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COMMENTARY

Ten Recommendations for Accelerating Hypertension and Diabetes Control to Reduce Stroke, Heart, and Renal Disease with the Aim to Save Lives in Cameroon Through Partnerships and Collaborations

Anastase Dzudie · Mesmin Dehayem · Liliane Mfeukeu Kuate · Marie Solange Ndom · Christian Ngongang Ouankou · Peter Vanes Ebasone · Armel Djomou Ngongang · Epie Njume · Felicite Kamdem · Simeon Pierre Choukem · Noël Emmanuel Essomba · Jerome Ateudjieu · Francois Kaze Folefack · Erika Nang Obada · Aristide Nono · Brice Kitio · Patrice Tchendjou · Friedrich Thienemann · Jerome Boombhi · Chris Nadege Nganou · Gloria Ashuntantang · Alain Patrick Menanga · Andre Pascal Kengne · Sylvie Ndongo Amougou · Appolinaire Tiam · Farida Haoua · Eugene Sobngwi · Jean Claude Mbanya · the Cameroon coalition against Noncommunicable diseases

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A. Dzudie · M. Dehayem · L. M. Kuate · F. K. Folefack · J. Boombhi · C. N. Nganou · A. P. Menanga · S. N. Amougou · E. Sobngwi · J. C. Mbanya
Faculty of Medicine and Biomedical Sciences, University of Yaounde I, Yaounde, Cameroon

A. Dzudie
Cape Heart Institute, University of Cape Town, Cape Town, South Africa

A. Dzudie (✉) · F. Kamdem
Service of Internal Medicine and Subspecialties, Douala General Hospital, 4856 Douala, Cameroon
e-mail: aitdzudie@yahoo.com

A. Dzudie
Lown Scholars Program, Department of Global Health and Population, Harvard T. H. Chan School of Public Health, Boston, USA

M. S. Ndom · F. Kamdem · N. E. Essomba
Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon

C. N. Ouankou · S. P. Choukem · J. Ateudjieu
Faculty of Medicine and Pharmaceutical Sciences, University of Dschang, Dschang, Cameroon

P. V. Ebasone · E. Njume
Clinical Research Education, Networking and Consultancy, Yaounde, Cameroon

A. D. Ngongang
Fondation Coeur et vie, Douala, Cameroon

E. Njume
Non-Communicable Diseases Prevention and Control Program, Cameroon Baptist Convention Health Services, Yaounde, Cameroon

F. K. Folefack
Service of Nephrology, University Teaching Hospital, Yaounde, Cameroon

E. N. Obada
Portefeuille Rein et Santé, Douala, Cameroon

A. Nono · G. Ashuntantang
Society of Nephrology, Yaounde, Cameroon

B. Kitio
Wiiqare, Paris, France

P. Tchendjou
Elizabeth Glaser Pediatric AIDS Foundation, Yaoundé, Cameroon

F. Thienemann
General Medicine & Global Health, Department of Medicine & Cape Heart Institute, University of Cape Town, Cape Town, South Africa

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ABSTRACT

Hypertension and diabetes are currently the most common, treatable, and controllable cardiovascular and metabolic risk factors for stroke, heart, and renal diseases in Cameroon. Hypertension affects 30% of adults aged ≥ 20 years with 90% as uncontrolled cases, while type 2 diabetes affects 6% of the same population, with 70% remaining underdiagnosed. Despite publication of the first Roadmap on raised blood pressure by the World Heart Federation in 2015, the Pan African Society of Cardiology Roadmap in 2017, and the technical package for cardiovascular disease management in primary health care (WHO-HEARTS) in 2020, very little progress has been made in improving the diagnosis, treatment, and control of cardiovascular risk factors and diseases in Cameroon. The Cameroon Cardiac Society and a dozen Cameroon non-communicable diseases societies, national organizations from the community and the civil society, along with researchers and members of academia and the health sector, came together under the patronage of representatives of the government to propose new strategies to improve hypertension and diabetes control and save lives in Cameroon. Two simple and practical algorithms for the management of hypertension and diabetes were developed. The ten recommendations tailored to be efficiently implemented in our country were summarized under the acronym 'A SMART VIEW' (Awareness, Screening, Manufacture, Activity, Research, Task-shifting, HIV/AIDS, Insurance, Education, and WHO-HEARTS). It is our hope that all stakeholders will further collaborate to remove barriers and enhance facilitators to deploy the proposed actions and reduce the burden of uncontrolled hypertension and untreated diabetes in Cameroon.

PLAIN LANGUAGE SUMMARY

Hypertension and diabetes are very common, yet treatable, cardiovascular, and metabolic risk factors for stroke, heart, and renal diseases in Cameroon. One-third of all adults aged 20 years or more in Cameroon have hypertension, in most of whom it remains uncontrolled. In addition, while 6% of these adults have type 2 diabetes, more than two-thirds remain underdiagnosed.

F. Thienemann
Department of Internal Medicine, University of Zurich, Zurich, Switzerland

G. Ashuntantang
Faculty of Health Sciences, University of Bamenda, Bamenda, Cameroon

A. P. Kengne
Non-Communicable Diseases Unit, Medical Research Council, Cape Town, South Africa

A. Tiam
Elizabeth Glaser Pediatric AIDS Foundation, Washington, DC, USA

A. Tiam
George Washington University Milken Institute School of Public Health, Washington, DC, USA

F. Haoua
Sub-Directorate of Non-Communicable Diseases, Department of Disease Control, Ministry of Public Health, Yaounde, Cameroon

E. Sobngwi
Division of Health Care Organization and Health Technology, Ministry of Public Health, Yaounde, Cameroon

J. C. Mbanya
Cameroon Civil Society NCD Alliance, Yaounde, Cameroon

Despite efforts to improve the diagnosis, treatment, and control of cardiovascular risk factors and diseases in Cameroon, minimal progress has been made. The Cameroon Cardiac Society, supported by input from Cameroon non-communicable diseases societies, national institutions/organizations, and representatives from the community, research, academia, and the health sector, has now developed two practical algorithms and ten recommendations specific to the Cameroonian population in an attempt to improve the control of hypertension and diabetes in Cameroon. It is hoped that these stakeholders will further collaborate to ensure the efficient implementation of these recommendations across the country, with the ongoing aim of monitoring their effectiveness over the next five years.

Keywords: Diabetes; Heart disease; Hypertension; Recommendations; Renal disease; Stroke

Key Summary Points

Hypertension and diabetes remain common, treatable, and controllable cardiovascular and metabolic risk factors for stroke, heart diseases, and renal diseases in Cameroon.
Algorithms and "A SMART VIEW" strategy have been proposed to improve hypertension and diabetes control to reduce organ damage and save lives in Cameroon.
The use of WHO-HEARTS has enabled the development of these algorithms and ten recommendations, which have been tailored to allow efficient implementation in Cameroon.
Further collaboration between stakeholders will help to remove barriers and support the facilitation and deployment of proposed actions in order to effectively reduce the burden of uncontrolled hypertension and untreated diabetes in Cameroon.

INTRODUCTION

Non-communicable diseases (NCDs) were traditionally uncommon in sub-Saharan Africa, but, in less than three decades, the region has been designated by the World Health Organization (WHO) as the epicenter of hypertension. Hypertension continues to be the most common risk factor and key driver of cardiovascular disease (CVD) and deaths globally, with a staggering number of people remaining undiagnosed, undertreated, and poorly controlled in Africa [1, 2]. In 2023, the WHO Africa region report [3] highlighted a similar figure for diabetes, also described as a silent killer in Africa. The disease is predicted to increase dramatically from 24 million people affected in 2021, with more than half undiagnosed, to 55 million by 2045. In Cameroon, type 2 diabetes has a similar pattern, evidenced as the result of increasing obesity and physical inactivity [4].

In 2013, the World Health Assembly endorsed nine voluntary global targets for NCD to be achieved by 2025, including the overall target of reducing premature mortality from NCD by 25% by 2025 (25 × 25) [5]. However, if current trends continue, most regions will see an increase in the number of deaths from CVD. Thus, a concerted, evidence-based approach to prevent CVD is essential to attain 25 × 25 and, beyond that, to reach the United Nations Sustainable Development Goal of reducing premature NCD mortality by one-third by 2030. In 2015, the World Heart Federation published its first Roadmap on reducing the burden of raised blood pressure (BP) by 25% in 2025. The Pan African Society of Cardiology published its hypertension Roadmap in 2017 [6], and the WHO's technical package for CVD management in primary health care (WHO-HEARTS) was published by the WHO in 2020 [7]. Both documents support ministries of health to strengthen hypertension and CVD management in primary health care settings. Despite all these international efforts, Cameroon is facing an unprecedented rapid growth of NCD, with a particular increase in the number of people living with hypertension, diabetes, and their complications. Thus, in 2015, with hypertension defined by an average systolic BP ≥ 140 mmHg,

diastolic BP ≥ 90 mmHg, or taking antihypertensive medication, it was estimated that 30% of adults aged > 25 years have hypertension, 65% of whom did not know that they had it, and only half were receiving treatment, with a control rate around 11% [8]. In 2023, the WHO estimated that the age-standardized prevalence of hypertension among adults aged 30–79 years in Cameroon was 37%, with 19% treated, and only 8% controlled [9]. Of 100 adult Cameroonians, 6 typically have diabetes, but 4 are unaware of it [4]. As a result, the number of affected individuals with complications, such as stroke, kidney failure, and heart failure continue to grow. On the other hand, if hypertension alone was controlled, 53,000 deaths could be averted by 2040 [10]. However, there is a lack of guidelines for the management of hypertension in the country. This exceptional situation deserves that all stakeholders work hand-in-hand to reduce the burden of hypertension and diabetes in Cameroon. Coming together as a coalition, we call for action to accelerate the control of hypertension and diabetes in Cameroon as a cost-effective and unique way to stop their complications and to reduce mortality. Our goal is to increase disease awareness, increase the number of people treated for hypertension and diabetes, and increase the number of people with controlled disease to ≥ 80% by 2030. This review presents two practical algorithms and ten key recommendations for improving hypertension and diabetes control, along with their rationale, implementation strategies, and performance indicators.

METHODS

Based on their area of expertise, field of intervention, and leadership in NCDs, the Cameroon Cardiac Society (CCS) invited relevant national organizations, including active members, people from the universities and the academia, stakeholders from the community and the civil society, and experts from the healthcare and policy-makers, to join efforts and define a roadmap focusing on hypertension and diabetes. Organizations which came together in this initiative included the Cameroon Cardiac Society, the Cameroon Academy of Neurology, the Cameroon Society of Endocrinology, Metabolism and Nutrition, the Cameroon Non-communicable Disease Alliance, the Cameroon Diabetes Association, the Clinical Research Education, Networking & Consultancy, the Health Research and Intervention Institute, the Cameroon Medical Doctor's Association, the Cameroon Society of Nephrology, the Cameroon Stroke Association, the Foundation Coeur et Vie, and the Cameroon Society of Internal Medicine. The initiative was under the patronage of the Ministry of Health, and was supported by the Pan African Society of Cardiology and the African Control of Hypertension through the Innovative Epidemiology and a Vibrant Ecosystem (ACHIEVE) consortium [11]. Invited experts included internists, cardiologists, nephrologists, public health physicians, researchers (including guidelines methodologists), HIV/AIDS experts, nurses, and pharmacologists.

Initially, hypertension and epidemiologist experts from the CCS conceived and circulated a draft of ten recommendations. The draft was reviewed by representatives from participants from various organizations, and their edits and comments were received. After deliberations of all stakeholders, a consensus was made on the ten recommendations. These were then launched as part of a call to action against NCDs during the CCS Hypertension National Days held at the Cameroon Doctor's House in Yaounde on 3 August 2023. The ceremony was largely covered by the media (Cameroon Radio and Television, Equinoxe Television, Canal 2 International Television, Vision 4 Television) [12] and was coupled with the delivery of a press release by experts and policy-makers, including the mayor of the Yaounde 1 Council, the Ministry of Health, and the governor of the Center region, Yaounde, Cameroon. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

RESULTS

The group endorsed the definitions of hypertension and diabetes by the WHO. In 2023, hypertension was defined having systolic blood pressure (SPB) ≥ 140 mmHg or diastolic blood pressure (DPB) ≥ 90 mmHg or taking medication

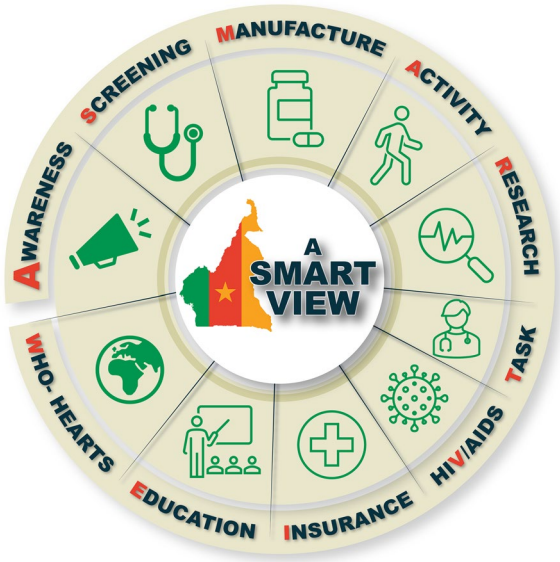


Fig. 1 A SMART VIEW (Awareness, Screening, Manufacture, Activity, Research, Task-shifting, HIV/AIDS, Insurance, Education, and WHO-HEARTS): schematic of the Ten recommendations for accelerating hypertension and diabetes control to reduce stroke, heart, and renal disease in Cameroon through partnerships and collaborations

for hypertension [1]. The WHO diagnostic criteria for diabetes consist of a fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dl) or 2-h plasma glucose ≥ 11.1 mmol/l (200 mg/dl) [13]. The ten recommendations adopted by the group are summarized in Fig. 1. These recommendations are described below in more detail, along with the rationales that led to their development, adoption, and launching during the Cameroon Cardiac Society Hypertension National Days in 2023.

Recommendation 1: The government must urgently involve the mobile phone operators CAMTEL (Cameroon Telecommunications), MTN (Mobile telephone network) Cameroon, ORANGE Cameroon, and NEXTTEL (Next and Telecommunication) Cameroon in raising awareness of hypertension and diabetes to reach the maximum number of Cameroonians and ultimately integrate mobile health into the control of NCDs. Altogether, mobile phone operators are reaching over 10 million Cameroonians and this number is rapidly increasing. Also, as the internet becomes increasingly available and affordable in the country, media artists, opinion leaders, and social media influencers are reaching a significant target population via short message services and/or social media. We felt that implementing a national public awareness and motivational communication for NCD prevention would reach the largest audience, and would potentially lead to a significant positive change in the behavior of the population.

Recommendation 2: Integrated screening and management of hypertension and diabetes are recommended at each visit to a health facility, regardless of the reason for the visit, with the aim to increase awareness. Experts recognized that the effect of an early detection program of hypertension and diabetes through screening for stroke, heart, and renal disease has not yet been rigorously tested in clinical trials or programmatic research, along with the associated cost(s) or harm of different screening strategies (mass, targeted, or opportunistic); however, there is an implicit assumption that screening works [14]. In addition, the group felt opportunistic screening will facilitate early diagnosis, and is both cheap and easy to organize in primary healthcare settings.

Recommendation 3: Access to low-cost and high-quality anti-hypertensive and anti-diabetic drugs should be accelerated by encouraging local manufacture of drugs and quality control of imports by national drug agencies. The availability of CVD essential medicines was found to be far below the WHO recommendations at the primary healthcare level in Cameroon, and these medicines were largely unaffordable [15]. Thus, improving the availability and affordability of medicines, particularly for public primary healthcare facilities, would provide additional benefits in reducing the burden of hypertension and diabetes in the country.

Recommendation 4: Government, particularly various councils, must urgently put in place policies that promote physical activity, such as the construction of parks for leisure physical activities in town halls and the construction of sidewalks for pedestrians. We noted that there are currently a very limited number of parks for leisure physical activities in urban municipalities, and few roads have been

built with sidewalks for pedestrians. The role of physical activity in schools, workplaces, and the built environment to prevent excessive weight gain and promote cardiovascular health and overall well-being cannot be overemphasized.

Recommendation 5: The government, development partners, and academics must make efforts to invest in high-quality research on hypertension and diabetes to generate more evidence that can guide the fight against NCDs in Cameroon. In the main cities, the government must particularly encourage and support NCD Excellence Centers that will deliver high-quality care and lead clinical hypertension and diabetes research, and therefore contribute to the advances of knowledge in the field. Although research is an essential component of the process of formulating a sound healthcare policy to evaluate the performance of interventions, data from randomized controlled trials and large cohort studies on hypertension and diabetes are still lacking in Africa. The CREOLE trial was a randomized, controlled study conducted in Africa, which found that three combination therapies (amlodipine/hydrochlorothiazide, perindopril/amlodipine, and perindopril/hydrochlorothiazide) were equally safe and associated with a low rate of adverse events [16]. Supporting this kind of high-quality research will help to provide the evidence that will guide local interventions and this would ideally happen in NCD Research Excellence Centers.

Recommendation 6: Task shifting and task sharing must be accelerated to cushion the effects of the shortage of human resources in the control of hypertension and diabetes. Indeed, of the 29 million Cameroonians, over 2.4 million aged between 30 and 79 years live with hypertension [1] and 800,000 live with diabetes. Cameroon has currently approximately 100 cardiologists, 47 endocrinologists, and 0.1 doctor per 1000 people [2] making it one of the countries with the lowest doctor:patient ratio. This means that the management of cardiometabolic diseases cannot be adequately covered by the doctors available. A task-sharing and task-shifting approach, in which trained and certified nurses, pharmacists, community health workers, and laboratory technicians assist in BP and blood glucose measurements, along with the distribution of free or subsidized medications, is therefore the only reasonable way to manage adequately uncomplicated cases, thereby freeing the few available doctors to focus on severe or complicated cases. The approach has been previously proven to be effective in primary healthcare in Cameroon [17] and China with a better BP control [18]. Also, we have successfully engaged international organizations and experts in the development of a certificate course in the management of hypertension in Africa (CCMH-Africa) [19].

Recommendation 7: Integration of hypertension and diabetes care into existing chronic care programs (e.g., HIV/AIDS, tuberculosis and malaria programs) should be accelerated to improve detection, treatment, and prevention of NCDs. Cameroon's population-level HIV prevalence remains high at around 3.7%, and 25% of people living with HIV aged ≥ 20 years have uncontrolled hypertension [20]. One of the barriers to control hypertension in patients with HIV is the lack of availability and affordability of cardiovascular drugs at the primary healthcare level, in contrast with HIV drugs which are largely available and free of charge. Integrating HIV and NCD services, particularly hypertension and diabetes, could be a strategy to support the early detection, treatment, and control of hypertension and diabetes, while achieving the Sustainable Development Goals and Universal Health Coverage. There is a consensus agreement on this approach both from cardiovascular and HIV experts [21]. This same approach can be applied to patients diagnosed with tuberculosis and chronic infectious, but treatable, diseases.

Recommendation 8: The integration of screening and treatment of hypertension and diabetes into the health insurance plan must be accelerated. Currently, the Cameroon central government has invested billions of Central African CFA Francs (CFA) for the management of chronic kidney disease (CKD) and coronary artery disease (CAD). This has resulted in the opening of hemodialysis centers in each of the ten regions of Cameroon, along with two public and two private catheterization laboratories. Furthermore, hemodialysis costs have been largely

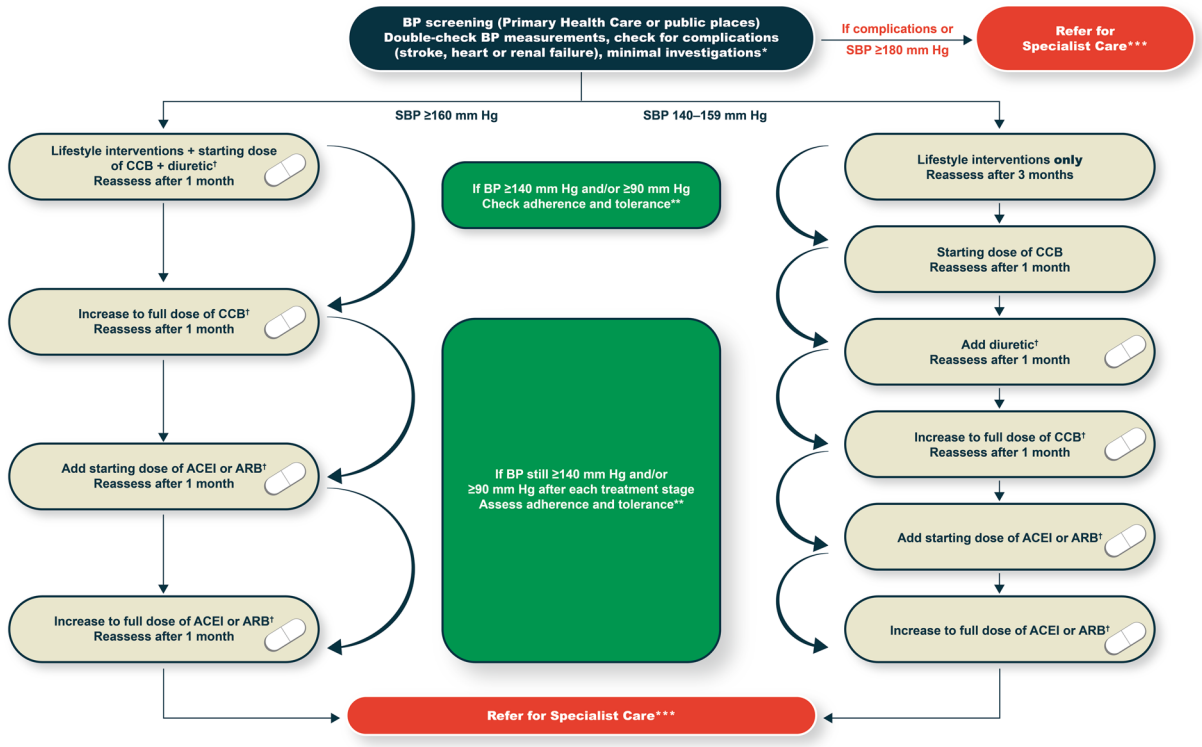
subsidized with direct cost to patients reducing from 60,000 CFA per session to 15,000 CFA per year in 30 years. Although this significant investment is pivotal for disease management in our high-risk population, we noted that, contrariwise, health insurance still does not include the management of hypertension and diabetes which are the main risk factors for CKD and CAD. This pure downstream approach can only have limited efficiency, and thus we believe this must be combined with an urgent upstream investment. We believe that every potential at-risk individual in Cameroon must be granted access to health insurance, to improve awareness, treatment, and control of hypertension and diabetes.

Recommendation 9: Education on the prevention of NCDs must be a priority in our country, in particular strengthening nutrition education in school curricula for the prevention of hypertension and diabetes. This education must continue across life to reduce the overall incidence and occurrence of complications, which are increasingly costly for the public authorities and society as a whole. Our rationale was that roadblocks to the control of NCDs include serious difficulties in changing lifestyles [6] and false health beliefs that these are curable diseases. We recommend early education given the high behavioral plasticity of childhood and adolescence. This must be done using school education programs, text messages, e-mails, or social media, along with an integrative approach using educational videos on TikTok, WhatsApp or Facebook, all of which are progressively widely available and accessible in Cameroon. A document to support nutritional education in schools has been developed and made available to the Ministry of Public Health.

Recommendation 10: We recommend the adoption of simple and practical protocols WHO-HEARTS guided approach [7] for the treatment of hypertension and diabetes with the inclusion of available and affordable single-pill combinations as guided by the WHO Essential Medicines' list. We have previously developed a consensus WHO-HEARTS-guided approach to drug- and dose-specific hypertension management (Fig. 2). In a pilot deployment, we demonstrated that the introduction of this protocol is possible at the primary healthcare level, and that it leads to greater homogeneity in prescription patterns and better hypertension control [2]. This was a crucial and tangible step in setting up a national strategy which can improve the detection, treatment, and control of hypertension strategy in our country. We strongly recommend that the Ministry of Public Health and other stakeholders should distribute it widely, train trainers, and ensure that the medicines are available and affordable for its efficient implementation, monitoring, and evaluation. A similar protocol was developed to facilitate task sharing in the management of diabetes by expert diabetologists and internists (Fig. 3) using the same methodological approach as for hypertension.

COMMENTS

While our document is rather short compared with other recommendations or guidelines for hypertension or diabetes from other societies or other nations, we believe it is also straightforward and more consumable by our target audience. We agreed not to write another comprehensive guideline, but chose instead to only focus on key actions via the delivery of a simple one-page protocol that, if implemented, could bring a significant change. While agreement on these ten recommendations was a key step, the important work lies in their implementation and monitoring with clear targets. Follow-up and referral systems are also important to improve treatment outcomes. The creation of a favorable 'ecosystem' to manage a chronic disease has previously worked with HIV/AIDS, and this can also be applied to other health problems requiring consistent, long-term care, such as hypertension and diabetes. A biennial meeting of all stakeholders will therefore be held to monitor and evaluate progress made with the use of these recommendations until 2030. Some performance indicators for the implementation of these recommendations are shown in Table 1.



Pharmacologic interventions: Example drugs and doses

Class	Medication	Starting dose	Full dose
CCB	Amlodipine	5 mg	10 mg
ACE-I	Perindopril / Ramipril	5 mg	10 mg
ARB	Losartan	50 mg	100 mg
	Valsartan	80 mg	160 mg
Thiazide-like diuretic	Indapamide SR	1.5 mg	Stay at 1.5 mg
Thiazide diuretic	Hydrochlorothiazide	12.5 mg	Stay at 12.5 mg

* Fasting blood sugar, urinalysis, serum Na, K, creatinin, uric acid, Total cholesterol, ECG, fundoscopy.
** Around 2/3 of patients are not adherent. Antihypertensive drugs are generally safe, just about 5-10% of patients on Amlodipine report pedal oedema, 5-10% on ACE-I may have a chronic cough.
*** Internist or cardiologist (if heart failure), or neurologist (if stroke), or nephrologist (if raised creatinin).

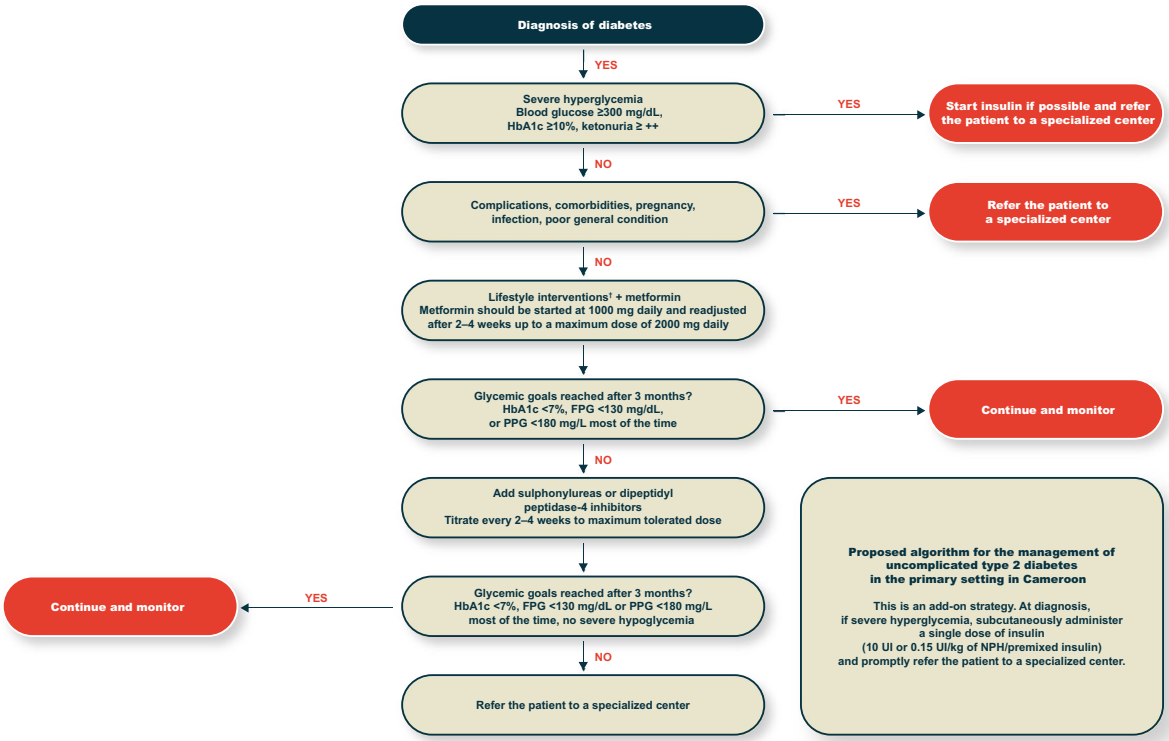
Lifestyle interventions

Lifestyle change	Reasons
Weight reduction (if the patient is overweight or obese)	1 kg reduction in body weight = 1 mmHg reduction in SBP
Use the DASH diet	DASH diet can lead to a reduction in SBP up to 11 mmHg. DASH diet: Eat more fruits, vegetables, whole grains, and low-fat meals; eat a low-salt diet; limit red meat to once or twice per week at most; eat fish or other foods rich in omega-3 at least twice per week
Stop all forms of smoking	Positive health benefits
Abstain from alcohol or limit to two units of alcohol (or half a bottle of local beer) per day	Positive health benefits
Take regular aerobic exercise	A brisk walk of 30 minutes, at least five days/week, can reduce SBP by up to 10 mmHg

Fig. 2 Consensus protocol for the management of uncomplicated hypertension at the PHC Center in Cameroon. Please note that this protocol is not suitable for patients who are pregnant or those with complicated hypertension (requiring referral to specialist***). *ACEI* angiotensin-converting enzyme inhibitor, *ARB* angiotensin receptor blocker, *BP* blood pressure, *CCB* calcium-channel blocker, *DASH* Dietary Approaches to Stop Hypertension, *PHC* Primary Health Care, *SBP* systolic blood pressure, *SR* sustained release. *Fasting blood sugar, urinalysis, serum sodium, potassium, creatinine, uric acid, and total cholesterol, electrocardiogram, fundoscopy. **Approximately two-thirds of patients are non-adherent. Antihypertensive drugs are generally well tolerated and effective (5–10% of patients receiving amlodipine will report pedal edema and 5%–10% receiving ACEIs may experience a chronic cough (necessitating a switch to ARBs). ***Internist or cardiologist (for heart failure), neurologist (for stroke), and nephrologist (for renal failure). †Treatment with a single pill combination is typically preferred

CONCLUSION

Measuring BP and glucose are simple ways of early detection and prevention of the risk of hypertension and diabetes, stroke, and heart and renal disease. Nevertheless, the number of people with NCDs, particularly hypertension and diabetes, continue to increase every year in Cameroon despite several international initiatives. The Yaounde conference was a unique opportunity during which Cameroon



Pharmacologic interventions for type 2 diabetes: Example drugs available at primary level and doses

Class	Medication	Starting dose	Full dose	Comments
Biguanides	Metformin	500 mg	2000 mg	Effective and safe, inexpensive, available, weight neutral, does not cause hypoglycaemia. Gastrointestinal side effects (diarrhoea…)
Sulphonylureas	Glibenclamide	5 mg	20 mg	Effective, low cost, available. Can cause weight gain and hypoglycaemia. Gliclazide recommended as an essential medicine by WHO. Glibenclamide not recommended in chronic kidney disease.
	Gliclazide	30 mg	120 mg	
	Glimepiride	1 mg	6 mg	
Dipeptidyl peptidase 4 inhibitors	Vildagliptin	25 mg	100 mg	Efficacy intermediate, weight gain and hypoglycaemia neutral
	Sitagliptin	25 mg	100 mg	
Insulin	Short-acting	-	-	Highly effective and safe. Can cause hypoglycaemia and weight gain
	Intermediate-acting	-	-	

Lifestyle interventions

Lifestyle change	Reasons
Weight reduction (if the patient is overweight or obese)	A modest weight loss of 5% of initial body weight helps improving glycemic control
Nutrition	Carbohydrate: Choose foods that are high in fiber, including vegetables, fruits, legumes, whole grains, as well as dairy products. Protein: Protein intake should be individualized based on current eating patterns Lipids: Limit fat consumption, especially saturated and trans fat (fried food, cheese, beef)
Stop all forms of smoking	Positive health benefits
Abstain from alcohol or limit to two units of alcohol (or half a bottle of local beer) per day	Positive health benefits
Physical activity	Aerobic exercise (fast walking, running, stair climbing, dance) ≥150 minutes/week across 2–3 sessions/week

Fig. 3 Proposed algorithm for the management of type 2 diabetes in Cameroon. Please note that this protocol is not suitable for patients who are pregnant or those with complicated diabetes (requiring referral to specialist). †Healthy diet, regular physical activity, and weight management. *FPG* fasting plasma glucose, *HbA1c* glycated hemoglobin, *NPH* neutral protamine Hagedorn, *PPG* postprandial glucose, *WHO* World Health Organization

Table 1 Some performance indicators for implementation of the recommendations with a biennial monitoring and evaluation until 2030

Performance measures
The proportion of patients by age and sex aged ≥ 18 years in a primary healthcare facility that have at least one documented BP and blood glucose measurement in the next 24 months
The proportion of patients by age and sex aged ≥ 18 years with an elevated BP and/or blood glucose on screening who have documentation of further assessment to determine whether the patient meets the diagnostic criteria for hypertension and/or diabetes as defined in the most recent national protocols for assessment, diagnosis, and treatment
The proportion of the population by age and sex aged ≥ 18 years with a new diagnosis of hypertension and/or diabetes in the past 24 months
The proportion of the population by age and sex aged ≥ 18 years with a new treatment for hypertension/diabetes over a period of 24 months
The proportion of the population by age and sex aged ≥ 18 years on treatment for hypertension and/or diabetes who have their BP/blood glucose controlled over a period of 24 months
The proportion of population by age and sex aged ≥ 18 years on treatment for hypertension and/or diabetes who have developed major complications (disaggregated by sex, age, type of complications)
The proportion of population by age and sex aged ≥ 18 years with hypertension and/or diabetes who died from any cause, including direct complication(s) of hypertension/diabetes

BP blood pressure

NCD experts, relevant national organizations, stakeholders from the community and the civil society, and policy decision-makers came together to agree on the key actions needed to control hypertension and diabetes in the country, while aiming to create a new ecosystem to enable their efficient implementation. The ten recommendations are expected to be incorporated into the current health system in Cameroon and implemented in an acceptable, efficient, and self-sustaining manner, breaking current barriers and facilitating the control of hypertension and diabetes in our country.

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Declarations

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Ethical Approval. This article is based on previously conducted studies and does not contain any new studies with human participants or animals performed by any of the authors.

REFERENCES

1. Global report on hypertension: the race against a silent killer [Internet]. [cited 2024 Jul 17]; Available from: https://www.who.int/publications/i/item/9789240081062. Accessed 28 July 2024.

2. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in blood pressure from. to 2015: a pooled analysis of 1479 population-based measurement studies with 19·1 million participants. Lancet Lond Engl. 1975;2017(389):37–55.

3. Welcome [Internet]. WHO Reg. Off. Afr.2024 [cited 2024 Jul 17]; Available from: https://www.afro.who.int/. Accessed 28 July 2024.

4. Sobngwi E, Mbanya JCN, Unwin NC, Kengne AP, Fezeu L, Minkoulou EM, et al. Physical activity and its relationship with obesity, hypertension and diabetes in urban and rural Cameroon. Int J Obes Relat Metab Disord J Int Assoc Study Obes. 2022;26:1009–16.

5. Dugani S, Gaziano TA. 25 by 25: achieving global reduction in cardiovascular mortality. Curr Cardiol Rep. 2016;18:10–20.

6. Dzudie A, Rayner B, Ojji D, Schutte AE, Twagirumukiza M, Damasceno A, et al. Roadmap to achieve 25% hypertension control in Africa by 2025. Cardiovasc J Afr. 2017;28:262–73.

7. HEARTS: Technical package for cardiovascular disease management in primary health care: Risk-based CVD management [Internet]. [cited 2024 Jul 17];Available from: https://www.who.int/publications/i/item/9789240001367. Accessed 28 July 2024.

8. Kingue S, Ngoe CN, Menanga AP, Jingi AM, Noubiap JJN, Fesuh B, et al. Prevalence and risk factors of hypertension in urban areas of Cameroon: a nationwide population-based cross-sectional study. J Clin Hypertens Greenwich Conn. 2015;17:819–24.

9. Yang F, Qian D, Hu D, Healthy Aging and Development Study Group, Nanjing Medical University, Data Mining Group of Biomedical Big Data, Nanjing Medical University. Prevalence, awareness, treatment, and control of hypertension in

the older population: results from the multiple national studies on ageing. J Am Soc Hypertens JASH. 2016;10:140–8.

10. Pickersgill SJ, Msemburi WT, Cobb L, Ide N, Moran AE, Su Y, et al. Modeling global 80–80-80 blood pressure targets and cardiovascular outcomes. Nat Med. 2022;28:1693–9.

11. Olowoyo P, Dzudie A, Okekunle AP, Obiako R, Mocumbi A, Beheiry H, et al. ACHIEVE conference proceedings: implementing action plans to reduce and control hypertension burden in Africa. J Hum Hypertens. 2024;38:193–9.

12. The global media. The new missionnaries of global capitalism (E.S. Hermann et R.M. Mc Chesney) - Persée [Internet]. [cited 2024 Jul 17];Available from: https://www.persee.fr/doc/reso_0751-7971_1997_num_15_86_3127. Accessed 28 July 2024.

13. https://www.who.int/publications/i/item/definition-and-diagnosis-of-diabetes-mellitus-and-intermediate-hyperglycaemia. Accessed 28 July 2024.

14. Schmidt BM, Durao S, Toews I, Bavuma CM, Hohlfeld A, Nury E, et al. Screening strategies for hypertension. Cochrane Database Syst Rev. 2020;5:1–26.

15. Dzudie A, Njume E, Abanda M, Aminde L, Hamadou B, Dzekem B, et al. Availability, cost and affordability of essential cardiovascular disease medicines in the south west region of Cameroon: preliminary findings from the Cameroon science for disease study. PLoS ONE. 2020;15:1–12.

16. Ojji DB, Mayosi B, Francis V, Badri M, Cornelius V, Smythe W, et al. Comparison of dual therapies for lowering blood pressure in black Africans. N Engl J Med. 2019;380:2429–39.

17. Labhardt ND, Balo JR, Ndam M, Grimm JJ, Manga E. Task shifting to non-physician clinicians for integrated management of hypertension and diabetes in rural Cameroon: a programme assessment at two years. BMC Health Serv Res. 2010;10:339–48.

18. Sun Y, Mu J, Wang DW, Ouyang N, Xing L, Guo X, et al. A village doctor-led multifaceted intervention for blood pressure control in rural China: an open, cluster randomised trial. Lancet Lond Engl. 2022;399:1964–75.

19. Dzudie A, Ojji D, Damasceno A, Sani MU, Kramoh E, Kacou JB, et al. Development of the certificate course in the management of hypertension in Africa (CCMH-Africa): proceedings of the first continental faculty meeting, Nairobi, Kenya, 25–26 February 2018. Cardiovasc J Afr. 2018;29:331–4.

20. Dzudie A, Hoover D, Kim HY, Ajeh R, Adedimeji A, Shi Q, et al. Hypertension among people living with HIV/AIDS in Cameroon: a cross-sectional analysis from Central Africa International Epidemiology Databases to Evaluate AIDS. PLoS ONE. 2021;16:1–17.

21. Dzudie A, Tchounga B, Ajeh R, Kouanfack C, Ebasone PV, Djikeussi T, et al. Research priorities for accelerating the achievement of three 95 HIV goals in Cameroon: a consensus statement from the Cameroon HIV Research Forum (CAM-HERO). Pan Afr Med J. 2021;40:124–41.