Preliminary study to establish the prevalence of familial hypertension in Oman

Yousuf Mohammed Al-Farsi*1, Abdullah Al-Zakwani2, Omayma Elshafie3, Nicholas JY Woodhouse4

ABSTRACT
Objective: In Oman, more than 60 percent of patients with a positive family history of hypertension (FHTN) are estimated to have primary hyperaldosteronism (PA). The objective of this study was to create a model and the methodology to establish the prevalence of a positive FHTN in a primary care settings among patients labeled as having essential hypertension and to estimate the potential number of patients with mineralocorticoid (MC) induced disease in Oman.

Methods: This cross-sectional pilot study was performed in one health center in Sohar which is the third largest city in Oman in terms of population. A detailed family history was obtained from 50 consecutive patients attending a single health center. Each patient was interviewed and detailed questionnaire was completed. The subject was considered to have a positive family history if two or more first-degree relatives including parents, offspring, and siblings were affected.

Results: Data were extrapolated to around 240 patients from the original 50 patients as the first-degree relatives were also considered as subjects. More than half of the subjects (55%) have two or more first-degree relative (FDR) with hypertension and 85 percent with one FDR.

Conclusion: These prevalence figures are 2-3 times higher than reported elsewhere. If they are representative of the country, we estimate that there are at least 150,000 patients with PA in Oman. We recommend that patients with uncontrolled blood pressure and positive FHTN to be given a one month therapeutic trial of spironolactone. Responders may then be investigated further or treatment continued using a single MC-receptor blocking drug.

Keywords: hypertension, family history, primary hyperaldosteronism, familial, Mineralocorticoids, High prevalence, Oman.

Introduction
Hypertension is considered a major public health problem in Oman. The crude prevalence of hypertension (HTN) among adults in a cross-sectional survey published in 2002 was 33.1%, while the age-adjusted prevalence was 38.3% [1]. This was higher than the previously stated values of 27.01% as reported by the National Blood Pressure Survey indicating a steady increase in the prevalence [2]. The Omani population is about 1.95 million according to the last census in 2010. There are about 1.025 million individuals more than 20 years of age and 38.3% of them will have or are being treated for, HTN. Hypertension is therefore considered as a major health problem in Oman in terms of complications and cost of treatment. In most of the hypertensive patients, no single specific etiological factor can be identified and hypertension seems to be multifactorial in origin. However, there is evidence that the risk of hypertension clusters in families [3–5]. Therefore, the family history of hypertension can provide a strong indicator of risk [6]. In a previous study, 80 % of patients with a positive family history of hypertension responded to treatment with spironolactone, a mineralocorticoid receptor blocking drug, suggesting that a high prevalence of mineralocorticoid-induced disease in Oman [7]. Later serum aldosterone and renin levels were measured in similarly affected patients and 66% were found to have PA [8]. The result of these two studies and many previous

*Dr. Yousuf Mohammed Al-Farsi,
Family Physician, Ministry of Health,
Oman
Email: dryousufalfarsi@gmail.com

Full list of author information is available at the end of the article.
studies suggest that patients with hypertension and positive FHTN should be screened for mineralocorticoid disease even in the absence of hypokalemia which is present in a small proportion of patients [9–12]. However, there are few reports on the prevalence of familial hypertension worldwide but none in Oman. In a study from the USA in the 1970s, an incidence of up to 40% was found but MC disease was not considered in this context [5]. It has been proposed that Metabolic diseases are more common in societies where consanguineous marriages occur more frequently and there is a lack of population mobility which is the case in Oman [13,14].

We anticipated that many hypertensive patients in Oman will have positive family history of the disease because of consanguinity [13]. In the previous two studies from Oman [7,8], the patients were studied at a tertiary care center, where it is known that the incidence of secondary hypertension is markedly higher than in the general population. We, therefore, propose to establish the prevalence of familial disease in primary care setting in Oman as an initial step before looking for an association between a positive family of HTN and PA. To the best of our knowledge, no similar studies have been reported in the GCC countries or elsewhere.

Methods
This cross-sectional pilot study performed in December 2010 in one health center in Sohar which is the third largest city in Oman in terms of population. A detailed family history was obtained from 50 patients attending hypertension clinic in that health center. Using selective stratified random sampling method data were collected over 5 days. First, ten patients attending the clinic each day were interviewed and detailed questionnaire about family history of hypertension was completed. Patients who were labeled as having essential hypertension were included in the study. The interviews were conducted by a physician trained in taking family histories by a geneticist. A patient was considered to have a positive family history if two or more first-degree relatives including parents, offspring and siblings were affected [15]. Patients were divided into two groups: those with positive FHTN and those with negative FHTN or unsure of their family details. Data were extrapolated to 240 patients from the original 50 patients as the first-degree relatives of the patients were also considered as patients using two statistical methods simulated relative of relative and interpolation. Ethical approval was obtained from the Research and Ethics Committee, College of Medicine and Health Sciences, Sultan Qaboos University (MREC# 371). Fully informed consent was obtained from all patients.

Results
Among the 50 patients who were included in this study, 38 were females. Mean age of the patients was 45 years and mean duration of hypertension was 8 years. Almost half of the patients (28) had HTN only, 18 patients had HTN with DM and the remaining 4 patients had a history of coronary heart disease or cerebrovascular accident with essential hypertension. Consanguinity was found to be 42%. More than half of the patients (55%) had two or more first-degree relative (FDR) with essential hypertension and 80% percent had one or more FDR with essential hypertension. Then data were extrapolated to 240 patients from the original 50 patients as the first-degree relatives were also considered as patients. Just above one-half of the extrapolated 240 patients (57%) had two or more FDR with essential hypertension. This extrapolation has been tested by two scientific statistical methods simulated relative of relative [16] and interpolation [17]. Distribution of positive family history of essential hypertension per both methods was almost same as the initial analysis of the 50 patients as shown in the figures 1 and 2.

![Figure 1](image1.png)
**Figure 1**
Number of patients with two or more first-degree relatives (FDR) of the original 50 (figure 1) and in the 240 extrapolated patients (figure 2).

![Figure 2](image2.png)
**Figure 2**
Discussion
These findings confirm our earlier clinical suspicion and hypothesis that FHTN is extremely common in Oman; the prevalence is more than double than in the USA [5]. In the latter study [8], the familial disease was defined as having one or more FDR. If we use the same criteria here, then more than 80% of our HTN population would be familial. PA has been identified to occur in patients with essential hypertension with the highest prevalence (17–23%) being in a specialized clinic dealing with resistant hypertension [18]. On the other hand, the prevalence of the PA among hypertensive patients in general practice is lower than in specialized clinic ranging from (0.7% to 13) [19–23]. Previous studies in Oman indicate that more than 60% of those with FHTN have PA. By extrapolation, there will be huge numbers of patients with PA in Oman. The current Omani population is estimated to be 1.95 million with 1.025 million of them over 20 years of age, 38.3% or around 400,000 of whom are estimated to be hypertensive. If our estimate of the prevalence of FHTN is confirmed in other areas of the country, then 55% of them or 216,000 individuals will have the familial disease and of these more than 60% or 143,000 patients are expected to have PA (Figure 3). If our hypothesis is correct, however, then many hypertensive patients could be treated with single mineralocorticoid receptor blocking agent.

A potential limitation of this study is our estimate, that 66 percent of patients with positive FHTN have PA, that is based upon the studies carried out in a tertiary center which might result in an overestimation of numbers involved. A second limitation is that we have extrapolated data from single primary care center to estimate the prevalence of FHTN. However, we expect these finding will be similar in other parts of Oman because of high consanguinity levels [13]. However, direct measurement of renin and aldosterone levels may prove impracticable as many hypertensive drugs can interfere with their measurements giving false positive and negative results [22–24]. Therefore, we suggest a more practical method, which is to give a one month trial of MC blocking agent such as spironolactone to patients with uncontrolled BP and a positive FHTN. Those whose blood pressure is controlled can then be continued a single MC blocking

(Figure 3): The hypothesized prevalence of the primary hyperaldosteronism in Oman.
agent having excluded the existence of an adrenal tumor. It is essential that serum potassium levels are monitored in the early stages of treatment and pregnancy must be avoided in women on spironolactone. There is another important consideration; a high prevalence of primary aldosterone in Oman might in part explain the explosion of type 2 diabetes mellitus in this country and possibly throughout the Middle East because aldosterone is known to cause insulin resistance and stimulate proinflammatory adipokines in adipocytes [25,26].

Conclusion
These prevalence figures are 2-3 times higher than reported elsewhere. If they are representative of the country as a whole, we estimate that there are at least 150,000 patients with PA in Oman. We recommend that patients with uncontrolled blood pressure and positive FHTN to be given a one month therapeutic trial of spironolactone. Responders may then be investigated further or treatment continued using a single MC-receptor blocking drug. Patients with hypertension and diabetes can be included in large-scale study to confirm the proposed prevalence of PA in those with strong family history of hypertension.

List of Abbreviations

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<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
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<td>FDR</td>
<td>First-degree relative</td>
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<td>HTN</td>
<td>Hypertension</td>
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<td>MC</td>
<td>Mineralocorticoid</td>
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<td>PA</td>
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Authors’ contribution
YMA conceived the idea, collected and analyzed the data and wrote the manuscript. AA participated in data analysis and reviewed the manuscript. OE participated in writing and reviewing the manuscript. NW conceived the idea and supervised the whole research and critically reviewed the manuscript.

Competing interests
None

Consent for publication
Not applicable

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