

Original Article

# Prevalence, Knowledge, Attitude, and Factors Associated With Practices of High Blood Pressure Prevention among Employees of an Authority in Kigali City

Joyce Icyimpaye<sup>1\*</sup>, Japheths Ogendi<sup>2</sup>

<sup>1</sup>Department of Public Health, School of Health Sciences, Mount Kigali University, Kigali, Rwanda

<sup>2</sup>School of Public Health, College of Medicine and Health Sciences, University of Rwanda, Kigali, Rwanda

**\*Corresponding author:** Joyce Icyimpaye. Department of Public Health, School of Health Sciences, Mount Kigali University, Kigali, Rwanda. Email: [jicyimpaye@gmail.com](mailto:jicyimpaye@gmail.com), [jicyimpaye@mylife.mku.ac.ke](mailto:jicyimpaye@mylife.mku.ac.ke). ORCID: <https://orcid.org/0000-0003-1643-4340>

**Cite as:** Icyimpaye J, Ogendi J. Prevalence, Knowledge, Attitude, and Factors Associated With Practices of High Blood Pressure Prevention among Employees of an Authority in Kigali City. *Rwanda J Med Health Sci.* 2024;7(2): 204-216. <https://dx.doi.org/10.4314/rjmhs.v7i2.9>

---

## Abstract

### Background

Hypertension is becoming a burden globally with a significant shift in developing countries resulting from rapid urbanization with associated changes in lifestyles. In Rwanda, there is limited knowledge about high blood pressure and its prevention measures practices among office workers.

### Objective

This study assessed the prevalence, knowledge, attitude, and factors associated with practices to prevent high blood pressure among employees of an authority in Kigali City.

### Methods

A cross-sectional study was undertaken with 166 employees of Rwanda FDA to collect data on blood pressure levels, knowledge, attitude and practice toward prevention of High Blood Pressure. Bivariate and multivariate logistic regression analysis were carried out using SPSS version 21.

### Results

The study surveyed 166 participants, mostly male (61.4%). High blood pressure prevalence was 4.8%, 81.3% had good knowledge, 69.3% had positive attitude, and 7.2% had good practice. This study discovered that the respondents with poor knowledge were less likely to have good practice.

### Conclusion

The study revealed lower blood pressure prevalence and high knowledge among participants, however, some knowledge questions on hypertension symptoms and complications were not answered correctly. Moreover, a quarter of participants with High blood pressure were unaware of their condition. These findings highlighted the need for public health education and awareness programs.

*Rwanda J Med Health Sci* 2024;7(2):204-216

---

**Keyword:** Knowledge, Attitude, Practice, High blood pressure

## Introduction

High blood pressure is a significant risk factor for cardiovascular disease-related morbidity and mortality and is one of the top three worldwide causes of disability adjusted life years (DALYs) in 2019.[1] The World Health Organization gives the range of normal blood pressure to be less or equal to 139/89 mmHg.[2]

Globally, the age standardized prevalence of high blood pressure was 33% in 2019, with 78% of adults living in low- and middle-income countries.[3] In 2019, a comprehensive analysis of the disease burden indicated that, globally, exposure to high blood pressure caused over 10 million deaths and about 218 million DALYs.[4] In Africa, WHO estimates indicate that prevalence of high blood pressure is 36% among general population.[3] Several studies conducted in East African countries revealed that the prevalence of hypertension varies from country to country. For example, in Kenya, a national representative survey conducted in 2015 reported a prevalence of 24.5%.[5]

In Rwanda, while the traditional disease burden has been dominated by communicable diseases, the disease landscape in Rwanda is fast changing with the increasing proportion of deaths attributed to non-communicable diseases. For example, while data reported in the National Civil registration system reported a decline in proportion of deaths due to communicable diseases, from 70% in 2019 to 62.3% in 2020, the proportion attributed to non-communicable diseases increased from 27.9% to 34.7% during this period.[6] Research conducted on 7,116 participants in Rwanda found an overall prevalence of 15.4%, with 70.7% of the participants not aware they had hypertension.[7] Another study conducted on the prevalence of hypertension in working adults at a higher learning institution workplace in Rwanda found a prevalence of 36%, with only 3% of participants knowing their hypertensive condition.[8]

In addition, a mass screening campaign in Kirehe District found a prevalence of high blood pressure of 21.2%, and of those participants with high blood pressure, 82.6% had not previously been diagnosed. [9] A much higher prevalence of 43.3% was revealed in patients attending outpatient department of Ruli District Hospital.[10] Furthermore, the magnitude of undiagnosed hypertension was demonstrated in rural areas at 41.9%, [11] and at 38.3%. [12]

Published studies around hypertension in Rwanda focused on its prevalence, awareness and associated risk factors. [7,9,10,12–14] Moreover, these studies were targeting community, [7,9,12,14] and outpatients coming at the hospital for consultation. [10] While there is evidence that prolonged sitting time increases the risk of developing high blood pressure [15,16], there is a scarcity of research that establishes a correlation between the prevalence, knowledge, attitude, and practices of high blood pressure prevention in workplace environments where individuals spend the majority of their time seating. The purpose of the current study was to assess the prevalence, knowledge, attitude, and factors associated with high blood pressure practices among Rwanda FDA employees.

## Methods

### Study setting

This study was conducted in Kigali, the capital city of Rwanda. Rwanda is one of the countries that comprise the East African Economic Block. Rwanda Food and Drug Authority is situated Gasabo District. The authority is a government-affiliated institution that reports to the Ministry of Health. Founded in 2018, it had the mission of safeguarding public health by regulating human and veterinary medicines, vaccines and other biological products, processed foods, poisons, medicated cosmetics, medical devices, household chemical substances, and tobacco products. [17] The reason Rwanda FDA was selected is that, out of its total 185 staff, 168 (90.8%) work full-time in offices, while only 17 (8.2%) divide their time between offices and fieldwork.

### **Study Design and study population**

This was a cross-sectional study in which blood pressure measurement and information on knowledge, attitude and practice toward high blood pressure and factors associated with it were collected from the employees of Rwanda FDA.

### **Sample size estimation and sampling techniques**

Rwanda FDA has 185 staff who worked from seven department and offices. The study used total member sampling, a method involving collecting data from every individual population. Therefore, with this method, all employees of Rwanda FDA were targeted. Total member sampling reduces random sampling errors and is preferred when the population size is small.[18]

### **Data collection tool and measurements**

Data was collected using a self-administered questionnaire. The questionnaire was adopted from the WHO STEPS tool,[19] and earlier related KAP studies.[20,21] The questionnaire had three parts. The first section asked questions about the socio-demographic characteristics of the respondents. The second section of the questionnaire sought and obtained information related to the diagnosis of high blood pressure. The last part of the questionnaire sought to collect data on knowledge, attitude and practice on high blood pressure and risk factors including include stress, high salt intake, sedentary life, overweight/obesity, smoking, and alcohol abuse and unhealthy diet.

### **Data collection**

The researcher provided orientation training to a licensed nurse including piloting the data collection instruments. The blood pressure was measured using a sphygmomanometer. [22] The procedure used in taking blood pressure measurements were borrowed from one previously used by WHO.[22] During the time of taking blood pressure, participants were instructed to sit with their legs uncrossed, The participants were instructed to rest in that position for 15 minutes before the initial reading.

The intervals between the first and the second reading was 3 minutes between two readings.[22] The questionnaire was then given to participants to respond to the questions.

### **Reliability and Validity of research instruments**

The design of the questionnaire that was used in this study was borrowed from WHO STEPS tool,[22] and previously conducted similar KAP studies.[20,21] Furthermore, the data collection instrument was pre-tested to determine the strength and weakness of the questionnaire and some adjustments were made to give more clarity on the questions. The content validity was ensured by translating the questionnaire into Kinyarwanda, which helped to keep the originality of the questions and get appropriate answers.

### **Data analysis**

Following data collection, each question was coded, and data entry was completed with SPSS version 21. The data analysis followed a quantitative approach, with frequencies and percentages used to outline socio-demographic factors, high blood pressure prevalence, knowledge, attitude, and practices related to high blood pressure prevention. High blood pressure levels were estimated using the mean of the last two readings, and the respondents with  $\geq 140/90$  mmHg were considered to have high blood pressure. Those with values  $\leq 139/89$  mmHg were considered to have normal BP.[22] The overall knowledge, attitude and practices were estimated using the sum of scores based on Bloom cut off point.[23] The cut-off points were based on percentage scored per item. Good knowledge, positive attitude and good practice were scores which were  $\geq 80\%$ ; scores of 59-79% were moderate knowledge, neutral attitude and fair practice. Those who scored below 59% were considered to have poor knowledge, negative attitude and poor practices. Bivariate and multivariate logistic regression methods were used to explore the factors associated with level of practice toward prevention of high blood pressure.

In multivariate analysis, the outcome variable was transformed into two different variables (Good and poor practice) for better analysis and interpretation.

**Ethical considerations**

This study was reviewed by Mount Kenya University Ethical Review Committee (MKU/ETHICS/24/3/2023) and conducted in accordance to the Laws governing Research in the Country. Facility clearance was obtained from the relevant offices (CFO/DAHR/2888/FDA/2023).

**Results**

**Social demographic characteristics**

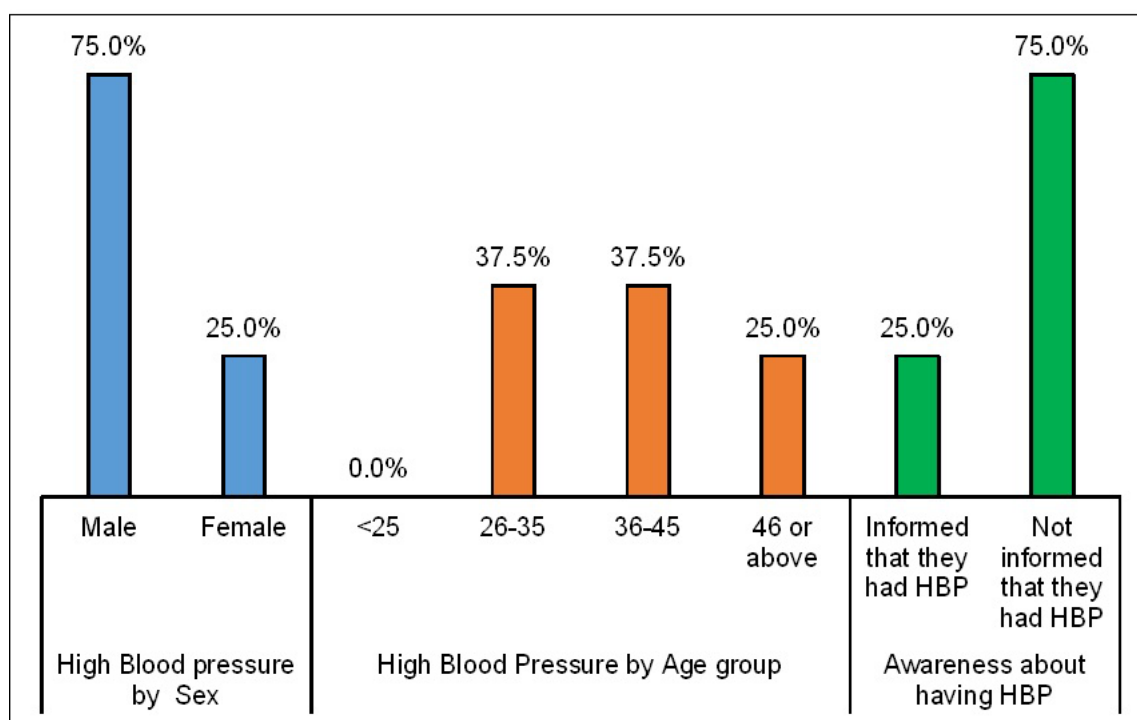
Between July 11, and August 7, 2023, we interviewed and took blood pressure measurement of a total of 166 employees of Rwanda FDA. Table 1 presents the socio-demographic characteristics of the respondents. The ages ranged from 21 to 56 years, with a mean age of 34.9 (SD=6.44). A majority, 102 (61.4%) were male. A total of 112 (67.5%), reported that they were married. An overwhelming majority, 157 (94.6%) had tertiary level of education (Table 1)

**Table 1 Socio-demographic characteristics of the respondents (n=166), 2023**

| Variables                         | n (%)      |
|-----------------------------------|------------|
| <b>Age (in years)</b>             |            |
| ≤ 25                              | 8 (4.8)    |
| 26-35                             | 89 (53.6)  |
| 36-45                             | 58 (34.9)  |
| 46 or above                       | 11(6.6)    |
| <b>Gender</b>                     |            |
| Male                              | 102 (61.4) |
| Female                            | 64 (38.6)  |
| <b>Marital status</b>             |            |
| Single                            | 51(30.7)   |
| Married                           | 112 (67.5) |
| Divorced                          | 3 (1.8)    |
| <b>Highest level of education</b> |            |
| Primary                           | 6 (3.6)    |
| Secondary                         | 3 (1.8)    |
| Tertiary                          | 157 (94.6) |

**Prevalence of high blood pressure among respondents**

The blood pressure was measured based on WHO guidelines.[22] Of a total of 164 respondents whose blood pressure measurements were taken, 8(4.8%) had blood pressure of ≥ 140/90 mmHg. Of the 8 who were assessed to have High blood pressure, majority 6 (75.0%) were male; a quarter, 2(25.0%) reported that they have been informed by the health practitioner previously that they have hypertension (Figure 1).



**Figure 1. Sex, age specific prevalence and prior diagnosis of High Blood Pressure, 2023**



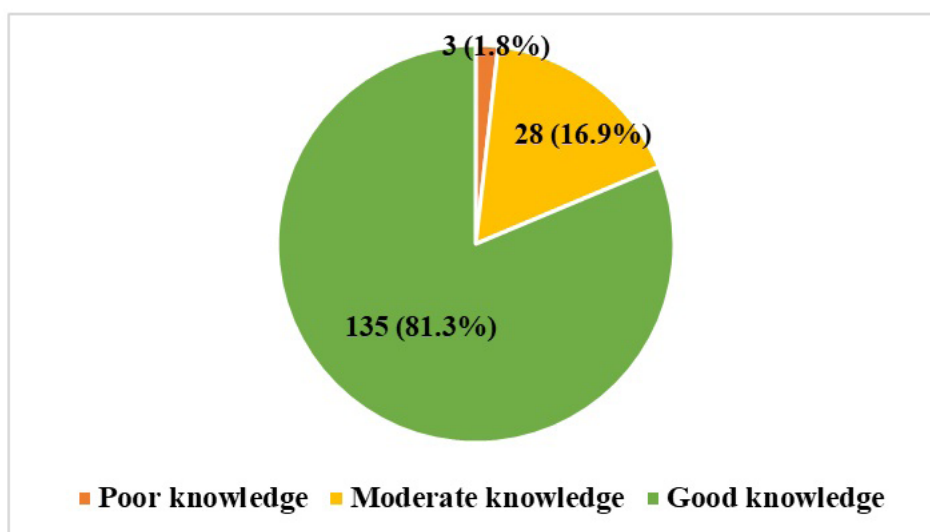
**Level of knowledge of high blood pressure and its risk factors among respondents**

Findings on knowledge of high blood pressure and its risk factors ranged from a low of 114(68.7%) and 127 (76.5%) for the statement like “HBP usually do not have symptoms” and “HBP can cause kidney damage” respectively,

to the high of 163(98.2%) for statement on high intake of salt and overweight/Obesity are risk factors of HBP. Other most commonly known risk factors include Stress or anxiety 159(95.8%), lack of Physical exercise 158 (95.2%), High consumption of alcohol 154(92.8%) and Tobacco use 150(90.4%), (see Table 2)

**Table 2. Knowledge of characteristics and risk factors of high blood pressure by respondents, 2023 (n=166)**

| Variables   | True n(%)  | False n(%) | I don't know n(%) |
|---|------------|------------|-------------------|
| HP is a cardiovascular disease  | 140 (84.3) | 17 (10.2)  | 9 (5.4)           |
| HBP can cause a serious damage to the heart                               | 154 (92.8) | 1 (0.6)    | 11 (6.6)          |
| HBP can cause kidney damage   | 127 (76.5) | 14 (8.4)   | 25 (15.1)         |
| HBP usually do not have symptoms  | 114 (68.7) | 37 (22.3)  | 15 (9.0)          |
| HBP is controlled through diet control, drug therapy and regular exercise | 156 (94.0) | 2 (1.2)    | 8 (4.8)           |
| <i>The risk factors for high blood pressure</i>                           |            |            |                   |
| Stress or anxiety   | 159 (95.8) | 1 (0.6)    | 6 (3.6)           |
| High intake of salt   | 163 (98.2) | 0 (0.0)    | 3 (1.8)           |
| Unhealthy diet  | 143 (86.1) | 20 (12.0)  | 3 (1.8)           |
| Lack of physical exercises  | 158 (95.2) | 6 (3.6)    | 2 (1.2)           |
| Overweight/Obesity  | 163 (98.2) | 2 (1.2)    | 1(0.6)            |
| Tobacco use   | 150 (90.4) | 3 (1.8)    | 13 (7.8)          |
| Diabetes  | 148 (89.2) | 7 (4.2)    | 11(6.6)           |
| High consumption of alcohol   | 154 (92.8) | 5 (3.0)    | 7 (4.2)           |
| High blood cholesterol  | 145 (87.3) | 7 (4.2)    | 14 (8.4)          |



A grate majority, 135 (81.3%), were reported to have good knowledge. Those whose findings indicated that they had moderate and poor knowledge were 28(16.9%) and 3(1.8%) respectively (see Figure 2).

**Figure 2. Overall knowledge score of high blood pressure and its risk factors among respondents, 2023 (n=166)**

## Attitude and practice toward high blood pressure prevention and associated factors among respondents

### Attitude

Findings on attitude ranged from a low of 105 (63.3%) for those who disagreed with the statement “hypertensive patients can take fat-rich food” to a high of 162 (97.6%) for those stating that HP is a serious disease.

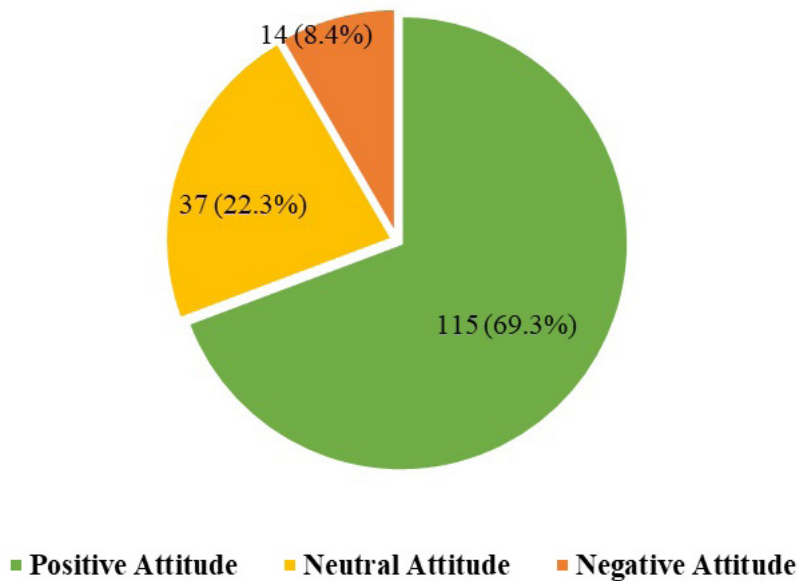
### Practice

In terms of practice, the lowest number of 27 (16.3%) responded “no” to the question of whether their work involved any activity that increased breathing, while the maximum number of 161 (97.9%) reported that they did not smoke.

Of the total respondents, 102 (61.4%), reported that they had checked their blood pressure at least once in the past year while the maximum number of 161 (97.9%) reported that they did not smoke. Of the total respondents, 102 (61.4%), reported that they had checked their blood pressure at least once in the past year while 61 (36.7%) reported consuming alcohol. Most of the respondents, 130 (78.3%), reported that they try to eat a balanced diet with less fat and sugar, 76 (45.8%) do moderate-intensity sports, and 83 (50%) spend 9 hours or more sitting. (see Table 3)

**Table 3. The attitude toward high blood pressure severity and prevention, and the practice toward high blood pressure and its associated factors among respondents, 2023 (n=166)**

| Variables  | Strongly agree/ agree<br>n(%) | Not sure<br>n(%) | Strongly disagree/ disagree<br>n(%) |
|--|-------------------------------|------------------|-------------------------------------|
| <b>A. The attitude toward high blood pressure severity and prevention</b>                  |                               |                  |                                     |
| HP is a serious disease  | 162 (97.6)                    | 0 (0)            | 4 (2.4)                             |
| Reducing salt, fat intake and consume fruits and vegetables reduces the risk of having HBP | 154 (92.8)                    | 8 (4.8)          | 4 (2.4)                             |
| Stop smoking and reducing alcohol helps to prevent HBP                                     | 155 (93.4)                    | 8 (4.8)          | 3 (1.8)                             |
| It is important to lower salt in your diet   | 152 (91.6)                    | 2 (1.2)          | 12 (7.2)                            |
| Hypertensive patients can take fat rich food   | 45 (27.1)                     | 16 (9.6)         | 105 (63.3)                          |
| Regular exercise help in the prevention of HBP   | 132 (79.5)                    | 15 (9.0)         | 19 (11.4)                           |
| Hypertensive patients should take medication regularly to control HBP                      | 149 (89.8)                    | 3 (1.8)          | 14 (8.4)                            |
| <b>B. Practice toward high blood pressure and its associated factors</b>                   |                               |                  |                                     |
| Variables  | Yes<br>n(%)                   | No<br>n(%)       |                                     |
| Have you ever checked your BP over the last one year                                       | 102 (61.4)                    | 64 (38.6)        |                                     |
| Do you currently smoke   | 5 (3.0)                       | 161 (97.0)       |                                     |
| Are you drinking alcohol?  | 61 (36.7)                     | 105 (63.3)       |                                     |
| Are you trying to eat balanced diet with less fat and sugar                                | 130 (78.3)                    | 36 (21.7)        |                                     |
| Do your work involve any activity that increase breathing                                  | 27 (16.3)                     | 139 (83.7)       |                                     |
| Do you continuously walk/use bicycle for at least 10min                                    | 78 (47.0)                     | 88 (53.0)        |                                     |
| Outside travel to work or any other places, do you do any vigorous intensity sport         | 59 (35.5)                     | 107 (64.5)       |                                     |
| Outside travel to work or any other places, do you do moderate intensity sport             | 76 (45.8)                     | 90 (54.2)        |                                     |
| Spending more than 9 hours sitting per day   | 83 (50.0)                     | 83 (50.0)        |                                     |
| Add salt before eating   | 60 (36.1)                     | 106 (63.9)       |                                     |
| Eat processed food   | 84 (50.6)                     | 82 (49.4)        |                                     |

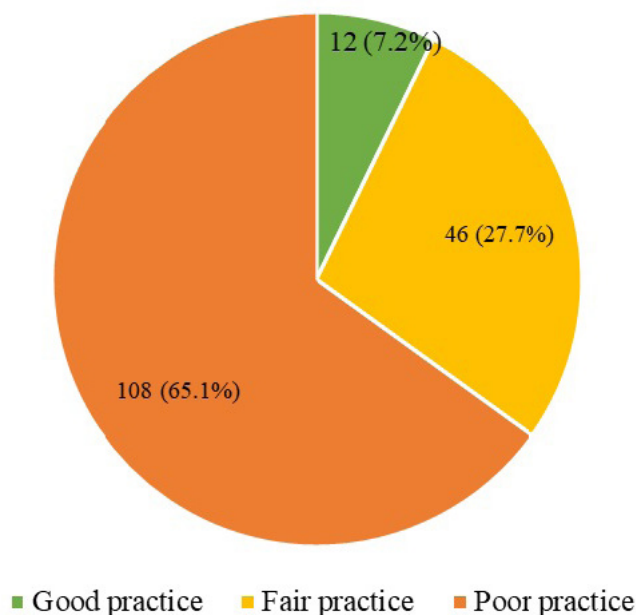


**Figure 3. Overall attitude score toward high blood prevention among respondents, 2023 (n=166)**

The overall level of attitude were classified into positive, neutral and negative using Bloom cut off point.[23] Results show that more than half of respondents, 115 (69.3%), had a positive attitude, 37 (22.3%) owned a neutral attitude, and 14 (8.4%) had a negative attitude toward high blood pressure severity and prevention. (see Figure 3)

The overall practice score was classified into good, fair and poor according to Bloom cut off point.(23)] According to the study’s findings, a small number of respondents 12 (7.2%) had good practice, 46 (27.7%) had fair practice, and 108 (65.1%) had poor practice toward preventable risk factors of high blood pressure. (see Figure 4)

In bivariate analysis, there was a statistically significant association between the level of knowledge and practice regarding preventable risk factors for high blood pressure, as well as between age group and level of practice, with a P-value of less than 0.05 calculated to 95% CI. The study revealed that the respondents with poor knowledge were less likely to have good practice [AOR=0.192; 95% CI= 0.08-0.462; P-value=<0.001] compared to respondents with good practice. (see Table 4)



**Figure 4. Overall practice scores toward high blood pressure prevention among respondents, 2023 (n=166)**

**Table 4. Factors associated with high blood pressure prevention practices (Bivariate and multivariate analysis), 2023 (n=166)**

| Variable  | Level of Practice |               |               | Bivariate  |                  | Multivariate |        |        |                  |
|---|-------------------|---------------|---------------|------------|------------------|--------------|--------|--------|------------------|
|   | Good Practice     | Fair Practice | Poor Practice | Chi-Square | P-Value          | AOR          | 95% CI |        | P-Value          |
|   |                   |               |               |            |                  |              | Lower  | Upper  |                  |
| <b>Age Group</b>  |                   |               |               | 13.018     | <b>0.04</b>      |              |        |        |                  |
| ≤ 25  | 1(12.5)           | 0 (0.00)      | 7(87.50)      |            |                  | Ref          |        |        |                  |
| 26- 35  | 10 (11.20)        | 20 (22.50)    | 59(66.30)     |            |                  | 0.109        | 0.001  | 11.029 | 0.346            |
| 36-45   | 0 (0.00)          | 22(37.90)     | 36(32.30)     |            |                  | 0.039        | 0      | 4.121  | 0.172            |
| 46 and above  | 1(9.10)           | 4(36.40)      | 6 (54.50)     |            |                  | 0.03         | 0      | 3.936  | 0.159            |
| <b>Gender</b>   |                   |               |               | 4.527      | 0.1              |              |        |        |                  |
| Male  | 4 (3.90)          | 28(27.50)     | 70 (68.60)    |            |                  | Ref          |        |        |                  |
| Female  | 8 (12.50)         | 18(28.10)     | 38 (59.40)    |            |                  | 0.668        | 0.348  | 1.281  | 0.225            |
| <b>Marital status</b>   |                   |               |               | 9.032      | 0.06             |              |        |        |                  |
| Single  | 5 (9.80)          | 7(13.70)      | 39 (76.50)    |            |                  | Ref          |        |        |                  |
| Married   | 7(6.30)           | 37(33.00)     | 68 (60.70)    |            |                  | 0.5          | 0.541  | 8.095  | 0.14             |
| Divorced  | 0 (0.00)          | 2(66.70)      | 1(33.30)      |            |                  | 0.3          | 0.272  | 9.117  | 0.363            |
| <b>Educational Level</b>                                      |                   |               |               | 3.949      | 0.68             |              |        |        |                  |
| Primary   | 0 (0.00)          | 3(50.00)      | 3 (50.00)     |            |                  | Ref          |        |        |                  |
| Secondary   | 0 (0.00)          | 0(0.00)       | 3 (100.00)    |            |                  | 1.62         | 0.136  | 6.11   | 0.999            |
| Bachelor’s degree   | 11(7.50)          | 39(26.70)     | 96 (65.80)    |            |                  | 1.92         | 0.374  | 9.862  | 0.435            |
| Masters   | 1(9.10)           | 4(36.40)      | 6 (54.50)     |            |                  | 1.2          | 0.164  | 8.799  | 0.858            |
| <b>Information health practitioner of having hypertension</b> |                   |               |               | 1.434      | 0.48             |              |        |        |                  |
| Yes   | 2 (15.40)         | 3(23.10)      | 8 (61.50)     |            |                  | Ref          |        |        |                  |
| No  | 10 (6.50)         | 43(28.10)     | 100(65.40)    |            |                  | 1.179        | 0.367  | 3.784  | 0.782            |
| <b>Currently on hypertension medicine</b>                     |                   |               |               | 3.008      | 0.22             |              |        |        |                  |
| Yes   | 1(14.30)          | 0(0.00)       | 6 (85.70)     |            |                  | Ref          |        |        |                  |
| No  | 11(6.90)          | 46(28.90)     | 102 (64.20)   |            |                  | 0.298        | 0.035  | 2.539  | 0.268            |
| <b>Type of knowledge</b>                                      |                   |               |               | 20.352     | <b>&lt;0,001</b> |              |        |        |                  |
| Poor knowledge  | 0 (0.00)          | 0(0.00)       | 3 (100.00)    |            |                  | 0.192        | 0.08   | 0.462  | <b>&lt;0.001</b> |
| Moderate knowledge  | 6 (21.40)         | 13(46.40)     | 9 (32.10)     |            |                  | 0. 656       | 0.102  | 1.34   | 0.999            |
| Good knowledge  | 6 (4.40)          | 33(24.40)     | 96 (71.10)    |            |                  | Ref          |        |        |                  |
| <b>Level of Attitude</b>                                      |                   |               |               | 4.334      | 0.11             |              |        |        |                  |
| Positive Attitude   | 8 (7.00)          | 32(27.80)     | 75 (65.20)    |            |                  | Ref          |        |        |                  |
| Neutral Attitude  | 1 (2.70)          | 10(27.00)     | 26 (70.30)    |            |                  | 1.875        | 0.614  | 5.722  | 0.269            |
| Negative Attitude   | 3 (21.40)         | 4(28.60)      | 7 (50.00)     |            |                  | 2.364        | 0.669  | 8.356  | 0.182            |

**Discussion**

The overall objective of this study was to assess the prevalence, knowledge, attitude, and factors associated with practices

to prevent high blood pressure among employees of an authority in Kigali City. Our findings indicate that the prevalence of high blood pressure among the participants was 4.8%.



The reported finding on prevalence was three times lower than that in a national survey report.[24] It is also four times lower than the report of prevalence in a mass screening campaign survey in rural Rwanda that was reported in 2022.[9] The prevalence of blood pressure among employees of an authority in Kigali City was also found to be lower than those reported in other studies conducted in Rwanda, and in other countries in the Easter African region.[5,10,25–29] Similar higher prevalence was reported in national surveys that assessed prevalence of hypertension in urban and rural areas in Northeast Brazil,[30] and in South Africa.[31]

The comparatively lower prevalence reported in the present study compared to other studies could possibly be explained by the healthy worker effect bias that could arise because of selection of employees as the study population.[32] Employees typically are relatively healthy persons who have heard the opportunity to find and maintain employment.[32] Since they do not represent the general population, they are unlikely to give blood pressure levels that reflect that of the general population. The studies reported with comparatively high prevalence of blood pressure like the Rwanda national survey [24] and the national survey in South Africa,[31] and those in the settings of the urban and rural areas in North eastern Province of Brazil surveys surveyed the whole population;[30] they captured all ages, including the older age brackets that are disproportionately vulnerable to high blood. In the present study, the ages of participants ranged from 21 to 56 years, with a mean age of 34.9 (SD=6.44). This population of younger age brackets further adds to the possible report of lower prevalence proportions. The mean age of 34.9 is a category that is known to be less vulnerable to High blood pressure.

The study also reported that 25% of the respondents were unaware that they had high blood pressure. This revelation is important for two main reasons. One, it reinforces other previous studies

that have also reported that a similar proportion of persons who have raised blood pressure but who are unaware exists in Rwanda.[7,9,10,12–14] Two, and more importantly, is the public health implication; it demonstrates existence of a proportion that are unable to benefit from early intervention strategies as emphasized currently existing scientific knowledge on hypertension control and care. It also would point to the need to strengthening interventions through opportunistic and targeted screening programs in health facilities.

The findings from this study also revealed that overall, 81.3% of respondents had good knowledge of hypertension and its risk factors. The scores on knowledge were found to vary by questions asked; the lowest knowledge scores were found in question regarding the symptoms of high blood pressure and those that inquired whether high blood pressure can cause kidney damage, with respondents scoring 68.7% and 76.5%, respectively. The low scores on knowledge of symptoms of hypertension and dangers of blood pressure point to the need to strengthen targeted public health education directed at improving the knowledge scope of the population with emphasis on symptoms and dangers of hypertension.

The findings of the study regarding the level of practice reveal that 78.3% of participants reported that they eat balanced diet. This finding is congruent with an earlier study conducted in India which reported the proportion who eat balanced food to be 78.4%.[33] This revelation would probably indicate the growing global efforts to improve the eating habits of the populations has yielded desired outcomes and resulting in an increasing proportion of populations across countries of different income levels are aware of the importance of eating a balanced diet. The present study also reports a statistically significant association between practices toward preventable risk factors of high blood pressure with high level of knowledge. This finding is important because of at least two reasons.

One, it reinforces existing knowledge that demonstrate strong association between education with most health -behavior measures.[34,35] Two, it demonstrates coherence on knowledge, attitudes, and skills that come with years of schooling makes education as an important enabling or coping resource.[36] Inequalities in education and illiteracy are crucial since they are among the indicators of modifiable inequities.[37] Three, the finding adds credence to the goals of Ministry of Education of Government of Rwanda which are to promote access to education at all levels. [38] Expanding education and reducing illiteracy may be important broader multidisciplinary intervention strategies that can play an important role in reducing the societal burden of hypertension.

### Study limitations

The findings from this study were subject to three main limitations. First, the cross-sectional nature of the study design necessitated the diagnosis of high blood pressure to be based on one sitting; the influence other external factors in the reported blood pressure results cannot be ruled out. Second, selection of persons in employment as study population makes it difficult to extend the reported findings to the general population. Three, some important responses were based on self-reports; it is not known the extent to which the reported findings could have been influenced by prevarication bias. Finally, because of small sample size, differences in responses to some inquiries might not be detectable.

### Conclusion

The findings of this study report prevalence of blood pressure which was lower than the national prevalence, and that reported amongst other populations. The study also reports high level of knowledge among the participants. However, the findings that some important knowledge questions like those inquiring on symptoms and dangers of hypertension were the least correctly answered to, points to the need to strengthen public health education to increase the knowledge scope of the population.

The revelation of this study that, about a quarter of those who have High blood pressure were actually unaware of their status at the time of data collection has public health implication. It demonstrates existence of a sizeable proportion of the members of the population who are unable to benefit from existing scientific knowledge that emphasizes early intervention strategies aimed at control of hypertension. Strengthening opportunist screening in health facilities and educating the public to understand the dangers of hypertension and seek medical checkups would be useful.

### Authors' contribution

IJ, OJ contributed to the conception, development of the manuscript and will work on reviewer's comment until its publication.

### Conflict of interest

No conflict of interest was declared.

This article is published open access under the Creative Commons Attribution-NonCommercial NoDerivatives (CC BYNC-ND4.0). People can copy and redistribute the article only for noncommercial purposes and as long as they give appropriate credit to the authors. They cannot distribute any modified material obtained by remixing, transforming or building upon this article. See <https://creativecommons.org/licenses/by-nc-nd/4.0/>

### Reference

1. World Health Organization (WHO). Global Health Estimates: Life expectancy and leading causes of death and disability. *WHO website*. <https://www.who.int/data/gho/data/themes/mortality-and-global-health-estimates>. Accessed 25 February 2024.
2. World Health Organization (WHO). Noncommunicable disease education manual for primary health care professionals and patients. *WHO website*. <https://iris.who.int/handle/10665/254746>. Accessed 7 July 2024.
3. World Health Organization. Global report on hypertension. *WHO website*. <https://www.who.int/teams/noncommunicable-diseases/hypertension-report>. Accessed 25 February 2024

4. Stanaway JD, Afshin A, Gakidou E, Lim SS, Abate D, Abate KH, et al. Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2018 Nov;392(10159):1923–94. doi.org/10.1016/S0140-6736(18)32225-6
5. Mohamed SF, Mutua MK, Wamai R, Wekesah F, Haregu T, Juma P, et al. Prevalence, awareness, treatment and control of hypertension and their determinants: results from a national survey in Kenya. *BMC Public Health*. 2018 Nov;18(S3):1219. doi.org/10.1186/s12889-018-6052-y
6. National Institute of Statistics Rwanda (NISR). Rwanda Vital Statistics Report - 2020 .NISR website. <https://www.statistics.gov.rw/publication/1705>. Accessed 25 February 2024.
7. Nahimana MR, Nyandwi A, Muhimpundu MA, Olu O, Condo JU, Rusanganwa A, et al. A population-based national estimate of the prevalence and risk factors associated with hypertension in Rwanda: implications for prevention and control. *BMC Public Health*. 2018 Dec;18(1):2. doi.org/10.1186/s12889-017-4536-9
8. Banyangiriki J, Phillips J. Prevalence of Hypertension among Working Adults in Rwanda. *Iranian Journal of Public Health*. 2013. <https://ijph.tums.ac.ir/index.php/ijph/article/view/4410>
9. Ntaganda E, Mugeni R, Harerimana E, Ngoga G, Dusabeyezu S, Uwinkindi F, et al. High rates of undiagnosed and uncontrolled hypertension upon a screening campaign in rural Rwanda: a cross-sectional study. *BMC Cardiovasc Disord*. 2022 Dec;22(1):197. doi.org/10.1186/s12872-022-02606-9
10. Habimana JF, Mureithi C, Ntiringanya S, Ntihakose C, Uwizeyimana A, Manirafasha JP, et al. Cigarette smoking and hypertension among adult outpatients: An explanatory evidence model from a rural District Hospital, Rwanda. *Global Scientific Journal*. 2021.
11. Mazimpaka C, Nsanzimana S, Logan JE, Binagwaho A, Wong R. Assessing the Magnitude and Risk Factors Associated With Undiagnosed Hypertension in Rural Rwanda. *Journal of Management and Strategy*. 2019.
12. Umwangange ML. Screening for Hypertension in People Aged 50 Years and Older in Byumba Sector: A Community-Based Approach. *OALib*. 2016;03(12):1–10. doi.org/10.4236/oalib.1103213
13. Joliana Phillips, Jacques Banyangiriki. Prevalence of hypertension among working adults in Rwanda. *Iranian Journal of Public Health*. 2023 :42(8). Aug;925-926.
14. Mazimpaka C, Nsanzimana S, Logan J, Binagwaho A, Wong R. Assessing the Magnitude and Risk Factors Associated With Undiagnosed Hypertension in Rural Rwanda. *JMS*. 2019 Mar 3;10(2):3. doi.org/10.5430/jms.v10n2p3
15. Chau JY, Grunseit A, Midthjell K, Holmen J, Holmen TL, Bauman AE, et al. Cross-sectional associations of total sitting and leisure screen time with cardiometabolic risk in adults. Results from the HUNT Study, Norway. *Journal of Science and Medicine in Sport*. 2014 Jan;17(1):78–84. doi.org/10.1016/j.jsams.2013.03.004
16. George ES, Rosenkranz RR, Kolt GS. Chronic disease and sitting time in middle-aged Australian males: findings from the 45 and Up Study. *Int J Behav Nutr Phys Act*. 2013;10(1):20. doi.org/10.1186/1479-5868-10-20
17. Rwanda Food and Drug Authority. Overview of Rwanda FDA. *Rwanda FDA website*. <https://rwandafda.gov.rw/about-fda/about/>. Accessed February 2024
18. Daniel J. Sampling Essentials: Practical Guidelines for Making Sampling Choices [Internet]. 2455 Teller Road, Thousand Oaks California 91320 United States. *SAGE Publications, Inc.* doi.org/10.4135/9781452272047.



19. World Health Organization. The WHO Stepwise approach to noncommunicable disease risk factor surveillance (STEPS), Standard STEPS instrument. *WHO website*. <https://www.who.int/publications/m/item/standard-steps-instrument>. Accessed 22 February 2024
20. Mittal A, Kumar S, Bishnoi A. Study of Knowledge, Attitude and Practice of General Population of Ambala towards Hypertension. *International Journal of Health Science and Research*. 2016.
21. Naseem S, Sarwar H, Afzal M, Gilani SA. Knowledge Attitude and Practice towards Hypertension among Adult Population in a Rural Area of Lahore, Pakistan. *International Journal of Scientific & Engineering Research*. 2018.
22. World Health Organization (WHO). The WHO Stepwise approach to noncommunicable disease risk factor surveillance (STEPS), STEP manual. *WHO website*. <https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps/manuals>. Accessed 24 February 2024
23. Karunamoorthi AK. Guideline for conducting a knowledge, attitude and practice (KAP) study. *AECS Illumination*. 2004.
24. Nahimana MR, Nyandwi A, Muhimpundu MA, Olu O, Condo JU, Rusanganwa A, et al. A population-based national estimate of the prevalence and risk factors associated with hypertension in Rwanda: implications for prevention and control. *BMC Public Health*. 2017. doi.org/10.1186/s12889-017-4536-9
25. Olack B, Wabwire-Mangen F, Smeeth L, Montgomery JM, Kiwanuka N, Breiman RF. Risk factors of hypertension among adults aged 35–64 years living in an urban slum Nairobi, Kenya. *BMC Public Health*. 2015 Dec;15(1):1251. doi.org/10.1186/s12889-015-2610-8
26. Ondieki AO, Kimani HM, Kahiga TM. Prevalence and socio-demographic factors associated with hypertension among rural and urban population of Kisii County, Kenya. *Int J Community Med Public Health*. 2021 Aug 27;8(9):4245. doi.org/10.18203/2394-6040.ijcmph20213211
27. Mosha NR, Mahande M, Juma A, Mboya I, Peck R, Urassa M, et al. Prevalence, awareness and factors associated with hypertension in North West Tanzania. *Global Health Action*. 2017 Jan;10(1):1321279. doi.org/10.1080/16549716.2017.1321279
28. Muhihi AJ, Anaeli A, Mpembeni RNM, Sunguya BF, Leyna G, Kakoko D, et al. Prevalence, Awareness, Treatment, and Control of Hypertension among Young and Middle-Aged Adults: Results from a Community-Based Survey in Rural Tanzania. *International Journal of Hypertension*. 2020 Sep 3;2020:1–13. doi.org/10.1155/2020/9032476
29. Musung JM, Kakoma PK, Kaut Mukeng C, Tshimanga SL, Munkemena Banze JP, Kaj NK, et al. Prevalence of Hypertension and Associated Factors in Lubumbashi City, Democratic Republic of Congo: A Community-Based Cross-Sectional Study. Corrao S, editor. *International Journal of Hypertension*. 2021 Apr 7;2021:1–8. doi.org/10.1155/2021/6674336
30. Souza NPD, Cesse EÂP, Souza WVD, Fontbonne A, Barreto MNSDC, Goff ML, et al. Temporal variation in prevalence, awareness and control of hypertension in urban and rural areas in Northeast Brazil between 2006 and 2016. *Cad Saude Pùblica*. 2020;36(4):e00027819. doi.org/10.1590/0102-311x00027819
31. Kandala NB, Nnanatu CC, Dukhi N, Sewpaul R, Davids A, Reddy SP. Mapping the Burden of Hypertension in South Africa: A Comparative Analysis of the National 2012 SANHANES and the 2016 Demographic and Health Survey. *IJERPH*. 2021 May 19;18(10):5445.

32. Friis RH, Sellers TA. *Epidemiology for Public Health Practice*. 2nd edition. Gaithersburg, Md: Aspen Pub; 1999. 506 p.
33. Patnaik L, Paul KK, Pattnaik S, Sahu T. Lifestyle Pattern and Hypertension Related Knowledge, Attitude and Practices among Diagnosed Patients of Hypertension Attending a Tertiary Care Hospital. *JCDR*. 2017 Nov 3;8(4):108–11. doi.org/10.5530/jcdr.2017.4.25
34. Green LW. Manual for scoring socioeconomic status for research on health behavior. “ *Public health reports*. 1970;9(85).
35. Metcalf P, Scragg R, Davis. Relationship of different measures of socioeconomic status with cardiovascular disease risk factors and lifestyle in a New Zealand workforce survey. *The New Zealand Medical Journal(Online)*. 2007;120(1248).
36. *Oxford textbook of public health*. 1: The scope of public health. 5. ed. Oxford: Oxford Univ. Press; 2009. 392 p.
37. Kunst AE, Mackenbach JP. The size of mortality differences associated with educational level in nine industrialized countries. *Am J Public Health*. 1994 Jun;84(6):932–7.
38. Ministry of Education. Education Sector Strategic Plan 2018/19 to 2023/24. *Ministry of Education website*. <https://www.mineduc.gov.rw/publications/essp>. Accessed 7 July 2024.