A Study to Assess the Validity of Community based Assessment Checklist – The Standard Non-Communicable Diseases Screening Tool of Frontline Health Workers

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ABSTRACT

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Backgrounds: Around 63% of deaths in India are due to non-communicable diseases (NCD), and 1 in 4 Indians is at risk of premature death between 30 to 70 years of age. Considering this burden, the Government of India has introduced a Community Based Assessment Checklist (CBAC) to be used by frontline health workers for universal screening of populations aged more than 30 years for common NCDs as a part of Health and Wellness Centres under Ayushman Bharat.

Objectives: This study aimed to assess the validity of CBAC in the screening of common NCDs like diabetes mellitus and hypertension.

Methods: A cross-sectional study was done in the rural southern part of India among adults aged more than 30 years. A total of 110 participants were screened using CBAC. Random blood glucose(RBS) and blood pressure were measured. RBS more than 200 mg/dl and blood pressure equal to or more than 140/90 mmHg were considered as operational diagnostic criteria. The CBAC score >4 was considered to be a risk for these NCDs. Data were collected in MS excel, and analysis was done using R software.

Results: A majority of participants belonged to the age group above 50 years (71%) and male sex (69%). The study participants' median (IQR) CBAC score was 5 (4-6), and 70% had scored more than 4. About 45% of participants had blood pressure equal to or more than 140/90 mmHg, 15% had RBS > 200 mg/dl, and 51% had at least one abnormal parameter. The sensitivity of the current CBAC score cut-off was 85.7% and 53.7%, respectively. Analysis showed that if the cut-off score is reduced to equal to or more than 4, sensitivity increases to 98%.

Conclusion: Community based assessment checklist is a valid tool for NCD screening and high-risk behaviour among the community. However, decreasing the cut-off score to equal to or more than four will increase the sensitivity of CBAC.

Keywords: Community Based Assessment Checklist, Validity, Non-Communicable Disease Screening

*See End Note for complete author details

INTRODUCTION

World Health Organization (WHO) estimates that 41 million people each year die globally due to Non-communicable diseases (NCD), which account for 71% of all deaths.[1] NCDs are a lead cause of premature death among the ages of 30 and 69 years in low- and middle-income countries. Tobacco use, alcohol abuse, physical inactivity, and unhealthy diets are the modifiable risk factors that increase the risk of dying from an NCD. WHO recommends early diagnosis, screening, and treatment of NCDs as the critical components of controlling the NCDs.[1] In India, around 63% of deaths are due to NCDs, and one in four Indians is at risk of premature death between 30 to 70 years of age due to NCDs.[2] As per the recommendation National Health Policy 2017, Ayushman Bharat, a flagship scheme, was launched in 2018 to achieve the vision of Universal Health Coverage. Considering the NCD burden in India as a part of Ayushman Bharat under the National Program for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS), a cost-effective diagnostic tool at primary levels Community Based Assessment Checklist (CBAC) was introduced.[3] The CBAC is a universal screening tool used by frontline health workers to

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screen common NCDs like Diabetes, Hypertension, and Cancers among the population aged more than 30 years.[4] Literature shows minimal studies on the validity of CBAC and no studies available in the south Indian population. Hence this study aims to assess the validity of CBAC in screening of common NCDs like diabetes mellitus and Hypertension.

METHODOLOGY

We did a cross-sectional study in the rural southern part of India among adults aged more than 30 years. Around 110 participants were screened using Community-Based Assessment Checklist, which is shown in **Figure 1.** The CBAC has six items based on basic risk factors; age, tobacco use, alcohol use, waist circumference, physical activity, and family history of NCDs. Each item is scored between 0 and 2, and the maximum score could be 10. A score above 4 is indicative of a high risk for NCDs, and individuals with such a score need to be prioritized for referral to the NCD clinic. The participants were screened using the checklist, and waist circumference was measured using constant-tension-tape over light clothing. The measurement was taken at the end of a normal expiration at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest (hip bone). The blood pressure was measured using a digital automatic blood pressure monitor. The participants were asked to sit comfortably with arms at rest and legs uncrossed. Blood pressure was measured twice with three minutes rest between the readings and mean of

Question	Range		Circle any	Write score
What is your age? (in complete years)	30-39 years		0	
	40-49 years		1	
	= 50 years		2	
Do you smoke or consume smokeless products such as Gutka; or Khaini?	Never		0	
	Used to consume in the past/ Sometimes now		1	
	Daily		2	
Do you consume alcohol daily?	No		0	
	Yes		1	
Measurement of waist (in cm)	Female	Male		
	=80 cm	= 90 cm	0	
	81-90 cm	91-100 cm	1	
	> 90 cm	> 100 cm	2	
Do you undertake any physical activities for minimum of 150 minutes in a week?	Less than 150 minutes in a week		1	
	At least 150 minutes in a week		0	
Do you have family history (any of your parents or siblings) of high blood pressure, diabetes, and heart disease?	No		0	
	Yes		2	
Total Score				

Figure 1. **Community Based Assessment Checklist**

Table 1. Distribution of NCD Risk Factors among the Study Participants

Variables	Subgroups		Frequency	Percent
Age Group	30-39 years		14	12.7
	40-49 years		17	15.5
	≥ 50 years		79	71.8
Tobacco use (smoking or smokeless)	Never user		70	63.6
	Non-Daily/ Former user		26	23.6
	Daily user		14	12.7
Daily Alcohol Use	Non-Daily/ Former/ Never user		103	93.6
	Daily user		7	6.4
Waist Circumference	Female	Male		
	≤80 cm	≤ 90 cm	24	21.8
	81-90 cm	91-100 cm	35	31.8
	> 90 cm	> 100 cm	51	46.4
Physical Activity	≥ 150 minutes per week		41	37.3
	< 150 minutes per week		69	62.7
Family history	Yes		53	48.2
	No		57	51.8
Total			110	100

two readings was recorded. The blood pressure equal to or more than 140/90 mmHg was considered hypertension. The blood glucose was measured using a glucometer, and random blood glucose of more than 200 mg/dl was considered as operational diagnostic criteria for diabetes mellitus (DM). Data were entered and analyzed using MS Excel® and analysis was done using R software. The categorical variables were summarized as frequencies and proportions. The CBAC score was summarized as median and interquartile range. The tool's validity was expressed as Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value, and Accuracy. Accuracy was calculated based on formula [Accuracy = Sensitivity × Prevalence + Specificity × (1 − Prevalence)].[5] The receiver operating characteristic curve was used to calculate the area under the curve (AUC). A P-value of <0.05 was considered to be statistically significant.

RESULT

The majority of participants belonged to the age group above 50 years (71%) and male (69%), shown in **Table 1.** Around 12% of participants were never using tobacco daily, and 6% were using alcohol daily. Four out of five participants had a higher waist circumference. More than 60% did not have adequate physical activity, and half had a family history of NCDs. The study participants' median (IQR) CBAC score was 5 (4-6), and 70% had a score of more than four. 51% had at least one abnormal parameter. The donut diagram

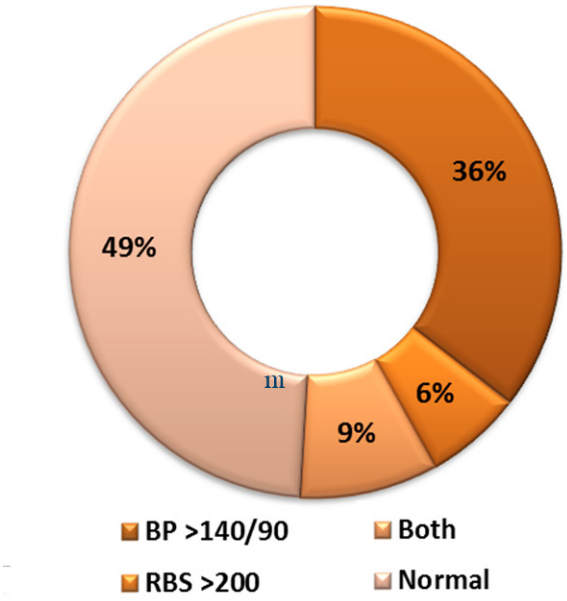

Figure 2. **Distribution of Abnormal Parameters among Study Participants**

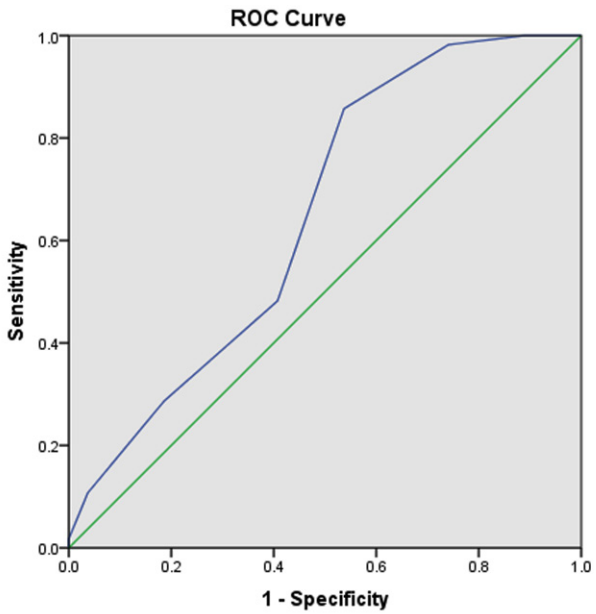

Figure 3. **Receiver Operating Characteristic curve for CBAC>4**

Figure 2 shows that half of the participants had at least one NCD. 42% had blood sugar more than 200 mg/dl, and 15% had blood pressure more than or equal to 140/90 mmHg.

Figure 3 shows a statistically significant receiver operating characteristic curve with an area under the curve of 0.65. **Table 2** shows the comparison of CBAC risk score and NCDs. The sensitivity, specificity, negative predictive value, and overall accuracy of CBAC score (with the suggested cut-off of more than four as high-risk) were 85.7%, 46.2%, 75.7%, and 66.4%, respectively. Sensitivity analysis shown in **Table 3,** when the cut-off score was reduced to equal to or more than four, shows that the sensitivity, specificity, negative predictive value, and overall accuracy rate changes to 98.2%, 25.9%, 93%, and 62.7%, respectively.

DISCUSSION

Establishing a cost-effective detection and treatment of NCDs is an important strategy in controlling the burden of NCDs. Community-Based Assessment Checklist (CBAC) is the population-based high-risk screening strategy for NCDs at the primary health care level introduced in India. This study is the first validity study of a community-based assessment checklist as a comprehensive approach to assessing NCD risk profile in rural areas.[6] The prevalence of tobacco use among the study participants was 12.7%, relatively lesser than the second global tobacco adult survey, which shows that current tobacco users were 20%. This could be due to different age groups in the survey.[7] The prevalence of alcohol among the study participants is 6.4%, similar to the NFHS 5 report. The prevalence of raised blood glucose (15%) and blood pressure (42%) were similar to NFHS 5 report in the older age group.[8] The ROC curve showed that CBAC is a valid tool for screening NCDs. A similar validation study done in Himachal Pradesh showed that CBAC has poor sensitivity for screening of diabetes mellitus, with the cut-off of more than four as high risk.[9] The sensitivity analysis showed that if the cut-off score is reduced to equal to or more than 4, sensitivity increases to 98% and NPV to 93%.

Table 2. Comparison of CBAC score and Presence of NCD

CBAC score cut-off>4				CBAC score cut-off ≥4			
Risk Score	NCD Present	NCD Absent	Total	Risk Score	NCD Present	NCD Absent	Total
> 4	48 (62.3)	29 (37.7)	77 (70)	≥ 4	55 (57.9)	40 (42.1)	95 (86.4)
≤ 4	8 (24.2)	25 (75.8)	33 (30)	< 4	1 (6.7)	14 (93.3)	15 (13.6)
Total	56 (50.9)	54 (49.1)	110 (100)	Total	56 (50.9)	54 (49.1)	110 (100)

Table 3. Comparison of CBAC score and Presence of NCD

	CBAC score cut-off>4	CBAC score cut-off ≥4
Sensitivity	85.7 (73.8- 93.6)	98.2 (90.4 - 99.9)
Specificity	46.3 (32.6- 60.4)	25.9 (14.9 - 39.6)
Positive Predictive Value	62.3 (41.2 - 60.6)	57.8 (53.9 - 61.8)
Negative Predictive Value	75.8 (55.8 - 68.4)	93.3 (65.6 - 99.0)
Accuracy	66.4 (56.73- 75.1)	62.7 (52.9 - 71.8)

CONCLUSION

Community-based assessment checklist (CBAC) is a valid tool for NCD screening and high-risk behaviour in the community. However, decreasing the cut-off score to ≥ 4 shall increase the sensitivity and NPV of CBAC.

END NOTE

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