ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
Index Copernicus Value: 49. 23
PubMed - National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 4, Issue – 1, February - 2019, Page No. : 67 - 77

Behavioural And Dietary Risk Factors For Non Communicable Diseases In Central India – A Cross Sectional Study.

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Type of Publication: Original Research Paper

Conflicts of Interest: Nil

Abstract

In developing countries an increasing burden of Non-communicable diseases (NCDs) threatens to overwhelm already stretched health services. India being a country of about 1.3 billion population, contributes to more than 2/3rd of the total deaths due to NCDs in the South-East Asia Region (SEAR) of WHO. An essential preventive strategy is targeting the risk factors for non-communicable diseases hence, this study is conducted to find various NCD risk factors such as unhealthy diet, lack of physical activity, use of tobacco and alcohol and to determine the effect of dietary factors and exercise on non-communicable disease and the relation between various addictions and the occurrence of non-communicable disease in central India.

Method: A cross-sectional study was conducted from July to December 2017 using 300 subjects between 18 to 65 years of age visiting OPD of a tertiary care hospital,were enrolled in study using a convinence sampling. Information regarding socio-demographic variables, and behavioural risk factors, i.e. tobacco use, alcohol use, physical inactivity, diet and related factors were collected using a pre tested, structured questionnaire.

Result: Statistically significant association between consumption of fruits and vegetable less than 3 times per week and consumption of high salt containing food and Junk food likely to exhibit NCDs. Consumption of fruits and vegetable more than 3 times per week and regular exercise during leisure time shows protective effect against DM, HTN and IHD. All females had abnormally high waist circumference and differ significantly when compared with males. Presence of NCDs and gender were significantly associated . Males were more likely to have DM and HTN than female.

Conclusion: Dietary habits and behavior of individuals are important factors in the patterns of risk factors for non-communicable diseases. So successful efforts to reduce smoking, alcohol consumption and, more recently, trans-fat and salt consumption should be taken.

Key words: NCDs, Behavioural risk facrors, dietary risk factors.

Introduction

In the 21st century, premature death due to non-communicable diseases (NCDs) continues to be one of the major development challenges. NCDs kill around 15 million of peoples each year between the ages of 30 to 70 years; This burden is rising disproportionately among low-income and lower-middle-income countries[1]. In developing countries an increasing burden of non-communicable diseases (NCDs) threatens to overwhelm already stretched health services[2]. India being a country of about 1.3 billion population, contributes to more than 2/3rd of the total deaths due to NCDs in the South-East Asia Region (SEAR) of WHO[3]. Non-communicable diseases (NCDs), such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases are the leading global cause of death and are responsible for 70% of deaths worldwide. An essential preventive strategy is targeting the risk factors for non-communicable diseases[3].

Various behavioural and biological risk factors are leading cause for NCDs, like use of tobacco and alcohol, physical inactivity, overweight and obesity, increased fat and sodium intake, low fruit and vegetable intake, raised blood pressure (BP), blood glucose and cholesterol levels (WHO, 2013)[4].

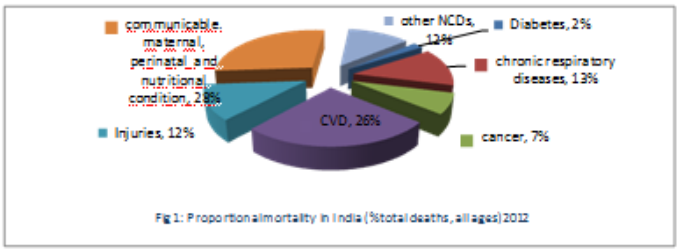

Fig 1 [6]

According to predictions, by 2030 NCDs will account for almost three quarters of all deaths in India[5].Knowing the socio-demographic patterns of non-communicable disease risk factors across India is important not only for predicting the future course of the epidemic and planning relevant policies for prevention and disease control, but may also provide new etiological insights through their juxtaposition to known variations in disease patterns.

Materials & Methods

A cross-sectional study was conducted in 300 subjects between 18 to 65 years of age visiting OPD of a tertiary care hospital from July to December 2017 were enrolled in the study using a convenience sampling.

Sample size - A study conducted by A. Krishnan et.al in Faridabad District of Haryana found the prevalence of alcohol consumption was 24.6%, using this prevalence of alcohol consumption one of important risk factors for NCDs sample size was calculated.

Sample size required for the study was calculated by using following formula,

$$\mathbf{n = Z^2 p (1-p) / (l)^2}$$

n=Sample Size

Z=Confidence level at 95% (Standard value of 1.96)

p= (0.246) Prevalence

l= Absolute error (0.05)

Sample size = 285.

Though the sample size estimated to be 285, we had recruited 300 study subjects for study.

After taking informed consent from all the participants and after explanation of the puepose of the study information was collected regarding socio-demographic variables, and behavioural risk factors, i.e. tobacco use, alcohol use, physical inactivity, diet and related factors in pretested structured questioner.

Study instrument and measures

WHO STEPS Instrument

The World Health Organization (WHO) has recommended surveillance of common risk factors with the "Stepwise" approach, which uses standardized instruments and protocols for collecting, analyzing and monitoring trends for risk factors within and across countries[7]. STEPS includes the following sequential phases:

STEP 1 - Collection of information on socio-demographic variables, and behavioural risk factors, i.e., tobacco use, alcohol use, physical inactivity, diet and related factors using a questionnaire.

STEP 2 - Obtaining clinical measurements such as weight, height, waist circumference, and blood pressure using standardized protocols and instruments.

STEP 3 - Acquiring biochemical measurements such as serum total cholesterol, high density lipoprotein (HDL) cholesterol, blood glucose and triglycerides using fasting blood samples.

We used only step 1 and step 2 component for our study. Some studies conducted in Indonesia[8] and Vietnam[9] did not include the STEP 3 component, which is expensive and logistically difficult to implement in low-resource settings. Questionnaire was suitably modified and translated in local language.

Measurement of height: The study subjects stood erect against the wall on a firm and level surface, with bare feet kept closed to each other, and the heel, calves, buttocks and back of head touching the wall. The study subjects were asked to look straight ahead with both of the eyes at the same level as the ears. A cardboard was placed on the top of the head and reading was taken to the nearest 0.1 centimeter [10].

Measurement of weight: Weight to the nearest 100 gms was recorded with the help of an electronic weighing scale with capacity up to 150 Kg. the scale was placed on a hard, smooth and horizontal surface and the reading corrected to zero before each measurement. The study subjects were asked to stand with bare feet and wearing light clothing and look straight in the horizontal direction for measurement of weight[10].

Calculation of Body Mass Index: It was calculated using weight and height values from the following formula: BMI= Weight (Kg) / [Height (meters)] ^{2}.

Waist circumference was measured in centimeters using a measuring tape[11]. Waist circumference was measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch-resistant tape that provides constant 100 g tension.

Hip circumference was measured around the widest portion of the buttocks, with the tape parallel to the floor.

The **blood pressure** was measured using OMRON digital automatic blood pressure monitor.

Definitions[12]

A. **Current daily smokers** were defined as those who were currently smoking cigarettes, bidis or hookah daily. Current daily smokeless tobacco users were defined as those who were currently using chewable tobacco products, *gutka*, *naswar*, *khaini* or *zarda*, *paan* daily.
B. **Current alcohol drinkers** were defined as those who reported to consuming alcohol within the past one

year. One standard drink was equivalent to consuming one standard bottle of regular beer (285 ml), one single measure of spirits (30 ml) or one medium size glass of wine (120 ml).

C. **One serving of vegetable** was considered to be 1 cup of raw green leafy vegetables, ½ cup of other vegetables (cooked or chopped raw) or ½ cup of vegetable juice.

D. **One serving of fruit was** considered to be 1 medium size piece of apple, banana or orange, ½ cup of chopped, cooked, canned fruit or ½ cup of fruit juice, not artificially flavored.

E. **Physical inactivity** was defined as less than 10 minutes of activity at a stretch, during leisure, work or transport.

F. **Body mass index (BMI**) was calculated by dividing the weight (in kilograms) by the square of height (in meters). Overweight was defined as BMI > 25kg/m² and < 30 kg/m². Obesity was defined as BMI ≥ 30 kg/m².

G. **Waist circumference** >90 cm for males and >80 cm for females was considered an indicator of abdominal obesity.

H. **Hypertension** was defined as BP ≥ 140 systolic and ≥ 90 diastolic mm of Hg or currently on antihypertensive drugs.

Statistical analysis

The data were collected and compiled using EPI info 7.2 and analysis was done using social package for statistical software (SPSS) version 20.00 for window. Chi square test was used to indicate the differences between two proportions. The unadjusted odds ratio was used to define the strength of the association.

Results

Table I describes the distribution of study subject according to socio-demographic characteristics. The majority,(128) 42.7% of study subjects were in 45 to 54 years of age group followed in 35 to 44 years. Mean age was 45.16 ± 8.18 years; minimum age was 20 years and maximum age was 58 years. 220 (73.3%) were males and 156(52.%) were living in urban areas. 41.3 % belonged to class II, socio-demographic class and 26.7% were educated up to senior secondary class.

Table II shows the distribution of study subject according to dietary factors, exercise and presence of NCDs. There is a statistically significant association between consumption of fruits and vegetable less than 3 times per week and presence of DM (p value =0.000002). Study subjects consuming fruits and vegetable less than 3 times per week show 1.45 times more likely to exhibit HTN and 1.63 times more likely to have IHD, but no statistical association was found. Consumption of high salt containing food and Junk food more than 2 times in week has statistically significant association with presence of DM and HTN (p value=0.000002 and p value =0.0000001 respectively). Study subjects consuming high salt containing food more than 2 times in week shows 1.8 times more likely to exhibit IHD. A statistically significant association was found between the presence of DM and HTN and not having regular exercise during leisure time (p value =0.00004 and p value =0.0000001 respectively). Study subjects not regularly exercising shows 1.22 times more likely to exhibit IHD but it is not statistically significant. Consumption of fruits and vegetable more than 3 times per week and regular exercise during leisure time shows protective effect against DM, HTN and IHD. 146 (56.6%) of study subjects

had Consumption of fruits and vegetable less than 3 times a week. 128(42.7%) of study subjects had Consumption of high salt containing food and junk food like *papad, pickles, sauce, packed food,* preserved food etc. 140(46.7%) of study subjec

Table I : Distribution of study subjects according to sociodemographic characteristics.

Socio demographic characteristics	Frequency	Percent
Age group in years		
< 24	6	2.0
25-34	34	11.3
35-44	88	29.3
45-54	128	42.7
55-64	44	14.7
Total	300	100.0
Gender		
Female	80	26.7
Male	220	73.3
Socio-economic status*		
I	50	16.7
II	124	41.3
III	62	20.7
IV	54	18.0
V	10	3.3
Place of residence		
Rural	144	48.0
Urban	156	52.0
Education#		
Illiterate	14	4.7
Primary(I to V)	42	14.0
Upper primary(VI to VIII)	70	23.3
Secondary (IX to X)	50	16.7
Senior secondary (XI to XII)	80	26.7
Undergraduate	24	8.0
Postgraduate and above	20	6.6

*=modified b g Prasad classification used, #=Indian standard education calcification[13]

Table II : Distribution of study subjects according to dietary factors, exercise and presence of NCDs.

Dietary factors and exercise		DM* (n=300)		HTN* (n=300)		IHD* (n=300)	
		Yes No.(%)	No No.(%)	Yes No.(%)	No No.(%)	Yes No.(%)	No No.(%)
Fruits and vegetable consumption /week*	<3 times a week	16(23.5)	114(49.1)	86(45.7)	44(39.3)	8(40.0)	122(43.6)
	>3 times a week	46(67.6)	68(29.3)	80(42.6)	34(30.4)	8(40.0)	106(37.9)
	Almost daily	6(8.8)	34(14.7)	10(5.3)	30(26.8)	0.0	40(14.3)
	No	0	16(6.9)	12(6.4)	4(3.6)	4(20.0)	12(4.3)
High salt containing food *	> 2 times a week	56(82.3)	116(50.0)	172(91.5)	0.0	14(70.0)	158(56.5)
	< 2 times a week	8(11.8)	82(35.3)	12(6.4)	78(69.6)	4(20.0)	86(30.7)
	No	4(5.9)	34(14.7)	4(2.1)	34(30.4)	2(10.0)	36(12.9)
Junk food*	> 2 times a week	56(82.3)	116(50.0	172(91.5)	0.0	14(70.0)	158(56.5)
	< 2 times a week	8(11.8)	82(35.3)	12(6.4)	78(69.6)	4(20.0)	86(30.7)
	No	4(5.9)	34(14.7)	4(2.1)	34(30.4)	2(10.0)	36(12.9)
Exercise regularly in leisure time*	almost daily	24(35.3)	92(39.7)	88(46.8)	28(25.0)	8(40.0)	108(38.6)
	=3times/week	28(41.2)	20(8.6)	44(23.4)	4(3.6)	2(10.0)	46(16.4)
	No	16(23.5)	120(51.7)	56(29.8)	80(71.4)	10(50.0)	126(45.0)

* Chi-square test applied, DF = 1

were sedentary at work and during leisure time they were engaged in light activities like watching TV, reading books/newspaper, etc. We found, the statistically significant association between gender and waist circumference (p value = 0.0000001). All females and 162 (73.6%) of males had abnormally high waist circumference. 64 (80.00%) females and 188(85.4%) males had a high waist hip ratio. 40 (50%) females and 102 (46.4%) males were pre-obese.

32 (40.0%) of females and 32(14.5%) of males were obese and 46(20.9%) of males were overweight.

Table III shows the association of addiction with the presence of NCDs (DM, HTN and IHD). There was a significant association between alcohol intake and smoking with the presence of DM (p= 0.0000016 and p = 0.005 respectively) with an odds ratio of 3.354(1.905 to 5.925) and 2.15(1.243 – 3.719) respectively.

Study subjects consuming alcohol had 1.19 times more likely to exhibit HTN, but no statistical association was found. Smoking shows statistical significant association with HTN) with an odds ratio of 3.354 (1.905 to 5.925).

Table III : The association of addiction with presence of NCDs (DM, HTN and IHD).

Addiction		DM		P value	Odds ratio (95% Confidence Interval)
		Yes No.(%)	No No.(%)		
Alcohol	Yes	44(64.7)	82(35.3)	0.0000016*	3.354(1.905 – 5.925)
	No	24(35.3)	150(64.7)		
Tobacco	Yes	34(50.0)	96(41.4)	0.20	1.417(0.823 – 2.43)
	No	34(50.0)	136(58.6)		
Smoking	Yes	38(55.9)	86(37.1)	0.005*	2.15(1.243 – 3.719)
	No	30(44.1)	146(62.9)		
Addiction		HTN			
		Yes No.(%)	No No.(%)		
Alcohol	Yes	82(43.6)	44(39.3)	0.46	1.196(0.74 – 1.92)
	No	106(56.4)	68(60.7)		
Tobacco	Yes	76(40.4)	54(48.2)	0.18	0.72(0.45 – 1.16)
	No	112(59.6)	58(51.8)		
Smoking	Yes	66(35.1)	58(51.8)	0.004*	0.50(0.312 – 0.811)
	No	122(64.9)	54(48.2)		
Addiction		IHD			
		Yes No.(%)	No No.(%)		
Alcohol	Yes	4(20.0)	122(43.6)	0.03*	0.323(0.105 – 0.99)
	No	16(80.0)	158(56.4)		
Tobacco	Yes	6(30.0)	62(44.3)	0.88	1.078(0.396 – 2.933)
	No	14(70.0)	156(55.7)		
Smoking	Yes	4(20.0)	120(42.9)	0.044*	0.33(0.108 – 1.022)
	No	16(80.0)	160(57.1)		

Chi-square test applied, DF = 1, * = significant

There was a significant association between alcohol intake and smoking with the presence of IHD (p= 0.03 and p = 0.044 respectively), study subjects having an addiction of tobacco shows 1.19 times more likely to exhibit IHD, but no statistical association was found.

126 (42%), 124 (41.3%) and 130 (43.3%) study subjects had an addiction of alcohol, smoking and tobacco consumption respectively. Almost equal proportion of study subjects had an addiction from urban and rural area, but the addiction was not statistically associated with area of residence.

Table III : The association of addiction with presence of NCDs (DM, HTN and IHD).					
Addiction		DM		P value	Odds ratio (95% Confidence Interval)
		Yes No.(%)	No No.(%)		
Alcohol	Yes	44(64.7)	82(35.3)	0.0000016*	3.354(1.905 – 5.925)
	No	24(35.3)	150(64.7)		
Tobacco	Yes	34(50.0)	96(41.4)	0.20	1.417(0.823 – 2.43)
	No	34(50.0)	136(58.6)		
Smoking	Yes	38(55.9)	86(37.1)	0.005*	2.15(1.243 – 3.719)
	No	30(44.1)	146(62.9)		
Addiction		HTN			
		Yes No.(%)	No No.(%)		
Alcohol	Yes	82(43.6)	44(39.3)	0.46	1.196(0.74 – 1.92)
	No	106(56.4)	68(60.7)		
Tobacco	Yes	76(40.4)	54(48.2)	0.18	0.72(0.45 – 1.16)
	No	112(59.6)	58(51.8)		
Smoking	Yes	66(35.1)	58(51.8)	0.004*	0.50(0.312 – 0.811)
	No	122(64.9)	54(48.2)		
Addiction		IHD			
		Yes No.(%)	No No.(%)		
Alcohol	Yes	4(20.0)	122(43.6)	0.03*	0.323(0.105 – 0.99)
	No	16(80.0)	158(56.4)		
Tobacco	Yes	6(30.0)	62(44.3)	0.88	1.078(0.396 – 2.933)
	No	14(70.0)	156(55.7)		
Smoking	Yes	4(20.0)	120(42.9)	0.044*	0.33(0.108 – 1.022)
	No	16(80.0)	160(57.1)		
Chi-square test applied, DF = 1, * = significant					

Table IV shows the association of gender with the presence of NCDs (DM, HTN and IHD). There was a significant association between gender and presence of NCDs. Males were 7.75(2.73 – 22.2) times more likely to exhibit DM and 9.69(5.35 – 17.55) times more likely to have HTN as compared to females.

Table IV : The association of gender with presence of NCDs (DM, HTN and IHD).

NCDs		Gender		P value	Odds ratio (95% Confidence Interval)
		Male No.(%)	Female No.(%)		
DM*	Yes	64(29.1)	4(5.0)	0.00002#	7.75(2.73 – 22.2)
	No	156(70.9)	76(95.0)		
HTN*	Yes	168(76.4)	20(25.0)	0.0000001	9.69(5.35 – 17.55)
	No	52(23.6)	60(75.0)		
IHD*	Yes	20(9.1)	0(0.0)	0.003@	
	No	200(90.9)	80(100.0)		

- Yates correction, @ - fisher exact

Discussion

India has a higher number of people with diabetes than any other country in the world. Projections for 2020, based on modelled estimates by WHO, show a marked escalation of diabetes related burden in South Asia. The number of people with diabetes is expected to rise by 195% in India during 1995-2025 to reach 57.2 million in 2025 [14]. We found 146 (56.6%) of study subjects had consumption of fruits and vegetable less than 3 times a week and 128(42.7%) of study subjects had consumption of high salt containing food and junk food. Pitchai P et al [2] also found, 76% of the subjects had low daily intakes of vegetables and fruits. Bhagyalaxmi A et al [15] found significantly low intake of fruits and vegetables. Srivastav et al[16] also found low consumption of fruits and vegetable in 89.6% of males and 90.0% of females. Consumption of fruits and vegetable less than 3 times per week significantly increases the risk of DM and it also increase the chance of having HTN and IHD. 46.7% of study subjects were sedentary at work and during leisure time they were engaged in light activities like watching TV, reading books/newspaper, etc. Pitchai P et al [2] found 86.8% of subjects were sedentary at work, but Thankappan et al [17] found only 6.8% physical inactive subjects**.** Srivastav et al[16] also found the prevalence of sedentary lifestyle was 9.6% in men and 19.0% in women.

All females and 162 (73.6%) of males had abnormally high waist circumference. 64 (80%) females and 188(85.4%) males had high waist hip ratio. 40 (50%) females and 102(46.4%) males were pre-obese. 32 (40.0%) of females and 32(14.5%) of males were obese and 46(20.9%) of males were overweight in our study. Pitchai P et al [2] and Bhagyalaxmi A et al[15] observed high prevalence of overweight and obesity in all age-groups. Minh HV et al [9] observed the prevalence of

overweight was only 3.0% among men and 4.0% among women, very low than our finding. We found, statistical significant association between gender and waist circumference. Bhagyalaxmi A et al[15] found women had significantly higher prevalence of central obesity compared to men.Thankappan et al [17] found overweight and abdominal obesity were associated with higher odds of presence of risk factors.

In our study 126(42%), 124(41.3%) and 130(43.3%) study subjects had an addiction of alcohol, smoking and tobacco consumption respectively. Here we have included current daily smokers and those who consumed tobacco in the past 12 months in any form like , *gutka, kharra, naswar, khaini or zarda paan etc*. Pitchai P et al [2] found 34.8% consumed smoked tobacco and 18.2% consumed smokeless tobacco, also Mehan et al [18] reported 22.3% of study subjects had tobacco in any form. The participants in our study were found to be consuming more of smokeless tobacco which is in contrast with Pitchai P et al and Mehan et al. Pitchai P et al reported 30.64% male participants consumed alcohol and study by Mehan et al found only 5% of the study subjects had the habit of alcohol consumption this may because, study was conducted in Baroda, Gujarat where alcohol is ban. While in our study 126 (42%) of study subjects had alcohol intake. A study by Minh HV et al [9] found 63% of men were smokers which was higher than our finding, also found significant association between hypertension and smoking. Thankappan et al [17] observed alcohol intake was associated with higher odds of hypertension. We also found a significant association in study subjects consuming alcohol and smoking with presence of DM. Alcohol consumption and smoking also increases the risk of hypertension and IHD.

Conclusion

The behaviors of individuals are important factors in the patterns of risk factors for non-communicable diseases. Consumption of fruits and vegetable more than 3 times per week and regular exercise during leisure time shows protective effect against DM, HTN and IHD. All females had abnormally high waist circumference and differ significantly when compared with males. Alcohol intake, smoking and tobacco consumption likely to exhibit NCDs. Presence of NCDs and gender were significantly associated. Males were more likely to have DM and HTN than female.

Recommendation

Study findings highlight the need for monitoring of risk factors and introduction of preventive and control measures. Successful efforts to reduce smoking, tobacco, alcohol consumption and more recently, trans-fat and salt consumption should be taken. There is also a need for bold and creative policies that address harmful alcohol consumption, improve diet, encourage consumption of fruits and vegetables and increase physical activity.

Acknowledgements

The authors gratefully acknowledge the participants and faculties at Department of Community Medicine, IGGMC, Nagpur for assistance and support.

Funding: No funding sources.

Conflict of interest: None declared.

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