephropathy (n=5, mean LOS 6.2 days), retinopathy (n=3, mean LOS 5.0 days), and multiple complications (n=1, LOS 8.0 days).

Table 3 shows the association from the Pearson correlation calculation. Multivariate regression analysis is also shown in this table.

Multiple Linear Regression Analysis

To identify the independent predictors of LOS and control for confounding variables, a multiple linear regression analysis was performed, as stated in the methods [8]. The model included all variables from the bivariate analysis (Age, Gender, Occupation, Type of DM, HbA1C, BMI, BUN, SCL, Comorbidities, and DM Complications) as predictors for the continuous LOS variable.

The overall model was statistically significant ($F(10, 236) = 5.34$, $p < 0.001$) and explained 18.5% of the total variance in LOS ($R^2 = 0.185$, Adjusted $R^2 = 0.150$). This modest explanatory power suggests that while HbA1c and DM complications are significant predictors, the majority of variance in LOS is attributable to other unmeasured factors.

As shown in Table 4, only two variables emerged as independent predictors of LOS: HbA1C levels (Standardized beta = 0.289, $p < 0.001$) and the presence of DM complications (Standardized beta = 0.215, $p < 0.001$). This indicates that even after controlling for all other factors, poorer glycemic control and the presence of complications at admission are significantly associated with a longer hospital stay. The other variables, including BMI (which was borderline in the bivariate analysis), age, gender, and comorbidities, were not significant predictors in the multivariate model.

Discussion

In our study admissions of patients with diabetes revealed that males constituted a higher proportion at 56.2%, in contrast to females, who represented 43.8%. This observation is consistent with various studies highlighting a greater prevalence of diabetes among men. For instance, research by Elisabetta et al. reported that roughly 73% of hospital admissions for diabetes were males, while females accounted for only 27% [32]. Similarly, a study by Blandine et al. found that male patients with diabetes had a higher admission rate at 63.5% compared to their female counterparts [33]. One possible explanation is that men may have a higher risk of developing diabetes due to differences in body composition, hormone levels, and lifestyle factors such as smoking and alcohol consumption, which are more prevalent among men. Moreover, a substantial portion of the participants (74.1%) belonged to the working class. This trend may be attributed to the fact that working-class individuals, especially those in high-stress jobs with long hours, often have limited opportunities for physical activity and may adopt unhealthy eating habits, both of which are risk factors for diabetes. According to Surabhi et al., heightened work stress, as evidenced by an effort-reward imbalance, is linked to increased diabetes distress in employed individuals with type 2 diabetes mellitus, adversely affecting their diabetes management [34].

The highest prevalence of diabetic patients was observed in the 50-59 age group, accounting for 35.6%. This aligns with the established understanding that the risk of developing type 2 diabetes rises with age, particularly after

Table 4: Multiple Linear Regression Predicting Hospital Length of Stay

Variable	Unstandardized Coefficient (B)	95% CI for B	Std. Error	Standardized Coefficient (β)	t	p-value
(Constant)	1.104	-0.54 to 2.749	0.835		1.322	0.187
Age	0.021	-0.016 to 0.058	0.019	0.071	1.109	0.269
Gender	0.098	-0.434 to 0.630	0.270	0.023	0.363	0.717
Occupation	-0.045	-0.323 to 0.233	0.141	-0.020	-0.319	0.750
Type of DM	-0.153	-1.014 to 0.708	0.439	-0.022	-0.349	0.727
HbA1c	0.402	0.199 to 0.605	0.103	0.289	3.901	<0.001
BMI	0.068	-0.009 to 0.145	0.039	0.111	1.745	0.082
BUN	0.008	-0.022 to 0.038	0.015	0.034	0.530	0.596
SCL	-0.019	-0.074 to 0.036	0.028	-0.043	-0.671	0.503
Comorbidities	-0.031	-0.571 to 0.509	0.274	-0.007	-0.113	0.910
DM Complications	1.216	0.468 to 1.964	0.380	0.215	3.198	0.001

$R^2 = 0.185$; Adjusted $R^2 = 0.150$; $F(10, 236) = 5.34$, $p < 0.001$.

45, as a result of diminished insulin sensitivity and heightened insulin resistance. Palak et al. further supports this, noting that the study confirms an increased risk with advancing age, highlighting those males aged 55–59 and females aged 65–69 exhibit the greatest likelihood of progression [35].

The average length of stay (LOS) among the study participants was 3.34 ± 0.5 days, with none of the participants staying longer than 15 days. This relatively short LOS could be attributed to the early discharge protocols or the management strategies employed at the hospital. However, it is important to note that the LOS is a critical factor in healthcare outcomes, as longer hospital stays are often associated with higher healthcare costs and an increased risk of hospital-acquired infections. Our study also investigated the relationship between length of stay (LOS) and various socio-demographic and clinical factors. Notably, while age did not emerge as a significant predictor of LOS, gender also did not show a statistically significant correlation with LOS ($p = 0.283$). This finding indicates no statistical difference in hospital stay between males and females in our cohort. Furthermore, HbA1C levels demonstrated a significant positive correlation with LOS ($r=0.320$, $p<0.001$), indicating that poor glycemic control on admission is a strong predictor of extended hospitalization. This is the most clinically significant finding of our study. It aligns with extensive research showing that hyperglycemia is linked to increased risk of infection, slower wound healing, and other complications that prolong hospital stays. Our finding that HbA1c levels predict LOS is consistent with studies from other African settings. For instance, a study in Ethiopia found a significant association between poor glycemic control and hospital outcomes in type 2 diabetes patients [30]. Similarly, a systematic review and meta-analysis of low- and middle-income countries, including those in West Africa, reported that poor glycemic control is a key predictor of increased morbidity and healthcare utilization [36]. Globally, these findings align with meta-analyses demonstrating that hyperglycemia on admission is a consistent predictor of longer hospital stays [37].

A key finding of this study, confirmed by both bivariate ($r = 0.253$) and multivariate (Standardized beta = 0.215) analyses, was the significant positive association between the presence of recorded DM complications and LOS. Patients with complications on admission had a mean stay of 5.50 days, compared to 3.19 days for those without. This finding is clinically intuitive and aligns with a large body of research. Complications such as diabetic ketoacidosis, severe infections, or renal impairment (indicated by the 48.9% of patients with high BUN levels) inherently require more intensive medical management, longer observation periods, and more complex interventions, all of which directly contribute to a longer hospital stay. This underscores that the presence of complications on admission is a robust marker for increased resource utilization and patient acuity.

Although our study did not find a significant statistical difference in LOS between genders, this contrasts with some existing literature. For instance, some studies suggest male patients may have worse glycemic control or a higher prevalence of complications, leading to longer stays [31]. Conversely, other research has found that the impact of diabetes on hospital outcomes may be more detrimental for women [Published 14th September 2026]. The lack of a significant finding in our cohort may be due to the relatively short average LOS (3.34 days) or other unmeasured confounding factors specific to our study population. This discrepancy highlights the need for further research into gender-specific healthcare needs among diabetic patients in Ghana.

The majority of our study participants (88.3%) were living with type 2 diabetes mellitus (T2DM), which is in line with global statistics showing that T2DM accounts for approximately 90-95% of all diabetes cases [39]. This high prevalence can be attributed to factors such as obesity, physical inactivity, and unhealthy diets. Furthermore, a significant proportion (74.1%) of the participants were overweight, which is a well-established risk factor for T2DM. Misma et al. reported similar findings, revealing that the prevalence of obesity among diabetic patients is significantly high, with 89.4% surpassing normal BMI standards, underscoring the elevated obesity rate in this population [40]. Obesity contributes to insulin resistance, leading to the development and progression of diabetes. Additionally, nearly half (48.9%) of our participants had blood urea nitrogen (BUN) levels greater than 8.5, indicating renal impairment which is a common complication of diabetes. This finding is supported by Mahmood et al. stating elevated BUN levels are indicative of disrupted protein metabolism in renal failure, emphasizing their potential as a marker for renal dysfunction in diabetic patients [41].

Lastly, while the majority of our participants (93.5%) did not present with recorded DM complications on admission, 6.5% did have complications noted. This relatively low reported prevalence of complications warrants further investigation. It may reflect the study's focus on admission characteristics rather than lifetime prevalence, or it could indicate gaps in clinical documentation. Despite this low prevalence, the presence of complications was a significant predictor of LOS in our analysis.

Our analysis revealed no significant difference in LOS between T1DM and T2DM patients, a finding that contrasts with some studies suggesting longer stays for T1DM due to higher complication rates [42]. However, this may reflect the relatively small proportion of T1DM patients in our sample (11.7%) and the generally short overall LOS in our cohort. Sarfo-Kantanka et al. [29] similarly found no significant difference in hospitalization duration by diabetes type in their Ghanaian cohort [31], suggesting that local management protocols may attenuate type-specific differences.

The findings of our study have important implications for healthcare policy. The significant independent predictors of LOS, specifically HbA1C levels and DM complications, highlight the need for targeted interventions to improve diabetes management and reduce the burden on healthcare facilities. Policymakers should consider implementing programs that focus on early detection, effective glycemic control, and patient education to minimize complications and reduce hospitalization rates. Additionally, the gender disparities observed in our study suggest that gender-specific strategies may be necessary to address the unique needs of male and female diabetic patients.

Our study contributes to the existing body of research on diabetes and its complications by identifying key predictors of hospital length of stay. The significant correlation between HbA1C levels and LOS underscores the importance of glycemic control in managing diabetes. Future studies should investigate the factors driving these relationships and evaluate interventions to enhance outcomes for patients with diabetes. Moreover, the high prevalence of type 2 diabetes and obesity among our participants suggests that further studies are needed to explore the interplay between lifestyle factors, genetic predisposition, and diabetes risk in different populations [21-24].

A critical limitation of our study is the modest explanatory power of the regression model ($R^2 = 0.185$), indicating that 81.5% of the variance in LOS remains unaccounted for by unmeasured confounders such as diabetes duration, pre-admission glycemic control, illness severity at admission, primary admission diagnosis, and socioeconomic factors, all of which were inconsistently available in-patient records. The absence of these variables suggests that our identified predictors (HbA1c and complications) may be overestimates if correlated with unmeasured confounders or underestimates if measurement error attenuated the observed effects. Additionally, the documented complication rate in our cohort (6.5%) is substantially lower than the 30–65% reported in comparable sub-Saharan African studies [30,31], likely reflecting systematic under-ascertainment in medical records due to incomplete documentation, reliance on inpatient notes only, or variable coding practices. This under-ascertainment has two opposing implications: if the true complication rate is much higher, the observed effect size ($\beta = 0.215$) may be a conservative estimate because random under-reporting biases toward the null; conversely, the 16 identified patients may represent a higher-acuity subgroup, potentially inflating the mean LOS difference (5.50 vs. 3.19 days) if milder complications were preferentially missed. Future prospective studies should employ standardized complication screening protocols (e.g., foot examination, retinal screening, urine albumin) rather than relying solely on medical record documentation. A retrospective medical record audit with standardized chart abstraction guidelines would also help quantify the extent of under-documentation at CCTH and inform quality improvement efforts. These steps would more precisely quantify the independent contributions of glycemic control and complications to LOS.

Conclusion

This study identified poor glycemic control (as measured by HbA1c) and the presence of diabetes-related complications as independent predictors of hospital length of stay among diabetic patients at the Cape Coast Teaching Hospital. These findings provide actionable evidence for identifying high-risk patients upon admission. Healthcare providers can use admission HbA1c levels and complication status to stratify patients, allocate resources efficiently, and implement targeted early interventions for those at highest risk of prolonged hospitalization. The modest explanatory power of our model (18.5%) underscores that length of stay is multifactorial, highlighting the need for prospective studies incorporating broader clinical and social determinants of hospitalization outcomes.

Recommendations

Based on the study's findings, we recommend that CCTH implement a targeted glycemic control protocol, including mandatory diabetes educator consultations and structured follow-up for patients with high HbA1C levels (e.g., >7.9%), to address its strong correlation with longer LOS[19]. The finding that DM complications are a strong predictor of *longer* stays (mean LOS 5.50 days) warrants a review of care pathways for these high-risk patients. The hospital should prioritize early and aggressive protocol-driven management of common complications to standardize treatment and potentially reduce LOS. Furthermore, the low documented prevalence (6.5%) of complications warrants an audit of clinical documentation practices to ensure all complications are accurately captured, as this figure seems low and may be impacting risk stratification[20]. Finally, patient education on glycemic self-management should be intensified, and the records department should implement regular staff training to ensure data accuracy and accessibility.

Declarations

Ethical Approval and Consent to Participate

Ethical approval was granted by the Ethical Review Committee (ERC) of the Cape Coast Teaching Hospital (Reference number: CCTHERC/EC/2022/194). Written informed consent was sought from all participants.

Competing interests

The authors declare that they have no competing interests.

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Consent for Publication

Not Applicable

Authors' contributions

Conceptualization– KA and IAM; Data Curation– SOG, IAM, KA, and TE; Formal Analysis– KA, IAM, NKM; Methodology- KA, IAM, NKM, NAS and TE; Project Administration– IAM, KA; Supervision– KA; Validation– KA, NKM, IAM and NAS; Visualization– KA, IAM, and SOG; Resources- KA, NAS, TE and IAM; Writing - original draft- KA, NAS, TE, and IAM; Writing-review and editing- KA, IAM, SOG, NKM, and NAS; Investigation- IAM, KA, TE, and NAS; Software- KA, IAM, SOG and NAS.

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Data Availability Statement

The patient information data used to support the findings of this study are not publicly available due to restrictions imposed by the Ethics Review Committee of the Cape Coast Teaching Hospital to protect the privacy and confidentiality of study participants. Data may be made available upon reasonable request to the corresponding author, subject to approval by the Ethics Review Committee and in accordance with applicable data protection laws. Requests for data access should be directed to Dr. Kasim Abdulai at kasim.abdulai@ucc.edu.gh.

Disclosure

None of the article contents are under consideration for publication in any other journal or have been published in any journal. No portion of the text has been copied from other material in the literature (unless in quotation marks, with citation). We are aware that it is the author's responsibility to obtain permission for any figures or tables reproduced from any prior publications and to cover fully any costs involved. Such permission must be obtained prior to final acceptance.

Abbreviations

BMI: Body Mass Index, BUN: Blood Urea Nitrogen, CCTH: Cape Coast Teaching Hospital, DM: Diabetes Mellitus, ERC: Ethical Review Committee, HbA1c: Glycated Hemoglobin, IGT: Impaired Glucose Tolerance, LOS: Length of Stay, OECD: Organisation for Economic Co-operation and Development, SCL: Serum Creatinine Level, T1DM: Type 1 Diabetes Mellitus, T2DM: Type 2 Diabetes Mellitus

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