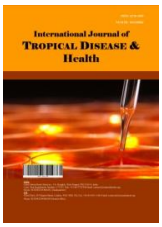

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Socio-demographic, Economic and Health Profile of Diabetic Patients Attending Some Primary Care Units in the City of Bukavu, Democratic Republic of Congo

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Authors' contributions

All authors listed have made a substantial, direct and intellectual contribution to the work. Authors OMA and ZNR developed the protocol, conducted collection and analyzed of data. Author OMA wrote the final manuscript in collaboration of the others authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Diabetes is a serious health problem; its prevalence is increasing in developing countries. This study aims to describe the socio-demographic, economic and health profile of diabetics attending the primary care units for the management of diabetes mellitus (DM).
Methods: We carried out a cross-sectional study in 2019 on 257 diabetics in seven primary care units (Maendeleo, Funu, Uzima, CBCA-Nyamugo, 8th Cepac-Buholo, Lumu and Charles-Mbogha).To collect the data, we used the survey questionnaire, medical tools and documents;

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anthropometric tools and statement of the prices (for drugs, laboratory exams and public transport).
Results: Most of respondents were female (79.4%), aged ≥ 45 years old (90.27%), with a level of study below secondary education (63.0), without paid employment (71.1 %) with a monthly income < $ 37.5 US (59.92%). Most of them had type-2 diabetes mellitus (93.3%). With family history (48.25%) and comorbidities (hypertension and stroke). All participants were on medication (77.0% on oral glucose-lowering drugs). Once a week glycemic control was assessed in six primary care units, we noted hyperglycemia in the majority of female 68.5% (OR = 2.25; P = 0.02); aged 55 or older 54.9% (OR = 2.62; P = 0.02), not respecting the diet 45.5% (OR = 2.09; P = 0.04) and ate the family meal on a common plate 40.5% (OR = 2.32; P = 0.007). Their monthly expenses covered the assessment of fasting blood sugar, medication, and food purchases. Body Mass Index has represented the increased (31.5% with overweight) and high (23.8% with obesity) disease risk. The waist circumference represented the abdominal obesity mainly in women.
Conclusion: Diabetes is an economic and health burden for the patient, family and community. Primary care units lacked human, material and financial resources to care for diabetics.

Keywords: Profile; socio-demographic; economic; health; diabetes; care; primary unit; Bukavu.

1. INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder, characterized by chronic hyperglycemia with altered carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both [1]. Hyperglycemia, the common characteristic of both type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), is at origin of several chronic and serious complications [2]. Diabetes mellitus (DM) confers about a two-fold excess risk for a wide range of vascular diseases, independently from other conventional risk factors [3]. T2DM is associated with increased risk of cardiovascular diseases (NCDs) and premature mortality [4]. Globally, in the year 2015, 415 million (215.2 million men and 199.5 million women) people had DM with a prevalence of 8.8%. In other words, one in eleven people have DM [5]. The incidence of diabetes is continuously increasing at an alarming rate, partly due to environmental factors and lifestyle changes [6]. DM is thus a major economic and public health issue in emerging countries [7]; the high prevalence of DM and its risk factors in Africa, limited access to modern medicines. 14 million people were suffering of DM in Africa in 2015 and are projected to reach 34 million in 2040. Endocrine, nutritional and metabolic diseases represent 7.9% of deaths in Democratic Republic of Congo (DR Congo) [8]. Currently there are about 1.7 million cases suffering from DM in DR Congo [9], ranking fourth in the top ten countries by diabetes cases in Africa [10].

Reducing the burden of DM requires increased control of blood sugar levels and better diagnosis and treatment of high blood pressure and high cholesterol [11]. There is significant progress in the medical treatment of DM; but this treatment is still chronic, not affordable, and high expensive [12]. Glycosuria and fasting plasma glucose are still the most tests available in villages and many cities in the interior of the country to manage DM.

The aim of this study is to present the socio-demographic, economic and health profile of diabetic patients attending some primary care units (PCU) of the city of Bukavu in the management of diabetes mellitus.

2. METHODS

2.1 Study Design and Sample

We conducted a cross-sectional study during the period from March to June 2019, in seven Primary Care Units (PCU) located in Bukavu city, South-Kivu, in DR Congo.

The study population consists of diabetic patients (type 1 and 2) attending the structures concerned.

All the diabetics who were cared for in the seven structures and who attended those structures during the period of our study made up our sample (Table 1). We proceeded by a non-probability sampling of convenience

2.2 Data Collection Methods and Tools

2.2.1 Questionnaire-based interview

We proceeded through the interview via the survey questionnaire administered directly to the participants who knew how to read and write

French language; and indirectly administered for those who could not read or write. We thus collected socio-demographic data (age, sex, marital status, profession, religion, level of education, household size); Socioeconomic (type of profession, monthly income, possession of blood pressure monitor, glucometer); Health (age of patients, family history of the disease, complications); lifestyle (smoking, alcohol consumption and physical activity) and nutritional (habit and diet).

Table 1. Sample of diabetic patients attending the seven health care units

N°	Name of the PCU	Number of Diabetic patient	Percentage
1	Charles-Mbogha	102	39.69
2	Cimpunda	50	19.46
3	8th CEPAC	33	12.84
4	CBCA-Nyamugo	29	11.28
5	Lumu	20	7.78
6	Funu	20	7.78
7	Uzima	3	1.17
Total		257	100.00

2.2.2 Statement of price

The price list for medical examinations and drugs have been obtained from pharmacies, while the price for public transport was obtained from Bukavu town hall.

All costs have been expressed in United State Dollars ($) at the exchange rate of 1600 Congolese francs (CF) for $ 1 US.

2.2.3 The of anthropometric evaluation

The scale allowed us to assess the weight (in Kg); the portable height rod allowed us to measure the height in standing position expressed in meters; the tape measure allowed us to measure the waist in length and the waist circumference.

The evaluation of weight and height was important to calculate the Body Mass Index (BMI) (weight in Kilograms (Kg) divided by the square of the respondent's height in meters) and allowed us to estimate the corpulence of participant. The standard weight status categories associated with BMI ($Kg.m^{-2}$) ranges for adults were as follow: <18.5 (Underweight), 18.5 to 24.9 (Normal or healthy weight), 25.0 to 29.9 (Overweight) and ≥30.0 (Obese) [13].

The waist circumference allowed us to assess abdominal obesity (placed just under the last rib at the end of an exhalation, without exerting pressure on the skin; then we noted the value obtained). The standard categories associated with abdominal obesity according to waist circumference (cm) ranges for adults were as follows: ≥88 cm in women and ≥ 102 cm in men [13].

2.2.4 Glycemic control

- Fasting glucose level has been assessed using a glucometer.
- (70-110 mg/dl): a fasting capillary plasma glucose levels < 6.0 mmol/l (roughly 110 mg/dl) Plasma glucose targets have been considered to predict a glycated hemoglobin (HbA1c) <7% (53 mmol/mol) [14].

2.3 Data Analysis

Data analysis was done using MS Excel 2013 and Epi-Info software, version 7.1.5.2 2015 [15]. The level of significance has been accepted with $P < 0.05$, at confidence interval (CI) of 95%.

The odds ratio (OR) was used to determine whether a particular exposure is a risk factor for the development of complications according to the International Diabetes Federation (IDF) glycemic control target [14].

"OR=1" the exposure does not affect the chances of result, "OR>1" the exposure is associated with a higher probability of result and "OR<1" the exposure associated with a less chance of result [16].

3. RESULTS

3.1 Sociodemographic

The majority of participants were over the 45 years old (90.27%) with the mean age of the 60.0± 12.5 years, female (79.4%), married (56.0%), and had a level of study below secondary education (63.0) and their household made up of more than six people (73.2%) (Fig. 1)

3.2 Socioeconomic Profile

3.2.1 Distribution of respondents according to socio-economic profile

They were without paid employment (71.1%) with the monthly income less than $ 37.5 US (59.92%) and the family covered heath and miscellaneous costs (57.98%).

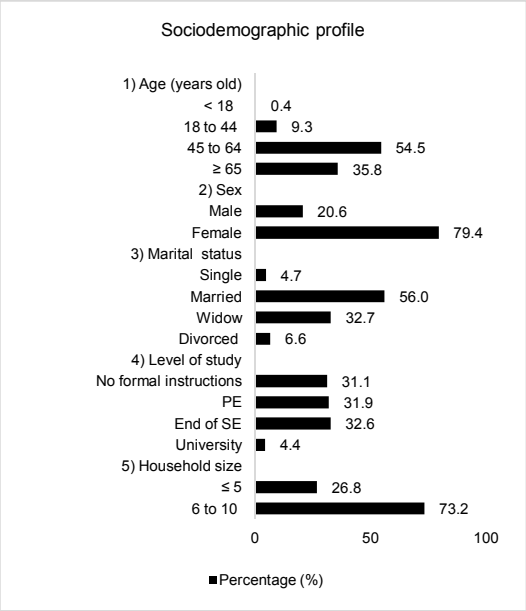

Fig. 1. Distribution of respondents according to socio-demographic profile

PE: Primary Education; SE: Secondary Education

Regarding diabetes self-management equipment, only 13.2% had the blood pressure monitor, 19.5% had a glucometer and 7.0% had both (Fig. 2)

3.2.2 Assessment of the direct costs of monthly care

We found that the majority of diabetic patients spent around $4-6 US on glycemic control (88.0%), $7-10 US for glycemic control and urine control (12.0%), $15 US for oral antidiabetic drugs (77.0%) and $31-56 US for insulin (16.4%).

The majority of respondents had spent around US $100 US and over for the monthly hospital costs (16.6%); the spent for diet was $150 US or less (65.0%) and $5 US for the transport costs (Table 2).

3.3 Health Profile

3.3.1 Health characteristics of respondents

All the participants were diabetic, mostly type 2 (93.39%) with a mean duration of diabetes was 7.3 ± 6.7 years. They were hypertensive (25.3%), had previously suffered a stroke (6.6%) and have a family history of diabetes (48.25%). All participants were under medication (77.0% on glucose-lowering drugs only) (Fig. 3).

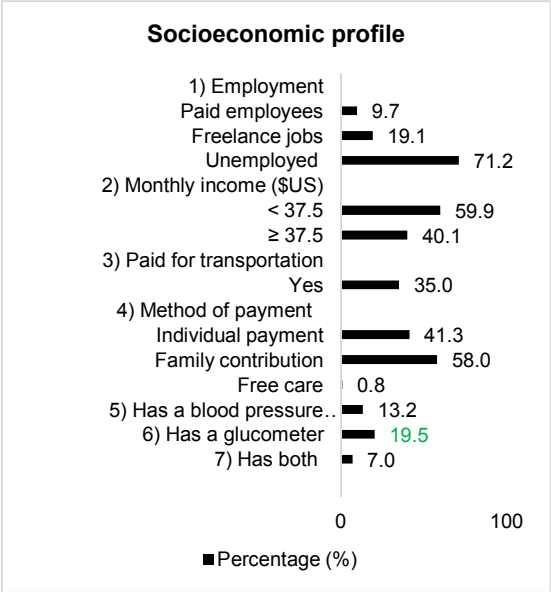

Fig. 2. Distribution of respondents according to socio-economic profile

The care activities for diabetic patients were carried out once a week in six primary care units (85.7%) and twice in one (Charles-Mbogha) (14.3%).

Health and nutrition education were offered free of charge by the nurse for 30 minutes a week, followed by glycemic control ($1 US) and blood pressure control (free). Urinary (12%), eye (15.6%) and foot (24.5%) checkups were performed at the participant's request (Fig. 4).

3.3.2 Anthropometric assessment and glycemic control

The Body Mass Index (BMI) revealed 6.6% of under-weight among the participant, but the majority of participants (55.3%) were either overweight (31.5%) or obese (23.8%). We evaluated an abdominal obesity in 45.2% of the participants including 44.0% of women and 1.2% of men (Table 3).

3.3.3 Lifestyle and diets

We found that no participants smoked, the minority consumed alcohol (31.5%). The majority

Table 2. Assessment of the direct costs of monthly care

Variables	Costs ($US)	Number of respondents (n=257)	Percentage (%)
1 Biological examinations carried out			
Fasting blood sugar	4-6	226	88.0
Blood glucose and urine test	7-10	31	12.0
2 Monthly cost of drugs			
Oral Glucose-Lowering Drugs (OGLD)	≤ 15	198	77.0
Insulin and OGLD	16-30	17	6.6
Insulin	31-56	42	16.4
3 Monthly cost of hospitalization			
Once	≤ 100	32	12.5
Twice	101-200	5	1.9
Three or more times per moth	> 200	6	2.3
4 Monthly cost of diet			
Carbohydrates, fats, proteins, vitamins and minerals	≤ 150	167	65.0
Carbohydrates, fats, proteins, vitamins and minerals	>150	90	35.0
5 Monthly cost of transport			
Have paid for transport	≤ 5	90	35.0

respected walking for at least an hour in duration per day (87.5%) and respected the diet (58.0%) (Table 4).

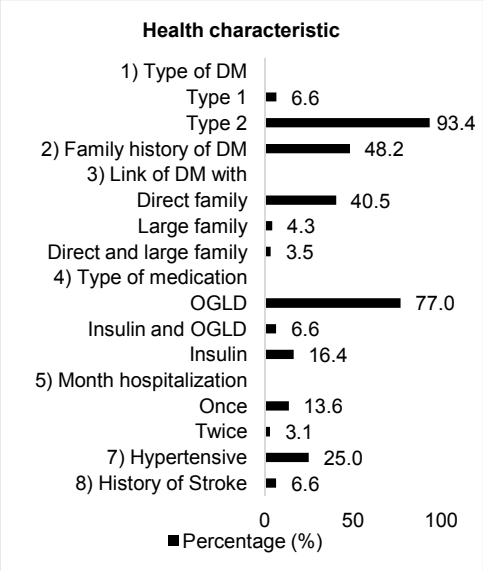

Fig. 3. Distribution of respondents according to health characteristic

OGLD: Oral Glucose-Lowering Drugs DM: diabetes mellitus

3.3.4 Analysis of data according to the glycemic target

Glycemic control revealed that 83.66% of the participants had not reached the glycemic targets (70 and 110 mg / dl) of the International Diabetes Federation (IDF). Regarding a fasting capillary blood glucose, hyperglycemia was revealed mainly in female participants (OR = 2.25; p = 0.026); in participants aged 55 or less (OR = 2.62; p = 0.023); not respecting the diet (OR = 2.09; p = 0.041) and taking the family meal on a common plate (OR = 2.34; p = 0.018).

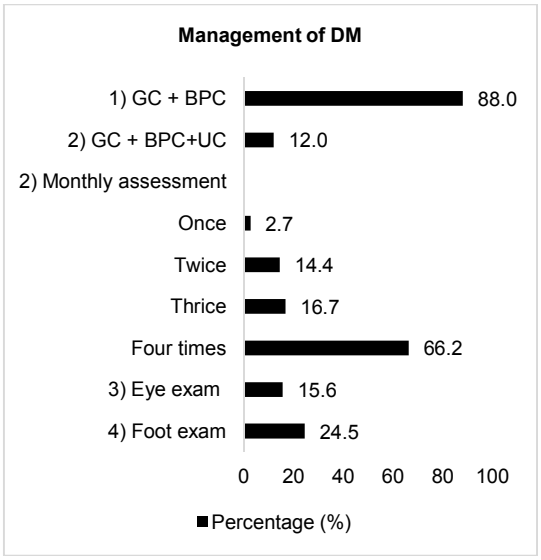

Fig. 4. Distribution of respondent according to management of diabetes

GC: Glycemic Control BPC: Control of blood pressure UC: Urine Control

Table 3. Distribution of respondents according to the anthropometric assessment and glycemic control

Category	Number of respondents (n=257)	Percentage (%)
1 Anthropometric assessment		
1.1 Body Mass Index (BMI)		
Underweight	17	6.6
Normal	98	38.1
Overweight	81	31.5
Obesity	61	23.8
1.2 Waist circumference		
1.2.1 Abdominal obesity in women		
Yes	113	44.0
No	91	35.4
1.2.2 Abdominal obesity in men		
Yes	3	1.2
No	50	19.5
2 Fasting blood glucose assessment		
≥ 110 mg/dL	198	77.0
< 110 (mg/dL)	59	23.0

Table 4. Distribution of respondents according to the lifestyle and diets

Category	Number of respondents (n=257)	Percentage (%)
1 Lifestyle of diabetic patients		
3.1 Tobacco consumption		
No	257	100
3.2 Alcohol consumption		
Yes	81	31.5
No	176	68.5
3.3 Respect for the hour-long walk a day		
Yes	225	87.5
No	32	12.5
2 Diets		
2.1 Respect for diet		
Yes	149	58
No	108	42
2.2 Family meal on a common plate		
Yes	113	44.0
No	144	56.0

They were all on medication: oral lowering-glucose drugs (OLGD) (77.0%), insulin (16.4%), Insulin and OLGD (6.6%). In the last 30 days preceding our study, 16.7% of participants have been hospitalized at least once in a higher-level health facility (Table 5).

4. DISCUSSION

Type-2 diabetes and age greater than or equal to 45 years characterize our respondents. These results are close to those obtained in a rural block in India by Jangra et al.[17], where the prevalence was highest (26.0%) among 55-64years age group. The age and living in an urban environment were appeared to be major determinants of diabetes mellitus in South-Kivu, in the DR Congo [18]. Epidemiological studies shown an increase in the prevalence of diabetes with age up to 75 years [19]; as well as a gradual increase in morbidity between 30 and 49 years then stabilized between 50 and 69 years [20], [21]. Similarly, previous investigations reported increased prevalence of diabetes with increasing age [22,23]. The rural exodus as well as the epidemiological transition contribute to the increase in the prevalence of type-2 diabetes [24]. We noted a predominance of the female sex characterized by the body mass index higher than normal (overweight and obesity). It was observed an association between overweight or obesity body mass index and

Table 5. Characteristics of participants according to the glycemic target

Category	≥ 110 mg/dL		< 110 mg/dL		Total		OR (95% CI)	P
	n	(%)	n	(%)	n	(%)		
1) Gender								
Male	36	(14.0)	17	(6.6)	53	(20.6)		
Female	162	(63.0)	42	(16.3)	204	(79.4)	1.81(0.91-3.53)	0.07**
2) Age (in years old)								
≤55	69	(26.8)	12	(4.7)	81	(31.5)	2.09(1.05-4.35)	0.03*
>55	129	(50.2)	47	(18.3)	176	(68.5)		
3) Level of study								
Less than secondary education	119	(46.3)	43	(16.7)	162	(63.0)		
End of secondary education and more	79	(30.7)	16	(6.2)	95	(37.0)	1.83(1.97-3.48)	0.05**
Monthly income (In USD)								
< 37.5	118	(45.9)	36	(14.0)	154	(59.9)		
≥37.5	80	(31.1)	23	(8.9)	103	(40.1)	1.06(1.58-1.92)	0.84***
4) Body mass index (BMI)								
Underweight	16	(6.2)	1	(0.4)	17	(6.6)		
Normal	70	(27.2)	28	(10.9)	98	(38.1)		
Overweight	61	(23.7)	20	(7.8)	81	(31.5)		
Obesity	51	(19.8)	10	(3.9)	61	(23.7)	1.65(0.91-2.98)	0.093**
5) Waist circumference								
Abdominal obesity								
No	108	(42.0)	33	(12.8)	141	(54.9)		
Yes	90	(35.0)	26	(10.1)	116	(45.1)	1.05(0.58-1.91)	0.85***
6) Has a glucometer								
Yes	38	(14.8	12	(4.7)	50	(19.5)		
No	160	(62.3)	47	(18.3)	207	(80.5)	1.07(0.52-2.22)	0.84***
7) Has a blood pressure monitor								
Yes	25	(9.7)	9	(3.5)	34	(13.2)		
No	173	(67.3)	50	(19.5)	223	(86.8)	1.24(0,54-2.84)	0.60**
8) Respected the diet								
Yes	107	(41.6)	42	(16.3)	149	(58.0)		
No	91	(35.4)	17	(6.6)	108	(42.0)	2.10(1.12-3.94)	0.019*
9) Eat with the family on a common plate								
Yes	96	(37.4)	17	(6.6)	113	(44.0)	2.32 (1.24-4.43)	0.007*
No	102	(39.7)	42	(16.3)	144	(56.0)		

**Exposure affects the chances (OR> 1) of blood sugar levels equal to 110 mg/dL and above with statistical significance (P <0.05)*

***Exposure affects the chances (OR> 1) of blood sugar levels equal to 110 mg/dL and above without statistical significance (P>0.05)*

****Exposure doesn't affect the chances (OR =1) of blood sugar levels equal to 110 mg/dL and above*

diabetes 2 [25]. The different lifestyle between the two sexes can contribute to the difference in risk of developing diabetes mellitus; thus leading to the difference in prevalence [26]. In Sub-Saharan Africa overweight and obesity are predominant risk factors for women compared to men, it can therefore be expected that the prevalence of diabetes mellitus is higher in women [27]. Overall obesity in diabetic patients in Kinshasa, in the DR Congo, was more common in patients aged 30 years or older, especially in women [28], [29]. Various representations and African beliefs favor voluntary weight gain, especially in women; overweight and obesity are seen as a criterion of beauty, but also as a sign of wealth and even good health [30]. The prevalence of diabetes mellitus and cardiovascular risk have shown a high prevalence of overweight and obesity affecting more sex feminine than masculine in

the developing country [21], [31]. To prevent overweight and obesity, in addition to the limited energy intake from fat and total sugars; World Health Organization (WHO) recommends regular physical activity, increasing consumption of fruits and vegetables, legumes, grains whole and nuts [32]. Nevertheless, the male sex has a high prevalence in the majority of West African countries [33], [20], [34].

The present study establish a link between participants' characteristics (socio-demographic, and economic) and general description of the population of the province of South Kivu; include high rate of unemployment, and low monthly household income. This situation extends as well in informal sector (agriculture, small trade, etc.) as in public administration [35]. Most families are involved financially in the care by meager contributions. This economic precariousness does not allow most patients to have some equipment such as the glucometer, blood glucose test strips and the blood pressure monitor for self-monitoring of blood glucose and blood pressure. In addition, studies have shown that the management of diabetes mellitus in Africa faces organizational difficulties following the limitation of health budgets; the technical platform is largely focused on the fight against communicable diseases [36].

The majority of the participants had not reached the glycemic objectives according International Diabetes Federation guidelines which recommend a value between 70 and 110 mg/dl [14], [37] and all participant were on medication. Blood sugar assessment have been based only on fasting blood glucose (twice a week). Optimal control of glycemia and related comorbidities is difficult and expensive to achieve in patients with established diabetes [38]. The course of the disease is affected by multiple complications secondary to poor glycemic control and intercurrent infections [36]. The initiation of drug treatment in these health facilities did not take into account the result of glycated hemoglobin (HbA1c) because it did not exist. The evaluation of glycated hemoglobin would be important because most of the studies had proved that its result allows to have a vision of the glycemic balance of the two to three months preceding the evaluation [39]. It is legitimate to offer drug treatment for type-2 diabetes mellitus when the HbA1c remains above 6.5% after 3 to 6 months [19]. The glycemic thresholds beyond which it is legitimate to modify the treatment are better expressed by glycated hemoglobin than by fasting and / or postprandial glycaemia. The results of the Diabetes Control and Complications Trial Research Group (DCCT) have shown a link between chronic hyperglycemia objectified by Hb A 1c and microangiopathic complications [40].

A nurse gave education once a week for a short period of 30 minutes. Studies have shown sustained improvement in glycated hemoglobin when education is based on individual need [41]. Managing diabetes requires a professional care team, often made up of medical specialists, nurses, dieticians, diabetes educators, podiatrists and other experts [38].

The predominant physical activity was walking for one hour in duration and the diet was not respected. According to the WHO, more than 150 minutes of moderate intensity physical activity per week may be necessary to maintain weight, as it is associated with weight loss of around 1 to 3% [42]. We found also that physical activity, weight loss and a low-fat diet have a favorable effect on improving the sensitivity of peripheral tissues to insulin [43].

The monthly cost of diabetes mellitus linked to diet, fasting blood glucose tests, ambulatory and/or hospital care, medicinal products including oral antidiabetic and insulin, as well as transportation. The management of diabetes is not subsidized (medical examinations, drugs, etc.) by the DR Congo State; contributions are made by members of the family. This situation does not contribute to the adequate management of this pathology. In this study, we showed that the management of diabetes has many difficulties: a lack of awareness of the magnitude of the problem, the cost of drugs, a socio-economic context that is not conducive to the diabetic diet, insufficient health facilities and personnel [44] and sometimes certain glucose-lowering drugs are unavailable on the market. A study carried out at the national obesity center at the Central Hospital of Yaoundé revealed that the cost of managing type 2 diabetes was 4.8 times the minimum wage [45]. In some sub-Saharan countries such as Mali for example, a family spends up to 38% of its income on caring for the sick. In Mozambique or Tanzania, where the price of insulin is reduced due to subsidies, this medication remains hardly accessible to populations whose daily income is less than USD 1.00 [46], [47].

5. CONCLUSION

Diabetes mellitus is a public health problem, mostly in adults. The low economic level and the lack of health coverage do not allow adequate management of diabetes mellitus. Primary health care units are limited in the lifelong care activities of the diabetic patient. Quality care in primary health care units requires improved human, financial and material resources; as well as the drug subsidy and laboratory tests.

CONSENT

Verbal or written consent was obtained from study participants after explaining the purpose and benefits of the research. Anonymity and confidentiality were guaranteed.

ETHICAL APPROVAL

We followed international guidelines for research ethics [48]. The ethics committee of the Official University of Bukavu approved the research procedure.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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