

**RENOUNCEMENT TO MEDICAL FOLLOW-UP BY PEOPLE LIVING WITH TYPE 2 DIABETES IN CÔTE D'IVOIRE, 2018.**

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**SUMMARY**

The non-compliance regarding treatment follow-up by diabetic mellitus patients is a barrier to effective treatment. Our main objective was to identify the social determinants of renouncement to medical follow-up in people living with type 2 diabetes mellitus receiving treatment at the Anti-diabetic Center of Abidjan (CADA). A retrospective survey was performed on diabetics' treatment follow-up data in 2018. The study population was drawn from the 2017 cohort. A multiple correspondence analysis and a logistic regression were performed. The threshold of significance of the statistical tests was set at 0.05. The study involved 403 diabetics. Nearly nine (9) out of ten (10) diabetics were non-compliance regarding medical follow-up. This non-compliance mainly concerned the fundus examination (86%), the performance of HbA<sub>1c</sub> (55%) and the electrocardiogram (53%). Widowed or divorced, often above 70 years of age and illiterate, and employed in the formal sector were positive predictors of non-compliance (OR=2.40 ; CI<sub>95%</sub> : 1.05 – 5.87 et OR=2.95 ; CI<sub>95%</sub> : 1.45 – 5.95 respectively). Our study has highlighted the need to improve on access to all diabetic follow-up checking at CADA and the need to communicate all national recommendations to diabetics through healthcare centers.

**Keywords:** Diabetes mellitus, Follow-up care, Patient drop-outs, Côte d'Ivoire

**Renoncement du suivi médical chez les personnes vivant avec le diabète de type 2 : analyse à partir des données du Centre antidiabétique d'Abidjan.**

**RESUMÉ**

*Le renoncement aux soins correspond au besoin de soins non satisfait par choix, par contrainte, ou encore du fait de l'insuffisance ou de l'inadéquation des soins ou des traitements reçus. Ce non recours aux soins en cas de besoins peut occasionner chez les patients souffrant de maladie chronique des complications pouvant mettre en jeu le pronostic vital. L'efficacité de la prise en charge du diabète dépend de l'observance par les patients des recommandations et du traitement. Devant les coûts élevés de prise en charge du diabète, les patients renoncent parfois à des soins. Notre travail avait pour objectif principal d'identifier les déterminants du renoncement au suivi médical chez les personnes vivant avec le diabète de type 2 fréquentant le Centre antidiabétique d'Abidjan (CADA). Nous avons réalisé une*

enquête rétrospective à partir des données de suivi des diabétiques en 2018. La population d'étude était issue de la cohorte de 2017. Les caractéristiques sociodémographiques et cliniques, les fréquences des consultations et des examens recommandés pour le suivi ont été reportées. Une analyse des correspondances multiples a été réalisée afin de décrire les relations entre les différentes modalités des variables. Une régression logistique, pas à pas descendant, a permis d'identifier les déterminants du recours aux soins chez les diabétiques. Le seuil de significativité des tests statistiques a été fixé à 0,05. L'étude a concerné 403 diabétiques. Les données ont été traitées avec le logiciel R version 3.6.0. L'âge moyen était de 55,72 ±9,90 ans, avec un âge médian de 55 ans, un minimum de 27 ans et un maximum de 85 ans. Près de 23% des diabétiques n'étaient pas scolarisés, la majorité vivait en couple (74%) et résidait en zone urbaine (71%), 63% avaient un revenu supérieur au SMIG et 65% exerçaient une activité dans le secteur informel. Pour ce qui est de la mutualisation du risque, 28% des diabétiques bénéficiaient d'une assurance. Le nombre moyen de consultation annuel par diabétique a été estimé à 3,29±1,49. Près de neuf (9) diabétiques sur dix (10) avaient renoncé aux soins. Ce renoncement concernait principalement les examens de suivi des complications : examen du fond d'œil (86%) et électrocardiogramme (53%). Le statut de veuf, qui sont des personnes souvent âgées de 70 ans et plus et non scolarisées, ainsi que le fait de travailler dans le secteur formel étaient des prédicteurs positifs du renoncement au suivi (OR=2,40 ; IC95%:1,05 – 5,87 et OR=2,95 ; IC<sub>95%</sub> :1,45 – 5,95 respectivement). Notre étude a mis en exergue la nécessité d'améliorer l'accès aux soins chez les diabétiques au CADA. La mise en place d'un système de prise en charge intégrée du diabète pourrait être une solution.

**Mots-clés :** Diabète de type 2, Suivi médical, Renoncement aux soins, Côte d'Ivoire

## INTRODUCTION

Type 2 diabetes mellitus, the most common form of diabetes, is a chronic disease that results from insulin resistance, where the body does not fully respond to insulin, and accounts for 90% of diabetes cases worldwide [FID 2017]. It is a major public health increasing threat. WHO estimated that the number of adults with diabetes mellitus rose from 108 million in 1980 to 422 million in 2014 with a prevalence rate from 4.7% up to 8.5% respectively [OMS 2016]. Prevalence has increased more rapidly in middle- and low-income countries [Mathers 2006]. In Africa, an estimated 41.4 million patients by 2035 has been announced, which is an increase of more than 109% [Diop 2015]. Diabetes is responsible for many premature deaths (1.6 million in 2015) and cardiovascular, neurological, ocular, and locomotor complications [OMS 2016]. More than 80% of deaths caused by diabetes mellitus occur in low- and middle-income countries [OMS 2016a]. In Côte d'Ivoire, the population of diabetics was estimated to 501,530 individuals and the prevalence of diabetes at 5.9% in 2013 [Diop 2015]. Diabetes accounted for about 2% of deaths [OMS 2016b].

The effectiveness of diabetes treatment management depends on patients' adherence to recommendations and treatment. Despite the existence of treatments and measures for the management of the disease, there is often a lack of adherence to the recommendations given for treatment management by diabetic patients that lead them to forego treatment. The notion of renunciation of care is closely linked to the notion of unmet need for care by choice, coercion, or because of insufficient or inadequate care or treatment received [Chaupain-Guillot 2014, Ancelot 2016]. Diabetics foregoing their care, are more prone to complications. For example, adherence to control guidelines has significantly reduced the risk of cardiovascular, renal and premature death [Chen 2015]. In people living with type 2 diabetes, these non-compliance have been observed especially in cases of

precariousness [Barnichon 2011]. Due to its adverse effects on the health of individuals, diabetes and its complications have a significant economic impact on diabetics and their families. The total amount spent on diabetes mellitus treatment accounted for 11% of total global health expenditure in 2013 [FID 2017]. Only 20% of these expenditures could be traced into low- and middle-income countries [Seuring 2015, FID 2017]. The treatment management of diabetes remains very expensive in Africa. Expenses can account for 70 to 96 percent of the household budget of the low income patients in Côte d'Ivoire [Ankotche, 2009]. In Mali, Alouki [2017] study estimated the cost of medical treatment of type 2 diabetes ranging from 70,845 FCFA (108€) to 195,475 FCFA (298€) in the public hospitals and nearly twice as much in the private hospitals. These high costs are borne mainly by individuals and their families and reflect the difficulty of treatment care by diabetics. For example, some households experienced financial difficulties such as Catastrophic Health Expenses after making payment for treatment, which can reach 20% of the diabetic population [WHO 2010, Okoronkwo 2015]. These financial difficulties experienced are responsible for poor treatment adherence or failure to continue regular monitoring tests [Gning 2007, Chuma 2012].

Most renouncement studies focus on treatment alone, and data on renouncement about monitoring of medical tests are rarely discussed [Revil 2018]. In the situation of lack of universal health insurance policy, understanding the factors influencing the taking of medical treatment by the people with diabetes could provide guidance for health policy-making. The main objective of this study was to identify the determinants of renouncement of medical follow-up of people with type 2 diabetes mellitus attending Abidjan Diabetes Center (CADA). The secondary objective was to quantify this non-compliance according to the different tests carried out.

## **METHODS**

### **Type of study**

We carried out a retrospective survey using the data of medical follow-up during the year 2018 for patients living with type 2 diabetes.

### **Data**

This study uses data from the CADA that receives diabetes patients attending this center for consultation, treatment and monitoring. These data included patient identification, consultation data, biological tests, radiological and ophthalmological data. The CADA is a reference establishment in the treatment of people living with diabetes. This center is located within the premises of the National Institute of Public Health of Côte d'Ivoire. Study population.

They consisted of the cohort of 2017, representing people living with type 2 diabetes and being monitored for their diabetes at CADA in 2017. People who were active as at the end of 2017 were included in the study, that is to say patients who did not give up treatment by the end of 2017. Patients who died in 2018 and those who were referred to another health center in 2018 were not included in the study. Diabetic patients who were not active in 2018 were contacted by telephone to check their status (alive and being referred to another health facility). The sample selection method is summarized in Figure 1.

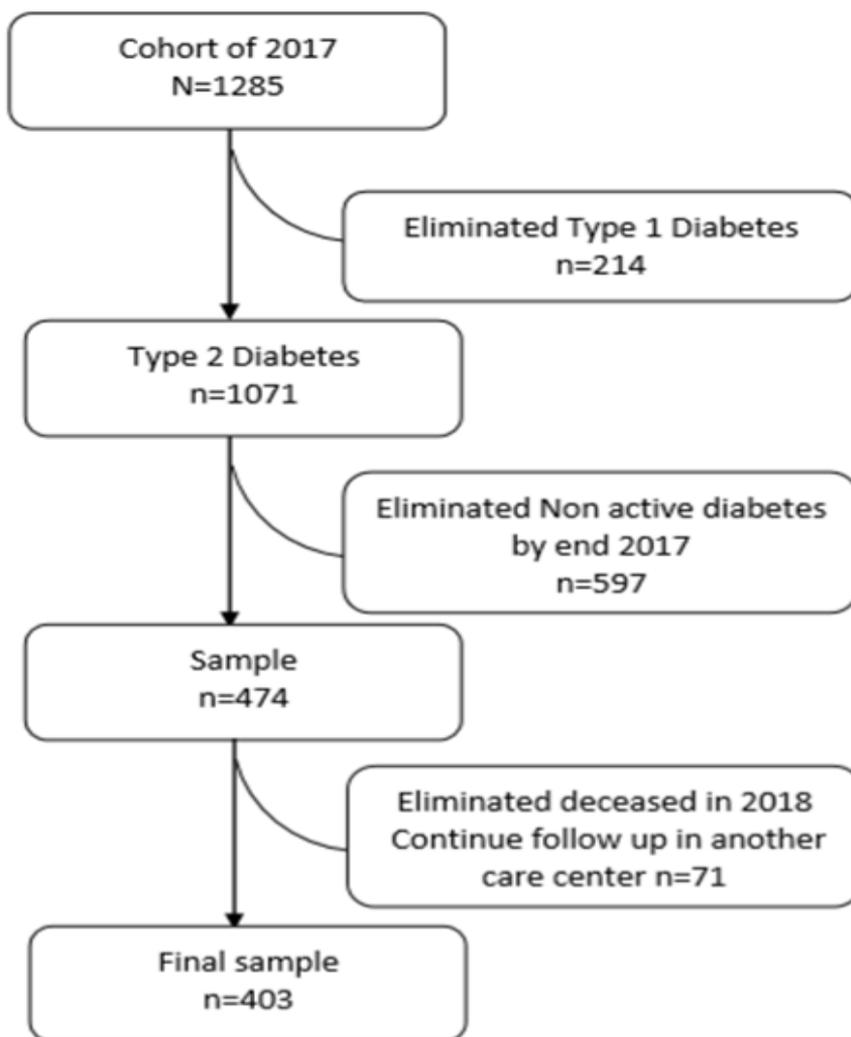


Figure 1: Flow diagram of the selection of the study sample

## Variables of the study

### *Dependent variable*

The variable to be predicted is the objective renunciation defined as the non-completion of prescribed care as recommended by the Ministry of Health. The Ministry of Health recommends per year at least two medical consultations, a glycemic report (2 blood glucose measurements and glycated Hb test), a lipid report, urine test (albuminuria, glycosuria), electrocardiogram (ECG) and fundus examination of the eye [Ministry of Health and Public Hygiene 2018]. Non-compliance to medical monitoring instruction was assessed

from the data contained in the patient's medical records. The judgment criterion was based on the effective completion of at least two medical visit, at least two blood glucose and HbA<sub>1c</sub> tests, at least one urinary albumin and glucose test, one lipid profile, one fundus examination and one electrocardiogram (ECG) in a year. These variables were each coded «0» if not done and «1» when done. These six variables were used to construct the dependent variable which was also coded in a binary way.

### ***Independent variables***

#### ***Sociodemographic characteristics:***

- Age in years: <40, [40 and 49], [50 and 59], [60 and 69], ≥ 70 years of age.
- Sex: «Male», «Female»
  - The level of education: «Not educated», «Primary», «Secondary», «Higher education»;
- Marital Status: «Single», «Married or Living in a Couple», «Widowed or Divorced»;
- Employment: «Formal» and «Informal»;
  - The economic characteristics defined from the government Guaranteed Minimum wages: «Higher than SMIG» and «Less than or equal to SMIG»;
  - The area of residence: «Urban» or «Rural»;
  - Health insurance: «Insured» and «Uninsured».

#### ***Clinical features***

- BMI: ≥30 kg / m<sup>2</sup>, 25-29 kg / m<sup>2</sup>, <25 kg / m<sup>2</sup>.

#### ***Risk Behaviors***

- Physical Activity: «Regular Physical Activity», «No Physical Activity»;
- Tobacco smoking: «smoking», «No smoking».

### ***Statistical analyzes***

The data were processed and analyzed using the software R 3.6.0. The data were described according to their frequency concerning the qualitative variables and mean, standard deviation, median, maximum and minimum for the quantitative variables. Multiple Correspondence Analysis (MCA) was performed to establish relationships between variables and modalities. Quantitative variables (age and BMI) were transformed into qualitative variables taking into account data from the literature and standards. Logistic regression was used to investigate factors associated with the objective renouncement. The final model of regression logistic was obtained by the top-down step-by-step method. The interactions between independent variables were tested. The significance of explanatory variables in the model was evaluated by the Wald test and the goodness of fit of the model by the Hosmer Lemeshow test. Association measures such as Odds Ratio (OR) and its 95% confidence interval were calculated. The significance of the statistical tests was set at 5%.

## RESULTS

Out of the entire cohort of 2017 (1256 person), 1070 were diagnosed with type 2 diabetes mellitus, of which 474 diabetics were active as of December 31, 2017. In the end, 403 people were included in the sample (Figure 1). People under 40 were excluded from the analysis as they represented only 1.5% of the study population so 397 people were selected for the analyzes.

### Characteristics of diabetic subjects in the sample

As shown in Table I, our sample consisted of 57% Female and 43% male. The 40-60 age group was the most common (61%) and the average age was  $55.72 \pm 9.90$  years, with a median age of 55, a minimum of 27 years and a maximum of 85 years. Nearly 23% of diabetics never attend school, majority are living in couples (74%) and in the city (71%). Regarding the economic status, 63% earned income superior to the SMIG and 65% work in the informal sector. Concerning health, 28% of patients with diabetes were insured, 5% are engaged in physical activity, 7% smoke tobacco and 19% had an elevated BMI.

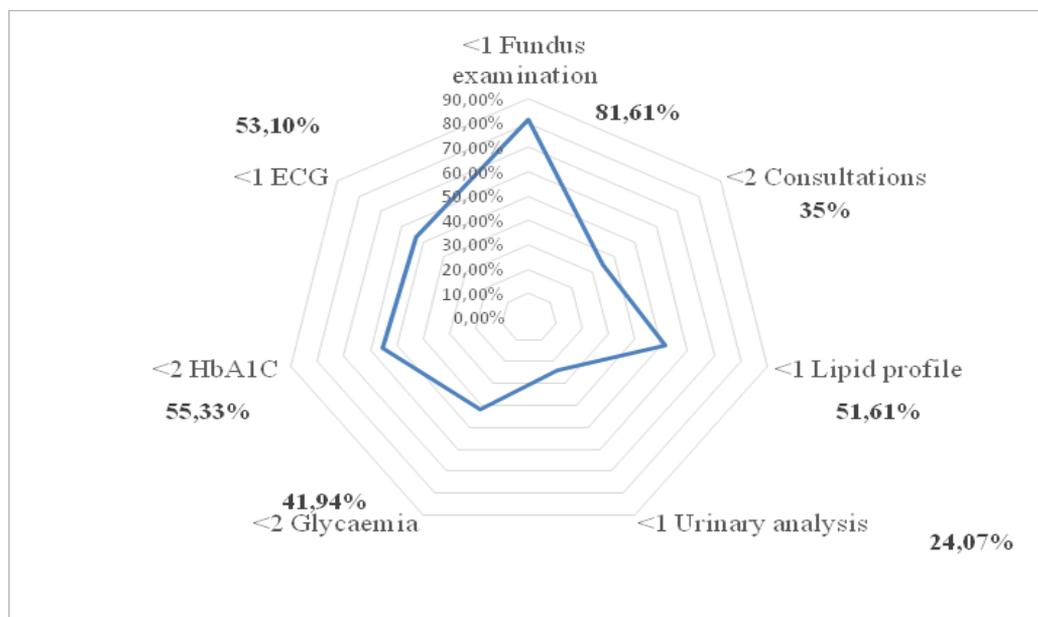
**Table I:** Characteristics of diabetic subjects, 2017 CADA cohort (n = 403)

	Variables	Number	Percentage (%)
Age in years	<40	6	1.49
	[40-49]	112	27.80
	[50-59]	133	33.00
	[60-69][	102	25.31
	$\geq 70$	36	8.93
Sex	Not determined	14	3.47
	Male	173	42.93
Marital Status	Female	230	57.07
	Single	38	9.43
Level of education	Married	298	73.94
	Widow (er) or Divorced	67	16.63
Employment Sector	Not educated	93	23.08
	Primary level	138	34.24
	Secondary level	87	21.59
	Higher education	74	18.36
Income	Undetermined	11	2.73
	Formal	262	34.99
Place of residence	Informal	141	65.01
	$\geq$ SMIG	149	36.97
	<SMIG	254	63.03
	Rural	116	28.78
	Urban	287	71.22

Health Insurance	Yes	112	27.79
	No	289	74.71
	Undetermined	2	0.5
Physical activity	Yes	21	5.21
	No	375	93.05
	Undetermined	7	1.74
Tobacco smoking	Yes	29	7.20
	No	363	90.07
	Undetermined	11	2.73
BMI (kg/cm <sup>2</sup> )	<25	174	43.18
	25-29	154	38.21
	≥30	75	18.61

### **Frequency of renunciation**

Nearly nine (9) out of ten (10) diabetics had renounced on treatment (86.84%). All medical analysis recommended are concerned by this renouncement (Figure 2). This giving up attitude mainly concerned the follow-up examinations of complications and the HbA<sub>1c</sub> measurement (55.33%). Therefore, ophthalmological (fundus) examinations were not performed in more than 3/4 of diabetics (85.61%). The ECG were not done in almost half of them (53.10%). The clinical urine test recorded the least renunciation, nearly two (2) out of (10).



**Figure 2:** Frequency of medical follow-up renunciation by Diabetics in the CADA according to Recommended tests, 2017 Cohort (n = 403)

### Profile of Diabetics who have renounced to medical follow-up

In view of the MCA carried out, axis 1 show 19.64% of the total inertia and the second 10.16% (Figure 3).

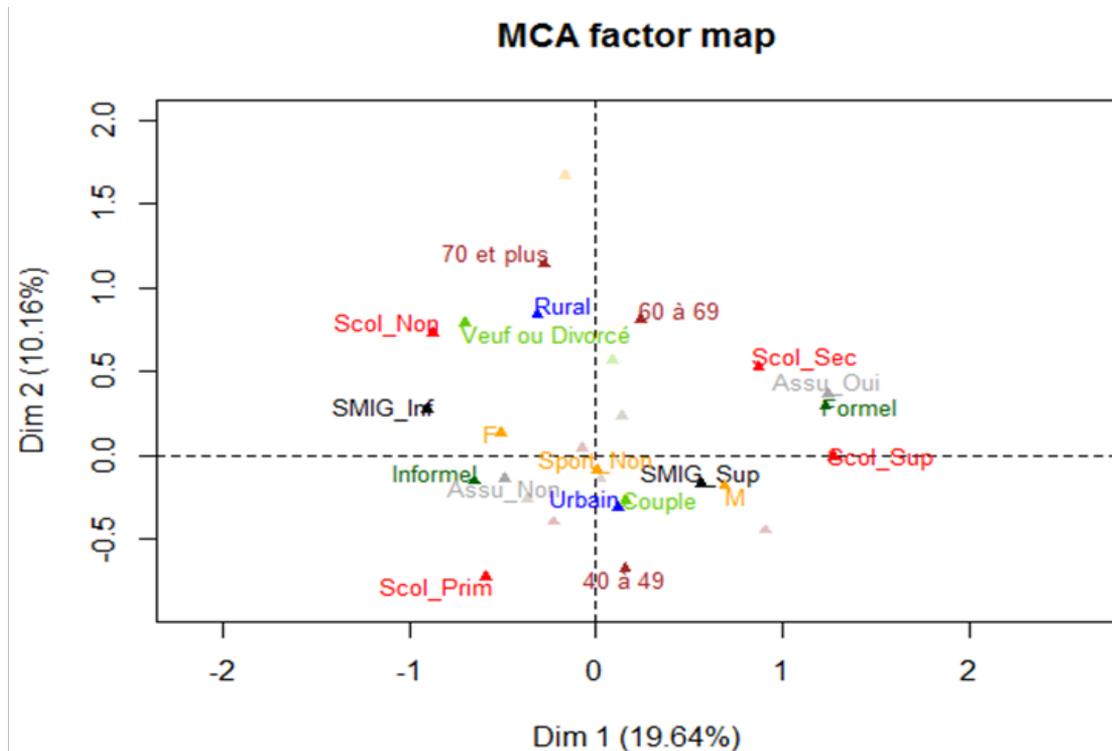


Figure 3: MCA Graph of variables modalities

F: Female; M: Male; Assu\_Oui: Insured; Assu\_Non: Not insured; Scol\_Non: Not educated; Scol\_prim: Primary level; Scol\_Sec: Secondary level; Scol\_Sup: Higher education; SMIG\_Inf: <SMIG; SMIG\_Sup: ≥SMIG; Couple: Married; Veufou Divorcé: Widow(er) or Divorced; Urbain: Urban; Formel: Formal employment sector; Informel: Informal employment sector.

The first axis is discriminating from the educational level of individuals. Those with no formal education or primary school level behave completely different compare to those having higher educational levels (secondary and higher education). This 1st dimension also opposes those working in the informal sector, widowed or divorced and earning income lower than the SMIG to diabetics employed in the formal sector, having higher incomes and benefiting from insurance policy.

The second axis opposes diabetics according to their area of residence and age. Those who live in rural areas and who are 70 years and above, and those in the urban area age between 40 and 69 years.

## Determinants of objective renouncement to healthcare

The final model retained after the step by step descending procedure is the one without interactions (Table II). The model is of good quality (Wald test:  $p = 0.026$ ) and adequate (Hosmer Lemeshow test:  $p = 0.99$ ).

**Table II:** Results of Logistic Regression (n = 397)

Variables		OR	CI <sub>95%</sub>	p
Employment	Informal	1	-	
	Formal	2.40	1.05 - 5.87	<b>0.044*</b>
Place of residence	Urban	1	-	
	Rural	0.49	0.22 - 1.00	0.063
Marital status	Married	1	-	
	Single	1.32	0.46 - 3.30	0.571
	Widow or divorced	2.95	1.45 - 5.95	<b>0.003*</b>
Income	≥SMIG	1	-	
	<SMIG	0.45	0.19 - 1.02	0.065
Tobacco Smoking	No	1	-	
	Yes	2.22	0.81 - 5.52	0.099
Constant		0.14	0.08 - 0.25	<b>&lt;0.001*</b>
Wald test		$p = 0.026^*$		
Hosmer Lemeshow test		$p = 0.99$		

p \*: p significant at 0.05

Logistic regression identified employment industry and marital status as predictors of objective renouncement to healthcare. Diabetics employed in the formal sector were more likely to give up healthcare than those in the informal sector (OR = 2.40, 95% CI: 1.05 - 5.87). Widowed and divorced gave up 2.95 times (95% CI: 1.45 - 5.95) more than those who are married (Table 2). Income, place of residence, and smoking are not associated to non-compliance.

## DISCUSSION

The diabetic population in our study is comparable to the typical diabetic population in low- and middle-income countries [FID 2017]. Almost 60% are between the ages of 40 and 59, 57% are female, and almost all of them are not practicing any physical activity.

The study on objective renouncement to healthcare in people living with type 2 diabetes has shown poor adherence to medical monitoring. Nearly 90% of non-compliance to medical monitoring was noted. This high rate is often observed in sub-Saharan Africa [OMS 2016] due to financial reasons [OMS 2016, Mense 2014]. However, one could cite the preferences of individuals regarding the type of healthcare facility. A study conducted on the utilization of healthcare facilities in Côte d'Ivoire in the year 2015 found that people resorted more to traditional medicine for chronic diseases [Attia-Konan 2018]. Monitoring

analysis recommended with the objective of preventing complications were the most concerned by this renunciation, namely ophthalmic tests (86%) followed by ECG (53%). This event reflects the difficulties of access to modern technology and specialized personnel in low-income countries due to insufficient personnel in the healthcare facilities [OMS 2016]. This situation affects the medical follow-up of diabetics and may expose them to complications and premature death. In fact, Africa has the highest mortality rate among diabetics due to lack of access to modern healthcare [FID 2017]. In addition, the high prices of these medical tests suggest a financial barrier to these examinations [WHO 2010]. This hypothesis seems justified by the fact that the urinary analysis which cost less were less concerned by the renunciation of healthcare in our study.

The mechanisms of non-adherence in chronic diseases are multiple [Reach 2013]. The financial barriers to healthcare services well-articulated with other factors. Our study found that sociodemographic parameters such as marital status and area of residence were determinants to healthcare renunciation. Widow status was a positive predictor of healthcare renouncement. According to the MCA carried out, widows are also elderly people and not educated. Although age and level of education were not determinants of healthcare renunciation in our study, these characteristics in association with the marital status widow(er) suggest that they are lacking comprehension of instructions by healthcare service provider [Reach 2013]. In fact, people with a low level of education have less access to healthcare information because of the difficulty in communicating with most medical doctors [Schillinger 2003, Schillinger 2004]. Patient-provider communication has been cited as common barriers to understand the HbA1C guideline [Gopalan 2018]. In addition, elderly people are also likely to forget because of the deterioration of their cognitive abilities.

Working in the formal sector also increased the renouncement to medical follow-up in our study. The diabetes business line was not linked to income according to the MCA but rather to insurance cover. This seems contradictory compared to literature [Gning 2007, Okoronkwo 2015]. This observed difference could be linked to many malfunctions in the insurance companies in Côte d'Ivoire with frequent interruption of benefits to the beneficiaries.

Our results should be interpreted with caution as all of the usual factors associated to healthcare renouncement have not been explored because they are absent from the study database. The parameters related to the health service organization, the practices of professionals have not been explored. In addition, income dichotomized can lead to misclassification of income. Individuals, although having similar incomes, could end up in different classes.

## **CONCLUSION**

This study demonstrated that adherence to recommended medical follow-up was poor among diabetics. They are thus exposed to complications and premature deaths. Complication preventive follow-up tests were the most concerned when it comes to care renouncement. Implementing integrated diabetes treatment management at CADA could reduce these care renouncement events. Our study highlighted the sociodemographic determinants of care renouncement that could lead to incomprehension of the recommendation by the patients. Improved communication on national recommendations to diabetics should be encouraged.

## Ethical considerations

The Scientific Committee of the National Institute of Public Health authorized the utilization of the database following the presentation of the study protocol. The data has been anonymised.

No conflict of interest

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