Factors Associated with Hospitalisation among Diabetes Patients in Western Kenya

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Abstract

BACKGROUND

Diabetes patients routinely visit hospitals and often get admitted for periods. However, drivers of routine hospital visits and admissions (here defined as hospitalisation) are poorly understood to inform improved management of diabetes at the household level. This study determined factors associated with hospitalisation among diabetes patients in Busia County, Kenya.

METHODOLOGY

The study adopted a hospital-based cross-sectional study design and employed systematic sampling to select 155 participants from diabetes patients seeking healthcare services at Busia County Referral Hospital. Data was collected in March 2023, six months retrospectively using a structured questionnaire. Bivariate and adjusted multivariable logistic regressions were used to assess factors associated with hospitalisation.

RESULTS

More than one-half (n = 89, 57.4%) of the participants were females. Over 85% of the participants enrolled were aged 40 years and above (40-59 years [n = 66, 42.6%]; 60+ years [n = 67, 43.2%]). Approximately 53% of respondents reported at least one hospital admission within six months, whereas 47% had routine visits. Participants aged at least 60 years old had higher odds of hospital admission and routine clinic visits; 16.07 (Adjusted Odds Ratio [AOR] = 16.07, 95% CI = 4.47 – 57.72, p-value <0.001) and 7.30 (AOR = 7.30, 95% CI = 2.35 – 22.62, p-value <0.010), respectively. Diabetes patients who reported to be taking alcohol had a higher proportion of hospital admissions, p-value = 0.004. Diabetes patients with concurrent HIV had more routine hospital visits compared to their counterparts without HIV (AOR =2.74, 95% CI = 1.03-7.25, p-value <0.001).

CONCLUSIONS

The study shows that old age, employment status, alcohol consumption, and comorbid HIV were associated with hospitalisation. These findings underscore the urgency of targeted interventions to address the socioeconomic disparities and strengthen diabetes management policies in Kenya. Further studies targeting; behavioral status, host diabetes, and comorbidity conditions will be important to inform improved management of diabetes at the household level to reduce hospitalisation.

Keywords: Diabetes, Hospitalisation, Routine Visit, Hospital Admission, Comorbidity

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Introduction

Diabetes, one of the most common non-communicable diseases (NCD) globally poses a substantial public health burden, especially in low-income countries (1). In 2021, more than half a million cases of diabetes were reported globally with a potential for these numbers to rise to over three-quarters of a million by 2045 (2). Diabetes prevalence in resource-constrained settings including Kenya is on an upward trajectory with an estimated prevalence of 3.3% in 2019 which is predicted to increase to ~ 4.5% by 2035 if no mitigation efforts are implemented (3). NCDs, including diabetes, account for ~40% of all deaths in Kenya (4). According to the STEPwise Survey of 2015, a significant challenge in preventing, treating, and managing diabetes in Kenya is undiagnosed cases. The report highlighted that over 88% of Kenyans have never undergone blood sugar testing, leading to late diagnosis, increased morbidity and mortality rates, and higher costs associated with disease management (5). This underscores the possible link between late diabetes diagnosis, the onset of complications and the potential for more frequent hospitalisations (6,7).

A study conducted in 12 of the 47 counties in Kenya: Isiolo, Kisumu, Nyeri, Machakos, Bomet, Bungoma, Homabay, Kitui, Meru, Nyandarua, Taita Taveta and West Pokot found that primary health facilities had limited availability and readiness to provide diabetes-specific services compared to secondary facilities (8). This deficiency poses a barrier to timely diagnosis of diabetes in these and other regions within the country. Busia County, with an estimated population of 893,681 persons, nearly 2% (17,875 individuals) are reported to have diabetes, with a significant number likely undiagnosed (9). This presents challenges in effectively managing and controlling diabetes in the county, potentially leading to a surge in cases presenting at advanced stages resulting in increased hospitalisations. Despite standardized national guidelines for diabetes management (10), hospitalisation rates among diabetes patients in Kenya remain unacceptably high, surpassing current intervention efforts stipulated in the World Health Organization (WHO) factsheet (11). Therefore, this study determined factors associated with hospitalisation within six months among persons living with diabetes in Busia County in Western Kenya.

Methodology
Study design, setting, population and sampling

The study employed a hospital-based cross-sectional study at Busia County Referral Hospital (BCRH) among diabetes patients seeking health care services. Data was collected in March 2023, six months retrospectively using a structured questionnaire.

Busia County Referral Hospital is the largest health facility in Busia County in Western Kenya with an active diabetes clinic. It has a bed capacity of over 170 (12) with an HIV/AIDs prevalence rate of 5% (13) and a life expectancy of below 45 years (14). Busia County covers an area of about 1,628 Km^2 with a population of ~893,681 (15).

Diabetes adult patients aged at least 19 years who presented to BCRH for routine clinic visits and medication due to diabetes and its related complications were included in this study.

This study described hospitalisation as a visit by a diabetes patient for either routine clinic visits or medication resulting in hospital admission (in-patient care). Therefore, routine clinic visits and hospital admissions were the two main outcome variables for the study. Systematic sampling was used to recruit diabetes patients who presented at BCRH for diabetes-related health care services. A total of 155 patients consented to participate in the study.

Data collection

A close-ended structured questionnaire was administered to the consented patients with

diabetes at BCRH. The questionnaire captured demographic factors (age, gender and level of education), and individual factors (presence of comorbidities, self-medication, physical activity, nutrition lifestyle, and drug use). The Kiswahili version of the questionnaire was administered to patients who couldn't comprehend English.

Pre-test study

A pre-test study was done at Bungoma County Referral Hospital in Western Kenya. Both Bungoma County Referral Hospital and Busia County Referral Hospital have similar disease dynamics and prevalence thus an ideal site for our pre-test study. We identified challenges with the data collection tools and conducted a feasibility test.

Essentially, this pretesting estimated the time tken to fill out the questionnaire and to understand the consistency and relevance of the data collected as per the research objectives. Adjustments were made where needed to improve clarity to the participants and in alignement with study objectives.

The results for the structured questionnaire from the pretest showed a high reliability coefficient (0.86) which is above the minimum threshold (0.70) implying reasonable reliability. To further enhance interpretive validity the following approaches were observed consistently throughout the study: contextual completeness, and awareness of the researcher's influence.

Statistical analysis

The data collected was cleaned for consistency before analysis was done. Participants' characteristics were summarised as proportions if categorical and visualised using a bar graph. Hospitalisation herein was defined as a visit to the hospital by a diabetes patient for either routine clinic visits or medication resulting in hospital admission (in-patient care). Therefore, routine clinic visits and hospital admissions were the two main outcomes of interest in this study. Pearson's Chi-square test was used to assess the

association between individual factors and hospitalisation. Additionally, bivariate and multivariable logistic regression were used to determine factors associated with hospitalisation. Data analysis was done using the STATA version 16.

Ethical consideration

The study protocol was authorized by the board of postgraduate studies at Jaramogi Oginga Odinga University of Science and Technology (JOOUST) and then approved by the JOOUST Ethical Review Committee (ERC), National Commission for Science, Technology & Innovation (NACOSTI) and the administration of BCRH. The study protocol was registered under license number NACOSTI/P/23/23811. Written informed consent was sought before data collection.

Results

Socio-demographic characteristics

Table 1 details the participant's socio-demographic characteristics. A total of 155 participants were interviewed for this study of which 43% (n = 67) were at least 60 years old. More than one-half of the participants enrolled in the study were female 57.4% (n = 89) and by marital status, about 59.4% (n = 92) of the entire study population were married.

The highest proportion of the participants had primary education 38.7% (n = 60) whilst only about one-fifth (23.2%) (n = 36) had a tertiary education level. Nearly three-quarters of the participants 72.9% (n = 113) were unemployed and one-third of the enrolled participants had an income of less than Kshs. 15,000 per month.

Diabetes patients aged 60 and above had more routine clinic visits and hospital admissions within six months

We first examined the distribution of participants who reported visiting the hospital for routing clinic visits or hospital admission within six months. A larger proportion of patients aged at least 60 years visited the hospital more often

for routine clinic visits within six months than patients aged 40 years and below (Figure 1A). Additionally, patients with primary education levels and those who were unemployed had a higher frequency of routine clinic visits (Figures 1D and 1E).

Female and male participants had a comparable proportion of routine clinic visits within six months, Figure 1B. Furthermore, patients aged 60 years and above reported the highest proportion of ever being admitted to hospital within the last six months compared to other age groups investigated in this study (Figure 2A). Taken together, these findings show that old age is associated with hospitalisation (both routine clinic visits and hospital admission) among diabetes patients.

Old age, unemployment and HIV co-infection are associated with hospitalisation

We examined the association between socio-demographic and individual factors with hospitalisation using both unadjusted and adjusted logistic regression models. In our unadjusted bivariate logistic regression model, we found that age and employment status were statistically significantly associated with hospitalisation. Age remained a significant predictor of hospitalisation after adjusting for potential confounders in the multivariable analysis (Table 2).

Patients aged 40-59 were over four times, and those aged 60 and over were over 16 times, more likely to visit the clinic at least once every two months compared to those aged 20-39 (AOR = 4.49, 95% CI = 1.22–16.58, p < 0.010; AOR = 16.07, 95% CI = 4.47–57.72, p < 0.001).

For hospital admission, patients aged 40-59 and 60+ years were at least 3 (AOR = 3.50, 95% CI = 1.16-10.61, p-value <0.010) and 7 (AOR = 7.30, 95% CI = 2.35 – 22.62, p-value <0.010) times more likely to be admitted to hospital in the last six months compared to participants aged 20-39 years old (Table 2), respectively.

Table 1:
Socio-Demographic Characteristics of the Diabetes Patients at BCRH Enrolled in the Study

	Socio-Demographic Characteristics	Total N= 155, (%)
Age Group (Years)	20-39	22 (14.2)
	40-59	66 (42.6)
	60+	67 (43.2)
Gender	Male	66 (42.6)
	Female	89 (57.4)
Marital Status	Single	14 (9.0)
	Married	92 (59.4)
	Divorced/Separated/Widowed	49 (31.6)
Education Level	None	16 (10.3)
	Primary	60 (38.7)
	Secondary	43 (27.7)
	Tertiary	36 (23.2)
Employment Status	Employed	42 (27.1)
	Unemployed	113 (72.9)
Household Monthly Income	< 15000	54 (34.8)
	15000-30000	44 (28.4)
	30000-45000	19 (12.3)
	45000-60000	23 (14.8)
	60000 and above	15 (9.7)

Moreover, participant employment status was significantly associated with clinic visits where unemployed diabetic patients were less likely to visit the health facility at least every 2 months as compared to employed participants (AOR = 0.15, 95% CI = 0.05 – 0.46, p-value <0.001).

To determine the association between individual factors and hospitalisation among diabetes patients we used both the Chi-square test of association and multivariable logistic regression.
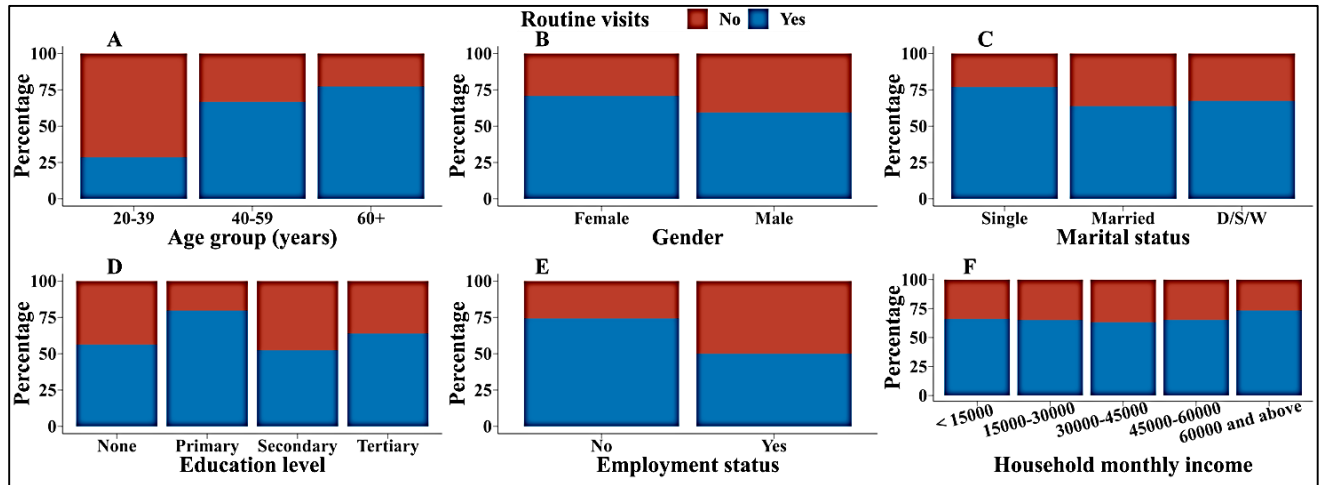

Figure 1:
Proportion of participants who visited the hospital at least 3 times in six months by socio-demographic factors: Panels A, B, C, D, E and F represent the proportion of participants by age group in years, gender, marital status, education level, employment status, and household monthly income, respectively. Blue colour represents the proportion of participants who had at least 3 routine visits within 6 months while red colour shows the proportion of participants with less than 3 routine clinic visits to the hospital.
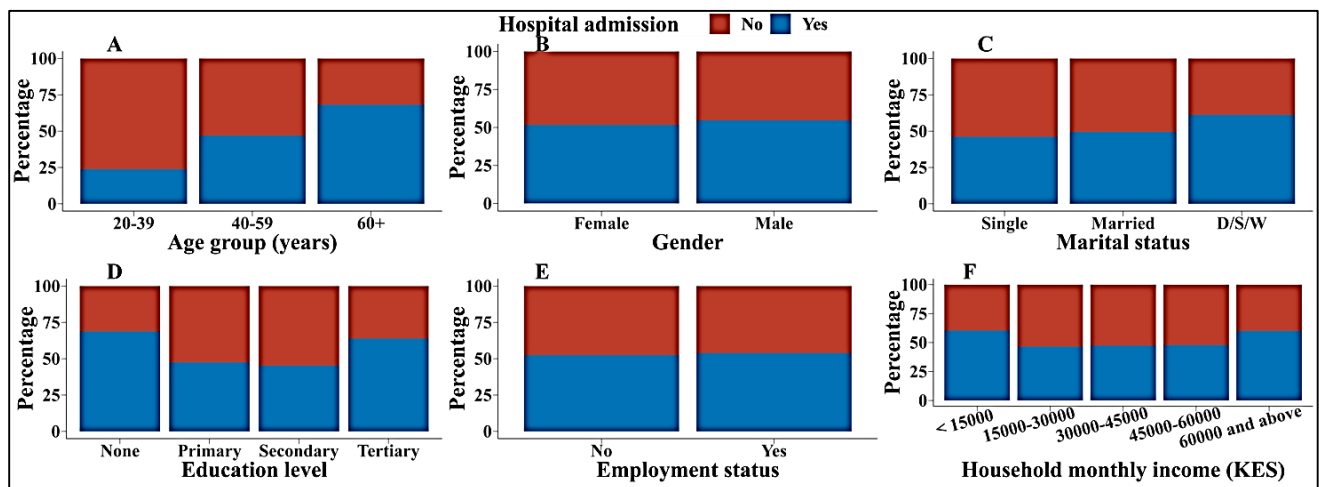

Figure 2:
Proportion of participants ever admitted to the hospital in the last six months by socio-demographic factors: Panels A, B, C, D, E and F represent the proportion of participants by age group in years, gender, marital status, education level, employment status, and household monthly income in Kenya shillings (KES), respectively. Blue colour represents the proportion of participants who at least reported hospital admission within the last 6 months of the study while red colour shows the proportion of participants who did not report hospital admission within the last 6 months of the study.

Diabetes patients who also had HIV had significantly higher odds of visiting the hospital for routine clinic visits than those without HIV. Adjusted multivariable logistic analysis revealed that the odds of adhering to diabetes routine clinic visits were 4.39 times higher among diabetic patients with HIV than those without HIV. The analysis showed an adjusted odds ratio (AOR) of 4.39, with a 95% confidence interval (CI) of 1.43–13.46 and a p-value of 0.010. (Table 2)

Table 2:
Unadjusted and Adjusted Analyses on Socio-Demographic and Individual Factors Associated with Hospitalisation among Diabetes Patients at BCRH

Socio-demographic	Unadjusted analyses		Adjusted Multivariable analyses	
	Clinic visits at least every 2 months	Admitted to hospital	Clinic visits at least every 2 months	Admitted to hospital
	OR (95%CI)	OR (95%CI)	AOR (95%CI)	AOR (95%CI)
Age group (years)				
20-39	Reference	Reference	Reference	Reference
40-59	5.33(1.83-15.53)***	2.36 (0.82-6.79)	4.49 (1.22-16.58)**	3.50 (1.16-10.61)**
60+	9.24(3.08-27.78)***	5.45(1.87-15.87)***	16.07(4.47-57.72)***	7.30 (2.35-22.62)***
Gender				
Male	Reference	Reference	Reference	Reference
Female	1.68 (0.86-3.28)	0.89 (0.47-1.69)	1.65 (0.67-4.04)	0.67 (0.31-1.43)
Marital Status				
Single	Reference	Reference	Reference	Reference
Married	0.72 (0.21-2.46)	0.96 (0.31-2.95)	0.57 (0.13-2.59)	0.90 (0.21-3.83)
Divorced/Separated/ Widowed	0.83 (0.22-3.04)	1.58 (0.48-5.22)	0.75 (0.14-4.11)	1.50 (0.30-7.56)
Education				
None	Reference	Reference	Reference	Reference
Primary	2.81 (0.88-9.00)	0.43 (0.13-1.37)	4.04(0.78-20.79)	0.63 (0.15-2.54)
Secondary	0.89 (0.28-2.84)	0.36 (0.11-1.21)	1.08(0.20-5.71)	0.68 (0.15-2.99)
Tertiary	1.38 (0.41-4.57)	0.80 (0.23-2.83)	1.17(0.16-8.88)	2.42 (0.36-16.22)
Employed status				
Employed	Reference	Reference	Reference	Reference
Unemployed	0.36 (0.15-0.84)**	1.03 (0.51-2.09)	0.15(0.05-0.46)***	0.74 (0.30-1.81)
Monthly income				
< 15000	Reference	Reference	Reference	Reference
15000-30000	1.05 (0.45-2.42)	0.53 (0.24-1.19)	1.31 (0.46-3.76)	0.48 (0.19-1.19)
30000-45000	0.93 (0.31-2.76)	0.57 (0.20-1.64)	0.92 (0.17-4.90)	0.33 (0.08-1.33)
45000-60000	1.02 (0.37-2.83)	0.58 (0.22-1.56)	1.06 (0.21-5.42)	0.19 (0.04-0.88)*
60000 and above	1.49 (0.42-5.33)	0.95 (0.30-3.07)	1.83 (0.22-15.30)	0.41 (0.09-1.84)
Individual factors				
Hypertension				
No			Reference	Reference
Yes			1.72 (0.83-3.53)	1.32 (0.63-2.75)
Malaria				
No			Reference	Reference
Yes			1.02 (0.47-2.22)	0.59 (0.27-1.27)
HIV Positive				
No			Reference	Reference
Yes			4.39 (1.43-13.46)**	0.50 (0.21-1.19)

CI=confidence interval, NA=not available, ref=reference category, *=P-value < 0.05, ** = P-value <0.01, ***= P-value < 0.001, AOR=adjusted odds ratio, OR=crude odds ratio,

Our results on the association of individual factors and hospitalisation using the Chi-square test also revealed that concurrence of HIV and diabetes was significantly associated with routine clinic visits (p-value < 0.05) and not hospital admissions. On the other hand, other comorbidities such as hypertension, malaria and tuberculosis were not associated with hospitalisation (either routine clinic visits or hospital admission). Diabetes patients who reported to be taking alcohol had a higher proportion of hospital admissions compared to the diabetes patients who didn't take alcohol. Routine clinic visits were not associated with alcohol consumption. Table 3.

Discussions

This study investigated factors associated with hospitalisation among diabetes patients in Busia County, Western Kenya. The analysis revealed that age and employment status were the socio-demographic factors significantly associated with hospitalisation among diabetes patients. Specifically, old age was associated with both routine clinic visits and hospital admissions while being unemployed was associated with lower odds of routine clinic visits. Additionally, the co-existence of HIV and diabetes was associated with increased routine clinic visits but not hospital admissions. Alcohol consumption was associated with hospital admissions.

Older age groups are widely recognised as risk factors associated with non-communicable diseases including diabetes (16). A study by Karinja *et al.* reported that persons aged at least 40 years were at risk of developing diabetese (4).

Table 3:
Association between Individual Factors and Hospitalisation among Diabetes Patients at BCRH Based on Chi-square Test

Individual factors	Overall (N=155)	Routine clinic visit			Admitted to the hospital		
		No (n=53)	Yes (n =102)		No (n=73)	Yes (N=82)	
	n(%)	n(%)	n(%)	P-value	n(%)	n(%)	P-value
Duration of diabetic				0.149	No	Yes	0.213
< 1 year	24(15.5)	9(37.5)	15(62.5)		10(41.7)	14(58.3)	
1 year	15(9.7)	6(40.0)	9(60.0)		5(33.3)	10(66.7)	
2 years	34(21.9)	6(17.7)	28(82.3)		13(38.2)	21(61.8)	
3yrs +	82(52.9)	32(39.0)	50(61.0)		45(54.9)	37(45.1)	
Taking alcohol				0.750			0.004
No	125(80.6)	42(33.6)	83(66.4)		66(52.8)	59(47.2)	
Yes	30(19.4)	11(36.7)	19(63.3)		7(23.3)	23(76.7)	
Smoking tobacco				0.470			0.344
No	154(99.4)	53(34.4)	101(65.6)		73(47.4)	81(52.6)	
Yes	1(0.6)	0(0.0)	1(100.0)		0(0.0)	1(100.0)	
Hypertension				0.113			0.959
No	57(36.8)	24(42.1)	33(57.9)		27(47.4)	30(52.6)	
Yes	98(63.2)	29(29.6)	69(70.4)		46(46.9)	52(53.1)	
Tuberculosis				0.207			0.099
No	152(98.1)	53(34.9)	99(65.1)		73(48.0)	79(52.0)	
Yes	3(1.9)	0(0.0)	3(100.0)		0(0.0)	3(100.0)	
Malaria				0.787			0.240
No	109(70.3)	38(34.9)	71(65.1)		48(44.0)	61(56.0)	
Yes	46(29.7)	15(32.6)	31(67.4)		25(54.3)	21(45.7)	
HIV				0.005			0.171
No	124(80.0)	49(39.5)	75(60.5)		55(44.4)	69(55.6)	
Yes	31(20.0)	4(12.9)	27(87.1)		18(58.1)	13(41.9)	

Our findings are consistent with this notion, revealing over 85% of the study participants were aged at least 40 years. Further analyses in this study showed that an increase in age increases the risk of one getting hospitalised due to diabetes, this mirrored the reports by WHO on how an increase in age predisposes one to diabetes and developing its related conditions (1). Additionally, our study supports reports by Bommer *et al*., on the increasing projection of diabetes prevalence and its associated mortality being age-specific (17). Although we recognise that the interpretation of our results could be limited to the recruitment of more elderly participants, it is worth noting that approximately 15% of the participants were aged 20-39 years indicating a need to also target younger age groups in diabetes mitigation measures.

The costs of diabetes care in Kenya are considerably high and get more expensive when transport costs are included (18). A study by Karinja *et al*., 2019 revealed that unemployed diabetes patients in rural settings of Kenya, who were running businesses had irregular visits to health facilities due to the fear of losing daily income (4). We also demonstrated that unemployed diabetes patients were less likely to visit the health facility at least every 2 months in six months for routine clinic visits. This unlikelihood of hospital visits among unemployed diabetes patients could be associated with low income to support their routine hospital visits. Additionally, this finding could mean that lack of source of income might hinder seeking health care among individuals with chronic illnesses such as diabetes. An intervention aimed at providing and improving psychosocial support might alleviate health-seeking behaviour among unemployed diabetes patients.

Despite the study enrolling a majority of participants with primary education, the current analysis didn't show any significant relationship between the level of education and hospitalisation among persons with diabetes. This finding is contrary to a report done by Waweru *et., al* 2016 which revealed that acquiring secondary education and above influenced more hospital visits compared to those with primary education (19). This contrast could be due to the difference in study design methods and study population employed, the study by Waweru *et., al* 2016 used secondary data, unlike this study which utilised primary data.

Marital status has previously been reported to be associated with hospitalisation. A study by Karinja *et al*., 2019 showed that married diabetes patients were more likely to seek diabetes-related healthcare services compared to unmarried diabetes persons (4). These reports are similar to the findings in this study where more than one-half of the enrolled participants were married (59.4%). Although at a significance level of 5% being married had no statistical significance with hospitalisation in this study. This higher proportion of married diabetes patients seeking health care services could be associated with the patients having moral, emotional and financial support from their partners towards the management of diabetes.

Number of years one has lived with diabetes following diagnosis can also affect hospitalisation rates. According to this study, participants who reported having lived with diabetes for a period of at least 3 years since diagnosis were the majority (68.4%). Although the duration of having lived with diabetes wasn't significantly associated with hospitalisation. Duration of being diabetic could be associated with the development and progression of diabetes-related complications over time, necessitating hospitalisation.

Previous studies (20,21) have identified the use of drug substances, particularly alcohol, as a risk factor for unstable blood sugar levels among diabetes persons. Withdrawal from alcohol consumption has been emphasized as a component of non-pharmacological therapy for managing diabetes in Kenya (10) and worldwide

(22). This study showed that diabetes patients who reported alcohol consumption had a higher proportion of being admitted to the hospital as compared to those with no alcohol consumption. On the other hand, the use of tobacco had no significance on hospitalisation, this could be partly due to only one diabetes individual reported to be using tobacco. This finding is consistent with a previous report which noted low usage of tobacco among diabetes patients (23).

Diabetes has previously been associated with other health conditions with hypertension being consistently observed among diabetes patients. Findings from this study showed that over 60% of the diabetes patients were also known to be hypertensive. This observation reflects findings from a study in northern Tanzania where high incidences of hospitalisation were reported among persons with co-existent diabetes and hypertension (24). Unsurprisingly hypertension was not significantly associated with either routine clinic visits or hospital admission among diabetes patients. This could mean that due to its high prevalence in diabetes individuals and almost similar management practices, it's difficult to realize any significant association with hospitalisation.

A study in South Africa among participants seeking Primary Health Care (PHC) services in two provinces with a high prevalence of HIV (25.2% and 17.6%) reported diabetes as one of the chronic comorbidities in people living with HIV (PLWH) (25). It highlighted the need for intensive PHC services for PLWH and diabetes since a combination of the two poses an increased risk of decreased life expectancy (25). In this current study, one in every five diabetes patients reported having HIV as a comorbidity, and this was significantly associated with routine clinic visits but not hospital admissions. This finding could be associated with the management programs enacted for PLWH, where they are educated on the need to attend their clinic appointments for regular check-ups on their progress. It's during these normal HIV routine clinic appointments that those with co-morbidities like diabetes get to have their conditions assessed (26).

Limitations of the study

One key limitation was the potential for selection bias, as the study focused on known diabetes patients who seek care at health facilities. This might not have captured the entire spectrum of diabetes cases, particularly those who remain undiagnosed or are managing their condition through other means like self-medication without reporting to health facilities. Additionally, the reliance on self-reported information from participants might have introduced recall bias and social desirability bias, impacting the accuracy of the collected data. Furthermore, the study's scope was restricted to Busia County, limiting the generalizability of findings to other regions or settings.

Conclusions

Increasing age, employment status, behavioural (alcohol consumption), and comorbidity are associated with hospitalisation among diabetes patients. These study findings underscore the urgency of targeted interventions to address the socio-economic disparities and strengthen diabetes management policies like the PHC systems to reduce hospitalisation rates in rural settings in Kenya. Therefore, further studies specifically targeting host diabetes, behavioural status, and comorbidity conditions will be important to inform improved diabetes management at the household level to reduce routine visits and hospital admissions. Future research should also explore the effectiveness of targeted interventions such as psychosocial support. Also, the county governments should consider the digitalisation of health systems to ease tracking of hospitalisation trends thus implementation of targeted intervention would be

efficient and guided by data from the tracked trends.

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