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Original Research Article

SCREENING FOR HYPERTENSION AND DIABETES MELLITUS AND ASSESSMENT OF RISK FACTORS FOR NON- COMMUNICABLE DISEASES AMONGST ADULTS RESIDING IN RURAL AREAS OF JAIPUR: A COMMUNITY BASED CROSS SECTIONAL STUDY

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Abstract

Background: Every year approximately three fourths of all deaths are due to Non Communicable diseases and amount to 41 million people globally, of which 15 million die between the ages 30- 69 years, and a majority of these "premature" deaths occur in low and middle income countries

Objectives: The objectives of the study were to assess the risk factors for NCDs amongst the adult population aged 30 years and above using the WHO STEPS approach, to estimate the prevalence of Hypertension and Diabetes in adult population residing in the rural areas of Jaipur, to assess the validity of IDRS as a screening tool for Type 2DM and to determine the association of between the socio- demographic factors and risk of development of Diabetes and Hypertension.

Methods: A community based cross sectional study was conducted in the rural field practice area of JNUIMSRC, Rajasthan using the WHO STEPS Approach and MDRF- IDRS. Study population comprised of 395 adults which were selected by systematic random sampling. The data was collected using a predesigned pretested structured interview schedule and data was analyzed using Jamovi software 2.4.1. $p<0.05$ was considered as statistically significant.

Results: The prevalence of hypertension and diabetes was found to be 21.51% and 12.15% respectively. Increasing age, sedentary lifestyle and obesity, positive family history, smoking and alcohol consumption were significantly associated with the development of diabetes. Majority of the individuals belonging to the high risk group (IDRS>50) were found to be diabetic and the association was statistically significant ($p<0.001$). Salt intake (>5 grams/day) was significantly associated with the development of Hypertension ($p<0.001$).

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Conclusion: The present study demonstrates that the burden of NCD risk factors in the population residing in the rural field practice areas of JNUIMSRC is quite high. It is showing the growing trend of NCDs among the population residing in the rural areas, thus making it necessary to promote lifestyle modification by creating awareness regarding Type 2 DM and Hypertension in the community in order to reduce the consequent growing burden of NCDs in the society.

Keywords: Indian Diabetic Risk Score (IDRS), WHO- STEPS Approach, Non- communicable diseases (NCDs).

INTRODUCTION

Every year approximately three fourths of all deaths are due to Non Communicable diseases and amount to 41 million people globally, of which 15 million die between the ages 30- 69 years. Also a majority of "premature" deaths due to NCDs occur in low and middle income countries [1] NCDs especially cardiovascular diseases, diabetes mellitus and stroke have emerged as a major public health problem in India. The morbidity and mortality in most productive phase of life is posing serious challenges to Indian society and economy.[2] NCDs have common risk factors such as use of tobacco, unhealthy diet, lack of physical activity and excess adiposity.[3] The WHO's approach to surveillance of NCD risk factors (STEPS) is a part of a global surveillance strategy in response to the growing need for country level trends in non communicable diseases. By using the same standardized protocols, all countries can use STEPS information not only for monitoring within country trends but also for making between country comparisons. It focuses on a minimum number of risk factors that predict the major non communicable diseases which can be used in planning for disease prevention through population level risk factor reduction.[4,5] This approach can thus be used for planning strategies for disease prevention by reduction of risk factors in the population. The International Diabetic Federation says that about 66% of Indians are unaware of their diabetic status as compared to 50% in Europe and 33% in USA[6]. This shows a need to devise effective strategies of screening to unmask the hidden burden of the disease. Thus, Indian Diabetic Risk Score (IDRS) was developed by V Mohan et al. A study called Chennai Urban Rural Epidemiological Study (CURES) at the Madras Diabetes Research Foundation (MDRF) assigned a score of above 60 to a sensitivity of 72.5% and a specificity of 60.1% for detecting the high risk of developing diabetes in an undiagnosed individual with a positive predictive value of 95.1% and accuracy of 61.3%. The advantages of IDRS are its simplicity, cost effectiveness and it was developed as a high risk assessment tool for screening purposes among Indians.[7]

The Indian Diabetic Risk Score (IDRS) developed based on multiple logistic regression analysis derived from CURES is as follows[8]:

S.No	Parameters		Score
1.	Age group	<35 years	0
		35- 49 years	20
		>49 years	30
2.	Abdominal Obesity	Waist <80cm (female), <90cm (male)	0
		Waist >80- 89cm (female), >90-99cm (male)	10
		Waist> 90cm (female), >100cm (male)	20
3.	Physical Activity	Exercise (Regular)+ Strenous work	0

		Exercise (Regular) or Strenous work	20
		No exercise and sedentary work	30
4.	Family History	Nil	0
		Father or mother	10
		Both	20
Minimum Score			**0**
Maximum Score			**100**

Many research studies have been done for assessment of risk factors for non communicable diseases amongst adults residing in the urban areas. Hypertension and diabetes represent the submerged portion of the iceberg and constitute major public health problem Screening helps in early diagnosis and treatment of these conditions. So the present study was conducted in rural catchment areas with the following objectives-

OBJECTIVES

i.) To assess the risk of development of NCDs amongst the adult population aged 30 years and above using the WHO STEPS approach.
ii.) To estimate the magnitude of undiagnosed Hypertension and Diabetes in adult population residing in the rural areas of Jaipur
iii.) To assess the validity of IDRS as a screening tool for Type 2 DM.
iv.) To determine the association between the socio- demographic and behavioural factors with the risk of development of Diabetes and Hypertension.

MATERIALS AND METHODS

Study Design: Community based cross sectional study

Study Area: Rural field practice area of JNUIMSRC

Study Period: January 2023- July 2023

Study Population: All persons aged 30 years and above residing in the rural field practice area of JNUIMSRC

Unit of Study: A person aged 30 years and above residing in the rural field practice area of JNUIMSRC and fulfilling the selection criteria of the study.

Inclusion criteria:

i.) All males and females aged 30 years and above.
ii.) Those willing to give consent to participate in the study.
iii.) Those who are permanent residents of the study area.

Exclusion criteria:

i.) Known cases of Type 2 DM and Hypertension.
ii.) Pregnant and lactating females.
iii.) Those individuals whose age is less than 30 years

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Sample size:

Sample size is calculated by the following formula:

$n= Z^2PQ/L^2$

Where n= sample size

Z= statistic at α level significance, that is 1.96

P= prevalence of undiagnosed Type II DM in India which is 57% (as per NFHS-5 survey)

Q= 100-P, when calculated accounts to 43

L= allowable error

By taking the absolute error as 5%, sample size was calculated to be 377.

By adding 10% non response rate, the total sample size was 418 but only 395 participants actually responded to participate in the study.

Sampling Technique: Systematic random sampling

Data collection: Pre designed, pre tested interview schedule

Data Analysis: Jamovi software 2.4.1

METHODOLOGY A community based cross sectional study was conducted in the field practice area of JNUIMSRC from January 2023- July 2023.

The rural field practice area comprises of 4 villages namely Sankh, Sindoli, Rooppura and Bishansinghpura. The RHTC of JNUIMSRC caters to a population of 5893. There are a total of 2505 persons aged 30 years and above residing in the catchment areas of RHTC. There are 1297 houses in the catchment areas having persons aged 30 years and above.

A list of all houses having persons aged 30 years and above was prepared. The houses were numbered. Systematic random sampling was used for selection of households. The sampling interval was 6. First house was selected randomly and thereafter every 6^{th} house was selected. After adding 10% non response rate, the total sample size was 418 but only 395 participants actually responded to participate in the study.

A pilot study was conducted on 10% of original sample size i.e on 38 persons aged 30 years and above to check the feasibility of study and necessary changes in the interview schedule were made accordingly and those 38 persons were not included in the study.

Data collection was started after obtaining clearance from the Institutional Ethics Committee (IEC). The study participants were interviewed after obtaining written informed consent from them.

Prior information regarding diabetes screening was provided in the study area.

Data Collection: The **STEPwise approach** to NCD risk factor surveillance includes the following 3 steps

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STEP 1 (Interview of study participants): Demographic data including their name, age, sex, residential address, education, social class, occupation, type of family, marital status, diet preferences, addiction to smoking, alcohol, drugs and family history of DM and HTN was collected.

Based on smoking, the study participants were classified as Current Smokers and Non-Smokers. Current smoker refers to a person who has smoked more than 100 cigarettes in their lifetime and has smoked in the last 28 days and ex- smoker refers to a person who has smoked more than 100 cigarettes in their lifetime but has not smoked in the last 28 days. Based on alcohol intake, the study participants were classified as "Teetotaller", "Takes alcohol occasionally" (<3 days per week) and "Takes alcohol on most days" (>3 days per week).[9]

Intake of less than 5 grams of iodized salt (equivalent to one teaspoon per day) was labelled as low salt intake.[10]

Socio economic status was calculated by using B.G Prasad scale of socio economic classification in rural areas based on per capita income per month in INR.[11]

STEP 2 (Physical measurements): Anthropometric measurements such as weight, height, waist circumference were taken by trained interns as per the guidelines of World Health Organization (WHO). Weight was measured on individuals without shoes, with the subject stationary on the weighing scale and weight equally distributed on each leg. Height was measured without shoes and the subject was made to stand in erect position against vertical surface with the head so positioned that the top of the external auditory meatus was at a level with the inferior margin of the bony orbit. BMI was calculated by dividing weight in (kg) by the square of height (in meters) and the study subjects were classified as normal, overweight, pre obese and obese as per their BMI. WHO criteria of BMI for Asians was used for classification. Individuals with BMI <18.5 were classified as Underweight, BMI between 18.5 to 22.9 was classified as Normal, BMI between 23- 24.99 was classified as Overweight and BMI> 25 was classified as Obese.[12]

A standard tape was used for measuring the waist circumference (in cm) of the study subjects at a point midway between the lower margin of rib and the iliac crest. Waist circumference greater than or equal to 80 cm in females and 90 cm in males was taken as a cut off for Central Obesity.

Blood pressure of the study subjects was measured with Standard Sphygmomanometer in right arm in sitting position as per the guidelines of WHO.[13] Hypertension was diagnosed if blood pressure of the individual was more than 140/90 mmHg as per JNC VII Criteria.

STEP 3 (Biochemical measurements): The study subjects were instructed to be on an overnight fasting of minimum 8 hours. Fasting Blood Glucose levels were measured using glucometer. All those who had a fasting blood glucose of more than 110 mg/dl and less than 126 mg/dl were labelled as having impaired fasting glucose and individuals having fasting blood glucose of more than or equal to 126mg/dl were labelled as diabetics.[14]

IDRS tool comprises of 2 modifiable and 2 non modifiable risk factors. Data for IDRS i.e Age, Family History of Type II DM, Abdominal obesity, Physical activity was collected. Study subjects with IDRS <30 were categorized as low risk, 30- 50 as medium risk and more than or equal to 50 as high risk.[8]

Data was collected by using pre designed and pre tested interview schedule and entered in Microsoft Excel and analyzed by using Jamovi software 2.4.1

OBSERVATIONS & RESULTS

Table No. 1: Gender wise distribution of NCD risk factors

Risk factors		Gender			Chi-square value	p value
		Males (N= 245)	Females (N= 150)	Total (N= 395)		
		N (%)	N (%)	N (%)		
Smoking status	Current smoker	96 (39.2)	34 (22.7)	130 (32.9)	13.1	0.001
	Ex- smoker	17 (6.9)	08 (5.3)	25 (6.3)		
	Non smoker	132 (53.9)	108 (72)	240 (60.8)		
Alcohol consumption	Most days (>3 days/ week)	52 (21.2)	10 (6.7)	62 (15.7)	27.2	<0.001
	Occasional (<3 days/ week)	48 (19.6)	14 (9.3)	62 (15.7)		
	Teetotaller	145 (59.2)	126 (84.0)	271 (68.6)		
Tobacco consumption	Yes	112 (45.7)	39 (26.0)	151 (38.2)	15.3	<0.001
	No	133 (54.3)	111 (74.0)	244 (61.8)		
Diet preferences	Non vegetarian	86 (35.1)	39 (26.0)	125 (31.6)	3.56	0.059
	Vegetarian	159 (64.9)	111 (74.0)	244 (61.8)		
Salt intake	More than 5 grams /day	101 (41.2)	60 (40.0)	161 (40.8)	0.0578	0.810
	Less than 5 grams/ day	144 (58.8)	90 (60.0)	234 (59.2)		
BMI	Obese	89 (36.3)	43 (28.7)	132 (33.4)	4.55	0.208
	Overweight	49 (20.0)	25 (16.7)	74 (18.7)		
	Normal	84 (34.3)	65 (43.3)	149 (37.7)		
	Underweight	23 (9.4)	17 (11.3)	40 (10.1)		
Type of worker	Sedentary worker	62 (25.3)	41 (27.3)	103 (26.1)	0.812	0.666
	Moderate worker	157 (64.1)	97 (64.7)	254 (64.3)		
	Heavy worker	26 (10.6)	12 (8.0)	38 (9.6)		

Regular exercise	No	130 (53.1)	92 (61.3)	222 (56.2)		0.108
	Yes	115 (46.9)	58 (38.7)	173 (43.8)		

Table No. 1 shows the gender wise distribution of NCD risk factors. The total number of individuals who participated in the study was 395 out of which 245 (64.3%) were males and 150 (37.97%) were females. It was observed that prevalence of alcohol consumption and tobacco consumption was higher among the males as compared to females and the difference was found to be highly significant ($p<0.001$). Current smokers were 39.2% among the males and 22.7% among the females. So majorly, it was a non smoking population and the difference was significant ($p<0.05$) No significant difference between males and females was observed with regard to diet preferences, salt intake, BMI, type of worker and regular exercise.

Table No. 2: Age wise distribution of NCD risk factors

Risk factors		**Age (in years)**				**Chi-square value**	**p value**
		30- 35 years *(N= 183)*	**35- 49 years *(N= 129)***	**More than 49 years *(N= 83)***	**Total *(N= 395)***		
		N (%)	**N (%)**	**N (%)**	**N (%)**		
Smoking status	Current smoker	41 (22.4)	43 (33.3)	46 (55.4)	130 (32.9)	33.4	<0.001
	Ex- smoker	08 (4.4)	11 (8.5)	06 (7.2)	25 (6.3)		
	Non smoker	134 (73.2)	75 (58.1)	31 (37.3)	240 (68.6)		
Alcohol consumption	Most days (>3 days/ week)	19 (10.4)	22 (17.1)	21 (25.3)	62 (15.7)	10.4	0.034
	Occasional (<3 days/ week)	28 (15.3)	21 (16.3)	13 (15.7)	62 (15.7)		
	Teetotaller	136 (74.3)	86 (66.7)	49 (59.0)	271 (68.6)		
Tobacco consumption	Yes	48 (26.2)	52 (40.3)	51 (61.4)	151 (38.2)	30.3	<0.001
	No	135 (73.8)	77 (59.7)	32 (38.6)	244 (61.8)		
Diet preferences	Non-vegetarian	47 (25.7)	43 (33.3)	35 (42.2)	125 (31.6)	7.43	0.024
	Vegetarian	136 (74.3)	86 (66.7)	48 (57.8)	270 (68.4)		

Salt intake	More than 5 grams /day	62 (33.9)	57 (44.2)	42 (50.6)	161 (40.8)	7.54	0.023
	Less than 5 grams/ day	121 (66.1)	72 (55.8)	41 (49.4)	234 (59.2)		
BMI	Obese	46 (25.1)	49 (38.0)	37 (44.6)	132 (33.4)	17.5	0.008
	Overweight	35 (19.1)	26 (20.2)	13 (15.7)	74 (18.7)		
	Normal	83 (45.4)	45 (34.9)	21 (25.3)	149 (37.7)		
	Underweight	19 (10.4)	9 (7.0)	(14.5)	40 (10.1)		
Type of worker	Sedentary worker	42 (23)	24 (18.6)	37 (44.6)	103 (26.1)	25.1	<0.001
	Moderate worker	128 (69.9)	85 (65.9)	41 (49.4)	254 (64.3)		
	Heavy worker	13 (7.1)	20 (15.5)	5 (6.0)	38 (9.6)		
Regular exercise	No	82 (44.8)	75 (58.1)	65 (78.3)	222 (56.2)	26.3	<0.001
	Yes	101 (55.2)	54 (41.9)	18 (21.7)	173 (43.8)		

Table No. 2 shows age wise distribution of NCD risk factors. It was observed that out of 395 study participants, 183 (46.32%) belonged to the age group of 30- 34 years, 129 (32.65%) were in the age group of 35- 49 years and 83 (21.01%) study participants were above 49 years old. Out of the total 395 participants, 130 (32.9%) were current smokers and 25 (6.3%) were ex-smokers. Majority of current (55.4%) and ex-smokers (7.2%) were >49 years and the difference was found to be statistically significant ($p<0.001$) with highest prevalence of current smokers and ex smokers in participants>49 years old. Alcohol consumption was highest in subjects >49 years (25.3%) and the difference between age groups and alcohol consumption was found to be statistically significant ($p<0.05$). Tobacco consumption was higher in the those >49 years (61.4), followed by 35- 49 years (40.3%) and least in subjects in the age group of 30- 34 years (26.2%) and the difference between age groups and tobacco consumption was found to be statistically significant. It was also observed that majority of participants (44.6%) who belonged to the obese category as per the WHO criteria of BMI for Asian population were > 49 years and the difference was found to be statistically significant ($p<0.05$). Out of the total 395 participants, 128 (69.9%) were moderate workers. Majority of participants who were sedentary workers were > 49 years and the difference of age groups with regard to the type of worker was found to be statistically significant ($p<0.001$) and majority of participants (78.3%) who did not perform regular physical activity were >49 years followed by those in the age group of 35- 49 years (58.1%) and least number of participants (44.8%) who denied performing regular physical activity were in the age group of 30- 34 years and the result was statistically significant ($p<0.001$). Also, majority of participants who consumed non- vegetarian diet were

> 49 years and salt intake was also higher in this age group with statistically significant results ($p<0.05$).

Table No. 3: Association of Socio- demographic and Behavioural risk factors with IDRS score

Risk factor		**IDRS SCORE**				**Chi-square value**	**p value**
		High risk (Score > 50) (N= 59)	**Moderate risk (Score 30-50) (N= 200)**	**Low risk (Score < 30) (N=136)**	**Total (N= 395)**		
		N (%)	**N (%)**	**N (%)**	**N (%)**		
Age	30- 35 years	02 (3.4)	62 (31.0)	119 (87.5)	183 (46.3)	222	<0.001
	35- 49 years	14 (23.7)	98 (49.0)	17 (12.5)	129 (32.7)		
	> 49 years	43 (72.9)	40 (20.0)	0 (0)	83 (21.0)		
Gender	Male	32 (54.2)	116 (58.0)	97 (71.3)	245 (62.0)	7.89	0.019
	Female	27 (45.8)	84 (42.0)	39 (28.7)	150 (38.0)		
Family history of diabetes	Yes	41 (69.5)	44 (22.0)	12 (8.8)	97 (24.6)	83.2	<0.001
	No	18 (30.5)	156 (78.0)	124 (91.2)	298 (75.4)		
Type of worker	Sedentary	37 (62.7)	51 (25.5)	15 (11.0)	103 (26.1)	58.8	< 0.001
	Moderate	21 (35.6)	102 (75.0)	131 (65.5)	254 (64.3)		
	Heavy	01 (1.7)	18 (9.0)	19 (14.0)	38 (9.6)		
Regular exercise	Yes	08 (13.6)	91 (45.5)	74 (54.4)	173 (43.8)	28.4	<0.001
	No	51 (86.4)	109 (54.5)	62 (45.6)	222 (56.2)		
Smoking status	Current smoker	34 (57.6)	65 (32.5)		130 (32.9)	27.8	<0.001
	Ex- smoker	06 (10.2)	09 (4.5)	10 (7.4)	25 (6.3)		
	Non- smoker	19 (32.2)	126 (63.0)	95 (69.9)	240 (60.8)		
Alcohol consumption	Teetotaller	33 (55.9)	137 (68.5)	101 (74.3)	271 (68.6)	23.1	<0.001
	Most days (>3 days /week)	21 (35.6)	25 (12.5)	16 (11.8)	62 (15.7)		

	Occasional (<3 days /week)	05 (8.5)	38 (19.0)	19 (14.0)	62 (15.7)		
BMI	Obese	38 (64.4)	66 (33.0)	28 (20.6)	132 (33.4)	38.3	<0.001
	Overweight	07 (11.9)	42 (21.0)	25 (18.4)	74 (18.7)		
	Normal	11 (18.6)	71 (35.5)	67 (49.3)	149 (37.7)		
	Underweight	03 (5.1)	21 (10.5)	16 (11.8)	40 (10.1)		

Table No. 3 shows association of socio- demographic and behavioural risk factors with IDRS score. Out of the total 395 participants, 59 participants (14.93%) had IDRS score> 50 and were classified as high risk, 200 (50.63%) participants had IDRS score 30- 50 and were classified as having moderate risk and 136 participants had IDRS score <30 (34.43%) who were classified as having low risk of development of diabetes. It was observed that 72.9% of study participants >49 years were at high risk of development of diabetes followed by those in the age group of 35- 49 years (20.0%) and the difference between age group and risk of development of diabetes was found to be statistically significant ($p<0.005$).

It was observed that majority of males (54.2%) were having IDRS score >50 followed by females (45.8%) and the results were statistically significant ($p<0.001$)

Out of the subjects who belonged to the high risk category, 69.5% had a family history of diabetes whereas 91.2% of study participants with no family history of diabetes had IDRS score <30 and the difference was statistically significant ($p<0.001$).

Sedentary lifestyle was found to be a risk factor for diabetes as 62.7% of study participants with a sedentary life style had IDRS score >50 followed by 35.6% of moderate workers and 1.7% of heavy workers had IDRS score >50. The difference between type of worker and IDRS score was found to be statistically significant ($p<0.001$).

Study has also observed that 64.4% of individuals who belonged to obese category as per WHO criteria for BMI in Asian population had IDRS score >50 and 49.3% individuals who belonged to normal category had low risk of development of diabetes (IDRS score <30) and the difference was found to be statistically significant ($p<0.001$).

It was also observed that smoking status and alcohol consumption were found to have significant association with the risk of development of diabetes ($p<0.001$).

Study also showed that subjects who performed regular exercise were at a low risk (IDRS <30) of developing diabetes and the results were statistically significant ($p<0.001$).

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Table No. 4: Distribution of study participants according to IDRS component

Component of IDRS	Total no. of study participants (N= 395)	Total no. of diabetics (N= 55)	Chi square value	p value
Age (in years)				
30- 34 years	183 (46.3)	05 (9.1)	44.7	<0.001
35- 49 years	129 (32.7)	23 (41.8)		
More than 49 years	83 (21.0)	27 (49.1)		
Abdominal obesity				
Females- Waist circumference <80 cm	72 (18.3)	03 (5.6)	48.4	<0.001
Males- Waist circumference <90 cm	51 (12.9)	02 (3.7)		
Females- Waist circumference 80- 89cm	27 (6.9)	13 (24.1)		
Males- Waist circumference 90- 99 cm	177 (44.9)	19 (35.2)		
Females- Waist circumference >90 cm	51 (12.9)	11 (20.4)		
Males- Waist circumference >100 cm	16 (4.1)	06 (11.1)		
Physical activity				
Regular exercise + strenuous work	38 (9.6)	06 (10.9)	13.6	0.001
Regular exercise or strenuous work	254 (64.3)	24 (43.6)		
No exercise and sedentary work	103 (26.1)	25 (45.5)		
Family History				
No family history	298 (75.4)	16 (29.1)	74.1	<0.001
Presence of family history	97 (24.6)	39 (70.9)		

Table No. 4 shows distribution of study participants and diabetics according to IDRS component. It was observed that the overall prevalence of Type 2 DM in the study population was 13.92% with majority being (49.1%) >49 years, followed by those in the age group of 35-49 years (41.8%) and least number of participants (41.8%) in the age group of 30- 34 years. Majority of diabetic males (35.2%) and females (24.1%) had a waist circumference of 90- 99 cm and 80- 89 cm respectively, followed by 11.1% males and 20.4% females with waist circumference >100 cm and >90 cm respectively. Majority of diabetics (45.5%) had a sedentary lifestyle and 70.9% of them had a family history of diabetes and the results were found to be statistically significant ($p<0.001$). Out of the 97 individuals who had a positive family history

of diabetes, 22 (56.4%) reported positive history of diabetes in both parents and in 17 (43.6%) individuals, either parent was diabetic with statistically significant results (p<0.001).

Table No. 5: Sensitivity & Specificity of IDRS

IDRS	Type 2 DM present	Type 2 DM absent	Total
IDRS positive	32	27	59
IDRS negative	23	313	336
Total	55	340	395

Table No. 5 is a 2x2 contingency table showing the sensitivity and specificity of IDRS. It was observed that the sensitivity of IDRS is 58.2% and specificity is 92.1% and the diagnostic accuracy is 87.3%. The cut off value was calculated using the ROC curve. The area under the curve is 75.1% and the cut off value was set to 0.5. It shows that 50% of the disease pool can be predicted by sensitivity 0.582 and specificity 0.921. 50% of TP and TN can be depicted by sensitivity 58.2% and specificity 92.1% respectively. False positives and false negatives are very low which shows that IDRS has a good diagnostic value as well.

Figure 1: ROC curve

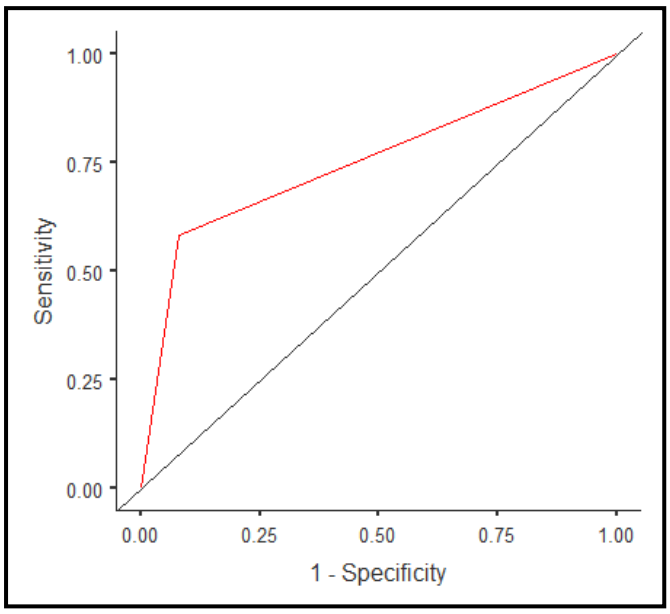

Table No.6: Regression analysis of socio- demographic and behavioural factors and Hypertension

Factors		**β coefficient**	**95% Confidence Interval**		**p value**	**Odd's Ratio**
			(Lower limit)	**(Upper limit)**		
Age	30- 34 years *(Ref)*					
	35- 49 years	0.508	0.77846	3.548	0.189	1.6618
	>49 years	1.113	1.26642	7.320	0.013	3.0447
Gender	Female *(Ref)*					
	Male	- 0.351	0.33934	1.460	0.346	0.7039
Presence of addictions	No *(Ref)*					
	Yes	0.353	0.48196	4.207	0.523	1.4239
Smoking status	Non- smoker *(Ref)*					
	Current smoker	0.482	0.55986	4.687	0.374	1.6199
	Ex- smoker	0.209	0.31639	4.804	0.763	1.2328
Alcohol consumption	Teetotaller *(Ref)*					
	Most days (>3 days per week)	1.346	1.344	10.9794	0.012	3.84187
	Occasional (<3 days per week)	0.133	0.432	3.0243	0.788	1.14278
Diet preferences	Vegetarian *(Ref)*					
	Non-vegetarian	0.929	1.20497	5.319	0.014	2.5316
Salt intake	Less than 5 grams/ day *(Ref)*					
	More than 5 grams/ day	1.899	3.04254	14.669	<0.001	6.6806
BMI	Underweight *(Ref)*					
	Obese	1.598	0.74733	32.713	0.097	4.9444
	Overweight	1.232	0.49133	23.933	0.214	3.4291
	Normal	0.739	0.30472	14.402	0.452	2.0949
Type of worker	Heavy *(Ref)*					
	Moderate	0.356	0.47895	4.252	0.523	1.427
	Sedentary	- 0.620	0.1588	1.822	0.319	0.5379
	Yes*(Ref)*					

Regular physical activity	No	-0.808	1.06556	4.719	0.033	2.2424

Table no. 6 shows the results of binomial logistic regression done on study variables. The overall prevalence of Hypertension in our study was 24.05%. Excessive salt intake (>5 grams/ day) was significantly associated with the development of hypertension ($p<0.001$). Other factors such as age >49 years, alcohol consumption on most days of the week (>3 days), non-vegetarian diet and subjects who did not perform regular physical activity were found to be associated with development of Hypertension and the results were statistically significant($p<0.05$).

DISCUSSION

The present study was conducted in a rural field practice area of a medical college in Jaipur. A total number of 395 subjects (>30 years) were interviewed out of which 62.02% were males and 37.97% were females. This study showed that the prevalence of smoking, alcohol consumption, other addictions (tobacco consumption, gambling) were higher among the males as compared to the females and the difference was statistically significant. Similar findings were observed in Report of surveillance of risk factors of NCDs (Step I and II) from Chennai in which the prevalence of smoking was higher among males (55.8%) as compared to females (0.2%).[15] A study conducted by Jain S et.al[16] in an urban slum of Bhopal also showed that prevalence of tobacco smoking was higher among the males (64.6%) as compared to the females (31.9%).

A study conducted by Thankappan et. al[17] in slums of Kerala also revealed that the prevalence of alcohol consumption was higher among the males (45.4%) as compared to the females (1%). Reports of IDSP NCDs risk factors[18] survey conducted in Madhya Pradesh revealed that the prevalence of alcohol consumption was higher in males (32.6%) as compared to the females (4.3%). Similar findings were observed in a study conducted by Jain S et. al[16] in an urban slum of Bhopal in which prevalence of alcohol use was higher in males (45.5%) than females (0.5%).

In our study, it was found that prevalence of low physical activity was 53.1% males and 61.3% females and 25.3% males and 27.3% of females were sedentary workers. With regard to BMI, it was observed that 36.3% males and 28.7% females fell into the category of obese as per South Asian classification of BMI and the mean BMI of the study group was 20.9kg/m^2. However, there was no significant difference between males and females with regard to BMI, type of worker and regular exercise. Similar findings were observed in a study conducted by Jain S et.al in which 33.2% males and 58.7% females reported low physical activity. In IDSP risk factor survey conducted in Madhya Pradesh, it was observed that 33.5% males and 52% females fell into the category of low physical activity.

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In a study conducted by Jain Set.al[16], it was reported that the mean BMI of the study group was 21.9kg/m^2 whereas the mean BMI of the study participants in IDSP NCDs risk factors survey[18] conducted in Madhya Pradesh was 20.1 kg/m^2.

In our study, out of 395 study participants, 183 (46.32%) belonged to the age group of 30- 34 years, 129 (32.65%) were in the age group of 35- 49 years and 83 (21.01%) study participants were above the age of 49 years. The prevalence of current smoking was highest in the age group of 35- 49 years and this is in concordance with studies conducted by Jain S et. al[16] and IDSP NCDs risk factors survey[18] conducted in Madhya Pradesh.

In the present study the prevalence of Hypertension was reported to be 24.05%. The overall prevalence of Hypertension in IDSP NCDs risk factor survey conducted in Madhya Pradesh was reported to be 24% similar to our study. [18]

In our study, we used the Indian diabetic risk score for identifying individuals who belonged to the high risk group as this is a cost effective tool for screening of diabetes in the community. Results showed that 14.93% of population belonged to the high risk group (IDRS score >50). Similar findings were reported in a study conducted in Lucknow by Arun A et. al[19] in which 14.9% of population was categorized as high risk group. However, a study conducted by Mohan et. al[20] at Chennai showed that 43% of population belonged to the high risk group. The discrepancy in the results could be attributed to different study settings as Mohan et. al[20] conducted their study in a metropolitan city and our study was done in a rural area.

In our study the overall prevalence of diabetes was found to be 13.92% in subjects aged 30 years and similar findings were observed in a study conducted by Arun A et. al[19] in which the overall prevalence of diabetes was found to be 13.8% in subjects aged 20 years and above.

We observed that increasing age, sedentary lifestyle and obesity were significantly associated with development of diabetes. Similarly, in a study conducted by Subramani R et. al.[21] in rural area of Sripuram, it was reported that sedentary lifestyle and mild physical activity were positive risk factors for diabetes.

In our study we found that components of IDRS such as increasing age, abdominal obesity, sedentary lifestyle and positive family history were significantly associated with development of diabetes ($p<0.001$) and Arun A et. al[19] in their study in rural and urban population of Lucknow also reported that IDRS components such as increasing age, abdominal obesity, sedentary lifestyle and positive family history were significantly associated with development of diabetes in urban population.

In the present study it was observed that the sensitivity of IDRS was 58.2% and specificity was 92.1%. These findings were in contrast with the findings seen in population based CURES[22] (Chennai Rural Urban Epidemiology Study) in which the sensitivity of IDRS was reported to be 72.5% and specificity was 60.1%.

CONCLUSION

The present study describes that the burden of NCD risk factors in the population residing in the rural field practice areas of JNUIMSRC is high and most of the people are living with two or more risk factors. It is therefore necessary to emphasize on conducting awareness campaigns in these areas so that the burden of modifiable NCD risk factors prevailing in the community can be reduced. The IDRS questionnaire developed by Madras Diabetic Research Foundation (MDRF- Chennai) is a validated and cost effective tool for screening of diabetes in a large population.

LIMITATIONS OF THE STUDY

i) Lipid profile of study participants (part of Step III of WHO- STEPS Approach) was not done due to funding issues.

ii) As MDRF- IDRS was derived from Asian Indian population, it can only be used as a screening tool for South- East Asians. False positives and negatives are relatively high with the tool. But since the prevalence of Type 2 DM is high, it can be used in Indian population.

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