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William Harvey (1578-1657):  
Discoverer of the Circulation  
(Refer to page 445-446)

# How Common is Hypertension in Young Adults in Singapore?

B L Chia

Hypertension is today a major health problem in Singapore, as well as in many other countries around the world. It is an important risk factor for stroke, coronary artery disease, heart failure and chronic renal disease.

Considerable controversies have arisen regarding the definition, as well as the sub-classification of hypertension<sup>(1)</sup>. This is largely because it is widely believed that there is no level of blood pressure (BP) that can be considered to be completely safe. Although this is true, it is nevertheless important to note that the relationship between the absolute risk of cardiovascular complications versus BP levels is not a straight line but is curvilinear and that at lower BP levels, this curve is relatively flat. Furthermore, at any given level of BP, the risk of complications can differ by many folds depending on the presence or absence of other risk factors such as diabetes mellitus and hyperlipidaemia. Despite these difficulties, most of the current major Hypertension Guidelines have defined hypertension as follows: systolic BP  $\geq 140$  mmHg and/or diastolic BP  $\geq 90$  mmHg in individuals who are 18 years and above (BP measured in a clinic setting)<sup>(2)</sup>. Using this definition, as well as including known hypertensives who are on treatment, the 1998 Singapore National Health Survey found that 27% of our adult population, aged 30-69 years, have hypertension<sup>(3)</sup>.

Both systolic and diastolic BP increase with age. In the case of systolic BP, this increase continues throughout the individuals' life. On the other hand, the rise in diastolic BP reaches a plateau at about 60 years of age, after which it begins to slowly decline. Therefore in the elderly, isolated systolic hypertension is the commonest form of hypertension. Fig. 1, which is based on data from the 1998 Singapore National Health Survey<sup>(3)</sup>, highlights dramatically the increasing prevalence of hypertension as the population grows older. Because of this very close relationship between age and hypertension, it is not surprising that the great majority of hypertensive patients seen in clinical practice are 40 years or older. However, although infrequent, hypertension does occur in younger individuals and in children. Many such patients have secondary hypertension due to a specific aetiology e.g. renal disease, in contrast to the great majority (about 95%) of adult hypertensive patients who have essential hypertension.

Although the epidemiology of hypertension in older patients has been extensively studied worldwide (and this includes Singapore), there is a paucity of such studies in the young. In this issue of the Singapore Medical Journal, Gan et al report a study of 3,352 Singapore military conscripts to determine the prevalence of "Hypertension" as well as "White coat hypertension" in this cohort of subjects<sup>(4)</sup>. The 3,352 subjects

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in the study were all males who were conscripted to undergo two to 2.5 years of national service. Their ages ranged from 17 to 23 years. Two consecutive, separate conventional BP measurements using a sphygmomanometer were taken in subjects whose first BP measurements showed a mean systolic BP >140 mmHg and/or diastolic BP >90 mmHg. If the second mean systolic BP remained >140 mmHg and/or diastolic BP >90 mmHg, the subject underwent a 24 hour ambulatory BP monitoring (ABPM) test. In the ABPM, the investigators used the criteria of the Task Force II Consensus<sup>(5)</sup> to determine whether hypertension was present or absent. Subjects with ABPM showing a mean 24-hour reading >135/85 mmHg and/or diurnal >140/90 mmHg and/or nocturnal >125/75 mmHg were classified as "Hypertensives". Subjects with elevated conventional sphygmomanometer readings of systolic BP >140 and/or diastolic BP >90 mmHg, but normal ABPM readings were classified as having "White coat hypertension". The overall prevalence of hypertension was 1.6% (1.3% [Chinese], 2.6% [Malays] and 1.5% [Indians]). The overall prevalence of white coat hypertension was 2.0% (1.6% [Chinese], 2.9% [Malays], 2.9% [Indians]). In addition, an exceptionally high percentage (55.9%) of elevated BP at first visit was eventually attributed to white coat hypertension.

White coat hypertension is most commonly defined as an elevated clinic BP of  $\geq 140/90$  mmHg and a normal daytime ABPM of  $< 135/85$  mmHg<sup>(6)</sup>. (Fig. 2) The actual clinical significance of white coat hypertension is today still not yet completely understood. Several studies have shown that the risk for cardiovascular complications is not much different from that of normotensive subjects. However, there are other studies which have shown that this risk is increased, but considerably less than that in hypertensive patients. The prevalence of white coat hypertension reported in the literature is between 15 to 30%. This wide range is mainly due to the different definitions and approaches that have been adopted. For example, BP readings tend to fall with consecutive clinic visits. Hence, studies which require only one or two clinic visits will very likely have a higher prevalence of white coat hypertension compared to those studies which require three or four clinic visits. Second, the prevalence of white coat hypertension in any study will be greatly influenced by the cut-off values that are used in the ABPM to define normotension – the lower these values, the lower will be the prevalence of white coat hypertension. Third, the likelihood of diagnosing white coat hypertension is much higher if the initial clinic BP is only mildly elevated compared to if it is severely elevated: e.g. 150/95 mmHg versus 180/110 mmHg. With these considerations in mind, the very high percentage (55.9%) of elevated BP at first visit which was eventually attributed to white coat hypertension reported by Gan et al could be because the first clinic visit BP was evaluated and also because most of their subjects had only mildly elevated BP readings.


Let us now look at the issue of the prevalence of hypertension (i.e. "true" hypertension) in this young cohort of subjects. The overall prevalence of 1.6% is comparable to the approximate 2-4% prevalence of hypertension in the 18-29 age group of the Third National Health Nutrition Study (NHANES III), which was carried out between 1988-1991 in the United States of America, using home and clinic BP measurements<sup>(7)</sup>. The higher prevalence of hypertension in Malays

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in Gan et al's study is also consistent with the findings of a higher prevalence of hypertension in this ethnic group in the Singapore 1998 National Health Survey which involved a much older population. While the prevalence of hypertension in their study is relatively low (1.6%), the investigators have rightly pointed out "that it nevertheless contributes an important problem, as target organ damage is correlated with duration of disease and early detection and management of hypertension may confer reduction in long term risks of cardiovascular disease".

So what are the appropriate strategies that we should adopt to screen and to detect hypertension in young adults? The recent Singapore Ministry of Health Clinical Practice Guidelines on Health Screening<sup>(4)</sup> recommend BP measurements: (1) at least once every two years for adults aged 21 years and above with a diastolic BP <85 mmHg and a systolic BP <130 mmHg and (2) annually for individuals with a diastolic BP between 85-89 mmHg or a systolic BP between 130-139 mmHg and even more frequently if the BPs are higher or if the individuals have a major coronary risk factor such as diabetes mellitus. They also recommend that any individual aged 21 years and above should have BP measurement during any visit to a physician ("case finding"). Although not covered in the above guidelines, it is reasonable to also screen individuals who are younger than 21 years for hypertension, if they have risk factors such as obesity or if they are known to have diabetes mellitus, renal disease or other systemic diseases.

Finally, I would like to end by asking the question "Is hypertension in young adults an underestimated problem?" which is the title of the paper. This is a difficult question to answer for a few reasons. The term "underestimate" implies "to guess too low a value for". Therefore to underestimate a problem, you must first have some estimate of the actual problem. Because of the paucity of studies and data, most of us (including myself) at least up to now, do not have a confident estimate of the prevalence of hypertension in young adults in Singapore, although all of us know that it is quite uncommon. This is mainly because we seldom see hypertensive patients who are between 17 to 23 years of age. Second, the Task Force II Consensus cut-off ABPM values for diagnosing hypertension and normotension which were used in Gan et al's study were based on 95% percentiles in large studies which have involved predominantly older normal subjects. Whether these same values can be applied accurately to young national service men who are 17-23 years of age in Singapore is at present unclear. However, despite these uncertainties, Gan et al should be congratulated for they have published for the first time some very useful epidemiological data regarding the problem of hypertension in young adult males in Singapore. Hopefully, there will be further studies in the future on this important but often neglected area of hypertension. 

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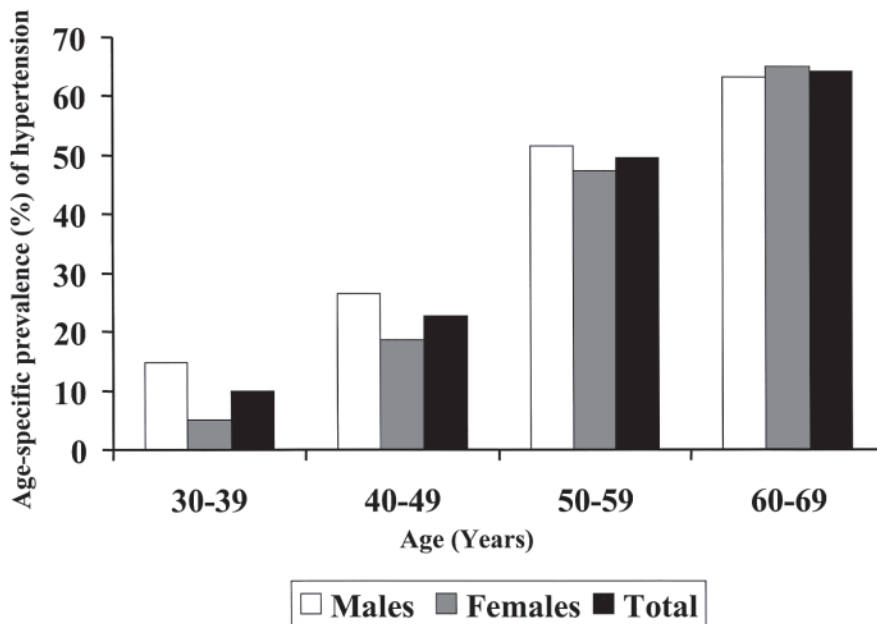
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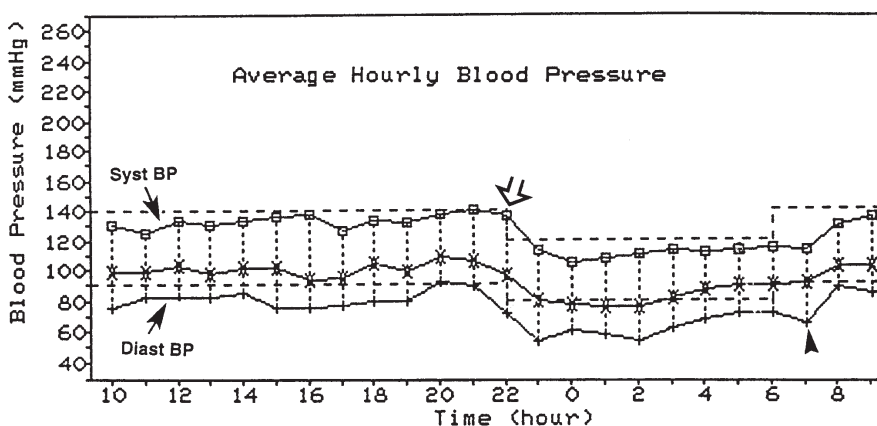
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**Fig. 1** Prevalence of hypertension in Singapore in different age groups (Source of data: 1998 Singapore National Health Survey<sup>(3)</sup>).



**Fig. 2** 24-hour ambulatory BP monitoring (AMBBP) in a 28-year-old man with white coat hypertension. The clinic BP readings were around 130/95 mmHg suggesting mild hypertension. However, the 24-hour AMBP showed a mean daytime BP of 132/82 mmHg, mean night time BP of 112/61 mmHg and mean 24-hour BP of 127/76 mmHg, all of which are normal. (Open arrow shows fall of BP during sleep. Arrowhead shows rise of BP just before awakening. Abbreviations: Syst BP = systolic blood pressure, Diast BP = diastolic blood pressure.)



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