



Predictive Factors of Complications in Diabetic Patients Under Care at The Haho Health District Hospital, Togo, 2020 – 2021

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Abstract

Introduction

Diabetes related complications constitute a factor of bad prognosis in diabetic patients and are also responsible of significant loss of life years in populations, especially in low- and middle-income countries. Many factors determine the occurrence of diabetic complications in one patient. The purpose of this study is to determine predictive factors associated to diabetic complications in Haho health district.

Methods

We conducted a prospective study at Notse hospital. The participants in this cohort were recruited from diagnosed diabetic patients who attended the hospital during 2020 for any purpose. To be included, they must not have at entrance any current diabetic complication and must have their HbA1c available. They were followed-up from 1st september 2020 to 31 august 2021. The screened outcome was the occurrence of any diabetic complication. Any macrovascular, microvascular or metabolic dysfunction attributable to diabetes was considered as diabetic complication. We predicted associated factors to diabetic complications using cox regression model with 95% confidence interval (CI).

Results

A total of 136 participants were followed-up. The overall incidence rate of diabetic complications was 12.5 cases per 100-person year 95% CI (6.4-18.6). Diabetes duration ($p=0.02$), non-paid patients' occupation ($p=0.01$) and living in rural area ($p=0.00$) were significantly associated with complications occurrence in bivariate analysis. Living with diabetes for a median duration of two years protected from complications and living in rural area had 4.54 (1.29-15.95) time hazard ratio of developing complications.

Conclusion

Only few participants in this cohort did not comply to the prescribed protocol and were able to be assessed with alternative designed means. The results found are clinical based one, specific to poor resources settings and easily reproducible and helpful to set a large database to help improve diabetes care in low- and middle-income countries.

Keywords: diabetes

Introduction

Diabetes is one of the deadliest diseases worldwide and is among non-communicable diseases (NCD), the fourth leading cause of death with almost two million deaths each year [1, 2]. This situation is in part linked to the fact that there are multiple complications related to diabetes that worsens its treatment prognosis [1,3,4]. Diabetes complications are responsible of about 5.8 years of life lost in men and 6.4 years of life lost in women at the age of 50 years [5, 6], and expenditures destined to take care of diabetes are constantly increasing at countries level. Diabetes is therefore a public health

problem that threatens healthcare systems, especially in low- and middle-income countries (LMIC) where communities usually lack financial resources to access diabetes care and prevent its complications. It is expected that by 2045, Africa will reach 129% of increase in prevalence of diabetes from the current prevalence, the highest increase by that time in the world [1]. There is a need for healthcare systems to strategize on how to reduce diabetes complications incidence. Recent studies on diabetes complications in sub-saharan Africans have revealed an increase in the prevalence of chronic complications that varies a lot from one country to another [7-10].

In Togo where the prevalence of diabetes was 2.6% in 2010 [11], the magnitude of all diabetes complications has never been studied in one setting. Despite the fact that there are few studies focused on some isolated diabetes complications [12,13], no data on all major diabetes complications incidence or their predictive factors were found in the reviewed literature. Knowing the magnitude of diabetes complications and their predictive factors in Haho health district, where there are limited resources for management of the disease, will help the scarce health workers in charge to prevent their occurrence and improve the survival of diabetic patients. The aim of this study was to determine the predictive associated factors of diabetes complications among patients attending the Haho health district hospital for care.

Methods

Study design and period

A prospective cohort study was conducted from 1st September 2020 to 31 august 2021.

Study setting

The department of General medicine at Notsè hospital in Haho health district, has served as setting for the current study. Haho health district is located in Plateaux health region in Togo, at about 57 miles from Lomé the capital town. Notsè hospital is the referral hospital of Haho health district that also welcome patients of surrounding health districts: Moyen Mono, Ogou and Zio. The staff of General medicine was composed of one (01) general practitioner, three (03) medical assistant and five (05) nurses all trained and equipped in diagnosis and management of diabetes complications according to national program against NCD policy during the study period. This hospital had the basic biological laboratory equipment for diagnosis, assessment of diabetes, and its complications. For specific biological laboratory testing, or imagery testing of diabetes complications, patients were referred to national referral institutes in Lomé to run them.

Participants to the current study were submitted to a simplified and integrated protocol of diabetes management according to the national health policy and were seen every month on check-up in case there is no emergency, by caregivers. In case a participant misses his appointment for routine check-up, community health workers in charge of the participant living area was contacted to check-up on him. Their glycosylated hemoglobin (HbA1c) was assessed once each semester. All the caregivers of the participants

were prior trained to this protocol, that include pharmacological treatment and systematic psychological support from two trained psychologists.

Study population

Participants to this study were recruited from diagnosed diabetic patients who have been attending Notsè hospital for routine check-up during the first semester of 2020. To be included, they must be diabetic and not have at entrance any current diabetic complication and must have their HbA1c available.

Definition of study Variables

The screened outcome was the occurrence of any diabetes complication. Any macro vascular, microvascular or metabolic dysfunction attributable to diabetes was considered as diabetes complication.

The independent variables were: socio demographic variables (age, sex, marital status, occupation, living area, level of income, schooling background), clinical characteristics (existing history of comorbidity in participants, participants' lifestyle regarding diabetes, glycemic control, adherence to diabetes treatment protocol)

Adherence to treatment was defined considering participants who took their treatment as prescribed by the protocol during the last 30 days before the routine check-up and this during the study period. Participant lifestyle regarding diabetes was fair if the participant follows physical exercise, alcohol and tobacco intake, dietary prescriptions as recommended; in other case, the lifestyle was not fair.

Glycemic control was defined as controlled if participants' HbA1c is less than or equal to 8%; in other case it was defined as uncontrolled [14].

Data collection and analysis

Data were collected with a designed semi-structured questionnaire by reviewing participant's records on their medical files, and by interviewing them concerning qualitative variables. Then, data were processed in a designed Microsoft excel 2016 spreadsheet. The database was cleared by removing its inconsistent data. The statistical software Stata 14 has been used for statistical analysis. Descriptive statistics: proportion, mean (if normal distribution), median (if distribution not normal), standard deviation (SD), interquartile range (IQR) and incidence with confidence interval (CI) were calculated. A bivariate analysis was first ran and then after, all the variables with a p-value inferior or equal to 0.20 were introduced in a cox model for multivariate analysis using a descending stepwise approach. With this method, we used 95% CI, to predict associated factors to the occurrence of diabetes complications among participants, by calculating hazard ratio (HR), p-values.

Ethical considerations

This study has the approval of Haho health district directorate. Participants were informed and gave their oral informed consent.

Data have been processed anonymously and in strict confidentiality.

Results

A total of 136 diabetic person participated in this cohort study from the beginning till end. Among them, 97.1% suffered type 2 diabetes while 2.9% suffered type 1 diabetes.

Socio demographic characteristic of participants

Participants were in mean, aged 49.9 years (± 14.7 SD), female in 55.9% of the case, living in rural areas in 50.0% of the cases, have a non-paid occupation in 73.5% of the cases and had equal to or more than interprofessionnal minimum wage as monthly income in 52.9% of the case (table 1).

Diabetes complications

During the one year of follow up in this cohort, 11.8% (16/136) participants (11.8%) encountered diabetes complications. Among all the participants, 52 (38.2%) have already had a history of diabetic complication in their past. Table 2 summarizes the prevalence of different types of diabetes complications in participants before their recruitment in the cohort.

The overall incidence of diabetes complication among participants was 12.5 complications per 100 person-year (CI: [6.4-18.6]). The incidence of microvascular complications was 28.2 complications per 100 person-year (CI: [23.7-32.7]), that of macro vascular was 19.5 complications per 100 person-year (CI: [16.6-22.4]) and that of metabolic was 21.1 complications per 100 person-year (CI: [16.9-25.3]).

Other characteristics

The median duration of diabetes disease in participants was 4 years (IQR, 2.0–8.0) with 2 years (IQR, 1.0–3.0) among participants that developed complications and 5 years (IQR, 2.0–8.5) among those that did not develop diabetic complications during the current cohort follow-up.

Of all the participants, 36.8% (50/136) had an associated comorbidity to their diabetic condition, 79.4% (108/136) had not a fair lifestyle regarding diabetes, 55.1% (75/136) were not adherent to treatment protocol and 46.3% (63/136) did not have a controlled glycaemia during the cohort time.

Independent predictive factors of diabetic complications

In bivariate analysis (table 3), duration of diabetes disease among participants was significantly different from those that had complications and those that did not have ($p=0.02$). The occurrence of a complication among participants was significantly different considering paid or non-paid occupation ($p=0.01$), living area (0.00) and having or not a history of diabetic complication ($p=0.00$) After cox multi variate regression, being diagnosed for diabetes and under treatment for a median duration of 2 years protect from the occurrence of complications (HR = 0.81; CI: [0.67-0.98],

$p=0.03$); and living in rural area increases the risk of developing diabetic complications (HR = 4.5; CI: [1.29-15.95], $p=0.02$).

Discussion

A few participants in this study have developed complications due to diabetes. Actually the aim of any diabetic treatment protocol is to prevent or reduce the occurrence of complications and on that base, observing any complications constitutes a threat to diabetic patient's survival. This incidence rate is related to the duration of the follow-up that was not enough and also to the fact that most of the participants lived in rural area where it is difficult to have access to all the recommended care. In the current study, it was demonstrated that living in rural area constitutes a predictive risk factor of complications occurrence. Also in rural areas like in Haho, people usually lack finances to take care of basic needs and if diagnosed with diabetes without sponsor, it worsens the ability of patients to provide financially for their care and also to geographically have access to drugs. All that, always drag to poor adherence to treatment protocol which is a determinant to any treatment success [15-17].

Being diabetic for a median duration of two years prevents the occurrence of diabetic complications in about one fifth of the cases in this study. This finding can be explain by the fact that usually, at diagnosis of long-term diseases like diabetes in our setting, patients present some critical symptoms that prompt them in the first place to check. On the announcement, they are more concern about relieving those symptoms and are more focused on the prescribed protocol and progressively their adherence decline resulting after this period in complications.

Microvascular complications (diabetic retinopathy, chronic kidney disease) were complications that occurred the most among the participants during the follow-up compared to macro vascular and metabolic complications. This confirms the evidence that there is an increase in the incidence of microvascular complications associated to uncontrolled glycemia [18,19], as observed in the current study where about half of participants were also not adherent to treatment protocol and had an uncontrolled glycemia. The observed prevalence of diabetic retinopathy in this study was higher than the one reported in Togo 19.4% [12], in Egypt 20.5% [20], in Tunisia 8.1% [21], in Italy 4.9% [22], 4.8% in China [23], in UK 21% [24], and in Hawaii 1% [25]. This difference in prevalence could be explain by the fact that during the follow-up, the screening for diabetic retinopathy was systematic and clinically done based on fundoscopic examination (operator dependent examination) combined with the clinical history while in other studies, the techniques used for diagnosis were more specific [26, 27]. Also the differences in study populations characteristics from one study to another could explain this high prevalence. These same reasons can explain the differences in prevalence in other studies for chronic kidney disease: 20.6% in Togo [12], 8% in Italy [22], 1.9% in China [23], 3% in UK and Denmark [24, 28], stroke: 2.4% in China [23], 10.6% in Togo [12], 2% in the ADDITION-Europe study [29] and 5% in Germany and UK [30].

This prospective study is the first one in Togo that assess all the complications in diabetic patients more specifically those followed

up in limited resource setting and is one of the few studies that presents the incidence of diabetes complications. The strengths of this study is related to the fact most of the complications were clinically diagnosed except complications that needs a minimum laboratory examination to confirm. And so it is easy to reproduce in other limited resource settings so that a wide database can be established especially in Africa for action. The limits in this study is related to the lack in systematic lab tests concerning, vascular ultrasonography, peripheral nerves assessment and also to the fact that some participants did not comply to the protocol in terms of responding to their check-up.

Conclusion

The overall incidence of diabetes complications in this study was low and were dominated by microvascular complications that were most chronic. The living area was found as a predictive factor of the occurrence of diabetes complications while living with diabetes for 2 years was of benefit in preventing complications. Diabetes complications epidemiological profile as found in this study constitutes a burden to public health as the number of diabetic patients in Togo still increase year by year. Considering all the disabilities than can result from these complications, the cost of their care, the national program need to near simplified strategies of care and follow up to diabetic patients through delegate care. A more emphasize on treatment adherence, drugs availability must be promoted in an individualized designed protocols from the second year of the disease in newly diagnosed diabetics and also in those living in rural areas. We suggest direct observed treatment (DOT) by a relative of patients, and community care as ways to improve diabetic patient's adherence. Also the approach of "discussing groups" (entertained by psychologists) that have shown good results in this cohort as patients were more able by sharing their experiences, to be precociously worried about complications symptoms, must be promoted.

Competing interests

The authors declare that they have no competing interests.

What is already known on this topic: diabetes complications have many underlying factors. **What this study adds:** the first two years after diabetes diagnosis are protective from complications and living in rural predicts diabetes complications.

How this study might affect research, practice or policy: direct observed treatment by a relative, community care and "discussing groups" need to be taken into account in diabetic patient's education from the second year on of the disease diagnosis.

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