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DIABETES KNOWLEDGE AND ASSOCIATED FACTORS AMONG PATIENTS WITH DIABETES TYPE 2 ATTENDING KITUI COUNTY REFERRAL AND TEACHING HOSPITAL, KENYA
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ABSTRACT

Objective: To assess diabetes knowledge and associated factors among patients with diabetes type 2 attending Kitui County and Referral Hospital, Kenya.

Methodology: A hospital based cross-sectional analytical study design with a sample size of 154 type 2 diabetes patients selected through systematic random sampling. Diabetes knowledge assessed by Diabetes Knowledge Questionnaire. Binary logistic regression analysis done to identify factors associated to diabetes knowledge.

Results: 152 respondents participated, females were the majority (63.2%, n=96). The age group of 50-59 years was predominant (43.4%, n=66), (40.4%, n=61) had attained a primary education. More than two thirds respondents' modality of treatment was oral drugs (79.6%, n=121). Study participants having diabetes 2-5 years were (34.2%, n= 52) and 6-10 years (29.6%, n=45). Participants demonstrating good knowledge were (44.6%, n=68). However, significant knowledge gap existed in identifying hypoglycemia (47.4%, n=72) and hyperglycemia (20.4%, n=31).

In binary logistic regression, level of education had significant positive association to diabetes knowledge (Adjusted Odds Ratio (AOR) = 2.82, CI = 1.05, 8.32). The duration of disease (AOR = 0.15, CI = 0.04, 0.54) and mode of treatment (AOR = 0.20, CI = 0.06, 0.60) demonstrated a significant negative association to diabetes knowledge.

Conclusion: The study findings urges for a structured, patient-centered education interventions targeting high-risk strata groups particularly those

with limited formal education, long-standing diabetes and oral antidiabetic medication regimens.

INTRODUCTION

Diabetes is group of metabolic diseases characterized by elevated blood sugars due to defects on insulin secretion, insulin action, or both.[1]. Type 2 diabetes mellitus accounts for the majority of all diabetes cases worldwide with a prevalence of 6.28% and rapidly on rise in the low and middle income countries with increasing morbidities and mortalities making it a modern century pressing public health concern [2]. Approximately 24 million people live with diabetes in Africa, a number forecasted to increase due to a shift driven by aging population, physical inactivity, unhealthy diet and rapid urbanization [3]. In the Sub Saharan, Kenya included, diabetes has demonstrated substantial burden with increased premature deaths and disabilities [4]. In the year 2000, people living with diabetes in Kenya were estimated 194,000, currently; it has quadrupled to 821,500 individuals with a prevalence of 4.1%. [3,5] with 15,284 annual diabetes related deaths [2]

Unmanaged type 2 diabetes often leads to serious complications such as loss of vision, kidney failure, amputation, cardiovascular diseases and debilitating musculoskeletal conditions [6]. Besides, frequent hospitalizations due to diabetes complications not only overstretch health care system but also compounds psychological and physical distress to patients [2]. Due to the chronic nature of type 2 diabetes spanning the entire lifetime, empowering patients with diabetes knowledge is the best weapon to improve self-management and adopt healthy behaviors in fight against development of diabetes complications [8]. Although knowledge on diabetes alone does not necessarily guarantee improved individual diabetes management, patients with inadequate diabetes knowledge do not frequently attain desirable glycemic control .[9]

Diabetes patient characteristics influence their diabetes knowledge and extent of their involvement in managing their condition [10]. Sociodemographic factors including level of education, age, gender, socioeconomic status, marital status and employment status as well as clinical factors such as history of diabetes in the family, duration of disease and type of therapy independently associate to diabetes knowledge [11]. Therefore, an assessment of diabetes knowledge of patient and related factors to provides a baseline that supports the implementation of targeted interventions to improve patients' knowledge is needed [10,11]. Identification of gaps in type 2 diabetes patients' diabetes knowledge is fundamental in developing patient focused diabetes educational interventions to breach deficits diabetes knowledge enhancing optimal control of diabetes [12,13]. In Kitui County Referral Hospital, there are no documented studies on patient diabetes knowledge and associated factors among diabetes patients. Therefore, this study aimed to assess level of diabetes knowledge and associated factors amongst type 2 patients attending Kitui County Referral Hospital at Kitui County in Kenya.

METHODOLOGY

Study design, setting and population

A hospital based cross sectional analytical study was employed.[14] The study was conducted at the Kitui County Referral Hospital, the largest facility for referral and teaching located at Kitui County, a devolved

unit in Kenya. Study population was type 2 diabetes patients attending outpatient diabetes clinic on planned appointments for treatment, care, drug refill and follow ups.

Sample size

Sample size was determined utilizing a formula adopted from [15]

$$n = \frac{Z^2\ (p \times q)}{C^2}$$

Where n = sample size, Z= Standard score of 95% level of significance, p = the proportion of occurrence of the variable of focus (which is 28.9%, level of diabetes knowledge among adults in Eastern Kenya [16] , q = Proportion of non-occurrence of the variable of focus (1-p), C= margin of error or confidence interval of ±5 % (±0.05). Substituting the values

$$= \frac{1.96^2\ (0.289 \times 0.711)}{0.05^2}$$

$$= 315$$

Since the target, population was less than 50,000 respondents; the sample size was adjusted by using correction formula. Therefore, new sample size

$$\frac{n}{1 + \frac{n-1}{\text{target population}}}$$

$$= \frac{315}{1 + \frac{315-1}{300}}$$

New sample size = 154 type 2 diabetes patients.

Sampling technique

The study utilized a systematic random sampling technique, a sample size of 152 The sampling interval was computed according to [17] period interval formulae by division of the population in the diabetes permanent register and the desired sample selected to participate. In the case of this study, number of diabetes in the register and desired sample was 600 and 154 respectively. Therefore, the sampling interval was 600/154, which provides four. This interval indicated that for every fourth patient attending the clinic and met inclusion criteria was selected. A start point was identified by generating a random number between one and 4 as the sampling interval.

Inclusion and exclusion criteria

Subjects with confirmed type 2 diabetes diagnosis voluntarily signing the consent form and attending outpatient type 2 diabetes clinic with an age of equal to or greater than 18 years. Excluded were subjects having mental health disorders or psychiatric disorder, pregnant, critically ill on examination with difficulties to communicate and declining to sign the consent form.

Ethical consideration

The study sought authorization and approval through Kitui County Hospital to conduct the study and Pwani University Ethical and Review Committee accredited by the National Commission of Science Technology and Innovation (Ref. No. ERC/MSc/005/2020)

Informed consent obtained after explicit study details made known to respondents. Privacy and confidentiality of the respondents upheld throughout the entire study

Data collection

A structured interviewer questionnaire used to gather sociodemographic and assess diabetes knowledge data. The diabetes knowledge was assessed by 24-item Diabetes Knowledge Questionnaire (DKQ) [18]. DKQ obtains knowledge on diabetes patients' fundamental understanding of diabetes with three choices of YES, NO or I DO NOT KNOW for every question. Criteria for scoring the respondents was that every correct response for every question earns one mark. Incorrect answer earns zero mark as well as respondents stating they do not know. The final score awarded to

each respondent depended on the number of items scored correctly. Out of the possible 24, scoring a sum of less than 13 items correctly indicated poor diabetes knowledge and scoring more than 13 items correctly indicated good diabetes knowledge.

Procedure

Two health care providers of the outpatient diabetes clinic were trained on the study to assist in clarifying the purpose and the significance of the study, assuring privacy and confidentiality in a quiet and properly arranged room. Data was collected using a consolidated questionnaire with sections of information on sociodemographic and diabetes knowledge. Item question were read to the patient then an allowed to provide a response. The researcher ensured a complete and accurate data collection through continuous follow up, supportive supervision and correcting wrongly done fields during the exercise and custody of the data to prevent loss and contamination.

Data analysis

Data was cleaned and entered in the SPSS version 26, descriptive statistics computed for proportions on categorical variables of the study such as sex, age level of education, marital status, religion, residence, income, employment status mode of treatment, duration of diabetes and family history of diabetes, and knowledge on diabetes. To determine association, univariate regression analysis was computed considering a significance of < 0.05. Finally, multivariable regression analysis was done. Confidence interval of 95% and P value of < 0.05 was considered statistically significant.

RESULTS

Sociodemographic Factors

Majority of the participants were females (63.2%, n= 96), (40.4%, n=63) had attained primary school education, (17%, n=26) had the disease for a duration of between 0-2 year and (34%, n=52) a span of 2-5 years. Main treatment was oral antidiabetic 121(79.6%, n=121). Table 1 demonstrates the findings

Table 1

Study participants' sociodemographic factors

Sociodemographic factors	Category	Frequency	Percent
Gender	Male	56	36.8
	Female	96	63.2
Age	20 – 39	7	4.6
	40 – 49	42	27.6
	50 – 59	66	43.4
	60 – 69	26	17.1
	70 – 99	11	7.2
Marital status	Single	8	5.3
	Married	111	73.0
	Widowed	21	13.8
	Separated	9	5.9
	Divorced	3	2.0
Level of education	No formal	19	19.1
	Primary	63	40.4
	Secondary	42	27.3

	Tertiary	18	11.8
Residence	Rural	91	59.9
	Urban	61	40.1
Religion	Christian	146	96.1
	Islam	6	3.9
Employment	Formal	40	26.3
	Informal	71	46.7
	Retired	14	9.2
	Dependent	17	17.8
Income per annum (Kenya shilling)	< 50000	58	38.2
	51000 – 100000	37	24.3
	101000 – 200000	46	30.3
	> 200000	11	7.2
Family History of diabetes	Yes	56	36.8
	No	96	63.2
Diseases duration (years)	0-2	26	17.1
	2-5	52	34.2
	6-10	45	29.6
	>10	29	19.1
Mode of treatment	Oral	121	79.6
	Insulin	21	13.8
	Oral & Insulin	10	6.6

Diabetes Knowledge

Majority of the respondents (55.4%, n=84) demonstrated poor knowledge on diabetes. Respondents demonstrated high knowledge in cautiously cutting their toenails (98%, n=149), meal preparation (96.1%, n=146), and abrasion and cuts of diabetics heal more slowly (90.8%, n=138). A large proportion of the respondents believed loss of sensation on the feet, hand and fingers (84.9%, n=129), poor blood circulation (67.7%, n=103) and damage of kidneys (82.9%, n=126) were a result of diabetes. Only (33.6%, n=51) knew of types of diabetes. Those able to recognize hypoglycemia and hyperglycemia were (19%, n=29) and (20.4%, n=31) respectively. Table 2 illustrates the findings.

Table 2

Diabetes Knowledge Score Distribution Using Diabetes Knowledge Questionnaire

Item Questions for Diabetes Knowledge	**Response (%)**	
	Correct	**Incorrect**
1. Consumption of excess sugar and other sweet foods is a cause of diabetes	44.1	55.9
2. Lack of effective insulin in the body is the usual cause of diabetes	64.5	35.5
3. Failure of the kidneys to keep sugar out of the urine causes diabetes	81.6	18.4
4. Insulin is produced by kidneys	66.5	33.5
5. In untreated diabetes, the level of glucose in the blood is usually elevated	7.2	92.8
6. If I am diabetic, my children have a higher chance of being diabetic	42.8	57.2

7. Diabetes can be cured	63.8	36.2
8. A fasting blood sugar level of 5mmol is too high	48.7	51.3
9. The best way to check my diabetes is by testing my urine	75.7	24.3
10. Diabetic medication can be increased by regular exercise	4.6	95.4
11. Type 1 and Type 2 are the main types of diabetes	66.4	33.6
12. Too much food can cause insulin reaction	86.8	13.2
13. Antidiabetic drugs is more important in control of diabetes than diet and exercise	25	75
14. Poor circulation can result from diabetes	32.3	67.7
15. Cuts and abrasions on diabetics heal more slowly.	9.2	90.8
16. Diabetics should take extra care when cutting their toenails	2	98
17. A person with diabetes should cleanse a cut with iodine and alcohol	53.9	46.1
18. Food preparation is as important as I eat	3.9	96.1
19. Kidneys can be damaged by diabetes	17.1	82.9
20. Numbness of hands, fingers, and feet can be caused by diabetes	15.1	84.9
21. Shaking and sweating are signs of hyperglycaemia	79.6	20.4
22. Polyuria and polydipsia are signs of hypoglycaemia	52.6	47.4
23. Tight elastic hose or socks are good for diabetics	48	52
24. Diet of diabetics comprise mostly of special foods	82.9	17.1
Total Average Score	44.76	55.24

Socio demographic factors associated to diabetes knowledge

For univariable logistic regression analysis, a P value of ≤ 0.05 was applied [19]. Level of education, employment status, income level, duration of diabetes and mode of treatment demonstrated significant association, they were then entered into multivariable logistics regression analysis to adjust for other variables for independent contribution. Only education, duration of diabetes and mode of treatment showed significant associations. In the adjustment, respondents with a primary education were 2.82 times more likely to have good diabetes knowledge unlike their counterparts who never had formal education. Respondents having the disease for a duration of at least 2 years were 0.15 times less likely to have good diabetes knowledge compared to those who had the disease for a duration of more than 10 years. Regarding mode of treatment, respondents that used oral drugs had 0.20 times less likely to have good diabetes knowledge as compared to those who used insulin. Findings are depicted on table 3.

Table 3

Factors associated to diabetic knowledge in univariate and multivariable logistic regression

Sociodemographic factors	Diabetes knowledge		COR (95% CI)	P value	AOR (95% CI)	P value
	Poor N (%)	Good N (%)				
Level of education						
No formal education	22 (75.9)	7 (24.1)	1.00			
Primary	32 (50.8)	31 (49.2)	3.05 (1.18, 8.64)	0.027	2.82 (1.05, 8.32)	0.048
Secondary	23 (56.1)	19 (43.9)	2.60 (0.94, 7.77)	0.074		
Tertiary	7 (38.9)	11 (61.1)	4.93 (1.43, 18.7)	0.014	2.62 (0.55, 13.11)	0.229
Employment status						
Formal	18 (45)	22 (55)	1.00			
Informal	42 (59.2)	29 (40.8)	0.57 (0.26, 1.23)	0.153		
Retired	20 (74.1)	7 (25.9)	0.29 (0.09, 0.80)	0.021	0.41 (0.09, 1.71)	0.228
Dependent	4 (28.6)	10(71.4)	2.05 (0.58, 8.47)	0.287		
Income per annum (Ksh)						
< 50000	37 (63.8)	21 (36.2)	1.00			
51000 – 100000	19 (51.4)	19 (48.6)	1.70 (0.72, 3.89)	0.231		
101000 – 200000	25 (54.3)	21 (45.7)	1.50 (0.67, 3.28)	0.330		
> 200000	3 (27.3)	8 (72.7)	4.70 (1.22, 23.26)	0.034		
Diabetes family history						
No	64 (48.0)	65 (52.0)	1.00			
Yes	20 (46.5)	23 (53.5)	1.64 (0.81, 3.35)	0.201		
Duration of Diabetes						
>10	14 (48.3)	15 (51.7)	1.00			
0-2	20 (76.9)	6 (23.1)	0.28 (0.82, 0.87)	0.041	0.15 (0.04, 0.54)	<0.01
3-5	28 (53.8)	24 (46.2)	0.80 (0.32, 1.99)	0.182		
6-10	22 (48.9)	23 (51.1)	0.98 (0.38, 2.50)	0.224		
Mode of treatment						
Insulin	6 (28.6)	15 (71.4)	1.00			
Insulin and orals	6 (60.0)	4 (40.0)	0.27 (0.05, 1.26)	0.062		
Orals	72 (59.5)	49 (40.5)	0.27 (0.09, 0.72)	<0.01	0.20 (0.06, 0.60)	<0.01

Ksh: Kenya Shillings.

DISCUSSION

Diabetes knowledge

The current study's finding demonstrated that majority of the participants had poor diabetes knowledge (55.24%). Results corroborate findings from Zimbabwe, Saudi Arabia and Bangladesh [19–21]. Contrastingly, evidence from studies in Iran and Ethiopia provided higher diabetes knowledge [22,23].The discrepancies may possibly be a reflection of differences in healthcare infrastructure, approaches to diabetes education program and socioeconomic determinants of health. These variations emphasize need to adapt tailored diabetes policy frameworks.

In present study findings, it emerged that diabetes knowledge on acute complications was low; hypoglycemia (47.4%) and hyperglycemia (19%). In agreement, a study

undertaken in India reported similar results [24] Nonetheless, this study showed knowledge on chronic diabetes complications was high; neuropathy (84.9%) and renal failure (82.9%). The results mirrored evidence from an Indian study indicating high knowledge on chronic diabetes complications [25]. The observed outcome for the present study on diabetes complication knowledge was asymmetry, importantly is the critical gap in hypoglycemia perception presenting serious patient safety concerns. This warrants balanced diabetes education coverage for both chronic and acute diabetes complications recognition.

In this study, level of education was strongly associated with good knowledge of diabetes. This result resonated with studies in Bangladesh and Ethiopia [22,25]. The strong positive association between educational attainment and diabetes knowledge underscores education as a powerful social weapon in determining health. It is believed that formal education process cultivates critical cognitive skills, enhanced ability to understand and navigate complex diabetes care demands [26]. This finding have implication on health equity as it suggests individuals with no formal education need to be considered by incorporating education programs that are tailored to their literacy appropriateness.

Present study showed that a shorter duration of diabetes of at least 2 years showed 85% less likelihood of good diabetes knowledge compared to those with a longer duration exceeding 10 years. This finding pinpoints the critical vulnerability period in the continuum of diabetes care characterized by reduced diabetes knowledge reflecting overwhelming initial diagnosis and delayed delivery of diabetes education. It is believed that long duration of diabetes leads to more interaction with health care providers, diabetes support groups and peers increasing patients' diabetes knowledge [27]. There is need to strengthen early post-diagnostic support to address critical diabetes knowledge deficits.

The present study revealed that diabetes knowledge is significantly associated with the mode of treatment. Respondents on oral drug treatment had 70% lower odds of having good knowledge about diabetes compared to those on insulin. This finding aligns with a study done in Portugal, which showed that the oral treatment mode was linked to lower diabetes knowledge, while insulin-treated respondents demonstrated greater knowledge [28] . The possible explanation could be insulin-treated patients tend to have more interactions with healthcare providers, increasing their chances of gaining more understanding of diabetes.

Study limitation

This study was hospital based cross-sectional analytical study therefore the results cannot be generalized to other diabetic populations.

CONCLUSION

The study revealed that 44.6% of respondents demonstrated good diabetes knowledge. Diabetes awareness was high regarding delayed wound healing and kidney-related complications. However, knowledge gaps were notable in recognizing acute complications and misconceptions about diabetic diets. Education level, diabetes duration and modality of diabetes treatment were significantly associated to diabetes knowledge. The findings underscore the need to evaluate these factors and strengthen patient education on diabetes to improve the overall diabetes knowledge.

Authors contributions

AA designed the study, data collection, and wrote the final draft of the manuscript. NM and MN guided in designing the study, data analysis, interpretation and writing the final

draft. VM and MM contributed in data analysis, interpretation, discussion and writing the final draft.

Conflict of interest

The authors declare no conflicts of interest.

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