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## **Prevalence of Hypertension in Hail Region, KSA: in a Comprehensive Survey**

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### **Abstract**

Hypertension is a global pandemic; thus, the purpose of this study was to estimate the current prevalence of hypertension in Hail Region, KSA. The study used a cross-sectional survey of Saudi civilian, included 5000 individuals selected from 30 primary health care centers (PHCs) in Hail Region. The results shows that the overall prevalence of hypertension in Hail was 30.2%. The prevalence of male was 30.8% and female was 29.6% ( $P < 0.0001$ ). The risk of hypertension increases with the increase of age, as well as, with increasing of body mass index (BMI) and this was found to be statistically significant  $p < 0.0001$ . The results designate that Hypertension is a chief health problem in Hail Region that necessitate urgent intervention control measures. Improved community-based awareness and prevention efforts are strongly needed to address the modifiable factors.

**Keywords:** hypertension; Saudi; Prevalence

### **1. Introduction**

Globally, hypertension is likely to cause 7.5 million deaths, about 12.8% of the total of all deaths. Internationally, the prevalence of hypertension in adults aged 25 and over was estimated to be around 40% in 2008.

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However, the number of persons with non-controlled hypertension increased from 600 million in 1980 to almost 1 billion in 2008, due to population growth and ageing, [1]. Hypertension is one of the most vital modifiable risk factors for cardiovascular disease. It is a tremendously frequent finding in the population and a risk factor for several conditions including; congestive heart failure, myocardial infarction, stroke, peripheral vascular disease and renal disease [2-6]. Since, hypertension can be asymptomatic in many individuals; the control of blood pressure is fundamental in the prevention of the harmful outcomes of hypertension. The discovery and control of hypertension is, consequently, an important public health challenge in various community based health services, in many countries [7].

Hypertension is a chronic medical condition in which the blood pressure in the arteries is elevated [8]. Blood pressure is determined by two measurements, systolic and diastolic, which depend on whether the heart muscle is contracting (systole) or relaxed between beats (diastole) and equate to a maximum and minimum pressure, respectively. Normal blood pressure at rest is within the range of 100-140mmHg systolic (top reading) and 60-90mmHg diastolic (bottom reading). High blood pressure is said to be present if it is determinedly at or higher than 140/90 mmHg. Hypertension is classified as either primary (essential) hypertension or secondary hypertension; about 90–95% of cases are categorized as "primary hypertension" which means high blood pressure with no noticeable original health reason [9]. The remaining 5–10% of cases (secondary hypertension) are caused by other conditions that have an effect on the kidneys, arteries, heart or endocrine system [10].

Hypertension may result from a composite interaction of genes and environmental factors [11,12]. Most of environmental factors are close to individual lifestyle. Although, many lifestyle factors elevate the risk of hypertension, many can lower it. Lifestyle factors that lower blood pressure include low dietary salt consumption [13,14], increased intake of fruits and low fat products (Dietary Approaches to Stop Hypertension (DASH diet)), exercise [15], weight loss [16] and reduced alcohol intake [17]. Stress appears to play a minor role [18] with specific relaxation techniques not supported by the evidence [19,20]. The possible role of other factors such as caffeine consumption [21], and vitamin D deficiency [22] are less clear cut. Insulin resistance, which is common in obesity and is a component of syndrome X (or the metabolic syndrome), is also thought to contribute to hypertension [23]. Recent studies have also implicated events in early life (for example low birth weight, maternal smoking and lack of breast feeding) as risk factors for adult essential hypertension, although the mechanisms linking these exposures to adult hypertension remain obscure [24].

The first line of treatment for hypertension is identical to the recommended preventive lifestyle changes [25] and includes dietary changes [26], physical exercise, and weight loss. These have all been shown to significantly reduce blood pressure in people with hypertension [27].

Although, hypertension is one of the largest causes of preventable morbidity and mortality worldwide [28]; there is a lack of population-based studies on hypertension epidemiology to guide public health strategies in KSA and in Hail region in a particular. Therefore, this a community-based aimed at providing data including prevalence of hypertension for implementing better control strategies to reduce the burden of the disease in Hail, KSA.

## **2. Materials and Methods**

Data for 4574 participants 15 years of age and older were collected from Saudi civilians living in Hail region Northern Kingdom of Saudi Arabia, during a comprehensive cross-sectional survey. During the survey participants were interviewed at PHC or home and invited to a mobile examination center to undergo various examinations and laboratory measurements. Data were collected by the doctors of the team utilizing a standard questionnaire, which included demographic information, previously diagnosed diseases (hypertension, diabetes and others) and familial history of hypertension. Blood pressure was measured and patient weight and height were obtained.

Diagnosis of hypertension was based on observation of blood pressure levels  $>140/90$  mmHg. Mean blood pressure was calculated from up to three blood pressure readings taken from participants in a seated position. Hypertension was defined as a mean blood pressure  $\geq 140/90$  or current use of medication for hypertension. Blood pressure between  $120/80$  mmHg and  $139/89$  mmHg was considered as pre-hypertension.

BMI was calculated from measured height and weight and classified as normal weight ( $<25$  kg/m<sup>2</sup>); overweight ( $25-30$  kg/m<sup>2</sup>); and obese ( $30-35$  kg/m<sup>2</sup>), morbid obesity ( $>36$  kg/m<sup>2</sup>).

### **2.1 Statistical analysis**

Data management was done using Statistical Package for Social Sciences (SPSS version 12). SPSS was used for analysis and to perform Pearson Chi-square test for statistical significance (P value). The 95% confidence level and confidence intervals were used.

### **2.2 Ethical consent**

The study was approved by University of Hail and Health affairs in Hail Region, KSA. All study subjects consented to participation by completing the self-administered questionnaire.

## **3. Results**

The mean age of the study population was  $43.5 \pm 18.7$  years with 50.8% male and 49.2% female. The overall prevalence of Hypertension in Hail was 30.2% using patients' history and 35.2% using raised blood pressure measurement. Pre-hypertension was detected in 5% of the participants. Moreover, the prevalence of male was 30.8% and female was 29.6%. First degree family history was available for 4387 participants of whom 2137/4387 (48.7%) declared as having a family history of hypertension.

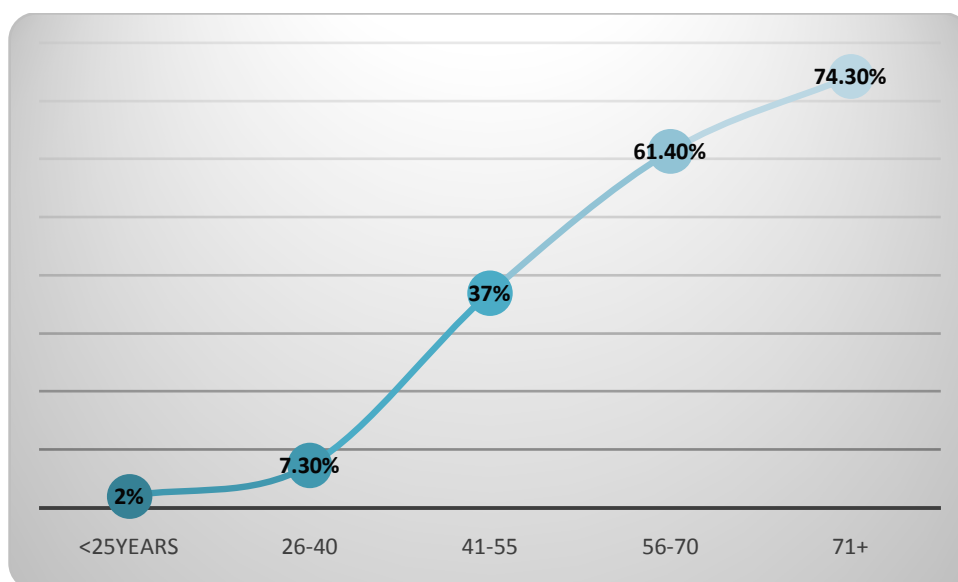
Table 1, Fig1 summarizes the relationship between hypertension and age. Of the 4574 hypertensive patients, 21,83,400,572 and 306 were at age ranges,  $<25$  years, 26-40, 41-55, 56-70, and 71+, respectively. However, when compare within the entire age group, it was found that the risk of hypertension increases with the increase of age and this was found to be statistically significant  $p < 0.0001$ , as indicated in Fig1.

Furthermore, of the 1382 hypertensive patients, diagnosis of diabetes was available for 1288 (93.2%) patients, among whom 702/1288 (54.5%) were diabetic. These findings showing strong association between diabetes and hypertension, which showing statistically significant difference ( $P < 0.001$ ).

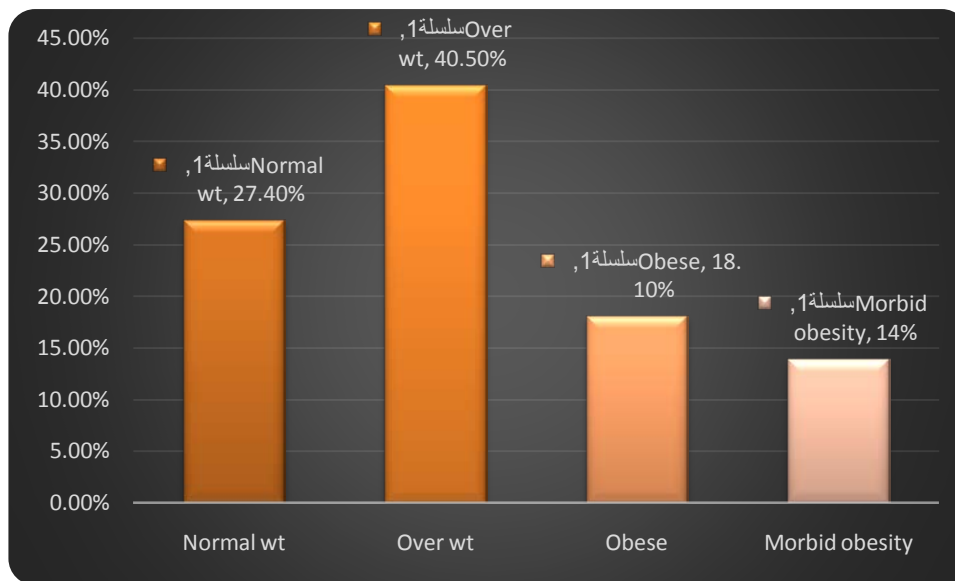
Furthermore, the body mass index was available for 3827/4574 (83.7%) of the hypertensive patients. The mean BMI was  $31.4 \pm 1.4$ . Of the 1382 hypertensive patients BMI was calculated for 1020/1382 (73.8%). Of the 1020 patients 279/1020(27.4%) were with normal weight, but 413/1020(40.5%), 185/1020(18.1%) and 143/1020(14%) were classified as overweight, obese and with morbid obesity, respectively, as shown in Fig2. Accordingly, the relationship between diabetes and getting overweight is very strong, which was found to be statistically significant ( $P < 0.0001$ ).

**Table 1. Distribution of the study population by diabetes and age**

Age	hypertensive	Non- hypertensive	Total
<25 years	21	992	1013
26-40	83	1051	1134
41-55	400	683	1083
56-70	572	359	931
71+	306	106	412
<b>Total</b>	<b>1382</b>	<b>3191</b>	<b>4574</b>



**Figure 1. Description of the proportions of diabetic patients by age ranges**



**Figure2 Description of Hypertensive patients with body mass index (BMI)**

#### 4. Discussion

Hypertension is a major risk factor for many diseases, particularly cardiovascular diseases. In the present study the prevalence of hypertension was 30.2% and raised blood pressure was 35.2% which were relatively lower than global reports. Globally, the prevalence of raised blood pressure was about 40%. The highest prevalence rate was in Africa (46%) for both sexes jointed. The lowest prevalence of raised blood pressure was in the Americas at 35% for both sexes. Men have higher prevalence than women [1]. However, most of these studies were performed in relatively older patients (> 25 years), where the current study used a cut age of 15 years.

In Saudi Arabia there are many studies in this context, in which, there was continuous increase in the prevalence rates of hypertension. A study from Saudi showed that Systolic blood pressure hypertension (SBPH) showed a statistically significant difference ( $P < 0.001$ ) among different KSA regions. Using the definition of hypertension as  $> 140/90$  mm Hg, the highest SBPH prevalence was reported from Makkah area (sexes combined) (27.9%), while the lowest was found in Jeddah area (14.9%). The highest prevalence of DBPH was identified in Al-Taif area (36.2%) and the lowest from Makkah and Asir areas (22% each) [29].

In a study examined 17,230 subjects, their ages 30-70 years for the duration of a 5-year period from 1995 to 2000 in Saudi Arabia; the prevalence of hypertension was 26.1% in rudimentary terms. For males, the prevalence of hypertension was 28.6%, whereas, for females, it was significantly lower at 23.9% ( $p < 0.001$ ) [30]. In a study investigated 4758 Saudi civilians in 2005 has found that the prevalence of hypertension is 25.5% [31]. The prevalence of hypertension (HTN) in a random sample of 243 individuals in 2008 in Jeddah, KSA, was 22.6% [32].

These studies show that different investigators found different prevalence rates of hypertension in different areas of the KSA. These differences in the prevalence of hypertension are very difficult to comprehend, unless one

explains them based on differences in the methods of data collection. Although, there are some limitations in this study, such as, the participants were recruited and most of respondents are older individuals, but our findings is in agreement with expected increase of hypertension due to growing exposure to different risk factors. However, and to the best of our knowledge this is only study in this context from North KSA, Hail area.

In the present study 54.5% of the hypertensive patients were found diabetic. Several studies have shown that hypertension frequently coexists with type 2 diabetes (DM), and increases the risk of cardiovascular outcomes [33,34]. Therefore, it is important to identify patients with these conditions early in the disease course, before reaching more complicated condition [35].

Furthermore, 72.6% of the hypertensive patients in the current study were regarded as overweight. Obesity is a well-known risk factor of many diseases, including cardiovascular and renal diseases [36]. Obesity elevates blood pressure in most patients with essential hypertension. Activation of the sympathetic nervous system acts as, a key part in escalating renal sodium re-absorption, impairing pressure natriuresis, and raising BP in obese persons. Activation of the SNS, which seems to be partially mediated by increased levels of the adipocyte-derived hormone leptin [37,38].

## **5. conclusions**

The prevalence of hypertension is increasing in North KSA (Hail Region) with increase of risk factors such as obesity. The number of individuals with both hypertension and diabetes or obesity is high which requires strict interventions. Increasing awareness of hypertension, improving hypertension control, and encouraging evidence-based practices addressing hypertension are strongly needed. Assessment of different hypertension risk factors is needed in Hail region. Finally we can say that the limitation of this study is its cross sectional setting.

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## ***Competing interests***

All authors declare that there is no competing interest in the submitted work.

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## **Novelty and Significance**

This study presented for the first time a huge data from Northern Saudi Arabia, which lacks such data about hypertension. The findings of this study may encourage local health providers to implement more measures regarding control and overall management of patients with hypertension. The study also stimulates more research in hypertension and its risk factors among Saudi population, particularly in Northern Kingdom of Saudi Arabia.

## **References**

- [1] WHO. Global Health Observatory (GHO): Raised blood pressure. Geneva, World Health Organization, 2013. Available at: [http://www.who.int/gho/ncd/risk\\_factors/blood\\_pressure\\_prevalence\\_text/en/](http://www.who.int/gho/ncd/risk_factors/blood_pressure_prevalence_text/en/)
- [2] Whelton PK. Epidemiology of hypertension. *Lancet*. 1994; 334:101-106.
- [3] MacMahon S, Peto R, Cutler J, Collins R, Sorlie P, Neaton J, Abbott R, Godwin J, Dyer A, Stamler J. Blood pressure, stroke, and coronary heart disease, part I: prolonged differences in blood pressure: prospective observational studies corrected for the regression dilution bias. *Lancet*. 1990;335:765-774.
- [4] Fiebach NH, Hebert PR, Stampfer MJ, Colditz GA, Willett WC, Rosner B, Speizer FE, Hennekens CH. A prospective study of high blood pressure and cardiovascular disease in women. *Am J Epidemiol*. 1989;130:646-654.
- [5] Whelton PK, Perneger TV, Klag MJ, Brancati FL. Epidemiology and prevention of blood pressure-related renal disease. *J Hypertens*. 1992;10(suppl 7):S77-S84.
- [6] Stamler J, Stamler R, Neaton JD. Blood pressure, systolic and diastolic, and cardiovascular risks: U.S. population data. *Arch Intern Med*. 1993;153:598-615.
- [7] Kwok Leung Ong, Bernard M.Y. Cheung, Yu Bun Man, Chu Pak Lau, Karen S.L. Lam. Hypertension Treatment and Control: Prevalence, Awareness, Treatment, and Control of Hypertension among United States Adults 1999–2004. *Hypertension* 2007; 49: 69-75.
- [8] Chobanian AV, Bakris GL, Black HR, et al. "Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure". *Hypertension (Joint National Committee On Prevention)*2003; 42 (6): 1206–52.
- [9] Carretero OA, Oparil S. "Essential hypertension. Part I: definition and etiology". *Circulation* 2000;101 (3): 329–35.
- [10] O'Brien, Eoin; Beevers, D. G.; Lip, Gregory Y. H. ABC of hypertension. London: BMJ Books. Papadopoulos DP, Mourouzis I, Thomopoulos C, Makris T, Papademetriou V (December 2010). "Hypertension crisis". *Blood Press* 2010;19 (6): 328–36.
- [11] Munroe PB, Rice KM et al. "Genetic variants in novel pathways influence blood pressure and cardiovascular disease risk". *Nature* 2011; 478 (7367): 103–9.
- [12] EhretLifton, RP; Gharavi, AG, Geller, DS (2001-02-23). "Molecular mechanisms of human hypertension". *Cell* 2001; 104 (4): 545–56.
- [13] He, FJ; MacGregor, GA). "A comprehensive review on salt and health and current experience of worldwide salt reduction programmes". *Journal of Human Hypertension*2009; 23 (6): 363–84.

- [14] He, FJ; Li, J; Macgregor, GA. "Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials". *BMJ (Clinical research ed.)* 2013;346: f1325.
- [15] Dickinson HO, Mason JM, Nicolson DJ et al. "Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials". *J. Hypertens* 2006; 24 (2): 215–33.
- [16] Haslam DW, James WP. "Obesity". *Lancet*2005; 366 (9492): 1197–209.
- [17] Whelton PK, He J, Appel LJ, Cutler JA, Havas S, Kotchen TA et al. "Primary prevention of hypertension: Clinical and public health advisory from The National High Blood Pressure Education Program". *JAMA* 2002;288 (15): 1882–8.
- [18] Marshall, IJ; Wolfe, CD; McKeivitt, C. "Lay perspectives on hypertension and drug adherence: systematic review of qualitative research". *BMJ (Clinical research ed.)*2012; 345: e3953.
- [19] Dickinson, HO; Mason, JM; Nicolson, DJ; Campbell, F; Beyer, FR; Cook, JV; Williams, B; Ford, GA. "Lifestyle interventions to reduce raised blood pressure: a systematic review of randomized controlled trials". *Journal of hypertension* 2006;24 (2): 215–33.
- [20] Ospina MB, Bond K, Karkhaneh M et al. "Meditation practices for health: state of the research". *Evid Rep Technol Assess (Full Rep)*2007; (155): 1–263.
- [21] Mesas, AE; Leon-Muñoz, LM; Rodriguez-Artalejo, F; Lopez-Garcia, E. "The effect of coffee on blood pressure and cardiovascular disease in hypertensive individuals: a systematic review and meta-analysis". *The American journal of clinical nutrition* 2011;94 (4): 1113–26.
- [22] Vaidya A, Forman JP. "Vitamin D and hypertension: current evidence and future directions". *Hypertension* 2010;56 (5): 774–9.
- [23] Sorof J, Daniels S. "Obesity hypertension in children: a problem of epidemic proportions". *Hypertension* 2002;40 (4): 441–447.
- [24] Lawlor, DA; Smith, GD. "Early life determinants of adult blood pressure". *Current Opinion in Nephrology and Hypertension*2005; 14 (3): 259–64.
- [25] NPS Medicines Wise. September 1, 2010. Retrieved 5 November 2010. Available at: <http://www.nps.org.au/publications/health-professional/prescribing-practice-review>
- [26] Siebenhofer, A; Jeitler, K, Berghold, A, et al. "Long-term effects of weight-reducing diets in hypertensive patients". In Siebenhofer, Andrea. *Cochrane Database of Systematic Reviews*2011; 9 (9): CD008274.
- [27] Go, AS; Bauman, M; King, SM; Fonarow, GC; Lawrence, W; Williams, KA; Sanchez, E. "An Effective Approach to High Blood Pressure Control: A Science Advisory From the American Heart Association, the American College of Cardiology, and the Centers for Disease Control and Prevention.". *Hypertension* 2013; PMID 24243703
- [28] PrashantKotwani, DalsoneKwarisiima, Tamara D Clark. Et al. Epidemiology and awareness of hypertension in a rural Ugandan community: a cross-sectional study. *BMC Public Health* 2013, 13:1151.
- [29] Mansour M. Al-Nozha, Ali K. Osman. The Prevalence of Hypertension in Different Geographical Regions of Saudi Arabia. *Ann Saudi Med* 1998;18(5):401-407.
- [30] Al-Nozha MM, Abdullah M, Arafah MR, et al. Hypertension in Saudi Arabia. *Saudi Med J.* 2007 Jan;28(1):77-84.
- [31] Abdalla AS, Nasser AA, Ahmed AB, et al. Prevalence, Awareness, Treatment, and Control of Hypertension among Saudi adult population: A national Survey. *International Journal of hypertension* 2011;2011: 12 pages.



- [32] Elkhalfa AM, Kinsara AJ, Almadani. Prevalence of Hypertension in a Population of Healthy Individuals. *Med Princ Pract* 2011;20:152–155.
- [33] Mancia G. The association of hypertension and diabetes: prevalence, cardiovascular risk and protection by blood pressure reduction. *Acta Diabetol* 2005, 42:S17-S25.
- [34] Luciana V Viana, Cristiane B Leitão, Maria F Grillo, et al. Hypertension management algorithm for type 2 diabetic patients applied in primary care. *Diabetology & Metabolic Syndrome* 2013, 5:52.
- [35] Sonak D Pastakia, Shamim M Ali, Jemima H Kamano, et al. Screening for diabetes and hypertension in a rural low income setting in western Kenya utilizing home-based and community-based strategies. *Globalization and Health* 2013, 9:21.
- [36] Bolesław Rutkowski, Piotr Czarniak, Ewa Król, Przemysław Szcześniak and Tomasz Zdrojewski. Overweight, obesity, hypertension and albuminuria in Polish adolescents—results of the Sopkard 15 study. *Nephrol. Dial. Transplant* 2013; 28(4):204.
- [37] John E Hall. The Kidney, Hypertension, and Obesity. *Hypertension*. 2003; 41: 625-633.
- [38] John E Hall, Alexandre A. da Silva, Jussara M, et al. Obesity-induced Hypertension: Role of Sympathetic Nervous System, Leptin, and Melanocortins. *Biological Chemistry*, 285, 17271-17276.