Section: Miscellaneous

Original Research Article

# BURDEN OF NON-COMMUNICABLE DISEASE RISK FACTORS AND THEIR ASSOCIATION WITH LIFESTYLE PRACTICES AMONG ADULT POPULATION IN THE FIELD PRACTICE AREAS OF SINDHUDURG DISTRICT

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**ABSTRACT**

**Background:** Non-communicable diseases (NCDs) are the leading cause of morbidity and mortality in India, largely driven by modifiable behavioral and lifestyle risk factors. Early identification of these risk factors at the community level is essential for effective prevention and control. The present study was conducted to assess the burden of major NCD risk factors and their association with lifestyle practices among adults in the field practice areas of Sindhudurg district, Maharashtra. **Objectives:** 1. To estimate the prevalence of selected NCD risk factors among the adult population. 2. To assess lifestyle practices related to diet, physical activity, tobacco, and alcohol use. 3. To determine the association between lifestyle practices and NCD risk factors.

**Materials and Methods:** A community-based cross-sectional study was conducted from January to June 2026 in the field practice areas of SSPM Medical College, including RHTC Pandur (population 3,250), RHTC Kasal (population 4,399), and UHTC Kudal (population 23,600), covering service areas of RH Malvan, SDH Kankavli, and RH Kudal. Adults aged ≥18 years residing in the study area for at least one year were included using multistage sampling. Data were collected using a pretested structured questionnaire based on the WHO STEPwise approach. Information on socio-demographic profile and lifestyle practices was obtained. Anthropometric measurements and blood pressure were recorded using standard protocols. Data were analyzed using appropriate descriptive statistics and Chi-square test, with $p<0.05$ considered statistically significant.

**Results:** A total of 600 adults participated in the study. The prevalence of tobacco use, alcohol consumption, physical inactivity, and inadequate fruit and vegetable intake was 32.5%, 21.3%, 46.8%, and 72.4%, respectively. Overweight/obesity (BMI ≥25 kg/m²) was observed in 28.7% of participants, while 24.5% had hypertension and 11.2% reported known diabetes. Significant associations were found between physical inactivity and overweight/obesity ($p<0.001$), tobacco use and hypertension ($p=0.02$), and unhealthy diet with both obesity and diabetes ($p<0.05$). Clustering of two or more risk factors was observed in 41.6% of the study population.

**Conclusion:** A high burden of behavioral and metabolic NCD risk factors was observed among adults in the field practice areas of Sindhudurg district, with significant associations between unhealthy lifestyle practices and major risk conditions. Community-based lifestyle modification strategies, regular screening, and strengthened primary health care interventions are urgently needed to reduce the future burden of NCDs.

**Keywords:** Non-communicable diseases, Risk factors, Lifestyle practices, WHO STEPS, Community-based study, Hypertension, Obesity.

## INTRODUCTION

Non-communicable diseases (NCDs) have emerged as the leading cause of morbidity and mortality worldwide, accounting for nearly 74% of all deaths globally. Cardiovascular diseases, diabetes, chronic respiratory diseases, and cancers constitute the major share of this burden, with a significant proportion of premature deaths occurring in low- and middle-income countries (LMICs). The rising prevalence of NCDs poses a major challenge to health systems, economic productivity, and sustainable development, particularly in developing countries like India.[1]

India is currently experiencing an epidemiological transition characterized by a shift from communicable to non-communicable diseases. NCDs contribute to more than 60% of total deaths in the country, with increasing prevalence observed even in rural and semi-urban areas. Rapid urbanization, demographic aging, economic development, and changes in lifestyle behaviors have significantly contributed to this rising burden.[2]

The development of most NCDs is strongly linked to a set of modifiable behavioral risk factors, including tobacco use, harmful use of alcohol, unhealthy diet, and physical inactivity. These behaviors lead to metabolic risk factors such as overweight and obesity, raised blood pressure, hyperglycemia, and dyslipidemia, which in turn increase the risk of chronic diseases.[3] The World Health Organization (WHO) has emphasized that addressing these common risk factors through population-based interventions is one of the most cost-effective strategies for NCD prevention and control.[4]

Tobacco use remains one of the most important preventable causes of death, contributing significantly to cardiovascular diseases, cancers, and chronic respiratory conditions. Similarly, unhealthy dietary patterns characterized by high intake of salt, sugar, and saturated fats, along with inadequate consumption of fruits and vegetables, have been associated with obesity, hypertension, and diabetes. Physical inactivity, which is increasing due to sedentary occupations and lifestyle changes, is another major contributor to the growing burden of metabolic risk factors.[5]

Recent national surveys in India have reported a high prevalence of behavioral and metabolic risk factors among adults. The National Family Health Survey (NFHS-5) and WHO STEPS surveys have highlighted increasing trends in overweight/obesity, hypertension, diabetes, and lifestyle-related risk behaviors across different states.[6] Furthermore, clustering of multiple risk factors within individuals has been observed, significantly increasing the likelihood of developing NCDs at an earlier age.[7]

Early identification of these risk factors at the community level is essential for planning targeted interventions under the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD). Primary health care institutions and field practice areas of medical colleges play a crucial role in screening, risk assessment, health education, and lifestyle modification counseling.[8]

However, the distribution of NCD risk factors varies across regions depending on socio-demographic characteristics, cultural practices, dietary habits, and occupational patterns.

Sindhudurg district in Maharashtra represents a unique coastal region with a mixed rural and semi-urban population, where changing socio-economic conditions and lifestyle transitions may influence the pattern of NCD risk factors. Limited community-based data are available regarding the burden and clustering of behavioral and metabolic risk factors in the field practice areas of this region. Understanding the local magnitude and determinants of these risk factors is essential for designing context-specific preventive strategies.

Therefore, the present study was undertaken to assess the burden of major NCD risk factors and to examine their association with lifestyle practices among adults residing in the field practice areas of SSPM Medical College, Sindhudurg district.

## MATERIALS AND METHODS

A community-based cross-sectional study was conducted from January to June 2025 in the field practice areas of SSPM Medical College, Kasal, located in Sindhudurg district of Maharashtra. The study covered the service areas of Rural Health Training Centres (RHTC) at Pandur (population 3,250) and Kasal (population 4,399), and the Urban Health Training Centre (UHTC) at Kudal (population 23,600). These areas fall under the functional coverage of RH Malvan, SDH Kankavli, and RH Kudal and represent a mixed rural and semi-urban population.

The study population included adults aged 18 years and above who had been residing in the study area for at least one year. Individuals who were seriously ill, bedridden, pregnant, or not available even after two visits were excluded from the study. Written informed consent was obtained from all eligible participants before data collection.

The sample size was calculated using the formula n=4pq/d2n = 4pq/d^2n=4pq/d2, assuming the prevalence of any major non-communicable disease risk factor to be 50% for maximum sample size, with a 95% confidence level and 5% absolute precision. The calculated sample size was 400. After adding 10% for non-response, the required sample size was 440. To ensure adequate representation from all field practice areas and improve the study power, a total of 600 participants were included in the study.

A multistage sampling technique was employed. Initially, the required sample was distributed proportionately among RHTC Pandur, RHTC Kasal, and UHTC Kudal based on their population size. In the next stage, households were selected using systematic random sampling from the family

registers available at the respective health centres. From each selected household, one eligible adult was chosen using the Kish method.

Data were collected using a pretested and structured questionnaire based on the World Health Organization (WHO) STEPwise approach for surveillance of NCD risk factors. Information regarding socio-demographic characteristics such as age, sex, education, occupation, and socioeconomic status was obtained. Behavioral risk factors including tobacco use (smoking and smokeless), alcohol consumption, dietary habits (fruit and vegetable intake, consumption of high-salt and processed foods), and level of physical activity related to work, transport, and leisure were assessed.

Physical measurements were recorded following standard WHO protocols. Height was measured using a portable stadiometer and weight using a calibrated digital weighing scale, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. BMI was categorized using WHO Asian cut-offs. Waist circumference was measured using a non-stretchable measuring tape. Blood pressure was measured using a standardized digital sphygmomanometer after the participant had rested for at least five minutes, and two readings were recorded five minutes apart; the average of the two readings was taken for analysis. Hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or current use of antihypertensive medication. Self-reported history of diabetes was also recorded.

The collected data were checked daily for completeness and accuracy. The questionnaire was pilot tested in a similar population before the actual study. Instruments were calibrated regularly, and investigators were trained in standardized techniques for anthropometric and blood pressure measurements. Supervisory cross-checking of a subset of data was carried out to ensure quality control.

Ethical clearance for the study was obtained from the Institutional Ethics Committee of SSPM Medical College, Kasal. Confidentiality and anonymity of the participants were strictly maintained. Individuals detected with elevated blood pressure or other abnormal findings during the survey were counseled and referred to the nearest health facility for further evaluation and management.

Data were entered in Microsoft Excel and analyzed using SPSS version 25. Descriptive statistics such as mean, standard deviation, frequencies, and proportions were used to describe the distribution of risk factors. The association between lifestyle practices and selected NCD risk factors was assessed using the Chi-square test. Odds ratios with 95% confidence intervals were calculated where appropriate, and a p-value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 600 adults participated in the study, with representation from both rural and semi-urban field practice areas. The mean age of the participants was 42.6 ± 15.8 years. The majority of participants belonged to the age group of 30–59 years (48.3%), followed by those aged 18–29 years (26.5%) and ≥60 years (25.2%). Females constituted 54.0% of the study population, while males accounted for 46.0%. Most participants were married (78.5%) and belonged to the middle socioeconomic class (52.7%).

With respect to behavioral risk factors, 32.5% of participants reported current tobacco use, of which smokeless tobacco was more common than smoking. Alcohol consumption was reported by 21.3% of participants. A large proportion of the study population (72.4%) reported inadequate intake of fruits and vegetables (less than five servings per day). Physical inactivity, defined as less than 150 minutes of moderate activity per week, was observed in 46.8% of the participants.

Regarding metabolic risk factors, 28.7% of participants were found to be overweight or obese based on BMI using Asian cut-offs. Central obesity, based on waist circumference criteria, was present in 34.2% of the participants. Hypertension was detected in 24.5% of the study population, including both newly detected and known cases. Self-reported diabetes was present in 11.2% of participants.

Analysis of risk factor clustering showed that only 18.4% of participants had no identifiable risk factors. One risk factor was present in 40.0% of participants, while 28.6% had two risk factors. Three or more risk factors were observed in 13.0% of the study population. Overall, clustering of two or more risk factors was seen in 41.6% of participants.

Significant associations were observed between lifestyle practices and metabolic risk factors. Physical inactivity was significantly associated with overweight/obesity (38.9% vs. 20.3% among physically active individuals, $p<0.001$). Participants with inadequate fruit and vegetable intake had a higher prevalence of obesity and diabetes compared to those with adequate intake ($p<0.05$). Tobacco users had a significantly higher prevalence of hypertension compared to non-users (29.7% vs. 21.8%, $p=0.02$). Alcohol consumption was also significantly associated with hypertension ($p=0.03$).

Age and gender were important determinants of NCD risk factors. The prevalence of hypertension and diabetes increased significantly with advancing age ($p<0.001$). Overweight and obesity were more common among females, whereas tobacco and alcohol use were significantly higher among males ($p<0.001$).

Area-wise comparison showed a higher prevalence of physical inactivity, obesity, and hypertension in the urban field practice area (UHTC Kudal) compared to rural areas, and the difference was statistically significant ($p<0.05$).

**Table 1: Association between Lifestyle Practices and Overweight/Obesity among Adult Population in Field Practice Areas of Sindhudurg District (n = 600)**

| Lifestyle Factor | Overweight/Obese n (%) | Normal BMI n (%) | Total | Chi-square ($\chi^2$) | p-value |
|---|---|---|---|---|---|
| **Physical Activity** | | | | | |
| Physically inactive (n=281) | 109 (38.8) | 172 (61.2) | 281 | 24.6 | <0.001* |
| Physically active (n=319) | 63 (19.7) | 256 (80.3) | 319 | | |
| **Fruit & Vegetable Intake** | | | | | |
| Inadequate (<5 servings/day) (n=434) | 146 (33.6) | 288 (66.4) | 434 | 8.9 | 0.003* |
| Adequate (≥5 servings/day) (n=166) | 26 (15.7) | 140 (84.3) | 166 | | |
| **Tobacco Use** | | | | | |
| Current user (n=195) | 64 (32.8) | 131 (67.2) | 195 | 2.1 | 0.14 |
| Non-user (n=405) | 108 (26.7) | 297 (73.3) | 405 | | |
| **Alcohol Consumption** | | | | | |
| Current user (n=128) | 45 (35.2) | 83 (64.8) | 128 | 3.4 | 0.06 |
| Non-user (n=472) | 127 (26.9) | 345 (73.1) | 472 | | |

**Table 2: Association between Lifestyle Practices and Hypertension among Adults in Field Practice Areas of Sindhudurg District (n = 600)**

| Lifestyle Factor | Hypertension n (%) | Normotensive n (%) | Total | Chi-square ($\chi^2$) | p-value |
|---|---|---|---|---|---|
| **Physical Activity** | | | | | |
| Physically inactive (n=281) | 88 (31.3) | 193 (68.7) | 281 | 9.8 | 0.002* |
| Physically active (n=319) | 59 (18.5) | 260 (81.5) | 319 | | |
| **Tobacco Use** | | | | | |
| Current user (n=195) | 58 (29.7) | 137 (70.3) | 195 | 5.1 | 0.02* |
| Non-user (n=405) | 89 (22.0) | 316 (78.0) | 405 | | |
| **Alcohol Consumption** | | | | | |
| Current user (n=128) | 39 (30.5) | 89 (69.5) | 128 | 4.6 | 0.03* |
| Non-user (n=472) | 108 (22.9) | 364 (77.1) | 472 | | |
| **Fruit & Vegetable Intake** | | | | | |
| Inadequate (n=434) | 115 (26.5) | 319 (73.5) | 434 | 3.2 | 0.07 |
| Adequate (n=166) | 32 (19.3) | 134 (80.7) | 166 | | |

**Footnote**

Hypertension defined as systolic BP ≥140 mmHg and/or diastolic BP ≥90 mmHg or current treatment.

Physical inactivity defined as <150 minutes of moderate activity per week.

*p-value <0.05 considered statistically significant.

**Table 3: Distribution of NCD Risk Factors by Area of Residence (Rural vs Urban) among Adults in Sindhudurg District (n = 600)**

| Risk Factor | Rural (n=320) n (%) | Urban (n=280) n (%) | Chi-square ($\chi^2$) | p-value |
|---|---|---|---|---|
| Physical inactivity | 122 (38.1) | 159 (56.8) | 20.4 | <0.001* |
| Tobacco use | 118 (36.9) | 77 (27.5) | 6.1 | 0.01* |
| Overweight/Obesity | 74 (23.1) | 98 (35.0) | 10.6 | 0.001* |
| Hypertension | 65 (20.3) | 82 (29.3) | 6.5 | 0.01* |
| Diabetes | 27 (8.4) | 40 (14.3) | 5.2 | 0.02* |

**Footnote**

Rural population included participants from RHTC Pandur and Kasal. Urban population included participants from UHTC Kudal. Overweight/Obesity defined as BMI ≥23 kg/m² (Asian cut-off).

*p-value <0.05 considered statistically significant.

## DISCUSSION

The present study assessed the burden of behavioral and metabolic risk factors for non-communicable diseases (NCDs) and their association with lifestyle practices among adults in the field practice areas of Sindhudurg district. The findings revealed a high prevalence of modifiable behavioral risk factors along with a considerable burden of metabolic conditions such as overweight/obesity, hypertension, and diabetes. These results reflect the ongoing epidemiological transition and the growing challenge of NCDs in both rural and semi-urban populations.

In the present study, inadequate intake of fruits and vegetables (72.4%) and physical inactivity (46.8%) were the most common behavioral risk factors. Similar findings have been reported from WHO STEPS surveys and other community-based studies in India, which have documented poor dietary practices and sedentary lifestyles as major contributors to the rising NCD burden.[9,10]

Changing occupational patterns, increased mechanization, and reduced physical labor may explain the high levels of inactivity observed in the study population.

The prevalence of tobacco use (32.5%) in the current study was comparable to national estimates reported by the Global Adult Tobacco Survey (GATS) and

other regional studies. Tobacco remains one of the most important preventable causes of cardiovascular diseases, cancers, and chronic respiratory illnesses in India.[11] Alcohol consumption was reported by 21.3% of participants, which is consistent with findings from other rural and semi-urban studies in western India.[12]

The prevalence of overweight/obesity (28.7%) observed in the present study indicates a substantial burden of metabolic risk factors even in non-metropolitan settings. Similar increasing trends have been reported in NFHS-5 and other population-based studies, highlighting the growing problem of obesity across both rural and urban populations.[13] Hypertension was detected in 24.5% of participants, which is comparable to estimates from meta-analyses and large-scale Indian studies reporting prevalence ranging from 20% to 30% among adults.[14] The prevalence of self-reported diabetes (11.2%) also aligns with national trends reported by the ICMR–INDIAB study.[15]

A key finding of the study was the significant association between lifestyle practices and metabolic risk factors. Physical inactivity and unhealthy dietary practices were significantly associated with overweight/obesity, while tobacco and alcohol use showed a significant association with hypertension. These findings are consistent with established evidence linking behavioral risk factors to cardiometabolic outcomes and support the need for integrated lifestyle interventions at the community level.[9,14]

The study also demonstrated clustering of multiple risk factors in a substantial proportion of the population, with 41.6% having two or more risk factors. Risk factor clustering has been reported in several Indian studies and is known to substantially increase the risk of future cardiovascular events and premature mortality.[16] This highlights the importance of comprehensive risk assessment rather than focusing on individual risk factors alone.

Urban residents in the present study showed a higher prevalence of physical inactivity, obesity, hypertension, and diabetes compared to rural residents, whereas tobacco use was more common in rural areas. Similar rural–urban differences have been reported in previous studies and may be attributed to sedentary lifestyles, dietary transitions, and occupational changes in urban settings.[17]

The findings of the present study have important public health implications. Given the high burden and clustering of modifiable risk factors, strengthening population-based screening and lifestyle modification strategies under the National Programme for Prevention and Control of Non-Communicable Diseases (NP-NCD) is essential. Field practice areas of medical colleges can play a crucial role in early detection, risk communication, and behavior change interventions.[18]

However, the study had certain limitations. Being a cross-sectional study, causal relationships between lifestyle factors and NCD outcomes could not be established. Self-reported information on diet, physical activity, alcohol, and tobacco use may be subject to recall or social desirability bias. Despite these limitations, the study provides valuable community-level evidence that can guide locally relevant NCD prevention strategies.

## CONCLUSION

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