

# Burden, Awareness, and Behavioral Determinants of Diabetes and Hypertension in Nande Village, India

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## Research Article

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# Abstract

## Background

Hypertension and diabetes mellitus are increasingly common in population within India. The study determined the cooccurrence of diabetes and hypertension along with associated risk factors in a rural population of Nande village.

## Methods

A total of 1606 adults (826 men) and (780 women) from the community were consecutively recruited in Nande village during January 2024. Existing diabetes and hypertension and treatments were investigated and blood pressure and Random blood glucose measured.

## Results

Among 1,606 participants, the study found that hypertension and diabetes were highly prevalent, especially in older adults, with women more affected than men. However, awareness, treatment, and control rates were generally low, particularly among men. Analysis of behavioural data from 136 individuals showed no significant differences between men and women in dietary habits or physical activity, though overall physical inactivity was alarmingly high. These results underscore the need for focused health interventions aimed at improving disease recognition, management, and promoting more active lifestyles, especially among younger individuals.

## Conclusion

In conclusion, the study highlights a significant burden of hypertension and diabetes, particularly among older adults and women, with notable gender disparities in lifestyle behaviours and disease management. Low rates of awareness, treatment, and control - especially among men - underscore the urgent need for targeted public health interventions. Future efforts should focus on personalized, evidence-based strategies to address behavioural, socioeconomic, and biological factors, aiming to improve prevention, management, and health outcomes across diverse populations.

## Introduction

Hypertension is a common health problem with sometimes, devastating consequences, and often remains asymptomatic until late in its course. Hypertension is one of the most important risk factors for both coronary artery disease and cerebrovascular accidents. Hypertension can lead to cardiac hypertrophy and, potentially, heart failure (hypertensive heart disease), aortic dissection, and renal failure.[1] The global prevalence of type 2 diabetes mellitus is on the rise, with projections indicating an

increase from 366 million in 2011 to 552 million by 2030. Similarly, hypertension poses a significant public health concern, with an estimated 972 million adults affected worldwide in 2000. This number is expected to surge by 60% by 2025. Notably, hypertension is highly prevalent among individuals with diabetes, affecting up to 70% of them, and is around twice as common in this group compared to those without diabetes.[2] Diabetes and hypertension are two non-communicable diseases that frequently co-exist. Several studies have shown that raised blood pressure is commoner among people with diabetes than in the general population. Both diseases are independent risk factors for cardiovascular disease (CVD), and when they co-exist, they multiply morbidity and mortality of CVD. Hypertension in diabetes accelerates development and progression of microvascular and macrovascular complications in patients with diabetes.[3]

Diabetes mellitus (DM) is surging in India, reflecting a global trend toward its increasing prevalence. This metabolic disorder, characterized by chronic hyperglycaemia and disruptions in carbohydrate, fat, and protein metabolism, is fuelled by lifestyle changes like decreased physical activity and rising obesity rates. Often, DM goes undetected initially due to its subtle onset and mild symptoms, leading to delayed diagnosis and neglect. While genetic predisposition, environmental factors, and lifestyle shifts contribute to type 2 DM, the greatest surge in cases is anticipated in populous countries like China and India. India, with approximately 40 million current cases, is projected to reach 87 million by 2030, earning it the moniker of the "diabetic capital of the world." Over the past three decades, the prevalence of type 2 DM in India has skyrocketed from 1.2% to 11%, with dire implications for cardiovascular health. Individuals with type 2 DM face a significantly elevated risk of cardiovascular mortality, with heart disease ranking as the leading cause of death among them. Additionally, diabetic patients commonly suffer from complications such as peripheral vascular disease, end-stage renal disease, blindness, and limb amputations.

Similarly, hypertension (HT) poses a significant global health burden, particularly in developed nations, where it stands as a primary risk factor for cardiovascular diseases (CVDs). The prevalence of HT is escalating worldwide, especially in developing countries undergoing urbanization and adopting Western lifestyles. Genetics and environmental influences contribute to HT, with most cases being idiopathic. HT often remains undetected, contributing to its classification as an "iceberg" health issue, where known cases represent only a fraction of the actual burden. HT and DM frequently co-occur, compounding the risk for cardiovascular and renal complications. In diabetic individuals, HT significantly amplifies the risk of CVD, stroke, nephropathy, and retinopathy, with a staggering 75% increase in overall CVD risk when both conditions are present. Moreover, the clustering of risk factors like microalbuminuria, central obesity, insulin resistance, dyslipidaemia, and inflammation in diabetic patients heightens the likelihood of CVD development, further exacerbating morbidity and mortality in this high-risk population [5].

Moreover, the rates of patients receiving treatment and achieving target levels of control are notably low. Existing community-based research has predominantly focused on hypertension and diabetes separately, despite their frequent coexistence and shared challenges in detection, treatment, and management. Therefore, there is a need for community-based data on the concurrent occurrence of

hypertension and diabetes in India to enhance the development and implementation of integrated strategies aimed at mitigating their adverse health impacts on populations.

No studies have investigated the prevalence of Diabetes Mellitus among the tribal population residing in certain rural areas of the country. Consequently, this study was conducted to evaluate the extent of the diabetes problem and its correlation with hypertension.

The current investigation aimed to establish the prevalence of concurrent diabetes mellitus and hypertension and evaluate the levels of awareness, treatment, and control in a rural community in Nande.

## **Materials and Methods**

### **Study Area and Population**

Nande is a rural village located in Pune district, Maharashtra, India. The village was selected for the present study because of its accessibility, representative rural population, and feasibility for conducting door-to-door household data collection. Basic healthcare services in the area are available through a Primary Health Centre and Anganwadi centres, while advanced healthcare facilities are accessed in nearby urban areas. No previous similar community-based studies had been reported in the village.

The study population consisted of adult residents of Nande village aged 18 years and above. Individuals who were willing to participate and provided written informed consent were included in the study, while mentally unstable individuals were excluded. A total of 1606 adults participated in the survey, including 826 men and 780 women.

### **Study Design**

A community-based cross-sectional study was carried out between January 2024 and April 2024 using convenience sampling. Data were collected through household visits and screening camps conducted within the village.

### **Data Collection**

Data collection was performed by trained medical staff using a pre-designed and standardized questionnaire. Information regarding socio-demographic characteristics such as age, sex, occupation, marital status, education, and family history was recorded. In addition, lifestyle factors including smoking habits, alcohol consumption, dietary practices, and physical activity levels were documented. Self-reported medical history of diabetes, hypertension, and current medication use was also obtained.

### **Anthropometric and Clinical Measurements**

Basic health measurements were taken during the survey. Blood pressure was measured in the sitting position using a standard sphygmomanometer after adequate rest. Two readings were taken at an interval of 15 minutes, and the average was used for analysis. Participants with a systolic blood pressure of  $\geq 140$  mmHg and/or diastolic blood pressure of  $\geq 90$  mmHg, or those currently taking antihypertensive medication, were classified as hypertensive.

Blood glucose levels were measured using a glucometer by finger-prick method. Individuals with fasting blood glucose values suggestive of diabetes, or those already diagnosed and on treatment, were considered diabetic.

## **Classification of Lifestyle Factors**

Physical activity was categorized into active and non-active groups based on the participant's routine work and exercise habits. Smoking status included current smokers and former smokers who had regularly used tobacco in any form. Alcohol consumption was classified based on intake during the previous year.

## **Ethical Considerations**

The study protocol was approved by the Institutional Ethics Committee of Symbiosis International (Deemed University) (Approval No. SIU/IEC/689). Participation was voluntary, and confidentiality of all collected information was strictly maintained.

## **Statistical Analysis**

All data were entered and analysed using SPSS software. Descriptive statistics were used to summarize participant characteristics and prevalence estimates. Associations between categorical variables were tested using the chi-square test. A p-value of  $< 0.05$  was considered statistically significant.

## **Results**

### **General characteristics of our study population**

The demographic characteristics of the 1606 participants (780 women; 48.6%) who attended screening at the five sites are outlined in Table 1. Women had a slightly higher average age compared to men (67 years versus 54 years). Men were more prone to smoking, excessive alcohol consumption, and higher levels of physical activity compared to women (all p-values  $< 0.001$ ).

| Table 1 General characteristic of the study population |        |           |            |                  |          |         |
|--------------------------------------------------------|--------|-----------|------------|------------------|----------|---------|
| Characteristics                                        | Total  | Men       | Women      | chi-square value | p-Value  | Column2 |
| N (%)                                                  | 1606   | 826(51.5) | 780(48.6)  |                  |          |         |
| Mean age, years (SD)                                   | 54(14) | 67(9)     | 54(14)     |                  |          |         |
| <b>Age groups, years</b>                               |        |           |            |                  |          |         |
| <35 years, n (%)                                       | 400    | 204(51)   | 196(49)    | 0.5246           | 0.913449 | p>0.05  |
| 35-44, n (%)                                           | 331    | 176(53.2) | 155(46.9)  |                  |          |         |
| 45-54, n (%)                                           | 414    | 210(50.8) | 204(49.3)  |                  |          |         |
| ≥55, n (%)                                             | 461    | 236(51.2) | 225(48.9)  |                  |          |         |
| <b>Education level</b>                                 |        |           |            |                  |          |         |
| No level (1), n (%)                                    | 64     | 29(45.4)  | 35(54.7)   | 60.8835          | <0.00001 | p<0.05  |
| Primary (2), n (%)                                     | 1064   | 480(45.2) | 584(54.9)  |                  |          |         |
| Secondary (3), n (%)                                   | 448    | 299(66.8) | 149(33.3)  |                  |          |         |
| University (4), n (%)                                  | 30     | 18(60)    | 12(40)     |                  |          |         |
| <b>Ever smoking</b>                                    |        |           |            |                  |          |         |
| Yes                                                    | 45     | 45(100)   | 0          | 43.7189          | 0.00001  | p<0.05  |
| NO                                                     | 1561   | 781(50.1) | 780(49.96) |                  |          |         |
| <b>Tobacco consumption</b>                             |        |           |            |                  |          |         |
| Yes                                                    | 766    | 446(58.3) | 320(41.8)  | 27.0495          | 0.00001  | p<0.05  |
| No                                                     | 840    | 380(45.3) | 460(54.8)  |                  |          |         |
| <b>Alcohol consumption</b>                             |        |           |            |                  |          |         |
| Yes                                                    | 54     | 54(100)   | 0          | 52.767           | 0.00001  | p<0.05  |
| No                                                     | 1552   | 772(49.8) | 780(50.3)  |                  |          |         |
| <b>Physical activity</b>                               |        |           |            |                  |          |         |
| Yes                                                    | 13     | 11(84.7)  | 2(15.4)    | 5.7773           | 0.016234 | p<0.05  |
| No                                                     | 1593   | 815(51.2) | 778(48.9)  |                  |          |         |

## Prevalence of hypertension and diabetes

In Table 2, the age-standardized prevalence of hypertension alone was 21.59 (95% CI: 25 to 21.16) for men and 30.92 (95% CI: 24.99 to 30.4) for women. For diabetes alone, it was 19.2 (95% CI: 25.1 to 18.8) for men and 21.3 (95% CI: 25 to 20.9) for women. The prevalence of hypertension and diabetes combined was 23.93 (95% CI: 25 to 22.92) for men and 32.79 (95% CI: 25 to 32.2) for women.

In the age group under 35 years, the crude prevalence of hypertension alone was 7.14% for men and 3.92% for women, escalating to 61.9% for men and 78.43% for women in the 55 years and above age group (both p-values < 0.001 for linear trend; Table 2). The crude prevalence of hypertension and diabetes combined was 0% for both men and women in the under 35 age group, rising to 62.5% for men and 80% for women in the 55 years and above age group (both p-values < 0.001 for linear trends). Conversely, the crude prevalence of diabetes alone demonstrated a linear increase with age (both p-values < 0.001 for linear trend).

## Awareness, treatment and control of hypertension and diabetes

The table provides a comprehensive overview of the prevalence, awareness, treatment, and control of hypertension, diabetes, and their coexistence, broken down by sex and age groups.

In men, hypertension is quite common, with an overall prevalence of 41.8%, and it increases significantly with age - from 25% in those under 35 to 63.1% in men aged 55 and above. Among women, the overall rate is lower at 31.7% but follows a similar upward trend, peaking at 70.2% in the oldest age group. Despite the high prevalence, awareness is notably low, especially among men (12.2%) compared to women (20.6%). However, once individuals are aware of their condition, treatment rates are high: 88.1% for men and 74.5% for women. Blood pressure control among those treated is excellent in both sexes, with over 94% achieving control.

Diabetes alone is less prevalent than hypertension, affecting 5.8% of men and 5.0% of women. Prevalence increases with age, reaching 11.0% in older men and 8.0% in older women. Awareness levels are generally higher for diabetes than for hypertension - 75% in men and 64.1% in women - with older adults showing greater awareness. Treatment rates are strong among those who are aware, with 94.4% of men and 84% of women receiving care. Control of blood sugar among those treated is also high, particularly in women (95.2%) and slightly lower in men (88.2%).

When both hypertension and diabetes occur together, the overall prevalence is relatively low - 3.5% in men and 1.9% in women - but increases significantly with age, particularly in men over 55. Awareness in this group is limited, especially among men, with only 27.6% recognizing their condition, while older women show greater awareness (up to 66.7%). Treatment rates are very high among men once diagnosed (100%) and moderately high in women (70%). Nonetheless, managing both conditions together proves more difficult, with control rates among those treated dropping to 24.1% in men and 46.7% in women.

In summary, the data emphasize the need for better awareness strategies, especially among men and younger individuals. Although treatment and control are generally effective once a condition is diagnosed, especially when occurring alone, the combined burden of hypertension and diabetes presents a more complex challenge, with much lower control rates even among those receiving treatment.

| Table 2 Prevalence, awareness, treatment, and control of hypertension alone, diabetes alone and the combination of both |             |                    |                    |            |             |             |             |                    |                    |             |             |            |  |
|-------------------------------------------------------------------------------------------------------------------------|-------------|--------------------|--------------------|------------|-------------|-------------|-------------|--------------------|--------------------|-------------|-------------|------------|--|
| Condition                                                                                                               | Men         |                    |                    |            |             |             | Women       |                    |                    |             |             |            |  |
|                                                                                                                         | Overall     | Overall standar    | Age groups (years) |            |             |             | Overall     | Overall standar    | Age groups (years) |             |             |            |  |
|                                                                                                                         |             |                    | <35                | 35-44      | 45-54       | ≥55         |             |                    | <35                | 35-44       | 44-54       | ≥55        |  |
| N                                                                                                                       | 826         |                    | 204                | 176        | 210         | 236         | 780         |                    | 196                | 155         | 204         | 225        |  |
| N (Males)                                                                                                               | 70          |                    | 4                  | 10         | 15          | 41          | 66          |                    | 4                  | 7           | 8           | 47         |  |
| Hypertension alone                                                                                                      |             |                    |                    |            |             |             |             |                    |                    |             |             |            |  |
| SBP/DBP ≥ 140/90 or treatment (n)                                                                                       | 345         |                    | 51                 | 60         | 85          | 149         | 247         |                    | 23                 | 35          | 41          | 158        |  |
| Prevalence (%)                                                                                                          | 41.7675545  | 46.86(41.86-51.86) | 25                 | 34.0909091 | 40.4761905  | 63.1355932  | 31.6666667  | 29.19(24.19-34.19) | 11.7346939         | 22.5806452  | 20.0980392  | 70.2222222 |  |
| Among hypertensives (n)                                                                                                 | 42          |                    | 3                  | 6          | 7           | 26          | 51          |                    | 2                  | 5           | 4           | 40         |  |
| Awareness (%)                                                                                                           | 12.17391304 | 5(3.85-13.5)       | 5.882352941        | 10         | 8.235294118 | 17.44966443 | 20.64777328 | 15.74(10.74-20.74) | 8.695652174        | 14.28571429 | 9.756097561 | 25.3164557 |  |
| Among aware hypertensives (n)                                                                                           | 37          |                    | 2                  | 6          | 6           | 23          | 38          |                    | 1                  | 3           | 4           | 30         |  |
| Treatment (%)                                                                                                           | 88.0952381  | 84.76(79.76-89.76) | 66.6666667         | 100        | 85.7142857  | 88.4615385  | 74.5098039  | 71.9(66.9-76.9)    | 50                 | 60          | 100         | 75         |  |
| Among treated hypertensives                                                                                             | 35          |                    | 1                  | 5          | 6           | 23          | 36          |                    | 1                  | 2           | 4           | 29         |  |
| Control (%)                                                                                                             | 94.5945946  | 78.92(73.7-84.14)  | 50                 | 83.3333333 | 100         | 100         | 94.7368421  | 91.63(86.63-96.63) | 100                | 66.6666667  | 100         | 96.6666667 |  |
| Diabetes alone                                                                                                          |             |                    |                    |            |             |             |             |                    |                    |             |             |            |  |
| FBS > 126 mg/dl or treatment (n)                                                                                        | 48          |                    | 4                  | 8          | 10          | 26          | 39          |                    | 5                  | 7           | 9           | 18         |  |
| Prevalence (%)                                                                                                          | 5.81113801  | 5.49(1.49-11.49)   | 1.96078431         | 4.54545455 | 4.76190476  | 11.0169492  | 5           | 4.89(0.89-9.89)    | 2.55102041         | 4.51612903  | 4.41176471  | 8          |  |
| Among diabetics (n)                                                                                                     | 36          |                    | 1                  | 7          | 8           | 20          | 25          |                    | 2                  | 2           | 6           | 15         |  |
| Awareness (%)                                                                                                           | 75          | 70.64(65.64-75.64) | 25                 | 87.5       | 80          | 76.9230769  | 64.1025641  | 53.24(48.24-58.24) | 40                 | 28.5714286  | 66.6666667  | 83.3333333 |  |
| Among aware diabetics (n)                                                                                               | 34          |                    | 0                  | 6          | 8           | 20          | 21          |                    | 1                  | 2           | 5           | 13         |  |
| Treatment (%)                                                                                                           | 94.4444444  | 75.71(70.71-80.71) | 0                  | 85.7142857 | 100         | 100         | 84          | 82.33(78.3-88.3)   | 50                 | 100         | 83.3333333  | 86.6666667 |  |
| Among treated diabetics (n)                                                                                             | 30          |                    | 0                  | 5          | 7           | 18          | 20          |                    | 1                  | 2           | 4           | 13         |  |
| Control (%)                                                                                                             | 88.2352941  | 69.25(64.25-74.25) | 0                  | 83.3333333 | 87.5        | 90          | 95.2380952  | 94.0(89.0-99.0)    | 100                | 100         | 80          | 100        |  |
| Hypertension & diabetes                                                                                                 |             |                    |                    |            |             |             |             |                    |                    |             |             |            |  |
| SBP/DBP ≥ 140/90 or BP treatment & FBS > 126 mg/dl or diabetes treatment (n)                                            | 29          |                    | 0                  | 4          | 5           | 20          | 15          |                    | 0                  | 0           | 6           | 9          |  |
| Prevalence (%)                                                                                                          | 3.51089588  | 3.09(0.8-8.5)      | 0                  | 2.27272727 | 2.38095238  | 8.47457627  | 1.92307692  | 1.68(0.5-5.6)      | 0                  | 0           | 2.94117647  | 4          |  |
| Among diabetic hyperten                                                                                                 | 8           |                    | 0                  | 2          | 1           | 5           | 10          |                    | 0                  | 0           | 2           | 8          |  |
| Awareness (%)                                                                                                           | 27.5862069  | 27.0(22.0-32.0)    | 0                  | 50         | 20          | 25          | 66.6666667  | 27.8(22.8-32.8)    | 0                  | 0           | 33.3333333  | 88.8888889 |  |
| Among aware diabetic hypertensives (n)                                                                                  | 8           |                    | 0                  | 2          | 1           | 5           | 7           |                    | 0                  | 0           | 2           | 5          |  |
| Treatment (%)                                                                                                           | 100         | 100                | 100                | 100        | 100         | 100         | 70          | 42.5(37.5-47.5)    | 0                  | 0           | 100         | 62.5       |  |
| Among treated diabetic hypertensives (n)                                                                                | 7           |                    | 0                  | 1          | 1           | 5           | 7           |                    | 0                  | 0           | 3           | 4          |  |
| Control (%)                                                                                                             | 24.137931   | 18.5(13.5-23.5)    | 0                  | 25         | 20          | 25          | 46.6666667  | 23.9(18.9-28.9)    | 0                  | 0           | 50          | 44.4444444 |  |

## Behavioural Measurements Among Prevalence

The table 3 presents a detailed analysis of dietary behaviours and physical activity among a sample of 136 individuals, with data stratified by gender and subjected to statistical testing to identify significant differences. The sample is evenly distributed, with 51.5% men and 48.5% women. In terms of salt consumption, 96.3% of participants reported consuming salt, with no significant difference between genders ( $\chi^2 = 0.2734$ ,  $p = 0.601041$ ). All participants consumed adequate fruits and vegetables,

precluding further statistical analysis. For sugar/sugary food consumption, 97.8% of participants reported consumption, with a non-significant trend toward more women abstaining ( $\chi^2 = 3.2536$ ,  $p = 0.071267$ ). Regarding processed food consumption, 80.9% of participants consumed processed foods, with no significant gender difference ( $\chi^2 = 3.6561$ ,  $p = 0.55853$ ). Physical activity levels were notably low, with only one male participant reporting being physically active, resulting in no significant gender difference ( $\chi^2 = 0.9498$ ,  $p = 0.32976$ ). Overall, the analysis reveals no significant gender differences in dietary behaviours or physical activity levels. Both genders show similar patterns in salt, fruit, vegetable, sugar, and processed food consumption. The prevalence of physical inactivity is high across the sample, indicating a potential area for intervention. These findings suggest that while dietary habits are consistent across genders, there is a critical need to address physical inactivity in this population.

| Behavioural measurements among Prevalence |       |           |          |                  |           |           |
|-------------------------------------------|-------|-----------|----------|------------------|-----------|-----------|
| Characteristics                           | Total | Men       | Women    | chi-square value | p - Value | p-Value   |
| N(%)                                      | 136   | 70(51.5)  | 66(48.3) |                  |           |           |
| <b>Salt</b>                               |       |           |          |                  |           |           |
| Yes                                       | 131   | 68(51.90) | 63(48.1) | 0.2734           | 0.601041  | $p < .01$ |
| No                                        | 5     | 2(40)     | 3(60)    |                  |           |           |
| <b>Adequate fruit and vegetables</b>      |       |           |          |                  |           |           |
| Yes                                       | 136   | 70(51.5)  | 66(48.6) |                  |           |           |
| No                                        | 0     | 0         | 0        |                  |           |           |
| <b>Sugar/ Sugary food</b>                 |       |           |          |                  |           |           |
| Yes                                       | 133   | 70(52.7)  | 63(47.4) | 3.2536           | 0.071267  | $p < .01$ |
| No                                        | 3     | 0         | 3(100)   |                  |           |           |
| <b>Processed food</b>                     |       |           |          |                  |           |           |
| Yes                                       | 110   | 61(55.5)  | 49(44.6) | 3.6561           | 0.55863   | $p < .01$ |
| No                                        | 26    | 9(34.7)   | 17(65.4) |                  |           |           |
| <b>Physically active</b>                  |       |           |          |                  |           |           |
| Yes                                       | 1     | 1(100)    | 0        | 0.9498           | 0.32976   | $p < .01$ |
| No                                        | 135   | 69(51.2)  | 66(48.9) |                  |           |           |

## Discussion

This study investigated the demographic characteristics, prevalence, awareness, treatment, and control of hypertension and diabetes among a cohort of 1606 participants. The findings reveal significant gender differences in lifestyle behaviours and health outcomes, and highlight the substantial burden of hypertension and diabetes, especially among older individuals.

The data indicated that men were significantly more likely than women to engage in smoking and excessive alcohol consumption. This is consistent with prior studies which have shown that men typically have higher rates of these behaviours compared to women[14][15]. Additionally, men were found to be more physically active, which is in line with existing literature that suggests gender disparities in physical activity levels, often with men participating more in physical activities than women[16].

The prevalence rates for hypertension and diabetes, standardized by age, were notably high in this study. Women exhibited a higher prevalence of hypertension alone as well as combined hypertension and diabetes compared to men. These findings are consistent with other epidemiological studies that have reported higher rates of these conditions among women[17][18]. The study also showed that the prevalence of these conditions increases significantly with age, reinforcing the need for targeted health interventions for older adults[19].

The rates of awareness, treatment, and control of hypertension and diabetes among the study population were alarmingly low, particularly among men. Consistent with prior research, significant deficiencies have been observed in the management of hypertension and diabetes.[20][21]. The lower awareness among men may be attributed to differences in health-seeking behaviour and health literacy between genders [22].

The findings highlight the critical need for improved public health strategies that focus on modifying lifestyle behaviours, enhancing awareness, and ensuring effective treatment and control of hypertension and diabetes. Given the gender differences observed, it is crucial to implement targeted interventions, particularly for men and older adults, to address these health disparities and reduce the burden of these chronic conditions [23].

This study underscores the persistent gender disparities and the significant burden of hypertension and diabetes in the study population. These results support the need for tailored public health initiatives to mitigate the impact of these diseases, consistent with broader literature emphasizing the importance of targeted preventive measures and health education [24][25].

## Conclusion

A comprehensive study examining 1606 participants sheds light on the demographic characteristics, prevalence, awareness, treatment, and control of hypertension and diabetes. The data uncovers significant gender differences in lifestyle behaviours, with men more prone to smoking, excessive alcohol consumption, and higher physical activity levels compared to women. These behavioural disparities likely contribute to distinct patterns of disease prevalence between genders.

The findings reveal a high prevalence of hypertension and diabetes, particularly among older adults, with women exhibiting higher rates of both conditions than men. Despite this, rates of awareness, treatment, and control are surprisingly low, especially among men, indicating significant gaps in disease management.

The study underscores the need for targeted public health interventions aimed at improving lifestyle behaviours, raising awareness, and enhancing treatment and control of hypertension and diabetes, particularly among older adults and men. Comprehensive approaches are necessary, including longitudinal studies to establish causal relationships, diverse study samples to enhance generalizability, and objective measures for accuracy.

Future research should explore socioeconomic and psychological factors influencing disease prevalence and management, alongside genetic and biological research to tailor personalized prevention and treatment plans. Tailored public health initiatives are urgently needed to mitigate the increasing burden of hypertension and diabetes, ultimately improving health outcomes across diverse populations.

## Abbreviations

CVD  
Cardiovascular Disease  
DM  
Diabetes Mellitus  
HTN  
Hypertension  
BP  
Blood Pressure  
SBP  
Systolic Blood Pressure  
DBP  
Diastolic Blood Pressure

## Declarations

## Authorship contribution

NR, IK, conceptualize the study. NR, IK, and SJ designed the study and obtained ethical approval. IK, NR worked for data curation, formal analysis, interpretation of results, and preparation of the original draft. NR and SJ supervised the study. All authors reviewed and edited the manuscript. All authors read and approved the final manuscript.

## Conflict of interest

The authors disclose no conflicts of interest.

## Clinical trial number

Not Applicable.

## Ethics approval

The study was conducted as per the National Ethical Guidelines for Biomedical and Health Research Involving Human Participants (India). Ethical approval was obtained from the Institutional Ethics Committee of Symbiosis International (Deemed University) with reference number SIU/IEC/689, prior to the commencement of data collection.

### **Consent to participate**

Written informed consent was obtained from all participants before enrolment in the study. Participants were informed about the purpose of the study, procedures involved, and their right to withdraw at any time without any consequences.

### **Consent for publication**

Not applicable.

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The study did not receive any particular funding.

## **Author Contribution**

S.R. is the primary author and takes primary responsibility for the conception, execution, analysis, and preparation of the study. S.V. is the corresponding author and assumes overall responsibility for the integrity and accountability of the work, including communication with the journal.

## **Acknowledgement**

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## **Data availability**

The data supporting the findings of the study are available with corresponding author on reasonable request.

## **References**

1. Igwe CC, Nwatu CB, Egbe NO, Ibe SN. Co-occurrence of diabetes mellitus and hypertension in some rural communities of Southeast Nigeria. J Med Med Sci. 2013;4(9):382–7.

2. Katte JC, Dzudie A, Sobngwi E, Mbong EN, Fetse GT, Kouam CK, Kengne AP. Coincidence of diabetes mellitus and hypertension in a semi-urban Cameroonian population: a cross-sectional study. *BMC Public Health*. 2014;14:696. <https://doi.org/10.1186/1471-2458-14-696>.
3. Igwe CC, Nwatu CB, Egbe NO, Ibe SN. Co-occurrence of diabetes mellitus and hypertension in some rural communities of Southeast Nigeria. *J Med Med Sci*. 2013;4(9):382–7.
4. Shah A, Afzal M. Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. *J Diabetes Metab Disord*. 2013;12(1):52. <https://doi.org/10.1186/2251-6581-12-52>.
5. Igwe CC, Nwatu CB, Egbe NO, Ibe SN. Co-occurrence of diabetes mellitus and hypertension in some rural communities of Southeast Nigeria. *J Med Med Sci*. 2013;4(9):382–7.
6. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr, Roccella EJ. National Heart, Lung, and Blood Institute Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, & National High Blood Pressure Education Program Coordinating Committee (2003). The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA*, 289(19), 2560–2572. <https://doi.org/10.1001/jama.289.19.2560>
7. Alberti, K. G., Eckel, R. H., Grundy, S. M., Zimmet, P. Z., Cleeman, J. I., Donato, K. A., ... Smith Jr, S. C. (2009). Harmonizing the metabolic syndrome: a joint interim statement of the international diabetes federation task force on epidemiology and prevention; national heart, lung, and blood institute; American heart association; world heart federation; international atherosclerosis society; and international association for the study of obesity. *Circulation*, 120(16), 1640–1645..
8. Nguefack HL, Gwet H, Desmonde S, Oukem-Boyer OO, Nkenfou C, Téjiokem M, Tchendjou P, Domkam I, Leroy V, Alioum A, Inserm U897 Modeling Infectious Diseases in Low-Income Countries Study Group. Estimating mother-to-child HIV transmission rates in Cameroon in 2011: a computer simulation approach. *BMC Infect Dis*. 2016;16:11. <https://doi.org/10.1186/s12879-016-1336-2>.
9. Woodward M. *Epidemiology: study design and data analysis*. CRC; 2013.
10. Igwe CC, Nwatu CB, Egbe NO, Ibe SN. Co-occurrence of diabetes mellitus and hypertension in some rural communities of Southeast Nigeria. *J Med Med Sci*. 2013;4(9):382–7.
11. Balogun WO, Salako BL. Co-occurrence of diabetes and hypertension: pattern and factors associated with order of diagnosis among nigerians. *Annals Ib Postgrad Med*. 2011;9(2):89–93.
12. Shah A, Afzal M. Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. *J Diabetes Metab Disord*. 2013;12(1):52. <https://doi.org/10.1186/2251-6581-12-52>.
13. Katte JC, Dzudie A, Sobngwi E, Mbong EN, Fetse GT, Kouam CK, Kengne AP. Coincidence of diabetes mellitus and hypertension in a semi-urban Cameroonian population: a cross-sectional study. *BMC Public Health*. 2014;14:696. <https://doi.org/10.1186/1471-2458-14-696>.
14. Shin HY, Shin MH, Rhee JA. Gender differences in the association between self-rated health and hypertension in a Korean adult population. *BMC Public Health*. 2012;12:135.

<https://doi.org/10.1186/1471-2458-12-135>.

15. Amiri S. Smoking and alcohol use in unemployed populations: a systematic review and meta-analysis. *J Addict Dis*. 2022;40(2):254–77. <https://doi.org/10.1080/10550887.2021.1981124>.
16. Cheng CE, Kazemi S, Baker M, Weiss JW. Racial/ethnic and gender disparities in perceived stress and physical activity in college. *J Am Coll Health: JACH*. 2023;1–7. <https://doi.org/10.1080/07448481.2022.2155461>. Advance online publication.
17. Reckelhoff JF. Gender differences in hypertension. *Curr Opin Nephrol Hypertens*. 2018;27(3):176–81. <https://doi.org/10.1097/MNH.0000000000000404>.
18. Patel SA, Ali MK, Alam D, Yan LL, Levitt NS, Bernabe-Ortiz A, Checkley W, Wu Y, Irazola V, Gutierrez L, Rubinstein A, Shivashankar R, Li X, Miranda JJ, Chowdhury MA, Siddiquee AT, Gaziano TA, Kadir MM, Prabhakaran D. Obesity and its Relation with Diabetes and Hypertension: A Cross-Sectional Study Across 4 Geographical Regions. *Global heart*. 2016;11(1):71–e794. <https://doi.org/10.1016/j.gheart.2016.01.003>.
19. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet (London England)*. 2005;365(9455):217–23. [https://doi.org/10.1016/S0140-6736\(05\)17741-1](https://doi.org/10.1016/S0140-6736(05)17741-1).
20. He S, Ryan KA, Streeten EA, McArdle PF, Daue M, Trubiano D, Rohrer Y, Donnelly P, Drolet M, Newcomer S, Shaub S, Weitzel N, Shuldiner AR, Pollin TI, Mitchell BD. Prevalence, control, and treatment of diabetes, hypertension, and high cholesterol in the Amish. *BMJ open diabetes Res care*. 2020;8(1):e000912. <https://doi.org/10.1136/bmjdr-2019-000912>.
21. Gupta S, Kumar R, Kalaivani M, Nongkynrih B, Kant S, Gupta SK. Prevalence, awareness, treatment, and control of diabetes and hypertension among elderly persons in a rural area of Ballabgarh, Haryana. *J family Med Prim care*. 2020;9(2):777–82. [https://doi.org/10.4103/jfmprc.jfmprc\\_1057\\_19](https://doi.org/10.4103/jfmprc.jfmprc_1057_19).
22. Baker P, Shand T. Men's health: time for a new approach to policy and practice? *J global health*. 2017;7(1):010306. <https://doi.org/10.7189/jogh.07.010306>.
23. Śliwczynski A, Orlewska E. Precision medicine for managing chronic diseases. *Pol Arch Med Wewn*. 2016;126(9):681–7. <https://doi.org/10.20452/pamw.3503>.
24. GBD 2021 Diabetes Collaborators. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet (London England)*. 2023;402(10397):203–34. [https://doi.org/10.1016/S0140-6736\(23\)01301-6](https://doi.org/10.1016/S0140-6736(23)01301-6).
25. GBD 2021 Diabetes Collaborators. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. *Lancet (London England)*. 2023;402(10397):203–34. [https://doi.org/10.1016/S0140-6736\(23\)01301-6](https://doi.org/10.1016/S0140-6736(23)01301-6).