

Presentation

Management of Hypertension and Diabetes in Health Centers in Sub Saharan Africa Countries

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Background

While communicable diseases such as malaria, tuberculosis, human immunodeficiency virus syndrome, low respiratory tract infections, diarrheal diseases have been rated among the top ten global causes of death in Sub-Saharan Africa (SSA) [1], it is now apparent that non-communicable diseases such as hypertension and diabetes mellitus are undoubtedly adding to the multiple burdens the peoples in this region suffer [2].

Usually health systems in these countries are designed around the need of acute and non-chronic care [3] as such there is a lack of coherent policies on chronic disease prevention, management and guidelines whereas non-communicable diseases are the second most common cause of deaths in SSA accounting for 2.6 million deaths equivalent to about 35% of all deaths [4].

The burden of non-communicable diseases is increasing rapidly in particular diabetes and hypertension [2]. The International Diabetes Federation reported that the prevalence of diabetes in SSA is anticipated to double between 2010 and 2030 and the number of adults with diabetes in Africa is predicted to rise to 55 million by 2045 (an increase of 134%) [5]. It is estimated that of approximately 650 million people in SSA, 10-20 million may have hypertension [6].

These estimates are based on scarce heterogenous studies and many countries in SSA still lack detailed up-to-date basic data on the prevalence of hypertension [7].

Abstract

Non-communicable diseases are increasing the incidence and prevalence in last ten years and only now national health systems are looking this phenomenon and they are searching to improve strategies to limit damages. Non-governmental organizations that work in these countries can contribute to improve strategies and tools against these chronic diseases.

Keywords: Non-communicable diseases; Hypertension; Diabetes mellitus; Health centers; Out-patients departments

While on the one hand there have been rapid improvements in HIV care programs in SSA, on the other hand health services for non-communicable diseases in SSA remains poor. No investments in health services, laboratory capacity, health information systems, healthcare workers capacity have led to non-communicable diseases as a forgotten issue in public health.

Health service prevision for non-communicable diseases in SSA remains poor and the care is limited with only 5-20% of people with diabetes or hypertension thought to be in regular care [8].

One of the biggest inadequacies in the development agenda is the omission of non-communicable diseases from the United Nations Millenium Developed Goals. The ability of SSA countries to effectively respond to the hypertension and diabetes epidemic has been hindered by limited funding.

Hypertension

Hypertension is now recognized as one of the most important diseases contributing for about 40% of cardiocerebrovascular diseases in the continent [9,10].

An increasing burden of hypertension will thus result in severe consequences as only very few people get treatment and control is likely to be low [11].

Prevalence of hypertension in Africa is estimated 27% of the

adult population [12] and the awareness, diagnosis, treatment and control remain low [13,14]. Major challenges for people living with hypertension relate to the asymptomatic nature of the condition leading to delayed diagnosis and treatment initiation. After diagnosis, hypertension requires lifelong lifestyle modifications, frequent medical check-ups, ongoing counselling and regular adaptation of treatment dosage or drug regimen [15]. Sub-Saharan health systems remain poorly adapted to provide comprehensive cardiovascular disease care, with insufficiency trained, equipped and supported workforce, limited availability of treatment options, and infrequent or non-existing monitoring of treatment outcomes, such as blood pressure control and end-organ function [16].

To overcome barriers a care model promoted is the task-shifting/sharing where there is a planned transfer of care duties from physicians to non-physicians such nurses or community health workers [17,18].

In a community based cross-sectional study conducted in Ethiopia 19.6% (95% CI: 13.7-25.5) people were hypertensive, higher in the urban population (23.7%) than in mixed rural and urban (14.7%) (19); in another study conducted in Gondar region (Ethiopia) 37% of people didn't know their hypertension [20].

Self-awareness as well as the treatment and control of hypertension are very low and these factors have contributed to the increasing burden of stroke [21] and myocardial infarction [22] where patients were diagnosed with hypertension only after these complications occurred.

Diabetes Mellitus

In 2019, the International Diabetes Federation (IDF) Atlas estimated that about 24 million individuals in SSA have diabetes with a potential rise to about 55 million by 2045 [5].

In contrast to developed countries, where the majority of the people with diabetes are over 60 years, the SSA diabetic population is in the economically productive age group of 30 to 45 years old. The late diagnosis of diabetes in this region, coupled with inequalities in accessing care, leads to early presentations of diabetic complications [23].

Rising prevalence of diabetes in SSA countries is associated with a nutritional transition from a high-fiber traditional diet to an energy-dense western diet leading to an unhealthy weight gain, raised fasting blood glucose levels, raised blood pressure and hyperlipidemia, all of which increase the risk of cardiovascular disease [24]. Moreover increasing prevalence of diabetes has been associated with ageing and lifestyle changes which accompany urbanization such a decrease in physical activity and changes in dietary patterns [25].

Table 1: Challenges and possible solutions to improve management of hypertension and diabetes in the population.

Challenges	Solutions
Poor patient attendance	Reorganization of health care system in HC and in OPD to dedicate time and space to manage chronic diseases
Poor patient education	Enhancing patient awareness about hypertension and diabetes
Lack of structured record keeping plan for patients in health care facilities	Expanding the data collected
Poor training programs for nurses and health care workers about chronic diseases	Improving training and availability of health care workers
Poor blood pressure and glycemic control among patients	Improving drug procurement and supply
Unsystematic evaluation and monitoring of hypertension and diabetes complications	Increasing patient education, empowerment and adherence to therapy
Inadequate health referral system	Share the project with hospital departments
Poor organization in service delivery to patients	Provision of diagnostic tools and infrastructure

Gestational diabetes is a real problem with a prevalence of 12.04% [95% CI (8.17-15.90)] in rural and mixed setting (urban and rural) in Ethiopia [26].

Metabolic and infective complications are so far the major reasons for the excess mortality associated with diabetes in SSA.

Type 2 Diabetes Mellitus (T2DM) is the most common form of diabetes (90–95%) in Africa [3], exhibiting an alarming prevalence among peoples.

Access to diabetic control is very poor. Beran and colleagues surveyed the availability of diagnostic testing tools in a sample of healthcare settings in three countries and found that in Mozambique urine glucose strips were available in just 18% of health centers surveyed, ketone testing strips in 8% and blood glucose meter and strips in 21%, whilst availability in Mali was 54%, 53% and 13% and in Zambia 61%, 54% and 49% [27].

If we consider type 1 diabetes the situation is much worse. Of 99 type 1 diabetics in the Tanzanian survey, only one person achieved good glucose control. None of them had the ability to monitor their glucose level at home, and hospital were unable to do it routinely [28]. The cost of diabetes monitoring equipment is high and usually there is an inability to afford monitoring equipment to test blood sugar levels [29].

Because of strained economic resources and a poor health care system, most of the patients are diagnosed only after they have overt symptoms and complications.

Microvascular complications are the most prevalent, but metabolic disorders and acute infections cause significant mortality. The high cost of treatment of type 2 diabetes and its comorbidities, the increasing prevalence of its risk factors, and the gaps in health care system necessitate that solutions be planned and implemented urgently.

Aggressive actions and positive responses from well-informed governments appear to be needed for the conducive interplay of all forces required to curb the threat of type 2 diabetes in SSA.

The availability of drugs is very limited and the majority, including insulin, are dispensed by hospital pharmacies in the towns. Sometimes patients buy their medications directly from local pharmacies without attending clinics to obtain an appropriate prescription to avoid healthcare and transportation costs [30]. Moreover traditional "doctors" will, of course, provide patients with a range of alternative remedies.

A systematic review evaluating the efficacy of herbal medicine for glucose control showed that although they were safe to use, there was inconclusive evidence to prove their efficacy [31].

Table 2: Model of hypertension register.

Patient No.	name	surname	DOB	Village	YOD	FH of hypertension (Y/N/U)
1						
2						
3						
4						
5						
6						
...						
...						

DOB: Date of Birth; YOD: Year of Diagnosis; FH: Family History; Y: YES, N: NO, U: UNKNOWN

Table 3: Patient record of Hypertension.

PATIENT HYPERTENSIVE RECORD						
Name Surname Hypertension Register No.		Date	date	date	date
Weight kg						
Height cm						
BMI (kg/m ²)						
Blood pressure mmHg						
Smoke (Y/N)						
Peripheral pulse						
Hypertensive treatment						
Other drugs						
Nutrition counselling						
Physical activity						
Drug compliance						
Clinical compliance						
FBG (fasting blood glucose)						
Urine protein						

Table 4: Model of diabetes register.

Patient No.	Name	surname	DOB	Village	YOD	FH of diabetes (Y/N/U)
1						
2						
3						
4						
5						
6						
...						

DOB: Date of Birth; YOD: Year of Diagnosis; FH: Family History; Y: YES, N: NO, U: UNKNOWN

Table 5: Patient record of diabetes.

PATIENT DIABETES RECORD						
Name Surname Diabetes Register No.		Date	Date	date	date
Weight kg						
Height cm						
BMI (kg/m ²)						
Blood pressure mmHg						
Smoke (Y/N)						
Peripheral pulse						
Foot examination						
diabetic treatment						
Other drugs						
Nutrition counselling						
Physical activity						
Drug compliance						
Clinical compliance						
FBG (fasting blood glucose)						
Urine protein						
Urine glucose						

Another challenge associated with the management of diabetes in SSA countries is the relationship between diabetes and HIV-infected persons. A multicenter cohort study concluded that the incidence rate for diabetes among HIV-infected men in highly active antiretroviral therapy was 4.7 cases per 100 person-years compared with 1.4 cases per 100 person-years among HIV-seronegative men [32].

While most studies have focused on diabetes as a risk factor for Tuberculosis (TB), emerging evidence suggests that the relationship is bidirectional, with a higher prevalence of diabetes found among TB-infected people [33]. Therefore not only TB increases the risk of diabetes but like many other infections, it also complicates diabetes management. For example TB treatment including isoniazid have hyperglycemic effects and interfere with insulin release, hence impairing glycemic control among diabetics who are in this medications [34].

Time to Action

The chief problem in SSA countries is how to make the management of hypertension and diabetes (and other lifelong diseases) more readily available [35]. One approach can be to take the necessary facilities to the rural areas, nearer to patient's home establishing a system of delivery of chronic diseases treatment at the rural Health Centers (HC) and in Out-Patient Departments (OPD) in country hospitals. This must involve nurses taking records, equipment and medicines on a regular basis to the health centers and arranging for patients to attend these peripheral clinics. The scheme should substantially reduce the travelling distance and time for many people with hypertension and diabetes and encourage them to attend more regularly. For this system to succeed in the long term, nurses will have to be trained in hypertension and diabetes management independently from physicians.

We must also remember that in SSA countries two health systems coexist, the western biomedical healthcare system and the traditional health care model [36]. Approximately 50% of diabetic patients visiting hospitals in urban cities like Lagos and Benin have used some forms of traditional medicine during the course of their disease management [37] and traditional healers use biomedical knowledge and terminologies to maximize the effectiveness of their traditional treatment.

The key challenges to chronic diseases as hypertension and diabetes care should be faced by some strategies as summarized in the Table 1 [38,39].

The high cost of treating complications due to hypertension and diabetes and the gaps in health care systems in resource-poor settings provide strong and valid reasons because interventions and solutions have to be implemented.

Hypertensive Patient's Management

Each HC and each OPD should have a *HYPERTENSION REGISTER* where reported essential data of the patients are attended (Table 2):

For each patient should be performed a hypertensive patient record (Table 3) with data collected during the visits with the aim to verify general status of the patient, plan a preventive action to avoid complications and allow counselling for a correct lifestyle.

Table 6: Procedures to determine glucose, protein and ketones in urine with strips or quali-quantitative method.

Urine Test for Determination of Glucose, Protein, Ketones.	Trade Name	Cost of each determination (euro)
Glucose (strips)	Diabur Test 5000®	0,18
Glucose and ketones (strips)	Keto Diabur Test 5000®	0,27
Glucose and protein (strips)	Combi Screen 3 Plus®	0,19
Glucose (Benedict ¹ qualitative solution for glucose in urine)		0,20
Protein ²		0,04

PROCEDURES

¹Benedict Solution: dissolve 17.3 g of copper sulphate crystals by heat in 100 ml of distilled water. In other volumetric flasks dissolve 173,0 g of trisodium citrate and 100,0 g of sodium carbonate in about 800 ml of water. Add the copper sulphate solution slowly to the trisodium citrate/sodium carbonate solution, stirring constantly. Make up the mixture to 1000 ml with distilled water

To 5 ml of Benedict solution add 8 drops of urine and mix well. Boil over the spirit lamp for 2 minutes. In presence of glucose the blue color turns: green (+/- = 250 mg/dl); yellow (+ = 500 mg/dl); orange (++) (1000 mg/dl); red (+++) (1500 mg/dl).

²Urine should be clear and acid.

To 5 ml of urine add 5 drops of 20% sulphosalicylic acid.

Absence of cloudiness means absence of proteins. Report as 0, +, ++, +++ or ++++.

Diabetic Patients Management

Each HC and OPD should have a *DIABETES REGISTER* where reported essential data of the patients are attended (Table 4):

The minimal biomedical instrument for nurses to manage patients with hypertension and diabetes are:

- Electronic sphygmomanometer
- Weighing machine
- Height measure system
- Blood glucose machine (glucometers)
- Urine (glucose, protein) strips

In HC sometimes there are glucometers given by donors with related strips for blood glucose levels but when finish the patients cannot be followed anymore until new furniture will be available (sometimes after several and several months).

When strips for blood glucose finish its possible determine glucose in urine as substitute and approximate value of blood glucose knowing the renal threshold of glucose (180 mg/dl or 10 mmol/l). Generally glucose is only found in urine in diabetics.

In the table 6 the procedures to determine glucose, protein and ketones in urine with strips or with quali-quantitative method and relative costs are reported.

Steps to Do

Doctors with Africa CUAMM is the leading organization in the promotion and safeguard of health of African populations and works on a daily basis in eight SSA countries (Angola, Ethiopia, Central African Republic, Mozambique, Sierra Leone, South Sudan, Tanzania and Uganda). The project of management of hypertension and diabetes can be proposed in HC around the St. Luke's Hospital in Wolisso (Ethiopia) and Hospital of Beira (Mozambique).

These are the steps:

1. Presentation of the program to Local Health Authorities
2. Once approved, determine the feasibility of the project
3. Identify the HC where the project can start

4. Share the project with local health facilities
5. Verify minimum standards to apply the project
6. Educational training program and sharing the project with nurses and health workers
7. Arrange educational material for attenders the HC and hospital OPD
8. Arrange all support to collect data
9. 6-months first check about number of patients, nurse and health worker opinion
10. 12-months second check for process and outcome indicators

Conclusion

It's now important that chronic diseases as hypertension and diabetes take a part of the public health agenda planning timely intervention specially at the community level not only as early detection, treatment and follow up but also as prevention and health education.

A good surveillance system needs to be integrated into the national health information system and repeated over time to provide a trend and to measure exposure (risk factors and social determinants), outcomes (morbidity and mortality) and health system capacity and response (infrastructure and health plans and policies).

We believe that the actions must start first in HC and in hospital OPD because these are the place where health system meets the first needs of the population, where there is the strong relationship between nurses and people and where the prevention policies can be made at low cost.

There is an urgent need to develop minimum standards for prevention and management of hypertension and diabetes.

Each of SSA countries through own Ministry of Health with the assistance from academic institution, non-governmental organizations for cooperation should ensure that local prevalence and incidence data (in this case for hypertension and diabetes) are collected to increase the availability of good information on current epidemiological trend. They should collect regional and country-specific data on morbidity, mortality and access to diagnosis and care. All these institutions should join forces and use their expertise and network to promote awareness of

the interaction between these diseases (hypertension, diabetes and cardiovascular diseases), to inform the development of integrated and complimentary service delivery program and health policies. In the end they should establish peer-learning and experience-sharing discussion forums to promote the development of feasible and cost-effective strategies and solutions for management and control of hypertension and diabetes in SSA countries.

Author Statements

Competing Interest

The authors declare no conflict of interest.

Authors' Contributions

All authors made a significant contribution to the work reported including the conception, analysis and reviewing of the literature, drafting the article and final approval of the version to be published. Moreover they all are part of long-term projects in SSA countries on behalf of Medicine with Africa-CUAMM.

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