May Measurement Month 2019: an analysis of blood pressure screening results from Ecuador

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Arterial hypertension is a growing burden worldwide, leading to over 10.8 million deaths each year. In Ecuador, it is the main risk factor for the major cause of death, coronary, and cerebrovascular disease [GBD 2017 Risk Factor Collaborators. Global, regional, and national comparative risk assessment of 84 behavioral, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392:1923–1994]. The May Measurement Month Campaign in 2019 (MMM19) 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. A volunteer cross-sectional survey was carried out in May 2019 across 42 health centres in Ecuador. The average age was 51 (SD ±17.6) years. Blood pressure measurement, the definition of hypertension (mean of the second and third BP measurement ≥140/90 mmHg or who were medicated for high BP), and statistical analysis followed the standard MMM protocol. In total, 15 885 volunteers participated in MMM19. After multiple imputation, 6654 (41.9%) had hypertension. Of individuals not receiving antihypertensive medication,
Introduction

In Ecuador, there are few epidemiological studies on the prevalence of arterial hypertension. In 1999, the results of the PREHTAE study were presented, a survey of 10 000 people that showed a prevalence of 28% in three cities in the country. The National Health Survey (ENSANUT), a document of the Ministry of Public Health in people between 18 and 59 years, found a prevalence of 9.3%. In 2010, the same researchers presented the SABE survey in people between 57 and over 80 years and found a hypertension prevalence of 46%. The Institute of Statistics and Census (INEC) showed a cardiovascular mortality of 27%, and ischaemic heart and cerebrovascular mortality of 10.1% and 7%, respectively. In MMM17, of the 6984 people that showed a prevalence of 28% in three cities in the country. The National Health Survey (ENSANUT), a document of the Ministry of Public Health in people between 18 and 59 years, found a prevalence of 9.3%. In 2010, the same researchers presented the SABE survey in people between 57 and over 80 years and found a hypertension prevalence of 46%. The Institute of Statistics and Census (INEC) showed a cardiovascular mortality of 27%, and ischaemic heart and cerebrovascular mortality of 10.1% and 7%, respectively. In MMM17, of the 6984 people who completed the survey, 28.2% had hypertension and of these, 21.9% were taking anti-hypertensive treatment. The proportion of people with hypertension among those not receiving treatment was 8.2% and 25.4% of people receiving treatment had uncontrolled BP (>140/90 mmHg). In MMM18, 11,922 individuals (53.7% female) were screened, from them, 38.3% had hypertension. Of individuals not receiving antihypertensive medication, 15% were hypertensive. Of individuals receiving antihypertensive medication, 28.6% had uncontrolled BP.

Methods

The MMM19 co-ordinator and national leader in Ecuador was Dr Ernesto Peñaherrera Patino. Verbal informed consent was obtained from responders. In February 2019, we met with several leaders in arterial hypertension to plan the conduct of the new survey. Three months prior to the start of the program 150 investigators were trained to take BP measurements. We followed the MMM19 study protocol and conducted data collection from May to September 2019. A team of investigators from various parts of Ecuador helped in the selection of measurement sites. Measurements were taken from 15 885 individuals. We enrolled individuals from 42 sites in the country to measure BP and complete the MMM19 survey. The most frequent sites were from Quito, Guayaquil, Milagro, Loja, Duran, and Cercita. We used our own resources and trained students of Medicine, respiratory therapy, nurses, Rotary Club Guayaquil Moderno members, medical staff in the Municipality of Quito, and Servier Laboratories collaborators. We also made posters, flyers, and radio interviews on several occasions. The survey and measurement stage lasted 3 months during which the most commonly used device was the validated upper-arm cuff oscillometric monitor OMRON 7120 Healthcare (Kyoto, Japan). After answering the survey, the individual sat for 5 min with their feet resting on the floor and their back against the chair before three BP measurements were made semi-automatically at intervals of one minute between measurements. Participants were also asked about their height and weight. Hypertension was identified if the BP of the individual (mean of second and third readings) was equal to or greater than 140/90 mmHg or if the individual was on antihypertensive medication. Blood pressure control was defined as a BP <140/90 mmHg in those on antihypertensive medication. Our data were inserted into an Excel 2019 spreadsheet, reviewed three times and then sent to the MMM statistical team. Where only two BP readings were available, multiple imputation using chained equations was used to impute missing readings, based on global data.

Results

Measurements were taken from 15 885 individuals. The average age of respondents was 51 (SD ± 17) years of which 83.8% were female, 16.1% male; and 99% of screenees were of mixed ethnicity. The average BP after three measurements was 122/76 (systolic BP/diastolic BP) mmHg. The average BP of the second and third measurements was 123/76 mmHg. Of all participants, 6654 (41.9%) were detected with hypertension, after multiple imputation. Of those, 8325 (65%) were aware of their diagnosis and 4271 (64.2%) were on medication, of whom 3267 (76.5%) were controlled (<140/90 mmHg). Of all 6654 participants with hypertension, 49.1% had controlled BP (Table 1). The proportion of people with hypertension of those who did not take medication was 20.5% (2383 out of 11 614).

Based on a linear regression model, patients with Type 2 diabetes had on average 1.6/0.6 mmHg higher BPs than those without diabetes. Similarly, current smokers (vs. non-smokers) were associated with 1.2/0.4 mmHg higher BPs. Patients with obesity (body mass index greater than or equal to 30.0 kg/m²) vs. healthy weight were associated
with 2.2/1.1 mmHg higher systolic and diastolic BPs (Figure 1).

**Discussion**

This survey includes the highest number of volunteers ever screened for BP in Ecuador. The biggest impact is to implement the correct measurement of the arterial pressure following international regulations to have the most accurate data, with a preceding rest of 5 min, in the correct position, and three separate measurements at 1-min intervals between each measurement. There has been a significant increase in volunteers participating in consecutive MMM programs: in MMM17, 6984 volunteers, in MMM18, 11,922, and in MMM19, 15,885. The proportion deemed hypertensive in these 3 years were 28.2%, 38.3%, and 41.9%, respectively. However, this may reflect differential sampling, which was not randomized, or aiming to be nationally representative. Interestingly, in MMM19-Ecuador, 83.8% were women, and there was very little participation of African Americans in a country that has 7% of its population in that racial group. Prevalence of hypertensive individuals with uncontrolled BP despite receiving medication was 23.5%, and hypertensive people who are not on medication appear to be higher in MMM19 (35.8%) compared to MMM17 (28.6) but slightly higher than MMM18 (38.3%), respectively. Of the 6654 participants with hypertension in MMM19, almost 50% had either untreated or uncontrolled BP. These data should draw attention to the medical community, to set medication treatment goals available for citizens and implement intensive and urgent programs to educate doctors, paramedics, and citizens in the correct measurement and proper treatment of this condition which has a very high prevalence in Ecuador. Greater population studies are needed to corroborate these data and include representation from other ethnic groups and additional study sites.

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| Total participants | Number (%) with hypertension | Number (%) of hypertensives aware | Number (%) of hypertensives on medication | Number (%) of those on medication with controlled BP | Number (%) of all hypertensives with controlled BP |
|--------------------|-----------------------------|----------------------------------|------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| 15 885             | 6654 (41.9)                 | 4328 (65.0)                      | 4271 (64.2)                              | 3344 (76.5)                                   | 3267 (49.1)                                   |

Figure 1  Difference in mean blood pressure in each weight category compared to healthy weight (mmHg).
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Conflict of interest: none declared.

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