

Original Research Article

ASSOCIATION OF SOCIODEMOGRAPHIC PROFILE WITH MODIFIABLE RISK FACTORS OF NON-COMMUNICABLE DISEASES AMONG SCHOOL-GOING ADOLESCENTS IN A RURAL AREA OF WESTERN UTTAR PRADESH: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Modifiable risk factors for non-communicable diseases (NCDs) frequently emerge during adolescence and are influenced by sociodemographic characteristics. Identifying these associations is essential for planning targeted preventive interventions. The present study aimed to determine the association between the Sociodemographic profile of school-going adolescents and modifiable risk factors for NCDs.

Materials and Methods: A school-based cross-sectional study was conducted among 450 adolescents aged 16–19 years studying in Classes XI and XII in government inter colleges located in a rural area of Western Uttar Pradesh. Sociodemographic characteristics and information on modifiable risk factors, including body mass index (BMI), blood pressure, physical activity, dietary practices, tobacco use, and alcohol consumption, were collected using a pretested structured questionnaire and standardized anthropometric measurements. Associations were analysed using appropriate statistical tests, with a p -value <0.05 considered statistically significant.

Results: Most participants belonged to the lower-middle Sociodemographic class and nuclear families. Inadequate physical activity and inadequate fruit and vegetable intake were the most common behavioural risk factors. Significant gender differences were observed in overweight/obesity, physical inactivity, tobacco use, alcohol consumption, and hypertension. A significant association was also observed between BMI and blood pressure status ($p<0.001$), while mean BMI and diastolic blood pressure were significantly higher among males.

Conclusion: Modifiable risk factors for NCDs were common among rural school-going adolescents and showed significant associations with selected sociodemographic characteristics. School-based screening and targeted lifestyle interventions may facilitate early identification of high-risk adolescents and contribute to the prevention of future non-communicable diseases.

Keywords: Adolescents; Non - communicable diseases; Sociodemographic factors; Modifiable risk factors; Rural population; School health.

INTRODUCTION

Non-communicable diseases (NCDs) are a major public health challenge worldwide, accounting for

substantial morbidity and mortality. Although these diseases usually manifest during adulthood, many of their behavioural and metabolic risk factors originate during adolescence. Lifestyle behaviours such as physical inactivity, unhealthy dietary habits,

tobacco use, alcohol consumption, overweight, and elevated blood pressure established during this period often persist into adult life, increasing the future risk of chronic diseases. Therefore, early identification of these modifiable risk factors is essential for effective prevention.^[1,2]

Evidence from India and neighbouring countries indicates that modifiable NCD risk factors are increasingly prevalent among school-going adolescents. Studies have reported considerable proportions of adolescents with unhealthy dietary practices, inadequate physical activity, excess body weight, tobacco use, alcohol consumption, and clustering of multiple risk factors, highlighting adolescence as an important stage for preventive interventions.^[3,4]

The distribution of these risk factors is influenced by sociodemographic characteristics. Factors such as age, sex, Sociodemographic status, parental education, family type, and school environment may affect lifestyle behaviours and health outcomes among adolescents. Variations in physical activity, dietary practices, obesity, and other modifiable risk factors have been reported across different sociodemographic groups, suggesting that certain populations may be more vulnerable than others.^[5,6] Rapid lifestyle transitions have also affected rural populations, where changing dietary patterns, increasing sedentary behaviour, and reduced opportunities for physical activity are contributing to the emergence of NCD risk factors among adolescents. Despite this growing concern, evidence on the association between sociodemographic characteristics and modifiable NCD risk factors among rural school-going adolescents remains limited, particularly in Western Uttar Pradesh. Region-specific data are necessary to identify vulnerable groups and guide appropriate school-based and community-level preventive strategies.^[7,8] Schools provide an ideal setting for identifying adolescents at risk because they allow systematic assessment of health behaviours during a critical stage of growth and development. Understanding the relationship between sociodemographic profile and modifiable NCD risk factors may help in planning targeted health promotion programmes and lifestyle interventions for adolescents.^[9,10]

Therefore, the present study was undertaken to determine the association of the Sociodemographic profile of school-going adolescents with modifiable risk factors of non-communicable diseases in a rural area Western Uttar Pradesh.

MATERIALS AND METHODS

This school-based cross-sectional study was conducted among adolescents studying in Classes XI and XII in government inter colleges located in a rural area. The study was carried out over a one-year period after obtaining approval from the Institutional Ethics Committee and permission from

the concerned school authorities. Written informed consent was obtained from the participants and, where applicable, from their parents or guardians before enrolment.

A total of 450 adolescents aged 16–19 years who fulfilled the eligibility criteria and were willing to participate were included in the study. Students with serious illness or those absent on the day of data collection were excluded.

Data were collected using a pretested, structured questionnaire comprising information on sociodemographic characteristics, including age, sex, educational class, Sociodemographic status, parental education, and family type. Information regarding modifiable risk factors for non-communicable diseases, including physical activity, dietary habits, tobacco use, alcohol consumption, and family history of selected non-communicable diseases, was also obtained through participant interviews.

Anthropometric assessment included measurement of height and weight using standardized procedures. Height was recorded to the nearest 0.1 cm using a stadiometer, while weight was measured to the nearest 0.1 kg using a calibrated digital weighing scale with participants wearing light clothing and no footwear. Body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared (kg/m^2), and participants were categorized according to the predefined BMI classification used in the study.

Blood pressure was measured using a standard sphygmomanometer after the participant had rested for at least five minutes in the sitting position. Appropriate cuff size was used for each participant, and systolic and diastolic blood pressure readings were recorded. Blood pressure status was classified according to the study criteria adopted for analysis.

Physical activity was assessed based on participants' self-reported daily duration of moderate-to-vigorous physical activity. Dietary assessment included the frequency of junk food consumption, adequacy of fruit and vegetable intake, and additional salt consumption. Information regarding current tobacco use and alcohol consumption was obtained through confidential self-reporting. Family history of hypertension, diabetes mellitus, cardiovascular disease, and stroke was also documented.

The primary outcome of the study was the association between sociodemographic characteristics and modifiable risk factors of non-communicable diseases. Sociodemographic variables were analysed in relation to behavioural and metabolic risk factors, including overweight or obesity, elevated blood pressure, physical inactivity, unhealthy dietary practices, tobacco use, and alcohol consumption.

Collected data were entered into Microsoft Excel and analysed using the Statistical Package for the Social Sciences (SPSS) software. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were

presented as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test wherever appropriate. Independent sample t-test

was used to compare continuous variables between groups. A p-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Sociodemographic Characteristics of the Study Participants (N = 450)

Variable	Category	n (%)
Age (years)	16	139 (30.9)
	17	194 (43.1)
	18	95 (21.1)
	19	22 (4.9)
Gender	Male	239 (53.1)
	Female	211 (46.9)
Academic class	XI	220 (48.9)
	XII	230 (51.1)
Sociodemographic status	Upper	0 (0.0)
	Upper middle	73 (16.2)
	Middle	151 (33.6)
	Lower middle	182 (40.4)
Family type	Lower	44 (9.8)
	Nuclear	287 (63.8)
	Joint	163 (36.2)

Table 2: Distribution of Modifiable Risk Factors among the Study Participants (N = 450)

Variable	Category	n (%)
BMI	Underweight	103 (22.9)
	Normal	212 (47.1)
	Overweight	85 (18.9)
	Obese	50 (11.1)
Physical activity	Adequate	139 (30.9)
	Inadequate	311 (69.1)
Fruit & vegetable intake	Adequate	114 (25.3)
	Inadequate	336 (74.7)
Additional salt intake	Never	248 (55.1)
	Sometimes/Always	202 (44.9)
Blood pressure	Normal	273 (60.7)
	Pre-hypertension	87 (19.3)
	Hypertension	90 (20.0)
Tobacco use	Current	35 (7.8)
Alcohol use	Current	24 (5.3)

Table 3: Association of Gender with Modifiable Risk Factors

Variable	Male n (%)	Female n (%)	p-value
Overweight/Obesity	94 (39.3)	41 (19.4)	<0.001
Inadequate physical activity	146 (61.1)	165 (78.2)	<0.001
Inadequate fruit & vegetable intake	183 (76.6)	153 (72.5)	0.323
Additional salt intake	100 (41.84)	102 (48.34)	0.198
Hypertension	57 (23.9)	33 (15.6)	0.031
Current tobacco use	32 (13.4)	3 (1.4)	<0.001
Current alcohol use	22 (9.2)	2 (0.9)	<0.001

Table 4: Association Between Body Mass Index and Blood Pressure Status

BMI category	Normal BP	Pre-hypertension	Hypertension	p-value
Underweight	70	19	14	<0.001
Normal	149	40	23	
Overweight	41	17	27	
Obese	13	11	26	
Total	273	87	90	

Table 5: Independent Sample t-test Comparing Mean BMI and Blood Pressure by Gender

Variable	Male (Mean $\pm$ SD)	Female (Mean $\pm$ SD)	p-value
BMI (kg/m ²)	21.81 $\pm$ 3.73	20.19 $\pm$ 3.03	<0.001
Systolic BP (mmHg)	113.33 $\pm$ 11.42	112.07 $\pm$ 9.65	0.210
Diastolic BP (mmHg)	73.38 $\pm$ 7.17	71.91 $\pm$ 6.47	0.024

A total of 450 school-going adolescents participated in the study. The majority belonged to the lower-

middle Sociodemographic class and were from nuclear families. The baseline sociodemographic

characteristics of the study participants are presented in Table 1.

The distribution of modifiable risk factors, including body mass index, physical activity, dietary habits, blood pressure, tobacco use, and alcohol consumption, is shown in Table 2.

Gender-based comparison demonstrated significant differences in overweight/obesity, physical inactivity, tobacco use, alcohol consumption, and blood pressure status, whereas fruit and vegetable intake did not differ significantly between males and females. [Table 3]

A statistically significant association was observed between body mass index and blood pressure status ($p < 0.001$). [Table 4]

Male adolescents had a significantly higher mean body mass index and diastolic blood pressure than females, while the difference in mean systolic blood pressure was not statistically significant. [Table 5]

DISCUSSION

The present study demonstrated that modifiable risk factors for non-communicable diseases were common among rural school-going adolescents. Physical inactivity, unhealthy dietary practices, overweight or obesity, hypertension, and substance use were frequently observed, indicating that behavioural risk factors become established during adolescence and may increase the future burden of NCDs.

Physical inactivity was the most common behavioural risk factor, affecting 69.1% of participants, with girls being significantly less active than boys. This may reflect lower participation of female adolescents in outdoor activities and sports in rural settings. Similar findings have been reported by Mathur et al. and Raghav et al., who also observed higher levels of physical inactivity among female adolescents, highlighting the need for targeted interventions to promote regular physical activity.^[2,3]

The prevalence of overweight and obesity was significantly higher among male adolescents, and boys also had a higher mean BMI. These findings are consistent with those of Jain et al., who reported an influence of sociodemographic factors on adolescent obesity, while Panda et al. highlighted the increasing burden of overweight and obesity among Indian adolescents because of changing lifestyle and dietary habits.^[6,11]

Dietary risk factors were also common in the present study. Inadequate fruit and vegetable intake was reported by most participants, while nearly half consumed additional table salt. However, neither of these dietary practices differed significantly between boys and girls, suggesting that unhealthy dietary habits are widespread irrespective of gender. Similar observations have been reported by George et al. and Urmya et al., who also documented poor dietary practices among adolescents.^[12,13]

Tobacco and alcohol use were significantly more common among male adolescents than females. These findings are comparable with those reported by Das et al. and Gupta et al., who observed greater substance use among male school-going adolescents. Early initiation of these behaviours is particularly concerning because they contribute substantially to the future risk of cardiovascular and other chronic diseases.^[7,14]

A significant association was observed between BMI and blood pressure, with hypertension becoming more frequent as BMI increased. Male adolescents also had significantly higher mean diastolic blood pressure than females. Similar associations between excess body weight and hypertension have been reported by Parle et al. and Thankappan et al., emphasizing the importance of maintaining healthy body weight during adolescence to reduce future cardiovascular risk.^[15,16]

Overall, the findings of the present study suggest that multiple modifiable NCD risk factors coexist among rural adolescents. Strengthening school-based screening, promoting healthy dietary practices and physical activity, and implementing tobacco and alcohol prevention programmes may help reduce the future burden of non-communicable diseases.

CONCLUSION

The present study demonstrated that modifiable risk factors for non-communicable diseases were common among school-going adolescents in a rural setting. Significant gender differences were observed in overweight/obesity, physical inactivity, tobacco use, alcohol consumption, and blood pressure status. Body mass index was also significantly associated with blood pressure, highlighting the interrelationship between metabolic risk factors during adolescence. These findings emphasize the importance of school-based screening, health education, and lifestyle modification programmes targeting adolescents to reduce the future burden of non-communicable diseases.

Strengths and Limitations

The major strength of this study is the comprehensive assessment of multiple behavioural and metabolic risk factors among a relatively large sample of rural school-going adolescents using standardized methods. However, the cross-sectional design limits causal inference, and behavioural information was self-reported, which may be subject to recall and reporting bias. The findings may not be generalizable to adolescents who are not attending school.

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Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

The study was conducted after obtaining approval from the Institutional Ethics Committee NCRIMS. Written informed consent was obtained from all participants and, where applicable, from their parents or legal guardians prior to enrolment. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Authors' Contributions

All authors contributed substantially to the conception and design of the study. Data collection, analysis, interpretation of findings, manuscript drafting, and critical revision were performed collaboratively by the authors. All authors reviewed and approved the final version of the manuscript.

Data Availability Statement

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

REFERENCES

1. Puwar T, Saxena D, Yasobant S, Savaliya S. Noncommunicable diseases among school-going adolescents: a case study on prevalence of risk factors from Sabarkantha District of Gujarat, India. *Indian J Community Med*. 2018;43(Suppl 1):S33-S37. doi:10.4103/ijcm.IJCM_117_18. PMID:30686872.
2. Mathur P, Kulothungan V, Leburu S, Krishnan A, Chaturvedi HK, Salve HR, et al. Baseline risk factor prevalence among adolescents aged 15–17 years old: findings from the National Non-communicable Disease Monitoring Survey of India. *BMJ Open*. 2021;11(6):e044066. doi:10.1136/bmjopen-2020-044066.
3. Raghav T, Jain S, Bano T, Singh G, Gautam NS, Kumar S. Prevalence of non-communicable diseases risk factors among school-going adolescents: a government and private school variation. *Indian J Community Health*. 2025;37(6):1068-1073. doi:10.47203/IJCH.2025.v37i06.029.
4. Subedi B, Pangeni PM, Rijal S, Maharjan PM, Rajbanshi M, Kunwar K, Oli L, Karki KB. Prevalence of risk factors of major non-communicable diseases among adolescents in schools of Rapti-Sonari rural municipality of Banke district: a cross-sectional study in Nepal. *BMJ Public Health*. 2025;3(2):e002494. doi:10.1136/bmjph-2024-002494. PMID:41190042.
5. Darukaradhya TB, Jayanna K, Somanna SN, Sequeira S, Nooyi SC. Correlates and co-occurrence of risk factors for non-communicable diseases among adolescents in schools in Karnataka, India: a cross-sectional study. *Osong Public Health Res Perspect*. 2026;17(1):83-93. doi:10.24171/j.phrp.2025.0204.
6. Jain B, Jain S, Garg SK, Chopra H, Singh G, Mittal C. Impact of sociodemographic factors on prevalence of overweight and obesity among adolescents of urban Meerut. *Indian J Community Health*. 2018;30(1):90-95. doi:10.47203/IJCH.2018.V30I01.016.
7. Das MK, Sinha R, Manna N, Das S. A study on behavioral risk factors of non-communicable diseases among rural school going adolescents in a block of Hooghly district, West Bengal. *Int J Res Rev*. 2021;8(11):357-364. doi:10.52403/ijrr.20211144.
8. Vijayakarhikeyan M, Krishnakumar J, Umadevi R. Cross-sectional study on the prevalence of risk factors for non-communicable disease in a rural area of Kancheepuram, Tamil Nadu. *Int J Community Med Public Health*. 2017;4(12):4600-4607. doi:10.18203/2394-6040.ijcmph20175338.
9. Pattanayak SK, Alagesan IR, Ray SS, Bhattacharyya S, Guha Ray T. Risk factors and awareness about non-communicable diseases among adolescents: a school-based analytical study from West Bengal. *Prev Med Res Rev*. Published online March 9, 2026. doi:10.4103/PMRR.PMRR_249_25.
10. Gupta RK, Kumari R, Hussain S, Raina SK, Langer B, Parveen Z. A cross-sectional study to evaluate awareness about noncommunicable diseases among rural adolescents in North West India. *J Dent Allied Sci*. 2018;7(2):60-64.
11. Panda A, Parida J, Jena S, Behera SS, Pradhan A, Patra PK, et al. Prevalence and associated risk factors of overweight and obesity among the adolescent population of India: a scoping review. *BMC Nutr*. 2025;11:110. doi:10.1186/s40795-025-01088-0.
12. George B, Bhaskaran D, Leela LM, Raju JA, Indiradevi L, Mahendran P, Thulaseedharan N. Prevalence and patterns of non-communicable disease risk factors in adolescents: a South-Kerala school based study. *Online J Health Allied Sci*. 2025;24(1):1. Available from: <https://www.ojhas.org/issue93/2025-1-1.html>.
13. Urmya NJ, Hossain MM, Shamim AA, Khan MSA, Hanif AAM, Hasan M, Akter F, Mitra DK, Hossain M, Ullah MA, Sarker SK, Rahman SMM, Bulbul MMI, Mridha MK. Noncommunicable disease risk factors among adolescent boys and girls in Bangladesh: evidence from a national survey. *Osong Public Health Res Perspect*. 2020;11(6):351-364. doi:10.24171/j.phrp.2020.11.6.03.
14. Gupta EK, Patel M, Mehta JP, Parmar DV. A cross-sectional study to assess modifiable lifestyle associated risk factors of non-communicable diseases among secondary school students. *Int J Med Sci Curr Res*. 2021;4(2):426-434.
15. Parle JA, Yadav MN, Raut K. A study on non-communicable diseases, its prevalence on anthropometric and behavioural risk factors among the tribal population of Raigad district: a cross-sectional study. *Int J Community Med Public Health*. 2021;8(12):5922-5928. doi:10.18203/2394-6040.ijcmph20214590.
16. Thankappan KR, Shah B, Mathur P, Sarma PS, Srinivas G, Mini GK, et al. Risk factor profile for chronic non-communicable diseases: results of a community-based study in Kerala, India. *Indian J Med Res*. 2010;131:53-63.