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Prevalence of risk factors of non-communicable diseases among adults in urban slums of Burdwan municipality, West Bengal: A cross sectional study

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Background & objectives: Non communicable diseases (NCD) have emerged as one of the leading causes of mortality and morbidity in India in the past few decades. This study was undertaken to determine the prevalence of NCD risk factors among adults residing in urban slums of West Bengal, India.

Methods: A community based cross-sectional study was conducted among adult population aged 15-69 yr in urban slums of Purba Burdwan district, West Bengal over a period of two months. A total of with 180 study participants selected by simple random sampling. Data were collected using a semi-structured schedule, adopted from the WHO STEPS questionnaire. Analysis was done using Chi-square test and logistic analysis. *P*<0.05 was considered to be significant.

Results: The prevalence of alcohol intake, smoking, inadequate vegetable and fruit intake, reduced physical activity and overweight and/or obesity was 27.8, 15.6 , 93.3 , 32.8 and 15.5 per cent, respectively among the study population. A significant association of smoking was found among males [Adjusted odds ratio (AOR) 2.54 Confidence interval (CI):1.76-6.99], those living in joint families (AOR 1.24 CI:1.17-1.34) and without any formal education (AOR 3.22 CI:1.50-13.87). The odds of alcohol consumption alcohol, were higher among those aged >44 yr (AOR 1.98 CI:1.34-7.22), males (AOR 2.65 CI:1.89-8.76), those who had no formal education (AOR 1.43 CI:1.23-2.77) and those who were employed (AOR 1.34 CI:1.02-4.09). Again respondents aged 45-69 yr (AOR 4.45 CI:1.79-10.99) and married (AOR 3.77 CI:1.76-7.44) were associated with overweight and or/obesity. Furthermore, age AOR 5.04 CI:1.34-17.98) and employment status (AOR 1.78 CI:1.67-3.09) were significantly associated with raised blood pressure in multivariate analysis.

Interpretation & conclusions: The high prevalence of risk factors of NCD in the study population is suggestive of a need for health promotion by creating awareness about the dangers of smoking and alcohol consumption as well as educating the people about the benefits of physical activity and eating a healthy diet.

Key words Alcohol - non communicable disease - risk factors - slums - tobacco - WHO STEPS

Non communicable diseases (NCDs) are defined as diseases which cannot be transmitted directly from one person to another. As of 2019, an estimated 41 million people die from NCDs which is almost equal to 71 per

cent of all death globally. Of these 15 million people who died were aged between 30-69 yr. 17.9 million people die from cardiovascular disease annually, which accounts for most NCD deaths, followed by 9.3 million cancer cases, respiratory diseases with 4.1 million cases, and diabetes with 1.5 million cases. Over 80 per cent of all premature deaths are accounted for by these four disease groups[1].

In the past few decades rapid transition of health has been experienced by India with a surge of NCDs. Surpassing the burden of communicable diseases, NCDs are becoming the primary cause of death and disability adjusted life year (DALY) in India. Approximately one in four Indians face the risk of dying from an NCD before turning 70 yr, contributing to around 61 per cent of all death[2].

There are several risk factors involved in the development of NCDs. World Health Organization (WHO) STEPwise approach to surveillance (STEPS) classified the risk factors into three categories, *i.e.*, behavioural, metabolic and biochemical risk factors[3]. Tobacco use, alcohol consumption, poor diet and physical inactivity constitute the primary risk factors. Metabolic risk factors include diabetes, hypertension, overweight and obesity. Biochemical risk factors include hypercholesterolaemia and hypertriglyceridemia. Various studies have been done using the WHO STEPwise approach, across the globe, including India, which have revealed that the prevalence of NCD risk factors was over 70 per cent in the year 2017[4-7].

Recent studies have shown that urban slums are also undergoing epidemiological transition[8,9]. The urban slums have a heavy burden of risk factors for NCDs like tobacco use, raised blood pressure and obesity. There are issues of overcrowding and poor living conditions, along with limited access to education and healthcare services. In the above context, this study was conducted to estimate the prevalence of NCDs, behavioural risk factors and anthropometrical measurements among the adult population in the slums of Burdwan municipality, Purba Bardhhaman District, West Bengal. Furthermore, we also studied the relationship, if any, between the socio demographic variables and the behavioural risk factors of NCD in the selected study population.

Materials & Methods

This cross-sectional study was undertaken by the department of Community Medicine, Burdwan Medical College, Kolkata, India from June 2022 to August 2022. Ethical clearance was obtained from the Institutional Ethics Committee. Prior to data collection, an informed consent was obtained from each study participant with assurance that confidentiality of given information will be maintained. This observational, cross-sectional study was conducted in slums of Burdwan Municipality, Purba Bardhhaman District, West Bengal among adults aged (18-64 yr) who resided in the study area for at least six months prior to the start of the study. Exclusion criteria were pregnant and lactating mothers, those who were seriously ill and those not willing to give consent.

Sample size: An earlier study conducted among the adult population in an urban slum in Pune[8] revealed the prevalence of tobacco use, alcohol consumption, and physical inactivity to be 22.5 per cent, 11.5 per cent, and 40 per cent, respectively. Drawing upon this study, in order to get an adequate sample size, the lowest prevalence rate, which was for that of alcohol consumption, was taken to calculate the required sample size (formula: $n = Z^2 \times P \times Q/D$ where, n=sample size P=prevalence of alcohol use=11.5%=0.115 Q=1-P=88.5%=0.885 D=absolute precision, taken as 5; Z=Standard normal deviate), taking 95 per cent Confidence Interval (α=0.05), a value of 1.96 the sample size was calculated (n=1.96×1.96×11.5× $88.5/5^2$=156.39≈157). So, taking non response rate of 10 per cent into consideration, the final sample size was =157×100/90=174.44≈175.

Sampling: Study participants were selected by multistage random sampling. Burdwan Municipality had 144 registered slums. By selecting 10 per cent of these slums (10/100 × 144 ≈ 15), 15 slums were chosen through simple random sampling. From each of these 15 slums, 12 adults were selected (175/15 ≈ 12), resulting in a total sample size of 175. Accounting for any unforeseen exigencies, as sample size of 180 was used for the study.

Study tools: Data were collected with a pre-designed, pre-tested schedule adopted from WHO STEPwise approach to non-communicable disease risk factor surveillance (Last update: October 2, 2020)[3]. The standard WHO STEPS questionnaire was translated into Bengali, the local language, and then retranslated into English to ensure semantic equivalence. The Bengali version was used for data collection. In the first Step, behavioural data and demographic information on tobacco consumption tobacco, alcohol, fruits, vegetables, and physical activity were collected. In the second, height, weight, and BP were measured

Table I: Distribution of study population according to their socio demographic profile (n=180)

Variables	n (%)
Age group (yr)	
18-27	41 (22.8)
28-37	40 (22.2)
38-47	51 (28.3)
48-57	18 (10)
58-67	26 (14.4)
>68	4 (2.2)
Gender	
Male	49 (27.2)
Female	131 (72.8)
Religion	
Hindu	179 (99.4)
Muslim	1 (0.6)
Caste	
General	54 (30)
Schedule Caste	61 (33.9)
Schedule Tribe	14 (7.8)
Other Backward Class	51 (28.3)
Type of family	
Nuclear	97 (53.9)
Joint	83 (46.1)
No. of family members	
≤4	100 (55.6)
>4	80 (44.4)
Occupation	
Skilled workers[*]	19 (10.5)
Unskilled workers[**]	34 (18.9)
At home	110 (61.1)
Unemployed	17 (9.4)
Education	
Illiterate/Just literate	83 (46.1)
Primary school completed	24 (13.3)
Middle school completed	47 (26.1)
High school certificate	18 (10)
Intermediate or Diploma	3 (1.7)
Graduation & above	5 (2.8)
Marital status	
Married	169 (93.9)
Unmarried	11 (6.1)
Socio-Economic Status (INR)	
Upper (≥8220)	60 (33.3)

Contd...

Variables	n (%)
Upper middle (4110-8219)	89 (49.4)
Middle (2465-4109)	23 (12.8)
Lower middle (1230-2464)	8 (4.4)
Lower (<1230)	0

[*]Skilled workers-driver, businessman; [**]Unskilled workers-labourer, sweeper, shopkeeper

according to standard operating procedure (SOP)[3,10,11]. Body mass index (BMI) was also calculated.

The operational definitions (as per WHO guidelines of STEPS)[3] for risk factors were as follows: (*i*) current tobacco users: those using smoke or smokeless tobacco in the form of chewing tobacco and smoking cigarettes, bidis, etc in the last thirty days; (*ii*) alcohol consumption: those who consumed any form of alcohol like beer, wine, spirits, whiskey and local alcohols in the last 30 days; (*iii*) The dietary recall method was employed to record the number of days per week, fruits and vegetables were consumed on an average. Intake of less than five servings of fruits and vegetables per week was classified as insufficient fruits and vegetables intake; (*iv*) physical inactivity: low physical activity *i.e.* less than 600 metabolic equivalent (MET minutes) per/week; (*v*) overweight: BMI ≥25 kg/m^2, and *(vi)* obesity: BMI ≥30 kg/m^2 as per Asian classification of BMI[11]

Data collection: Data were collected by interviewing the study participants. A verbal consent from individuals to participate in the study was first taken. Anthropometric measurements were done thereafter.

Data analysis: The data were entered in Microsoft Excel 2016 (Microsoft, Redwoods, WA, USA) data sheet and analysed by using Statistical Package for Social Sciences Inc. (IBM SPSS Statistics 20.0, Windows, 2012, Chicago, IL, USA) software. Data was summarised by calculating percentage frequencies, mean and standard deviation (SD). Bivariate analysis was done using the Chi-square test to identify significant associations between NCD risk factors and other variables at a 95 per cent CI. Independent variables with a *P*<0.2 from the bivariate analysis were then considered for the logistic regression model for multivariate analysis to calculate the adjusted odds ratio. *P* value of <0.05 was considered significant.

Results

Socio demographic characteristics: Table I shows the recorded sociodemographic characteristics. The

Table II: Prevalence of NCD risk factors among the study population (n=180)			
Variables	Characteristics	Category	n (%)
Behavioural risk factors			
Smoking	Currently smoking	Yes	50 (27.8)
		No	130 (72.2)
	Currently chewing tobacco	Yes	44 (24.4)
		No	136 (75.5)
Alcohol consumption (in the past one month)		Yes	28 (15.6)
		No	152 (84.4)
Fruits and/or vegetables intake	No. of servings	<5 servings/day	168 (93.3)
		≥5 servings/day	12 (6.7)
Salt consumption	Amount	≤5 g/day	88 (48.9)
		>5 g/day	92 (51.1)
Physical activity	Level of physical activity	Sufficient (moderate physical activity ≥ 600 MET min/wk)	121 (67.2)
		Insufficient (moderate physical activity < than 150 min/wk)	59 (32.8)
Metabolic risk factors			
Overweight/Obesity	>24.9 kg/m^2	Yes	28 (15.5)
		No	152 (84.5)
Raised blood pressure	≥140 mm of Hg Systolic and/or ≥90 mm of Hg Diastolic or previously diagnosed hypertension	Yes	26 (14.4)
		No	154 (85.6)

mean age of the study population was 41.23±13.44 yr. Among the 180 study participants, 28.3 per cent were in the middle age group (38-47 yr), 72.8 per cent were females and 99.4 per cent were Hindus. Of these, 33.3 per cent Schedule Caste (SC), 30 per cent were general caste, 28.3 per cent were from other backward class (OBC) and remaining were Schedule Tribes (ST). Majority of the study participants (53.9%) belonged to nuclear family and more than half (55.6%) lived in a family having ≤4 members. Majority of the study participants, 46.1 per cent had no formal schooling, 26.1 per cent of them had middle school certificate. Out of all the study subjects 61.1 per cent were 'stay at home' which included homemakers and retired persons. Among those who were working 18.9 per cent were unskilled labourers. Of the total study participants, 78.9 per cent were married. About half (49.4 per cent) of the study population belonged to class II (upper middle) socioeconomic class according to modified BG Prasad scale[12].

Prevalence and determinants of NCD risk factors:
<u>Smoking and alcohol consumption</u>: In this study, the overall prevalence of current tobacco use was 27.8

per cent, and alcohol consumption over the past 30 days was reported by 15.6 per cent of participants (Table II). Both tobacco and alcohol use was found to be higher among males compared to females. It was found that most of the study population started tobacco consumption at an early age. The mean age of starting bidi and cigarette smoking was 20.21±3.74 yr and that of starting smokeless tobacco (khaini & guthkha) was 21.34±2.70 yr. The median (IQR) number of bidis/cigarettes smoked per day was 5 (3-10). Males were found to be 2.54 times more likely to smoke compared to females [Adjusted odds ratio (AOR) 2.54, Confidence interval (CI):1.76-6.99]. Similarly those living in joint families (AOR 1.24 CI:1.17-1.34) and with no formal education (AOR 3.22, CI:1.50-13.87) were also significantly associated with smoking. As far as alcohol consumption was concerned, in bivariate analysis (Table III) the type of family and occupation was found to be significantly associated with it but in multivariate logistic regression, it was seen that respondents aged >44 yr consumed alcohol 1.98 times more than those <44 yr (AOR 1.98 CI:1.34-7.22). Similarly, males consumed alcohol more than females (AOR 2.65, CI:1.89-8.76), those who had no

Table III: Association of NCD risk factors with sociodemographic profile of the study subjects (n=180)						
Variables	Smoking	Alcohol consumption	Insufficient fruits and/or vegetables	Insufficient physical activity	Overweight/ obesity	Raised blood pressure
Age (yr)						
18-44	15	10	36	27	15	10
45-69	35	18	24	32	13	16
P value	0.000*	0.782	0.458	0.345	0.003**	0.001**
Sex						
Male	36	26	37	45	7	12
Female	14	2	23	14	21	14
P value	0.067	0.045	0.087	0.067	0.453	0.227
Marital status						
Married	29	17	35	32	17	20
Unmarried	21	11	25	27	11	6
P value	0.002**	0.676	0.354	0.565	0.645	0.04*
Type of family						
Nuclear	22	19	14	45	13	18
Joint	28	9	46	14	15	8
P value	0.121	0.001**	0.002**	0.231	0.004**	0.007**
Educational status						
Literate	28	14	24	16	15	10
Primary school completed	5	4	14	19	7	5
Middle school completed	6	3	10	12	3	1
High school certificate	7	2	5	6	0	2
Intermediate or Diploma	2	3	5	6	1	4
Graduation & above	2	2	2	0	0	4
P value	0.001**[a]	0.769[a]	0.445[a]	0.098[a]	0.077[a]	0.998[a]
Occupation						
Employed	34	17	23	43	17	11
Unemployed	16	11	37	16	11	15
P value	0.002**	0.005**	0.002**	0.988	0.066	0.013*
P*<0.05, **<0.001. [a]expected cell count <5						

formal education consumed alcohol 1.43 times more than others (AOR 1.43, CI:1.23-2.77) and those who were employed consumed 1.34 times more than those who were unemployed (AOR 1.34, CI:1.02-4.09) (Table IV).

Consumption of fruits and vegetables: It was observed that 93.3 per cent of respondents consumed <5 servings of fruits and vegetables per day, while only 6.7 per cent met the recommended intake of five or more servings daily (Table II). In bivariate analysis, (Table III) type of family and occupation were found to be significantly associated with insufficient intake of fruits and vegetables. But on multivariate logistic regression, it

was seen that males consumed insufficient fruits and vegetables, 1.05 times lesser than females (AOR 1.05 CI:1.02-3.77) and this association was significant. Type of family and occupation was no longer associated with intake of fruits and vegetables (Table IV).

Salt consumption: 51.1 per cent population consumed >5 g of salt per/day.

Physical activity: A total of 67.2 per cent of study participants were engaged in sufficient physical activity (≥600 MET-min per wk) through activities such as commuting to work, cycling, and jogging (Table II). None of the sociodemographic factors were found to

Table IV: Multiple logistic regression to determine the predictors of NCD risk factors (n=180)					
Variables	Smoking	Alcohol consumption	Insufficient fruits and/or vegetables	Overweight/obesity	Raised blood pressure
	Hosmer Lomeshow test=0.32	Hosmer Lomeshow test=0.62	Hosmer Lomeshow test=0.43	Hosmer Lomeshow test=0.23	Hosmer Lomeshow test=0.65
Age (yr)					
18-44	Ref	Ref	Ref	Ref	Ref
45-69	1.78 (0.34-9.56)	1.98 (1.34-7.22)*	0.96 (0.92-1.00)	4.45 (1.79-10.99)*	5.04 (1.34-17.98)*
Sex					
Female	Ref	Ref	Ref	Ref	Ref
Male	2.54 (1.76-6.99)*	2.65 (1.89-8.76)*	1.05 (1.02-3.77)*	1.04 (0.98-5.55)	1.09 (0.34-6.43)
Marital status					
Unmarried	Ref	Ref	Ref	Ref	Ref
Married	1.05 (0.99-5.76)	1.02 (0.98-4.99)	1.06 (0.57-1.99)	3.77 (1.76-7.44)*	1.23 (0.77-5.89)
Type of family					
Nuclear	Ref	Ref	Ref	Ref	Ref
Joint	1.24 (1.17-1.34)*	1.67 (0.88-3.45)	1.98 (0.65-4.56)	0.97 (0.92-1.08)	0.56 (0.45-1.78)
Educational status					
Graduation & above	Ref	Ref	Ref	Ref	Ref
Literate/Just literate	3.22 (1.50-13.87)*	1.43 (1.23-2.77)*	1.01 (0.23-2.22)	0.76 (0.56-3.56)	1.03 (0.66-2.09)
Primary school completed	1.90 (0.26-5.33)	0.98 (0.88– 0.96)	0.34 (0.23-1.09)	1.20 (0.56-3.78)	0.98 (0.56-1.89)
Middle school completed	0.95 (0.22-5.43)	0.67 (0.45-3.99)	1.99 (0.45-2.97)	0.88 (0.76-4.77)	0.99 (0.78-1.09)
High school certificate	1.23 (0.33-7.23)	0.89 (0.45-2.34)	0.76 (0.55-1.96)	0.54 (0.34-5.01)	1.09 (0.67-2.76)
Intermediate or Diploma	0.99 (0.56-3.89)	1.67 (0.45-2.32)	0.56 (0.45-1.77)	1.98 (0.45-2.78)	1.98 (0.67-2.09)
Occupation					
Unemployed	Ref	Ref	Ref	Ref	Ref
Employed	0.98 (0.78-1.67)	1.34 (1.02-4.09)*	0.89 (0.67-1.09)	1.09 (0.02-2.09)	1.78 (1.67-3.09)*
P<0.05. Ref, reference group					

be significantly associated with physical inactivity (Table III and IV).

Overweight and/or obesity: The prevalence of overweight/obesity was observed in 15.5 per cent of the study participants, with a higher rate among females than males (Table II) Bivariate analysis (Table III) revealed that age and family type were significantly associated with overweight and obesity. In multivariate logistic regression, it was seen that the odds of being overweight and/obese was higher (AOR 4.45 CI:1.79-10.99) among those aged 45-69 yr and among married people (AOR 3.77 CI:1.76-7.44) (Table IV).

Raised blood pressure: The prevalence of elevated blood pressure, including individuals on medication, was 14.4 per cent (Table II). As far as raised blood pressure was concerned, participants who were aged 45-69 yr, married, lived in joint families and were employed had high blood pressure compared to their counterparts (Table III). But in multivariable logistic regression, only age (AOR 5.04 CI:1.34-17.98) and employment status (AOR 1.78 CI:1.67-3.09) retained its significance (Table IV).

Discussion

This study conducted in urban slums of Purba Bardhaman aimed to identify the determinants of risk factors of NCD. The findings revealed that some of the NCD risk factors, including smoking, alcohol consumption, low fruit and vegetable intake, and high salt consumption, were common among the participants. The mean age of the study population was 41.23±13.44 yr.

The prevalence of tobacco use in the present study among adults in the slums was found to be 27.8 per cent, which was almost similar to a study conducted in urban slums of Mumbai[13] (27.5% among males) but was higher than studies conducted in Delhi[14] (17% smokers), Kathmandu (22%)[15], Pune[8] (22.5%) and in Punjab (11.3%)[16]. It was lower than those reported in another study conducted in Amarpur Village UP[7]. It was found in this study that males were 2.54 times more likely to be associated with smoking as compared to females. Similarly, those living in joint families and with no formal education were also associated significantly with smoking in this study. This finding was similar to Kathmandu[15] study where males and those with formal education smoked more suggesting that education and health awareness is a must especially in slums.

The prevalence of alcohol use in this study was 15.2 per cent, which is lower than the rates reported in other studies from different regions of India[17]. However, it is similar to the findings from another study conducted in Punjab[16]. In contrast, the observed prevalence is higher than that reported in a study in Pune (11.5%)[8] and Delhi (17%)[14]. In the present study the prevalence of tobacco and alcohol consumption was more among males (73.5% and 53.1%) than in females (10.7% and 1.5%) which was in conformity with different studies[9,13]. This study showed a strong association between alcohol consumption, age, gender, literacy status and occupation. Similarly, studies conducted in Kathmandu[15], Delhi[14] and 2013 STEPS survey in Nepal[17] also found males to have consumed more alcohol than females.

Regarding dietary habits, in this study it was seen that 93.3 per cent of the respondents consumed <5 servings of fruits and/vegetables and only 6.7 per cent consumed recommended five or more servings of fruits and/vegetables per day. In another study conducted in urban slums at Mayapuri, New Delhi, there was moderate intake of fruits and vegetable (78%)[14]. There was no association between sociodemographic variables and dietary habits in studies conducted in Kathmandu[15] and STEPS survey 2013[18] but in the present study males consumed less fruits and vegetables than females. This could be due to certain food fads and to a certain extent cost might be an issue too.

In this study 51.1 per cent of the study population consumed > 5g per day salt which was more than the WHO recommendation. In a study conducted by Garg *et al*[9] in urban Slums of Central Karnataka, 37 per cent of the study participants add salt to the prepared food. Furthermore, in Kathmandu[15] study the prevalence of salt consumption was as high as 92.7 per cent.

In this study the prevalence of low physical activity was 32.8 per cent which was much lower compared to the study conducted in Kathmandu[15] studies conducted in UP[7] and Puducherry[19] showed 37.1 per cent and 45.8 per cent people were physically inactive, respectively. There were no significant predictors for physical activity reported.

In this study the prevalence of hypertension was observed to the 14.4 per cent of the participants. In a study conducted in central Karnataka[9], 19 per cent were diagnosed as hypertensives and Kathmandu[15] study revealed 27.8 per cent. In another study from Kerala, prevalence of raised BP was 30.4 per cent[20]. These studies showed a higher prevalence which could be due to difference in demography, size of study population, and difference in percentage of male and female populations. In the present study, older age and employment status was strongly associated with high blood pressure.

In this study the prevalence of overweight/obesity was found among 15.5 per cent of the participants. In a study at Guntur,[17] this prevalence was 53 per cent [females (63.5%) > males (44.2%)]. A study in Punjab revealed the prevalence of overweight and obesity was 28.6 per cent and 12.8 per cent, respectively[16]. In the present study there was a strong association of overweight and or/obesity with age and type of family. Similarity was found in the study conducted at Kathmandu[15] where strong association was seen with age but in their study marital status and ethnicity were also strongly associated which was not so in this study.

The findings of this study should be interpreted with caution due to limited generalizability, as only fifteen slums were covered. A few behavioural risk factors could have been under reported. Recall bias could be a possibility as behavioural risk factors assessed depended on the participant's ability to recall their health behaviours.

The study revealed that tobacco and alcohol use, unhealthy diets, inadequate physical activity, overweight, and high blood pressure were common NCD risk factors prevalent in the studied slum population. Given this burden, there is an urgent need for community-based interventions at various levels, including health promotion, prevention, early diagnosis, treatment, and rehabilitation. The public

health significance of this study is to promote health by creating awareness about the dangers of smoking and alcohol consumption as well as educating the people about the benefits of physical activity and eating a healthy diet.

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