Study of the frequency of diabetes mellitus and its risk factors in the emergency units of two hospitals in Dakar, Senegal

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Abstract

Introduction-Objectives: The global prevalence and mortality of diabetes mellitus worldwide is steadily increasing, and its increases are faster in low and middle income countries. In Senegal, diabetes mellitus affects 2.1% of the population and is responsible for 3% of deaths from all causes. However, the epidemiological profile of the patients received in the emergency unit is not clearly established. This is how this study was conducted to find out the frequency of diabetes mellitus and the factors associated within the emergency unit of Dakar hospitals.

Methodology: The study setting was for the emergency unit of Pikines Hospital and The Principal Hospital of Dakar. This was an observational, descriptive cross sectional study for analytical purposes looking for factors associated with the onset of diabetes. A representative sample was drawn and a consecutive recruitment of eligible patients was carried out. The data collection tools were based on the WHO stepwise survey questionnaire and the data collection was conducted in an ethical manner.

Results: It was 615 patients who were included, of which 53.7% at The Principal Hospital of Dakar and 46.3% at the Pikine's Hospital. This was 72.4% of those surveyed who did not engage in sufficient physical activity and only 3.6% reported consuming more than five fruits and vegetables per day. They were 22.7% to be overweight and 17.4% were obese. The patients who reported never having controlled their glycemia in their life were 40.4%. Among the patients who had measured their glycemia at least once in their life, 69.7% did so in a health facility, before resorting to the pharmacy and self-measurement. The frequency of diabetes mellitus was 16.9% of which 77% were previously diagnosed diabetes mellitus cases and 23% were newly diagnosed. The mean random capillary glycemia was 1.34 g/L with a standard deviation of 0.7 g/L. In decreasing order of frequency of metabolic complication diagnosed there was hyperglycaemic hyperosmolarity (48.8%) followed by diabetic ketoacidosis (39.5%). The risk factors identified for the onset of

diabetes mellitus in the emergency's unit population were age, existence of employment and body mass index.

Conclusion: The risk factors for diabetes mellitus are well represented in our emergency units. The fight for primary prevention of diabetes mellitus remains a multi-ministerial challenge, as suggested by the associated factors identified in this study. All strategic plans for the fight against diabetes mellitus and non-communicable diseases in general must be built according to the One Health vision.

Keywords: Risk factors; Diabetes mellitus; Emergency unit; Senegal

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Introduction

Between 2017 and 2019, the global prevalence of diabetes mellitus in the age group of 20 to 79 years increased from 425 to 463 million people according to the 8th and 9th editions of the atlas of the international federation of diabetes.[1,2] In this same age group, in 2017, the number of deaths attributable to diabetes mellitus and its complications was 4 million, or 10.7% of global mortality from all causes.[1] According to the World Health Organization (WHO), diabetes mellitus was the seventh leading cause of death in the world in 2016-2017.[3]

The disease progresses faster in low and middle income countries.[2-4] In sub-Saharan Africa (SSA), the prevalence of complications such as retinopathy, neuropathy and diabetic nephropathy ranged from 7% to 63%, 27 to 66% and 10 to 83%, respectively.[4] In 2011, the economic cost attributed to diabetes mellitus in most SSA countries was significantly higher than the gross domestic product per capital expenditure on health.[5]

By 2030, statistical forecasts have shown that in SSA the number of deaths from non-communicable diseases including diabetes mellitus will be higher than deaths from communicable diseases.[6]

The morbidity linked to diabetes mellitus highlights the phenomenon of epidemiological demographic and nutritional transition.[5,6] Senegal is considered to be one of the five countries in sub-Saharan Africa that have made the nutritional transition exposing populations to a high risk of non-communicable diseases such as diabetes mellitus.[7] In Senegal, diabetes mellitus affects 2.1% of the population is responsible for 3% of deaths from all causes and represents a burden for the health system, but also a physical, emotional and financial burden for people, patients and

their families.[8-11]

However, the epidemiological profile of the patients seen in the emergency units (EU) is not clearly established. However, studies have been devoted to these questions. For example, in Spain, it has been shown that the frequency of diabetes mellitus is high in patients seen in EU.[9] EU are marked by a high influx of patients due to the lack of downstream medical solutions. These patients are most often suffering from chronic diseases and their management quickly requires an opinion.[10] However, in Senegal, the burden of diabetes mellitus in patients admitted to EU is not sufficiently documented. It follows from this insufficiency the need to decline the epidemiological profile of this category of patients.

This study aims to answer the following research questions: What is the frequency of diabetes mellitus in patients received in the EU of Dakar hospitals? What are the factors associated with the onset of diabetes mellitus in patients received in the EU of Dakar hospitals? Answers to these questions would provide additional information to effectively target diabetes mellitus interventions.[4] The objective of this study was to determine the frequency of diabetes mellitus and its risk factors in patients admitted to the EU of Dakar hospitals.

Methodology

Study framework

A country in the SSA, Senegal had an estimated population of 15,256,346 inhabitants at the end of September 2017.[11] Of the 14 regions that make up Senegal, the Dakar region is the most populated in the country.[12] There were 3,529,300 inhabitants or 23.13% of the total population.[13] Among the 4 departments of the Dakar region, it is the department of Pikine which is the most populated (1,317,123 inhabitants) followed by the department of Dakar (1,289,292 inhabitants).[14] Together, they contain more than 60% of the population of the Dakar region. The EU of Pikine's Hospital (HP) and The Principal Hospital of Dakar (HPD) are located in the most populated departments of the Dakar region (respectively the departments of Dakar and Pikine). These hospitals offered a polarity; HP is in fact located in the Dakar suburbs and mainly hosts a population with a low socio economic level, on the other hand HPD is located in the most developed urban center of Dakar and it mainly hosts a population with a high socio economic level. Finally, they are both level 3 public health establishments and their respective EU merges both medical and surgical emergencies.

Type and period of study

It was a multi centric cross sectional, descriptive, analytical study. Data was collected from January 25 to February 05, 2018 at HP's EU and from February 25 to March 05, 2018 at HPD's EU.

Study population: The study population consisted of patients seen in the EU of HPD and HP.

Sampling and selection criteria

Inclusion criteria: The patients included were those over 18 years old and received in these EU were included in the study.

Non-inclusion criteria: Patients who refused to participate in the survey, those who were pregnant and those who arrived and died were not included in our study.

Sample size: The sample size is calculated according to the following formula. [15-17]

$n_0=\varepsilon^2.(P(1-P))/i^2$

ε=1.96 for a risk of error of the first kind α=5%

P=expected proportion of patients with diabetes mellitus among those admitted to the EU (50%)15

I=precision (5%)

$n_0=1,96^2.(0,5(1-0,5))/0,05^2=384$

A review of consultation registers revealed that the average number of patients admitted to each EU was 25 per day. Thus, the expected size (N) of the source population was 750 patients for a period of one month. Since this number was less than 10,000, the sample size was adjusted (n) according to the following formula:

$n=n_0/(1+n_0/N)=284/(1+384/750)=254$

In anticipation of non-respondents (10%), the minimum sample size retained was 280 patients in each EU.

Sampling procedure: Eligible patients were recruited consecutively during the study period until the required sample size was achieved for each study site.

Collection of data collection tool: Data were collected using a questionnaire and form based on the WHO stepwise survey questionnaire.[18] These collection tools were first tested at the EU at FANN's University Hospital. The final version of the questionnaire was made up of four sections including socio-demographic characteristics, behavioral characteristics, and patient's profiles with diabetes, length of time with diabetes, treatment followed and methods of monitoring their glycemia. The final version of the collection form consisted of two sections. The first made it possible to collect the values of the anthropometric parameters and of the capillary glycemia. The second section was to collect the type of diabetic complication diagnosed.

Variables collected: It was about socio demographic characteristics such as age, sex, marital status, level of education, professional status and behavioural characteristics such as fruit/vegetable consumption and physical activity. Patient profiles with respect to diabetes, length of time with diabetes, treatment followed and methods of monitoring their glycemia.

Anthropometric measurements: Weight, height, waist circumference, body mass index.

Biological measurement: Random capillary glycemia.

Collection method: In each EU, the investigator was in the sorting room. He saw patients with the nurse in charge of reception. Patients who met the eligibility criteria and consented were registered. The questionnaire was administered during a face to face interview with each patient. The form was completed using the measurement of weight, height, waist circumference and capillary glycemia.

The weight was measured using a SECA mechanical scale, calibrated with a unit graduation in kg, ranging from 0 to 150 kg. Weight was measured in all subjects wearing minimal clothing and standing upright on the scale placed on a horizontal plane.

The size was measured with a SECA 206 brand wall measuring rod with metal tape ranging from 0 to 220 cm, with a unit graduation of 1 mm. Height was measured in all subjects in an upright position, back against the wall, heels together, without shoes and looking straight ahead.

The waist circumference was measured with a flexible, non-stretchy tape measure, graduated in mm. The measurement was made in a standing subject with his feet about 25 cm to 30 cm apart, midway between the inferior limit of the rib cage and the iliac crest.

The capillary glycemia was measured with an INFINITY brand glucometer. The device turned on automatically after inserting a single use INFINITY test strip. When the code displayed by the device matched the code on the test strip vial, we took the blood. Rigorous asepsis on the pulp of the middle finger of the non-dominant hand was performed. An injection was performed using a sterile disposable lancet. The patient's finger was gently placed on the end of the test strip which automatically aspirated 0.5 µL of blood. A "beep" was heard when the sample was correctly taken and the test started automatically. After a 5 second countdown, the result of the capillary glycemia measurement appeared on the LCD screen in mg/dl. After the test, the test strip and the used lancet were discarded in the sharps container.

The form was also completed using medical records. These made it possible to collect data relating to the type of diabetes mellitus complication diagnosed.

Operational definitions of variables

Fruit and vegetable consumption: We assessed the frequency and amount of fruit and vegetable consumption. The data was obtained from the participant's statements. Three items were used to assess the quantity: at least 5 fruits and vegetables; 3 to 4 fruits and vegetables; 1 to 2 fruits and vegetables. Frequency was assessed using the five point Likert scale.[19] Insufficient consumption of fruits and vegetables is retained for any consumption of less than 5 fruits and/or vegetables per day.[20]

Physical activity: The data was obtained from the participant's statements.

Global obesity: It is defined using the Body Mass Index (BMI). The BMI was calculated using the Weight (kg)/ Height² (m^2) ratio. BMI was classified into the following categories: thinness <18.5 kg/m^2, normal weight between 18.5 and 24.9 kg/m^2, overweight between 25 and 29.9 kg/m^2 and obese ≥ 30 kg/m^2.[13-16]

Abdominal obesity: A waist circumference threshold of >102 cm for men and >88 cm for women has been used according to WHO criteria for detecting abdominal obesity.

Classification of random capillary glycemia values: Random capillary glycemia values are classified into:

Hypoglycemia for any glycemic value strictly lower than 0.7 g/l.

Normal glycemia for any glycaemic value between 0.7 g/l and 1.1 g /l excluded.

High blood sugar for any glycaemic value between 1.1 g/l and 2 g/l excluded.[17-19]

Diabetes mellitus: A subject was considered diabetic when the capillary glycemia level at random was above 2 g/l with signs of hyperglycemia syndrome (polydipsia, polyuria, polyphagia, weight loss) or when he was under antidiabetic treatment (oral antidiabetic or insulin).[17,18]

Proportions: The proportion of diabetics was calculated by adding together known cases and newly diagnosed cases.

Statistical analyzes: Once the collection was completed, the data entry was made with an entry mask on the Epi info software version 7. The analysis was done with the Statistical Package for Social Sciences version 18 (SPSS 18) software. The results consisted of two parts: a descriptive part and an analytical part.

The descriptive part consisted in expressing on the one hand the quantitative variables in the form of the mean accompanied by its standard deviation, mode, median and extremes and on the other hand the qualitative variables with their absolute and relative frequencies.

The analytical part consisted of the bivariate analysis and the multivariate analysis. The bivariate analysis consisted only of the comparison of unpaired proportions. The objective was to find the existence of a statistically significant link between the independent (explanatory) variables which are the socio-demographic and behavioural variables with the dependent variable which is binary: onset of diabetes mellitus (yes / no). The presence of a statistically significant link was retained for a $p \leq 0.05$. This link was sought with the appropriate statistical test (parametric test or nonparametric test) according to its conditions of applicability.

Multivariate analysis was performed with independent variables whose p-values were <0.25 in the bivariate analysis. It identified the factors associated with the onset of diabetes mellitus. In this logistic regression, a given independent variable was retained as a factor associated

with the onset of diabetes mellitus when it had a $p \leq 0.05$. When this was true, we continued the interpretation with the value of the Odds Ratio (OR) surrounded by its 95% confidence interval (95% CI). The associated factor was considered as a risk factor when the OR>1. Otherwise, the factor was said to be protective against the onset of diabetes mellitus.

Ethical considerations: The study had received clearance from the heads of the EU department. Compliance with the ethical framework was also achieved through a clear, complete and precised information text that presented the context and the aim of the study for the free and informed consent of the participants. The consent was signed. In addition, data collection was carried out with confidentiality and strict respect for the privacy of the participant. Subsequently, access to the data collected was limited exclusively to the analyst, which ensured the confidentiality of the data.

Results

In total, those are 615 patients who were included, including 330 (53.7%) patients with HPD and 285 (46.3%) with HP.

Sociodemographic characteristics: Men were in the majority with 52.4% (322/615). Patients under 40 years of age accounted for 44.5% (273/613) in our study. By marital status, married people were in the majority with 64.5% (397/615) and 32.0% (192/600) of our patients were of secondary education. The proportion of employed patients was 46.7% (285/610) (Table 1).

Table 1: *Sociodemographic, behavioral and anthropometric characteristics of patients during the study of the frequency of Diabetes mellitus and its risk factors for 615 patients in the emergency units of two hospitals in Dakar in 2018, Senegal.*

Variables	Absolute frequencies (n)	Relative frequencies (%)
Sex		
Man	322	52.4
Women	293	47.6
Age class in years		
<40	272	44.4
[40-69]	235	38.3
≥ 70	106	17.3
Marital status		
Married	397	64.5
Not married	218	35.4
Educational level		
No	153	25.5
Primary	155	25.8
Secondary	192	32.0
Superior	100	16.7
Professional status		
Employment	285	46.7
Unemployed	325	53.3
Physical activity		
Sufficient	170	27.6
Insufficient	445	72.4
Daily fruit and vegetable consumption		
Sufficient	22	3.6
Insufficient	593	96.4
Body mass index		
Thinness	84	14.9
Normal	255	45.1
Overweight	128	22.7
Obesity	98	17.3

Behavioural characteristics: The study showed that 72.4% of those surveyed did not get enough physical activity. In addition, only 3.6% of patients said they reported consuming more than 5 fruits and vegetables per day.

Anthropometric characteristics: According to BMI classes, 22.7% of patients were overweight (128/565) and 17.4% of patients were obese (98/565).

Random capillary glycemia: The capillary glycemia was aged in 608 patients. The average was 1.34 g/l with a standard deviation of 0.7 g/l. Capillary glycemia indicated a value greater than 2 g/l with signs of hyperglycemia in 10.5% (64/608) of patients (Table 2).

Table 2: *Clinical and therapeutic characteristics of patients during the study of the frequency of Diabetes mellitus and its risk factors for 615 patients in the emergency units of two hospitals in Dakar in 2018, Senegal.*

Variables	Absolute frequencies (n)	Relative frequencies (%)
Random capillary blood sugar		
Hypoglycemia	3	0.5
Normo glycemia	277	45.6
High blood sugar	264	43.4
Diabetes mellitus screened	64	10.5
Known history of diabetes		
Yes	76	12.4
No	320	52.4
Do not know	216	35.3
Monitoring of capillary glycemia		
Never	246	40.4
Rarely	125	20.5
Occasionally	176	28.6
Often	48	7.9
Always	14	2.3
Capillary glycemia Monitoring Mode		

In a health facility	251	69.7
In a drug store	73	20.3
Auto measure	36	10.0
Treatment followed*		
Oral anti diabetic	39	51.3
Healthy diet	27	35.5
Insulin	23	30.3
Herbal medicine	1	1.3
No	3	3.9
Acute metabolic complications		
Hyper glycemic hyper osmolarity	21	48.8
Ketoacidosis	17	39.5
Hypoglycemia		6.98
Lactic acidosis	2	4.7

*NB: a patient can be counted several times

Monitoring of capillary glycemia: Out of 609 patients, 246 patients (40.4%) said they had never controlled their blood sugar in their life.

Capillary glycemia monitoring mode: Among the patients who had measured their blood sugar at least once in their life (360 patients), it is the use of a consultation in a health structure to control their blood sugar which was by far the most frequent modality 69.7% before the use of pharmacy and self-measurement.

History of diabetes mellitus: Of the 611 patients who answered this question, 76 patients or 12.4% declared to be known diabetics, 35.3% (216/611) declared not to know whether they were diabetic or not and 52.4% (320/611) said they were sure they did not have diabetes mellitus.

Proportion of diabetics: Among the 615 respondents, the frequency of diabetes mellitus was 16.9% (99/615). Previously diagnosed cases of diabetes mellitus were 77% (76/99) while 23% (33/99) were newly diagnosed, that is, they did not know they had diabetes mellitus.

Duration of diabetes mellitus: Of the 76 known diabetics, seventy patients indicated how old their diabetes mellitus was. The mean was 138 months ± 112 months.

Treatment followed: In the 76 known diabetic patients, one in two patients was on oral antidiabetic drugs.

Acute metabolic complications: 43 patients presented with acute metabolic decompensation of diabetes. In decreasing order of frequency there were: 21 diagnoses of hyperglycemia, hyperosmolarity (48.8%); 17 diagnoses of diabetic ketoacidosis (39.5%); 3 diagnoses of hypoglycemia with 6.98% and finally 2 diagnoses of lactic acidosis with (4.7%).

Bivariate and multivariate analyzes: This study showed that independent risk factors for the occurrence of diabetes mellitus in the EU population were age, existence of employment and body mass index (Table 3).

Being 40 to 69 years old increased the risk of having diabetes mellitus by 21.18 times compared to those who

Table 3: *Bivariate analysis of the occurrence of Diabetes mellitus mellitus during the study of the frequency of Diabetes mellitus and its risk factors in 615 patients in the emergency units of two hospitals in Dakar in 2018, Senegal.*

Variables	Diabetes				p-value
	YES		NO		
	Effective	%	Effective	%	
Sex					0.0517
Man	32	41.6	232	53.6	
Women	45	58.4	201	46.4	
	Age class in years				<0.0001
<40	3	3.9	226	52.2	
[40-69]	48	62.3	143	33.0	
≥ 70	26	33.8	64	14.8	
Marital Status					0.7904
Married	51	66.2	280	64.7	
Not married	26	33.8	153	35.3	
	Educational level				<0.0001
No	41	42.3	112	22.3	
Primary	27	27.8	128	25.4	
Secondary	20	20.6	172	34.2	
Superior	9	9.3	91	18.1	
Professional status					<0.0001

Employment	17	22.1	224	51.7	
Unemployed	60	77.9	209	48.3	
Daily fruit and vegetable consumption					0.2237
Sufficient	5	6.5	48	11.1	
Insufficient	72	93.5	385	88.9	
Physical activity					<0.0001
Sufficient	35	3.9	125	28.9	
Insufficient	74	96.1	308	71.1	
Body mass index					0.0119
Thinness	12	17.1	62	15.3	
Normal	22	31.4	198	48.9	
Overweight	18	25.7	93	23.0	
Obesity	18	25.7	52	12.8	

were under 40 years old (p-Value <0.0001; 95% CI=[6.11; 73, 42]) (Table 4).

Table 4: *Multivariate analysis of the occurrence of Diabetes mellitus during the study of the frequency of Diabetes mellitus and its risk factors concerning 615 patients in the emergency units of two hospitals in Dakar in 2018, Senegal.*

Variables	ORa	IC95%	p-Value
Sex			0.642
Man	1		Reference
Women	0.849	[0.43-1.69]	0.642
Age class in years			<0.0001
<40	1		Reference
[40-69]	21.184	[6.11-73.41]	<0.0001
≥ 70	12.62	[3.29-48.28]	0.00021
Educational level			0.338
No	1		Reference
Primary	0.72	[0.33-1.59]	0.418
Secondary	0.45	[0.18-1.08]	0.073
Superior	0.82	[0.29-2.36]	0.713
Professional status			0.00065
Employment	1		Reference
Unemployed	3.47	[1.69-7.10]	0.00065
Physical activity			0.088
Sufficient	1		Reference
Insufficient	3.07	[0.85-11.13]	0.088
Daily fruit and vegetable consumption			0.168
Sufficient	1		Reference
Insufficient	2.25	[0.71-7.15]	0.168
Body mass index			0.065
Normal	1		Reference
Thinness	1.64	[0.69-3.87]	0.26
Overweight	1.76	[0.82-3.75]	0.145
Obesity	3.17	[1.35-7.45]	0.0081

People over 70 were 12.62 times more likely to have diabetes mellitus than those under 40 (p-Value=0.00021; 95% CI=[3.3; 48.3]).

Being obese increased the risk of having diabetes mellitus by 3.17 times compared to those with a normal BMI (p-Value=0.0081; 95% CI=[1.35; 7.45]).

Being unemployed were a risk factor compared to those who were employed. It increased the risk of developing diabetes mellitus by 3.47 times (p-Value=0.0006549; 95% CI=[1.7; 7.1]).

Discussion

First, the frequency of diabetes mellitus in patients admitted for consultation in the respective EU of The Principal Hospital of Dakar and of the Pikine's Hospital was 16.9%. Two studies carried out in Germany and Spain with patients hospitalized and received in the EU has shown prevalence of 22.15% and 36.6%, respectively. The prevalence of diabetes mellitus is estimated through several population surveys. In Senegal, two studies conducted in rural and semi-rural areas respectively revealed prevalence of 4.2% and 7.2%.[20] In Burkina Faso, Ethiopia and Iran, these surveys respectively revealed prevalences of 7.27%, 1.9% and 8.19%.[21,22] In the southern cone of Latin America, this indicator varied from 8.4 to 14.3%.[23] These results show that the frequencies of diabetes mellitus among patients admitted to the EU were higher than those resulting from surveys carried out in the general population. This proves to what extent the population of the EU is concerned by diabetes. So it should be the subject of constant attention.

After this, one in five people with diabetes mellitus did not know they had the disease. Worldwide in 2017, the proportion of people with undiagnosed diabetes mellitus was 50%. Also in 2017, this proportion was higher in Africa with 69.2% and varied from country to country.[1] In Ethiopia and Cameroon, this indicator is estimated at 54% and 42.6% respectively.[21,24] The high frequency of undiagnosed diabetes mellitus cases may reflect a

lack of awareness among the population, community stakeholders and primary health care providers.[25] This situation has both clinical and economic consequences. On the one hand, late diagnosis can lead to complications leading to premature death.[1] This situation is worrying in that the majority of people with diabetes mellitus are unaware that they have complications from this disease.[1] It is necessary that the primary health care structures carry out activities of detection and management of cases of Diabetes mellitus through the measurement of blood sugar. Referral and counter referral systems should be put in place so that patients will need periodic specialized examinations or treatment for complications.[3]

To add, being at least 40 years old, unemployed and obese was identified as risk factors for developing diabetes mellitus. This study shows a statistically significant association between the status of unemployed, and the occurrence of diabetes mellitus. In the literature, it is established that difficult socio-economic conditions expose populations to several risk factors for non-communicable diseases. Poor people are less able to engage in healthy behaviours due to the environments in which they live, thus increasing their likelihood of developing a noncommunicable disease and receiving a late diagnosis. This study also showed that people aged 40 and over are more likely to develop diabetes. However, this risk decreases from the age of 70. This could be explained by the high risk of premature death in people aged 30 to 69 years with chronic diseases.[26] In France, a study showed that the increase in the prevalence of diabetes mellitus with age is in fact only observed up to 75 years. Beyond that, it decreases sharply; probably due to the excess mortality of diabetic patients.[8] Our study finally revealed that obesity was a risk factor for the onset of diabetes. A systematic review of studies carried out in Cameroon, demonstrated a close relationship between the occurrence of diabetes mellitus and age, obesity and overweight.[27]

So, the response to diabetes mellitus requires effective preventive measures. First, improving the social conditions of populations is essential. For example, the public authorities should facilitate access to employment and fruit and vegetables, and build sports infrastructures. Then, the three levels of prevention can be implemented. Primary prevention should consist in sensitizing populations to adopt healthy behaviors such as playing sports, reducing weight and consuming fruits and vegetables. The second line of intervention involves secondary prevention. To do this, it would be necessary to popularize and make systematic screening for diabetes mellitus in primary health care services, sensitizing patients on the importance of adherence to treatment and regular blood sugar testing. In the specific case of EU, practitioners should systematically look for risk factors for complications in diabetic patients. In tertiary prevention, management will consist, among other things, in identifying the risks of recurrence in those already presenting complications.

Conclusion

To conclude, diabetes mellitus and its risk factors are widely represented in our emergency units. This suggests the burden of non-communicable diseases such as diabetes in developing countries. To achieve target 3.4 of the Sustainable Development Goals the fragile population of emergency units will need special attention at all times. The victory against diabetes and diseases in general is intimately conditioned by the One Health vision in our strategic plans, because even this study reveals that the prevention of diabetes requires full employment, in other words the achievement of target 8.3 of the Sustainable Development Goals.

Conflicts of Interest

The authors declare no conflict of interest.

Contributions from Authors

The study protocol was written by Pengd-Wende Habib Bousse TRAORE and Oumar BASSOUM. The field survey, data entry and analysis were carried out by Pengd-Wende Habib Bousse TRAORE. The manuscript was written by Pengd-Wende Habib Bousse TRAORE, Oumar BASSOUM and Jean Augustin Diegane TINE. The validation of the protocol, the supervision of the field survey and the correction of the manuscript had been done by Jean Augustin Diegane TINE, Roger Clement TINE and Adama FAYE. Cheikh Tidiane MBOW, Ababacar DIOP had granted authorization to investigate in their respective emergency units.

Acknowledgments

Institute of Health and Development

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References

1. Fédération Internationale du Diabète. Atlas du diabète-Huitième édition. Bruxelles, Belgique; 2017.
2. Fédération Internationale du Diabète. Atlas du diabète. 9ème. 2019; 176 p.
3. Organisation Mondiale de la Santé. Rapport mondial sur la diabète. Genève, Suisse; 2016.
4. Hall V, Thomsen RW, Henriksen O, et al. Diabetes in sub Saharan Africa 1999-2011: Epidemiology and public health implications. A systematic review. BMC public health. juill 2011;11:564.
5. Renzaho AMN. The post-2015 development agenda for diabetes in sub-Saharan Africa: Challenges and future directions. Global health action. 2015;8:27600.
6. Kane J, Landes M, Carroll C, et al. A systematic review of primary care models for non-communicable disease interventions in Sub-Saharan Africa. BMC family practice. mars 2017;18(1):46.
7. Abrahams Z, Mchiza Z, Steyn NP. Diet and mortality rates in Sub-Saharan Africa: Stages in the nutrition

transition. BMC Public Health [Internet]. déc 2011 [cité 14 juin 2020];11(1).

8. Ministère de la Santé et de l'Action Sociale du Sénégal. Enquête STEP nationale sur les facteurs de risque des maladies non transmissibles, 2015; Dakar: Ministere de la santé; 2016 juin p. 69.
9. Alvarez-Rodriguez E, Laguna Morales I, Rosende Tuya A, et al. Frequency and management of diabetes and hyperglycemia at emergency departments: the GLUCE-URG Study. Endocrinologia, diabetes y nutricion. févr 2017;64(2):67-74.
10. Sentilhes-Monkam A. Les services d'accueil des urgences ont-ils un avenir en Afrique de l'Ouest ? Exemple à l'hôpital principal de Dakar. Santé Publique. 2011;23(1):7.
11. France volontaires, échanges et solidarité internationale. Présentation du Sénégal région par région. 2008.
12. Charan J, Biswas T. How to calculate sample size for different study designs in medical research? Vol. 35, Indian J. Psychol. Med. 2013; p. 121-6.
13. Houehanou YCN. Épidémiologie des facteurs de risque cardiovasculaire en population tropicale-cas du Bénin [Thèse de l'école doctorale des sciences de la santé de Cotonou-Lemancen]. Université de Limoges cotutelle université d'Abomey-Calavi; 2015.
14. Organisation Mondiale de la Santé. Recommandations mondiales sur l'activité physique pour la santé. OMS; 2010. 60 p.
15. Ba I. Etude du syndrome métabolique dans la population générale de saint louis du sénégal : enquête transversale portant sur 1424 sujets Universite Cheikh Anta Diop de Dakar; 2012.
16. Frelut ML. Obésité de l'enfant et de l'adolescent. Editions Odile Jacob. 2003;143 p.
17. Kufeldt J, Kovarova M, Adolph M, et al. Prevalence and distribution of diabetes mellitus in a maximum care hospital: Urgent need for HbA 1c -screening. Experimental and clinical endocrinology and diabetes. 2018;126(2):123-9.
18. Yanogo RDA, Sagna Y, Tieno H, et al. Prevalence of diabetes and cardiovascular risk factors in ouagadougou (Burkina-Faso). OALib. 2014;01(04):1-5.
19. Diop PM. Aspects épidémio-cliniques des urgences médicales à l'hôpital de Pikine : étude rétrospective réalisée sur un an dans le SAU [Thèse de doctorat de Médecine générale]. [Dakar Sénégal]: Universite Cheikh Anta Diop de Dakar; 2010.
20. Duboz P, Boëtsch G, Gueye L, et al. Type 2 diabetes in a Senegalese rural area. World J Diabetes. 2017;8(7):351.
21. Zekewos A, Loha E, Egeno T, et al. Prevalence of Diabetes Mellitus and Associated Factors in Southern Ethiopia: A Community Based Study. Ethiop. J. Health Sci. 2018;28(4):451-60.
22. Safari-Faramani R, Rajati F, Tavakol K, et al. Prevalence, Awareness, Treatment, Control, and the Associated Factors of Diabetes in an Iranian Kurdish Population. J. Diabetes Res. 2019;2019:1-9.
23. Irazola V, Rubinstein A, Bazzano L, et al. Prevalence, awareness, treatment and control of diabetes and impaired fasting glucose in the Southern Cone of Latin America. PLoS ONE. 2017;12(9).
24. Kufe CN, Klipstein-Grobusch K, Leopold F, et al. Risk factors of impaired fasting glucose and type 2 diabetes in Yaoundé, Cameroon: A cross sectional study. BMC Public Health. 2015;15(1).
25. Worede A, Alemu S, Gelaw YA, et al. The prevalence of impaired fasting glucose and undiagnosed diabetes mellitus and associated risk factors among adults living in a rural Koladiba town, northwest Ethiopia. BMC Res. Notes. 2017;10(1):251.
26. Confortin SC, Andrade SR de, Draeger VM, et al. Premature mortality caused by the main chronic noncommunicable diseases in the Brazilian states. Vol. 72, Braz. J. Nurs. 2019; p. 1588-94.
27. Bigna JJ, Nansseu JR, Katte JC, et al. Prevalence of prediabetes and diabetes mellitus among adults residing in Cameroon: A systematic review and meta-

analysis. Vol. 137, Diabetes Res Clin Pract. 2018; p. 109-18.