

## Original Research Article

# Assessment of the epidemiological risk factors of diabetic and hypertensive patients amongst the adult population

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## ABSTRACT

**Background:** 93 lakh people in India are undergoing diabetes and hypertension medication. It is true that the most important modifiable risk factors for type 2 diabetes and hypertension today are poor diet, cigarette smoking, and insufficient exercise. NCD-related deaths worldwide will increase by 17% by 2025, costing \$47 trillion in lost productivity between 2011 and 2030.

**Methods:** 300 diabetics, hypertensive and diabetic with hypertensive patients were selected from 8 urban wards and 8 rural panchayats of Bhopal by multi-stage random sampling. A semi-structured, pretested and validated questionnaire derived from WHO-STEPPS survey was used to collect data in terms of socio-demographic variables, behavioural risk factors measurement and physical measurements. Mean and standard deviations were calculated for quantitative data, frequency and proportions were calculated for qualitative data. Chi-square value was calculated and p value less than 0.05 was considered statistically significant.

**Results:** The mean age was  $46.55 \pm 2.17$  years. DBP found to be 3% more than 39% of males have systolic BP  $\geq 140$  mm of Hg. 33.6% fall under obese-I category. Current tobacco smokers, current alcohol consumption, heavy alcohol use, salt intake  $>5$  gm/day, BMI  $\geq 30$  (obese-II) was significantly associated with hypertension.

**Conclusions:** The study's findings indicate that the alarmingly high occurrence of risk factors for diabetes and hypertension among adults need immediate attention. This indicates the need for an extensive screening and awareness campaign to identify undetected cases in the community and to offer early treatment and continuous follow-up to prevent consequences.

**Keywords:** BMI, Diabetes, Hypertension, NCD risk factors

## INTRODUCTION

According to recent estimates from the World Health Organization (WHO), NCDs kill about 38 million people worldwide each year.<sup>1</sup> The National NCD portal states that 93 lakh individuals in India are receiving treatment for hypertension and diabetes. An estimated 2 million fatalities were attributed to diabetes renal disease in 2019.<sup>2</sup> Madhya Pradesh's NFHS-5 (2019-2021) revealed that 14.3% of women and 12.9% of men had blood sugar levels  $\geq 140$  mg/dl and blood pressure (systolic  $\geq 140$  mmHg and diastolic  $\geq 90$  mmHg) was found to be 24.9%

and 22.4%, respectively.<sup>3</sup> Over 8 million fatalities worldwide are related to tobacco use (including second hand smoke exposure). Excessive consumption of salt and potassium has been linked to 1.8 million fatalities each year.<sup>4</sup> It's true that poor diets and little exercise have become two of the most significant modifiable risk factors for type 2 diabetes as well as other chronic, non-communicable diseases including cardiovascular disease. While many research from western nations have examined the levels of physical exercise in their respective populations, there aren't many from India that examine this significant risk factor.<sup>5</sup> Only 42% of adults

with hypertension receive a diagnosis and course of treatment. Of adults with hypertension, about one in five (21%) have it under control. A global goal for noncommunicable diseases is a 33% decrease in the prevalence of hypertension by the year 2030. There are currently approximately 66.8 million instances of diabetes in India; by 2035, that figure is predicted to increase to 120.9 million. NCDs currently account for three of the top five causes of morbidity and mortality in the nation.<sup>6</sup> In addition, 86.7% of Indians did not eat enough fruits and vegetables, and just 47% of them ate enough dark green and leafy vegetables each day.<sup>7</sup> In a nation this size and diversity, research on the regional-level NCD risk factor profile is necessary. Globally, the number of fatalities from NCDs is expected to rise by 17% by 2025, resulting in an estimated \$47 trillion in lost production between 2011 and 2030.<sup>8</sup> Non-communicable diseases (NCDs) are a significant public health and wider social issue that result in around 42 million deaths globally annually, high health care expenses, absenteeism, and lost years of productive life.<sup>9</sup>

### **Rationale**

To understand that the study on diabetic and hypertensive adult population will establish that what is the most predominant risk factors among the diseased population. To estimate the associations between socio-demographic profile, diabetic and hypertensive history with various epidemiological risk factors.

## **METHODS**

### **Study design**

It was an observational cross-sectional study.

### **Settings and sample**

Study was conducted in selected 8 urban wards ward-1 (Mahatma Gandhi ward), ward-2 (CTO), ward-5 (Koh e Fiza), ward-6 (Noor mahal), ward -8 (fire brigade), ward-9 (Idgah hills), ward-11 (gufa mandir), ward-17 (Ibrahimpura) and 8 rural village panchayats, 4 from Berasia village panchayat (Semra kalan, Nipaniya jat, Habibganj, Bairagarh) and 4 from Phanda village panchayat (Kurana, Chandukhedi, Khajuri sadak, Phanda kalan) of Bhopal district.<sup>10</sup>

Over a duration of one and a half years (August 2022-January 2024), study was conducted among diabetic and hypertensive adults having elevated blood pressure systolic  $\geq 140$  and/or diastolic  $\geq 90$  mmHg and/or elevated blood sugar  $>140$  mg/dl and those above 18 years of age were included. Population below 18 years of age, critically ill and mentally disabled were excluded from the study. NFHS-5 MP shows elevated blood pressure systolic  $\geq 140$  and/or diastolic  $\geq 90$  mm of Hg in Bhopal is 13.6%.<sup>3</sup> Using the formula  $n = z^2 pq/d^2$ , sample size came to be 282 which was rounded to 300.

### **Sampling**

Multi-stage random sampling. Stage 1: by simple random sampling, out of 85 urban wards of Bhopal 8 wards and from 2 blocks (i.e., Berasia and Phanda) 4 rural village panchayats from each block were randomly selected. Stage 2: by simple random sampling, ASHAs of respective wards/villages were contacted and list of diabetic and hypertensive patients were obtained and their houses were identified. Stage 3: by simple random sampling, we have selected 19 diabetic and hypertensive patients randomly from each ward and village panchayats and hence a total of 300 patients were interviewed. This sampling approach aimed to capture a representative sample on considering the results should be generalizable to population in Bhopal.

### **Study tools**

The subjects were interviewed using a semi-structured, pretested and validated questionnaire derived from WHO-STEPs survey.

### **Questionnaire design and validation**

The questionnaire contains information on socio-demographic variables such as age, education, occupation, number of family members, religion, type of family and housing. Modified Kuppaswamy's socio economic scale 2023, scores were used.<sup>11</sup> The questionnaire includes behavioural risk factors measurement in terms of tobacco use, alcohol consumption, dietary pattern, physical activity and physical measurements derived from WHO-STEPs questionnaire.<sup>12</sup> Physical measurements including blood pressure, weight, height and waist circumference. Then pilot testing of questionnaire was done at the non-study population at Lal Ghati among 5% of the sample size, after testing the validity of the proforma study was started.

### **Ethical approval**

The study received approval from the institutional ethics committee, Gandhi Medical College Bhopal having an IEC protocol no: (75/IEC/2022).

### **Statistical analysis**

The filled questionnaires were checked for completeness and findings were coded for analysis. Data were entered using Microsoft Excel 2021 and analysed using Epi Info version 7.2.5.0.<sup>13</sup> Descriptive analyses were performed means and standard deviations were calculated for quantitative data, frequency and proportions were calculated for qualitative data. Inferential statistics (chi-square test) were performed between two categorical data to check association. Chi-square value is calculated and p value less than 0.05 was considered statistically significant.

## RESULTS

Majority of participants nearly 99 (33%) belonged to 41-50 years followed by 51-60 years. The mean age was  $46.55 \pm 2.17$  years. 154 (51.3%) were Muslims by religion.

About 182 (60.6%) belonged to nuclear family. One-fifth were graduates. 85 (28.3%) were skilled workers, 101 (33.7%) were unemployed. 265 (85.3%) were married (Table 1).

**Table 1: Socio-demographic profile of the study participants (n=300).**

| Variables                      | Male (n=187) N (%) | Female (n=113) N (%) | Total (n=300) N (%) |
|--------------------------------|--------------------|----------------------|---------------------|
| <b>Age groups (in years)</b>   |                    |                      |                     |
| 18-30                          | 11 (5.8)           | 4 (3.5)              | 15 (5)              |
| 31-40                          | 32 (17.1)          | 16 (14.1)            | 48 (16)             |
| 41-50                          | 62 (33.1)          | 37 (32.7)            | 99 (33)             |
| 51-60                          | 52 (27.8)          | 26 (23)              | 78 (26)             |
| ≥61                            | 30 (16)            | 30 (26.5)            | 60 (20)             |
| <b>Residence</b>               |                    |                      |                     |
| Urban                          | 92 (49.2)          | 66 (58.4)            | 158 (52.7)          |
| Rural                          | 95 (50.8)          | 47 (41.6)            | 142 (47.3)          |
| <b>Educational status</b>      |                    |                      |                     |
| Primary school                 | 23 (12.3)          | 20 (17.7)            | 43 (14.3)           |
| Middle school                  | 36 (19.5)          | 10 (8.8)             | 46 (15.3)           |
| High school                    | 32 (17.1)          | 22 (19.4)            | 54 (18)             |
| Intermediate/diploma           | 27 (14.4)          | 6 (5.3)              | 33 (11)             |
| Graduate                       | 46 (24.6)          | 14 (12.4)            | 60 (20)             |
| Post-graduate                  | 12 (6.4)           | 9 (8)                | 21 (7)              |
| Illiterate                     | 10 (5.3)           | 32 (28.3)            | 42 (14)             |
| <b>Religion</b>                |                    |                      |                     |
| Hindu                          | 93 (49.7)          | 39 (34.5)            | 132 (44)            |
| Muslim                         | 83 (44.4)          | 71 (62.8)            | 154 (51.3)          |
| Jain                           | 9 (4.8)            | 1 (0.8)              | 10 (3.3)            |
| Christian                      | 2 (1.07)           | 2 (1.7)              | 4 (1.3)             |
| <b>Marital status</b>          |                    |                      |                     |
| Married                        | 162 (86.6)         | 100 (88.5)           | 262 (87.3)          |
| Unmarried                      | 21 (11.2)          | 4 (3.5)              | 25 (8.3)            |
| Widowed                        | 4 (2.14)           | 7 (6.2)              | 11 (3.7)            |
| Divorced                       | 0                  | 2 (1.7)              | 2 (0.7)             |
| <b>Occupation</b>              |                    |                      |                     |
| Professional                   | 17 (9.1)           | 3 (2.7)              | 20 (6.7)            |
| Technician                     | 29 (15.5)          | 4 (3.5)              | 33 (11)             |
| Skilled worker                 | 67 (35.8)          | 15 (13.2)            | 82 (27.3)           |
| Clerk                          | 39 (20.8)          | 7 (6.2)              | 46 (15.3)           |
| Craft and related trade worker | 6 (3.2)            | 2 (1.7)              | 8 (2.7)             |
| Elementary occupation          | 5 (2.7)            | 2 (1.7)              | 7 (2.3)             |
| Unemployed                     | 22 (11.7)          | 79 (69.9)            | 101 (33.7)          |

Salt intake found to be significantly associated with diabetes ( $p=0.005$ ). Fruit and vegetable servings  $<5$ /day, salt intake  $>5$  gm/day and WC $>94$  cm in men were found to be significantly associated with diabetes. Nearly all the diabetics in this study were eating fruits and vegetables  $<5$  servings/day and is highly significant. About 33(19.4%) of diabetic male have increased waist circumference and is statistically significant (0.04) (Table 2).

Association of tobacco consumption with hypertension found to be statistically significant. Salt intake  $>5$  gm/day in about 43 (24%) of hypertensives is found to be statistically significant (0.02). Obese-I and II were significantly associated with hypertension about 37.4% and 11.7% respectively (Table 3).

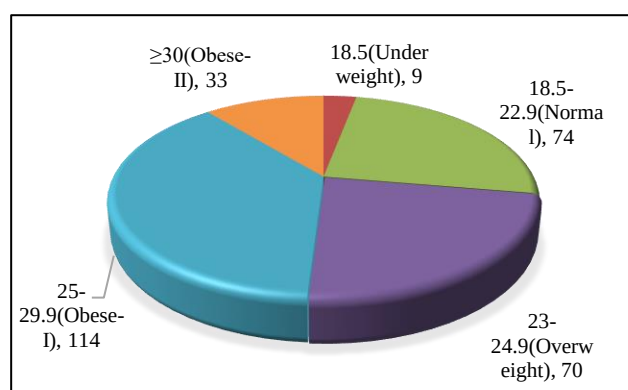
114 (38%) of the participants falls under obese-I. 33 (11%) were obese-II having a BMI $\geq 30$  (Figure 1).

**Table 2: Distribution of risk factors of study participants according to their history of diabetes.**

| Risk factor profile                                            | Diabetes Yes N=170 (%) | Diabetes No N=130 (%) | Chi-square value and p value |
|----------------------------------------------------------------|------------------------|-----------------------|------------------------------|
| Current tobacco smokers (n=100)                                | 47 (27.6)              | 53 (40.7)             | $\chi^2=4.8$ , P=0.18        |
| Current alcohol consumption (n=66)                             | 43 (20.3)              | 23 (17.7)             | $\chi^2=5.06$ , P=0.16       |
| Fruit servings <5/day (n=298)                                  | 170 (100)              | 128 (98.4)            | P=0.003                      |
| Vegetable servings <5/day (n=298)                              | 170 (100)              | 128 (98.4)            | P=0.003                      |
| Salt intake >5 gm/day (n=66)                                   | 30 (17.6)              | 36 (27.7)             | $\chi^2=9.5$ , P=0.041       |
| Physical activity <30 minutes/day or <150 minutes/week (n=175) | 102 (60)               | 73 (56.1)             | $\chi^2=8.14$ , P=0.58       |
| BMI 23-24.9 (overweight) (n=70)                                | 43 (25.2)              | 27 (20.7)             | $\chi^2=5.4$ , P=0.1         |
| BMI 25-29.9 (obese-I) (n=114)                                  | 60 (35.3)              | 54 (41.5)             | $\chi^2=1.3$ , P=0.7         |
| BMI $\geq 30$ (obese-II) (n=33)                                | 21 (12.3)              | 12 (9.2)              | $\chi^2=1.7$ , P=0.6         |
| WC>94 cm in men (n=62)                                         | 33 (19.4)              | 29 (22.3)             | $\chi^2=8.5$ , P=0.04        |
| WC>80 cm in women (n=51)                                       | 27 (15.9)              | 24 (18.4)             | $\chi^2=1.8$ , P=0.9         |
| WC $\geq 88$ cm in women (n=58)                                | 36 (21.1)              | 22 (16.9)             | $\chi^2=3.4$ , P=0.7         |

**Table 3: Distribution of risk factors of study participants according to their history of hypertension.**

| Risk factor profile                                            | Hypertension Yes N=179 (%) | Hypertension No N=121 (%) | Chi-square value and p value |
|----------------------------------------------------------------|----------------------------|---------------------------|------------------------------|
| Current tobacco smokers (n=100)                                | 56 (31.2)                  | 44 (36.3)                 | $\chi^2=5.9$ , P=0.005       |
| Current alcohol consumption (n=66)                             | 21 (11.7)                  | 45 (37.1)                 | $\chi^2=15.7$ , P=0.001      |
| Fruit servings <5/day (n=298)                                  | 178 (99.4)                 | 120 (99.1)                | $\chi^2=1.6$ , P=0.1         |
| Vegetable servings <5/day (n=298)                              | 178 (99.4)                 | 120 (99.1)                | $\chi^2=1.7$ , P=0.18        |
| Salt intake >5 gm/day (n=66)                                   | 43 (24)                    | 23 (19.1)                 | $\chi^2=4.9$ , P=0.029       |
| Physical activity <30 minutes/day or <150 minutes/week (n=175) | 91 (50.8)                  | 84 (69.4)                 | $\chi^2=2.7$ , P=0.43        |
| BMI 23-24.9 (overweight) (n=70)                                | 33 (18.4)                  | 37 (30.5)                 | $\chi^2=1.4$ , P=0.23        |
| BMI 25-29.9 (obese-I) (n=114)                                  | 67 (37.4)                  | 47 (38.8)                 | $\chi^2=4.1$ , P=0.014       |
| BMI $\geq 30$ (obese-II) (n=33)                                | 21 (11.7)                  | 12 (9.9)                  | $\chi^2=4.5$ , P=0.021       |
| WC>94 cm in men (n=62)                                         | 34 (18.9)                  | 28 (23.1)                 | $\chi^2=1.2$ , P=0.5         |
| WC>80 cm in women (n=51)                                       | 28 (15.6)                  | 23 (19)                   | $\chi^2=0.9$ , P=0.6         |
| WC $\geq 88$ cm in women (n=58)                                | 33 (18.4)                  | 25 (20.7)                 | $\chi^2=0.7$ , P= 0.6        |

**Figure 1: BMI distribution of the study participants.**

## DISCUSSION

In the present study, out of 300 study participants, mean age of study participants was  $46.55 \pm 2.17$  years. 187 (62.3%) were males and 113 (37.7%) were females.

Shriraam et al in Vellore district.<sup>14</sup> Out of 502 study participants, 212 (42.2%) were males and 290 (57.8%) were females. The mean age and SD of study participants was  $55.1 \pm 10.86$ . Study conducted in Uttar Pradesh by Srivastav et al among 207 participants 201 (97.1%) were Hindu by religion and 6 (2.9%) were Muslim by religion.<sup>15</sup> Study in rural India among 1375 participants by Kinra et al 147 (11%) were low socio economic status, 358 (26%) were middle socio-economic status and 870 (63%) were high socio economic status.<sup>16</sup> 60 (20%) were graduates, 55 (18.3%) have studied up to high school, whereas study by Zaman et al in Bangladesh among 9275 study participants, 3924 (42.3%) were literates in which males were 2044 (47.4%) and females were 1880 (37.9%).<sup>17</sup> Nearly 5351 (57.7%) were illiterates. Newtonraj et al among 569 participants, 447 (78.6%) were currently married, 88 (15.5%) were single and 31 (5.4%) were widowed.<sup>18</sup> 128 (42.7%) participants were addicted to substance abuse. About 100 (33.3%) were smokers and using smokeless tobacco, in which 75% use daily. In Mathur et al study, current smokeless

tobacco use was (24.7%).<sup>19</sup> 66 (22%) consumes alcohol in the past 12 months. 29 (43.9%) used to consume 2-3 days per week. In Gupta et al study 202 (26.6%) were under alcohol consumption in which nearly 78 (38.6%) were hypertensives.<sup>20</sup> Acharrya et al study, 38 (7%) males and 61 (12%) females consumed four or more fruit and vegetable servings daily.<sup>21</sup> 175 (58.3%) of participants were doing moderate physical activity <30 mins per day. 41.7% meets the WHO recommended 150 minutes/week. Gamage et al study, 142(47.5%) were physically inactive/less active among hypertensives.<sup>22</sup> 161 (53.7%) were diabetics. 56 (34.7%) were taking insulin. Nearly 135 (83.9%) having duration of diabetes <10 years. Misra et al in Assam, 85 (25.6%) were found to have raised blood pressure  $\geq 140/90$  mmHg (hypertensives).<sup>23</sup> Kolahi et al study in Iran reveals 648(39.1%) falls under overweight, 640 (38.6%) were obese.<sup>24</sup> Of 972 diabetics nearly 372 (38.3%) were obese. Shrestha et al study in Nepal 916 were hypertensives.<sup>25</sup> Nearly 681 (74.3%) were having high risk waist circumference i.e., more than cut-off value.

Strengths of this study is that it used a questionnaire derived from the WHO-STEPPS survey; hence majority of risk factor components were covered. Conducting the study in their own language helps to build good rapport with participants and helped them to open responses and it strengthened the validity of the findings.

Because this was a cross-sectional study, it was only possible to show the relationship between the sociodemographic determinants; the causal relationship between these determinants could not be shown. The study was conducted in Bhopal district of rural and urban area, thus extrapolating the findings to other populations is not possible.

## CONCLUSION

In this study, alcohol and tobacco use were prevalent. Diabetes and hypertension were substantially correlated with age, salt intake, elevated waist circumference, BMI, and substance misuse such as smoking and alcohol use. health planners should use preventative strategies, such as health education about dietary modifications, lifestyle adjustments, and abstaining from substance abuse, to address the rising rates of diabetes and hypertension in both urban and rural communities.

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