

May Measurement Month 2018: an analysis of blood pressure screening results from Oman

Sunil K. Nadar^{1*}, Hassan Al-Riyami¹, Adil Al-Riyami¹, Hatim Al-Lawati¹, Benny Panakkal², Shafeek Mohammed², G.B. Nagaraju², S.N. Sharma², Muhamed M. Abdulkader², Thomas Beaney^{3,4}, Anca Chis Ster³, and Neil R. Poulter³

¹Department of Medicine, Sultan Qaboos University Hospital, Muscat, 123, Oman;

²Department of Medicine, Badar Al-Samaa Hospital, Ruwi, Muscat, Oman;

³Imperial Clinical Trials Unit, Imperial College London, Stadium House, 68 Wood Lane, London W12 7RH, UK; and

⁴Department of Primary Care and Public Health, Imperial College London, St Dunstan's Road London W6 8RP, UK

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As per WHO estimates, around 17% of the adult Omani population are hypertensive. However, people with hypertension are often unaware of the diagnosis, and so the May Measurement Month (MMM) programme was set up to raise awareness of the importance of blood pressure (BP) screening. A cross-sectional screening of BP of subjects aged 18 years or more was carried out in May 2018 at various sites in Muscat, Oman. Screening sites were set up at the reception areas of participating hospitals, and at a few public areas such as shopping malls and workplaces of the volunteers. Blood pressure was measured according to a standardized protocol, and hypertension was defined as per the 2018 European Society of Hypertension guidelines. The data were analysed centrally by the MMM project team. A total of 12 689 individuals (mean age 40.6 ± 12.5 years, 72% male) were screened. The crude mean BP of the second and third readings (where three readings were taken, $n = 4\ 738$) was 127.1/79.2 mmHg. After multiple imputations, the average age and sex standardized BP was 127.3/80.2 mmHg. Of all participants, 29.8% had hypertension. There were 1 983 patients with a previous diagnosis of hypertension, of whom 1 810 were on anti-hypertensive medication. A further 1 973 subjects were newly diagnosed with hypertension. Of those on antihypertensive medication, 34.9% had uncontrolled BP readings. Screening programmes such as MMM are useful to identify persons with undiagnosed hypertension. However, more educational activities are required to increase the public awareness regarding the dangers of hypertension.

Introduction

Hypertension is a major cardiovascular risk factor, and it is estimated that over 10.5 million deaths worldwide are attributable to hypertension.^{1,2} While the prevalence of hypertension appears to be remaining static in developed

countries, in many developing countries it appears to be increasing mainly due to factors such as 'westernization' of lifestyles, better access to healthcare and improved reporting.³

Many patients with hypertension are asymptomatic, and often the first sign of the disease is when they present with a stroke or a heart attack.⁴ May Measurement Month (MMM) is a global initiative by the International Society of Hypertension, to screen members of the general public for hypertension.⁵

*Corresponding author. Tel: +968-24144816, Email: sunilnadar@gmail.com

In Oman, as per WHO estimates, 17% of the adult population aged above 18 years are hypertensive.⁶ However, an earlier study from Oman suggested that the prevalence of hypertension is around 27%,⁷ with another study finding that nearly three-quarters of patients picked up in a screening programme being unaware of their diagnosis.⁸ Hypertension accounts for 68% of adult patients who present with an acute coronary syndrome in Oman.⁹ By taking part in the MMM initiative, we hoped to be able to screen a large number of individuals and increase the awareness of hypertension in Oman.

Methods

This study was conducted in Muscat, the capital city of Oman. The study coordinator was Dr Sunil Nadar, from the Sultan Qaboos University Hospital, Muscat, Oman. Ethical approval was obtained from the Medical Research Ethics committee of the hospital, and the study was conducted in accordance with the Declaration of Helsinki.

This was a cross-sectional screening programme for blood pressure (BP) among the adult population aged 18 years or above, in Muscat, Oman. Screening sites were set up at various locations in the Sultan Qaboos University Hospital, and at the different branches of the Badar Al-Samaa private hospitals in Muscat. A few screening events were also held at shopping malls and workplaces of the 40 volunteers who helped with this survey. They were mainly hospital nursing staff, who were trained to take BP according to the study protocol with automated and aneroid sphygmomanometers. The study was conducted in the month of May 2018.

Verbal informed consent was obtained, and BP was measured as per the standard protocol of the MMM campaign. The subjects had to be seated for at least 5 min before the BP was measured on the arm closest to the table (depending on how the subjects were seated). Three BP measurements were taken at 1-min intervals, and the mean of the second and third readings was used in analyses. Most of our readings were performed using automated Omron machines donated by OMRON Healthcare. In some of the sites, an Analog and Digital (A&D)TM apparatus was used. Blood pressure was calculated as the mean of the second and third readings. As per the 2018 European Society of Hypertension guidelines, a subject was considered to be hypertensive if the systolic BP was above 140 mmHg or a diastolic greater than 90 mmHg¹⁰ or the subject was on treatment for raised BP.

In addition to the BP readings, personal data including demographics and cardiovascular risk factors were obtained. The data were submitted to the central team via the specialized MMM app. The data were analysed initially as part of the global investigator and individually for each country.

Results

A total of 12 689 participants were enrolled in the study, of which 9 095 (71.7%) were male, 2 837 (22.4%) were female and gender was not recorded for 757 (5.9%). The mean age

of the participants was 40.6 ± 12.5 years. The majority of the participants were of Arab ethnicity (44.2%) followed by East Asian (11.7%) and South Asian (8.5%). However, the ethnicity was not documented in 28.3% of the subjects. In total, 14.3% were on antihypertensive medications, 6.9% were diabetic, 13.2% were active smokers, 1.2% had had a previous heart attack, and 2.7% had had a previous stroke. Interestingly, 45.9% of the population screened were either overweight or obese with a BMI greater than 25 kg/m^2 .

For the purpose of BP analysis, only those with three BP readings were used ($n = 4\,738$).

The mean of the three BP readings was 128.2/78.7 mmHg with 37.3% of the subjects deemed to be hypertensive. The mean of the second and third readings was slightly lower at 127.1/79.2 mmHg with 35.6% being in the hypertensive range. After multiple imputations, the average age and sex standardized BP was 127.4/80.2 mmHg with 38.6% being in the hypertensive range. The age and sex standardized BP for those not on antihypertensive medications was 125.9/79.4 mmHg and 138.1/87.3 mmHg for those on medications ([Supplementary material online, Figure S1](#)).

Of all participants, 3783 (29.8%) were found to have hypertension. There were 1 810 patients who were on antihypertensive medications and another 173 patients who were previously diagnosed as having hypertension but not on medication giving a total of 1 983 patients with a previous diagnosis of hypertension. In the survey, a further 1 973 subjects were newly diagnosed to have hypertension. Of those on hypertension medication, 34.9% had uncontrolled BP ($\geq 140/90$ mmHg). Of all hypertensive patients only 31.2% had controlled BP.

Further analysis of different groups revealed that those with a previous diagnosis of hypertension, diabetes, those with a previous stroke and those on antihypertensive medications had a higher BP than those without ([Supplementary material online, Figure S2](#)). Similarly, those who were obese or overweight had higher BP than those with normal weight ([Supplementary material online, Figure S3](#)). Pregnant women appeared to have lower BP than their aged-matched subjects. Blood pressure readings taken in public areas (indoors and outdoors) appeared to be higher than readings taken in hospitals/clinics.

Discussion

Oman is a country of around 4.6 million inhabitants, of which nearly 2 million are expatriates.¹¹ The Omani population is ethnically diverse with the majority of the population living in Muscat and northern province of Al-Batinah. The median age is currently 25.6 years with around 30% of the population below 14 years of age.¹² As it is still a relatively young population, the prevalence of non-communicable diseases is important.

Our survey demonstrated that the proportion of hypertension among screenees was around 29.8% which is in keeping with previous studies,⁷ but higher than the WHO fact sheet.⁶ It is interesting to note that around a third of patients on antihypertensive medication had BP that was uncontrolled. Although this proportion is by no means

optimal, it is much better than figures published from other countries.¹³⁻¹⁵ Despite this more still needs to be done to improve the compliance to medications and improve BP control among all our hypertensive population, with just under one-third of all hypertensives controlled.

Our study also clearly reinforces the importance of taking three BP readings especially in hypertensive patients. There was a significant difference between the third and the first readings which was more pronounced in hypertensive patients. This is in keeping with guideline recommendations. Similarly, as expected, we found that patients who were previously diagnosed as having hypertension or those who were on antihypertensive medications had higher readings than those without such a diagnosis or those not on antihypertensive medications. Diabetic patients and those with previous strokes also had higher readings than the reference groups. Subjects who were obese or overweight also had higher readings than those with normal or low body mass index. These are high-risk groups that need strict BP control and this highlights the importance of increased surveillance in these groups of patients.

There are many limitations to our survey. As most of our screening centres were located at various sites in different hospitals, most of the screened population were healthy adults who came to visit relatives or friends. Our screened population also included healthcare staff and staff at other workplaces of our volunteers. However, this was a main objective of the study, to identify undiagnosed hypertensive patients. Our subjects are therefore relatively healthy with only a small proportion being diabetic or having ischaemic heart disease or a previous stroke. Our survey was conducted almost exclusively in the urban areas of Muscat and was based on convenience sampling and therefore does not accurately represent the true prevalence of hypertension in Oman, rather the proportion of patients with hypertension in the screened population.

Conclusions

The proportion of individuals with hypertension among the screened population in Muscat, Oman is comparable to that in other middle-eastern countries. The overall BP control among patients on antihypertension medications, although better than that reported in other countries, is still sub-optimal. More still needs to be done to improve BP control and increase awareness about the dangers of hypertension.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal Supplements* online.

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