

## ORIGINAL RESEARCH

# Knowledge of type 2 diabetes mellitus and adherence to management guidelines: a cross-sectional study in Juba, South Sudan

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**Introduction:** In South Sudan, inadequate education and the lack of efficient diabetes care centres compounded by high costs are common barriers for diabetes care.

**Objective:** To assess the level of knowledge and adherence to guidelines for management of type 2 diabetes (T2D) and detect associations between knowledge scores and HbA<sub>1c</sub> levels.

**Method:** A cross-sectional study among 176 participants aged from 20 to 79 years with T2D randomly selected in Malakia Diabetic Clinic, Juba from July to September 2017.

**Results:** The proportions of “poor”, “average”, and “good” scores for knowledge were 58%, 18% and 24%, respectively. Fewer than half of the patients had had retinal check-ups (46.6%), HbA<sub>1c</sub> tests (44.3%), lipid measurements (37.5%), dental examinations (20.5%) and renal function reviews (10.2%) in the last year.

**Conclusion:** There was poor knowledge and low adherence to diabetes management guidelines. This study highlights the significance of educational intervention and implementation of diabetes management guidelines in South Sudan.

**Keywords:** Type 2 diabetes; knowledge; adherence to guidelines; self-management; South Sudan

## INTRODUCTION

South Sudan is one of the world's youngest nations with extreme poverty and poor healthcare provision. Diabetes mellitus (DM) has steadily increased across the country in recent years and currently has a prevalence rate of 11.8%<sup>[1]</sup>.

Diabetes is an expensive disease to treat because of the range of complications which exerts a tremendous economic burden on patients, families, health systems and society as a whole<sup>[2]</sup>. Knowledge of DM and adherence of physicians and patients to management guidelines are crucial for the reduction of complications and improved health outcomes. Management requires clear instruction from both doctors and nurses, and the patients making various life style choices<sup>[3]</sup>.

No studies in the country have specifically examined to what extent the diabetes management guidelines are being followed. This small cross-sectional study evaluated the knowledge of, and adherence to, clinical guidelines of patients with type 2 diabetes (T2D), and detected associated factors.

## METHODOLOGY

This descriptive cross-sectional study design used primary data that were collected from 176 adults with T2D in the Malakia Diabetic Control Centre of Juba City between July and September 2017. A three-part questionnaire was used: Part I consisted of general characteristics of patients, Part II related to knowledge about different aspects of diabetes and general principles of disease care and Part III collected data on patients' self-management of diabetes for annual follow-up criteria as reported in guidelines. The guidelines' criteria were extracted from international guidelines<sup>[4-6]</sup>. The questionnaire about knowledge was developed and adopted from the Michigan Diabetes Training Centre Diabetes Knowledge Test (DKT) as a guide for primary data collection<sup>[7]</sup>.

Data were analysed using Statistical Package for Social Sciences (SPSS) version 24. Descriptive statistics (frequencies and percentages) were used to describe the general characteristics. The level of adherence to criteria, i.e. the number of criteria achieved, was calculated for each criterion in percentage terms. The knowledge scores and HbA<sub>1c</sub> levels were compared with general information

**Table 1. Characteristics of the study subjects (n = 176)**

Characteristic	n	%
<b>Age (years, mean±SD)</b>	52.6±11.1	
<b>Age category</b>		
<40	19	10.7
50 – 40	58	33.0
60 – 51	61	34.7
>60	38	21.6
<b>Gender</b>		
Male	85	48.3
Female	91	51.7
<b>Education level</b>		
No formal education	62	35.2
Primary education	39	22.2
Secondary education	50	28.4
Post-secondary education/degree	25	14.2
<b>Employment status</b>		
Employed	114	64.8
Unemployed	62	35.2
<b>Monthly income (190 South Sudan Pounds (SSP) = 1US\$)</b>		
<SSP 1000	102	58
SSP 2000 – 1001	38	21.6
>SSP 2000	36	20.5
<b>Duration of diabetes (years, mean±SD)</b>	6.9±5.7	
<2 years	30	17
2-5 years	57	32.4
>5 years	89	50.7
<b>Family history of DM</b>		
Present	65	63.1
Absent	111	36.9
<b>Body Mass Index (BMI) (mean±SD)</b>	25.6±5.1	
Underweight: BMI < 18.5	10	5.7
Normal: BMI 18.5 - 25	70	39.8
Overweight: BMI 25 - 30	67	38.1
Obese: BMI ≥ 30	29	16.5
<b>Smoking habit</b>		
Yes	27	15.3
No	149	84.7

variables and management practices using an independent sample t-test and ANOVA. The means and standard deviations were calculated and a p-value of 0.05 or less was considered statistically significant.

## RESULTS

The level of adherence to criteria varied among the study participants. In the past year fewer than half of respondents had had eye examinations 46.6% (n=82), HbA<sub>1c</sub> tests 44.3% (n=78), lipid tests 37.5% (n=66), dental check-ups 20.5% (n=36) and renal check-ups 10.2% (n=18) (Figure 1.A). Almost 40% (n=69) were not using oral anti-diabetic medication or insulin (Figure 1.B). Only 1.7% (n=3) were following physical activity guidelines (Figure 1.C); 30.1% (n=53) were always following the dietary recommendations (Figure 1. D).

Only 78 (44.3%) patients had been tested for HbA<sub>1c</sub> within last four months and only their results were used to compare their adherence to DM management guidelines. The mean HbA<sub>1c</sub> differed significantly according to whether respondents were taking neither oral anti-diabetic medication nor insulin, not undertaking vigorous physical activity and habitually not following diet recommendations. Insulin, 150 minutes/week of exercise and always following diet recommendations for diabetes were significantly associated with lower or normal HbA<sub>1c</sub> values (p < 0.01) (Table 2).

More than 50% of patients showed poor knowledge (58%, n=102), 24% (n=42) expressed good knowledge and 18% (n=32) exhibited moderate knowledge (Figure 2).

The knowledge score was unaffected by the duration of diabetes and family history of diabetes. However, subjects younger than 40 years had significantly higher knowledge scores than those older than 60 years (P =.022). Similarly, subjects with post-secondary education or degrees had significantly higher knowledge scores than those with secondary education or less (P=<0.001). Participants with normal HbA<sub>1c</sub> (6.5) had significantly higher knowledge scores than subjects with HbA<sub>1c</sub> results >6.5 (P=<0.001). (Table 3).

## DISCUSSION

Diabetes is a demanding disease requiring much patient self-management. This study highlights a critical situation in South Sudan, a country without official guidelines for the management of diabetes. Evidence suggests that knowing the facts about diabetes and adherence of patients to guidelines have a significant effect on control of the disease. One of the objectives of this study was to assess the level of knowledge among T2D patient: 58% of whom showed poor knowledge. This was associated with a low level of education among participants. Our study observed that higher educational backgrounds were associated with gradually increasing knowledge scores - a

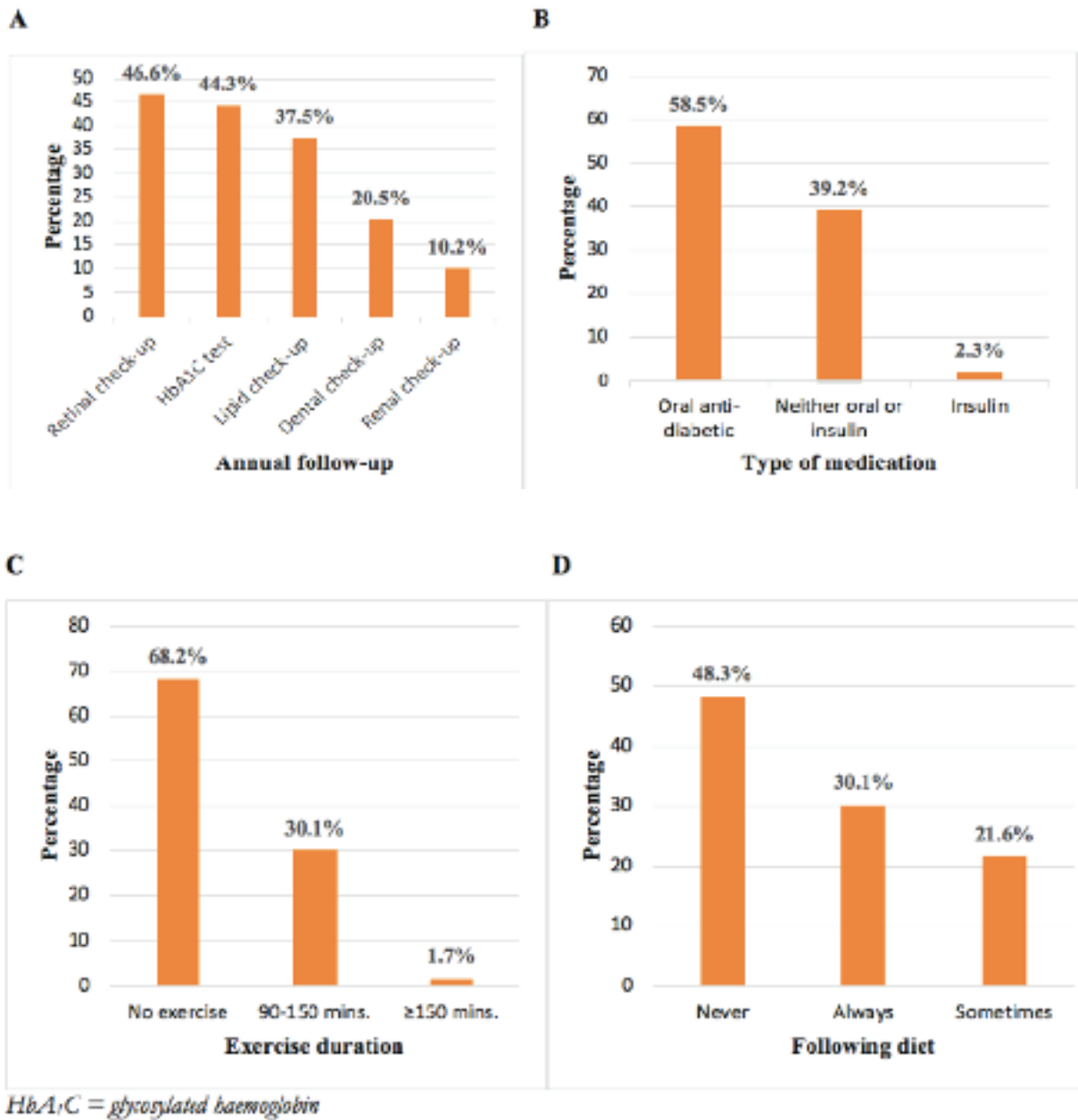


Figure 1. Level of adherence according to the criteria for type 2 diabetes follow-up (% of patients)

finding similar to that from Bangladesh<sup>[8]</sup>. However this is in contrast from a Kenyan report which found very low levels of knowledge (27%)<sup>[9]</sup>. Our study discovered that knowledge was associated with age: age under 40 years was significantly associated with better knowledge regarding diabetes compared to those aged over 40 years. This matches findings from Ethiopia<sup>[10]</sup>. This indicates that older people are at a higher risk and may need targeted programmes for their care.

Concerning the adherence to recognised guidelines we

found 28%, 27%, 46.6%, 10.2% and 20.5% of the patients had had at least one HbA<sub>1c</sub> test, lipid profile, retinal, renal and dental check-up respectively in the last year which agree with previous Sudanese data in 2015: 22.9%, 17%, 9.2% and 14.1%<sup>[11]</sup>.

Recommendations for the frequency of HbA<sub>1c</sub> measurement range from twice to four times annually<sup>[6]</sup>. This study found a strong inverse association between knowledge scores and HbA<sub>1c</sub> levels; the HbA<sub>1c</sub> level was lower with each one-unit increase in knowledge score.

**Table 2. HbA<sub>1c</sub> level in patients with different medication, diet and exercise (78 patients)**

Characteristic	Category	HbA <sub>1c</sub> level (mean±SD)	P
Diabetes medication	Oral anti-diabetic (n=22)	6.47±2.89 <sup>b</sup>	<0.01
	Insulin (n=4)	5.90±3.14 <sup>c</sup>	
	Neither oral nor insulin (52)	12.22±3.14 <sup>a</sup>	
Following diet recommendations	Always (n=22)	6.20±2.82 <sup>c</sup>	<0.01
	Sometimes (n=15)	8.87±2.87 <sup>b</sup>	
	Never (n=41)	10.93±2.69 <sup>a</sup>	
Exercise duration/week	No exercise (n=69)	10.42±2.88 <sup>a</sup>	<0.01
	90-120 min./wk. (n=8)	9.67±2.40 <sup>a</sup>	
	≥150 min./wk. (n=1)	5.20±0.00 <sup>b</sup>	

\* Note: different letters (a, b or c) indicate statistical significance ( $P < 0.05$ ) among groups. SD=standard deviation.

Almost 50% of respondents were not following diet recommendations. Also, the finding of a statistically significant association between HbA<sub>1c</sub> levels and diet for T2D is as predicted.

This study found that patients who undertook vigorous activity had normal HbA<sub>1c</sub> levels compared to patients who undertook no physical activity, which was inconsistent with Bouléet et al [12]. Physical activity has the greatest effect to minimize diabetes complications and reducing weight. Our study suggested some barriers to exercise adherence such as lack of motivation and convenience and weather. Another barrier is that South Sudanese adult population are less inclined to engage in physical activity.

## CONCLUSION

Knowledge about diabetes mellitus and adherence to guidelines and recommendations are important drivers for controlling the disease and reducing risks of complications and death. Thus, this study emphasises the importance of implementation of guidelines in South Sudan and education of communities and physicians, with a view to improved management of the disease.

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**Conflict of interest:** The authors declare that there is no conflict of interest.

1. Akway M, Maker M, Dhel N, Yohanis R, Makuach G, Ohide P. et al. What is the Prevalence

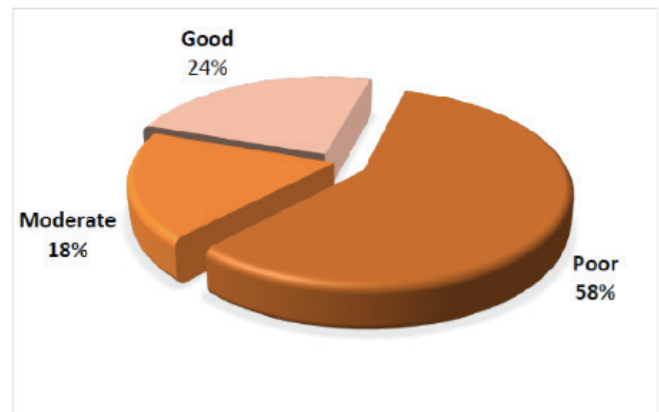


Figure 2. Distribution of participants according to their levels of knowledge of diabetes

of Diabetes Mellitus In Juba City, South Sudan. Journal of Health Sciences and Nursing 2017; 2(12): 1-6.

- World Health Organization. Global status report on noncommunicable diseases 2014. World Health Organization, Geneva, Switzerland 2014.
- Archana G, Neeraj K, Parameswarappa S. Clinical assessment of dietary interventions and lifestyle modifications in Madhumeha. Ayu 2014; 35(4): 391-397.
- World Health Organization, Regional Office for Eastern Mediterranean: Prevention and management of diabetes.
- International Diabetes Federation: Global Guidelines for Type 2 Diabetes.

**Table 3. Knowledge scores of the study participants according to different variables**

Characteristic	Category	Knowledge score (mean±SD)	P
Age	<40 years (n=19)	8.47±3.72 <sup>a</sup>	.022
	40 – 50 years (n=58)	3.72±3.59 <sup>c</sup>	
	51 – 60 years (n=61)	4.84±3.63 <sup>b</sup>	
	>60 years (n=38)	3.84±3.71 <sup>c</sup>	
HbA <sub>1c</sub>	≤6.5	9.43±3.86 <sup>a</sup>	<0.01
	>6.5	4.30±3.54 <sup>b</sup>	
Education level	No formal (n=62)	1.68±2.25 <sup>d</sup>	<0.01
	Primary (n=39)	3.23±3.09 <sup>c</sup>	
	Secondary (n=50)	6.38±3.0 <sup>b</sup>	
	Post-sec./degree (n=25)	9.24±.53 <sup>a</sup>	
Duration of diabetes	<2 years (n=30)	4.70±3.89	.911
	2–5 years (n=57)	4.37± 3.71	
	>5 years (n=89)	4.38±3.75	
Family history of diabetes	Present (n=65)	4.77±3.78	.358
	Absent (n=111)	4.23±3.70	

\* Note: different letters (a, b or c) indicate statistical significance (P<0.05) among groups. SD=standard deviation.

6. American Diabetes Association: Standards of Medical Care in Diabetes. *Diabetes Care*, 2017. vol. 40. ISSN 0149-5992.
7. University of Michigan. Michigan Diabetes Research Center, University of Michigan Health System. Tools for Health Professionals
8. Hasina A, Kniz F, Sharmin H, Khurshid N, Tahmina K, Jesmin A. Knowledge and self-care practice regarding diabetes among type 2 diabetics: experience from non-profit hospital chain in Bangladesh. *Intl J Diab Dev Countries* 2017; 1-8.
9. Maina K, Zachary N, Eva N, Eva M. Knowledge, attitude and practices related to diabetes among community members in four province in Kenya: a cross-sectional study. *Pan Afr Med J* 2010; 7(2):2.
10. Tefera K, Hailay G, Lillian M, Tesfahun E. Diabetes related knowledge, self-care behaviours and adherence to medications among diabetic patients in Southwest Ethiopia: a cross-sectional survey. *BMC Endocr Disord* 2016; 16(1): 28.
11. Mazin E. Assessment of Type 2 Diabetes management practice: A study in public hospitals outpatient clinics, Khartoum and Gezira, Sudan 2015. Thesis
12. Boulé NG, Haddad E, Kenny GP, Wells GA, Sigal RJ. Effects of exercise on glycemic control and body mass in type 2 diabetes mellitus: a meta-analysis of controlled clinical trials. *JAMA* 2001; 268(10):1218-27.