

Table 8. Diabetic foot by type of care structure.

Name of structures / Type of collection tools	Foot
CS Ref I	32
CS Ref II	0
CS Ref III	7
CS Ref IV	12
CS Ref V	3
CS Ref VI	5
Point-G University Hospital	26
Gabriel Touré CHU	18
Luxembourg University Hospital	122
Mali Hospital	168
Total	399

The total number of diabetic feet recorded in the care structures.

Table 9. Biological examinations by type of care structure.

Type of biological examinations / Names of structures	Public sector								
	CS Ref I	CS Ref II	CS Ref III	CS Ref IV	CS Ref V	CS Ref VI	Point-G University Hospital	CHU GT	Mali Hospital
Minimum balance	0	0	0	0	0	0	0	0	0
Average balance	0	0	0	0	0	0	0	0	0
Optimum balance	1	1	1	1	1	1	1	1	0
Optimum + balance	0	0	0	0	0	0	0	0	1

Minimum balance	Average balance	Optimum balance	Optimum + balance
Glycemia, Glycosuria	Glycemia, Glycosuria, HbA1c, NFS, The lipidogram, Creatinine, Uricemia	Glycemia, Glycosuria, HbA1c, NFS, The lipidogram, Creatinine, Uricemia OGTT, ECB of samples, Antibigram, 24 H microalbuminuria, 24 h proteinuria, Complete blood ionogram	Glycosuria, HbA1c, NFS, The lipidogram, Creatinine, Uricemia OGTT, ECB of samples, Antibigram, 24 H microalbuminuria, 24 h proteinuria, Complete blood ionogram, Auto-antibody / Anti-GAD.

*1 (presence) *0 (absence)

All diabetes care structures provided minimum check-ups. The CSRefs and the Hospitals ensured the optimum balance sheets except the hospital in Mali also provided the optimum balance sheet.

D. Medications

Table 10. Antidiabetics by care structures (n = 10).

Sources of supply / structures	Metformin	Sulfamide	Intermediate insulin (NPH and Mix)	Rapid insulin
CS Ref I	1	1	1	0
CS Ref II	1	1	1	0
CS Ref III	1	1	1	0
CS Ref IV	1	1	1	0
CS Ref V	1	1	1	0
CS Ref VI	1	1	1	0
Point-G University Hospital	1	1	1	0
Gabriel Touré CHU	1	1	1	0
Luxembourg University Hospital	1	1	1	0
Mali Hospital	1	1	1	0

* 1 (presence) * 0 (absence)

There was at least one oral antidiabetic drug (Metformin or Sulfamide) in the stores all the structures doing screening and PEC. In addition to at least one ADO, CSRefs and hospitals had at least the insulin intermediate. Rapid insulin was often out of stock in CSRefs and hospitals.

Table 11. Sources of drug supply by type of care structure (n = 10).

Sources of supply / structures	Regional PPM	Private Wholesaler	Total
CS Ref I	1	0	1
CS Ref II	1	0	1
CS Ref III	1	0	1
CS Ref IV	1	0	1
CS Ref V	1	0	1
CS Ref VI	1	0	1
Point-G University Hospital	1	0	1
Gabriel Touré CHU	1	0	1
Luxembourg University Hospital	1	1	2
Mali Hospital	1	0	1

* 1 (presence) * 0 (absence)

We have noticed that all our structures get their supplies from the regional PPM except the CSRef V and Luxembourg University Hospital have recognized that they often get their supplies from private wholesalers as well.

DISCUSSION

Our study was cross-sectional, focused on data from January to December 2019 from 10 health structures in Bamako. Diabetes screening was effective in all facilities. Diabetes screening and management were effective at all 10 facilities. We also noted that 6/10 were CSRefs (first referral structure) and 04 were hospitals.

The management of diabetes in the structures was ensured by at least an endocrinologist and / or a diabetologist in the 10 structures in total they had at least 18 specialists. This care provided by specialists is provided at CSRef and hospital level. The presence of specialists in these structures is explained by the creation of a diploma course (DES / DU) at the University of Bamako since 2010 and the recruitment of specialists by the public service of the state and communities in Bamako [9]. All public sector structures have equipment for screening for diabetes and these risk factors, namely a blood glucose meter, a blood pressure monitor, a bathroom scale and a tape measure. In addition to screening equipment, CSRefs and hospitals had at least one HbA1c reader and foot kit. The therapeutic education material (televisions and DVD players, BAI, posters) is no longer functional in a majority of structures. In the different structures, the main data collection tool used was the consultation register. Data was collected systematically via monthly or quarterly reports. There is a disparity in the centralization of data since to date several modes of data feedback in both the public and private sectors. This lack of centralization and data processing makes it difficult to advocate, but also to monitor consultations and the supply of anti-diabetic drugs.

The active file of diabetic patients was estimated at 15,000 patients. This figure highlights an almost daily increase in the number of diabetic patients followed in Bamako. A

hospital prevalence of 5.1% was reported in a recent article published in Mali Medical [10]. Other old studies carried out by Malian medical specialists indicated that diabetes affects around 3% of the population, and that type 2 represents 90% of cases [11]. The adoption of the STEP wise strategy [12], which is a chronic disease surveillance approach through risk factors carried out in Mali in 2013, gave a prevalence of overweight 16.6% and that of obesity 8, 8% in Bamako [13]. Mali is going through a health transition, as increased globalization and accompanying urbanization have created a double burden of communicable and non-communicable diseases.

All diabetes care structures provided minimum check-ups. The CSRefs and the Hospitals ensured the optimum biological assessments. The hospital in Mali, in addition to the optimum assessment, carried out other more specialized tests, in particular the dosage of diabetes auto-antibodies. This hospital houses a sub-unit for the management of type 1 diabetes in Bamako, which is the result of a collaboration between the Ministry of Health and Sante Diabetes with the support of the Life for A Child program. It is reported that although few resources are available for health in Mali, a mobilization around diabetes has gradually taken shape, since 2003, other actors have become involved, in particular Santé Diabète, but also the Malian State, which created in 2002 a section specific to non-communicable diseases within the National Directorate of Health [14]. This MNTs section of the DNS has now become a division in the General Directorate of Health and Public Hygiene (DGSHP). Mali has included NCDs in its Health and Social Development Program II since the 2005 period and the IV currently being validated.

This study allowed us to have an inventory of the health offer in connection with the screening and management of diabetes in the health system in Bamako. The challenges are still enormous, such as the often-late management of diabetic patients, but also by other factors, such as the difficulty of patients to respect a balanced diet or the difficulty of access to treatment.

CONCLUSION

With this research, we tried to identify some key elements of the diabetes management process in Bamako. More specifically, we have highlighted the role played by referring physicians and the underlying logic of their interventions in the offer and structuring of care and the construction of knowledge in initial and continuing training. This study makes it possible to understand the process of screening and treatment of diabetes, to identify the capacities and the gaps existing between the different structures but also the multiple underlying constraints. These results focus on the planning of capacity building actions and the technical platform of health structures. The amplification of targeted actions based on some of the difficulties raised by the various referring physicians, could make it possible to

optimize the management of diabetes in Mali. We recommend practical proposals to improve the diabetes response:

- (i) align the response to the health transition with the strengthening of health systems by decentralizing the PEC for diabetes at the primary level (CSCOM).
- (ii) improve data on Diabetes;
- (iii) the implementation of a structured approach to strengthen the achievements and work on the overall prioritization of CVD in Mali.

REFERENCES

1. Human Development Report (2020) Fractured Societies Lead People and Planet to Collision, UNDP Says UNDP in Mali. Accessed on: November 11, 2021. Available online at: <https://www.ml.undp.org/content/mali/fr/home/presscenter/pressreleases/2020/rapport-sur-le-developpement-humain-2020-selon-le-pnud.html>
2. Soumaoro B (2018) Mme OUANE Aïssatou TANGARA, Statistician. INSTAT: 57.
3. Wesenbeeck CFA van (2018) Distinguish urban and rural food security in West Africa. Accessed on: March 2, 2020. Available online at: https://www.oecd-ilibrary.org/fr/development/distinguer-securite-alimentaire-urbaine-et-rurale-en-afrique-de-l-ouest_159010a5-fr
4. ICCP-Portal (2013) Mali-National Policy for the Control of Noncommunicable Diseases. Accessed on: November 11, 2021. Available online at: <https://www.iccp-portal.org/sites/default/files/plans/Mali-Politique%20nationale%20de%20lutte%20contre%20les%20maladies%20non%20transmissibles%202013.pdf>
5. Yaya SH, Kengne AP (2014) Management and control of hypertension in Africa: A barrier analysis. The challenge of preventing cardiovascular disease. 2014: 163.
6. Traore A (2006) Problem of the care of diabetic patients in health centers in Mali. University of Bamako.
7. Dembélé S (2021) Problem of the management of Graves' disease in sub-Saharan Africa (case of Mali). [PhD Thesis]. USTTB.
8. Gobatto I, Traoré AT (2011) From one knowledge to another, the fight against diabetes in Mali. Otherwise, Mook Collection.
9. Diabetes in Mali: A health emergency! (2016) Le Monde.fr. Accessed on: March 13, 2020. Available online at:

https://www.lemonde.fr/afrique/article/2016/03/28/diabetes-au-mali-une-urgence-sanitaire_4891061_3212.html

10. Aa D, Ia N, Am G, Aht D (2019) Epidemiological and Clinical Study of Sugar Diabetes in A Reference Health Center of Sikasso. 2019: 6.
11. Sidibé AT, Besançon S, Beran D (2007) Diabetes: A new public health issue for developing countries: The example of Mali. *Med Metabol Dis* 1(1): 93-98.
12. WHO (2006) STEPS: The WHO STEPwise approach to chronic disease risk factor surveillance: WHO STEPS surveillance manual. Accessed on: March 9, 2020. Available online at: <https://apps.who.int/iris/handle/10665/43483>
13. Bâ HO, Menta I, Camara Y, Sangaré I, Sidibé N, et al. (2014) Overweight and obesity in the population over 20 years old in Bamako urban areas (Mali). *Pan Afr Med J* 19: 352.
14. Martini J, Fligg A (2020) The emergence of type 2 diabetes as a public health problem in Mali. Analysis of national health policies and training of health professionals.