Prevalence, awareness, treatment and control of hypertension among adults 50 years and older in Dakar, Senegal

E MACIA, P DUBOZ, L GUEYE

Abstract

Background: Older adults are disproportionately affected by hypertension, which is an established risk factor for cardiovascular disease. Despite these facts, no study on the prevalence, awareness, treatment and control on arterial hypertension in Senegal has been conducted, specifically among elderly people.

Methods: Five hundred people aged 50 years and older, living in the city of Dakar were interviewed. This sample was constructed using the combined quota method in order to strive for representativeness of the target population.

Results: Prevalence of hypertension was 65.4% in our sample. Half of those suffering from high blood pressure were aware of their problem and among the latter, 70% said they were on treatment. However, of these, only 17% had controlled arterial blood pressure. The only factor associated with awareness, treatment and control of hypertension was the frequency of doctor visits.

Conclusion: Improving follow-up health checks of older adults are necessary to limit the consequences of hypertension in Dakar.

Keywords: hypertension, risk factors, older adults, Senegal

Prevalence of hypertension was 65.4% in our sample. Half of those suffering from high blood pressure were aware of their problem and among the latter, 70% said they were on treatment. However, of these, only 17% had controlled arterial blood pressure. The only factor associated with awareness, treatment and control of hypertension was the frequency of doctor visits.

The aims of this study were therefore to (1) assess the prevalence, awareness, treatment and control of hypertension in the population aged 50 years and older living in the city of Dakar; (2) identify factors associated with hypertension, and also its awareness, treatment and control.

Methods

This study was conducted from January to June 2009 on a sample of 500 individuals. The sample was constructed using the quota method (cross-section by age, gender and town of residence) in order to strive for representativeness of the population 50 years and older living in the city of Dakar. Data from the Agence Nationale de la Statistique et de la Démographie dating from the last census (2002) were used to this end. The quota variables used were gender (male/female), age (50–59, 60–69, 70 years and older) and town of residence.

The towns were grouped into the four districts making up the city of Dakar: Plateau-Gorée (five towns), Grand Dakar (six towns), Parcels Assainies (four towns) and Almadies (four towns). This method requires building up a sample that follows the proportions observed in the general population: for example, according to the last census, men aged 50–59 years living in the town of Medina (district of Plateau-Gorée) represented 2.4% of the population of 50 years and older living in the city of Dakar. The sample was constructed so as to reflect this proportion and included 12 men 50–59 years old living in this town.

For each town, four investigators (PhD students in the departments of Medicine and Pharmacy) started out from different points each day to measure and interview individuals in Wolof or French in every third home. Investigators had a set number of individuals to interview (women and men 50–59 years, 60–69 years, and 70 years and over in each town) to meet the quotas. Only one person was selected as a respondent in each home.

The objective of this bio-anthropological survey was to carry out...
out a holistic study on aging in the city of Dakar. To do so, face-to-face guided interviews based on a questionnaire were used to collect the data required for the study. These interviews were followed by a physical examination that involved taking blood pressure and anthropometric measurements.

**Study definitions and measurements**

Blood pressure was measured twice for each participant in the course of a single visit. The first measurement was taken midway through the interview, just after the questions related to individual health. The second measurement was taken at the end of the questionnaire, after about 15–20 minutes’ rest. These measurements were taken by medical and pharmacy students in Dakar, using an Omron® M3 Intellisense device validated by the International Protocol. The mean of the two measurements was used for the analyses.

In accordance with the Seventh Report of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, individuals with systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg and/or who reported the current use of antihypertensive medication were considered to be suffering from high blood pressure.

Weight was measured using a digital scale (accuracy of 100 g) with subjects dressed in minimum clothing and barefoot. To measure height, the subject was asked to stand ‘at attention’, arms at the sides, heels together and without shoes. Following World Health Organisation recommendations, body mass index (BMI) was calculated by dividing weight (kg) by the square of the height (m²). Overweight was defined as 25 ≤ BMI < 30 kg/m²; obesity corresponded to a BMI of ≥ 30 kg/m².

Given the large proportion of people who had not visited a doctor in the year preceding the interview (48%), the frequency of doctor visits was split into two groups, as in the study conducted by the hypertension study group in India and Bangladesh. Therefore, people who had not visited a doctor in the year preceding the interview were distinguished from those who had seen a doctor at least once during the year.

Among the socio-demographic data collected during the interviews, four variables were taken into account for this study: age, gender, educational level and marital status. Three age groups were defined: 50–59, 60–69 and 70 years and over. Gender was coded as follows: 1 for women, 0 for men. Three levels of education were defined: none, one to eight years of schooling, more than eight years of schooling. Marital status was coded as follows: married = 0, other = 1.

**Statistical analysis**

To answer our research questions, we used Chi-square tests and logistic regressions. The software used for the statistical analysis was PASW Statistics 18.

### TABLE 1. CHARACTERISTICS OF THE SAMPLE (**n** = 500)

| Variable                  | Category | Total. n (%) | Men. n (%) | Women. n (%) | Analysis                  |
|---------------------------|----------|--------------|------------|--------------|---------------------------|
| Age (years)               | 50–59    | 268 (53.6)   | 144 (54.7) | 124 (52.3)   | **Chi² (2 df) = 0.41;** NS |
|                           | 60–69    | 136 (27.2)   | 71 (27)    | 65 (27.4)    |                           |
|                           | ≥ 70     | 96 (19.2)    | 48 (18.3)  | 48 (20.3)    |                           |
| Educational level         | None     | 228 (45.6)   | 97 (36.9)  | 131 (55.3)   | **χ² (2 df) = 29.46,** *p* < 0.001 |
|                           | 1–8 years| 186 (37.2)   | 100 (38.0) | 86 (36.3)    |                           |
|                           | ≥ 9 years| 86 (17.2)    | 66 (25.1)  | 20 (8.4)     |                           |
| Marital status            | Married  | 372 (74.4)   | 234 (89)   | 138 (58.2)   | **χ² (1 df) = 61.87,** *p* < 0.001 |
|                           | Not married | 128 (25.6) | 29 (11)    | 99 (41.8)    |                           |
| Doctor visits in previous year | 0   | 240 (48)     | 141 (53.6) | 99 (41.8)    | **χ² (1 df) = 70.00,** *p* < 0.01 |
|                           | ≥ 1      | 260 (52)     | 122 (46.4) | 138 (58.2)   |                           |
| | BMI (kg/m²)               | < 25     | 231 (46.2)   | 149 (56.7) | 82 (34.6)    | **χ² (1 df) = 24.40,** *p* < 0.001 |
|                           | ≥ 25     | 269 (53.8)   | 114 (43.3) | 155 (65.4)   |                           |

*The numbers of older Dakarites aware of their hypertension, treated and controlled were obtained by multiplying the prevalence figure by the population aged 50 years and older, according to the last census (2002).***

### Fig. 1. Prevalence, awareness, treatment and control of hypertension in the population of Dakar aged 50 years and older.
Results

The socio-demographic characteristics of our population sample and the descriptive results regarding frequency of doctor visits and BMI are presented in Table 1. Men were better educated and less often overweight or obese than women. On the other hand, women had visited a doctor in the year preceding the interview more often than men, and less often overweight or obese than women. On the other hand, gender and marital status were not significantly associated with hypertension (Table 2). The bivariate results were confirmed using logistic regression analysis (Table 3).

Aside from BMI, using bivariate analyses, all factors studied were associated with awareness of hypertension. Women, the older and unmarried individuals were more often informed of this problem than men, younger people and married individuals. Likewise, many more individuals who had seen a doctor at least once in the year preceding the interview were aware of their hypertensive condition than those who had not seen a doctor during this period. Lastly, and more surprisingly, people who had had at least nine years of schooling were less often aware of their hypertensive status than the less educated (Table 2). Most of these results were controlled using logistic regression analysis and only marital status was not significantly associated with awareness of hypertension (Table 3).

Multivariate analysis showed that among hypertensives, women, older adults, and those who had seen a doctor during the preceding year more often reported taking treatment than men, younger people, and those who had not seen a doctor during the previous year, respectively (Table 3).

![Table 2. Factors Associated with Hypertension, Awareness, Treatment and Control](image)

![Table 3. Adjusted Odds Ratios for Hypertension, Awareness, Treatment and Control](image)
The results for the sub-sample of individuals who were aware of their hypertension problem were quite different. In this logistic regression analysis, only the frequency of doctor visits was significantly associated with treatment of hypertension (Table 3). Among the hypertensives, on multivariate analysis, only the frequency of doctor visits was associated with control of hypertension (Table 3). Therefore, people having seen a doctor during the preceding year more often had controlled hypertension than those who had not seen a doctor the previous year. However, among treated individuals, no variable was associated with control of hypertension (Table 3).

**Discussion**

The prevalence of hypertension in our population sample corresponded with that observed among older people in other sub-Saharan African cities14-16 or in other developing countries such as India and Bangladesh.17 In Dakar, two out of three people 50 years and older suffered from arterial hypertension, a disease that has now become a major public health concern in the Senegalese capital.

In keeping with what has been observed among other populations, aging and problems of overweight and obesity were associated with hypertension.22-24 However, this was not the case with educational level. This observation seems to indicate that the Dakar population is currently in an advanced stage of epidemiological transition. This process is characterised by a transfer of risk factors for chronic illnesses from the better-educated individuals in the early stages of the process to the less educated at the end of the transition.25

The rate of awareness of hypertension among the hypertensives, approximately 50%, corresponds with that observed among the elderly living in other developing countries.17 This rate is, however, much lower than that noted in the West, where over two-thirds of older hypertensives are aware of the problem.18-20 If the ‘rule of halves’26 remains valid here, it nevertheless conceals great disparities, especially between men and women. As with most developing populations, women were more often informed on their problem of hypertension than men.27 However, the reasons for this association remain poorly understood.27 In fact, it may appear surprising in Senegal, where male domination over women is taken for granted.28

The Demographics and Health Survey conducted in 2005 indicated for instance that scarcely 12% of married women made their own decisions about their personal healthcare spending, whereas for 67% of them, only their spouse made such decisions.29 However, in Senegal, it is primarily women who take care of the health of members of the household, accompanying their daughters, daughters-in-law and grandchildren to healthcare institutions. This might explain both their more frequent visits to these institutions and their greater monitoring of hypertension.

Unlike the results noted for elderly German and American populations,30,31 awareness of hypertension rises with age among the elderly in Dakar. Therefore the probability of having been identified as hypertensive rises with age. More surprisingly, we have seen that people with a higher educational level were often less informed on their hypertension than those with an average educational level. This result runs contrary to all research conducted on the subject, which generally demonstrates the opposite.32 More research is required to understand this specificity, but it could be that education does not have the same implications for health management in Dakar as in developed countries. Nevertheless, it is not surprising to note that the factor most strongly associated with awareness of hypertension was the frequency of doctor visits.

More than 70% of individuals aware of their hypertension reported taking treatment, which seems well above the rule of halves. This theoretically encouraging statistic should, however, be discussed in light of the results associated with control of hypertension. Fewer than 17% of the people who reported being treated actually had controlled hypertension, i.e. 6.7% of hypertensives.

A study conducted in Ghana could help explain why the hypertension control rate was so low among the elderly in Dakar. According to this study, 93% of the people treated for hypertension did not comply with their medical prescriptions, usually due to the high cost of medication.33 The same observation seems to hold true in Dakar where the price of medication is disproportionate to average expenditure per person per day, i.e. 1 224 FCFA (≈ 2.7 dollars).32

However, another explanation could be advanced. According to Salem, treatment of chronic disease is generally misunderstood. In Dakar, when a disease is identified, it is believed it should be ejected as a foreign body.34 The notion of chronic illness goes against this conception, which could explain the low level of compliance with treatment.

Since pharmacological treatment of hypertension is the consequence of its detection by healthcare personnel, factors associated with treatment among hypertensives were the same as those associated with awareness of this health problem, i.e. frequency of doctor visits, gender and age. Among these factors, only the frequency of doctor visits was significantly associated with the control of hypertension. Therefore it was the only factor investigated that was associated with awareness, treatment and control of hypertension in this study. This result highlights the absolute necessity of improving the follow-up health checks of older adults to minimise the consequences of hypertension in Dakar.

**Strengths and limitations of the study**

This research was, to our knowledge, the first study conducted specifically on hypertension among the elderly in sub-Saharan Africa. In years to come, the elderly in developing countries will represent the majority of older people on the planet.34 Therefore it is necessary to understand the prevalence of hypertension among these populations, as well as the rates of awareness, treatment and control of the disease, in order to combat this burden more effectively and in a more appropriate manner.

This study has several limitations. As in many studies, arterial blood pressure was measured twice during a single visit, which may have led to overestimation of the prevalence of hypertension. Furthermore, the treatment rate of hypertension was assessed solely by individual self-reporting. Verification of the actual presence of medication in the home might have limited the bias associated with these declarations.

**Conclusion**

The results of this study have several public health implications. Firstly, two-thirds of the Dakar elderly suffer from hypertension,
and this disease therefore constitutes a major public health concern in the Senegalese capital. Detection could be considerably improved given that only 50% of those suffering from high blood pressure were aware of this problem. Nearly three-quarters of the people informed on their condition reported being treated, which is an encouraging statistic in a developing country. However, compliance with these treatments appears particularly problematic, given that fewer than 20% of individuals treated had controlled hypertension. It is likely that the high cost of pharmacological treatment when compared to income was responsible for the low rate of compliance with these treatments.

One of the factors studied was associated with awareness, treatment and control of hypertension: the frequency of doctor visits. This result highlights the absolute necessity to improve follow-up health checks of older adults to minimise the consequences of hypertension in Dakar.

This research was supported by grants from the National Institute for Heath Prevention and Education (INPES) and the Department of Research (ACI ‘Constructions, normes et écarts’ No. 045398). The manuscript was translated from French by Cynthia Schoch.

References

1. Sani MU. Cardiovascular diseases in sub-Saharan Africa: an emerging problem. *Etnh Dis* 2007; 17: 574–575.

2. World Health Organisation. Death and DALY estimates for 2004 by cause for WHO Member States. http://www.who.int/entity/healthinfo/statistics/bodgddealthdalyestimates.xls. Accessed 2006.

3. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet* 2005; 365: 217–223.

4. Opie LH, Seedat YK. Hypertension in sub-Saharan African populations. *Circulation* 2005; 112: 3554–3561.

5. Addo J, Smeeth L, Leon DA. Hypertension in sub-Saharan Africa: a systematic review. *Hypertension* 2007; 50:1012–1018.

6. Agyemang C. Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Publ Hlth* 2006; 120: 525–533.

7. Amoah AG. Hypertension in Ghana: a cross-sectional community prevalence in greater Accra. *Etnh Dis* 2003; 13: 310–315.

8. Bovet P, Ross AG, Gervasoni JP, et al. Distribution of blood pressure, body mass index and smoking in the urban population of Dar es Salaam, Tanzania, and associations with socioeconomic status. *Int J Epidemiol* 2002; 31: 240–247.

9. Damasceno A, Azevedo A, Silva-Matos C, Prista A, Diogo D, Lunet N. Hypertension prevalence, awareness, treatment, and control in Mozambique: urban/rural gap during epidemiological transition. *Hypertension* 2009; 54: 77–83.

10. Edwards R, Unwin N, Mugusi F, et al. Hypertension prevalence and care in an urban and rural area of Tanzania. *J Hypertens* 2000; 18: 145–152.

11. Kadiro S, Walker O, Salako BL, Akinkugbe O. Blood pressure, hypertension and correlates in urbanised workers in Ibadan, Nigeria: a revisit. *J Hum Hypertens* 1999; 13: 23–27.

12. Mbanya JC, Minkouou EM, Salah JN, Balkau B. The prevalence of hypertension in urban and rural Cameroon. *Int J Epidemiol* 1998; 27: 181–185.

13. Steyn K, Gaziano TA, Bradshaw D, Laubscher R, Fourie J. South African Demographic and Health Coordinating Team. Hypertension in South African adults: results from the Demographic and Health Survey 1998. *J Hypertens* 2001; 19: 1717–1725.

14. Vorster HH. The emergence of cardiovascular disease during urbanisation of Africans. *Publ Hlth Nut* 2002; 8: 239–243.

15. Duboz P, Macia E, Dia M, Gueye L. Prevalence and risk factors of hypertension in Dakar’s department. *Dakar Médical* (in press).

16. Ong KL, Cheung BM, Man YB, Lau CP, Lam KS. Prevalence, awareness, treatment, and control of hypertension among United-States adults 1999-2004. *Hypertension* 2007; 49: 69–75.

17. Hypertension study group. Prevalence, awareness, treatment and control of hypertension among the elderly in Bangladesh and India: a multicentre study. *Bull World Hlth Organ* 2001; 79: 490–500.

18. McDonald M, Hertz RP, Unger AN, Lustik MB. Prevalence, awareness, and management of hypertension, dyslipidemia, diabetes among United States adults aged 65 and older. *J Gerontol A Bio Sci Med Sci* 2009; 64: 256–263.

19. Van Rossum CTM, van de Mheen H, Wittens JCM, Hofman A, Mackenbach JP, Grobbee DE. Prevalence, treatment, and control of hypertension by sociodemographic factors among the Dutch elderly. *Hypertension* 2000; 35: 814–821.

20. Asmar R, Khabouth J, Topouzian J, El Feghali R, Mattar J. Validation of three automatic devices for self-measurement of blood pressure according to the International Protocol: the Omron M3 Intellisense (HEM-7051-E), the Omron M2 Compact (HEM 7102-E), and the Omron R3-1 Plus (HEM 6022-E). *Blood Press Monit* 2010; 15: 49–54.

21. Chobanian AV, Bakris GL, Black HR, et al. Seventh report of the Joint National Committee of Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Hypertension* 2003; 42: 1206–1252.

22. World Health Organisation. *Obesity: Preventing and Managing the Global Epidemic: Report of the WHO Consultation*. WHO Technical Report Series 894. WHO: Geneva, 2000.

23. Must A, Spadano J, Colditz GA, Dietz WH. The disease burden associated with overweight and obesity. *J Am Med Assoc* 1999; 282: 1593–1594.

24. Mufunda J, Mebratlu G, Usman A, et al. The prevalence of hypertension and its relationship with obesity: results from a national blood pressure survey in Erytrea. *J Hum Hypertens* 2006; 20: 59–65.

25. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. *Circulation* 1998; 97: 596–601.

26. Marques-Vidal P, Tuomilehto J. Hypertension, awareness and control in the community: is the “rule of halves” still valid? *J Hum Hypertens* 1997; 11: 213–220.

27. Fuentes R, Ilmaniemi N, Laurikainen E, Tuomilehto J, Nissinen A. Hypertension in developing economies: a review of population-based studies carried out from 1980 to 1998. *J Hypertens* 2000; 18: 521–529.

28. Macia E, Duboz P, Gueye L. Les dimensions de la qualité de vie subjective à Dakar. *Sciences Sociales et Santé* 2010; 28: 75–84.

29. Ndiaye S, Ayad M. Enquête Démographique et de Santé au Sénégal (EDS-SV) 2003. Demographic and Health Surveys: Dakar, 2005.

30. Regidor E, Guitierrez-Frisac JL, Banegas JR, Dominguez V, Rodriguez-Artalejo F. Association of adult socioeconomic position with hypertension in older people. *J Epidemiol Commun Hlth* 2006; 60: 74–80.

31. Ohene Buabeng K, Matowe L, Plange-Rhule J. Unaffordable drug price: the major cause of non-compliance with hypertension medication in Ghana. *J Pharm Pharm Sci* 2004; 7: 350–352.

32. Agence Nationale de la Statistique et de la Démographie (ANSD). Enquête de suivi de la pauvreté au Sénégal – EPPS 2005-2006. http://www.ansd.sn/publications/rapports_enquetes_etudes/enquetes/Rapport_ESPS.pdf. Accessed 2007.

33. Salem G. La Santé dans la Ville. *Géographie d’un Petit Espace Dense: Phéne (Sénégal).* Paris: Karthala; 1998.

34. United Nations. Rapport de la deuxième assemblée mondiale sur le vieillissement. Madrid, 8-12 avril 2002. http://access-dds-ny.un.org/doc/UNDOC/GEN/N02/397/52/PDF/N0239752.pdf?OpenElement. Accessed 2002.