# Determinants of therapeutic nonadherence to antihypertensive treatment: a hospital-based study on outpatients in Northern Cameroon

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## Abstract

**Background:** Poor therapeutic adherence has disastrous consequences for the patient and the health-care system as a whole. In patients, poorly controlled blood pressure facilitates the occurrence of cardiovascular complications. Adherence to therapy is more central to good clinical outcomes than the improvement of treatment efficiency, reason why it is important to identify risk factors of poor therapeutic adherence to ameliorate current interventions; hence, enabling the health system attain its goals.

**Objective:** To assess the level of therapeutic adherence to antihypertensive treatment and to identify factors associated to poor observance among patients with hypertension in Garoua city, North Cameroon.

**Materials and Methods:** The patients were randomly and consecutively selected at the consultation services of the Medico-Social Centre of the National Social Insurance Fund in Garoua. Data were collected using self-administered semi-structured questionnaire that included the Girerd X compliance test.

**Result:** In total 210 patients were enrolled into the study. Of them, 12.9% of patients followed up their treatment correctly, 52.9% had minor observance problems, and 34.3% had a poor therapeutic adherence to antihypertensive drugs. The determining factors of poor adherence were the presence of complications of high blood pressure ($p = 0.002$; odds ratio [OR] = 0.198), the presence of a handicap ($p = 0.040$; OR = 0.295), and a low level of education ($p = 0.008$).

**Conclusion:** Adherence to antihypertensive drug treatment is poor within our population of study. It is therefore important to emphasize on therapeutic education initiatives in our environment to limit the progression of hypertension, thus, minimizing the occurrence of complications because of high blood pressure and consequently the associated economic burden.

**KEY WORDS:** High blood pressure, hypertension, therapeutic adherence, North Cameroon

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## Introduction

High blood pressure (HBP) is one of the main risk factors for cardiovascular disease (CVD), whose prevalence has significantly increased during the last two decades. Developed countries were previously the main focus, but recent projections show that by 2025, an estimated 75% of the hypertensive population worldwide will be found in developing countries.[1] In sub-Saharan Africa, a continuous increase

in the prevalence of HBP and CVDs has thus been established. In a study by Fourcade et al, the reported prevalence rate of HBP was 47.5% in Nigeria, 21.4% in Kenya, 23.7% in Tanzania, and 38.0% in Namibia.[2] In Cameroon, according to a study in 2012 on 2,120 patients, the prevalence rate of HBP was recorded at 45.5% in an adult population.[3] The same study showed that only 24.6% of patients with hypertension were under medical follow-up.[3] This low rate of blood pressure (BP) control is linked to many factors one of which is the poor adherence to therapeutic recommendations.[4]

A study carried out in the United States in 2012 on 149 council servants revealed 70% adherence to antihypertension drug treatment.[5] In Brazil, according to Daniel and Veiga,[6] the adherence rate was 44.93% in 2013. In Togo, a study published in 2013, on a population of 363 patients with hypertension reported a 16.25% rate of therapeutic adherence,[7] whereas in Democratic Republic of Congo, it was observed at 21.2% in 2013.[8]

Poor therapeutic adherence has disastrous consequences for the patient and the health-care system as a whole. In patients, poorly controlled BP facilitates the occurrence of cardiovascular complications.[4,9] In their study, Pressman et al. pointed out a high mortality rate among patients with a poor therapeutic adherence to antihypertensive treatment compared to those with normal control.[10] At the economic level, repercussions of poor therapeutic adherence are evaluated in terms of direct costs because of treatment (including hospitalization) and indirect costs owing to deterioration of the patients' health conditions and decreased productivity.[11–13] According to the World Health Organization, "optimising medical adherence will have a better impact on global health than developing new drugs."[14] As a matter of fact, adherence to therapy is more central to good clinical outcomes than the improvement of treatment efficiency, the reason why it is important to identify risk factors of poor therapeutic adherence to ameliorate current interventions; hence, enabling the health system attain its goals.[14]

Data on therapeutic adherence in Cameroon are almost inexistent in the northern regions of the country, thus enforcing the objective of this work in assessing the level of therapeutic adherence to antihypertensive drug treatment and identifying the associated factors among patients with hypertension in the northern regions of Cameroon.

## Materials and Methods

### Study Area and Population
The study was carried out in Garoua town, the administrative headquarter of the north region of Cameroon and included patients with hypertension under antihypertensive treatment who consulted the Medico-Social Centre of National Social Insurance Fund in Garoua.

### Inclusion Criteria
Patients diagnosed with HBP and on antihypertensive drug treatment for at least the last 6 months and who consented to this study were enrolled.

### Exclusion Criteria
Patients with hypertension presenting memory disorders and difficulty in communication for reasons such as illiteracy (without a translator), stroke, and other CVD aftereffects, and who refused to participate in the study were excluded.

### Variables
#### Independent Variables
The independent variables retained were age, sex, marital status, type of home, level of education, profession, monthly income, health insurance, severity of the illness, type of treatment, number of tablets prescribed per day, number of tablet taken per day, presence of side effects to antihypertension drug treatment, presence of HBP complications, and patient's knowledge on HBP (causes, treatment, and complications).

#### Dependent variable
Therapeutic adherence to antihypertensive drug treatment was considered as the dependent variable.

### Data Collection Tools
Data collection was done with the aid of a self-administered structured questionnaire with adequate assistance in the French language. It comprised questions grouped into three categories as the following:

1. Identification of patients: sociodemographic and economic characteristics
2. Patients' knowledge on HBP: causes, treatment, and complications
3. Girerd Xavier test of therapeutic adherence

### Data Collection Procedure
The patients admitted into this study were randomly and consecutively selected at the consultation services or hospitalization rooms. After obtaining a written consent, we measured the resting BP of each patient and later administered a semi-structured questionnaire, and the information obtained was immediately recorded on a data record form.

### Measurement of Variables
#### Blood Pressure Measurement
BP was measured according to Seventh report of the Joint National Committee on prevention, Detection, Evaluation, and Treatment of High Blood Pressure recommendations.[15] For measurement of BP, we employed a sphygmomanometer (OMRON-HEM-712CN2; Serial number: 64167999LF, USA).

*High Blood Pressure and Hypertension*

HBP was defined as systolic BP >140 mm Hg and/or diastolic BP >90 mm Hg. Participants with HBP or currently using antihypertensive drugs were considered hypertensive. BP control was considered when pressure digits were inferior to 140 mm Hg for systolic and inferior to 90 mm Hg for diastolic among patients with hypertension who were under treatment.

*Therapeutic Adherence*

We evaluated the therapeutic adherence of patients on the basis of Girerd X observance test.[16] This is divided into the following three groups:

- Good adherence: total of "yes" = 0
- Minor adherence problems: total of "yes" between 1 and 2
- Poor adherence: total of "yes" ≥3.

### Data Processing and Analysis

The data obtained were recorded in a database using Statistic IBM SPSS software, version 20. This software also permitted us to make statistical analyses of the data.

The $\chi^2$-test (for qualitative variables) and the Student's *t*-test (for quantitative variables) were used to determine the associations between variables. A multivariate logistic regression was done to identify predictive factors of poor therapeutic adherence. The level of statistical significance was considered at 5%.

To facilitate the analyses, we grouped the dependent variable (therapeutic adherence) into two.

1. Good observance: This group concerned patients with a good adherence and those with minor observance problems according to Girerd X observance test.
2. Poor observance: This group concerned patients with a bad adherence according to Girerd X observance test.

### Ethical Considerations

Patients were informed on the nature and the goal of this study. Those who accepted to participate in our study signed an informed consent form. The identity and information collected from patients were kept strictly confidential and participants were free to quit the study without any sanctions. This research work was granted the approval of the Garoua National Social Insurance Medico-Social Fund.

# Result

### Descriptive Analysis of Results
### Sociodemographic and Economic Characteristics of Participants

Two hundred and ten patients were recruited into our study, comprising 95 men and 115 women with a sex ratio of 1:2 in favor of women. The average age of the study participants was 53.8 ± 12.4 years, ranging from 17 to 85 years

and with the 46–65 year (57.1%; *n* = 120) age group being the most represented. Also, participants were mostly married persons (76.2%; *n* = 160), among which 105 (65.6%) were monogamous and 55 (34.4%) polygamous, and with almost all (91.9%; *n* = 193) patients lived with a family. Furthermore, more than half of the study participants (60%; *n* = 126) had a very low monthly income of less than CFA F 100,000 (about $165), with a wide majority (91.4%; *n* = 192) who were uninsured for health. The sociodemographic and economic characteristics of study participants are presented in Table 1.

**Table 1:** Demographic and socioeconomic characteristics of participants

| Variables | Males | Females | Total |
|---|---|---|---|
| | *n* (%) | *n* (%) | *n* (%) |
| Age (years) | | | |
| <25 | 3 (3.2) | 5 (4.3) | 8 (3.8) |
| 25–45 | 15 (15.8) | 20 (17.4) | 35 (16.7) |
| 46– | 57 (60.0) | 63 (54.8) | 120 (57.1) |
| >65 | 20 (21.0) | 27 (23.5) | 47 (22.4) |
| Religion | | | |
| Animist | 2 (2.1) | 1 (0.9) | 3 (1.4) |
| Christian | 50 (52.6) | 37 (32.2) | 87 (41.4) |
| Muslim | 43 (45.3) | 77 (66.9) | 120 (57.1) |
| Marital status | | | |
| Single | 5 (5.2) | 3 (2.6) | 8 (3.8) |
| Monogamous | 55 (57.9) | 50 (43.5) | 105 (50) |
| Polygamous | 32 (33.7) | 23 (20) | 55 (26.2) |
| Divorced/widowed | 3 (3.2) | 39 (33.9) | 42 (20) |
| Type of habitation | | | |
| Solitary | 4 (4.2) | 13 (11.3) | 17 (8.1) |
| Family | 91 (95.8) | 102 (88.7) | 193 (91.9) |
| Level of education | | | |
| Uneducated | 14 (14.7) | 60 (52.2) | 74 (35.2) |
| Primary | 27 (28.4) | 22 (19.1) | 49 (23.3) |
| Secondary | 38 (40) | 27 (23.5) | 65 (31) |
| Higher | 16 (16.8) | 6 (5.2) | 22 (10.5) |
| Profession | | | |
| Farmer/trader | 26 (27.4) | 10 (8.7) | 36 (17.1) |
| Salary earner | 33 (34.7) | 19 (16.5) | 52 (24.8) |
| Student | 2 (2.1) | 0 (0) | 2 (1.0) |
| Housewife | 0 (0) | 79 (68.7) | 79 (37.6) |
| Retired | 30 (31.6) | 2 (1.7) | 32 (15.2) |
| Unemployed | 4 (4.2) | 5 (4.3) | 9 (4.3) |
| Monthly income (CFA F) | | | |
| <28,000 | 11 (11.6) | 67 (58.2) | 78 (37.1) |
| 28,000–100,000 | 27 (28.4) | 21 (18.3) | 48 (22.9) |
| >100,000 | 57 (60.0) | 27 (23.5) | 84 (40) |
| Health insurance | | | |
| Yes | 12 (1.6) | 6 (5.2) | 18 (8.6) |
| No | 83 (87.4) | 109 (94.8) | 192 (91.4) |

## Clinical and Paraclinical Characteristics of Participants

The results of our study show that 32.8% of patients had stage I hypertension and 32.4% had stage II hypertension. The majority of patients (*n* = 172; 81.9%) reported having neither sight nor hearing handicap. Among those who had a handicap, 32 had sight disorders, three had hearing disorders, and three had both disorders. The most frequently associated pathology to HBP was diabetes (or 47%; *n* = 99), followed by kidney failure (8.6%; *n* = 18).

Regardless of the sex, 65.7% of patients (*n* = 138) were on monotherapy and 34.2% (*n* = 72) on multidrug therapy. The proportion of patients on tritherapy (100%) who were nonadherent to antihypertensive therapy were significantly highest compared with bitherapy (36.9%) and monotherapy (29.7%) (*p* = 0.001). Also 51.2% of patients taking three tablets or more per day, 25.4% taking two, and 32.7% taking one were nonadherent to therapy, a difference that was significant (*p* = 0.025). In addition, 42.5% of participants who took their drugs twice daily were nonadherent compared with 28.5% of those who took once a day, a difference that was significant (*p* = 0.034). Duration of hypertension, on the other hand, was associated to poor therapeutic adherence, with the highest proportion of patients diagnosed and on treatment for more than 5 years (49.5%) being nonadherent to treatment compared with those with treatment duration of 1 to 5 years (29.6%) and less than 1 year (21.4%) (*p* = 0.023).

## Monthly Cost Estimate of Hypertension Drug Treatment

The monthly total cost of medical treatment of our population of study was CFA F 2,060,400 ($3404) with an average of CFA F 9,811 per patient per month.

## Participants' Knowledge on High Blood Pressure

An assessment of the patients' knowledge on HBP revealed that the majority of patients were unaware of the causes of HBP (62.9%; *n* = 132), composed of 61.1% (*n* = 58) male patients and 64.3% (*n* = 74) female patients.

The number of patients who answered that the treatment of HBP was a lifetime commitment made up the majority of our study population (72.4%; *n* = 152). Concerning the HBP therapeutic strategy, 149 patients knew that their treatment consisted taking tablets, going on an adjusted diet, and performing physical exercises. A total of 137 patients (65.2%) were unaware of HBP complications. For those who knew them, the most recorded complication was cerebral vascular accident (stroke) (19.5%; *n* = 41). Within the studied population, 196 patients (93.3%) said they were unable to carry out auto BP measurement.

## Level of Medical Observance by Patients

On the basis of Girerd X observance test, our results revealed that only 12.9% of patients had a good medical observance.

## Bivariate and Multivariate Analysis of Results

According to bivariate analysis, 10 factors were found to be associated with therapeutic nonadherence to antihypertensive medications; these results are represented in Table 2.

Multivariate analysis by logistic regression permitted us to identify the following four predictive factors of poor nonadherence [Table 3]:

1. Presence of HBP complications: Patients who had already developed HBP complications were more associated with a poor level of adherence than those who had not yet developed any (*p* = 0.007; odds ratio [OR] = 0.201).
2. Knowledge on HBP complications: Patients who knew about HBP complications were more exposed to a poor medical adherence than those who ignored HBP complications (*p* = 0.002; OR = 0.198)

**Table 2:** Factors associated with antihypertensive therapeutic nonadherence

| Variables | Good adherence | Bad adherence | *p* |
|---|---|---|---|
| | *n* (%) | *n* (%) | |
| Level of education | | | |
| Uneducated | 44 (34.9) | 30 (41.6) | 0.035 |
| Primary | 37 (26.8) | 12 (16.7) | |
| Secondary | 47 (34.1) | 18 (25.0) | |
| Higher | 10 (7.2) | 12 (16.7) | |
| Type of habitation | | | |
| Solitary | 7 (5.0) | 10 (13.9) | 0.026 |
| Family | 131 (95.0) | 62 (86.1) | |
| BP control | | | |
| Controlled | 60 (43.5) | 42 (58.3) | 0.041 |
| Uncontrolled | 78 (56.5) | 30 (41.7) | |
| Duration of hypertension | | | |
| <1 year | 22 (15.9) | 6 (8.3) | 0.023 |
| 1–5 years | 76 (55.1) | 32 (44.5) | |
| >5 years | 40 (29.0) | 34 (47.2) | |
| Awareness of complications of hypertension | | | |
| Yes | 55 (40.0) | 18 (25.0) | 0.032 |
| No | 83 (60.0) | 54 (75.0) | |
| Treatment type | | | |
| Monotherapy | 97 (70.3) | 41 (57.0) | 0.001 |
| Bitherapy | 41 (29.7) | 24 (33.3) | |
| Tritherapy | 0 (0.0) | 7 (9.7) | |
| Number of tablets taken per day | | | |
| 1 | 74 (53.6) | 36 (50.0) | 0.025 |
| 2 | 44 (31.9) | 15 (20.8) | |
| ≥3 | 20 (14.4) | 21 (29.2) | |
| Number of times taken per day | | | |
| 1 | 88 (63.8) | 35 (48.6) | 0.034 |
| ≥2 | 50 (36.2) | 37 (51.4) | |
| Presence of complications | | | |
| Yes | 41 (29.7) | 10 (13.9) | 0.034 |
| No | 97 (70.3) | 62 (86.1) | |
| Cost of treatment | | | 0.027 |

BP, blood pressure.

**Table 3:** Determinants of poor therapeutic adherence (multivariate analysis)

| Variables | OR | df | *p* | [CI 95%] |
|---|---|---|---|---|
| Sex | | | | |
| Male (Ref) | 1 | | | 0.338–2.513 |
| Female | 0.921 | 1 | 0.873 | |
| Age (years) | | 3 | 0.403 | |
| <25 (Ref) | | | | |
| 25–45 | 3.647 | 1 | 0.224 | 0.452–29.419 |
| 46–65 | 4.802 | 1 | 0.132 | 0.622–37.069 |
| >65 | 6.786 | 1 | 0.095 | 0.717–64.250 |
| Marital status | | 2 | 0.129 | |
| Single (Ref) | 1 | | | |
| Married | 0.260 | 1 | 0.236 | 0.028–2.417 |
| Divorced/widowed | 0.757 | 1 | 0.823 | 0.066–8.656 |
| Level of education | | 3 | 0.004 | |
| Uneducated (Ref) | 1 | | | |
| Primary | 1.417 | 1 | 0.572 | 0.423–4.747 |
| Secondary | 0.188 | 1 | 0.070 | 0.031–1.145 |
| Higher | 0.226 | 1 | 0.017 | 0.067–0.764 |
| Job status | | | | |
| Employed (Ref) | 1 | | | 0.568–6.553 |
| Unemployed | 1.929 | 1 | 0.292 | |
| Monthly income | | 2 | 0.685 | |
| <28,000 (Ref) | 1 | | | |
| 28,000–100,000 | 0.672 | 1 | 0.491 | 0.216–2.086 |
| >100,000 | 1.000 | 1 | 1.000 | 0.282–3.549 |
| Health insurance | | | | |
| Yes (Ref) | 1 | | | |
| No | 0.957 | 1 | 0.954 | 0.214–4;273 |
| Type of habitation | | | | |
| Family (Ref) | 1 | | | |
| Solitary | 3.419 | 1 | 0.132 | 0.690–16.943 |
| Presence of complications | | | | |
| Yes (Ref) | 1 | | | |
| No | 0.153 | 1 | 0.002 | 0.047–0.497 |
| Number of tablets/day | | 2 | 0.098 | |
| 1 (Ref) | 1 | | | |
| 2 | 2.909 | 1 | 0.104 | 0.804–10.520 |
| ≥3 | 0.856 | 1 | 0.821 | 0.222–3.297 |
| Number of times taken/day | | | | |
| 1 time (Ref) | 1 | | | |
| ≥1 time | 0.193 | 1 | 0.071 | 0.032–1.150 |
| Time drugs are taken | | 3 | 0.551 | |
| Morning (Ref) | 1 | | | |
| Afternoon | 5.378 | 1 | 0.259 | 0.289–100.099 |
| Evening | 2.237 | 1 | 0.361 | 0.397–12.600 |
| Presence of a handicap | | | | |
| Yes (Ref) | 1 | | | |
| No | 0.317 | 1 | 0.047 | 0.102–0.983 |
| Awareness of complications of hypertension | | | | |
| Yes (Ref) | 1 | | | |
| No | 0.231 | 1 | 0.004 | 0.086–0.624 |
| Presence of secondary effects | | | | |
| Yes (Ref) | 1 | | | |
| No | 1.236 | 1 | 0.750 | 0.335–4.562 |
| Presence of complications | | | | |
| Yes (Ref) | 1 | | | |
| No | 0.153 | 1 | 0.002 | 0.047–0.497 |
| Cost of treatment | 9.174 | 1 | 0.263 | 1.000–1.000 |
| Practice of self-measurement of BP | | | | |
| Yes (Ref) | 1 | | | |
| No | 2.951 | 1 | 0.247 | 0.473–18.418 |

OR, odds ratio; CI, confidence interval.

3. Presence of a disability (hearing, sight, or motor): Participants who had no disability were more likely to have followed up their treatment correctly ($p = 0.047$; OR = 0.295) as compared with those who had a disability.

4. Level of Education: Patients who had not attended any school were more exposed to a poor adherence compared with those who had attended any level of education ($p = 0.008$).

## Discussion

This cross-sectional descriptive and analytic study had to evaluate the level of therapeutic adherence to antihypertensive therapy and identify the associated factors among patients who were hypertensive in the northern Cameroon as the main objective.

### Sociodemographic and Economic Characteristics of Participants

Our study sample comprised 210 participants whose average age was $53.8 \pm 12.4$ years with extremes of 17 and 85 years. In this study, we observed a small proportion of patients with hypertension (3.8%) under 25 years of age, with the age group 46–65 years (57.1%) being the most represented. Our results were in line with the previous literature.[2,3] By gender-based distribution of patients, it was observed that women were more represented, this was contrasting to the previous reports by other authors. In a 2012 study carried out in Cameroon on 2,120 persons, Dzudie et al. reported that HBP was more frequent in the masculine population (50.1%) than in the feminine population (44.6%).[3]

Furthermore, about two-thirds of the study participants had a small monthly income less than CFA F 100,000 (~$165), and just a few were covered by health insurance (8.6%). This could be primarily because of the fact that health insurance is not mandatory in the current health-care system, and in part because of the lack of awareness on the benefits of health insurance. Almost all (91.9%; $n = 193$) the patients of our population of study had lived in a family; only 8.1% ($n = 17$) lived alone and according to bivariate analysis, solitary life was associated with poor therapeutic adherence compared with family life. This was possibly because of the fact that patients living alone have a relatively lower financial, physical, and/or moral assistance. Several studies have shown that familial stability and social assistance had a positive impact on the therapeutic adherence.[17,18]

### Clinical and Paraclinical Characteristics of Participants

The occurrence of stage I hypertension (32.8%) and stage II hypertension (32.4%) in our study population was not statistically different.

A total of 34.8% of participants were observed to present with good BP control levels; it remains low as compared with data obtained in Western countries.[19,20] This poor BP control noticed in our study participants can be due to the lack of

therapeutic adherence and intensification (small dose or inappropriate therapeutic combinations).

The study findings also established an association between the level of good BP control and poor therapeutic adherence ($p = 0.041$) among the participants. Higher BP values were more frequent among patients who had a good therapeutic adherence compared with those who had a poor adherence. This observation seems contradictory as the objective of HBP treatment is to normalize BP. But this paradoxical phenomenon can be justified by the fact that inappropriate treatment may have just a little impact on BP control; this because, even though the patient may respect his treatment, the dosage or wrongly adapted therapeutic combination makes it difficult for the therapeutic objective to be attained. Besides, in an American study, Daugherty et al.[21] depicted that the intensification of antihypertension drug treatment (augmentation of the dose or adding of a new antihypertensive molecule) permitted to have a better control of the BP. Concerning comorbidities, it is well established that the most frequent comorbidity associated to HBP is diabetes and our results are in line with the previous observations.[22,23]

Also in this study, 51.4% of participants had been diagnosed with HBP and placed on treatment within at least a 5-year period (54.3% of cases). According to bivariate analysis, it was noticed that the duration of hypertension lowered therapeutic adherence. This can be explained by the fact that chronic diseases lead to considerable increase in the financial expenditures of patients. In fact, in most sub-Saharan African countries, financial expenditures for health care rely on particular individuals, families, sometimes enterprises, and even the health system.[24] In our context, as the burden is supported by the patients and their families in a generally unfavorable economic environment, they more often have difficulties in procuring their drugs, thus favoring a poor therapeutic adherence.

Furthermore, we recorded an association between therapeutic adherence on one hand, and the type of treatment and the number of tablets taken per day on the other hand. Our results were in line with those of the authors who were of the opinion that reducing the number of tablets taken per day facilitates drug intake and, therefore, ameliorates therapeutic adherence.[7,18]

The estimated total cost of antihypertensive drugs in our population of study was CFAF 2,060,400 with an average of CFAF 9,811 per patient per month. This estimate was close to CFAF 10,560 per patient per month, obtained in Togo in 2013.[7] Our study showed that therapeutic adherence was dependent on the cost of treatment. Several studies have previously showed that a high cost of antihypertension drug treatment favored a poor adherence to treatment.[25–27]

### Patients' Knowledge on High Blood Pressure

The results of our study revealed a low level of patients' awareness on HBP. The majority of patients ignored a lot about their disease (causes, complications, and the normal value of BP). This observation was similar to that of Hashmi

et al. in Pakistan.[28] This low level of awareness may be a direct result of the limited information obtained by patients because of the ineffectiveness in the existing public health programs and the insufficiency of the health personnel to provide health care and therapeutic information to patients in our region.

### Level of Therapeutic Adherence

We recorded in this study a high frequency of therapeutic nonadherence, with a great majority of patients (87.1%; $n = 183$) having problems conforming to treatment. This finding concurs to those previous studies, for example, in Ghana, according to Kretchy et al., 93.3% of patients with hypertension had a poor therapeutic adherence.[29] In Congo, Ikama et al.[8] reported that 78.8% of patients had observance difficulties, versus 21.2% who had a good observance level. These figures affirm the difficulties associated with therapeutic adherence among patients with hypertension in sub-Saharan Africa. Many studies portray a better picture in Western countries compared with African countries. In Canada, for example, Natarajan et al.[30] reported a prevalence of 77.4% good observance and 1.7% poor observance, and in the United States, 70.9% of patients with hypertension had a good therapeutic adherence and 1.8% poorly adhered to antihypertensive therapy.[31]

### Determinants of Therapeutic Adherence

Multivariate analysis of our results revealed that poor therapeutic observance was linked to the low level of education, this being in line with current literature.[26,32] A disability was considered to be the presence of any disorder capable of negatively influencing the learning process of patients in the framework of a therapeutic education. In our population of study, 18.1% of patients had disabilities, mainly sight disorders (84.2%) and hearing disorders (7.9%). Analysis further showed that the absence of a disability favors a good therapeutic adherence ($p = 0.047$). This was also illustrated in a study by Park JH et al.[33]

We also noticed that patients who knew about HBP complications were more exposed to a poor therapeutic adherence than those who were unaware ($p = 0.004$). This finding contradicted some recent studies in which a significant positive association has been found between adequate or good knowledge level about hypertension (including the complications) and drug adherence.[32,34]

Our results differ from those of the earlier studies wherein patients who knew well about their disease (including the complications) had a good therapeutic adherence.[32,34]

According to the authors, knowing the complications of HBP may encourage patients to correctly follow up their treatment for fear of developing them. On our part, we think that, "knowing" complications can only encourage a better therapeutic adherence when all measures are in place to facilitate access to and acquisition of antihypertensive drugs by a majority of patients, which is not currently the case in our environment.

The occurrence of complications of hypertension has been considered an eventual outcome of poor therapeutic adherence by many authors.[27] Our results are in line with these observations as participants who presented with any of the complications of hypertension were recorded to poorly adhere to antihypertensive therapy at present or at one point in the past ($p = 0.007$; OR = 0.201).

### Study Limitations

Our results permit us to explain just partially the causes of poor therapeutic adherence; several factors likely to influence the therapeutic adherence were not studied, such as those related to health personnel–patient relationship. Also, the methodology used (Girerd X Observance Test) does not permit us to obtain entirely reliable results because it is based on verbal responses whose authenticity is usually difficult to verify.

## Conclusion

The results of this study have demonstrated a high occurrence of poor therapeutic adherence to antihypertensive treatment among the patients with hypertension studied. Lack of knowledge on hypertension and its complications, the presence of handicap, a low level of education, duration of hypertension, multidrug therapy, solitary lifestyle, number of tablets taken and dosage per day, and the cost of treatment have been identified as main determining factors of poor therapeutic adherence among patients with hypertension. Furthermore, the presence of hypertension complications is associated with poor therapeutic adherence. Further studies are needed to explore and adjust to these factors, their interaction, and impact on BP levels over time.

## Acknowledgment

## References

1. Wang TJ, Vasan RS. Epidemiology of uncontrolled hypertension in the United States. Circulation 2005;112(11):1651–62.
2. Fourcade L, Paule P, Mafart B. [Arterial hypertension in sub-Saharan Africa. Update and perspectives]. Méd Trop (Mars) 2007; 67(6):559–67.
3. Dzudie A, Kengne AP, Muna WF, Hamadou B, Menanga A, Kouam Kouam C, et al. Prevalence, awareness, treatment and control of hypertension in a self-selected sub-Saharan African urban population: a cross-sectional study. BMJ Open 2012;2(4):e001217.
4. Boswort HB, Olsen MK, Neary A, Orr M, Grubber J, Svetkey L, et al. Take Control of Your Blood Pressure (TCBP) study: a multi-factorial tailored behavioral and educational intervention for achieving blood pressure control. Patient Educ Couns 2008; 70 (3): 338-47.

5. Breaux-Shropshire TL, Brown KC, Pryor ER, Maples EH. Prevalence of blood pressure self-monitoring medication adherence, self-efficacy, stage of change, and blood pressure control among municipal workers with hypertension. Workplace Health Saf 2012;60(6):265–71.

6. Daniel AC, Veiga EV. Factors that interfere the medication compliance in hypertensive patients. Einstein (Sao Paulo) 2013;11(3):331–7.

7. Pio M, Baragou S, Afassinou Y, Pessinaba S, Atta B, Ehlan K, et al. [Adherence to hypertension and its determinants in the cardiology department of the University Hospital of Lomé Tokoin]. Pan Afr Med J 2013;14:48.

8. Ikama MS, Nsitou BM, Loumouamou M, Kimbally-Kaky G, Nkoua JL. [Drug compliance and its factors in a group of hypertensive Congolese]. Pan Afr Med J 2013;15:121.

9. Avins AL, Pressman A, Ackerson L, Rudd P, Neuhaus J, Vittinghoff E. Placebo adherence and its association with morbidity and mortality in the studies of left ventricular dysfunction. J Gen Intern Med 2010;25(12):1275–81.

10. Pressman A, Avins AL, Neuhaus J, Ackerson L, Rudd P. Adherence to placebo and mortality in the Beta Blocker Evaluation of Survival Trial (BEST). Contemp Clin Trials 2012;33(3):492–8.

11. Bosch-Capblanch X, Abba K, Prictor M, Garner P. Contracts between patients and healthcare practitioners for improving patients' adherence to treatment, prevention and health promotion activities. Cochrane Database Syst Rev 2007;(2):CD004808.

12. IMS, Institute for Health care Informatics. Avoidable cost in U.S. healthcare. 2013. Available at: http://theimsinstitute.org/en/thought-leadership/ims-institute/reports/avoidable-costs (last accessed on November 25, 2014).

13. Benjamin RM. Medication adherence: helping patients take their medicines as directed. Public Health Rep 2012;127(1):2–3.

14. Sabate E. *Adherence to Long-Term Therapies. Evidence for Action*. Geneva, Switzerland: World Health Organization, 2003. Available at: http//whqlibdoc.who.int/publications/2003/9241545992.pdf (last accessed on November 20, 2014).

15. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, et al. Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Hypertension 2003;42(6):1206–52.

16. Girerd X, Hanon O, Anangnostopoulos K, Ciupek C, Mourad JJ, Consoli S. [Assessment of antihypertensive compliance using a self-administered questionnaire: development and use in a hypertension clinic]. Presse Méd 2001;30(21):1044–8.

17. Daly JM, Hartz AJ, Xu Y, Levy BT, James PA, Merchant ML, et al. An assessment of attitudes, behaviors, and outcomes of patients with type 2 diabetes. J Am Board Fam Med 2009;22(3):280–90.

18. Krousel-Wood M, Joyce C, Holt E, Muntner P, Webber LS, Morisky DE, et al. Predictors of decline in medication adherence: results from the cohort study of medication adherence among older adults. Hypertension 2011;58(5):804–10.

19. Wong ND, Dede J, Chow VH, Wong KS, Franklin SS. Global cardiovascular risk associated with hypertension and extent of treatment and control according to risk group. Am J Hypertens 2012;25(5):561–7.

20. Egan BM, Zhao Y, Axon RN, Brzezinski WA, Ferdinand KC. Uncontrolled and apparent treatment resistant hypertension in the United States, 1988 to 2008. Circulation 2011;124(9):1046–58.

21. Daugherty SL, Powers JD, Magid DJ, Massoudi FA, Margolis KL, O'Connor PJ, et al. The association between medication adherence and treatment intensification with blood pressure control in resistant hypertension. Hypertension 2012;60(2):303–9.

22. Scheen AJ, Philips J-C, Krzesinski. Hypertension et diabète: à propos d'une association commune mais complexe. Rev Med Liège 2012;67(3):133–8.

23. Colossia AD, Palencia R, Khan S. Prevalence of hypertension and obesity in patients with type 2 diabetes mellitus in observational studies: a systematic literature review. Diabetes Metab Syndr Obes 2013;6:327–38.

24. Abegunde DO, Mathers CD, Adam T, Ortegon M, Strong K. The burden and costs of chronic diseases in low-income and middle-income countries. Lancet 2007;370(9603):1929–38.

25. Pesa JA, Van Den Bos J, Gray T, Hartsig C, McQueen RB, Saseen JJ, et al. An evaluation of the impact of patient cost sharing for antihypertensive medications on adherence, medication and health care utilization, and expenditures. Patient Prefer Adherence 2012;6:63–72.

26. Vawter L, Tong X, Gemilyan M, Yoon PW. Barriers to antihypertensive medication adherence among adults—United States, 2005. J Clin Hypertens (Greenwich) 2008;10(12):922–9.

27. Adoubi A, Diby KF, Nguetta R, Yangni-Angate KL, Adoh AM. Facteurs de la mauvaise observance thérapeutique de l'hypertendu en Côte d'Ivoire. Rev Int Méd 2006;8(2):18–22.

28. Hashmi SK, Afridi MB, Abbas K, Sajwani RA, Saleheen D, Frossard PM, et al. Factors associated with adherence to antihypertensive treatment in Pakistan. PLoS One 2007;2(3):e280.

29. Kretchy IA, Owusu-Daaku FT, Danquah S. Locus of control and anti-hypertensive medication adherence in Ghana. Pan Afr Med J 2014;17(Suppl 1):13.

30. Natarajan N, Putnam W, Van Aarsen K, Lawson B, Burge F. Adherence to antihypertensive medications among family practice patients with diabetes mellitus and hypertension. Can Fam Physician 2013;59(2):e93–100.

31. Irvin MR, Shimbo D, Mann DM, Reynolds K, Krousel-Wood M, Limidi NA, et al. Prevalence and correlates of low medication adherence in apparent treatment-resistant hypertension. J Clin Hypertens (Greenwich) 2012;14(10):694–700.

32. Wariva E, January J, Maradzika J. Medication adherence among elderly patients with high blood pressure in Gweru, Zimbabwe. J Public Health Afr 2014;5(1):28–32.

33. Park JH, Park JH, Lee SY, Kim SY, Shin Y, Kim SY. Disparities in antihypertensive medication adherence in persons with disabilities and without disabilities: results of a Korean population-based study. Arch Phys Med Rehabil 2008;89(8):1460–7.

34. Malik A, Yoshida Y, Erkin T, Salim D, Hamajima N. Hypertension-related knowledge, practice and drug adherence among inpatients of a hospital in Samarkand, Uzbekistan. Nagoya J Med Sci 2014;76(3–4):255–63.