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## Brief Report

# Self-monitoring of blood glucose (SMBG) and glycaemic control in Cameroon: Results of the International Diabetes Management Practices Study (IDMPS)



Jean Claude Mbanya<sup>a,b,\*</sup>, Pablo Aschner<sup>c</sup>, Juliana C.N. Chan<sup>d</sup>, Juan Jose Gagliardino<sup>e</sup>, Jude Saji<sup>a</sup>

<sup>a</sup> Faculty of Medicine and Biomedical Sciences and Laboratory for Molecular Medicine and Metabolism, The Biotechnology Centre, University of Yaoundé 1, Yaoundé, Cameroon

<sup>b</sup> Health of Population in Transition Medical Research Group, P.O. Box 8046, Yaoundé, Cameroon

<sup>c</sup> Endocrinology Unit, Javeriana University, Bogotá, Colombia

<sup>d</sup> Department of Medicine and Therapeutics, Chinese University of Hong Kong, Prince of Wales Hospital, Hong Kong, China

<sup>e</sup> Center of Experimental and Applied Endocrinology, National Scientific and Technical Research Council, Pan American Health Organization/World Health Organization Collaborating Centre for Diabetes, School of Medicine, National University of La Plata, La Plata, Argentina

## ARTICLE INFO

### Article history:

Accepted 15 November 2016

Available online 17 February 2017

### Keywords:

Africa South of the Sahara

Type 1 diabetes

Type 2 diabetes

HbA1c

Blood glucose self-monitoring

## ABSTRACT

This study examined the relationship between self-monitoring of blood glucose (SMBG) and glycaemic control among patients from Cameroon. A minority of patients with diabetes owned a blood glucose meter; of these patients, most performed SMBG inconsistently. The lack of SMBG may be a contributing factor to the poor glycaemic control in the country.

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## 1. Introduction

Self-monitoring of blood glucose (SMBG) provides timely information to patients with diabetes about their glycaemic

control. Both patients with type 1 (T1DM) and type 2 diabetes mellitus (T2DM) treated with insulin rely on SMBG for guidance to adjust insulin doses to achieve desired glucose levels without hypoglycaemia. In patients with T2DM not taking

\* Corresponding author at: Faculty of Medicine and Biomedical Sciences and Laboratory for Molecular Medicine and Metabolism, The Biotechnology Centre, University of Yaoundé 1, Yaoundé, Cameroon.

E-mail addresses: [jcmbanya@yahoo.co.uk](mailto:jcmbanya@yahoo.co.uk) (J. Claude Mbanya), [paschner@cable.net.co](mailto:paschner@cable.net.co) (P. Aschner), [jchan@cuhk.edu.hk](mailto:jchan@cuhk.edu.hk) (J.C.N. Chan), [cenexaar@yahoo.com.ar](mailto:cenexaar@yahoo.com.ar) (J. Jose Gagliardino), [judesaji@yahoo.com](mailto:judesaji@yahoo.com) (J. Saji).

<http://dx.doi.org/10.1016/j.diabres.2016.11.029>

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**Table 1 – Self-management of blood glucose in patients with type 1 (T1DM) and type 2 (T2DM) in Cameroon.**

	T1DM N = 38	T2DM N = 524	Total N = 562
Ownership of glucose meter			
Yes	14 (36.8)	204 (38.9)	218 (38.8)
Of those owning a glucose meter:			
N	14	203 <sup>a</sup>	217 <sup>a</sup>
Number performing SMBG <sup>b</sup>	13 (92.9)	177 (87.2)	190 (87.6)
Of those performing SMBG:			
Number of SMBG tests per day <sup>b</sup>			
N	10	164	174
Mean (SD)	1.60 (0.84)	1.07 (0.53)	1.10 (0.56)
Time of SMBG test <sup>b,c,d</sup>			
N	13	177	190
At all meals	1 (7.7)	3 (1.7)	4 (2.1)
At some meals (breakfast or lunch or dinner)	12 (92.3)	168 (94.9)	180 (94.7)
At bed time	0 (0.0)	2 (1.1)	2 (1.1)
Unknown	0 (0.0)	5 (2.8)	5 (2.6)
Frequency of SMBG testing <sup>b</sup>			
N	13	177	190
Every day	3 (23.1)	40 (22.6)	43 (22.6)
Occasionally	8 (61.5)	118 (66.7)	126 (66.3)
Very occasionally	2 (15.4)	17 (9.6)	19 (10.0)
Only very occasionally	0 (0.0)	2 (1.1)	2 (1.1)
Is the cost of strips a limiting factor for regular SMBG? <sup>b</sup>			
N	12	192	204
Yes	9 (75.0)	138 (71.9)	147 (72.1)

The figures represent n (%) unless otherwise stated. Variations in 'n' values are due to missing data for certain parameters. N: number of patients; SD: standard deviation; SMBG: self-monitoring of blood glucose; T1DM: type 1 diabetes mellitus; T2DM: type 2 diabetes mellitus.

<sup>a</sup> Data missing for one patient.

<sup>b</sup> Only includes patients who owned a blood glucose meter.

<sup>c</sup> Patients could have more than one time.

<sup>d</sup> A patient may have tested several times.

insulin, SMBG can also promote self-management [1,2]. Meta-analyses have reported moderate but statistically significant improvements in glycosylated haemoglobin (HbA1c) levels in patients who performed SMBG compared with those who did not [3–5].

Despite the known benefits, encouraging SMBG is a major healthcare challenge in developing countries such as Cameroon, where patients often have suboptimal glycaemic control [6] and poor access to and affordability of medications and tests, including HbA1c testing [6,7]. These non-medical factors place African people with diabetes at a disadvantage compared with their counterparts in developed countries, potentially leading to an increased risk of complications, poorer quality of life and increased health care costs [8,9].

The International Diabetes Management Practices Study (IDMPS) is a fact-finding survey designed to document the pattern of care and identify any gaps in the management of patients with T1DM or T2DM from over 50 developing countries, in order to inform policies and practices. This report examines the SMBG practices and its association with glycaemic control in a sub-sample of patients from Cameroon.

## 2. Methods

### 2.1. Study design and patients

The IDMPS is an ongoing, international, observational study conducted in Africa, the Middle East, Latin America, Eastern Europe, and Asia. The design of the IDMPS has already been described [10]. Data in this report were obtained from participants based in Cameroon who were included in wave 5 of the IDMPS, conducted in 2011. Male and female adult patients aged  $\geq 18$  years with T1DM or T2DM, diagnosed according to the 2007 American Diabetes Association criteria [11], were included.

### 2.2. Data collection and statistical analysis

Data were collected using case report forms, which were completed for each patient by a physician. The form included questions pertaining to participants' demographic profiles and diabetes-relevant medical history, including HbA1c control, utilisation of SMBG and self-adjustment of insulin. In

**Table 2 – Glycaemic control in patients with type 1 (T1DM) and type 2 (T2DM) in Cameroon.**

Characteristic	T1DM N = 38	T2DM N = 524	Total N = 562
Previous HbA1c testing			
N	33	448	481
Yes	18 (54.5)	332 (74.1)	350 (72.8)
If yes:			
Frequency of tests for HbA1c during previous year			
N	18	310	328
0	0 (0.0)	28 (9.0)	28 (8.5)
1	15 (83.3)	238 (76.8)	253 (77.1)
2	1 (5.6)	35 (11.3)	36 (11.0)
3	2 (11.1)	6 (1.9)	8 (2.4)
4	0 (0.0)	3 (1.0)	3 (0.9)
Last measured value of HbA1c level			
N	18	322	340
Mean (SD) HbA1c, %	9.21 (2.94)	8.98 (2.98)	9.00 (2.98)
HbA1c < 7%	3 (16.7)	91 (28.3)	94 (27.6)
HbA1c ≥ 7%	15 (83.3)	231 (71.7)	246 (72.4)
HbA1c value according to the target value considered appropriate by the physician			
N	18	322	340
HbA1c < target value	2 (11.1)	75 (23.3)	77 (22.6)
HbA1c ≥ target value	16 (88.9)	247 (76.7)	263 (77.4)

Values are n (%). Variations in 'n' values are due to missing data for certain parameters. HbA1c: glycosylated haemoglobin; N: number of patients; T1DM: type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

this analysis, self-management was defined as patients who performed both SMBG and self-adjustment of insulin.

Qualitative data for the eligible patient population were summarised in frequency tables, and quantitative data were summarised using descriptive statistics. The relationship between glycaemic control and self-management was assessed using Fisher's exact test. A *p*-value of <0.05 was considered statistically significant.

### 3. Results

#### 3.1. Study population

Among the 567 patients recruited for the study within Cameroon, 562 met the inclusion criteria (38 patients with T1DM; 524 patients with T2DM). The majority of patients (69.9%) were aged between 40 and 65 years (mean ± standard deviation [SD] 56.4 ± 12.0 years), and resided in urban areas (79.2%). All patients with T1DM and 183 patients with T2DM were treated with insulin, either alone (*n* = 114; 20.3%) or in combination with at least one oral glucose-lowering drug (OGLD; *n* = 69; 12.3%).

#### 3.2. Self-monitoring of blood glucose (SMBG)

Less than half of the patients owned a glucose meter (36.8% T1DM; 38.9% T2DM) and 87.6% of those who owned a meter performed SMBG (Table 1). Among the patients who performed SMBG, 66.3% performed SMBG 'occasionally' and only 22.6% performed SMBG daily. The cost of blood glucose strips was considered a major barrier for performing regular SMBG by most patients (72.1%).

#### 3.3. HbA1c testing

Among the 340 patients with an available HbA1c measurement, 72.4% had HbA1c levels ≥7% (Table 2). According to the individual HbA1c targets considered appropriate by the treating physicians (which might be higher or lower than 7%), 77.4% of patients did not achieve their treatment target.

#### 3.4. Relationship between self-management and attainment of HbA1c targets in patients with T2DM

Among 181 insulin-treated T2DM patients with available data, only 22 (12.2%) were performing self-management. The association between attainment of HbA1c target (<7%) and self-management was significant in T2DM patients treated with insulin alone (*n* = 14, *p* = 0.043) but not in those treated with insulin and at least one OGLD (*n* = 8, *p* = 0.465).

### 4. Discussion

In Cameroon, both T1DM and T2DM patients performed SMBG infrequently (mainly due to economic constraints) and glycaemic control was sub-optimal. There is evidence supporting the principle that SMBG, when followed-up with appropriate interpretation of the results, can empower patients and promote self-management [1,2]. There are also positive associations between frequency of SMBG and degree of glucose control in both T1DM [12] and T2DM [13,14], including patients not treated with insulin [15]. In this study less than half of the patients from Cameroon owned a glucose meter. Even among those who did own a meter, more than three-quarters (77.4%) did not achieve the individual treat-

ment targets set by their physicians. In other regions involved in the IDMPS (Asia, Eastern Europe and Latin America), 36.4% of T2DM patients achieved HbA1c <7% [10], whereas only 28.3% of patients in Cameroon reached this target. The infrequent SMBG testing with limited patient involvement might be a contributing factor to the suboptimal glycaemic control in Cameroon.

This analysis provides useful information to decision makers regarding the current status of diabetes care in developing countries such as Cameroon. Of note, there was a statistically significant relationship demonstrating that T2DM patients treated with insulin and who performed self-management were more likely to attain HbA1c <7%. Although this finding should be interpreted with caution due to the small sample size, it highlights the importance of SMBG and is supported by previous findings from three meta-analyses [3–5].

In conclusion, there is low engagement with SMBG and suboptimal glycaemic control in patients with diabetes in Cameroon. This is partly due to poor access to glucose meters and financial constraints preventing more frequent performance of SMBG. Given the importance of self-management in improving glycaemic control, there is a need to educate payers, healthcare providers and patients in order to advocate for better access to and affordability of self-management tools and patient education.

### Funding

The International Diabetes Management Practices Study (IDMPS) was funded by Sanofi, Sanofi study number DIREED\_R\_05941.

### Conflicts of interest

Jean Claude Mbanya, Pablo Aschner, Juliana Chan and Juan Jose Gagliardino are members of the steering committee of the IDMPS and have received honoraria and travelling sponsorships from Sanofi in relation to the IDMPS. Jean Claude Mbanya is the Director and Jude Saji is a researcher of the Health of Populations in Transition Research Group.

### Acknowledgements

The authors would like to acknowledge the involvement of the IDMPS steering committee, and the study investigators from Cameroon (Caroline Akombum, Narcisse Ateba, Vanessa Balla, RenéMouliomNijkam, MesminDehayemYefou, Marielle EpackaEwane Lobe, Alain Lambert KamgangFogoum, Denia-Kamwa, Monique Kenfack, IrèneKounaTsala, Pierre Lowe, Mani Maka, Nadia Mandeng, Noël Mbango, Elaine Ngassam, Ivan NkengAtteh, EugèneSobngwi, Yacoubou Tena and Joseph Zekou).

Editorial support in the form of suggestions to all drafts of the article, copyediting, and referencing was provided by Laura Maguire, MChem (Zoetic Science, Macclesfield, UK), and was funded by Sanofi.

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