rise to 4.5% by 2025. However, two-thirds of diabetics may be undiagnosed. So is it a revolution or an evolution in diabetes therapy?

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Knowledge on Diabetes Mellitus and its Management Strategies among Diabetic Outpatients in a Tertiary Referral Hospital in Kenya

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Abstract

Background: Good knowledge about diabetes and its management enhances the ability of patients to cope and adjust to their illness.

Objectives: To determine the knowledge on diabetes mellitus and its management among diabetic outpatients at Kenyatta National Hospital, Diabetic Clinic.

Methodology: This was a cross-sectional study involving 105 consenting diabetic outpatients, aged ≥18 years. Consecutive sampling was used to collect data using pre-designed semi structured interviewer administered questionnaires. Patients' knowledge on diabetes mellitus including cause, symptoms, complications, medications, dietary control, importance of exercises and diabetes affiliate organizations was collected and analysed using IBM statistical package for social sciences version 21. Chi square tests were used to compute associations between participants' sociodemographics and outcome variables at p≤0.05.

Results: The ratio of males to females was approximately 1:1. The mean age of the participants and duration of diabetes was 41.0±16.0 and 6.0±5.0 years, respectively. Knowledge on causes, signs and symptoms of diabetes mellitus was statistically significantly associated with the education level (p=0.0001) and was more common among males (p=0.01). Knowledge on dietary control (p=0.02), exercise (p=0.04) and complications (p=0.05) was more common among males and the more educated. Irrespective of sociodemographic variables (p>0.05), only 33.3% of the patients knew their medication and dosing schedules in relation to meals. A large proportion (90%) of the patients was unaware of the role of diabetes affiliate organizations.

Conclusion: Knowledge on diabetes among diabetic outpatients varies with level of education and gender. More health education is, however, advocated to diabetic patients in order to increase their knowledge on antidiabetic medication and diabetes affiliate organizations. Future work should, however, be carried out to correlate the patients' level of knowledge and long term glycaemic control.

Keywords: *Diabetes mellitus, patient knowledge, control measures, antidiabetic medication, diabetic affiliate organizations.*

Introduction

Globally, diabetes mellitus (DM) is emerging as one of the

world's biggest healthcare problems and its prevalence is increasing at an alarming rate [1–3]. Many people are unaware that they have the disease [4–6]. Furthermore, some patients are diagnosed during routine check-ups on clinic visits as they do not know about the disease and DM complications may be the first presenting sign [7]. Owing to inadequate knowledge, some patients are treated for urinary tract diseases which mimic features of DM [8] while others are inadequately managed [9,10].

Studies have shown that patients' knowledge about the disease and control activities plays a vital role in its future development, early prevention, detection and optimal management as well as improved outcomes [11,12]. Most importantly, for chronic illnesses such as diabetes, emphasis is now placed on educational preventive programmes, early detection and control measures [11]. These strategies require the patient to be empowered through health education [13,14]. Nevertheless, available literature from some parts of Middle East has revealed that there is substantial poor knowledge on DM and its management among patients [15].

Treatment of diabetes involves both drug and non-drug methods (16). For instance, type I DM is treated with insulin, exercise, and a diabetic diet [17] while type II DM is initially managed with concurrent employment of a low glycaemic index diet and exercise before introduction of the medication [16,18]. The roles of exercise, controlled diet and medication are clear [18,19] and therefore, diabetic patients' knowledge on management measures is paramount for optimal blood sugar control [20]. Additionally, diabetes management activities require clear understanding of the disease manifestations and control strategies by the patient [21]. Furthermore, patients' knowledge on medications and lifestyle modifications can significantly reduce diabetes complications [20,22,23]. There is compelling evidence that good knowledge about DM and its complications enhances the ability of patients to cope and adjust to their illness whereas poor knowledge is associated with increased rate of hospitalization [24,25].

Patients with DM and their families provide more than 90% of the care [26,27] and as a consequence, knowledge on the disease and self-management are central components of any effective treatment plan (28). Additionally, patients with knowledge on diabetes and its management are more likely to participate in management and control activities [29,30] as knowledge is a critical component of behaviour change [31]. Moreover, patients' awareness of support groups or affiliate organizations such as diabetic associations is important for provision of knowledge and other essential management strategies [32].

This study, therefore, sought to measure the knowledge of diabetes, control measures and awareness of their organizations among diabetic outpatients at Kenyatta National Hospital with an objective of improving the practice of diabetes management.

Methods

Study approval (reference number KNH-ERC/01/4742) was obtained from Kenyatta National Hospital/ University of Nairobi Ethics and Research Committee (KNH/UoN-ERC) and a cross sectional study was carried out in KNH diabetic clinic. The study population consisted of 105 diabetic patients aged ≥18 years who attended the clinic.

The study sample size was estimated using Cochran's formula [33]. There were no previous studies on the level of knowledge among diabetics attending KNH outpatient clinics. As such, it was estimated that the proportion of patients with adequate knowledge in each study variable would be 50% with an error margin of ± 10%. Using these proportions at 95% confidence level, the minimum sample size was calculated as 96 participants. However, to allow for data losses and non-responders, a 10% was added to the estimated sample size to make total of 105 DM respondents.

Participants were eligible if they were aged ≥18 years, had been diagnosed with DM and were on treatment. Both males and females were invited to participate in a face to face interview. Pregnant and lactating mothers were excluded as their treatment modalities could have been altered by their status. Only eligible DM patients who gave written, signed, informed consent to participate were interviewed consecutively by the researcher as they came for clinic appointments.

Semi structured serialized questionnaires were used to collect the raw data. Every questionnaire was assigned a unique alphanumerical serial study number to avoid confusion and duplication of the data. Patients' identifiers such as names or their file numbers were not recorded. The questionnaires were designed to capture participants' sociodemographic characteristics such as gender, highest education level and age as well as clinical characteristics including duration of diabetes, treatment modalities and respondents' knowledge and importance on each of the management strategies. Participants were evaluated on their understanding of the disease pertaining to the causes, signs and symptoms of DM.

Respondents' knowledge on the possible complications of diabetes and the organs affected were also assessed as well as on their medication pertaining to the name of the drug they were using, the time of the day they were required to take in relation to meals and the dose. Those who were using insulin therapy were required to tell the type and units that they were injecting at different times of the day in relation to meals. Final knowledge assessment was conducted on participants' awareness of the role of diabetes affiliate organizations. The answers given by patients were written in the questionnaire as accurately as possible. The information collected was kept confidential at all times.

Each measurable parameter had a series of questions to be answered by the patient. Questions were rated at a 100 per

cent for each parameter. Therefore, for every parameter, the patients' level of knowledge was expressed as a percentage by taking the number of questions correctly answered by the patient divided by total number of questions in each parameter, and the answer multiplied by 100.

Since, there were no previous studies on the level of knowledge among diabetic patients, a participant who scored 50% and above in each of the measurable parameters was termed to have sufficient knowledge in that particular parameter. A patient who scored less than 50% was termed to have insufficient knowledge in the respective parameter.

The raw data were keyed into Microsoft Access 2010 computer database structure resembling the questionnaire. When data entry was completed, it was cleaned by checking the data entered into the computer database against questionnaires. Any errors identified during data clean-up were rectified. The data were then exported to IBM statistical software version 18 for analysis. Descriptive statistics on frequencies of the participants' sociodemographics characteristics were done. Chi square tests were used to compute the associations between the participants' socio-demographic data versus the outcome variables such the level of knowledge on the disease, dietary control, exercise, complications, antidiabetic medication and diabetes affiliate organizations. The level of confidence was set at 95% and all values with p≤0.05 were considered statistically significant. Tables and graphs were presented for important findings.

Results

Out of a total of 105 diabetic adult outpatients who participated in the study, there were 53 (50.5%) males and 52 (49.5%) females. The mean age was 41.0±16.0 years and mean duration of diabetes was 6.0±5.0 years. There was an almost even distribution of participants across all the age categories and >60% of the patients had reached at least secondary level of education (Table 1).

Table 1. Socio-demographic characteristics of the study participants (N=105)

Variable	Category	Frequency (N=105	Percent (%)
Age Category (Years)	18-30	12	11.4
	31-40	24	22.9
	41-50	21	20.0
	51-60	21	20.0
	61-70	22	21.0
	Above 70	5	4.8
Age Years Duration of illness (years)	(Mean, SD) (Mean, SD)	**(41.0, 16.0)** **(6.0, 5.0)**	
Sex	Male	53	50.5
	Female	52	49.5
Highest Education level	Non-formal	11	10.5
	Primary	25	23.8
	Secondary	42	40.0
	College/University	27	25.7

Key: SD-Standard deviation

Figure 1 below shows the proportion of patients and the level of knowledge across the study variables.
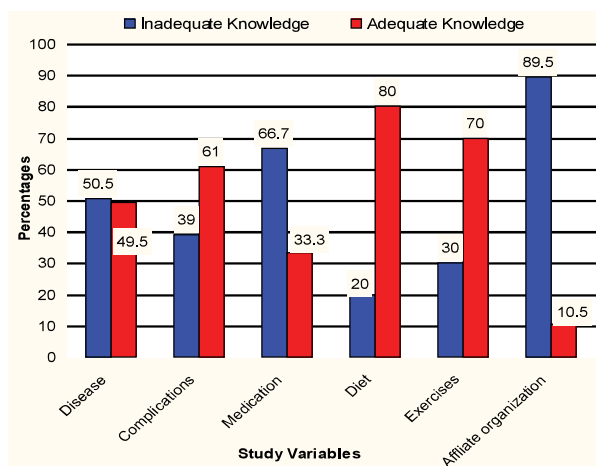

Figure 1. Proportions of patients with adequate knowledge on the various study variables.

Key: Disease-Knowledge on causes and manifestations of DM

As seen in Figure 1, more than half of the patients had sufficient knowledge on dietary control (80%) and the role of exercise (70%) in managing diabetes as well as on complications (61%). Conversely, there was inadequate knowledge on the diabetic medication and the role of DM affiliate organizations in more than two-thirds of the participants. Knowledge about the disease and its clinical features was evident in almost half (49.5%) of the patients interviewed (Figure 1).

The study also explored the adequacy of patients' knowledge on the disease and, the role of dietary measures and medication in the management of diabetes across the age categories as well as education levels. This was noted in order to find out the patients' age bracket or education level that would require emphasis regarding education on disease, medication and dietary measures because the three are paramount in management of diabetes. The findings are shown in figures 2 and 3 below.
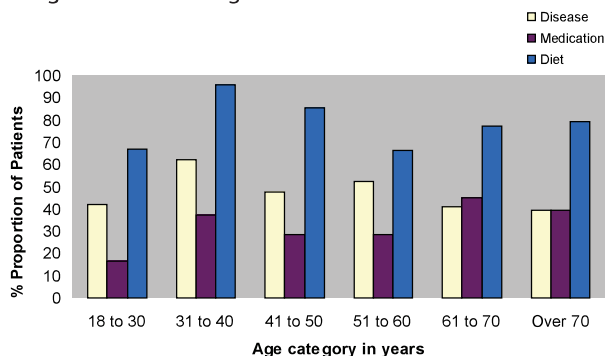

Figure 2. Proportions of patients with adequate knowledge on disease, medication and diet according to age.

Key: Disease-Knowledge on causes and manifestations of DM

Almost 40-50% of the patients in studied age categories had adequate knowledge about the DM and its clinical manifestations. Over 60% of the respondents in all the age categories had adequate knowledge on the importance of dietary control in the management of DM. Knowledge on antidiabetic medication was insufficient in over 60% of patients across the age categories and was worse at 18-30 years age bracket where less than a fifth (16%) of the participants had adequate knowledge (Figure 2).

Knowledge on disease, dietary control measures and medication was also evaluated against the highest academic level of the study participants.
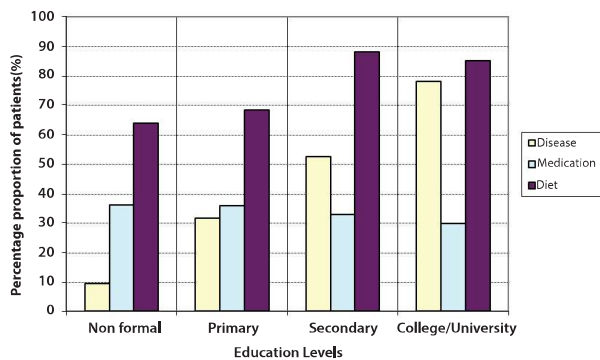

Figure 3. Proportions of patients with adequate knowledge on disease, medication and diet according to education level.

More than 60% of the respondents at all education levels had adequate knowledge on the importance of dietary control in the management of diabetes mellitus. However, less than 40% of the patients across the ages did not have adequate knowledge on antidiabetic medications. The proportions of patients with adequate knowledge about the disease increased with the level of education (Figure 3). This was statistically significant (p=0.0001) as seen in table 3 below.

Tables 2 and 3 below reveal the bivariate analysis for associations between the predictor and outcome variables. Adequacy of knowledge on the various study variables (outcome) was assessed against the predictor variables including gender of the participants (Table 2) and other sociodemographics such as age and highest education level (Table 3).

Table 2. Association between adequacies of knowledge on the measured variables by gender.

Adequacy of Knowledge		Males, n (%)	Females, n (%)	Chi square, P-value
Disease	Yes	30 (28.6)	2(20.9)	$X^2_{(1,5.05)}=21.46$ (p=0.01)
	No	23(21.9)	30(28.6)	
Diabetes Medication	Yes	17(16.2)	18(17.1)	$X^2_{(1,5.05)}=3.097$ (p=0.08)
	No	36(34.3)	34(32.4)	
Dietary Control	Yes	45(42.8)	19(18.1)	$X^2_{(1,5.05)}=16.10$ (p=0.02)
	No	8(7.6)	33(31.4)	

Diabetes Complications	Yes	34(32.4)	30(28.6)	$X^2_{(1,5.05)}=4.60$, (p=0.05)
	No	19(18.1)	22(20.9)	
Exercise	Yes	39(37.1)	34(32.3)	$X^2_{(1,5.05)}=8.333$ (p=0.04)
	No	14(13.3)	18(17.1)	
Affiliate organizations	Yes	4(3.8)	7(6.7)	$X^2_{(1,5.05)}0.979$, (p=0.32)
	No	49(46.7)	45(42.9)	

The proportion of males with adequate knowledge on the diabetes and its manifestations (p=0.01), diet (p=0.02), complications (p=0.05) and exercise (p=0.04) was statistically significantly higher than that of females. However, there was no gender disparity on the proportions of patients with adequate knowledge on antidiabetic medication and the awareness of affiliate organizations in the management of diabetes (Table 2).

Table 3. Associations between the measurable outcome variables with the participants' demographics of age and highest academic qualifications

Predictor variables	Outcome Variables					
	Disease	Complication M	edication	Diet E	xercise	Affiliate organizations
Age category	$\chi^2_{(5,0.05)}=2.847$ (p=0.72)	$\chi^2_{(5,0.05)}=60.750*$ (p=0.03)	$\chi^1_{(5,0.05)}3.671$ (p=0.60)	$\chi^2_{(5,0.05)}=7.958$ (p=0.16)	$\chi^2_{(5,0.05)}=28.810*$ (p=0.07)	$\chi^2_{(5,0.05)}=45.030*$ (p=0.05)
Highest Education levels	$\chi^2_{(3,0.05)}=19.024*$ (p=0.0001)	$\chi^2_{(3,0.05)}=0.999$ (p=0.19)	$\chi^2_{(3,0.05)}=0.292$ (p=0.96)	$\chi^2_{(3,0.05)}=62.650*$ (p=0.01)	$\chi^2_{(3,0.05)}=34.530*$ (p=0.03)	$\chi^2_{(3,0.05)}=4.386$ (p=0.22)

***statistically significant**

Adequate knowledge on diabetes complications (p=0.03) and importance of diabetes affiliate organizations (p=0.05) were statistically significantly associated with patients age. On the other hand, knowledge on disease presentation (p=0.0001), dietary control in the management of diabetes (p=0.01) and importance of exercises for a diabetic patient (p=0.003) were statistically significantly associated with the participants highest academic level.

Discussion

This study sought to find out the patients' knowledge on diabetes and various aspects of disease management. It revealed that only 49.5 % of diabetic patients could identify the cause and clinical manifestations of diabetes which is comparable to similar findings in Pakistan(15). In the Pakistanian study which involved knowledge and risk assessment, only 47.4% of the participants could identify the cause of diabetes. This proportion is, however, low considering that patients' awareness of their medical condition promotes optimal disease management (34). The small proportion suggests most of the diagnosing clinicians do not explain to patients the causes and manifestations of diabetes despite the fact that inadequate knowledge on disease impacts on its management and adherence to medication (14,35).

Eighty per cent of the patients interviewed had adequate knowledge on importance of dietary control. This is comparable to other studies that found 63.1% of the

participants with adequate knowledge on dietary control (15). The small difference could be attributed to the difference in the current study smaller sample size (105 vs. 198) and the fact that the latter study examined knowledge of oil use in cooking among diabetics (15). Studies have revealed that education on dietary control among DM patients is conducted by physicians, nurses and dietician immediately following diagnosis (25,36). Probably majority of the respondents had gone through education on dietary control measures following the diagnosis of diabetes mellitus, thus explaining the large proportion of patients with adequate knowledge on the parameter.

We observed that DM patients were advised to split the menu into about six small meals per day, rather than the traditional three square meals to prevent dangerous post prandial hyperglycaemia as has been revealed in other studies (16,35,37). Studies have also reported that diabetic patients are required to eat low glycaemic index foods that do not turn into sugar quickly (37). They are advised to eat fewer calories in order to maintain ideal body weight and refrain from taking excessive proteins (35).

Adequate knowledge on diabetes complications and exercise were exhibited by 61% and 70% of the participants, respectively. Similar studies have shown 60.6% of the participants with adequate knowledge on the exercise but a smaller proportion of 19.1% knowledge on complications (15). The conflicting figures are probably due to the fact that the latter study looked at adequacy of knowledge of diabetes complications in non-diabetic patients.

One-third (33.3%) of patients had adequate knowledge on use of antidiabetic drugs and was worse at 18-30 years age category (16%), which probably comprised of newly diagnosed individuals with minimal experience in managing the disease. Related studies have revealed that diabetic patients' education on rational use of antidiabetic medicines is important for maintenance of adequate glycaemic control in diabetes (25,35). It was observed that regardless of age, sex and the education level, patients did not know the dosing of the drugs in relation to meals.

It was also found that most insulin users did not know appropriate injecting techniques, the appropriate sites of injection and storage requirements for the drug (38). Majority of the patients were unfamiliar with the units (IU) of insulin but were more conversant with the millilitres (ml) of measurements. The likely explanation to this observation was that healthcare providers might have not adequately instructed patients on proper usage of their antidiabetic drugs, which is important in diabetes management. Additionally, it was likely that the healthcare providers did their best, but lack of an expert counselling in drug use at the diabetic clinic was encountered. There is considerable evidence that counselling on medication by an expert in drug use enhances the patient's understanding and adherence to medication (39,40).

Adequate knowledge on majority of study variables was found to be better in males than females. For instance, compared to females, there was a statistically significant proportion of males with adequate knowledge on disease (p=0.01), dietary control (p=0.02), complications (p=0.05) and exercise (p=0.04). Similar studies on knowledge on diabetes have found that male sex was statistically significantly associated with adequate knowledge (15). The reasons as to why there was sex disparity in knowledge level and yet DM has no gender predilection requires further investigation. On the other hand, although diabetes affiliate organizations are vital in supporting DM patients in managing the disease (32), only 10.5% of our respondents were aware of their existence and role. There was no gender or education level predilection on adequacy of knowledge on diabetes organizations although statistically, the elderly patients showed to have better awareness (p=0.05) than others but the number (n=5) was too small to draw meaningful conclusions.

Most of the patients who had attained university and secondary education had adequate knowledge about diabetes mellitus (p=0.0001), diet (p=0.01) and exercise (p=0.03) compared to those with primary and non-formal education. A similar finding where higher education level has been positively correlated with adequate knowledge on diabetic management measures has been revealed in similar studies (15). A possible reason for these findings could be that the highly educated patients are better placed in understanding the importance of dietary control and doing exercises in the management of DM. There is also a possibility that the highly educated patients read more about diabetes mellitus and its management in other references like textbooks, magazines or internet because they are assumed to have a better understanding.

The main limitation for this study was that we did not know how frequent the interviewed patients came for diabetes training in the hospital. Secondly, as common with cross-sectional studies involving interviews, patients could have over-reported or under-reported their experiences.

Conclusions and Recommendations

Knowledge on causes and clinical features of diabetes mellitus, use of antidiabetic medication and the importance of diabetes affiliate organizations is poor among diabetic outpatients attending KNH. Health education should be emphasized so as to increase awareness and knowledge on rational use of antidiabetic medications, especially among the younger population. Health education among DM patients should be tailored to their highest education level and gender. Lastly, future work should, however, be carried to correlate the patients' level of knowledge and long term glycaemic control. It may also be necessary to do qualitative study or larger samples over long period of time to clarify why males did better in knowledge level than females in the majority of variables studied.

Conflict of Interest Declaration

The authors declare no conflict of interest.

Acknowledgment

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Patterns and Predictors of medication use practices during pregnancy at the Kenyatta National Hospital, Nairobi, Kenya

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Abstract

Background: The study set out to establish drug use practices among mothers and prescribers at the Obstetrics and Gynaecology department of Kenyatta National Hospital. Since it is difficult to determine effects on the foetus before marketing new drugs due to ethical reasons, most drugs are contraindicated in pregnancy. However, pregnancy itself often necessitates medication. A careful balance between the risks of medications to the foetus and the benefits to the mother is therefore necessary. The study assessed patterns and predictors of drug use practices in pregnancy among women admitted to the labour wards of Kenyatta National Hospital. It was carried out as a cross sectional survey at the Obstetrics and Gynaecology wards of Kenyatta National Hospital. Data was analysed using STATA 13 computer software. Knowledge on medication use was measured by a score generated by combining ten variables of knowledge. Association between predictors and knowledge was done by chi square and logistic regression. Up to 70% of the respondents had practiced self-medication with at least one drug during pregnancy.