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Original Research Article

A Cross-Sectional Study on the Distribution of Behavioural and Biological Risk Factors for Non-Communicable Diseases in an Urban Population of Kalaburagi — WHO STEPS Approach

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Abstract

Background: Non-communicable diseases (NCDs) are the leading cause of death and disability worldwide, driven by a cluster of modifiable behavioural and biological risk factors including tobacco use, alcohol consumption, physical inactivity, obesity, hypertension and diabetes mellitus. India is undergoing a rapid health transition, with NCDs accounting for over half of all deaths in the country, and urban populations bearing a disproportionate burden. Understanding the local distribution of these risk factors is essential for planning targeted preventive interventions.

Objective: To assess the distribution of various behavioural and biological risk factors associated with non-communicable diseases 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 were collected using a pre-tested questionnaire based on the WHO STEPS (Steps 1–3) approach, along with anthropometric, blood pressure and blood glucose measurements. Data were analysed using SPSS version 25.0, with the Chi-square test applied to assess associations; $p<0.05$ was considered significant.

Results: Of 300 participants, 180 (60%) were men and 120 (40%) were women. Current tobacco smoking was seen in 19%, smokeless tobacco use in 20%, and current alcohol use in 25% of participants, all markedly higher among men. Physical inactivity at work was reported by 62% of participants, more among women. Hypertension was present in 28%, new-onset diabetes mellitus in 9%, and overweight/obesity in nearly a third of participants, with hypertension and obesity marginally higher among women.

Conclusion: This study demonstrated a substantially high prevalence of behavioural and biological risk factors for NCDs in this urban population, calling for urgent lifestyle-modification and structured screening programmes, with particular focus on tobacco and alcohol control and promotion of physical activity.

Keywords: Non-communicable diseases; risk factors; WHO STEPS; behavioural risk factors; biological risk factors; urban population.

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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] Hence, this study was undertaken to assess the distribution of various behavioural and biological risk factors for NCDs among 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 and behavioural risk factors — tobacco use, alcohol consumption and physical activity — and included anthropometric measurements, blood pressure recording and capillary blood glucose estimation. 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. Socioeconomic status was classified using the Modified B.G. Prasad's classification (2020).

Data were entered in Microsoft Excel 2013 and analysed using IBM SPSS version 25.0. Results were expressed as frequencies and percentages, and the Chi-square test was applied to test associations between categorical variables, 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 were analysed descriptively and using the Chi-square test, with $p<0.05$ taken as statistically significant. The distribution of sociodemographic characteristics and of behavioural and biological risk factors is presented below.

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

Variable	Category	Number	Percentage
Sex	Men	180	60%
	Women	120	40%
Age group (years)	18–25 (Young adult)	36	12%
	26–44 (Adult)	103	34%
	45–59 (Middle age)	72	24%
	60–64 (Old age)	91	30%
Religion	Hindu	225	75%
	Muslim	66	22%
	Christian	9	3%
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	Illiterate	75	25%
	Primary school	57	19%
	Middle school	63	21%
	High school	60	20%
	PUC/Degree	21	7%
	Post-graduate	24	8%
Occupation	Professional	6	2%
	Semi-professional	12	4%
	Clerical/Shop/Farm	42	14%
	Skilled worker	30	10%
	Semi-skilled worker	6	2%
	Unskilled worker	66	22%
	Homemaker	96	32%
	Student	42	14%

Of the 300 participants, 180 (60%) were men and 120 (40%) women, with the largest age group being 26–44 years (34%) (Table 1). Three-quarters were Hindu by religion, and the majority belonged to socioeconomic class III (27%) and class IV (25%). Three-quarters of participants were literate, and homemakers (32%) formed the largest occupational group, followed by unskilled workers (22%) (Table 1).

Table 2: Distribution of behavioural risk factors by sex

Risk factor	Men n (%)	Women n (%)	Total n (%)	χ^2; p-value
Current smoking				
Daily	54 (30%)	3 (3%)	56 (19%)	—
Occasional	7 (4%)	0 (0%)	7 (2%)	—
Past smoker	2 (1%)	0 (0%)	2 (1%)	—
Never	117 (65%)	117 (97%)	235 (78%)	—
Smokeless tobacco (current)				
Daily user	53 (29%)	8 (7%)	61 (20%)	—
Never user	127 (70%)	112 (93%)	238 (79%)	—
Alcohol use				
Ever used	80 (45%)	2 (2%)	82 (27%)	67.0; p<0.001
Current use	72 (40%)	2 (1%)	74 (25%)	44.32; p<0.001
Physical activity				
Sedentary at work	79 (44%)	106 (88%)	185 (62%)	60.57; p<0.001
No walking/cycling to work	56 (31%)	56 (47%)	112 (37%)	7.11; p<0.001

Current tobacco smoking was seen in 19% of participants overall, almost entirely among men (30%), and smokeless tobacco use (mainly gutka) in 20%. Alcohol use — both lifetime and current — was significantly more common among men than women (p<0.001). Physical inactivity at work was reported by 62% of participants and was significantly more prevalent among women (88%) than men (44%) (p<0.001) (Table 2).

Table 3: Distribution of biological risk factors by sex

Risk factor	Men n (%)	Women n (%)	Total n (%)	χ^2; p-value
Blood pressure category				
Normal	96 (53%)	60 (50%)	156 (52%)	18.59; p<0.001
Pre-hypertension	48 (27%)	13 (11%)	61 (20%)	
Hypertension	36 (20%)	47 (39%)	83 (28%)	
Diabetes mellitus (new cases)				
Present	18 (10%)	9 (7.5%)	27 (9%)	0.549; p=0.458 (NS)
Absent	162 (90%)	111 (92.5%)	273 (91%)	
Body mass index category				
Normal	128 (71.1%)	77 (64.2%)	205 (68.3%)	2.97; p=0.227 (NS)
Overweight	35 (19.4%)	24 (20.0%)	59 (19.7%)	
Obese	17 (9.4%)	19 (15.8%)	36 (12.0%)	

Hypertension was present in 28% of participants overall and was significantly more common among women (39%) than men (20%) (p<0.001). New-onset diabetes mellitus was found in 9% of participants, slightly more among men. Overweight (19.7%) and obesity (12%) together affected nearly a third of participants and were marginally more common among women, though this difference was not statistically significant (Table 3).

Table 4: Age-wise distribution of behavioural and biological risk factors

Age group (years)	Current smoking n (%)	Hypertension n (%)	Diabetes mellitus n (%)	Overweight/Obesity n (%)
18–25	11 (17%)	13 (15.7%)	3 (11.1%)	12 (12.6%)
26–44	15 (23%)	18 (21.7%)	7 (25.9%)	21 (22.1%)
45–59	18 (27%)	26 (31.3%)	10 (37.0%)	39 (41.1%)
60–64	22 (33%)	26 (31.3%)	7 (25.9%)	23 (24.2%)
Total	66 (100%)	83 (100%)	27 (100%)	95 (100%)
χ^2; p-value	41.33; p<0.001 (HS)	0.386; p=0.943 (NS)	2.978; p=0.395 (NS)	1.664; p=0.645 (NS)

Smoking prevalence increased significantly with advancing age (p<0.001), rising from 17% in the 18–25-year group to 33% in the 60–64-year group. Hypertension, diabetes mellitus and overweight/obesity were all most frequent in the 45–59-year group, though none of these age-wise differences reached statistical significance (Table 4).

Discussion

All study participants were aged 18–64 years, with the largest proportion of both men and women in the 26–44-year age group; this is consistent with the study by Thakur et al,[5] in which 68% of participants belonged to the 18–44-year age group, and broadly comparable to Khargekar et al,[6] where 57.6% of participants were below 30 years of age, though Vijayakarthikeyan et al[7] reported a higher proportion (44.1%) in the 51–60-year group. Men constituted 60% of the study population, similar to the male preponderance reported by Khargekar et al (66.1% males),[6] though Thakur et al(5) and Vijayakarthikeyan et al[7] reported a female preponderance (55% and 62.4%, respectively), a difference likely related to differential availability of each sex at the time of data collection. The majority of participants were Hindu by religion (75%), comparable to Vijayakarthikeyan et al (56% Hindu).[7] Most participants belonged to socioeconomic class III (27%), similar to Vijayakarthikeyan et al (45.1% class III)[7] and Sandhu et al (37% class III),[8]with variation attributable to differing study settings. Three-quarters of participants were literate, a proportion higher than the illiteracy reported by Thakur et al (12% with no formal schooling)[5] and Sandhu et al (8%),[8] reflecting improving educational attainment. Homemakers formed the largest occupational group (32%), followed by unskilled workers (22%), broadly consistent with Thakur et al, where homemakers (45%) were also the single largest group.[5]

Current smoking was reported by 19% of participants, almost entirely among men (30% versus 3% of women); this was somewhat higher than the 17.8% tobacco use reported by Vijayakarthikeyan et al[7] and comparable to the 23.4%/23% reported by Sandhu et al and Oommen et al, respectively.[8,9] The mean age at initiation of smoking among men was 19.7±5.3 years, comparable to the 21 years reported by Thakur et al[5] and 21.4 years by Vijayakarthikeyan et al,[7] and smoking prevalence increased progressively with age, similar to the pattern of higher smoking prevalence among older adults reported by Thakur et al,[5] reflecting the cumulative effect of prolonged tobacco exposure. The most common form of smokeless tobacco used was gutka (66%), with an average frequency of use of 6±3.2 times per day; overall smokeless tobacco use (20%) was lower than the 21.4% reported by Thakur et al,[5] a difference attributable to variation in local cultural practices. Lifetime alcohol use was reported by 27% of participants and current use by 25%, both markedly higher among men; this was broadly comparable to the 17.3% reported by Vijayakarthikeyan et al,[7] Devi et al[10] and Agarwal et al,[11] though considerably higher than the low prevalence reported by Naseem et al (1.8%),[12] Tagurum et al (3.1%)[13] and Chhaya et al (5.9%),[14] and lower than that reported by Oommen et al (62%)[9] and Krishnan et al (37.7%);[15] alcohol use among men in this study was comparable to the 24% current-drinker prevalence reported in the National Family Health Survey (NFHS-4).[16] Given the established association between alcohol use and elevated cardiovascular risk among South Asians,[17] control of alcohol consumption remains a priority. Physical inactivity at work was observed in 62% of participants and was significantly more common among women (88%) than men (44%), differing from the gender pattern reported by Thakur et al, where inactivity was more prevalent among males.[5]

The overall prevalence of hypertension was 28%, higher among women (39%) than men (20%); this was higher than the 6.4% reported by Khargekar et

al[6] and the national age-adjusted prevalence of 11.3% reported by Ghosh et al,[18] a difference likely related to variation in study population and measurement methodology, and underscores hypertension's position as a leading contributor to avoidable morbidity in India. New-onset type 2 diabetes mellitus was detected in 9% of participants, more common among men (10%) than women (7.5%); this was lower than the 15.5% raised blood glucose prevalence reported by Thakur et al,[5] higher than global and South Asian estimates of 9% and 8%, respectively,[19] and lower than the 12.5% reported by Khargekar et al, itself higher than the national prevalence of 7.3%,[6,20] differences attributable to variation in diagnostic cut-offs and sampling methodology, as also reflected in the comparatively lower estimates from the National Family Health Survey (NFHS-4).[16]

Overall, 19.7% of participants were overweight and 12% obese, both marginally more prevalent among women; this combined burden was similar to that reported by Thakur et al[5] and lower than the substantial rise in overweight/obesity prevalence documented across Indian states by Verma et al,[21] reaffirming overweight and obesity as important modifiable risk factors for NCDs. Pre-hypertension was observed in 20% of participants, more common among men (27%) than women (11%); elevated blood pressure prevalence in this study was broadly comparable to the 26.2% reported by Thakur et al[5] and higher than the 15.7% reported by Vijayakarthikeyan et al,[7] with such variation attributable to differences in study population and measurement conditions.

Conclusion

This community-based study revealed a substantially high prevalence of both behavioural (tobacco use, alcohol consumption, physical inactivity) and biological (hypertension, diabetes mellitus, overweight/obesity) risk factors for non-communicable diseases among the productive urban population of Kalaburagi, with several risk factors more pronounced among men and increasing with advancing age.

These findings highlight the urgent need for community-based screening, targeted health education and lifestyle-modification programmes, particularly for tobacco and alcohol cessation and promotion of physical activity, to reduce the future burden of non-communicable diseases in this population.

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