Orapuh Journal

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

Motuta, C. A.[1], Koko, L. L.[1], Biembe, E.[1], Lutete, M. K.[2], Mawunu, M.[3], Masengo, C. A.[4], & Ngbolua, K. N.[5]

[1]Faculty of Medicine, University of Mbandaka, Mbandaka, Equateur Province, Democratic Republic of the Congo
[2]Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[3]Polytechnic Institute of the University Kimpa Vita, Uíge, Angola
[4]Higher Institute of Medical Techniques, Medical biology Section, Biochemistry unit, Kinshasa, Democratic Republic of the Congo
[5]Department of Biology, Faculty of Science and Technology, University of Kinshasa, Kinshasa, Democratic Republic of the Congo

ARTICLE INFO

ABSTRACT

Introduction

Arterial hypertension (AH) is still the main risk factor for several complications, including coronary heart disease, stroke, peripheral artery disease, and renal dysfunction.

Purpose

This study aimed to determine the epidemiological and therapeutic characteristics of patients treated for high blood pressure at the Cardiology Department of the General Hospital of Kinshasa. Methodology: A retrospective descriptive study of records of patients admitted for hypertension to the Department of Cardiology of the General Hospital of Kinshasa was conducted. This study covers two years from January 1, 2022, to January 31, 2023.

Results

The incidence of arterial hypertension was 9.2% in the cardiology department and 2.9% in the general hospital. The average age was 55.4 to 12.3, the extremes were 25 to 90, and patients were 51 to 75 years old (54.1%). Women are more affected (59.5%), and the male-female ratio is 0.6. Alcohol consumption is the main complaint in 35.1 percent of cases, while the most reported clinical signs are dizziness, headaches, and muscle dyspnea in 89.3 percent, 77.1 percent, and 53.4 percent, respectively. As for treatment, 100% of patients received medical care and 55.7 % of patients had low-salt diets. According to the distribution of prescribed drugs, diuretics (100%), conversion enzyme inhibitors (78.6%), anticalcitamines (66.4%), and beta-blockers (41.2%) are the most prescribed drugs. In 94.6% of cases, the result was good, with a death rate of 5.4%.

Conclusion

We can say that arterial hypertension is now a major concern for all medical and paramedical staff. Despite the efforts currently being made, we still see many patients with hypertension every day.

Motuta et al., *Orapuh Journal* 2024, 5(1), e1108

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

INTRODUCTION

Cardiovascular diseases (CVDs) are currently a serious public health problem in developing countries, leading to an increase in morbidity and mortality (Sigmund et al., 2020; Wojciechowska et al., 2022; Bousseau et al., 2023), serious threats to economic development, especially due to long-term treatment costs and negative effects on productivity, and destroying health budgets in countries with limited financial resources (Tran-Duy et al., 2021; Kostova et al., 2020). Hypertension is still a major risk factor for cardiovascular disease, stroke, peripheral artery disease, and renal failure (Zhou et al., 2021; Bousseau et al., 2023). High blood pressure was once considered a disease of the rich, but the situation has changed dramatically over the past two decades, with the average blood pressure in Africa now higher than in Europe and the United States and the prevalence in the poor. High blood pressure is the leading cause of cardiovascular disease and renal failure in Africa (Guwatudde et al., 2015). As a result, cardiovascular disease has become the main cause of death in Africa, and the number is expected to increase further over the next few decades, reflecting growing urbanization and the changes in lifestyles associated with it. High blood pressure is a cardiovascular disease that is generally silent, with no specific physical problems (Mancia et al., 2023). Recent statistics show that hypertension has not decreased in the last 20 years. Preventing the emergence of hypertension through standardised guidelines for the management of hypertension in primary care settings is far more effective in terms of health and financial terms than the treatment of hospital complications. According to Brain (2005), the prevalence of high blood pressure is 25% in adults and increases dramatically as the age increases (80% of people over the age of 70 have high blood pressure). In some parts of Africa, more than 40% of adults are estimated to suffer from high blood pressure. In the Democratic Republic of the Congo, urban populations are almost 10 percent more prevalent than rural populations. A population-based study conducted in the Democratic Republic of the Congo also revealed a high prevalence of hypertension among millers (Ngombe et al., 2015). According to the World Health Organization (WHO), cardiovascular disease (CVD) causes one-third of the world's deaths and affects 26.4% of adult global populations. In 2025, 150 million people will be hypertensive and 7.5 million will die from hypertension.

Hypertension accounts for 49 % of the deaths from heart disease, 50 to 70 % of strokes, and 20 to 25 % of end-stage renal failure (Amar et al., 2009). It is not only a major public health problem but also has serious economic effects, with many productive populations suffering and dying from it and families in poverty. Thus, despite the availability of a wide range of therapeutic options, the elevated cost of conventional drugs compels the population to turn to traditional and folk medicine in Africa (Robijaona et al., 2014; Fatiany et al., 2015; Fatiany et al., 2016). The study aimed to determine the epidemiological, clinical, and therapeutic characteristics of patients suffering from hypertension at the Department of Cardiology at the General Hospital of Kinshasa (formerly Maman YEMO).

MATERIAL AND METHODS

Study area

The current study was carried out at the Cardiology Unit of the Department of Internal Medicine of the General Hospital of Kinshasa (HPGRK), Democratic Republic of the Congo. The HPGRK, located in the Gombe community of Kinshasa, is located at the intersection of Wangata and Tombalbaye Avenue. It borders the Avenue de l'Hopital, the Avenue Wangata, the Avenue Tombalbaye, and the Kinshasa Zoological Garden to the east. We conducted descriptive and retrospective studies that analysed the medical records of patients admitted to the HPGRK Department of Cardiology for high blood pressure. The study lasted two years, from 1 January 2022 to 31 January 2023.

Study population

The present study included all patients admitted for hypertension to the cardiology department of the HPGRK during the above-mentioned study period and whose records and parameters of interest were available.

Data collection

The first step was to obtain the required authorizations for data collection. After the necessary authorization was obtained, the next phase of the study was to search the HPGRK integrated emergency department archives (first records, then patient files) of patients receiving hypertension during the study period. In each identified file, the following parameters of interest were collected:

Motuta et al., *Orapuh Journal* 2024, 5(1), e1108

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

- Socio-demographic data: age, gender, level of education, marital status, occupation, place of residence (municipality);
- Clinical data:
    i. Previous medical history;
    ii. History of current illness: mode of onset of symptoms, duration of symptoms, patient's place of origin;
    iii. Complaints on admission;
    iv. Data from the initial physical examination: PAS, PAD, heart rate, respiratory rate, and neurological data (state of consciousness, etc.).
- Paraclinical informations :
    a) Initial biological data: glycaemia, creatinine, lipidogram;
    b) Medical imaging data
- Diagnostic data (presumed or confirmed) and other diagnoses (co-morbidities) used;
- Therapeutic data: treatment prescribed;
- Evolutionary data.

Operational definitions
- Cardiac output: This is equal to the product of heart rate (HR) and systolic ejection volume (SEV).
- Peripheral resistance: This is the total force opposing the progression of the blood column inside the vessels. The more open the vessel lumen, the lower the resistance to blood flow, and vice versa.
- Arterial pressure: Measurement of the pressure forces exerted by the walls of the arteries to propel the blood they contain.

Statistical analysis
The data are collected using pre-configured Word 2010 collection formats, encoded to Excel 2010 sheets that serve as databases, and imported and analysed using SPSS version 21 software. Standard descriptive statistics are used to describe the population of the study. Qualitative variables are expressed in proportions (percentages), while quantitative variables and continuous variables are expressed as means of standard deviation. The results are presented in tables and figures.

Ethical issues
Confidentiality of patient records was strictly enforced in the management of data in this study.

RESULTS

Prevalence of hypertension
Between January 1, 2022, and January 31, 2023, 4379 patients were admitted to the HGK Department of Internal Medicine. Of these 4,379 patients, 1,446, or 33 percent were cardiologists. Of these 1446 patients, 131 cases of hypertension were identified, a rate of 9.2% in the cardiology department and 2.9% in all HGK patients.

General patient characteristics
During the study duration, a total of 131 cases of patients admitted for hypertension were documented. The average age, indicated by the mean (standard deviation), was 55.4 ± 12.3 years, ranging from 25 to 90 years. Notably, there was a prevalence of patients aged between 51 and 75 years, constituting 54.1% of the total cases. Most of the patients were female, accounting for 59.5%, resulting in a male-to-female ratio of 0.6. Among the patient demographic, a significant portion (61.8%) were employed, and the majority (69.4%) were married **(Table 1)**.

Table 1 shows the general characteristics of the patients studied at Kinshasa General Hospital.

Table 1:
General patient characteristics

Variables	N=131 (%)
Age (years)	
26 – 50	29 (22.1)
51 – 75	71 (54.1)
> 75	32 (24.4)
Sex	
Female	78 (59.5)
Male	53 (40.5)
Occupation	
Employees	81 (61.8)
Unemployed	50 (38.1)
Marital status	
Single	30 (22.9)
Married	91 (69.4)
Divorced	3 (2.2)
Widows (ers)	7 (5.3)

Cardiovascular risk factors (CRFs)
Concerning CRFs of patients admitted to hypertension during the study period, alcohol consumption accounted for 35.1 percent of the sample, followed by obesity and smoking for 16.7 percent.

Figure 1:
Distribution of patients according to cardiovascular risk factors

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC
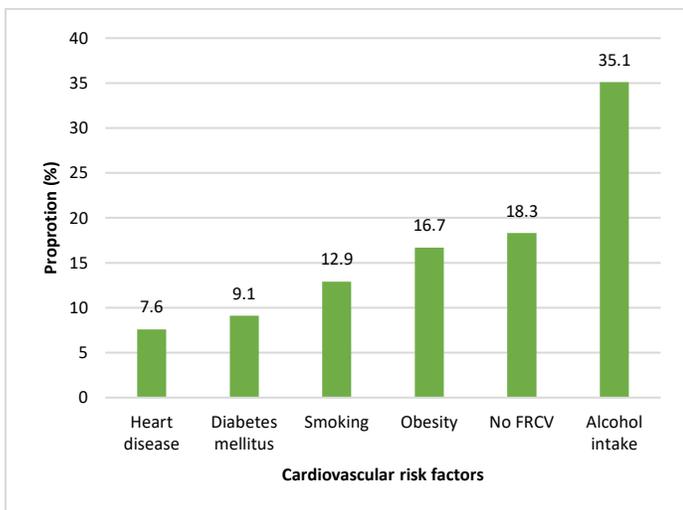
Table 2 shows the distribution of patients according to clinical signs.

Clinics

Table 2:

Distribution of patients according to clinical signs

Clinical signs	N (%)
Vertigo	117 (89.3)
Headaches	101 (77.1)
Effort dyspnoea	70 (53.4)
Palpitations	31 (23.6)
Decrease in state of consciousness	25 (19.1)
Visual disorders	13 (9.9)
Thoracic pain	9 (6.8)
Vomiting	4 (3.1)
Others	19 (14.5)

Table 2 showed that vertigo, headache, and exertional dyspnoea were the clinical signs recorded most frequently (89.3%, 77.1%, and 53.4%, respectively).

Physical examination

Table 3 shows the data from the physical examination on patient admission.

Table 3:

Data from physical examination on admission

Variable	Average ± SD
PAS (mmHg)	151.2 ± 45.8
PAD (mmHg)	90.0 ± 20.1
Cardiac frequency (b/min)	87.3 ± 22.2
Respiratory frequency (c/min)	23.0 ± 2.6

Table 3 presents various parameters documented during the physical examination, including Systolic Blood Pressure (PAS), Diastolic Blood Pressure (PAD), Heart Rate (HR), and Respiratory Rate (FR). The average values, along with their standard deviations, were as follows: 151.2 ± 45.8

mmHg for PAS, 90.0 ± 20.1 mmHg for PAD, 87.3 ± 22.2 beats/min for HR, and 23.0 ± 2.6 cycles/min for FR.

Clinical profile

Table 4 shows the distribution of patients according to paraclinical parameters.

Table 4:

Distribution of patients according to paraclinical parameters

Balance Sheet	N [Requested, (%)]	N [Realized, (%)]
Urea and creatinine	131 (100)	39 (29.7)
Glycemia	131(100)	57 (43.5)
Kalaemia	10 (7.6)	2(1.5)
Ca^{++}	10 (7.6)	2(1.5)
Cholesterol	6 (4.5)	2 (1.5)
Pro-BNp	5 (3.8)	3 (2.2)
FO	13 (9.9)	4 (3.1)
Scanner	10 (7.6)	5 (3.8)
Echocœur	31 (23)	12 (9.1)
ECG	59 (45)	32 (24.4)
C-peptide	5 (3.8)	1 (0.7)

Blood glucose, urea, and creatinine were consistently requested as biological parameters in all cases (100%), yet they were executed in 29.7% and 43.5% of instances, respectively. The most requested and conducted imaging tests were ECG and Echocardiogram, which were performed in 24.4% and 9.1% of cases, as indicated in **Table 4**.

Associated pathologies

Figure 2 shows that most patients did not have a pathology associated with 96 (73.2%). In 12, 9.1%, and 10, 7.6%, respectively, diabetes and CKD were observed.

Figure 2:

Distribution of patients according to associated pathologies (%)
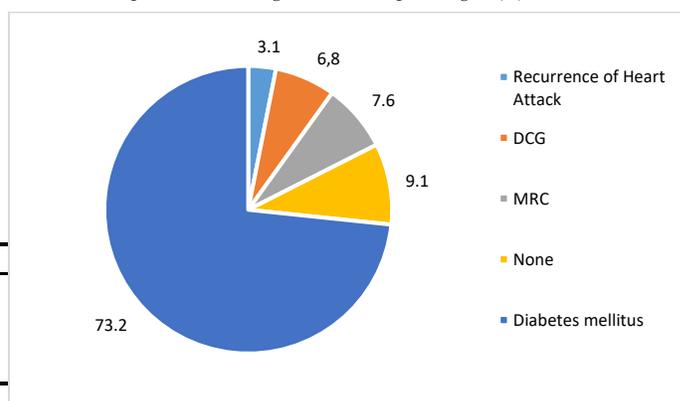
Patient management

Table 5 shows the distribution of drugs prescribed to patients.

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

Table 5:
Distribution of drugs prescribed to patients

Drugs	N (%)
Diuretics	131 (100)
Inhibitors of the converting enzyme	103(78.6)
Anticalcic	87(66.4)
Low-sodium diet	73(55.7)
Beta-blockers	54(41.2)
Others	58(44.2)

Regarding treatment, every patient (100%) received the medical intervention and 55.7% of patients adhered to a low-salt diet (**Table 5**). Examining the distribution of prescribed medications (**Table 5**), diuretics (100%), converting enzyme inhibitors (78.6%), anticalcics (66.4%), and beta-blockers (41.2%) emerged as the most frequently prescribed drugs.

Evolution

Figure 3 shows that the outcome was good in 94.6% of cases and the death rate was 5.4%.

Figure 3:
Distribution of patients according to outcome (%)

5.4

94.6

- Living
- Deaths
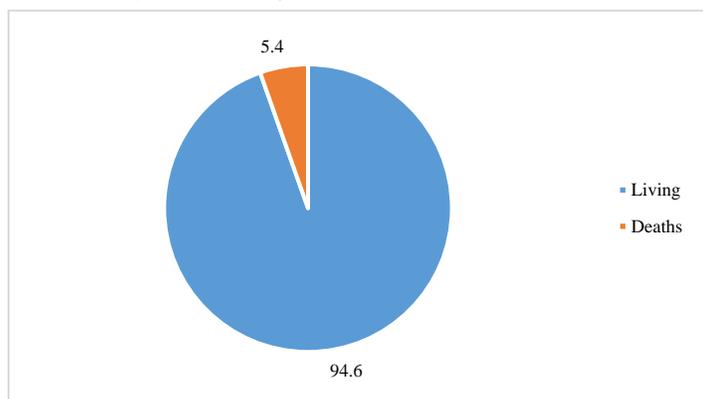
DISCUSSION

Frequency

From January 1, 2022, to January 31, 2023, the Department of Internal Medicine at HPGRK attended to a total of 4,379 patients. In this cohort, 1,446 people (33%) received cardiovascular services. Of these 1,446 patients in cardiology, 131 were identified with high blood pressure, with 9.2% in cardiology departments and 2.9% in HPGRK departments. Our findings align with those of Vesin (2009), who reported a similar frequency of approximately 10% among hypertensive patients in a general population. Daouda (2010) observed a hospital frequency of 10.3%. Conversely, Jenson et al. (2011) in Kenya noted a 15%

incidence of hypertension, while Doulougou (2014) in Burkina Faso, during a semi-urban study, found a higher prevalence of 19% for arterial hypertension.

Demographic characteristics of patients

In our series, the average age (standard deviation) was 55.4 ± 12.3 years, with ages ranging from 25 to 90 years. There was a notable prevalence of patients aged 51 to 75 years, constituting 54.1% of the total. However, in Dakar, Diao et al. (2009) identified the 40-50 age group as the most dominant, while Daouda (2010) reported that most patients were over 50 years old. In Coulibaly's study (2001); it was found that most hypertensive patients fell between the ages of 31 and 50. Females were more commonly affected in our study (59.5%), resulting in a male-to-female ratio of 0.6. These results closely mirror those reported by Daouda (2010). Lastly, more than half of the patients were married (69.4%), a finding consistent with results from Ekwunife et al. (2005) in Nigeria.

Clinical profile of patients

Concerning the cardiovascular risk factors (CRFs) observed in patients admitted for hypertension during the study period, alcohol consumption emerged as the dominant factor in 35.1% of cases, followed by obesity in 16.7% and smoking in 12.9% of cases. The most frequently recorded clinical signs were dizziness (89.3%), headache (77.1%), and exertional dyspnea (53.4%). Our findings align with those of Wamala et al. (2009) and Addo et al. (2012), who also identified a familial history of hypertension and a background of alcohol consumption as prevalent factors. In contrast, the study by Doulougou (2014) reported a negative association between alcohol consumption and hypertension, finding no positive correlation. Hercberg & Tallec (2000) indicated obesity as a precursor to hypertension, highlighting the role of fat distribution and establishing a correlation between the waist/hip circumference ratio and blood pressure. Abdominal obesity, more closely linked to hypertension, increases the risk of stroke by a factor of 2.3 (Wamala et al., 2009) and elevates the overall risk of mortality.

Physical examination data

Concerning the cardiovascular risk factors (CRFs) observed in patients admitted for hypertension during the study period, alcohol consumption emerged as the dominant

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

factor in 35.1% of cases, followed by obesity in 16.7% and smoking in 12.9% of cases. The most frequently recorded clinical signs were dizziness (89. 3%), headache (77.1%), and exertional dyspnea (53.4%). Our findings align with those of Wamala et al. (2009) and Addo et al. (2012), who also identified a familial history of hypertension and a background of alcohol consumption as prevalent factors. In contrast, the study by Doulougou (2014) reported a negative association between alcohol consumption and hypertension, finding no positive correlation. Hercberg & Tallec (2000) indicated obesity as a precursor to hypertension, highlighting the role of fat distribution and establishing a correlation between the waist/hip circumference ratio and blood pressure. Abdominal obesity, more closely linked to hypertension, increases the risk of stroke by a factor of 2.3 (Wamala et al., 2009) and elevates the overall risk of mortality.

Paraclinical profile of patients

Blood glucose, urea, and creatinine were consistently requested as biological parameters in all cases (100%), but actual testing was carried out in 29.7% and 43.5% of instances, respectively. ECG and echocardiography were the most frequently requested and conducted imaging examinations, accounting for 24.4% and 9.1% of cases. In Camara et al.'s study (2008), creatinine, blood glucose, complete blood count (NFS), potassium levels (potassium levels), and protein levels (proteinemia) were identified as the most requested baseline assessments for hypertension. These findings align with those of Amar et al. (2009), although statistically significant differences exist between the two studies.

Patient management

In the present study, all patients (100%) received medical treatment, and 55.7% of them followed a low-salt diet. Examining the distribution of prescribed drugs, diuretics (100%), converting enzyme inhibitors (78.6%), anticalcics (66.4%), and beta-blockers (41.2%) were the most frequently prescribed medications. Some authors have affirmed that diuretics are classified as first-line drugs in the management of hypertension (Cisse, 2000). According to these authors, the initiation of drug treatment should consider not only blood pressure levels but also the presence of additional risk factors or complications.

Evolution

The progression was good in 94.6% of cases. The mortality rate was 5.4% of cases (Coulibaly, 2001), with 8 % of deaths.

CONCLUSION AND RECOMMENDATIONS

Finally, this study emphasizes the crucial importance of arterial hypertension as the primary focus of medical and paramedical professionals in modern health care. Despite ongoing efforts, many hypertension patients are still being diagnosed daily. It is necessary to raise awareness among healthcare professionals by establishing guidelines to address clinical inertia and prevent patients from experiencing the effects of seemingly asymptomatic conditions. Physician collaboration is required to conduct proactive screening and the implementation of hypertension treatment in accordance with the established recommendations. This approach ensures that all patients, especially those at high cardiovascular risk, are optimally treated.

Toward the end of this study, it is appropriate to recommend the following:

Ministry of Public Health
- o Strengthening the policy of hypertension reduction through the establishment of support units for the prevention of hypertension and the establishment of a national antihypertension programme;
- o Equipment of reference hospitals and health centres with electrocardiograms and echocardiograms to improve treatment;
- o Training and refresher courses for general practitioners in the management of hypertension and other cardiovascular diseases;
- o Establish a health insurance system that provides affordable care for hypertension patients;
- o To perform certain basic paraclinical examinations free of charge for hypertensive patients.

Hospital practitioners
- o Explain to patients the benefits of good treatment compliance and early screening;
- o Promote day-to-day monitoring of high blood pressure and emphasize the benefits of regular blood pressure monitoring;
- o Ensure effective management of high blood pressure in pregnant women.

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

Population

- o Seek medical advice immediately when certain signs occur (headache, dizziness, ear noise);
- o Follow the medical directions carefully;
- o Participate in health insurance systems to reduce the cost of treating cardiovascular diseases.

ORCID iDs:

Motuta, C. A.[1]:   Nil identified
Koko, L. L.[1]:   Nil identified
Biembe, E.[1]:   Nil identified
Lutete, M. K.[2]:   Nil identified
Mawunu, M.[3]:   Nil identified
Masengo, C. A.[4]:   Nil identified
Ngbolua, K. N.[5]:   https://orcid.org/0000-0002-0066-8153

REFERENCES

Addo, J., Agyemang, C., Smeeth, L., de-GraftAikins, A., Edusei A.K., Ogedegbe O. 2012. A review of population-based studies on hypertension in Ghana. Ghana Med. J. 46(2 Suppl):4-11.

Amar, L., Lepoutre, C., Bobrie, G., Plouin, P. 15 millions d'hypertendus en France. Le revue du praticien, médecine générale 2009; 23: 479-84.

Bousseau S., Sobrano F.R., Gu S., Frump A., Lahm T. 2023. Pathophysiology and new advances in pulmonary hypertension. BMJ Med. 2(1):e000137. doi: 10.1136/bmjmed-2022-000137.

Bousseau, S., Sobrano, F.R., Gu, S., Frump, A., Lahm, T. 2023. Pathophysiology and new advances in pulmonary hypertension. BMJ Med. 2(1):e000137. doi: 10.1136/bmjmed-2022-000137.

Camara, Y., Coulibaly, S., Diall, I.B., Diarra, A., Keita, L., Koné, D. et al. 2008. Pratiques et connaissances sur l'hypertension artérielle du personnel soignant des CHU Gabriel Touré et Point G. Mali Méd. 25-29.

Cisse, AA. 2000. Approche diagnostique et thérapeutique de l'hypertension artérielle chez le chez le sujet âgé (50 ans et plus)au Mali. Thèse Méd, Bamako: 2000.M-34. Daouda KO. 2010. Pratiques et connaissances sur l'hypertension artérielle du personnel soignant des CHU GT et Point G thèse de médecine : Faculté de Médecine de Pharmacie et d'Odonto Stomatologie/Université de BAMAKO : 10M516

Coulibaly, O.M. 2001. Hypertension artérielle et sa prise en charge thérapeutique dans le service de cardiologie A de l'hopital du point G. Thèse de Doctorat (Numéro 114): Faculté de Médecine, Université de Bamako, République du Mali.

Coulibaly, OM. 2001. Hypertension artérielle et sa prise en charge thérapeutique dans le service de cardiologie CHU du Point G Thèse Méd, Bamako: M-114.

Diao, M.M., Hakim, R., Ndiaye, M.B., Kane, AD., Bodian, M., Ciss, ECC., Sarr, M., Ba, SA. 2009. Enquête sur la prise en charge par les praticiens de l'hypertension artérielle (HTA) systémique de l'adulte au Sénégal. Congrès, SO.CAR.B.

Doulougou, B. 2014. Hypertension artérielle dans la population adulte du Burkina Faso: Prévalence, Détection, Traitement et Contrôle. Département de Médecine Sociale et Préventive École de Santé Publique Thèse présentée à l'École de Santé Publique en vue de l'obtention du grade de Ph. D. en santé publique Option épidémiologie.

Ekwunife, O.I., Udeogaranya, P.O., Nwatu, I.L. 2010. Prevalence, awareness, treatment and control of hypertension in a nigerian population. Health 2(7):731-735.

Fatiany, P.R., Fiatoa, B., Raoelson, G., Randrianirina, A.O., Randriantsoa, A., Andrianjara, C., Minjié, Z., Marchioni, E., Robijaona, B., Solofoniaina, M., Ngbolua, K.N. 2016. Vasodilator effects of Cymbopogon pruinosus (Poaceae) from Madagascar on isolated rat thoracic aorta and structural elucidation of its two bioactive compounds. Journal of Pharmacognosy and Phytochemistry 5(1): 46-55.

Fatiany, P.R., Robijaona, B., Raharisololalao, A., Mpiana, P.T., Mudogo, V., Ngbolua, K.N. 2015. Ethno-botanical Survey and Assessment of Vasorelaxant

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

Activity of Some Extracts Obtained from the Leaves of Carissa spinarum L. (Apocynaceae) Originated from Madagascar on Isolated Rat Thoracic Aorta. Pharmacologia 6: 88-96. DOI:10.5567/Pharmacologia.2015.88.96.

Guwatudde, D., Nankya-Mutyoba, J., Kalyesubula, R., Laurenc,e C., Adebamowo, C., Ajayi, I., Bajunirwe, F., Njelekela, M., Chiwanga, F.S., Reid, T., Volmink, J., Adami, H.O., Holmes, M.D., Dalal, S. 2015. The burden of hypertension in sub-Saharan Africa: a four-country cross sectional study. BMC Public Health. 2015 Dec 5;15:1211. doi: 10.1186/s12889-015-2546-z.

Hercberg, S., Tallec, A. 2000. Pour une politique nutritionnelle de santé publique en France. Rapport du Haut Comité de Santé Publique. ISBN : 2-85952-629-3.

Jenson, A., Omar, AL., Omar, MA., Rishad, AS., Khoshnood, K. 2011. Assessment of hypertension control in a district of Mombasa, Kenya. Global public health 6(3):293-306.

Kostova, D., Spencer, G., Moran, A.E., Cobb, L.K., Husain, M.J., Datta, B.K., Matsushita, K., Nugent, R. 2020. The cost-effectiveness of hypertension management in low-income and middle-income countries: a review. BMJ Glob Health. 2020 Sep;5(9):e002213. doi: 10.1136/bmjgh-2019-002213.

Mancia, G., Kreutz, R., Brunström, M., Burnier, M., Grassi, G., Januszewicz, A., Muiesan, ML., Tsioufis, K., Agabiti-Rosei, E. et al. 2023. ESH Guidelines for the management of arterial hypertension The Task Force for the management of arterial hypertension of the European Society of Hypertension: Endorsed by the International Society of Hypertension (ISH) and the European Renal Association (ERA). J Hypertens. 41(12):1874-2071.

Ngombe, L.K., Cowgill, K., Monga, B.B., Ilunga, B.K., Stanis, W.O., Numbi, O.L. 2015. Prévalence de l'hypertension artérielle dans la population des meuniers de la ville de Lubumbashi, République Démocratique du Congo. Pan Afr Med J. 22:152.. doi: 10.11604/pamj.2015.22.152.6677.

Robijaona, B., Fatiany, P.R., Ngbolua, K.N., Fiatoa, B., Raharisololalao, A., Rakotomamonjy, P., Moulis, C., Mudogo, V., Mpiana, P.T., Rakotondramanana, S.,

Razakarivelo, R.M. 2014. Evaluation of the Vasorelaxant Effect Induced by the Essential Oil Extracted from the Root Bark of Hazumalania voyronii (Jum.) Capuron (Hernandiaceae) in Wistar Rat Aorta Ring. J. of Advancement in Medical and Life Sciences. V2I1.01 DOI : 10.5281/zenodo.890253

Sigmund, C.D., Carey, R.M., Appel, L.J., Arnett, D.K., Bosworth, H.B., Cushman, W.C., Galis, Z.S., Green, P.M., Hall, J.E., Harrison, D.G., McDonough, A.A., Nicastro, H.L., Oparil, S., Osborn, J.W., Raizada, M.K., Wright, J.D., Oh, Y.S. 2020. Report of the National Heart, Lung, and Blood Institute Working Group on Hypertension: Barriers to Translation. Hypertension. 75(4):902-917. doi: 10.1161/HYPERTENSIONAHA.119.13887.

Tran-Duy, A., Morrisroe, K., Clarke, P., Stevens, W., Proudman, S., Sahhar, J., Nikpour, M. 2021. Australian Scleroderma Interest Group (ASIG). Cost-Effectiveness of Combination Therapy for Patients With Systemic Sclerosis-Related Pulmonary Arterial Hypertension. J Am Heart Assoc. 2021 Apr 6;10(7):e015816. doi: 10.1161/JAHA.119.015816. Epub 2021 Mar 24. PMID: 33759539; PMCID: PMC8174376.

Vesin, C. 2009. Hypertensions artérielles secondaires d'origine surrénalienne: syndromes de Conn, de Cushing et autres entités. EMC Cardiologie 1–12. [Article 11-301-F-10]

Wamala, JF., Karyabakabo, Z., Ndungutse, D., Guwatudde, D. 2009. Prevalence factors associated with Hypertension in Rukungiri District, Uganda- A Community-Based Study. African Healh Sciences 9(3):153-60.

Wojciechowska, W., Terlecki, M., Klocek, M., Pac, A., Olszanecka, A., Stolarz-Skrzypek, K., Jastrzębski, M., Jankowski, P., Ostrowska, A., Drożdż, T., Prejbisz, A., Dobrowolski, P., Januszewicz, A., Krzanowski, M., Małecki, M.T., Grodzicki, T., Kreutz, R., Rajzer, M. 2022. CRACoV-HHS Investigators. Impact of Arterial Hypertension and Use of Antihypertensive Pharmacotherapy on Mortality in Patients Hospitalized due to COVID-19: The CRACoV-HHS Study. Hypertension. 2022 Nov;79(11):2601-2610. doi: 10.1161/HYPERTENSIONAHA.122.19575.

Motuta et al., *Orapuh Journal* **2024, 5(1), e1108**

Epidemiological, clinical, and therapeutic profiles of patients treated for arterial hypertension in the Cardiology Department of Kinshasa General Hospital (Formerly Maman Yemo), DRC

Zhou, B., Perel, P., Mensah, G.A., Ezzati, M. 2021. Global epidemiology, health burden and effective interventions for elevated blood pressure and hypertension. Nat Rev Cardiol. 18(11):785-802. doi: 10.1038/s41569-021-00559-8.