International Journal of Community Medicine and Public Health
Jain S et al. Int J Community Med Public Health. 2019 Apr;6(4):1565-1572
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20191385

Original Research Article

Prevalence of modifiable risk factors for non-communicable diseases in urban slum: a cross sectional study using WHO STEPS approach

Swati Jain[1]*, Vikas Jain[2], Swapnil Jain[3], Shweta Jain[4]

[1]Department of Community Medicine, [2]Department of Microbiology, RKDF Medical College and RC, Bhopal, Madhya Pradesh, India
[3]Department of Community Dentistry, Peoples University, Bhopal, Madhya Pradesh, India
[4]Department of Biochemistry, Peoples College of Medical Science and RC, Bhopal, Madhya Pradesh, India

Received: 19 January 2019
Accepted: 01 March 2019

***Correspondence:**
Dr. Swati Jain,
E-mail: sjain_4012006@yahoo.co.in

ABSTRACT

Background: Non communicable diseases (NCDs) represent a cluster of major chronic diseases. Smoking habit, alcoholism, low quality diet intakes, physical inactivity are some of the established risk factors of the NCDs. In developing country like India the problem of lifestyle and its consequent diseases needs to be addressed vigorously by all public health care personnel. Objective of the study was to assess prevalence of modifiable risk factors using the WHO STEPS approach in urban slum.
Methods: A community based cross-sectional study was carried out in the field practice area of urban health training centre of the department of community medicine of PCMS and RC, Bhopal using questionnaire.
Results: Highest prevalence of modifiable risk factor was inadequate diet (85.2%), followed by smokeless tobacco consumption (59.1%) and low physical activity (46.1%). Tobacco smoking (31.9%) and alcohol (22.6%) were next, followed by high blood pressure (20.1%). Prevalence of least risk factors was overweight (13.9%).
Conclusions: It can be concluded from our study that the burden of risk factors for NCDs is quite high. Its prevalence even in the younger age groups is a pointer to the fact that the burden of NCDs is going to rise in near future.

Keywords: NCD, Prevalence, Modifiable risk factors, Urban slum, Cross-sectional study

INTRODUCTION

The rising prevalence of non-communicable diseases (NCDs) poses a major clinical, economic, and societal burden around the world. The cost of NCDs care is high and is rising worldwide. For centuries, infectious diseases were the main cause of mortality around the world. NCDs were emerging as major health problem in industrialized countries after the Second World War. By 2020, it is anticipated that NCDs will accounts for 80% of the world-wide burden of diseases.[1]

NCDs refer to diseases or conditions that occur in, or are known to affect, persons over an extensive period of time and for which there are no known causative agents that are transferred from one affected person to another.[2]

With industrial development and increasing level of affluence, the price that the community is paying is a terrific load of "non-communicable diseases", also referred to as "lifestyle diseases". NCDs represent a constellation of major chronic diseases including cardio vascular diseases, diabetes, obesity, stroke, cancers, and chronic obstructive pulmonary disease.[3] The risk factors

for many of these conditions are connected with lifestyle related behaviours, environmental and genomic factors. NCDs are the leading causes of death universally, killing more people each year than all other causes combined.[4] A total of 57 million deaths occurred in the world during 2008, 36 million (63%) were due to NCDs.[5]

In India, NCDs were accountable for 53% of death and 44% of disability adjusted life years lost[6] and are likely to account for an increasing share of diseases load, rising from 43% in 1998 to 73% by 2020.[7] It was expected that in 2005 non communicable diseases responsible for 5.4million(53%) of all deaths in our contry.[8]

The emergence of NCDs as a public health problem in developing countries stems mainly from epidemiological and demographic transition, characterized by a changing pattern of disease from communicable diseases to NCDs, and increased life span and a rise in geriatric population respectively.[9] NCDs are caused, to a large extent, by four behavioural risk factors: tobacco use, unhealthy dietary habits, insufficient physical activity and the harmful use of alcohol.[10]

Rapidly growing burden of NCDs is also driven by the negative effects of urbanization. NCDs are aggravated in urban areas by changes in dietary habits and physical activity, exposure to air pollutants (including tobacco smoke) and harmful use of alcohol.[11]

Identification of risk factors and their quantification is of great importance in order to determine the avoidable burden of NCDs. Therefore it is important to assess the prevalence of risk factors for NCDs in a community. Numerous studies have been conducted all over the world including India for estimation of burden of risk factors for NCDs. No such study has been conducted in our area However, such data are necessary to formulate a plan for the preventive strategy. Therefore the present study has been undertaken to assess prevalence of modifiable risk factors using the WHO STEPS approach in urban field practice area of PCMS and RC, Bhopal.

METHODS

It was community based cross-sectional study conducted in urban slum of the field practice area of urban health training centre (UHTC), Department of Community Medicine People's College of Medical Sciences and Research Centre, Bhopal from July 2012 to Oct 2014. Study population consisted all adult aged 25 year and above belongs from the study area. We included those who were willing to participate in study, all persons, age more than 25 year and above. We excluded the participant's those who were not willing to participate in study, not available for interview on account of absence or door locked, pregnant mothers and Individuals suffering from severe chronic illness requiring bed rest, physical disability and presence of communication barriers and non-co-operative.

Sample size and sampling

The sample size for present study was calculated after conducting a pilot study among 100 individual of urban slum of study area. This pilot study revealed proportion of various modifiable risk factors in study area. Alcohol consumption was the least occurring risk factor in study area which was 24% among study population.

Then final sample size was estimated by taking the prevalence of least occurring modifiable risk factor for non-communicable diseases which was 24% for alcohol consumption. Sample size was calculated by using the formula $n=4pq/l^2$, so the sample size of 1266 came out to be maximum. Thus for this study, a sample of 1270 adults was studied. The urban field practice area of PCMS and RC divided into four sectors. Total sample size is equally drawn from these four sectors and study population will be selected by systematic random sampling method.

Survey instrument

The survey protocol was based on the STEPS approach of WHO.[12] A semi structured questionnaire adopted from WHO STEPS approach will be used for the study of NCD risk factors for step-1 and step-2 only. Because biochemical analysis is expensive and logistically challenging in resource-poor settings, so analysis for step-3 was restricted to only on at high risk subjects (those who have ≥3 modifiable risk factors).

For the purpose of this study, the following operational definitions of the variable were used.[12]

Current daily smokers: currently smoking cigarettes, bidis or hookah daily.

Current daily smokeless tobacco users: Currently using chewable tobacco products such as gutka, khaini or zarda paan daily.

Current alcohol drinkers: Report consuming alcohol within the past 1 year.

Adequate diet: Diet including consumption of 5 servings of 80 grams of fruits and vegetables per day.

Inadequate diet: Diet not including consumption of 5 servings of 80 grams of fruits and vegetables per day.

Standard serving: One standard serving of fruits and vegetables is equivalent to 80 grams, translated into different units of cups depending on type of vegetables and fruits.

Physical inactivity: Less than 10 minutes of activity at a stretch during leisure, work or transport.

Overweight: Body mass index >25 kg/m^2.

Obesity: Body mass index >30 kg/m^2.

Hypertension: Blood pressure>140/90 mmHg or currently on antihypertensive drugs.

Data analysis

All statistical analysis was carried out using SPSS version20 and Appropriate Statistical tools were applied wherever required like test of proportion, Chi-square test etc.

Ethical consideration

Research permission and Ethical approval was obtained from the RAC and institutional ethics committee of PCMS and RC Bhopal respectively.

RESULTS

The total 1270 individuals participated in the study out of which 624 (49.1%) were male and 646 (50.9%) were female. Distribution of study participants as per age, highest education level achieved, type of occupation and socioeconomic class is depicted in Table 1. Prevalence and association of various risk factors in different age-groups and in both the sex is displayed in Table 2 and 3.

People from most economic productive group (36-45 and 46-55 years) were found to have highest prevalence of smoking and alcohol use and this was found significant. There was significant association between increasing age and smokeless tobacco consumption, low physical activity, overweight and hypertension (Table 2).

Smoking, smokeless tobacco and alcohol consumption was more in males than females and it was found to be significant. There was significant difference between male and female participants with regard to consumption of adequate diet (Table 3).

Out of total 405 smokers, 298 (73.5%) were daily smokers whereas 107 (26.5%) of them smoked on irregular basis. The mean age for initiation of smoking among respondents was 19.6 years. Chewing tobacco was (40.8%) most common form of smokeless tobacco consumption followed by khani (28%) and gutkha (27.7%).

Out of 287 alcoholics, maximum participants consumed alcohol occasionally i.e. once a month (53.9%). The mean number of drinks per drinking session was 3.09. Overall 85% study population consumed inadequate diet (less than five serving of fruits and vegetables per day, which was inadequate as per WHO recommended standards).

Table 1: Socio-demographic profile of the study population.

Socio-demographic factors	Male (n=624)	Female (n=646)	Total (n=1270)
	N (%)	N (%)	N (%)
Age (in year)			
25-35	169 (27.1)	161 (24.9)	330 (26.0)
36-45	185 (29.6)	143 (22.1)	328 (25.8)
46-55	110 (17.6%)	86 (13.3)	196 (15.4)
56-65	77 (12.3)	78 (12.1)	155 (12.2)
>65	83 (13.4)	178 (27.6)	261 (20.6)
Education			
Professional	0	0	0
Graduate/post-graduate	30 (4.7)	01 (0.2)	31 (2.4)
Intermediate	25 (4.0)	13 (2)	38 (3.0)
High school	91 (14.6)	54 (8.4)	145 (11.4)
Middle school	157 (25.2)	140 (21.7)	297 (23.4)
Primary school	202 (32.4)	195 (30.2)	397 (31.3)
Illiterate	119	243 (37.6)	362 (28.5)
Occupation			
Professional	0	0	0
Semi-professional	0	0	0
Clerical/shop/farm owner	90 (14.4)	06 (0.9)	96 (7.6)
Skilled worker	99 (15.9)	26 (4.0)	125 (9.8)
Semiskilled worker	77 (12.3)	36 (5.6)	113 (8.9)
Unskilled worker	268 (42.9)	147 (22.8)	415 (32.7)
Unemployed	90 (14.4)	14 (2.2)	102 (8.0)
Homemakers	0	417 (64.6)	419 (33.0)
Socioeconomic status			
Lower	103 (16.5)	150 (23.2)	253 (19.9)
Upper lower	368 (59.0)	417 (64.6)	785 (61.8)
Lower middle	150 (24.0)	77 (11.9)	227 (17.9)
Upper middle	03 (0.5)	02 (0.3)	05 (0.4)
Upper	0	0	0

Table 2: Age wise distribution of modifiable risk factors.

Risk factor		Age category (in years)					Total (n=1270)	X^2 df=4	P value
		25-35 (n=330)	36-45 (n=328)	46-55 (n=196)	56-65 (n=155)	>65 (n=261)			
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		
Smoking	Yes	100 (30.3)	137 (41.8)	82 (41.8)	48 (31)	38 (14.6)	405 (31.9)	60.19	0.000
	No	230 (69.7)	191 (58.2)	114 (58.2)	107 (69)	223 (85.4)	865 (68.1)		
Smokeless tobacco	Yes	119 (36.1)	176 (53.7)	132 (67.3)	120 (77.4)	204 (78.2)	751 (59.1)	142.7	0.000
	No	211 (63.9)	152 (46.3)	64 (32.7)	35 (22.6)	57 (21.8)	519 (40.9)		
Alcohol	Yes	66 (20)	98 (29.9)	60 (30.6)	29 (18.7)	34 (13)	287 (22.6)	33.41	0.000
	No	264 (80)	230 (70.1)	136 (69.4)	126 (81.3)	227 (87)	983 (77.4)		
Low physical activity	Yes	122 (37)	122 (37.2)	35 (17.9)	83 (53.5)	224 (85.8)	586 (46.1)	253.6	0.000
	No	208 (63)	206 (62.8)	161 (82.1)	72 (46.5)	37 (14.2)	684 (53.9)		
Over weight	Yes	16 (4.84)	22 (6.7)	09 (4.6)	36 (23.2)	93 (35.6)	176 (13.9)	165.6	0.000
	No	314 (95.2)	306 (93.3)	187 (95.4)	119 (76.8)	168 (64.4)	1094 (86.1)		
High BP	Yes	8 (2.4)	29 (8.8)	8 (4.1)	55 (35.4)	155 (59.4)	255 (20.1)	395.4	0.000
	No	322 (97.6)	299 (91.2)	188 (95.9)	100 (64.5)	106 (40.6)	1015(79.9)		

Table 3: Sex wise distribution of the modifiable risk factors.

Risk Factor		Gender		Total (n=1270)	χ^2	P value
		Male (n=624)	Female (n=646)			
		N %	N %	N %	df= 1	
Smoking	Yes	403 (64.6)	02 (0.3)	405 (31.9)	603.69	0.000
	No	221 (35.4)	644 (99.7)	865 (68.1)		
Smokeless tobacco	Yes	446 (71.5)	305 (47.2)	751 (59.1)	77.30	0.000
	No	178 (28.5)	341 (52.8)	519 (40.9)		
Alcohol	Yes	248 (45.5)	03 (0.5)	287 (22.6)	368.25	0.000
	No	340 (54.5)	643 (99.5)	983 (77.4)		
Adequate diet	Yes	122 (19.6)	66 (10.2)	188 (14.9)	21.92	0.000
	No	502 (80.4)	580 (89.8)	1082(85.1)		
Low physical activity	Yes	207 (33.2)	379 (58.7)	586(46.1)	83.02	0.000
	No	417 (66.8)	267 (41.3)	684 (53.9)		
Overweight	Yes	14 (2.4)	162 (25.1)	176 (13.9)	138.6	0.000
	No	610 (97.8)	484 (74.9)	1094(86.1)		
High BP	Yes	71 (11.4)	184 (28.5)	255 (20.1)	57.86	0.000
	No	553 (88.6)	462 (71.5)	1015(79.9)		

Table 4: Association between smoking status and various risk factors.

Risk Factor		Smoking		χ2 df=1	P value
		Present (n=405)	Absent (n=865)		
		N (%)	N (%)		
Smokeless tobacco	Yes	315 (77.8)	436 (50.4)	85.53	0.000
	No	90 (22.2)	429 (49.6)		
Alcohol	Yes	206 (50.9)	81 (9.4)	271.6	0.000
	No	199 (49.1)	784 (90.6)		
Low physical activity	Yes	127 (31.4)	459 (53.1)	52.29	0.000
	No	278 (68.6)	406 (46.9)		
Overweight	Yes	14 (4.5)	162 (18.7)	53.89	0.000
	No	391 (96.5)	703 (81.3)		
High BP	Yes	48 (11.9)	207 (23.9)	25.07	0.000
	No	357 (88.1)	658 (76.1)		

Table 5: Association between alcohol consumption and various risk factors.

Risk Factor		Alcohol consumption			
		Present (n=287)	Absent (n=983)	χ^2 df=1	P value
		N (%)	N (%)		
Low physical activity	Yes	100 (34.8)	486 (49.4)	19.04	0.000
	No	187 (65.2)	497 (50.6)		
Overweight	Yes	9 (3.1)	167 (17)	622.6	0.000
	No	278 (96.9)	816 (83)		
High BP	Yes	34 (11.8)	221 (22.5)	409.5	0.000
	No	253 (88.2)	762 (77.5)		

Table 6: Association between low physical activity, overweight and high BP.

Variables		Low physical activity			
		Present (n=586)	Absent (n=684)	χ2 df=1	P value
		N (%)	N (%)		
Overweight	Yes	139 (23.7)	37 (5.4)	88.64	0.000
	No	447 (76.3)	647 (94.6)		
High BP	Yes	363 (61.9)	32 (4.7)	483.0	0.000
	No	223 (38.1)	652 (95.3)		

Mean height of the study participants was 170.48 cm and mean weight was 63.24 kg. The mean BMI was 21.9 kg/m^2. Female had higher BMI as compared to males. The prevalence of overweight (grade I, II and III) among the study population was 13.9% (Figure 1). The prevalence among female respondents was high (25.1%) compare with males (2.2%).

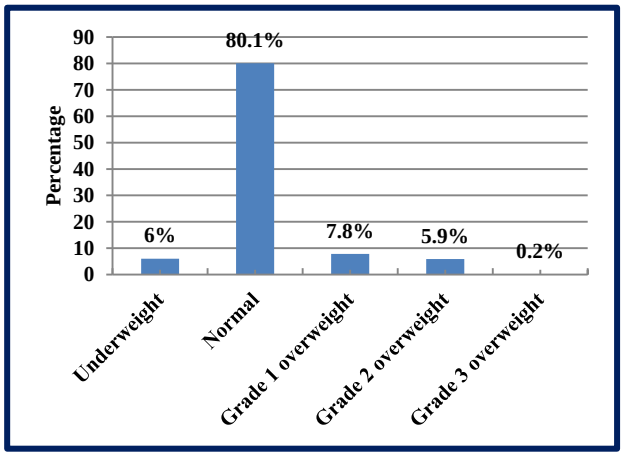

Figure 1: Categorization of BMI in the study population.

In this study we found that mean systolic BP was 121.4 mmHg (118.3 mmHg for male and 124.4 mmHg for females), whereas mean diastolic BP was 79.4 mmHg (77.1 mmHg for males and 81.6 mmHg for females). After measuring the blood pressure, the individuals were classified into various categories like normal, pre hypertensive, stage 1 and 2 hypertension. Figure 2 gives the percentage of respondents according to categories of measured blood pressure. Overall prevalence of HTN (stage 1 and stage 2) among males and females was 11.4% and 28.5% respectively. The prevalence of HTN among female respondents was high compare with male. The prevalence of hypertension was found increasing with age.

Taking smoking as an exposure variable and other NCDs risk factors as outcome, significant association was found between smoking and other risk factors as depicted in Table 4. These observations suggest that smoking, though a risk factor for NCDs is also independently associated with other risk factors.

It can be seen from Table 5 that there was significant association between alcohol consumption and low physical activity, being overweight and high blood pressure.

There was significant association between low physical activity and being overweight and high blood pressure as depicted in Table 6.

It can be seen from Table 7 that there was significant association between diet (adequate/ inadequate) and being overweight. There is high number of overweight individuals who consume inadequate diet i.e, low consumption of fruits and vegetables. There was significant association between inadequate diet and high blood pressure (Table 8).

In this study, respondents were divided in two groups based on risk factors. A study participant declared as high risk if he/she had more than three risk factors. Blood sugar level and serum cholesterol was measured only in high risk individuals. It was found that 243 (19.1%) study participants belong to high risk group. About 15.7%

males and 22.6% females had more than three risk factors hence belongs to high risk group.

Table 7: Association of diet with body mass index.

BMI categories	Diet	
	Adequate (n=188)	Inadequate (n=1082)
	N (%)	N (%)
Underweight	3 (1.6)	73 (6.7)
Normal	159 (84.6)	859 (79.4)
Grade 1 overweight	21 (11.2)	78 (7.2)
Grade 2 overweight	5 (2.7)	70 (7.5)
Grade 3 overweight	0	2 (0.2)
Total	188 (100)	1082 (100)

χ^2=15.53, df=5, P=0.008.

Table 8: Association of diet with measured blood pressure.

Blood pressure categories	Diet	
	Adequate (n=188)	Inadequate (n=1082)
	N (%)	N (%)
Normal	126 (67.1)	694 (64.1)
Pre hypertension	39 (20.7)	156 (14.5)
Stage 1 hypertension	04 (2.1)	60 (5.5)
Stage 1 hypertension	19 (10.1)	172 (15.9)
Total	188 (100)	1082 (100)

χ2 =11.66, df=3, P value = 0.009

Mean fasting blood sugar level in the study population of high risk group was 121.24 mg/dl, with a standard deviation of 35.4. Females had higher mean fasting blood sugar than males.

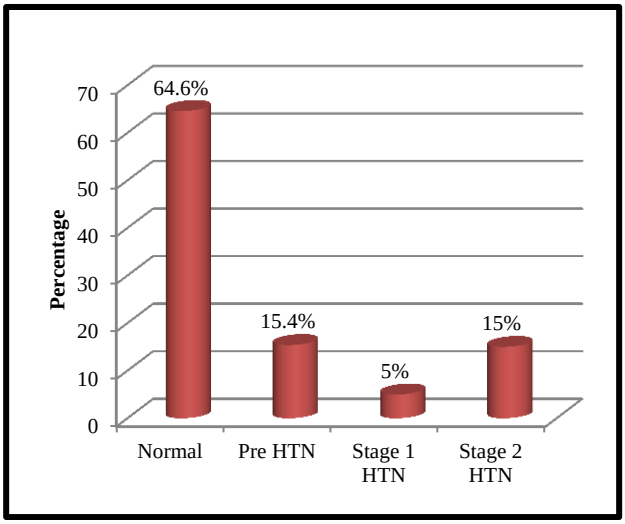

Figure 2: Categorization of measured blood pressure in the study population.

Mean cholesterol level in the study population of high risk group was 156.79 mg/dl, with a standard deviation of 24.08. Females had higher mean cholesterol level than males.

DISCUSSION

This study estimated the prevalence of smoking tobacco in any form to be 31.9% and it was 64.6% in male and 0.3% in female. These figures were in consistency with a study conducted by Garg et al in Delhi, in which prevalence of ever smoking was 31.5% among study participants.[14] Report of the surveillance of risk factors of non-communicable diseases (STEP 1 and 2) from Chennai showed that prevalence of smoking was 55.8% among males and 0.2% among females of urban slum.[15] These figures are close to findings of our study. IDSP non-communicable diseases risk factor survey in Madhya Pradesh had found that about one fifth of respondents (41.2% men and 0.9% women) in Madhya Pradesh were current smoker.[16] These figures are lower than our study (64.6% male and 0.3% females). The difference in prevalence may be due to different study setting area, as this is an urban slum community based field study where smoking is more common. Current smoking was highest in the age group 36-45 and 45-54 years, which is in consonance with IDSP NCDs risk factors survey in Madhya Pradesh.[16]

45.5% male and 0.5% females were current alcohol users in this study, giving a total prevalence of 22.6%. The overall prevalence is similar to that for slums in Kerala i.e, 23.1% (45.4% among men and 1% among women) as brought out by Thankappan et al in their study.[17] IDSP non-communicable diseases risk factor survey in Madhya Pradesh reports that prevalence of alcohol consumption was 32.6% in men and 4.3% in women, giving a total prevalence of 19.1%.[16]

We found a high prevalence (85.2%) of unhealthy dietary habit which was similar to finding of IDSP NCDs risk factor survey in Madhya Pradesh.[16] However Thankappan et al found prevalence of unhealthy dietary habits in 62.9% in urban slum of Kerla.[17] Kerala has better educational status and with a high female literacy level, this may be reason for prevalence of healthy food habits being high in Kerala, than in other Indian studies.

It was found that 33.2% males and 58.7% females fell in to the category of 'low physical activity' in this study, giving a total of 46.1% prevalence of 'low physical activity'. In Madhya Pradesh, IDSP NCDs risk factor survey in Madhya Pradesh reports overall level of low physical activity was 42.3% (33.5% in men and 52.0 % in women).[16] These figures are similar to our study findings. Thankappan observed that 6.9% study population in their study were fallen in to the category of 'low physical activity'.[17] Results varied from our study, may be because of different study settings.

Mean BMI for males and females was 20.79 kg/m^2 and 23.01 kg/m^2, giving the mean BMI of 21.9 kg/m^2 for all

study participants. Similar findings was reported by IDSP non-communicable diseases risk factor survey in Madhya Pradesh in which mean BMI of study population were 20.1 kg/m^2.[16]

The prevalence of overweight (grade I, II, III) among the study population was 13.9%. The prevalence among female respondents was high (25.1%) as compare with males (2.2%). These figures were lower than those of slums elsewhere in the country (16% males and 21.9% females being overweight) and other study carried out by Thankappan in urban slum of Kerala (29.7% males and 41% in females).[17,18] The discrepancies in the prevalence of overweight/obesity between the current study and other studies is due to different socioeconomic conditions and varied geographical backgrounds from different regions of India, while our study focused on a particular urban slum community.

According to IDSP NCDs risk factor survey in Madhya Pradesh the mean systolic and diastolic blood pressure was 126.1 mmHg and 78.1 mmHg respectively.[16] In this survey overall 32.6% respondents were normal, 46.2% were in the category of pre-hypertension, 16.1% in stage 1 hypertension and only 5.0% were in stage 2 hypertension, giving the overall prevalence of HTN was 24%. This is slightly higher than our study (Figure 2).

Not many studies are presently available in the country which has undertaken STEP3 of the WHO instruments that involves biochemical parameters measurements because biochemical analysis is expensive and logistically challenging in resource-poor settings.

CONCLUSION

It can be concluded from our study that the burden of risk factors for non-communicable diseases (NCDs) in the urban field practice areas of PCMS and RC, Bhopal is quite high. Its prevalence even in the younger age groups is a pointer to the fact that the burden of NCDs is going to rise in near future. More efforts need to be put in to increase awareness in the community regarding NCDs.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. World Health organization. The World health report: Today's challenges, 2003. Available at: http://www.who.int/whr/2003/en/. Accessed on 28 December 2018.
2. Daar AS, Singer PA, Persad DL, Pramming SK, Matthews DR, Beaglehole R, et al. Grand challenges in chronic non-communicable diseases. Nature. 2007;22:494-6.
3. Agrawal S. General Principles and Practice of Healthy Lifestyle. Textbook of public health and community medicine. 1st edition: AFMC Pune India; 2008: 1180.
4. World Health Organization. Global status report on Non Communicable Diseases, 2011. Available at: http://www.who.int/nmh/publication/ncd_report2010/en/. Accessed on 28 December 2018.
5. Alwan A, Maclean DR, Riley LM, d'Espaignet ET, Mathers CD, Stevens GA, Bettcher D. Monitoring and surveillance of chronic non communicable diseases; progress and capacity in high-burden countries. Lancet. 2010;376:1861-8.
6. Reddy KS, Shah B, Varghese C, Rmadoss A. Responding to the threat of chronic diseases in India. Lancet. 2005;366:1744-9.
7. WHO. Preventing chronic disease: a vital investment. Geneva: World Health Organization, 2005. Available at: http://www.who.int/chp/chronic_disease_report/contents/foreword.pd. Accessed on 29 December 2018.
8. Ministry of Health, Government of India. Annual Report 2006-07.New Delhi: Ministry of Health and Family Welfare; Govt. of India; 2007.
9. World Health Organization, Regional Office for South-East Asia. Non-communicable Diseases in the South-East Asia Region: Situation and response. Geneva: WHO; 2011.
10. Reddy KS, Yusuf S. Emerging epidemic of cardiovascular disease in developing countries. Circulation. 1998;97:596-601.
11. World Health Organization. Global status report on Non Communicable Diseases, 2010. Available at: http://www.who.int/nmh/publication/ncd_report2010/en/. Accessed on 29 December 2018.
12. World Health Organization. WHO-STEPS instrument. Available at: http://www.who.int/chp/steps/STEPS_Instrument_v2.1.pdf. Accessed on 29 December 2018.
13. Kumar N, Gupta N, Kishore J. Kuppuswamy's socioeconomic scale updating income ranges for the year 2012. Ind J Public Health. 2012;56(1):103-4.
14. Garg A, Singh MM, Gupta VK, Garg S, Daga1 MK, Saha R. Prevalence and correlates of tobacco smoking, awareness of hazards, and quitting behavior among persons aged 30 years or above in a resettlement colony of Delhi, India. Lung India. 2012;29:336-40.
15. WHO India-ICMR, NCD Risk Factor Surveillance 2002-2003. Report of the surveillance of risk factors of non-communicable disease (step 1 and step 2) from Chennai. Geneva: WHO; 2003.
16. Non-Communicable Disease Risk Factors Survey, Madhya Pradesh, 2007-08. National Institute of Medical Statistics and Division of Non-Communicable Diseases, Indian Council of Medical Research, New Delhi, India.
17. Thankappan KR, Shah B, Mathur P, Sharma PS, Srinivas G, Mini GK, et al. Risk factor profile for chronic non-communicable disease: Result of a

community based study in Kerala, India. Indian J Med Res. 2010;131:53-63.
18. Anand K, Shah B, Yadav K, Singh R, Mathur P, Paul E, et al. Are the urban poor vulnerable to non-communicable diseases? A survey of risk factors for non-communicable diseases in urban slums of Faridabad. NMJI. 2007;20(3):115-20.

Cite this article as: Jain S, Jain V, Jain S, Jain S. Prevalence of modifiable risk factors for non-communicable diseases in urban slum: a cross sectional study using WHO STEPS approach. Int J Community Med Public Health 2019;6:1565-72.