ORIGINAL ARTICLE

# Family History of Hypertension and Hypertension's Associated Risk Factors from Diet among the Saudi Population

**Mohammed Zaid Aljulifi[1], Jazil Innab[2], Ghaida Alzahrani[3], Sultan Abdulrahman Alarfaj[4], Abdulelah Almaslami[5], Abdulmajeed Balud Alotaibi[6], Abdullah Ayyadah Alruwaili[7], Osama Mishal Alshaikh[8], Ghunyah Hassan Alfaraj[9], Razan Jadid Alanazi[10], Khames T. Alzahrani[11]**

*[1]Department of Family and Community Medicine, College of Medicine, Majmaah University, Majmaah, Saudi Arabia, [2]Department of Family and Community Medicine, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia, [3]Department of Family and Community Medicine, Taif University, Taif, Saudi Arabia, [4]Department of Family and Community Medicine, Qassim University, Buraydah, Saudi Arabia, [5]Department of Family and Community Medicine, King Faisal University, Al-Hofuf, Saudi Arabia, [6]Department of Family and Community Medicine, Shaqra University, Al-Dawadmi, Saudi Arabia, [7]Department of Family and Community Medicine, Jouf University, Sakaka, Saudi Arabia, [8]Department of Family and Community Medicine, King Abdulaziz University, Jeddah, Saudi Arabia, [9]Department of Family and Community Medicine, Dar Aluloom University, Riyadh, Saudi Arabia, [10]Department of Family and Community Medicine, Qassim University, Al-Qassim, Saudi Arabia, [11]Department of Endodontics, Stanford University, Saudi Board of Endodontic SR, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia*

## Abstract

**Introduction:** Hypertension (HTN) is defined as a clinic (office) systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg. It is common, but if left untreated, it can be serious. HTN is classified as primary or secondary. High blood pressure is a disorder that damages blood vessels by forcing blood against the walls of the arteries. The circulatory system will be under greater stress, which raises the chance of cardiac conditions such as stroke, aneurysm, and congestive heart failure, as well as other conditions including renal issues, retinal hemorrhage, metabolic syndrome, and dementia. There has been a growing worry worldwide over the rise in teenage and young adult HTN cases, which go undiagnosed due to insufficient screening in that age group. We are conducting this study due to insufficient number of researches related to our topic, especially in Saudi Arabia. **Objective:** The study aimed to assess the respondents' family history of HTN and its associated risk factors from dietary triggers among the Saudi population. **Materials and Methods:** This was a cross-sectional study. This study, which conducted from July 2024 to February 2025, uses an online questionnaire to assess the prevalence of HTN and its associated risk factors (dietary among patients in Saudi Arabia). The study plans to recruit participants through an online questionnaire. The inclusion criteria for this study were as follows: All Saudi males and females over 18 years. Non-Saudis, <18 years, were excluded from this study. The minimum target sample size is 384, which was calculated using a formula based on prevalence estimation, 95% confidence level, and 5% acceptable error. **Results:** The study assessed the family history of HTN and associated dietary risk factors among 460 Saudi participants, with a mean age of 37.9 years. A significant 60.2% reported a family history of HTN, highlighting genetic predisposition. Dietary habits revealed concerning trends: 30.7% consumed white rice daily, while 45% reported daily intake of high-salt foods, both linked to HTN. Caffeinated drink consumption was high, with 60.4% drinking them daily. Notably, a lack of engagement with health-oriented beverages such as green tea and hibiscus was evident, indicating a potential gap in dietary education that could impact HTN management in this population. **Conclusion:** The findings of this study contribute to the growing body of evidence regarding the family history of HTN and its associated dietary risk factors among the Saudi population.

**Key words:** Diet, hypertension, prevalence, risk factors, Saudi Arabia

**Address for correspondence:**
Khames T. Alzahrani, King Faisal Specialist Hospital and Research Centre, Riyadh, Saudi Arabia.
E-mail: dr.khames.alzahrani@gmail.com

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## INTRODUCTION

Hypertension (HTN) is defined as a clinic (office) systolic blood pressure ≥140 mm Hg and/or diastolic blood pressure ≥90 mm Hg.[1] HTN is classified as primary or secondary, primary HTN, also called essential HTN, is described as an increased in blood pressure due to an unexplained reason that raises the risk of cerebral, cardiovascular, and renal problems.[2] Secondary HTN is defined as an elevated blood pressure that results from another disease or health condition. This includes medication, renal artery stenosis, Cushing's syndromes, and others. Even though the majority of people have essential HTN, it is crucial to recognize secondary HTN and address it.[3] High blood pressure is a disorder that damages blood vessels by forcing blood against the walls of the arteries. The circulatory system will be under greater stress, which raises the chance of cardiac conditions such as stroke, aneurysm, and congestive heart failure, as well as other conditions including renal issues, retinal hemorrhage, metabolic syndrome, and dementia.[4] Major risk factors for HTN were diabetes, chronic renal disease, body mass index (BMI), physical activity, and nutrition. Numerous of these risk variables can be changed.[5]

According to reports, 46% of people worldwide with HTN are said to live in Africa, where the incidence of HTN is highest.[6] In terms of HTN, there are clear gender disparities. It is more common among men.[7] There has been a growing worry worldwide over the rise in teenage and young adult HTN cases, which go undiagnosed due to insufficient screening in that age group.[8]

Published research has examined the prevalence of arterial HTN and its contributing factors. According to De Carvalho Lavôr *et al*., there is a substantial correlation between the occurrence of HTN and characteristics including age, brown skin color, sedentary lifestyle, and being overweight or obese.[9] According to a study done in 2023, 9.2% of Saudi people who are 15 years of age and older have HTN. Compared to men (8.5%), it was comparatively greater in women (10.0%). The frequency of HTN was comparatively low in the younger age group, accounting for 0.1% in those between the ages of 15 and 19, but it rose with age (55.3% in women and 48.0% in males) at 65 years and beyond. The prevalence of HTN varied significantly among the regions, from 6.0% in the Najran region to 10.0% in the Makkah region.[10] A medical evaluation conducted in 2021 revealed an association between the risk of HTN and nutrients, physical activity, sleep duration, smoking, coffee use, and anxiety. Smoking had the lowest factor association and nutritional status (IMT) the highest.[11]

We are conducting this study due to insufficient researches related to our topic, especially in Saudi Arabia.

### Objectives

The main objective of this study was to assess the family history of HTN and HTN's associated risk factors from dietary triggers among the Saudi population.

## MATERIALS AND METHODS

### Study design

This was a cross-sectional study. This study, which conducted from July 2024 to February 2025, uses an online questionnaire to assess the family history of HTN and HTN's associated risk factors (dietary triggers) among patients in Saudi Arabia.

### Study setting: Participants, recruitment, and sampling procedure

Participants in the study were Saudi adults over the age of 18 and English or Arabic speakers. Those who provide consent were recruited for the online questionnaire.

### Inclusion and exclusion criteria

The inclusion criteria for this study were as follows: All Saudi males and females over 18 years.

Non-Saudis, <18 years, were excluded from this study.

### Sample size

The sample size of 384 has been estimated using the Qualtrics calculator, with a 95% confidence level and a 5% margin of error.

The following formula would be used to calculate the appropriate sample size in a prevalence investigation.

To calculate sample size, use the formula $n = (z)^2\ p\ (1-p)/d^2$.

The confidence level (z) is 1.96, while the expected prevalence is 50% (p).

d = Absolute error (5%).

The sample size is 384.

### Method for data collection and instrument (data collection technique and tools)

Structured questionnaire was used as a study tool, the questionnaire consisted of 24 questions with two sections.

The main questions were taken from this research.[12]

Section 1 includes that the participant's, age, sex, social status, place of living, nationality, employment status, educational qualification, family history of HTN, smoking status, alcohol consumption, BMI, physical activity level, coffee consumption, and stress level were among the sociodemographic details gathered through the questionnaire.[13,14]

Section 2 includes food frequency and diet in the last year on average (meat and fish, bread and savory biscuits, cereals, potatoes, rice and pasta, dairy products and fats, sweets and snacks, soups, sauces, and spreads, drinks, fruits, and vegetables).

### Pilot test

The questionnaire was distributed to 20 individuals who have reached at least 18 years old and older, and they were asked to complete the points.

### Analyzes and entry method

The information was input into the device. The information was entered into a device using Microsoft Office Excel for Windows (2013). The data that were collected after that was submitted into the IBM Statistical Package for the Social Sciences (SPSS) Statistics for Microsoft Windows, Version 21.0 (SPSS Software, version 20).

### Questionnaire internal validity assessment

Cronbach's alpha coefficients were calculated to assess the internal consistency and reliability of the dietary-related sections of the questionnaire for three different groups of food frequency items. Group A included items concerning carbohydrate sources and fruits/vegetables (e.g., rice, bread, cereals, bananas, and leafy vegetables). Protein and dairy products (red meat, poultry, fish, milk, yogurt, and cheese) were included in the group of protein and dairy products (Group B). Group C looked at dietary triggers (caffeinated drinks, sweets, fast food, and pickles) and processed food items. Each item was responded to by the participants with an ordinal scale in terms of frequency of consumption: "Never" (0), "Once a week" (1), "2–3 times/week" (2), "4–6 times/week" (3), and "Daily" (4). Responses were numerically coded (standard procedures) and the degree to which multiple items in a group were measuring the same underlying construct (Cronbach's alpha) was calculated. Reliability was excellent for Groups A and B, and acceptable for Group C as the resulting alpha values were 0.83 for Group A, 0.82 for Group B, and 0.77 for Group C. The findings are consistent with the internal coherence of the questionnaire items used to assess the dietary behaviors and possible nutritional risk factors related to HTN in the studied population.

## RESULTS

Table 1 displays various demographic parameters of the participants with a total number of (460). The mean age of

**Table 1:** Sociodemographic characteristics of participants (*n*=460)

| Parameter | No. | Percentage |
|---|---|---|
| Age (Mean: 37.9, STD: 14.9) | | |
| 26 or less | 148 | 32.2 |
| 27–39 | 112 | 24.3 |
| 40–49 | 88 | 19.1 |
| 50 or more | 112 | 24.3 |
| Gender | | |
| Female | 214 | 46.5 |
| Male | 246 | 53.5 |
| Marital status | | |
| Single | 161 | 35.0 |
| Married | 265 | 57.6 |
| Divorced | 22 | 4.8 |
| Widowed | 12 | 2.6 |
| Occupational status | | |
| Student | 101 | 22.0 |
| Health sector employee | 40 | 8.7 |
| Non-health sector employee | 140 | 30.4 |
| Freelancer | 30 | 6.5 |
| Unemployed | 78 | 17.0 |
| Retired | 71 | 15.4 |
| Family history of hypertension | | |
| No | 183 | 39.8 |
| Yes | 277 | 60.2 |
| Smoking status | | |
| No | 320 | 69.6 |
| Yes | 104 | 22.6 |
| Ex-smoker | 36 | 7.8 |
| Alcohol consumption | | |
| No | 451 | 98.0 |
| Yes | 9 | 2.0 |
| Height in cm (Mean: 165.5, STD: 9.1) | | |
| 160 cm or less | 158 | 34.3 |
| 161–170 cm | 175 | 38.0 |
| 171 cm or more | 127 | 27.6 |
| Weight in kg (Mean: 74.0, STD: 19.8) | | |
| 65 kg or less | 156 | 33.9 |
| 66–80 | 183 | 39.8 |
| 81 or more | 121 | 26.3 |
| Stress level | | |
| High | 59 | 12.8 |
| Moderate | 312 | 67.8 |
| Low | 89 | 19.3 |

STD: Standard deviation

**Table 2:** Parameters related to diet regarding grains, starches, fruits, and vegetables (*n*=460) (Cronbach's alpha value for the items is 0.83)

| Parameter | No. | Percentage |
|---|---|---|
| White rice | | |
| Once a week | 57 | 12.4 |
| 2–3 times a week | 122 | 26.5 |
| 4–6 times a week | 129 | 28.0 |
| Daily | 141 | 30.7 |
| Never | 11 | 2.4 |
| Brown rice | | |
| Once a week | 85 | 18.5 |
| 2–3 times a week | 59 | 12.8 |
| 4–6 times a week | 72 | 15.7 |
| Daily | 31 | 6.7 |
| Never | 213 | 46.3 |
| Potatoes | | |
| Once a week | 155 | 33.7 |
| 2–3 times a week | 148 | 32.2 |
| 4–6 times a week | 86 | 18.7 |
| Daily | 43 | 9.3 |
| Never | 28 | 6.1 |
| Whole grains | | |
| Once a week | 142 | 30.9 |
| 2–3 times a week | 121 | 26.3 |
| 4–6 times a week | 83 | 18.0 |
| Daily | 52 | 11.3 |
| Never | 62 | 13.5 |
| White bread and rolls | | |
| Once a week | 67 | 14.6 |
| 2–3 times a week | 109 | 23.7 |
| 4–6 times a week | 114 | 24.8 |
| Daily | 133 | 28.9 |
| Never | 37 | 8.0 |
| Brown bread and rolls | | |
| Once a week | 101 | 22.0 |
| 2–3 times a week | 99 | 21.5 |
| 4–6 times a week | 77 | 16.7 |
| Daily | 65 | 14.1 |
| Never | 118 | 25.7 |
| Breakfast cereals | | |
| Once a week | 117 | 25.4 |
| 2–3 times a week | 84 | 18.3 |
| 4–6 times a week | 61 | 13.3 |
| Daily | 27 | 5.9 |
| Never | 171 | 37.2 |
| Leafy vegetables | | |
| Once a week | 84 | 18.3 |
| 2–3 times a week | 130 | 28.3 |
| 4–6 times a week | 117 | 25.4 |
| Daily | 110 | 23.9 |
| Never | 19 | 4.1 |
| Bananas | | |
| Once a week | 167 | 36.3 |
| 2–3 times a week | 134 | 29.1 |
| 4–6 times a week | 72 | 15.7 |
| Daily | 30 | 6.5 |
| Never | 57 | 12.4 |
| Oranges | | |
| Once a week | 169 | 36.7 |
| 2–3 times a week | 117 | 25.4 |
| 4–6 times a week | 72 | 15.7 |
| Daily | 39 | 8.5 |
| Never | 63 | 13.7 |
| Beets | | |
| Once a week | 128 | 27.8 |
| 2–3 times a week | 76 | 16.5 |
| 4–6 times a week | 46 | 10.0 |
| Daily | 26 | 5.7 |
| Never | 184 | 40.0 |
| Pomegranates | | |
| Once a week | 182 | 39.6 |
| 2–3 times a week | 72 | 15.7 |
| 4–6 times a week | 55 | 12.0 |
| Daily | 29 | 6.3 |
| Never | 122 | 26.5 |
| Dates | | |
| Once a week | 69 | 15.0 |
| 2–3 times a week | 106 | 23.0 |
| 4–6 times a week | 90 | 19.6 |
| Daily | 171 | 37.2 |
| Never | 24 | 5.2 |
| Apricots and grapes | | |
| Once a week | 172 | 37.4 |
| 2–3 times a week | 102 | 22.2 |
| 4–6 times a week | 41 | 8.9 |
| Daily | 25 | 5.4 |
| Never | 120 | 26.1 |

(*Contd*...)

participants, at 37.9 years, is remarkably low and its standard deviation of 14.9 suggests an extremely young cohort: 32.2%

**Table 3:** Participants' diet of proteins, milk, and milk products (*n*=460) (Cronbach's alpha value for the items is 0.82)

| Parameter | No. | Percentage |
|---|---|---|
| Red meat | | |
| Once a week | 142 | 30.9 |
| 2–3 times a week | 147 | 32.0 |
| 4–6 times a week | 92 | 20.0 |
| Daily | 48 | 10.4 |
| Never | 31 | 6.7 |
| Poultry | | |
| Once a week | 25 | 5.4 |
| 2–3 times a week | 112 | 24.3 |
| 4–6 times a week | 171 | 37.2 |
| Daily | 150 | 32.6 |
| Never | 2 | 0.4 |
| Fish | | |
| Once a week | 228 | 49.6 |
| 2–3 times a week | 72 | 15.7 |
| 4–6 times a week | 49 | 10.7 |
| Daily | 27 | 5.9 |
| Never | 84 | 18.3 |
| Eggs | | |
| Once a week | 74 | 16.1 |
| 2–3 times a week | 143 | 31.1 |
| 4–6 times a week | 113 | 24.6 |
| Daily | 111 | 24.1 |
| Never | 19 | 4.1 |
| Legumes | | |
| Once a week | 158 | 34.3 |
| 2–3 times a week | 120 | 26.1 |
| 4–6 times a week | 76 | 16.5 |
| Daily | 41 | 8.9 |
| Never | 65 | 14.1 |
| Shrimp | | |
| Once a week | 189 | 41.1 |
| 2–3 times a week | 55 | 12.0 |
| 4–6 times a week | 27 | 5.9 |
| Daily | 20 | 4.3 |
| Never | 169 | 36.7 |
| Whole butter milk | | |
| Once a week | 113 | 24.6 |
| 2–3 times a week | 117 | 25.4 |
| 4–6 times a week | 86 | 18.7 |
| Daily | 89 | 19.3 |
| Never | 55 | 12.0 |
| Whole milk | | |
| Once a week | 103 | 22.4 |
| 2–3 times a week | 113 | 24.6 |
| 4–6 times a week | 88 | 19.1 |
| Daily | 63 | 13.7 |
| Never | 93 | 20.2 |
| Low fat milk | | |
| Once a week | 98 | 21.3 |
| 2–3 times a week | 89 | 19.3 |
| 4–6 times a week | 52 | 11.3 |
| Daily | 41 | 8.9 |
| Never | 180 | 39.1 |
| Yogurt | | |
| Once a week | 122 | 26.5 |
| 2–3 times a week | 134 | 29.1 |
| 4–6 times a week | 80 | 17.4 |
| Daily | 76 | 16.5 |
| Never | 48 | 10.4 |
| Cheese | | |
| Once a week | 71 | 15.4 |
| 2–3 times a week | 123 | 26.7 |
| 4–6 times a week | 120 | 26.1 |
| Daily | 117 | 25.4 |
| Never | 29 | 6.3 |
| Mayonnaise | | |
| Once a week | 138 | 30.0 |
| 2–3 times a week | 58 | 12.6 |
| 4–6 times a week | 51 | 11.1 |
| Daily | 24 | 5.2 |
| Never | 189 | 41.1 |

of participants were aged 26 or younger, the rest distributed evenly between older age brackets. It is distributions of gender that are balanced equally, with the males making up 53.5% and the females are at 46.5%. Marital status data indicates, however, a relatively married population (57.6% married, respecting population), which might be indicative of implications for familial health patterns. More than one in five are students, though still a massive educational demographic, and almost a third engage in work outside of health, 30.4%. In addition, a very high 60.2% stated a family history of HTN, which is a key factor in health risk assessments. More importantly, 69.6% do not smoke, and a huge 98% do not drink alcohol, which could help explain overall health outcomes. It turns out that 67.8% of people have moderate stress levels.

**Table 4:** Participants' consumption of other food that may influence blood pressure (*n*=460) (Cronbach's alpha value for the items is 0.77)

| Parameter | Once a week (%) | 2–3 times a week (%) | 4–6 times a week (%) | Daily (%) | Never (%) |
|---|---|---|---|---|---|
| Caffeinated drinks such as coffee and tea | 27 (5.9) | 53 (11.5) | 94 (20.4) | 278 (60.4) | 8 (1.7) |
| Soft drinks | 124 (27.0) | 97 (21.1) | 94 (20.4) | 77 (16.7) | 68 (14.8) |
| Canned foods | 145 (31.5) | 133 (28.9) | 80 (17.4) | 36 (7.8) | 66 (14.3) |
| Green tea | 110 (23.9) | 74 (16.1) | 63 (13.7) | 67 (14.6) | 146 (31.7) |
| Nuts | 140 (30.4) | 138 (30.0) | 81 (17.6) | 52 (11.3) | 49 (10.7) |
| Hibiscus | 125 (27.2) | 66 (14.3) | 52 (11.3) | 25 (5.4) | 192 (41.7) |
| Chocolate | 114 (24.8) | 136 (29.6) | 103 (22.4) | 67 (14.6) | 40 (8.7) |
| Fast food | 151 (32.8) | 114 (24.8) | 80 (17.4) | 47 (10.2) | 68 (14.8) |
| Sweets | 144 (31.3) | 133 (28.9) | 86 (18.7) | 48 (10.4) | 49 (10.7) |
| Food containing salt | 53 (11.5) | 93 (20.2) | 91 (19.8) | 207 (45.0) | 16 (3.5) |
| Pickles | 158 (34.3) | 95 (20.7) | 48 (10.4) | 25 (5.4) | 134 (29.1) |

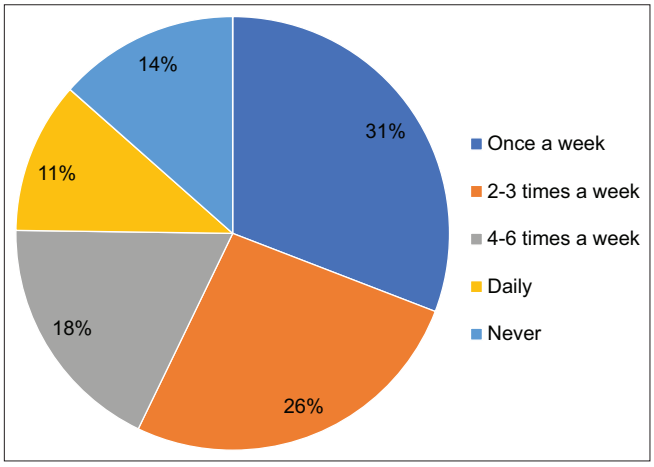


**Figure 1:** Illustrates consumption of whole grains among participants

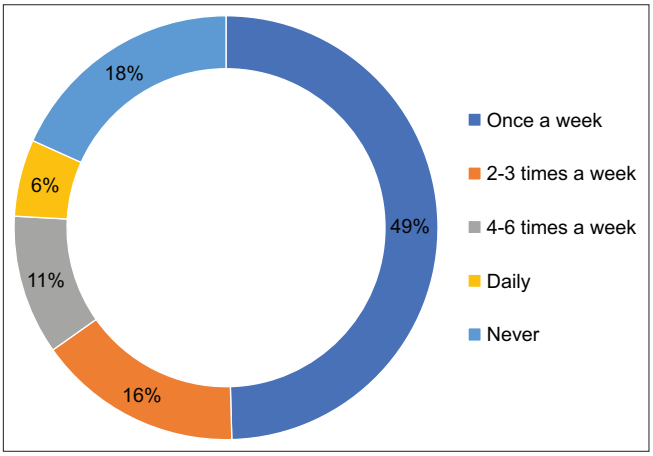


**Figure 2:** Illustrates consumption of fish among participants

As shown in Figure 1, notable trends in dietary habits are presented based on whole grain consumption data of 460 participants. About 30.9%, or 142 people, reported consuming whole grains once a week, while 26.3%, or 121 people, rated this topic as being consumed 2–3 times/week. About 18.0% (83 individuals) segment eats whole grains 4–6 times and 11.3% (52 people) eats them daily. However, 13.5% (62 respondents) never consumed whole grains.

Table 2 presents several insightful parameters with respect to dietary habits with respect to grains, starches, fruits, and vegetables, in a sample of 460 individuals. It is noteworthy that people are eating white rice, with 30.7% of the respondents saying they eat it daily, versus only 2.4% telling us they have never eaten white rice. Unlike brown rice, brown rice seems less valued, with 46.3% of participants saying that they never place it in their diet. Potatoes consumption is balanced: 65.9% people put it on the list of products that are used in a week. They also engage pretty well with whole grains; 30.9% eat them weekly. It seems that bananas and oranges are mainly eaten among fruits with 36.3% and 36.7% respondents eating them at least once a week. On the contrary, red beets and pomegranate are consumed less rarely-40% and 26.5% of respondents never consumed them.

As shown in Figure 2, data presented on fish consumption in the total sample of 460 individuals reveal dietary habits. More importantly, fish was consumed 1 once a week by 228 participants out of the sample population, which comes to 49.6%, indicating a strong weekly involvement with this protein source. On the other hand, the proportion of the population reporting that they eat fish 2–3 times a week is 72 (15.7%) and that of 4–6 times a week is 49 (10.7%). Twenty-seven people reported daily consumption (5.9% of the total sample), indicating a modest daily fish consumption prevalence. However, 84 people (18.3%) replied that they never eat fish.

As depicted in Table 3, the data presented are a detailed description of the dietary habits of protein consumption, milk, and milk products for 460 respondents. Moreover,

**Table 5:** Relationship between white bread consumption and sociodemographic characteristics

| Parameters | White bread consumption | | Total (*n*=460) (%) | *P*-value* |
|---|---|---|---|---|
| | Never or rarely (%) | Often or daily (%) | | |
| Gender | | | | |
| Female | 59 | 155 | 214 | 0.018 |
| | 56.7 | 43.5 | 46.5 | |
| Male | 45 | 201 | 246 | |
| | 43.3 | 56.5 | 53.5 | |
| Age | | | | |
| 26 or less | 23 | 125 | 148 | 0.0001 |
| | 22.1 | 35.1 | 32.2 | |
| 27–39 | 17 | 95 | 112 | |
| | 16.3 | 26.7 | 24.3 | |
| 40–49 | 24 | 64 | 88 | |
| | 23.1 | 18.0 | 19.1 | |
| 50 or more | 40 | 72 | 112 | |
| | 38.5 | 20.2 | 24.3 | |
| Marital status | | | | |
| Single | 27 | 134 | 161 | 0.149 |
| | 26.0 | 37.6 | 35.0 | |
| Married | 68 | 197 | 265 | |
| | 65.4 | 55.3 | 57.6 | |
| Divorced | 5 | 17 | 22 | |
| | 4.8 | 4.8 | 4.8 | |
| Widowed | 4 | 8 | 12 | |
| | 3.8 | 2.2 | 2.6 | |
| Occupational status | | | | |
| Student | 15 | 86 | 101 | 0.005 |
| | 14.4 | 24.2 | 22.0 | |
| Health sector employee | 6 | 34 | 40 | |
| | 5.8 | 9.6 | 8.7 | |
| Non-health sector employee | 29 | 111 | 140 | |
| | 27.9 | 31.2 | 30.4 | |
| Freelancer | 7 | 23 | 30 | |
| | 6.7 | 6.5 | 6.5 | |
| Unemployed | 19 | 59 | 78 | |
| | 18.3 | 16.6 | 17.0 | |
| Retired | 28 | 43 | 71 | |
| | 26.9 | 12.1 | 15.4 | |
| Family history of hypertension | | | | |
| No | 35 | 148 | 183 | 0.147 |
| | 33.7 | 41.6 | 39.8 | |
| Yes | 69 | 208 | 277 | |
| | 66.3 | 58.4 | 60.2 | |
| Smoking status | | | | |
| No | 75 | 245 | 320 | 0.213 |
| | 72.1 | 68.8 | 69.6 | |
| Yes | 18 | 86 | 104 | |
| | 17.3 | 24.2 | 22.6 | |
| Ex-smoker | 11 | 25 | 36 | |
| | 10.6 | 7.0 | 7.8 | |
| Alcohol consumption | | | | |
| No | 103 | 348 | 451 | 0.405 |
| | 99.0 | 97.8 | 98.0 | |
| Yes | 1 | 8 | 9 | |
| | 1.0 | 2.2 | 2.0 | |
| Height in cm | | | | |
| 160 cm or less | 38 | 120 | 158 | 0.646 |
| | 36.5 | 33.7 | 34.3 | |
| 161–170 cm | 41 | 134 | 175 | |
| | 39.4 | 37.6 | 38.0 | |
| 171 cm or more | 25 | 102 | 127 | |
| | 24.0 | 28.7 | 27.6 | |
| Weight in kg | | | | |
| 65 kg or less | 29 | 127 | 156 | 0.053 |
| | 27.9 | 35.7 | 33.9 | |
| 66–80 | 52 | 131 | 183 | |
| | 50.0 | 36.8 | 39.8 | |
| 81 or more | 23 | 98 | 121 | |
| | 22.1 | 27.5 | 26.3 | |
| Stress level | | | | |
| High | 11 | 48 | 59 | 0.553 |
| | 10.6 | 13.5 | 12.8 | |
| Moderate | 75 | 237 | 312 | |
| | 72.1 | 66.6 | 67.8 | |
| Low | 18 | 71 | 89 | |
| | 17.3 | 19.9 | 19.3 | |

**P*-value was considered significant if ≤0.05

red meat consumption is rather modest as indicated by 62.9% of respondents consuming it at least once a week and 6.7% not consuming red meat at all. Poultry, on the other hand, seems to be an important part of the diet as 64.9% participated at least weekly. In fact, fish intake is very high, with 49.6% of fish consumers having it once a week, and

**Table 6:** Consumption of leafy vegetables in association with sociodemographic characteristics

| Parameters | Leafy vegetables consumption | | Total (*n*=460) (%) | *P*-value* |
|---|---|---|---|---|
| | Never or rarely (%) | Often or daily (%) | | |
| Gender | | | | |
| Female | 42 | 172 | 214 | 0.185 |
| | 40.8 | 48.2 | 46.5 | |
| Male | 61 | 185 | 246 | |
| | 59.2 | 51.8 | 53.5 | |
| Age | | | | |
| 26 or less | 47 | 101 | 148 | 0.008 |
| | 45.6 | 28.3 | 32.2 | |
| 27–39 | 22 | 90 | 112 | |
| | 21.4 | 25.2 | 24.3 | |
| 40–49 | 17 | 71 | 88 | |
| | 16.5 | 19.9 | 19.1 | |
| 50 or more | 17 | 95 | 112 | |
| | 16.5 | 26.6 | 24.3 | |
| Marital status | | | | |
| Single | 48 | 113 | 161 | 0.010 |
| | 46.6 | 31.7 | 35.0 | |
| Married | 53 | 212 | 265 | |
| | 51.5 | 59.4 | 57.6 | |
| Divorced | 1 | 21 | 22 | |
| | 1.0 | 5.9 | 4.8 | |
| Widowed | 1 | 11 | 12 | |
| | 1.0 | 3.1 | 2.6 | |
| Occupational status | | | | |
| Student | 34 | 67 | 101 | 0.022 |
| | 33.0 | 18.8 | 22.0 | |
| Health sector employee | 8 | 32 | 40 | |
| | 7.8 | 9.0 | 8.7 | |
| Non-health sector employee | 33 | 107 | 140 | |
| | 32. | 30.0 | 30.4 | |
| Freelancer | 3 | 27 | 30 | |
| | 2.9 | 7.6 | 6.5 | |
| Unemployed | 12 | 66 | 78 | |
| | 11.7 | 18.5 | 17.0 | |
| Retired | 13 | 58 | 71 | |
| | 12.6 | 16.2 | 15.4 | |
| Family history of hypertension | | | | |
| No | 39 | 144 | 183 | 0.652 |
| | 37.9 | 40.3 | 39.8 | |
| Yes | 64 | 213 | 277 | |
| | 62.1 | 59.7 | 60.2 | |
| Smoking status | | | | |
| No | 75 | 245 | 320 | 0.615 |
| | 72.8 | 68.6 | 69.6 | |
| Yes | 22 | 82 | 104 | |
| | 21.4 | 23.0 | 22.6 | |
| Ex-smoker | 6 | 30 | 36 | |
| | 5.8 | 8.4 | 7.8 | |
| Alcohol consumption | | | | |
| No | 100 | 351 | 451 | 0.426 |
| | 97.1 | 98.3 | 98.0 | |
| Yes | 3 | 6 | 9 | |
| | 2.9 | 1.7 | 2.0 | |
| Height in cm | | | | |
| 160 cm or less | 29 | 129 | 158 | 0.007 |
| | 28.2 | 36.1 | 34.3 | |
| 161–170 cm | 33 | 142 | 175 | |
| | 32.0 | 39.8 | 38.0 | |
| 171 cm or more | 41 | 86 | 127 | |
| | 39.8 | 24.1 | 27.6 | |
| Weight in kg | | | | |
| 65 kg or less | 31 | 125 | 156 | 0.077 |
| | 30.1 | 35.0 | 33.9 | |
| 66–80 | 36 | 147 | 183 | |
| | 35.0 | 41.2 | 39.8 | |
| 81 or more | 36 | 85 | 121 | |
| | 35.0 | 23.8 | 26.3 | |
| Stress level | | | | |
| High | 22 | 37 | 59 | 0.011 |
| | 21.4 | 10.4 | 12.8 | |
| Moderate | 61 | 251 | 312 | |
| | 59.2 | 70.3 | 67.8 | |
| Low | 20 | 69 | 89 | |
| | 19.4 | 19.3 | 19.3 | |

**P*-value was considered significant if ≤0.05

18.3% of them never eating fish. Furthermore, patterns of egg consumption vary – there is a strong preference for 2–3 times a week (31.1%). About 60.4% of respondents consume legumes routinely, often meaning they consume legumes weekly for crucial plant-based protein. Dairy-wise, whole milk, and yogurt are mostly consumed, while

we only find a higher percentage of non-consumers of low-fat milk (up to 39.1%).

Table 4 shows the various food items that one might include in the diet to influence blood pressure taken from data of 460 participants. A noteworthy finding is the high amounts of caffeinated drinks that were consumed by all participants, of which 60.4% consume daily, possibly linking them with higher levels in blood pressure, known for its stimulatory effect. However, while the consumption of food items high in salt seems to be a problem because a total of 45% of respondents reported consumption of such food on a daily basis – a pattern in diet which can worsen HTN. Interestingly, while both soft drinks and fast food were heavily reported as consumable, especially by the cohort, they were not as high as caffeinated beverages reported by the participants. The data also demonstrates a spectrum of willingness towards health-orientated options such as green tea and hibiscus; 31.7% never consume green tea, and 41.7% never consume hibiscus. This points to a possible gap in education on what beverages can do in terms of managing blood pressure.

Table 5 shows that white bread consumption has a statistically significant relation to gender ($P = 0.018$), age ($P = 0.0001$), and occupational status ($P = 0.005$). It also shows a statistically insignificant relation to marital status, family history of HTN, smoking status, alcohol consumption, height, weight, and stress level. Participants of male gender, aged 26 or less, and students were found to be the most consumers of white bread.

Table 6 shows that consumption of leafy vegetables has a statistically significant relation to age ($P = 0.008$), marital status ($P = 0.010$), occupational status ($P = 0.022$), height ($P = 0.007$), and stress level ($P = 0.011$). It also shows a statistically insignificant relation to gender, family history of HTN, smoking status, alcohol consumption, and weight. Participants who are aged 50 or older and married were found to be better consumers of leafy vegetables. It was also noticed that participants with higher levels of stress never or rarely consume leafy vegetables.

## DISCUSSION

The objective of the present study was to estimate the participants' family history of HTN and related dietary risk factors among the Saudi population. Results raise concern about high prevalence of HTN, given the current dietary habits in participants. The demographic analysis showed that a large proportion of participants had a family history of HTN, consistent with previous studies which have demonstrated that familial predisposition is an important risk factor for HTN in Saudi Arabia.[15,16] Results also showed that many participants consumed high salt foods and caffeinated beverages daily, which are associated with increases in blood pressure.[17,18]

Prevalence of HTN in this study compare favorable to other literature with those patients who are unknown as being undiagnosed and uncontrolled where the Saudi Health Information Survey revealed a considerable number of patients with high blood pressure.[15] This corresponds to the prospective urban rural epidemiology study report, the prevalence of HTN was higher in Saudi women than men, suggesting gender disparity that needs further exploration.[15] The demographic distribution in the present study being 37.9 years had a mean suggests that HTN may not be restricted to older populations only but also affecting the younger adults as shown by other studies[19,20] that had the rising rates of HTN among the younger populations in Saudi Arabia.

Dietary habits consistent with traditional Saudi diets are reported, which include dependence on white rice and high salt foods. Previous research has demonstrated an association of such dietary patterns with enhanced HTN risk, particularly when further associated with low intake of fruits and vegetables.[18,21] The results of this study are consistent with those of Alkhunaizi *et al*. who reported an increase in epidemic of HTN and diabetes since lifestyle changes in Saudi Arabia.[17] Furthermore, the high levels of caffeine consumption in participants represent results of other studies which have shown a direct linkage of caffeine intake with increase in blood pressure levels.[18,21]

The study also shows why lifestyle factors – physical activity and stress levels, for example – influence the prevalence of HTN. This is in line with previous work by Bahijri *et al*., wherein the data suggest that a large majority of participants report moderate stress levels, and that chronic stress may influence the development of HTN and other metabolic disorders.[22] In addition, the dietary habits and their correlation to BMI indicated by this study concur with conclusions reached by Memish *et al*. who found that the risk of lethage to HTN in the Saudi population is the obesity.[23] This is underscored by the need for healthier dietary choices and physical activity to combat these rising rates of HTN through public health interventions.

However, despite the, this study nonetheless provides valuable insights. The design is cross-sectional, preventing the establishment of causal relationships between dietary habit and prevalence of HTN. In addition, reliance on self-reported data may introduce biases because participants may underreport unhealthy dietary practices or over report healthy ones. As well, the sample size sufficient for preliminary findings might not completely include different Saudi population, especially in rural areas where access to health care and educational on diet could be very different from urban environment.[16,24] The dynamics of HTN and its risk factors in Saudi Arabia should be further understood from longitudinal designs, and larger and more representative samples.

## CONCLUSION

The findings of this study add to the expanding literature regarding prevalence of family history of HTN and its dietary risk factors in the Saudi population. The results highlight the need for targeted public health tactics to improve dietary habits and to heighten HTN risk factor awareness. Treatment of the HTN and its associated health complications may be possible by considering the above issues in Saudi Arabia.

## REFERENCES


1. Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, *et al*. 2020 international society of hypertension global hypertension practice guidelines. Hypertension 2020;75:1334-57.
2. Messerli FH, Williams B, Ritz E. Essential hypertension. Lancet 2007;370:591-603.
3. Puar TH, Mok Y, Debajyoti R, Khoo J, How CH, Ng AK. Secondary hypertension in adults. Singapore Med J 2016;57:228-32.
4. Mushcab H, Al Mutairi A, Al Matroud A, Dossary S, Ghamdi MJ. A lifestyle intervention to prevent hypertension in primary healthcare settings: A Saudi Arabian feasibility study. Prev Med Rep 2023;36:102487.
5. Leung AA, Bushnik T, Hennessy D, McAlister FA, Manuel DG. Risk factors for hypertension in Canada. Health Rep 2019;30:3-13.
6. Al-Nozha MM, Osman AK. The prevalence of hypertension in different geographical regions of Saudi Arabia. Ann Saudi Med 1998;18:401-7.
7. Gillis EE, Sullivan JC. Sex differences in hypertension: Recent advances. Hypertension 2016;68:1322-7.
8. Gan SK, Loh CY, Seet B. Hypertension in young adults--an under-estimated problem. Singapore Med J 2003;44:448-52.
9. De Carvalho Lavôr LC, de Sousa RR, Rodrigues LA, Rodrigues Filho OS, Paiva AA, Frota KM. Prevalence of arterial hypertension and associated factors : A population-based study. Rev Assoc Med Bras (1992) 2020;66:630-6.
10. Alenazi AM, Alqahtani BA. National and regional prevalence rates of hypertension in Saudi Arabia: A descriptive analysis using the national survey data. Front Public Health 2023;11:1092905.
11. Wahyudi AS, Suarilah I, Sukartini T, Pratiwi IN. Unhealthy lifestyle and the prevalence of high blood pressure among early adults : A cross-sectional study. Int J Psychosoc Rehabil 2021;24:8923-31.
12. Agarwal A, Hamayun R, Fahmy EK, Alanazi KS, Alanazi AM, Makhdoom AK, *et al*. Prevalence and awareness of hypertension among the shopkeepers working in the market in northern border province of Saudi Arabia. Med Sci 2023;27:1-10.
13. Omar SM, Musa IR, Osman OE, Adam I. Prevalence and associated factors of hypertension among adults in Gadarif in eastern Sudan : A community-based study. BMC Public Health 2020;20:291.
14. Wahab A, Lotfy M, Elmancy IM, Mohamed TS. Prevalence of hypertension and associated risk factors among Al-Azhar university male students hostel Cairo, Egypt. Al Azhar Int Med J 2020;1:85-90.
15. Alharbi T, Uddin R, Almustanyir S, Alashqar M, Ambia AA, Ghozy S, et al. Trends of the Burden of Hypertension in Saudi Arabia between 1990 and 2019: An Analysis from the Global Burden of Diseases Study. Preprint posted; 2023.
16. Hazazi A, Wilson A. Improving management of non-communicable chronic diseases in primary healthcare centres in the Saudi health care system. Health Serv Insights 2022;15:11786329221088694.
17. Alkhunaizi AM, Jishi JH, Sadah AZ. Salt intake in eastern Saudi Arabia. East Mediterr Health J 2013;19:915-8.
18. Zhao Q, Wu Q, Zhong H, Yan B, Wu J, Guo W. Association of dietary habits with body mass index and waist circumference, and their interaction effect on hypertension. Medicine (Baltimore) 2024;103:e38178.
19. Ahmed AM, Hersi A, Mashhoud W, Arafah MR, Abreu PC, Al Rowaily MA, *et al*. Cardiovascular risk factors burden in Saudi Arabia: The Africa middle east cardiovascular epidemiological (ACE) study. J Saudi Heart Assoc 2017;29:235-43.
20. Aldiab A, Shubair MM, Al-Zahrani JM, Aldossari KK, Al-Ghamdi S, Househ M, *et al*. Prevalence of hypertension and prehypertension and its associated cardioembolic risk factors; a population based cross-sectional study in Alkharj, Saudi Arabia. BMC Public Health 2018;18:1327.
21. Zheng PF, Shu L, Zhang XY, Si CJ, Yu XL, Gao W, *et al*. Association between dietary patterns and the risk of hypertension among Chinese: A cross-sectional study. Nutrients 2016;8:239.
22. Bahijri S, Borai A, Ajabnoor G, Khaliq AA, AlQassas I, Al-shehri D, *et al.* Relative metabolic stability, but disrupted circadian cortisol secretion during the fasting month of ramadan. PLoS One 2013;8:e60917.
23. Memish ZA, El Bcheraoui C, Tuffaha M, Robinson M, Daoud F, Jaber S, *et al*. Obesity and associated factors--kingdom of Saudi Arabia, 2013. Prev Chronic Dis 2014;11:E174.
24. Saeed AA, Al-Hamdan NA, Bahnassy AA, Abdalla AM, Abbas MF, Abuzaid LZ. Prevalence, awareness, treatment, and control of hypertension among Saudi adult population: A national survey. Int J Hypertens 2011;2011:174135.


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