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Prevalence of Hypertension among the Adult Population in Qatar: A Literature Review

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Abstract **Original Research Article**

Background: Hypertension (HTN) is the leading preventable and modifiable cardiovascular risk factor. Diseases well known to be associated with hypertension have been discerned among the adult population within the state of Qatar. These include myocardial infarction (MI), stroke, obesity, diabetes mellitus, heart failure, dyslipidemia and erectile dysfunction. Our literature review aims to provide a review of the current literature on hypertension among the adult population within the State of Qatar. ***Methods:*** A review of studies published between 1982-2019 in the area of hypertension was conducted with the use of PubMed, using the key words "hypertension + adults+ Qatar". We also used the reference list of all articles retrieved, and author names to expand our search that was used for this review. Hypertension in Children and Hypertension in Pregnancy was excluded from our search results. ***Results:*** A total of 17 studies were included for review, which included 9 cross sectional studies, 4 retrospective studies, 3 prospective studies and 1 matched case control study. In addition to diseases well known to be associated with hypertension novel associations have been observed. These include hearing impairment, potentially inappropriate prescribing and subclinical magnesium deficiency. There is a significantly greater prevalence of hypertension among individuals with a family history of consanguinity within the indigenous population of Qatar. Furthermore a greater morbidity and mortality from certain conditions associated with hypertension have been noted within this group. ***Conclusion:*** Prevalence of hypertension among adults within the State of Qatar is approximately 32% (16.8% - 32.1%) which is in keeping with current overall global estimates. Hypertension in the State of Qatar primarily affects the elderly population (above 50 years) and is associated with a number of morbidities including cardiovascular disease (CVD), congestive heart failure (CHF), obesity, type 2 diabetes mellitus (T2DM), polypharmacy and erectile dysfunction (ED). Further studies are needed to verify the differences that have been discerned among the different ethnic communities of Qatar and to investigate possible reasons for this. Research to establish current rates of optimal blood pressure (BP) control among hypertensive adults as well as prescribing patterns among physicians is required as a clinical control measure.

Keywords: Hypertension in adults, Hypertension in Qatar, prevalence of hypertension.

INTRODUCTION

Hypertension is one of the leading preventable and modifiable risk factors for CVD and all cause mortality across the globe [1, 2]. In addition several studies have found that hypertension is a strong independent risk factor for the development of chronic kidney disease leading to end-stage renal disease [3-5]. Despite these well-known health implications and the widely available treatments, prevalence and disease burden remain high globally.

Mills *et al.*, [6] estimated that in 2010 the global age-standardized prevalence of hypertension (defined as systolic BP ≥140 mm Hg, diastolic BP ≥90 mm Hg, and/or current use of antihypertensive medication) was 31.1%. Other studies have suggested that the proportion of hypertensive patients who achieve optimal BP control (defined as BP <140/90) is abysmally low, varying between 14% and 54% [7, 8]. The overall prevalence of hypertension within Qatar is estimated at approximately 32% (16.8 to 32.1%) which is in keeping with global estimates of disease prevalence [9, 10].

We found no data demonstrating rates of optimal BP control within the state of Qatar. Lowering

BP with commonly used anti-hypertensive drugs have significant benefit in reducing the risk of CVD as well as reducing the rate of all cause mortality [11]. Furthermore, the magnitude of BP reduction achieved is proportional to the reduction in relative risk of CVD and all cause mortality [12].

Our search retrieved no review articles on the subject of hypertension among adults within Qatar's adult population. In this review we discuss the currently available literature looking at hypertension among adults within the State of Qatar. We conclude by discussing the consequences of current trends in hypertension and areas where more research is needed.

METHODOLOGY

A literature search on Pubmed using the key words "hypertension + adults + Qatar" was conducted on the 11/10/2021. The titles and abstracts were evaluated to determine eligibility for inclusion. All studies wherein hypertension was investigated within the State of Qatar were eligible for inclusion except those investigating hypertension in pregnancy or paediatric hypertension (less than 18 years of age). Studies reviewed were carried out between the years 1982 – 2019. Hypertension is defined as systolic BP ≥140 mm Hg, diastolic BP ≥90 mm Hg. Table 1 provides a summary of all reviewed articles.

Table 1: Summary of all reviewed studies

Author(s)	Objectives(s)	Sample	Design /year	Measurements	Findings
Ahmad *et al.*, [13]	To determine the prevalence & risk factors for ED.	n = 1139 men aged > 30 years	Descriptive cross sectional study. 2008.	Sexual health inventory & questionnaire	Statistically significant association between ED and chronic disease including HTN.
Alyazeedi *et al*., [14]	To assess the prevalence and associated risk of potentially inappropriate prescribing (PIP) in older adults	n = 3537 patients aged > 65 years Mean age 72.8 yrs	National registry based retrospective study of older adult outpatients. 2016-2019.	Demographics, medications, diagnoses, results and admissions. Beers Criteria for reference.	HTN was identified as one of the factors associated with PIP and have poor clinical outcome
Bener *et al.*, [15]	Assess prevalence of ED, its severity and other sexual function domains in hypertensive patients in Qatar	n = 642 hypertensive men aged 25-75 Mean age 57.1 years	Cross sectional study. 2006.	International Index of erectile function (IIEF) & questionnaire detailing medical history.	Prevalence of ED in hypertensive men was 58.3%. Type of anti hypertensive may also contribute to ED symptoms.
Bener *et al.*, [16]	To investigate the prevalence of ED, its severity, and other sexual function domains in hypertensive and normotensive Qatari men	n= 296 hypertensive men + 298 age matched normotensive men aged 30-75 years Mean age 54.8 + 54.5 years	matched case-control study. 2006.	IIEF & questionnaire detailing medical history	Prevalence of ED in hypertensive and normotensive men was 66.2% and 23.8% respectively. Severity of ED was greater among hypertensive men.
Bener *et al.*, [17]	To assess the effect of hypertension among patients admitted to hospital in Qatar with congestive heart failure and to identify risk factors that contribute to the development of CHF in hypertensive subjects	n= 1744 hypertensive patients hospitalised with congestive heart failure mean age 62.4 years range 50-80 years	retrospective cohort study. 1991-2001.	Clinical records Age, gender, CVD risk profile, ECG.	Hypertensive subjects hospitalized with CHF were more likely to have diabetes, high cholesterol & angina. Mortality rate of hypertensive patients with CHF was higher among Qatari's than non Qatari's. Hospital mortality rate was lower in the hypertensive group.
Bener *et al*., [18]	to determine the prevalence of hearing loss and its association with T2DM in a highly endogamous population.	n= 459 diabetic patients aged 20 - 59 years Qatari or non Qatari Arabs. Mean age 48.2 years Range 39.2 – 57.2	cross-sectional study. 2013-2014.	Audiological testing Sociodemographic, anthropometric data & biochemical data	Adults with DM & HTN showed greater hearing impairment. Prevalence of hearing loss was greater among Qataris than non Qataris

		years			
Bener *et al*., [19]	To determine the prevalence of HTN & CVD risk factors and its association with other characteristics in the Qatari population	n= 1208, Aged 25-65 years Mean age Males 45.7 years Females 41.3 years	Cross sectional study. Multi stage stratified cluster sample. 2003.	Questionnaire based sociodemographic and anthropometric data Medical history	Prevalence of HTN 32.1 %.
Bener *et al*., [20]	To investigate the association of the Pro12Ala polymorphism of the PPARy2 gene with hypertension and obesity	n= 1528, aged > 20 years Qatari population Mean age 50.44 years Range 20-63 years	Cross sectional study. 2011-2012.	Questionnaire, anthropometric, biochemical & genetic data,	Parents consanguinity was significantly higher in hypertensive individuals
Chaikouni *et al*., [21]	To study various characteristic of patients admitted to CCU in Qatar with confirmed MI	n= 2515 Mean age 51 years Range 18-99	Retrospective 1982-1990	Data registry analysis	women were more likely to have diabetes, hypertension or both than men with. However both were not significantly associated with higher mortality.
Ali *et al*., [22]	Examine common conditions associated with the prevalence of diabetes in Qatar with a focus on hypertension – obesity	n= 4775 Range 18 – 64 years	Cross sectional study. 2006.	demographic, anthropometric and biochemical data from the World Health Survey.	Increasing systolic BP was associated with diabetes. 58.7% of hypertensives are above the age of 60 years.
AlKaabi *et al*., [23]	Construct and compare predictive models to identify individuals at high risk of hypertension	n= 974	Cross sectional. 2012 – 2019.	Survey, anthropometric, spirometry, BP	Age contributed most in predicting hypertension followed by cholesterol, diabetes & waist circumference.
Nazzal *et al*., [24]	To investigate stroke outcome predictors	n= 111 ischemic stroke patients	Longitudinal prospective. 2000 – 2001.	Modified Barthel Index	hypertension had a significant impact on stroke rehabilitation outcome
Thani *et al.*, [25]	To describe the results of the Qatar Biobank Study for the first cohort	n=10,694 aged > 18 years mean ages 39.9 – 41.45 years	Prospective population based cohort 2012	Questionnaire, biological samples, imaging, -omics	Prevalence of hypertension 16.8%.
Ghoneim *et al*., [26]	Efficacy and tolerability of Nifedipine in the middle eastern & Moroccon population	n= 1990 aged > 18 years Mean ages 60.9 + 51.3 years	Prospective, non-interventional observational study. 2005-2006.	BP, HR, adverse drug events	Nifedipine was effective and well tolerated
Hajj *et al*., [27]	Role of pharmacists in CVD prevention	n= 141 pharmacists	Cross sectional survey. 2015.	Questionnaire	Scope of pharmacy practice in CVD prevention is limited in Qatar
Imam *et al*., [28]	To study stroke in the adult Qatari population	n= 862 patients Mean age 64.3 years Range 19-105 years	Retrospective cohort. 2013-2017.	Demographic and clinical characteristics	Hypertension was found in 82.7% of this cohort. Females had greater morbidity and mortality.
Shi *et al*., [29]	To examine the association between serum magnesium and DM & HTN	n= 9693 aged > 20 years.	Cross sectional. 2019.	Food questionnaire Blood biochemistry	Subclinical magnesium deficiency is common in Qatar and associates with diabetes, prediabetes and hypertension.

Reviewed Studies

A cross sectional study conducted by Ahmed *et al*., [13] in 2008 across 21 primary healthcare centres in Qatar demonstrated an association between ED and hypertension. The study included 1136 patients and collected sociodemographic and sexual health data by questionnaire. The target population were males above 30 years of age of various ethnicities. A total of 649 participants (59.6%) reported various degrees of erectile dysfunction. A significant association between ED and

chronic diseases was found including, hypertension, hypercholesterolaemia, diabetes and coronary heart disease. Qatari males reported the highest rates of ED (64.7%) followed by Asian (Indian subcontinent) males (60.7%) and men of other Arab nationalities (48%). ED was also more prevalent among overweight and obese men.

Alyazeedi *et al*., [14] described the prevalence and associated risk of potentially inappropriate prescribing (PIP) or polypharmacy in a study that included 3537 older adults in a 3 year national registry based retrospective study. Medication was deemed potentially inappropriate if it was found in the 2nd table of the 2019 Beers list of medications that should be avoided in older adults. PIP was associated with risk of poor clinical outcome among older adults that included admission to hospital, bone fracture and constipation. The study identified hypertension as one of the main conditions associated with potentially inappropriate prescribing.

In a cross sectional study that included 642 hypertensive patients the prevalence for ED was found at 58.3% [15]. The study also suggested an association between ED and type of anti hypertensive treatment being taken. Patients taking beta blockers were more likely to have ED than other anti-hypertensive treatments.

In a matched case control study Bener *et al*., [16] showed the prevalence of erectile dysfunction among hypertensive and non-hypertensive Qatari men. 196 (66.2%) patients had erectile dysfunction among 296 hypertensive patients whilst 71 (23.8%) among 298 non-hypertensive patients. The study concluded that the prevalence of ED was significantly higher among hypertensive patients. Furthermore, not only was prevalence higher among the hypertensive group, the severity of ED symptoms was also greater as measured by the IIEF score. The duration of hypertension was considered a statistically significant predictor of ED. ED was also more common among hypertensive individuals receiving antihypertensive treatment.

Bener *et al*., [17] conducted a retrospective study in patients admitted to Hamad General Hospital in Qatar with CHF. The aim of the study was to identify risk factors that contribute to the development of CHF in hypertensive subjects over a period of 10 years. A total of 3713 were hospitalised with CHF. Overall a total of 46.9% of patients with CHF had hypertension. CHF was found to be more prevalent among males than females (56.4 vs 43.6%). Furthermore hypertensive patients admitted with CHF were significantly more likely to have diabetes, high cholesterol and angina. The mortality rate among hypertensive patients was higher among Qatari than in non-Qataris. In hospital mortality was lower among non hypertensive group. Hypertension was the most common risk factor for CHF and contributed to a large proportion of heart failure cases.

In an observational cohort study aimed to determine the prevalence of hearing loss and its association with type two diabetes mellitus Bener *et al*., [18] concluded that diabetic patients with hypertension were at greater risk of hearing loss. Patients with hearing loss were more likely to have risk factors like hypertension, retinopathy, nephropathy and neuropathy. The study was carried out between 2013 to 2014 and included 459 diabetic patients aged between 20 and 59 years who where Qatari nationals or of non-Qatari Arab ethnicity. Hearing was evaluated with the use of pure tone audiometry. The proportion of diabetic subjects found to have hypertension and hearing loss was 32.6%. The prevalence of hearing impairment was higher in Qataris than in non-Qataris (59.7% versus 46.6%).

In a cross sectional study by Bener *et al*., [19] that included 1208 subjects the overall prevalence of hypertension was found to be 32.1%. Independent risk factors for hypertension included low educational level, female gender, advanced age, sedentary work, obesity, smoking. Similarly, diabetes, hormonal problems, the ingestion of animal fats, Turkish coffee and obesity were the predictors of hypertension.

Bener *et al*., [20] conducted a cross sectional survey to determine the association of *PPARg2* gene variant Pro12Ala polymorphism with hypertension and obesity in the Qatari population. This survey was performed on a random sample of 1528 Qatari male and female population older than 20 years of age. 220 were diagnosed with hypertension and 420 were obese with BMI >30. One-third of the hypertensive participants were obese with BMI of >30 as opposed to only one-fourth of the obese participants in the normotensive group. This study revealed an association between the *PPARg2*Ala allele and hypertension in the highly consanguineous aboriginal population of Qatar. On the other hand, this study found no association between the Ala allele and obesity.

A retrospective study of patients admitted between 1982 and 1990 to the Coronary Care Unit at Hamad General Hospital with a diagnosis of acute myocardial infarction was conducted by Chaikouni *et al*., [21]. A total of 2,515 patients with a mean age of 51 years were included. These patients belonged to 22 different nationalities and ethnic groups which were combined into 3 major nationality groups: 853 (34%) Qatari citizens,1072 (42.7%) Asians and 422(16.7%) Arabs. 62% were active smokers, 20% diabetic, 14% hypertensive, and 15% had a history of previous myocardial infarction. In this study women were more likely to have diabetes, hypertension, or both than men with MI. However, diabetes, hypertension, or both,

were not significantly associated with higher mortality. Hypertension was more common in the older age group.

Ali *et al*., [22] analyzed data from 4775 patient records and found that obesity, high cholesterol and systolic hypertension were significantly associated with diabetes. A positive linear relationship was found between BP and diabetes prevalence. A significant relationship between obesity and diabetes was found. Almost one third of the population of the country would be considered obese based on BMI. Qataris were more likely to have diabetes.

In a cross-sectional study by AlKaabi et al[23] assessed 987 Qataris and long-term residents' data from the Qatar Biobank study (QBB) with the aim of constructing a predictive model to identify individuals at high risk of developing hypertension. Age, gender, education level, tobacco use, physical inactivity, adequate consumption of fruits and vegetables, abdominal obesity, history of diabetes, history of high cholesterol and mother's history of hypertension were predictors of hypertension.

A longitudinal prospective study by Nazzal *et al*., [24] of 111 patients admitted following ischemic stroke analyzed the effect of modifiable risk factors: diabetes mellitus (DM), hypertension (HTN), ischemic heart disease (IHD) and non-modifiable factors such as age, gender, race and side of lesion on stroke outcome. The study concluded that patients with modifiable risk factors had a significantly better rehabilitation outcome than patients with non-modifiable risk factors. Similarly, patient with two or more co-morbidities did not show clinically significant improvement. However, non-modifiable risk factors (age, gender, race and side of lesion) did not play a significant role in stroke outcome.

Hypertension was the 3rd most prevalent noncommunicable disease found by Thani et al[25] in the Qatar Biobank (QBB) study, with a self reported prevalence of 16.8%. Actual BP measurements revealed a prevalence of 10.5% among men and 8.6% among women.

A prospective, non-interventional, multi-centre observational study was conducted by Ghoneim *et al*., [26] in the Middle eastern and Moroccan population. The study aimed to investigate the efficiency and tolerability of long acting Nifedipine (30 mg or 60mg; monotherapy or in combination). 1990 patients were enrolled in the study and followed over a period of 14 weeks. The mean reduction in systolic blood pressure from initial to last visit was significant in each population, decreasing 31.3mmHg in the Middle Eastern population and by 38.6 mmHg in Morrocan patients. Likewise a reduction in diastolic blood pressure of 16.8mmHg was seen in the Middle Eastern population and of 14.9mmHg in the Moroccan population. Nifedipine was well-tolerated in both populations, with efficacy dependent on cardiovascular risk factors such as hypertension grade and age.

A cross-sectional survey of 141 pharmacists performed by Hajj *et al*., [27] examined services provided to patients with CVD risk factors as well as their attitudes and perceived barriers to CVD prevention. This survey concluded that Qatar's pharmacists have very positive attitudes towards CVD prevention and perceive their potential role as very important in CVD-related health promotion and prevention. However a disparity exists between their attitude and actual clinical practice. The perceived barriers for CVD prevention services included lack of CVD related educational material, lack of a private counselling area and lack of time. Lack of training was also notable as 75% of pharmacists had not completed any form of CVD related training and or continuing professional education activities.

A retrospective review was undertaken by Imam *et al*., [28] of all Qatari adults presenting with stroke to Hamad Medical Corporation over a 5-year period. 862 patients were included, with 58.9% being male. The average incidence of stroke over the 5-year period was 92.04 per 100,000 adult Qatari population. The mean age of the cohort was 64.3 years. The mean age of first ever cerebro- vascular event was 63.2 years. The diagnosis was ischemic stroke in (73.7%), transient ischemic attack in (13.8%), intracerebral hemorrhage (ICH) in (11.6%), subarachnoid hemorrhage in (0.7%) and (0.2%) cerebral venous sinus thrombosis. The study revealed that small vessel disease was the most common cause of ischemic stroke accounting for (46.5%), followed by large artery atherosclerosis (24.5%). The prevalence of hypertension and diabetes were 82.7% and 71.6% respectively. Qatari Females were older (65.8 vs 63.4 years), had more hypertension and diabetes and more disability or death at 90 days compared to Qatari males.

A cross-sectional study was conducted by Shi *et al*., [29]. This study included data of 9693 Qatari participants aged 20 years and above attending the Qatar Biobank. Food consumption was assessed by a food frequency questionnaire. The prevalence of diabetes, prediabetes and subclinical magnesium deficiency was 18.9%, 11.5% and 59.5%, respectively. Low intake of magnesium was positively associated with diabetes and high HbA1c. The authors concluded that subclinical magnesium deficiency associates with diabetes, prediabetes and hypertension in Qatari adults.

DISCUSSION

Studies reviewed in our manuscript provide data related to both the indigenous population of Qatar as well as expatriates including non-Qatari Arab and Non-Arabs.

Interestingly the indigenous population represent a uniquely distinct group displaying a greater morbidity and mortality from conditions associated with hypertension. Erectile dysfunction was significantly more prevalent among hypertensive males than normotensive males, however, Qatari males more frequently reported ED symptoms as compared to non-Qatari males. Similarly the prevalence of hearing loss was greater among Qatari patients with diabetes and hypertension in comparison to non-Qatari patients with diabetes & hypertension. In addition, hypertensive Qatari patients admitted to hospital with congestive heart failure had a higher mortality rate than hypertensive non-Qatari patients.

A higher morbidity and mortality from disease associated with hypertension within the Qatari population may in part be related to a higher prevalence of parental consanguinity and or the PPAR2y gene variant within this population.

Differences were also observed between genders. The prevalence of hypertension was non significantly higher among males. However hypertensive females had significantly higher rates of obesity and physical inactivity than men with hypertension. Females admitted to hospital following a cerebrovascular event showed greater morbidity and mortality and were more likely to be diabetic, hypertensive or both in one study. However another smaller study found that non modifiable risk factors such as gender had no impact on outcome following stroke and that outcome following rehabilitation was better in patients with modifiable risk factors such as hypertension. Women also displayed a higher mortality than men following myocardial infarction. CHF was more prevalent among males in both the hypertensive and the normotensive groups.

Most of the reviewed studies have small sample sizes and are observational, drawing on associations. Multiple factors (ie age, obesity, medication compliance, education level, diabetes, duration of hypertension, smoking, diet, lifestyle and income) are likely to be implicated in the differences observed between genders as well as those between the different ethnic communities. Further well designed studies of larger sample sizes are needed to better understand the clinical significance of these observed differences among Qatar's population.

The current prevalence of hypertension among adults within the State of Qatar is in keeping with current overall global estimates of 32%. Qatar has witnessed immense economic and population growth in recent years and it is anticipated that growth will continue ahead of 2030. Alongside this the above 60 year age group is expected to increase by the year 2050 to 19.8% of the country's total population (3.5% in 2020).

CONCLUSION

Our review shows that hypertension primarily affects the elderly population (above 50 year age group). Morbidity related to it (ie CVD, diabetes, obesity, chronic kidney disease, polypharmacy, and erectile dysfunction) will almost certainly increase in prevalence in the near future. Further high quality data is needed to well inform health policy making. Specifically studies researching rates of medication compliance, rates of optimal BP control and prescribing practices among physicians. Preventative steps ought to be taken through public health awareness, healthy lifestyle and BP screening campaigns in order to reduce the anticipated burden of hypertension related morbidity.

Community pharmacists are well placed to increase awareness and carry out screening among the general public as well as monitoring of patients with known hypertension.

Limitations: There is s possibility of data overlapping.

Abbreviations

BP Blood Pressure, CHF Congestive Heart Failure, CVD cardiovascular disease, DM Diabetes Mellitus, ED Erectile dysfunction, HTN Hypertension, MI Myocardial Infarction, QBB Qatar Biobank, T2DM type 2 Diabetes Mellitus,

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