Original Article

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Community Section

Risk Assessment for Non-Communicable Diseases among Adults in a Rural Area of Eastern India: A Single Centre Cross-sectional Study

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ABSTRACT

Introduction: Non-Communicable Diseases (NCDs) cause significant premature mortality. Prevention of major cardiovascular disease risk factors, like diabetes and hypertension, is a priority for public health.

Aim: To estimate the risk assessment of NCD using the Community-Based Assessment Checklist (CBAC) scoring system developed by the Government of India among adults in rural areas.

Materials and Methods: This community-based cross-sectional study was conducted among 400 adults attending the hospital at the rural health training centre of Kalinga Institute of Medical Sciences (KIMS), Bhubaneswar, Odisha, India, from March 2023 to August 2023 using consecutive sampling. Face-to-face interviews using a structured CBAC questionnaire and socio-demographic variables were used to gather data on age, tobacco consumption, alcohol intake, waist measurement, physical inactivity, and family history. Data were analysed using IBM Statistical Package for Social Sciences (SPSS) version 21.0 and interpreted in frequencies, percentages, and the Chi-square test. A p-value <0.05 was considered statistically significant.

Results: The overall risk of NCD was estimated to be 57.25%. The risk of NCD was significantly associated with age (p-value <0.00001), tobacco consumption (p-value <0.0001), alcohol consumption (p-value <0.0001), waist circumference (p-value <0.0001), physical activity (p-value=0.000018), family history of diabetes mellitus, hypertension, and cardiovascular illness (p-value <0.00001), education (p-value=0.0079), and socio-economic status (p-value=0.0415).

Conclusion: The overall risk of NCD was estimated to be 57.25%. Most of the CBAC variables were found to have a significant association with NCD risk. However, no significant association was found between CBAC variables and gender. CBAC is a simple and economical screening tool employed at the community level so that early intervention strategies can be planned for those at risk of NCDs.

Keywords: Cardiovascular disease, Community based assessment checklist, Diabetes mellitus, Risk factors

INTRODUCTION

The NCDs account for 71% of all fatalities worldwide and 85% of "premature" deaths in low- and middle-income nations [1]. With the ongoing epidemiological and demographic transition, the incidence of NCD is on the rise in India. NCDs account for 60% of all fatalities in India, with coronary heart disease, stroke, and hypertension (45%), chronic respiratory disease (22%), cancers (12%), and diabetes mellitus (3%) as the leading causes of fatalities [2]. The National Family Health Survey-5 (NFHS-5) reported that 65% of mortality was due to NCDs. The State of Odisha reported a higher prevalence of both hypertension and impaired blood glucose levels (random blood glucose >140 mg/dL) among men (25.6%, 16%) and women (22.4%, 13.1%), aged 15 years and above, as compared to the national prevalence of hypertension (24% in men and 21.3% in women) and impaired blood glucose (14.4% in men and 12.4% in women). The prevalence of screening tests for breast, cervical, and oral cancers among 15 to 49-year-old women was also very low [3]. Less than half of patients in rural areas knew they had these significant CVD risk factors, according to a recent evaluation of the effectiveness of the Indian healthcare system for diabetes and hypertension [4,5]. Early screening and diagnosis of such risk factors are of utmost importance. India has agreed to the Global Action Plan for the Prevention and Control of NCDs, and as a signatory, is now required to reduce the prevalence of hypertension by 25% between 2010 and 2025 and to halt the growth in diabetes by that time [6]. The National Multisectoral Action Plan for the Prevention and Control of NCDs [7] and a special program for the National Prevention and control of Cancer, Diabetes, Cardiovascular disease, and Stroke (NPCDCS) have both been introduced by the Indian government to meet these goals [8].

Under the Ayushman ka Amrit Mahotsav, the Government of India plans to screen and include 75 million people with hypertension and diabetes in routine care by the year 2025 through the network of health and wellness centres as a part of upscaling services at primary care settings [9]. Since the onus is now on primary health centres, screening tools that are economical and can be implemented by grassroots workers are required to achieve this coverage for NCDs. Identifying the hidden spectrum using non invasive and basic screening techniques is essential for the general public to address the steadily rising burden of NCDs. The CBAC is one such tool developed by the Government of India to screen the risk factors of NCDs at the community level and ultimately act as a tool for early detection and treatment under the NPCDCS program [2]. It screens the population for both modifiable and non modifiable risk factors of NCDs. Tobacco use, excessive alcohol consumption, and physical inactivity are some of the behaviour-related risk factors that can be modified and should be the focus of NCD control efforts. The risk of NCDs could be eliminated if these risk factors are managed early and effectively [10]. Studies about employing the CBAC screening tool for the adult population in a rural setting are scarce. The population registered under the rural health unit of KIMS represents a virgin population, as the population visiting the health unit has never been screened by the CBAC tool. Therefore,

this study aimed to estimate the risk assessment of NCDs using the CBAC scoring system developed by the Government of India among the rural population visiting the health unit for different health needs.

This opportunistic screening will provide baseline data on the NCD risk scores among the registered population. This data can be further utilised by administrative bodies and government health officials when planning a mass community screening to achieve the targets of Ayushman ka Amrit Mahotsav for NCDs. The population with higher NCD risk scores should be prioritised for early management of their condition through referrals and follow-ups.

MATERIALS AND METHODS

This community-based cross-sectional observational study was carried out at the Rural Health and Training Centre (RHTC) in Kalarabanka. The RHTC is a health unit under the Department of Community Medicine at KIMS, Bhubaneswar, Odisha, India, between March 2023 and August 2023. The study received approval from the Institutional Ethics Committee (IEC) of KIMS, Bhubaneswar, Odisha, India, (Reference no. KIIT/KIMS/IEC/1324/2023).

Inclusion criteria: All consenting adults aged 30 years and above who were visiting the rural health centre and had been residing in the study area for at least six months were included in the study.

Exclusion criteria: All known and diagnosed cases of NCDs, such as diabetes, hypertension, cancers, disabled individuals, pregnant females, and severely ill individuals, were excluded from the study.

The study area was the rural field practice area under the RHTC located in Kalarabanka, a smart village in Odisha. This area caters to the population of 39 villages covering an area of 68 square km with approximately 54,260 residents. For sample size estimation, the expected prevalence (p) of the adult population at risk of developing NCDs with a CBAC score greater than four was taken as 57.7% from a study by Kaur P et al., at a 95% confidence interval and 5% allowable error (d). The sample size (n) was estimated using the formula: $n=3.84\ p(1-p)/d^2$ [11]. A 5% attrition rate was added, and the final sample size was rounded up to 400.

The eligible population (patients and individuals accompanying them) visiting the health centre for various health needs were included in the study until the sample size was met, after obtaining valid informed consent. The participants were briefed about the study's purpose, and informed consent was obtained.

The socio-demographic details like age, gender, socio-economic status (according to the Modified Kuppuswamy classification) [12], and educational status, were collected using a predesigned and pretested proforma through face-to-face interviews. Information about NCD risk factors (both modifiable and non modifiable) was gathered using the CBAC [2]. Data on risk factors like tobacco consumption, alcohol intake, waist measurement, physical activity, and family history were collected using the tool. Waist measurement was conducted using a non stretchable measuring tape. Individuals who met specific criteria and had a CBAC score exceeding four were classified as "high-risk," based on the following: Waist circumference: 81-90 cm (women)/91-100 cm (men) (+1), >90 cm (women)/>100 cm (men) (+2); physical activity <150 min per week (+1); a family history of high Blood Pressure (BP), diabetes, or heart disease (+2); age 40-49 years (+1), age ≥50 years (+2); history of smoking, use of smokeless tobacco products, or occasional current use (+1), daily current use (+2); daily alcohol consumption (+1). Those with CBAC scores below four were categorised as "low-risk."

STATISTICAL ANALYSIS

The data were compiled in MS Excel and analysed using IBM SPSS version 21.0 software. Descriptive statistics were presented as means, frequencies, and percentages. The Chi-square test was employed to examine the relationship between risk factors and CBAC scores, with a p-value <0.05 considered statistically significant.

RESULTS

A total of 400 adults completed the baseline assessment, of which 248 (62%) were males and 152 (38%) were females. Approximately 131 (32.75%) of the study sample had education up to intermediate or diploma, and 103 (25.75%) belonged to the upper-middle-class socio-economic status. The risk of NCD with a score ≥ 4 was found in 229 (57.25%) of the study population, while a score <4 was observed in 171 (42.75%). The socio-demographic characteristics of the study population are outlined in [Table/Fig-1] along with their association with NCD risk scores. There was a significant association of NCD risk score with education (p-value=0.0079) and socio-economic status (p-value=0.0415). The distribution of study participants as per the CBAC variables is outlined in [Table/Fig-2]. Approximately 177 (44.25%) of the participants belonged to the age group 30-39 years. About 234 (58.5%) of the participants had never consumed tobacco, and the majority, i.e., 312 (78%), did not have a history of daily alcohol intake. Amongst those with an NCD risk score ≥4, 81 (35.4%) people consumed tobacco daily, and 71 (31%) consumed alcohol daily. Around 109 (47.6%) of participants at higher risk of NCDs belonged to the group of females with 80-90 cm and males with 90-100 cm waist circumference. A total of 204 (51%) of the study population engaged in physical activity <150 minutes a week, of which 138 (34.5%) had an NCD risk score ≥4. Approximately 202 (50.5%) of participants had a family history of diabetes, hypertension, and cardiovascular diseases. A significant association was found between NCD risk score and CBAC variables - age, tobacco consumption, daily alcohol intake, waist circumference, physical activity, and family history (diabetes, hypertension, cardiovascular diseases) (p-value <0.00001) [Table/Fig-2].

Variables	NCD risk score <4 (n=171) N (%)	NCD risk score ≥4 (n=229) N (%)	Total (n=400) N (%)	χ^2 (p-value)*
Gender				
Male	98 (57.3)	150 (66.5)	248 (62)	2.7887 (0.0949)
Female	73 (42.7)	79 (34.5)	152 (38)	
Education				
Professional degree	12 (7)	6 (2.6)	18 (4.5)	13.815 (0.0079)
Graduate/Postgraduate	39 (22.8)	53 (23.1)	92 (23)	
Intermediate/Diploma	66 (38.6)	65 (28.4)	131 (32.75)	
High school certificate	20 (11.7)	49 (21.4)	69 (17.25)	
Middle school certificate	17 (10)	22 (9.6)	39 (9.75)	
Primary school certificate	13 (7.6)	19 (8.3)	32 (8)	
Illiterate	4 (2.3)	15 (6.6)	19 (4.75)	
Socio-economic status				
Class-I (Upper)	21 (12.3)	33 (14.4)	54 (13.5)	9.9331 (0.0415)
Class-II (Upper Middle)	32 (18.7)	71 (31)	103 (25.75)	
Class-III (Lower Middle)	48 (28)	54 (23.6)	102 (25.5)	
Class-IV (Upper Lower)	39 (22.8)	43 (18.8)	82 (20.5)	
Class-V (Lower)	31 (18.2)	28 (12.2)	59 (14.75)	

[Table/Fig-1]: Socio-demographic variables and their association with NCD risk scores.
*The Chi-square test has been used to test the association between variable; p<0.05 was considered statistically significant

DISCUSSION

This study presents the risk assessment for NCDs by the CBAC in a rural area. It was found that more than half of the study population was at 'high-risk' for developing NCDs after the risk assessment by the CBAC. It is a well-known fact that prevalent risk factors will

CBAC variable		NCD risk score <4 (n=171) N (%)	NCD risk score ≥4 (n=229) N (%)	Total (n=400) N (%)	χ^2 (p-value)*
Age (in years)					
30-39		125 (73.1)	52 (22.7)	177 (44.25)	113.43 (<0.00001)
40-49		31 (18.1)	57 (24.9)	88 (22)	
≥50		15 (8.8)	120 (52.4)	135 (33.75)	
Tobacco consumption					
Never		149 (87.1)	85 (37.1)	234 (58.5)	103.02 (<0.0001)
Used to consume in past/Sometimes		15 (8.8)	63 (27.5)	78 (19.5)	
Daily		7 (4.1)	81 (35.4)	88 (22)	
Alcohol intake (Daily)					
No		154 (90.1)	158 (69)	312 (78)	25.309 (<0.0001)
Yes		17 (9.9)	71 (31)	88 (22)	
Waist circumference (in cm)					
Female	**Male**				
<80	**<90**	85 (49.7)	50 (21.8)	135 (33.75)	43.9932 (<0.0001)
80-90	**90-100**	70 (40.9)	109 (47.6)	179 (44.75)	
>90	**>100**	16 (9.4)	70 (30.6)	86 (21.5)	
Physical activity (minutes a week)					
<150		66 (38.6)	138 (60.3)	204 (51)	18.3884 (0.000018)
At least 150		105 (61.4)	91 (39.7)	196 (49)	
Family history of DM, HTN, CVDs					
No		133 (77.8)	65 (28.4)	198 (49.5)	95.5465 (<0.00001)
Yes		38 (22.2)	164 (71.6)	202 (50.5)	

[Table/Fig-2]: Association of NCD risk score with CBAC variables.
*The chi-square test has been used to test the association between variable
p<0.05 considered statistically significant

manifest into diseases in the future. Given the lag time between exposure and disease development, identifying these risk factors in the community serves as the focal point of the surveillance system. An economically feasible early screening strategy at the primary healthcare level can be crucial in decreasing the burden of NCDs. One such screening tool is the CBAC checklist, which was first validated by Choudhary N et al., [13]. In this study, the overall risk of common NCDs was 57.25% with a CBAC score ≥4, while 42.75% had a score <4. A similar prevalence was noted in a study by Yadav SP et al., where the overall risk of NCDs was 60.9% with a CBAC score ≥4 and 39.1% with a score <4 [14]. A study by Kalidoss VK et al., also reported an overall NCD risk of 70% with a CBAC score of >4 [15]. The presence of 'high-risk' in more than half of the study population was probably due to the reason that the study sample was selected from a health centre, which will include people with pre-existing health problems. However, the findings of this study can provide a baseline for undertaking more robust community screening projects for NCDs.

Around 177 (44.25%) of the participants belonged to the age group 30-39 years. However, in studies by Kaur P et al., and Choudhary N et al., 41% and 64.66% of the participants were more than 50 years of age, respectively [11,13]. This difference may be because, in the present study, most of the participants who were more than 50 years of age were diagnosed cases of NCDs and hence were excluded. The prevalence of daily tobacco consumption and alcohol intake was 22% in this study. Similar findings were also noted by Jaacks LM et al., where the prevalence of tobacco consumption was as low as 4.5% and that of alcohol intake was 12.8% [16]. Similar prevalence was also reported in studies by Choudhary N et al., and Preet K et al., [11,17]. This low prevalence might be due to under-reporting of these habits since it is considered taboo behaviour. Around 109 (47.6%) of participants with a higher risk of NCDs belonged to the group of females with 80-90 cm and males with 90-100 cm waist circumference. This finding was inconsistent with the findings of other studies by Choudhary N et al., and Yadav SP et al., [11,14]. However, waist measurement might be considered a slightly invasive test since it requires the measuring tape to be used on bare skin for accurate estimation. Thus, other non invasive procedures like Blood Pressure (BP) measurement might be considered for implementation as a screening tool. Nevertheless, proper training sessions need to be planned for the frontline workers who will be conducting the BP measurements.

Physical inactivity was around 51% in this study, which was consistent with the findings of other studies [18-21]. This physical inactivity might be due to increased life responsibilities with age, leading to less time and opportunity for physical activity. Additionally, people tend to become less conscious about their physical appearance as they age. With urbanisation rapidly spreading to rural areas, jobs involving manual labour are decreasing. Around 202 (50.5%) of participants had a family history of diabetes, hypertension, and cardiovascular diseases. A much lower prevalence was reported by Kaur P et al., Choudhary N et al., and Kalidoss VK et al., where 42.9%, 49.24%, and 48.2% respectively had a family history of NCDs [11,13,15]. These results validate the planned intervention efforts of the Government through the National Program for NCD (NP-NCD) [22], especially through the participation of the local health department committed to ensuring diagnosis, testing, and medication availability within the community health system.

In the present study, there was a significant association of NCD risk score with education (p-value=0.0079) and socio-economic status (p-value=0.0415), which was consistent with the findings of a study by Jaacks LM et al., [16]. A significant association was also reported between NCD risk score and CBAC variables such as age, tobacco consumption, daily alcohol intake, waist circumference, physical activity, and family history (diabetes, hypertension, cardiovascular diseases) (p-value <0.00001). These findings were similar to the results of a study by Kaur P et al., except for tobacco usage [11]. A study by Premanandh K and Shankar R also found that alcohol consumption and abdominal obesity were significantly associated with a higher CVD risk [23]. The findings of this study will pave the way for further robust community-based screening projects in collaboration with local administrative bodies and policymakers so that the growing pandemic of NCDs can be halted at a nascent stage.

Limitation(s)

This was an observational cross-sectional study that did not conduct any investigations for further screening of the identified individuals with a higher NCD risk score. Hence, a more comprehensive approach is warranted. The data on tobacco and alcohol consumption might have been underreported due to the associated stigma. Family history and physical activity might not have been accurately reported by the participants.

CONCLUSION(S)

The overall risk of NCD was high among the adults visiting the rural health centre. There was a significant association between the majority of CBAC variables and an increased risk of NCDs. Proper awareness activities need to be planned by the local government bodies so that the frequency of risk factors and the development of diseases in subsequent generations are reduced, thus ending the vicious cycle of NCDs in the community.

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