

Association of Behavioural and Biological Risk Factors for Non-Communicable Diseases with Sociodemographic Correlates in Urban Kalaburagi WHO STEPS Approach

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ABSTRACT

Background: Non-communicable diseases (NCDs) are shaped not only by individual behaviours but also by the sociodemographic context in which they occur, with socioeconomic status and educational level known to influence the distribution of both behavioural and biological risk factors. Understanding these correlates at the community level is important for designing equitable and targeted preventive strategies in rapidly urbanizing settings in India.

Objective: To estimate the relationship of behavioural and biological risk factors for non-communicable diseases with sociodemographic correlates among adults in an urban field-practice area of Kalaburagi. **Methods:** A community-based cross-sectional study was conducted among 300 adults aged 18–64 years residing in the field practice area of the Urban Health Training Centre (UHTC), Rajapur, Kalaburagi, between February 2021 and August 2022, using a multi-stage sampling technique. Data on sociodemographic characteristics and behavioural and biological risk factors were collected using a WHO STEPS-based questionnaire along with physical measurements. Data were analysed using SPSS version 25.0; the Chi-square test was used to assess associations between socioeconomic/educational status and risk factors, with $p < 0.05$ considered significant. **Results:** Smoking, smokeless tobacco use, current alcohol use, and sedentary behaviour at work and during travel were all significantly more common among participants of socioeconomic class V compared with higher classes ($p < 0.001$ for all). No significant association was found between socioeconomic status and overweight/obesity, hypertension or diabetes mellitus ($p > 0.05$). However, educational status was significantly associated with both overweight/obesity and hypertension ($p < 0.05$), with the highest prevalence among participants educated to the post-graduate level, while no significant association was found between educational status and diabetes mellitus. **Conclusion:** Behavioural risk factors for NCDs showed a strong inverse relationship with socioeconomic status, while biological risk factors were more closely linked to educational status than to socioeconomic class. These findings underscore the need for socioeconomically and educationally tailored preventive strategies to address the growing burden of non-communicable diseases in urban India.

Keywords: Non-communicable diseases; risk factors; socioeconomic status; educational status; WHO STEPS; sociodemographic correlates

INTRODUCTION

Non-communicable diseases (NCDs), also known as chronic diseases, are of long duration and result from a combination of genetic, physiological, environmental and behavioural factors. The major types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes mellitus.⁽¹⁾ These diseases disproportionately affect people in low- and middle-income countries, where more than three-quarters of

global NCD deaths occur; although often associated with older age, nearly 17 million NCD deaths occur before the age of 70 years, and 86% of these premature deaths occur in low- and middle-income countries.⁽²⁾ Children, adults and the elderly are all vulnerable to the risk factors that contribute to NCDs unhealthy diets, physical inactivity, tobacco use and harmful alcohol consumption. These diseases are driven by rapid unplanned urbanization, globalization of unhealthy lifestyles and population ageing, manifesting

as raised blood pressure, blood glucose, blood lipids and obesity the metabolic risk factors that underlie cardiovascular disease, the leading cause of NCD-related premature death.(1) India illustrates the ongoing "health transition," with NCDs emerging as a major public health challenge of growing magnitude in the 21st century; the burden of cardiovascular disease and other NCDs is greater in urban than in rural India.(3)

Overweight, obesity and physical inactivity have become important determinants of health in urban India, raising the risk of coronary heart disease, stroke, diabetes mellitus and several cancers,(4) and NCDs account for 53% and 44% of all deaths and disability-adjusted life years, respectively, in the country.(2) Indians experience cardiovascular deaths at least a decade earlier than their counterparts in established market economies, with the Global Burden of Disease study estimating that 52% of cardiovascular deaths in India occur among young and middle-aged adults, compared with 23% in established market economies, resulting in a profound adverse impact on the economy.(4) Since risk-factor distribution alone does not capture the underlying inequalities driving the NCD epidemic, this study was undertaken to estimate the relationship of behavioural and biological risk factors for NCDs with the sociodemographic correlates of the adult urban population attending the UHTC, Rajapur, Kalaburagi.

MATERIALS AND METHODS

This community-based cross-sectional study was conducted among adults aged 18–64 years residing in the field practice area of the Urban Health Training Centre (UHTC), Rajapur, attached to the Department of Community Medicine, Mahadevappa Rampure Medical College, Kalaburagi, Karnataka, between

February 2021 and August 2022. A sample size of 300 was calculated using the formula $n = 4pq/L^2$, assuming a prevalence (p) of 25% and an allowable error (L) of 10% of p. Individuals aged 18–64 years who were permanent residents of the study area and provided informed consent were included, while those already diagnosed with a non-communicable disease and those who refused consent were excluded.

A multi-stage sampling technique with households as the sampling unit was adopted. A preliminary house-to-house enumeration was carried out to identify eligible individuals, following which systematic random sampling was used to select every alternate eligible person, with a 10% oversampling applied to compensate for non-response. Data were collected by the investigator through face-to-face interviews using a pre-tested, semi-structured questionnaire adapted from the WHO STEPS (Steps 1, 2 and 3) surveillance instrument, which captured sociodemographic details including socioeconomic status classified by the Modified B.G. Prasad's classification (2020) and educational status along with behavioural risk factors and anthropometric, blood pressure and blood glucose measurements. Blood pressure was measured using a digital sphygmomanometer after five minutes of rest, and body mass index was calculated from height and weight recorded using standard techniques.

Data were entered in Microsoft Excel 2013 and analysed using IBM SPSS version 25.0. The association between socioeconomic status, educational status and the various behavioural and biological risk factors was tested using the Chi-square test, with a p-value <0.05 considered statistically significant. Institutional Ethics Committee approval and written informed consent from all participants were obtained prior to the study.

RESULTS

Data were collected from 300 adults aged 18–64 years using the pre-tested WHO STEPS-based questionnaire described above, and the association of behavioural and biological risk factors with socioeconomic and educational status was assessed using the Chi-square test, with $p < 0.05$ taken as statistically significant. Findings are presented below.

Table 1: Socio-demographic profile of study participants (N = 300)

Variable	Category	Number	Percentage
Sex	Men	180	60%
	Women	120	40%
Socioeconomic status (Modified B.G. Prasad)	Class I	36	12%
	Class II	54	18%
	Class III	81	27%
	Class IV	75	25%
	Class V	54	18%
Education	No formal schooling	75	25%
	Primary school	57	19%

Variable	Category	Number	Percentage
	Middle school	63	21%
	High school	60	20%
	PUC/Degree	21	7%
	Post-graduate	24	8%

The majority of the 300 participants belonged to socioeconomic class III (27%) and class IV (25%), and three-quarters were literate, providing the sociodemographic base against which behavioural and biological risk factors were examined (Table 1).

Table 2: Association of behavioural risk factors with socioeconomic status

SES class (n)	Smoking n (%)	Smokeless tobacco n (%)	Current alcohol use n (%)	Sedentary — at work n (%)	Sedentary — during travel n (%)
Class I (36)	4 (1.6%)	2 (3.3%)	5 (6.9%)	6 (3.2%)	2 (1.8%)
Class II (54)	9 (14.3%)	8 (13.1%)	5 (6.9%)	9 (4.9%)	3 (2.7%)
Class III (81)	10 (15.9%)	11 (18.0%)	10 (13.9%)	10 (5.4%)	10 (8.9%)
Class IV (75)	13 (20.6%)	12 (19.7%)	22 (30.6%)	51 (27.6%)	36 (32.1%)
Class V (54)	30 (47.6%)	28 (45.9%)	30 (41.7%)	118 (63.8%)	61 (54.5%)
Total (300)	66 (100%)	61 (100%)	72 (100%)	185 (100%)	112 (100%)
χ^2 ; p-value	50.94; p<0.001 (HS)	48.37; p<0.001 (HS)	31.75; p<0.001 (HS)	61.78; p<0.001 (HS)	41.87; p<0.001 (HS)

Smoking, smokeless tobacco use, current alcohol use, and sedentary behaviour both at work and during travel were all found in significantly higher proportions among participants belonging to socioeconomic class V, and progressively lower proportions were seen with increasing socioeconomic status; this association was statistically highly significant for every behavioural risk factor examined (p<0.001) (Table 2).

Table 3: Association of overweight/obesity, hypertension and diabetes mellitus with socioeconomic status

SES class (n)	Overweight/Obesity n (%)	Hypertension n (%)	Diabetes mellitus n (%)
Class I (36)	24 (25.3%)	16 (19.3%)	6 (22.2%)
Class II (54)	20 (21.1%)	15 (18.1%)	5 (18.5%)
Class III (81)	17 (17.9%)	19 (22.9%)	9 (33.3%)
Class IV (75)	18 (19.0%)	17 (20.5%)	8 (29.6%)
Class V (54)	16 (16.8%)	16 (19.3%)	4 (14.8%)
Total (300)	95 (100%)	83 (100%)	27 (100%)
χ^2 ; p-value	12.37; p=0.093 (NS)	4.49; p=0.344 (NS)	2.09; p=0.719 (NS)

No statistically significant association was found between socioeconomic status and overweight/obesity, hypertension or diabetes mellitus (p>0.05 for all), though overweight/obesity was numerically highest in class I (25.3%) and hypertension and diabetes mellitus were numerically highest in class III (Table 3).

Table 4: Association of overweight/obesity, hypertension and diabetes mellitus with educational status

Education (n)	Overweight/Obesity n (%)	Hypertension n (%)	Diabetes mellitus n (%)
No formal schooling (75)	16 (16.9%)	15 (18.1%)	4 (14.8%)
Primary school (57)	12 (12.6%)	10 (12.1%)	5 (18.5%)
Middle school (63)	16 (16.8%)	13 (15.7%)	6 (22.2%)
High school (60)	15 (15.8%)	12 (14.5%)	4 (14.8%)

Education (n)	Overweight/Obesity n (%)	Hypertension n (%)	Diabetes mellitus n (%)
PUC/Degree (21)	17 (17.9%)	14 (16.9%)	3 (11.1%)
Post-graduate (24)	19 (20.0%)	19 (22.9%)	5 (18.5%)
Total (300)	95 (100%)	83 (100%)	27 (100%)
χ^2 ; p-value	17.36; p=0.024 (S)	16.17; p=0.017 (S)	9.31; p=0.213 (NS)

A statistically significant association was found between educational status and both overweight/obesity and hypertension ($p<0.05$), with both conditions being most prevalent among participants educated up to the post-graduate level, whereas diabetes mellitus showed no significant association with educational status (Table 4).

DISCUSSION

Both smoking and smokeless tobacco use, as well as current alcohol consumption and sedentary behaviour at work and during travel, were significantly more prevalent among participants belonging to socioeconomic class V and progressively lower with increasing socioeconomic status, with the association being statistically highly significant for all behavioural risk factors examined ($p<0.001$). This finding contrasts with the study by Thakur et al,(5) in which alcohol consumption and smoking were more common among socioeconomic classes II and III, and smoking among younger adults was more common in class IV; however, it is consistent with the study by Sugathan et al in Kerala, which identified low socioeconomic status as a strong predictor of smoking, alcohol use and unhealthy dietary habits,(6) and with the broader observation that the socioeconomic patterning of behavioural risk factors is an important driver of rising NCD risk-factor trends across India.(7) Such variation reflects the fact that the relationship between socioeconomic status and behavioural risk factors changes as the NCD epidemic evolves within a population in early stages, urban, affluent and educated groups with greater disposable income are more likely to experiment with risk behaviours, whereas in more advanced stages of the epidemic, the burden shifts toward lower socioeconomic groups, as reflected in the present findings.

No statistically significant association was found between socioeconomic status and the biological risk factors examined in this study ($p>0.05$ for overweight/obesity, hypertension and diabetes mellitus), although overweight/obesity was numerically highest among participants in socioeconomic class I (25.3%) and hypertension and diabetes mellitus were numerically highest in class III. This finding is at variance with the study by Thakur et al,(5) which reported higher central obesity among females than males, and with a study conducted in Kerala,(8) where the prevalence of obesity and overweight was highest among high-income groups and lowest among low-income groups; such differences likely reflect variation in purchasing power, food availability and sedentary lifestyle patterns across different socioeconomic strata and study settings. Regardless of the direction of association, biological risk factors such as obesity,

hypertension and diabetes mellitus contribute substantially to the household economic burden of NCDs across all socioeconomic strata in India, underscoring the importance of early detection irrespective of socioeconomic status.(9)

A statistically significant association was observed between educational status and both overweight/obesity and hypertension ($p<0.05$), with the highest prevalence of both conditions among participants educated up to the post-graduate level, while diabetes mellitus showed no significant association with educational status. This finding is consistent with the study by Verma et al, in which the prevalence of hypertension among those with no education was 29.3% compared with 49.6% among those educated to high-school level and above,(10) although it contrasts with the lower prevalence (19.3%) reported among the less-educated by Thompson et al;(11) many of the hypertension cases identified in the present study were newly diagnosed, and the observed variation across studies likely reflects the influence of other correlated risk factors such as obesity, as well as cultural and lifestyle differences, with awareness and treatment-seeking behaviour for hypertension also varying by educational level.

Strengths of the Study

The present study utilized the standardized World Health Organization (WHO) STEPwise approach to assess behavioural and biological risk factors for non-communicable diseases. The use of a multistage sampling technique, standardized WHO STEPS questionnaire, and objective measurements of anthropometric and clinical parameters enhanced the reliability and validity of the findings. The study provides important community-based evidence regarding the association between sociodemographic characteristics and non-communicable disease risk factors in an urban population, which may help guide public health interventions and policy planning.

Limitations of the Study

The present study has certain limitations. As a cross-sectional study, causal relationships between sociodemographic factors and non-communicable disease risk factors could not be established. The study was conducted in a single urban field practice area, which may limit the generalizability of the findings to

other populations. Behavioural risk factors were self-reported and therefore may be subject to recall and reporting bias. In addition, dietary practices and biochemical parameters such as lipid profile were not assessed, which may have provided further insights into non-communicable disease risk.

CONCLUSION

This study demonstrated that behavioural risk factors for non-communicable diseases tobacco use, alcohol consumption and physical inactivity showed a strong, statistically significant inverse gradient with socioeconomic status, being most prevalent among the lowest socioeconomic class, whereas biological risk factors such as obesity, hypertension and diabetes mellitus showed no significant association with socioeconomic status but were significantly associated with educational status, particularly among those educated to higher levels. These findings suggest that preventive strategies for non-communicable diseases in this urban population need to be tailored differently for behavioural and biological risk factors, with focused interventions for lower socioeconomic groups to reduce risk behaviours, alongside broader screening efforts across all educational strata to detect biological risk factors early.

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Conflict of Interest

The authors declare that they have no conflicts of interest related to this study.

Author Contributions

Dr. Della: Conceptualization, study design, data collection, statistical analysis, interpretation of results, manuscript drafting, and literature review.

Dr. Shilpa B.K.: Data collection, literature review, manuscript preparation, and critical revision of the manuscript.

Dr. Punith: Data analysis, interpretation of data, manuscript editing, and literature review.

Dr. Sunil Deshmukh: Study supervision, methodology, critical revision of the manuscript, and final approval of the manuscript.

Dr. Mubeen Hussain: Study supervision, statistical guidance, interpretation of findings, manuscript review, and final approval of the manuscript.

All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Data Availability Statement

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

Abbreviations

Abbreviation	Full Form
BMI	Body Mass Index
IEC	Institutional Ethics Committee
NCD	Non-Communicable Disease
SES	Socioeconomic Status
SPSS	Statistical Package for the Social Sciences
STEPS	STEPwise Approach to NCD Risk Factor Surveillance
UHTC	Urban Health Training Centre
WHO	World Health Organization

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