

Social knowledge of symptoms, risk factors, causes and complications of hypertension among Al-Ahsa population, Saudi Arabia

To Cite:

Elsheikh E, Al Gharash A, Almohammed B, AlJumaah M, Al Omaish M, Albahrani A, Al Musaleem H, Ebrahim S. Social knowledge of symptoms, risk factors, causes and complications of hypertension among Al-Ahsa population, Saudi Arabia. *Medical Science*, 2021, 25(112), 1355-1363

Author Affiliation:

¹Department of Internal Medicine, college of Medicine, King Faisal University, Alahsa, Saudi Arabia & Department of Cardiology, College of Medicine, Tanta University, Egypt

²Medical Intern, college of Medicine, King Faisal University, Alahsa, Saudi Arabia

³Department of Family medicine, college of Medicine, King Faisal University, Alahsa, Saudi Arabia

Peer-Review History

Received: 08 May 2021

Reviewed & Revised: 10/May/2021 to 01/June/2021

Accepted: 01 June 2021

Published: June 2021

Peer-review Method

External peer-review was done through double-blind method.

Eman Elsheikh¹, Ali Al Gharash², Baqer Almohammed², Mohammed AlJumaah², Murtada Al Omaish², Abdulaziz Albahrani², Haider Al Musaleem², Sayed Ebrahim³

ABSTRACT

Background: Hypertension is a major global health concern. Despite it is a leading risk of morbidity and mortality, most people with hypertension are unaware of their problem. The main aim of this study was to determine the knowledge of symptoms, risk factors, causes and complications of hypertension among AL-Ahsa population, Saudi Arabia. *Methods:* A cross sectional study of Saudi adults was conducted in the assigned primary health care centres in Al-Ahsa area of Saudi Arabia. A suitably designed questionnaire (standard self-reported questionnaire) was used for data collection. *Results:* Out of total of 660 participants, (55.3%) of the subjects were females and (44.7%) were males. Among those, most of the participants were at the age of 55 or below (86.4%). Level of knowledge about hypertension was low score in (28.3%), while (44.4%) are moderate and (27.6%) considered having a high level of knowledge. *Conclusion:* Although more than two third of the study subjects were having average to good awareness level about hypertension and its risk factors, patients do not have a comprehensive understanding of this global and preventable condition.

Keywords: Hypertension, Knowledge, AlAhsa, Saudi Arabia.

1. INTRODUCTION

Hypertension (HTN) represents one of the major cardiovascular risk factors (WHO global status report on noncommunicable diseases, 2014). Uncontrolled HTN causes diseases affecting various organs including cardiac failure, myocardial infarction, stroke, dementia, renal failure, and blindness (WHO global status report on noncommunicable diseases, 2014). Although it can lead to life-threatening complications, it is rarely symptomatic, hence, named a "silent killer" (WHO- A global brief on hypertension, World Health Day, 2013). It is estimated that HTN affects around 1.13 billion people worldwide



DISCOVERY
SCIENTIFIC SOCIETY

© 2021 Discovery Scientific Society. This work is licensed under a Creative Commons Attribution 4.0 International License.

(WHO-hypertension fact sheets, 2021). Furthermore, the World Health Organization classifies it as a major cause of premature mortality worldwide (WHO-hypertension fact sheets, 2021).

In Saudi Arabia (SA), it has been estimated that HTN affects more than a quarter of the adult population, being more prevalent among the urban population (Al-Nozha et al., 2007). A study, conducted in SA 2010, stated that ischemic heart disease and cerebrovascular disease were respectively the two leading causes of death and disability (Memish et al., 2014). In addition, the same study showed that elevated blood pressure (BP) was the fourth leading risk factor for disability-adjusted life years in the country (Memish et al., 2014). Another study, in the eastern province of SA, reported that HTN was the most prevalent risk factor (38%) among patients diagnosed with stroke (Al-Rajeh et al., 1998).

Being more specific, a screening campaign, in the eastern province of SA, investigated the geographical distribution of confirmed HTN cases in the region, among women; the highest rate was from Al-Ahsa (22.8%) (Al-Turki et al., 2008). On the other hand, among men, the second highest rate was also from Al-Ahsa (15.6%) (Al-Turki et al., 2008). To assess the prevalence of BP control in patients with both HTN and type 2 diabetes mellitus, another study in Al-Ahsa found that 84% of the participants had poorly controlled BP (Emeka et al., 2017). Upon investigating the level of awareness among hypertensive patients in SA, it was found that less than half (44.7%) were adequately aware of their disease (Saeed et al., 2011). A lower result was found in Al-Qassim's primary health care centers, as only 23% of the studied hypertensives were adequately aware of their disease (Kalantan et al., 2001).

In the majority of HTN cases, the specific etiology cannot be determined (Carretero et al., 2000). However, several modifiable and non-modifiable risk factors contribute to its development (WHO- A global brief on hypertension, World Health Day, 2013). Unhealthy diet, physical inactivity, obesity, tobacco use, alcohol abuse and persistent stress are modifiable risk factors (WHO- A global brief on hypertension, World Health Day, 2013). Therefore, HTN is considered the most important modifiable risk factor for cardiovascular diseases; hence, lifestyle modification plays an essential role in the prevention and control process (Samadian et al., 2016). Consequently, lack of knowledge and awareness becomes a barrier to the prevention and control of this condition (WHO global status report on noncommunicable diseases, 2014). As the literature is deficient regarding such information in Al-Ahsa in Saudi Arabia, the aim of this study was to assess the social knowledge and practice regarding HTN symptoms, risk factors, causes and complications in Al-Ahsa.

2. STUDY METHODOLOGY

Study design and population

A descriptive cross-sectional study of Saudi adults (18 years and above) is carried out mainly to determine the social knowledge about symptoms, risk factors, causes and complications of hypertension. All adults who currently live in Al-Ahsa cities or villages and accept to be a part of this study by signing a consent form are included.

Setting

The study was conducted in multiple primary health care centers in Al-Ahsa area of the Eastern province of Saudi Arabia. It is considered the largest oasis in Saudi Arabia, lies about 40 miles (65 km) west of the Arabian Gulf. Al-Ahsa has a population about 1000000 Saudi inhabitants. Most of its population is congregated in towns Al-Hufuf and Al-Mubarraz, the rest of the population is scattered through more than 50 small villages. Many of the Saudi inhabitants work in traditional careers e.g., farming.

Sample Size and Sampling Technique

Sample size was determined by Raosoft software, with margin of error 5%, confidence level 95%, population size about 1000000, and response distribution 50% for calculation of sample size. The sample size was estimated to be 400 participants. However, we increased the sample size to be 661 participants. We followed a convenience sampling technique for selection of the participants from about 12 centers of primary health care in Al-Ahsa cities and villages.

Study procedure

The study conducted by using a questionnaire for patients who visit the assigned primary health care centers in Al-Ahsa, without collection of any identifiable data. Only patients who agreed to participate in the study, asked to complete and return the questionnaire form. The primary outcome was that the level of social knowledge of symptoms, risk factors, causes and complications of hypertension is low. The secondary was that there is an association between knowledge of hypertension risk

factors and lifestyle practices. Also, there might be a relationship between the level of knowledge and the socio-demographic factors.

The data of this study was collected by using a standard self-reported questionnaire, which was reviewed by specialists, and will be written in Arabic. After taking the permission from the administration of each primary health care center in Al-Ahsa, we tried to have an agreement with nurses who work there to help us and ask the patients to complete the questionnaire form after taking their consent. It was pre-tested on 15 patients to ensure readability and proper administration of the data collection forms. The questionnaire contained 3 sections; the first section was socio-demographic data: which included questions about age, gender, marital status, occupation, residency, level of education, monthly family income. The second section was knowledge about symptoms, risk factors, causes and complications of hypertension. The third section was lifestyle practices and attitude regarding preventing or controlling hypertension.

Data management

The data was stored in the computer with high privacy and confidentiality even though it will not contain any identifiable data.

Statistical analysis

Statistical Package for social sciences (SPSS) was used for data entry and analysis.

Study duration

The period of the study was from July 2020 to November 2020.

3. RESULTS

A total of 660 participants where (55.3%) of the subjects were females and (44.7%) were males. Among those, most of the participants were at the age of 55 or below (86.4%), and (13.6%) were above the age of 55, whereas the youngest involved participants were at the age of 18. The majority of the subjects (70.15%) were within the low-moderate monthly income (10000 SAR and below), while (29.75%) of the participants were within the high-income category (more than 10000 SAR). About half of the participants (52.6%) with an educational level beyond high school and (33.3%) were school level educated and the least category (14.1%) represents the uneducated participants. Regarding the marital status, most of the participants were married (79.2%), and (18%) were singles while the rest (2.8%) composed of widows & separated couples (Table 1).

Table 1 Distribution of the subjects according to age, gender, social & economic status

| | Category | Frequency | Percent |
|--------------------|------------------|-----------|---------|
| 1. Age | 18-25 | 114 | 17.3 |
| | 26-35 | 136 | 20.6 |
| | 36-45 | 201 | 30.5 |
| | 46-55 | 119 | 18.0 |
| | >55 | 90 | 13.6 |
| 2. Gender | male | 295 | 44.7 |
| | female | 365 | 55.3 |
| 3. Education level | school | 220 | 33.3 |
| | higher education | 347 | 52.6 |
| | uneducated | 93 | 14.1 |
| 4. Marital status | single | 119 | 18 |
| | married | 523 | 79.2 |
| | separated | 9 | 1.4 |
| | widow | 9 | 1.4 |
| 5. Residence | village | 349 | 52.9 |
| | city | 311 | 47.1 |

| | | | |
|--------------------------|-----------------|-----|-------|
| 6. Family monthly income | less than 5000 | 259 | 39.2 |
| | 5000-10000 | 205 | 30.95 |
| | more than 10000 | 196 | 29.75 |

General knowledge

The conducted survey involved multiple questions regarding the knowledge and attitude that can influence blood pressure. In this study, the source of knowledge of the participants was mainly from mainly from doctors (57.4%) while the least source was the surrounding society (8.9%) (Figure 1). The participants’ most answers in regard to the manifestation of hypertension contributes to headache (77.7%), while the least believed presentation was asymptomatic (9.1%) (Figure 2).

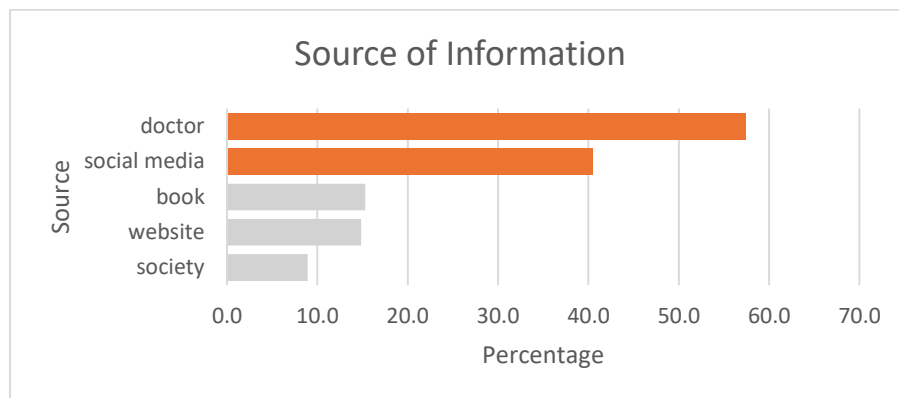


Figure 1 Pivot chart demonstrating the distribution of the source of information regarding HTN

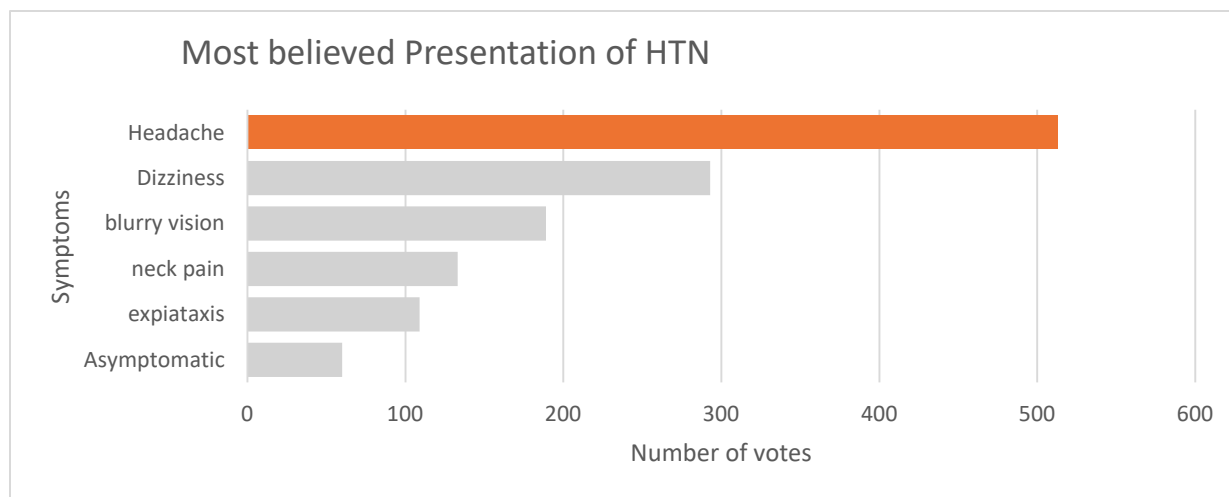


Figure 2 Pivot chart demonstrating the distribution of most believed manifestation of HTN

Overall knowledge level & socioeconomic status

Regarding the overall knowledge, most of the study population showed a moderate level of knowledge (44.1%), in addition, 28.3% showed low level of knowledge and 27.6% showed a high level of knowledge. The sociodemographic groups that demonstrated the highest levels of knowledge are the higher education group and whose family income exceeds 10,000 Saudi Riyal per month (P value = 0.0001 and 0.024 respectively) (Tables 2 & 3).

Table 2 General Level of Knowledge

| Level of Knowledge | chi square | p value |
|--|------------|---------|
| Level of Knowledge with Occupation. | 9.276 | 0.055 |
| Level of Knowledge with Education. | 33.641 | 0.0001 |
| Level of Knowledge with Monthly family income. | 14.549 | 0.024 |

Table 3 Level of Knowledge in Association with socioeconomic status

| | | Frequency | Percentage |
|-----------|----------|-----------|------------|
| knowledge | low | 187 | 28.3 |
| | moderate | 291 | 44.1 |
| | high | 182 | 27.6 |

Practice of regular exercise was significantly associated with age, male gender, higher education level and being unmarried. Smoking was significantly associated with male gender, low education level and city residency. Consumption of unhealthy diet was significantly associated with young age students' group. Although the obese population believed that practicing regular physical activity and lifestyle modification are essential in the management of HTN, this population did not have a significant association with the practice of healthy attitudes. As BP screening was a part of the survey, we found that 3.5% of the study population who was not previously diagnosed with HTN has a systolic blood pressure (SBP) higher than 140mmHg.

4. DISCUSSION

Awareness regarding different aspects of any illness is vital in prevention and control of that illness. Many health programs have endorsed this for prevention and control of diseases in community.

Knowledge

Awareness of the major lifestyle risk factors of hypertension and its warning signs has a direct implication for the therapeutic measures and prevention of its complication among hypertensive patients. In the present study, out of total 660 participants 97.3 % heard of the disease hypertension through many sources and the doctor (57.4%) was the most frequent one. However, in another Indian study, only 73 % (out of 500 participants) had heard of the word hypertension (Kumar et al., 2016). More than half of the participants in this study (51.1%) believed that HTN is extreme dangerous which is in line with another study done in Jeddah, Saudi Arabia in 2017 (Bakhsh et al., 2017).

In the current study, only 40.9 % of the participants knew the normal SBP value (less than 140) and 35 % of them knew the normal diastolic blood pressure (DBP) value (less than 90) according to JNC 8. On the other hand, there are several studies showed higher percentage of the knowledge regarding the normal values of blood pressure (Bollampally et al., 2016; Mounica et al., 2015; Sanne et al., 2008; Pirasath et al., 2017). In this study, 42.6 % of the participants believed that SBP and DBP are both important, that is much better than near study in 2017 Northern Sri Lanka, which reported only 24.8 % (out of 303 participants) were aware of the importance of monitoring and controlling the SBP (Pirasath et al., 2017).

Understanding of the persistent nature of HTN may affect long term outcomes of the disease. Only 56.1% of the participants in our study believed that HTN is a lifelong disease, which is the same in a previous study in Louisiana in New Orleans that reports 60.5 % (out of 100 participants) (Sanne et al., 2008). Furthermore, a low percentage (6.3%) of a study done in Northern Sri Lanka showed that HTN is a lifelong disease (Pirasath et al., 2017). In the conducted study, most of the participants believed that HTN is symptomatic, and the most frequent symptoms were headache (77.7%), dizziness (44.4%), and blurry vision (28.6%). Only 9.1% of the participants believed it is asymptomatic, which is considered to be the most common presentation of HTN. As a result, delaying in the diagnosis of this disease which is why called silent killer. Mounica et al., (2015) supported the results of this study, whose study showed 84% knew the symptoms of HTN. On the other hand, in several previous studies showed lower percentage regarding the knowledge of the symptoms of HTN (Kumar et al., 2016; Bollampally et al., 2016).

Only 68.9% of studied population agreed that lowering and controlling the blood pressure improves the person's health and prevents the complications. Compared with a previous study done in Saudi Arabia in Jeddah, 83.7 % of the participants agreed that lowering blood pressure improves the person's health and prevent the complications (Bakhsh et al., 2017). In the current study, the most frequent measures were claimed by the participants for lowering the blood pressure were sleeping enough hours (82.4%) and regular exercising (85.6%). Compared with previous studies, participants were less aware of the good association between the physical activity and HTN in term of improving the condition (Kumar et al., 2016; Mounica et al., 2015).

In this study, most of the participants knew most of the common complications of HTN, which included stroke (71.1%), cardiovascular diseases (73.6%), and eye diseases (50.9%). This agrees with previous studies stated that the studied populations were aware of common HTN complications e.g., stroke and cardiovascular (Bollampally et al., 2016; Al-Turki et al., 2008). On the

contrary side, a previous study showed only 23.75 % of participants were knowledgeable regarding the complications of HTN and in another study only 6 % knew the complications of HTN (Bakhsh et al., 2017; Pirasath et al., 2017).

Awareness of the risk factors of HTN in this study was better than other several studies done in several areas in the world. Awareness of the most common risk factors noticed in this study by the participants are too much salt intake (90%), stress (89.1 %), obesity (75.5%), and smoking (62.1%). A previous study was done in Jeddah, Saudi Arabia, reported that only 64.9 % of the participants consider high salt intake as a risk factor, as well as stress (58.8%) (Bakhsh et al., 2017). In another previous study in Pakistan and Najera, showed less knowledge regarding the risk factors of HTN (Shaikh et al., 2012; Bakhsh et al., 2017). Awareness of aging and smoking as risk factors for HTN in our study found to be low compared with a previous study which showed higher percentage (Pirasath et al., 2017). Inversely, awareness of possible inheritance as a risk factor for HTN in this study was high (65%) compared with previous study (Pirasath et al., 2017).

Level of Knowledge was average (44.1%) among participants in our study, which is in line with another previous study done in Jeddah, Saudi Arabia (Bakhsh et al., 2017). However, in a previous study done in India 2016, half of the studied sample had poor level of knowledge regarding HTN. Furthermore, in several previous studies showed that most of the participants were having good level of knowledge (Bollampally et al., 2016; Mounica et al., 2015).

Attitude

The present study shows that 54.5% of the participants are physically active. Moreover, 89.2% of the participants in this study think that regular physical activity can decrease BP. The majority of participants in this study were non-smokers and only 15.9% are smokers. Similarly, in a previous national study 90.7% of eastern province populations were non-smokers (MOH- Environmental Risk Factors, world health survey, 2021). In this study 89.4% believe that changing lifestyle help to lower BP. On the contrary, 18.8% of the participants in the study think that medications alone can control HTN. In the conducted study, 46.1% of the participants in this study were following unhealthy diet. This is aligned with what was reported previously that 90.1% of eastern province population have insufficient intake of fruit and vegetables (MOH- Preventative health behavior, world health survey, 2021). However, 84.2% of the participants think that diet control will improve BP.

Relationship between knowledge and sociodemographic characteristics

A total of 660 participants where (55.3%) of the subjects were females and (44.7%) were males. Among those, most of the participants were at the age of 55 or below (86.4%), and (13.6%) were above the age of 55, whereas the youngest involved participants were at the age of 18. The majority of the subjects (67.8%) were withing the low-moderate monthly income (10000 SAR and below) and most of the participants (85.9%) were educated, whereas the rest (14.1%) were uneducated. In this study, the level of knowledge about hypertension was low score in (28.3%), while (44.4%) are moderate and (27.6%) considered having a high level of knowledge. In contrast to another study that was conducted in KSA which showed a majority of (72.6%) are highly educated (Bakhsh et al., 2017). In addition to other studies that showed a majority of high level of knowledge (Sadeq et al., 2017; Kwak et al., 2016).

The results imply that those with a higher level of knowledge are mainly composed of those with a higher monthly income ($p=0.024$) as well as those with higher educational levels ($p<0.05$). Similar results were also reported in other studies (Bakhsh et al., 2017; Sadeq et al., 2017). In comparison the participants with lower monthly income (<10000 SAR) and lower educational level (high school and non-educated) scored a lower level of knowledge. Such findings were also reported in another study conducted for 294 hypertensive patients (Ferdinand et al., 2016). Yet there was no significant relationship between knowledge and age or gender, in contrast to the other reported studies that showed a significant relationship (Bakhsh et al., 2017; Sadeq et al., 2017; Kwak et al., 2016).

However, despite the fact that (71.1%) of the participants of this study have moderate-high level of knowledge, most of them did not know about the normal readings of blood pressure. The results showed (59.1%) did not know that SBP should be <140 mm HG, and (65%) did not know that DBP should be <90 mm HG. Unlike another study which showed reported that (>70%) of the participants know about the normal readings (Amer et al., 2019; Pirasath et al., 2017; Fiala et al., 2000).

Relationship between the sociodemographic characteristics and lifestyle practices and attitude

Certain sociodemographic characteristics were associated with certain participants' attitudes toward the risk factors of HTN. The younger population in our study reported a higher practice of exercise. Specifically, the age group 26-35 years was associated with the highest practice of regular exercise (p value 0.000). Previous two studies, in the central region of SA, found similar results and suggested that health education has led to this improvement in the younger generations (Sadeq et al., 2017; AlQuaiz et al., 2019). On

the other hand, the older population in the current study reported a dietary modification towards a healthier dietary choice; it is the same case as in Qassim region, SA (Sadeq et al., 2017).

Males were found to practice more physical activity than females; in contrast, the majority of the smokers were from the male population. These gender differences are consistent with the results of other studies done in Riyadh city, the neighboring Gulf countries, the United States and Czech Republic (Al Quaiz et al., 2019; Fiala et al., 2000). Consequently, females should be targeted in health education campaigns regarding the importance of practicing regular physical activity. Furthermore, although the employed participants knew that lifestyle modification has an essential role in the control of BP level and medications alone are not enough, they smoke more and practice less physical activity than the student population (p value 0.000 and 0.001 respectively). This finding maybe attributed to a busier lifestyle and more responsibilities; nevertheless, more information must be obtained to assess the underlying reasons. In comparison, in the United State they found that full-time workers are more active than non-workers (p value 0.004) but not in Sweden (Van Domelen et al., 2011; Kwak et al., 2016). Other categories, including the highly educated and whose family income exceeds 10,000 Saudi riyals, showed the highest levels of overall knowledge (p value 0 and 0.024 respectively) similar to other studies (Bakhsh et al., 2017; Sadeq et al., 2017), but inversely they thought that medications alone are adequate for the control of BP. A similar finding was found among the obese and villages' residents.

These findings suggest that being knowledgeable about HTN does not necessarily lead to a healthier lifestyle practices to control the disease by a part of the population. This indicates a need for a higher emphasis from the physicians and the awareness campaigns that the cornerstone of HTN management is lifestyle modification (Ferdinand et al., 2016).

5. CONCLUSION

These results suggest that, although more than two third of the study subjects were having average to good awareness level about hypertension and its risk factors; patients do not have a comprehensive understanding of this condition. For instance, less than ten percent of the subjects believed that HTN is asymptomatic, which is considered to be the most common presentation of HTN. This study clearly shows the tip of iceberg phenomenon for hypertension which will be helpful in policy making to increase awareness about hypertension and its risk factor.

Authors' contributions

Eman Elsheikh: Conception, supervision, data interpretation and revision, data collection.

Ali Al Gharash: Leadership, Communication, literature review, data collection.

Baqer Almohammed: Writing and revision, data collection.

Muhammed AlJumah: Writing and revision, data formatting and documentation.

Murtada Al Omaish: Writing, data collection.

Abdulaziz Albahrani: Writing, data collection.

Haider Al Musailleem: Writing and revision, data collection.

Sayed Ebrahim: Statistical analysis, data revision.

Acknowledgments

The authors express their gratitude to all the participants for their cooperation and feedbacks.

Ethical approval

Institutional review board (IRB) of this study was obtained by King Fahad Medical city, Riyadh, KSA. (Ethical approval code: 20-499E).

Informed consent

Informed consent was obtained from all the participants in the study.

Competing interests

Authors declare, No conflict of interest.

Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES AND NOTES

- Al-Nozha MM, Abdullah M, Arafah MR. Hypertension in Saudi Arabia. *Saudi Med J* 2007; 28(1):77-84.
- AlQuaiz AM, Siddiqui AR, Kazi A, Batais MA, Al-Hazmi AM. Sedentary lifestyle and Framingham risk scores: a population-based study in Riyadh city, Saudi Arabia. *BMC Cardiovasc Disord* 2019; 19(1):88.
- Al-Rajeh S, Larbi EB, Bademosi O, Awada A, Yousef A, Al-Freihi H. Stroke Register: Experience from the Eastern Province of Saudi Arabia. *Cerebrovasc Dis* 1998; 8(2):86-9.
- Al-Turki KA, Al-Baghli NA, Al-Ghamdi AJ, El-Zubaier AG. Hypertension in the eastern province of saudiarabia: results of a screening campaign. *J Family Community Med* 2008; 15(3):95-101.
- Amer M, N, Nazir S, Raza A, Riaz H, Sadeeqa S. Hypertension-related knowledge, medication adherence and health-related quality of life (HRQoL) among hypertensive patients in Islamabad, Pakistan. *Trop J Pharm Res* 2019; 18(5):1123-1132.
- Bakhsh LA, Adas AA, Murad MA, Nourah RM, Hanbazazah SA, Aljahdali AA, Alshareef RJ. Awareness and Knowledge on Hypertension and its Self- Care Practices among Hypertensive Patients in Saudi Arabia. *Ann Int Med Den Res* 2017; 3(5): ME58-ME62.
- Bollampally M, Chandershekhar P, Kumar KP, Surakasula A, Srikanth S, Reddy TRM. Assessment of patient's knowledge, attitude and practice regarding hypertension. *Int J Res Med Sci* 2016; 4:3299-304.
- Carretero OA, Oparil S. Essential hypertension. Part I: definition and etiology. *Circulation* 2000; 101(3):329-335.
- Emeka PM, Mukalaf AA, Helal HA, Khan TM, Almukalf MA. Prevalence of poor glycemic and blood pressure control and pattern of drug use among primary health-care outpatients in Al Ahsa Saudi Arabia. *Int J Health Sci (Qassim)* 2017; 11(3):38-44.
- Ferdinand KC, Nasser SA. Management of Essential Hypertension. *Cardiol Clin* 2017; 35(2):231-246.
- Fiala J, Brázdová Z. A comparison between the lifestyles of men and women--parents of school age children. *Cent Eur J Public Health* 2000; 8(2):94-100.
- Kalantan KA, Mohamed AG, Al-Taweel AA, Abdul Ghani HM. Hypertension among attendants of primary health care centers in Al-Qassim region, Saudi Arabia. *Saudi Med J* 2001; 22(11):960-963.
- Kumar C, Sagar V, Kumar M, Kiran KA. Awareness about hypertension and its modifiable risk factors among adult population in a rural area of Ranchi district of Jharkhand, India. *Int J Community Med Public Health* 2016; 3:1069-73.
- Kwak L, Berrigan D, Van Domelen D, Sjöström M, Hagströmer M. Examining differences in physical activity levels by employment status and/or job activity level: Gender-specific comparisons between the United States and Sweden. *J Sci Med Sport* 2016; 19(6):482-487.
- Memish ZA, Jaber S, Mokdad AH, et al. Burden of disease, injuries, and risk factors in the Kingdom of Saudi Arabia, 1990-2010. *Prev Chronic Dis* 2014; 11:E169.
- Midhet F, Al Mohaimeed AR, Sharaf F. Dietary practices, physical activity and health education in qassim region of saudi arabia. *Int J Health Sci (Qassim)* 2010; 4(1):3-10.
- Ministry of health. Preventative health behavior. Saudi Arabia. Published 2021. 12 p [cited 20 February 2021]. Available from: <https://www.moh.gov.sa/en/Ministry/Statistics/Indicator/Documents/2-Preventive-Health-Behaviors.pdf>
- Ministry of health. Environmental Risk Factors. Saudi Arabia. Published 2021. 17 p [cited 20 February 2021]. Available from: <https://www.moh.gov.sa/en/Ministry/Statistics/Indicator/Documents/3-Environmental-Risk-Factors.pdf>
- Mounica B. Study of Knowledge, Attitude and Practice of General Population of Guntur towards Silent Killer Diseases: Hypertension and Diabetes. *Value in Health*. 2015; 18. doi:10.1016/j.jval.2015.09.907
- Pirasath S, Kumanan T, Guruparan M. A Study on Knowledge, Awareness, and Medication Adherence in Patients with Hypertension from a Tertiary Care Centre from Northern Sri Lanka. *Int J Hypertens* 2017; 2017: 9656450.
- Sadeq, Raghdaa, and Riyadh K. Lafta. Knowledge, attitude and practice about hypertension in hypertensive patients attending hospitals in Baghdad, Iraq. *South East Asia Journal of Public Health* 2017; 7(1): 29-34.
- Saeed AA, Al-Hamdan NA, Bahnassy AA, Abdalla AM, Abbas MA, Abuzaid LZ. Prevalence, Awareness, Treatment, and Control of Hypertension among Saudi Adult Population: A National Survey. *Int J Hypertens* 2011; 2011: 174135.
- Samadian F, Dalili N, Jamalian A. Lifestyle Modifications to Prevent and Control Hypertension. *Iran J Kidney Dis* 2016; 10(5):237-263.

24. Sanne S, Muntner P, Kawasaki L, Hyre A, DeSalvo KB. Hypertension knowledge among patients from an urban clinic. *Ethn Dis* 2008; 18(1):42-7.
25. Shaikh MA, Dur-e-Yakta, Sadia, Kumar R. Hypertension Knowledge, Attitude and Practice in Adult Hypertensive Patients at LUMHS. *JLUMHS* 2012; 11:113-6.
26. Van Domelen DR, Koster A, Caserotti P. Employment and physical activity in the U.S. *Am J Prev Med* 2011; 41(2):136-145.
27. World Health Organization. A global brief on hypertension. Silent killer, global public health crisis. (Geneva, 2013) https://apps.who.int/iris/bitstream/handle/10665/79059/WHO_DCO_WHD_2013.2_eng.pdf
28. World Health Organization. Global status report on noncommunicable diseases 2014 (Geneva, 2014). <https://www.who.int/nmh/publications/ncd-status-report-2014/en/>
29. World Health Organization. Hypertension. (13 September 2019). <https://www.who.int/news-room/fact-sheets/detail/hypertension>