European Heart Journal Supplements (2019) **21** (Supplement D), D86–D88
The Heart of the Matter
doi:10.1093/eurheartj/suz064

ESC
European Society
of Cardiology

May Measurement Month 2017: screening for hypertension in Nigeria—Sub-Saharan Africa

Okechukwu Samuel Ogah[1], Ayodeji Arije[1], Xin Xia[2], Thomas Beaney[2], Adewole Adebiyi[1], Mahmoud Umar Sani[3], Dike Brevis Ojji[4], Tolulope Taiwo Sogade[5], Simeon Isezuo[6], Innocent Ijezie Chukwuonye[7], Patience Akinwusi[8], Amam Chinyere Mbakwem[9], Folasade Adeola Daniel[10], Ayodele Babatunde Omotoso[11], and Neil R. Poulter[2]

[1]*Department of Medicine, University College Hospital/University of Ibadan, Nigeria;*
[2]*Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London, W12 7RH;*
[3]*Department of Medicine, Aminu Kano Teaching Hospital/Bayero University Kano, Nigeria;*
[4]*Department of Medicine, University of Abuja Teaching Hospital/University of Abuja, Nigeria;*
[5]*Department of Medicine, University of Uyo Teaching Hospital/University of Uyo, Nigeria;*
[6]*Department of Medicine, Usman Danfodio University Teaching Hospital/Usman Danfodio University, Sokoto, Nigeria;*
[7]*Department of Medicine, Federal Medical Centre Umuahia, Nigeria;*
[8]*Department of Medicine, Osun State University, Osogbo, Nigeria;*
[9]*Department of Medicine, University of Lagos teaching Hospital/University of Lagos, Nigeria;*
[10]*Department of Medicine, Lagos State University Teaching Hospital, Ikeja, Nigeria; and*
[11]*Department of Medicine, University of Ilorin Teaching Hospital, Ilorin/University of Ilorin, Nigeria*

Hypertension and its complications are now responsible for about a quarter of emergency medical admissions in urban hospitals in Nigeria. It is the commonest risk factor for stroke, heart failure, chronic kidney disease, and dementia. Furthermore, high blood pressure is the commonest cause of sudden unexpected natural death in the country. Regrettably, the rate of awareness, treatment, and control is abysmally low in the country and in many parts of the world. May Measurement Month (MMM) is a global initiative of the International Society of Hypertension aimed at raising awareness of high blood pressure (BP) and to act as a temporary solution to the lack of screening programs worldwide. An opportunistic cross-sectional survey of volunteers aged $\geq$18 years was carried out in May 2017. Blood pressure measurement, the definition of hypertension and statistical analysis followed the standard MMM protocol. A total of 19 904 individuals with a mean age of 40.9 years, were screened during MMM17. After multiple imputation, 6709 (36.2%) had hypertension. Of individuals not receiving anti-hypertensive medication, 4140 (25.9%) were found to have hypertension. Of individuals receiving anti-hypertensive medication, 1449 (58.8%) had uncontrolled BP. MMM17 was one of the largest BP screening campaigns undertaken in Nigeria. A significant number of the participants were identified with hypertension (but not on any treatment) and uncontrolled BP despite being treated. These results suggest that opportunistic screening can identify significant numbers with raised BP.

*Corresponding author. Tel: +234 (0) 80677 47121, Fax: +1215-975-6817, Email: osogah56156@gmail.com

Published on behalf of the European Society of Cardiology. © The Author(s) 2019.
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com

Background

Hypertension is now recognized as a major contributor to the global burden of disease and global mortality.[1] In Nigeria, like in most African countries, hypertension is the foundation of cardiovascular disease. In a recent meta-analysis of blood pressure (BP) surveys in Nigeria, the documented overall prevalence of hypertension was 28.9% (95% CI 21.1–32.8%), with a prevalence of 29.5% (95% CI 24.8–34.3%) among men and 25.0% (95% CI 20.2–29.7%) among women.[2] There were about 20 million cases of hypertension in the country in the year 2010. This is projected to rise to 39.1-million cases by the year 2030.[3] Regrettably, the rate of awareness, treatment, and control are abysmally low.[2] Hypertension and its complications are responsible for about 25% of emergency medical admissions in urban hospitals in the country and is the commonest clinical diagnosis in elderly Nigerians, senior executives, and army recruits. It is the commonest risk factor for stroke, heart failure, chronic kidney disease, and dementia. The burden of hypertensive-related eye disease is high, and hypertension in pregnancy contributes to the high maternal morbidity and mortality in the country. Furthermore, high BP is the commonest cause of sudden unexpected natural death in the country.[4]

Nigeria got involved in the May Measurement Month (MMM)17 project as a member of the International Society of Hypertension (ISH) through the Nigerian Hypertension Society (NHS). The NHS considers the MMM project as a worthy action knowing fully well the burden and impact of hypertension in the country and the possible role MMM can play in the detection, awareness, and treatment of hypertension.

Methods

The study was coordinated by Professor Ayo Arije [immediate past President of the NHS] and was ably assisted by Dr Okechukwu Ogah who organized the mobilization of NHS members as well as the central collation of data at Ibadan. Nineteen sites participated in Nigeria, and these were from the six geopolitical regions of the country and the federal capital territory at Abuja and the economic centre of the country, in Lagos. These sites were: Ibadan, Osogbo, and Lagos (in the South West region), Zaria, Kano, Sokoto, and Kebbi (North West region); Bida, Ilorin, and Abuja (North-Central region). Others are Uyo (South-South region); and Abakaliki, Umuahia, Enugu, Awka, Aba, and Nnewi (South East region); and finally Gombe, Zamfara, and Maiduguri (North-East region). Many investigators as well as volunteers were involved in the project. Each screening site conducted training using the training materials supplied by ISH. There was no other funding aside from the OMRON BP monitors donated by OMRON and T-shirts supplied by the ISH.

It was an opportunistic cross-sectional survey of participants who were 18 years and above, and this was carried out in the month of May, 2017. Screenings were conducted in public places after a session of public messages and this occurred most of the days of the month. Omron BP monitors (Omron M3 Intellisense) were used mostly and supplemented by mercury BP sphygmomanometers in some centres. Blood pressures were measured after at least 5 min of rest. Hypertension was defined as a systolic BP $\geq$ 140 mmHg or diastolic BP $\geq$ 90 mmHg or in those on treatment for BP.

All screening sites obtained ethics approval from their various ethics review committees or boards and all participants gave informed consent before screening. Detailed methodology, data management, and statistical analysis have been published elsewhere.[5]

Results

A total of 19 904 participants were screened, including 9616 women (48.3%) and 7977 men (40.1%). The sexes of 11.6% were unknown. The mean age of the participants was 40.9 (SD 14.4) years and 90.3% were black Africans. A total of 2569 (12.9%) were on anti-hypertensive medications. Diabetes mellitus, previous myocardial infarction, previous stroke, current history of cigarette smoking, and alcohol use were reported in 4.0%, 0.5%, 0.8%, 4.8%, and 14.1%, respectively.

After imputation, the age and sex-standardized mean BP in the participants was 125.8/78.7 mmHg. The mean BP after excluding those on treatment was 124.3/78.1 mmHg and 138.7/85.7 mmHg in those on treatment. A total of 36.2% (6709 out of 18 530) of participants with available BP readings after imputation had hypertension. A total of 25.9% of the participants not receiving treatment (4140 out of 15 961) had hypertension. A total of 58.8% (1449 of 2466 participants) of participants receiving treatment had uncontrolled BP. After adjustment for sex and age and allowing for an interaction, BP was significantly higher in participants who were on BP medications, who had diabetes and in smokers, and alcohol users (Supplementary material online, *Figure S1A*). Blood pressure also increased significantly with increasing body mass index (BMI) (Supplementary material online, *Figure S1B*). Higher systolic BP was observed on weekends (Saturday and Sunday) and lowest on Monday (Supplementary material online, *Figure S2*).

Discussion

This large opportunistic screening programme revealed that about 36.2% of adult Nigerians were hypertensive, 12.9% of all the participants were on treatment and almost 60% of those receiving anti-hypertensive treatment had uncontrolled BP. The proportion of hypertensive subjects in this study is similar to recent randomized surveys and opportunistic screenings in various parts of the country where about one-third were found to be hypertensive and even higher in surveys that screened middle-aged and elderly populations. The treatment and control rates are also low. Such opportunistic screening can help in increasing the detection and awareness rates of hypertension in the country,

provide opportunities for health education as well as referral of those detected to health facilities for further care. Day to day variation in BP as well as the relationship of BP to other cardiovascular disease risk factors such as age, BMI, use of BP lowering drugs, smoking, and alcohol history was similar to the global data. MMM17 provided an ideal opportunity for mobilization of health workers in different parts of the country towards a collective effort at improving the detection and awareness rates of hypertension in Nigeria. Since the project was an opportunistic screening, it could only provide the proportion of hypertensive participants but not prevalence since the sample was not randomly selected.

List of collaborators

Samuel Oluwole Ajayi[1], Kamilu Musa Karaye, Akinyemi Aje[1], Abiodun Moshood Adeoye[1], Aduragbenro Deborah Adedapo[3], Olulola Olutoyin Oladapo[1], Muhammad Sani Isa[4], John Austin Chikezie[5], Earnest Ndukaife Anyabolu[6], Ikeoluwapo Ajayi[7], Philip Manma Kolo[8], Kolawole Wasiu Wahab[8], Alaba Philip Adebola[9], Umar Gati Adamu[10], Godffrey Nwuruku[11], Henry Okolie[12], Mohammed Abubakar Talle[13], Uzoamaka Alice Uja[14], Pascal Njoku[15], and Solomon Kadiri[1]

[1]Department of Medicine, University College Hospital/University of Ibadan, Nigeria; [2]Department of Medicine, Aminu Kano Teaching Hospital/Bayero University Kano, Nigeria; [3]Department of Pharmcology & Therapeutics, University of Ibadan, Nigeria; [4]Department of Medicine, Ahmadu Bello University Zaria, Nigeria; [5]Department of Medicine, Abia State University Teaching Hospital Aba/Abia State University Uturu, Nigeria; [6]Department of Medicine, Chukwuemeka Odumegwu Ojukwu University, Awka, Nigeria; [7]Department of Epidemiology and Medical Statistics, University of Ibadan, Nigeria; [8]Department of Medicine, University of Ilorin Teaching Hospital, Ilorin/University of Ilorin, Nigeria; [9]Department of Medicine, Lagos State University Teaching Hospital, Ikeja, Nigeria; [10]Department of Medicine, Federal Medical Centre, Bida, Nigeria; [11]Department of Medicine, Federal Teaching Hospital Abakaliki, Nigeria; [12]Department of Medicine, Federal Teaching Hospital Gombe, Nigeria; [13]Department of Medicine, University of Maiduguri Teaching Hospital/University of Maiduguri, Nigeria; [14]Department of public health, Abia state ministry of health, Umuahia, Nigeria; and [15]Department of Medicine, University of Nigeria Teaching Hospital, Ituku Ozalla, Enugu, Nigeria

Supplementary material

Supplementary material is available at *European Heart Journal - Supplements* online.

Acknowledgements

We thank the International Society of hypertension for the support towards this programme. We thank the numerous investigators and research assistants who participated in the screening exercise.

Conflict of interest: none declared.

References

1. Forouzanfar MH, Liu P, Roth GA, Ng M, Biryukov S, Marczak L, Alexander L, Estep K, Hassen Abate K, Akinyemiju TF, Ali R, Alvis-Guzman N, Azzopardi P, Banerjee A, Bärnighausen T, Basu A, Bekele T, Bennett DA, Biadgilign S, Catalá-López F, Feigin VL, Fernandes JC, Fischer F, Gebru AA, Gona P, Gupta R, Hankey GJ, Jonas JB, Judd SE, Khang Y-H, Khosravi A, Kim YJ, Kimokoti RW, Kokubo Y, Kolte D, Lopez A, Lotufo PA, Malekzadeh R, Melaku YA, Mensah GA, Misganaw A, Mokdad AH, Moran AE, Nawaz H, Neal B, Ngalesoni FN, Ohkubo T, Pourmalek F, Rafay A, Rai RK, Rojas-Rueda D, Sampson UK, Santos IS, Sawhney M, Schutte AE, Sepanlou SG, Shifa GT, Shiue I, Tedla BA, Thrift AG, Tonelli M, Truelsen T, Tsilimparis N, Ukwaja KN, Uthman OA, Vasankari T, Venketasubramanian N, Vlassov VV, Vos T, Westerman R, Yan LL, Yano Y, Yonemoto N, Zaki MES, Murray CJL. Global burden of hypertension and systolic blood pressure of at least 110 to 115 mmHg, 1990–2015. *JAMA* 2017;**317**:165–182.
2. Ogah OS, Okpechi I, Chukwuonye II, Akinyemi JO, Onwubere BJ, Falase AO, Stewart S, Sliwa K. Blood pressure, prevalence of hypertension and hypertension related complications in Nigerian Africans: a review. *World J Cardiol* 2012;**4**:327–340.
3. Adeloye D, Basquill C, Aderemi AV, Thompson JY, Obi FA. An estimate of the prevalence of hypertension in Nigeria: a systematic review and meta-analysis. *J Hypertens* 2015;**33**:230–242.
4. Ogah OS. Hypertension in Sub-Saharan African populations: the burden of hypertension in Nigeria. *Ethn Dis* 2006;**16**:765.
5. Beaney T, Schutte AE, Tomaszewski M, Ariti C, Burrell LM, Castillo RR, Charchar FJ, Damasceno A, Kruger R, Lackland DT, Nilsson PM, Prabhakaran D, Ramirez AJ, Schlaich MP, Wang J, Weber MA, Poulter NR and Investigators MMM. May Measurement Month 2017: an analysis of blood pressure screening results worldwide. *Lancet Glob Health* 2018;**6**:e736–e743.