

The Association of Epidemiological and Clinical Parameters with Diabetes and Hypertension in a Rural Area: A Mahbubnagar District Study

Munnaji Vyankatesh Mavatkar¹⁾, Kiran Prakash Kanaparthi¹⁾,
Aruna Devi Sadamalla¹⁾, Arif Mahboob Syed²⁾, Yamini Anjaneya Rao Vaia²⁾

¹⁾Department of Community Medicine, Government Medical College Mahbubnagar India

²⁾Government Medical College Mahbubnagar India

ABSTRACT

Background: Rapid development in a country like India has also brought an explosion in the prevalence of non-communicable disease. Affluence to western culture can be one of the reason. This might have encroached the rural India. A cross-sectional survey was done to assess the socio-demographic, clinical and laboratory factors diabetes and hypertension among the study population.

Subjects dan Method: This is a descriptive cross-sectional study. A sample of 244 diabetes and hypertensive patients registered under the subcentre were taken as study subjects. Sociodemographic factor, clinical parameters and Laboratory parameters were taken independent variables. The dependent variables were diabetes and hypertension. Data analysis was done with help of SPSS version 26 software. Standard instruments were used to measure, weight, height, and waist circumference (WC), blood pressure. The random blood sugar, HbA1C and lipid profile values were taken from laboratory reports. The other variables were collected by questionnaire.

Results: A total of 244 participants reported and responded to this study who were having diabetes, hypertension or both. About 35% of the population belonged to lower SEC. Amongst males almost 50% of the male had dual co-morbidity i.e Diabetes and Hypertension. About 85% of the population was Illiterate ($p < 0.05$). Mean value of HbA1C was high among the diabetic patient who were under treatment (Mean = 7.10; SD = 1.20). Lipid profile value were in normal range but higher compared to stats of other selected states.

Conclusion: Study subjects even on treatment were unable to keep the laboratory parameters under control hence requiring indepth research.

Keywords: Diabetes, hypertension, risk factors, Mahbubnagar District.

Correspondence:

Munnaji Vyankatesh Mavatkar. Assistant Professor Department of Community Medicine Government Medical College Mahbubnagar. Department of Community Medicine Government Medical College Mahbubnagar Yedira 509001. Email: Kiranmavatkar0647@gmail.com. Mobile phone: 8999712782.

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BACKGROUND

Non Communicable diseases (NCDs), principally cardiovascular diseases, cancer,

diabetes and chronic respiratory disorders, impose a major and burgeoning burden on health and development in the South-East

Asia Region. Globally, NCD deaths are projected to increase by 15% between 2010 and 2020 (to 44 million deaths) with an estimated 10.4 million deaths in South-East Asia. Of particular concern is the high level of premature mortality from NCDs (deaths before 70 years of age) in several low- and middle-income countries (LMIC) (WHO, 2021).

As per the research published in Lancet, there is an inflated burden of cardiovascular diseases, respiratory diseases and diabetes (Perianayagam, 2018). Lifetime risk of diabetes in metropolitan cities in India, is alarming across the spectrum of weight, and soars dramatically with increased BMI. Over half of the men in metropolitan cities, over 20yrs, without diabetes develop the disease during their lifetime. Among women it is about 64% (Shammi et al., 2021).

The lifestyle in urban areas amassing to high stress, faulty dietary habits, sedentary jobs supplemented with dependence on alcohol and tobacco, manifolds the risk of afflicting with Non communicable disease. There are multiple studies depicting an upward trend in prevalence of Non communicable diseases in rural hinterlands (Krishnaswamy et al., 2017).

Here, we are targeting a study area which is at its nebulous transformative phase from being a rural belt to an urban one. Thus, this approach at this point might help us in understanding the natural progression of Non communicable diseases, and active measures required to revert the progression, if evidence is found. Thus, the aforementioned was the objective for this study to assess the socio demographic factors among the diabetic and hypertensive study subjects and to find the association of various clinical and Laboratory factors with Diabetes and Hypertension.

SUBJECTS AND METHOD

1. Study Design

We conducted a Descriptive Cross-Sectional Study. The references of the study belonged to several data base like: PubMed, Cochrane Library, SpringerLink, Science Direct, and Google Scholar.

2. Population and Sample

Rural health training center for Government Medical College is located at Yedira which covers thirteen Subcenters. Out of which seven Subcentre are under rural area which cover a total population of 67,475. The Diabetes and Hypertensive patients registered under the Subcentre were taken as Study Subjects. The sample size came out to be 244 as per the NCD register maintained by the Subcentre.

3. Study Variables

Sociodemographic factor, Clinical parameters and Laboratory parameters were taken independent variables and Diabetes and Hypertension were considered as Dependent variables.

4. Inclusion Criteria

All the registered cases of Diabetes and Hypertension under the subcentres. Schedule was prepared for the camp and accordingly one subcentre was covered on one day.

5. Operational Definition of Variables

Generalized obesity (GO) was defined as a body mass index (BMI) ≥ 25 . Diabetes was defined as either having a history of diabetes on medications or HbA1c of $\geq 6.5\%$ in those without a history of diabetes. Hypertension was defined as either having a history of hypertension on medications or a systolic blood pressure (SBP) of ≥ 140 mm Hg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg on two occasions taken 15 min apart. Dyslipidemia was defined as a low-density lipoprotein cholesterol (LDL-C) ≥ 130 mg/dl, high-density lipoprotein cholesterol (HDL-C) < 40 mg/dl in males

and <50 mg/dl in females. Triglycerides were non fasting samples due to logistical issues related to fasting samples.

6. Study Instrument

Semi Structured Questionnaire was prepared which included Sociodemographic, Clinical and Laboratory parameters. Blood Pressure was measured by Mercury Sphygmomanometer. Waist Circumference measured by Measuring tape with calibration at 1mm.

Blood investigations were done using following methods, a random glucose (hexokinase/glucose oxidaseperoxidase/endpoint method), glycated hemoglobin (HbA1c) (automated high performance liquid chromatography method), nonfasting lipid profile, and hemoglobin (Flowcytometry). Fasting and post meal glucose were not considered due to logistical issues in a farming village. The blood investigations were done through “Telangana Hub” diagnostic center which is the new initiative by Telangana government where by diagnostic center are set up at District Hospital Mahbubnagar.

7. Data Analysis

Data Analysis was done using Microsoft Excel and SPSS version 28. Mean was used to assess the dependent variables among

same group. Independent t test was used to compare the mean between two different groups.

8. Research Ethics.

Obtained from the study Institute’s Ethical Committee.

RESULTS

1) Sample Characteristics

The baseline characteristics of the study population are depicted in Table 1. A total of 244 participants reported and responded to this study, of which 30% (n= 74) were males and females 70%% (n= 170). The age distribution of the study population is as follows: 60% of the study population were between 51 and 70 years of age, 19% were between 41 and 50 years, and 15% were more than 71 years. About 85% of the Study subjects were Illiterate and only 4% had completed their graduation, this was found to be statistically significant. About half of the study subjects under study were not doing any official job and female candidates were housewives. Thus, about 50% were doing some kind of job which was either unskilled or skilled. Only 15% of the subject had family history of NCD (i.e) Obesity, Diabetes or Hypertension and was statistically significant.

Table 1. Baseline characteristics of the study population

Variables	Category	Frequence	Percentage	p
Age	< 30 years	0	0	0.172
	31-40 years	10	2	
	41-50 years	46	9	
	51-60 years	78	15.90	
	61-70 years	74	15.16	
	71-80 years	32	6.55	
	> 80 years	4	1.63	
Sex	Male	74	30.32	0.095
	Female	170	69.68	
Education	Illiterate	206	84.42	0.032
	Primary	14	5.73	
	Seconary	14	5.73	
	Graduate	10	4.09	

Occupation	Umemployed	110	45.08	1.782
	Unskilled	72	29.50	
	Semiskilled	22	9.01	
	Skilled	34	13.93	
	Professional	6	2.45	
Family History of NCD	Present	206	84.42	0.046
	Absent	38	15.57	
SEC	Upper (%)	17	6.96	0.882
	Upper Middle (%)	46	18.85	
	Lower Middle (%)	34	13.93	
	Upper Lower (%)	63	25.81	
	Lower (%)	84	34.42	

2)Bivariate Analysis

As per Table 2, amongst males almost half of the male had dual co-morbidity i.e Diabetes and Hypertension. Alcohol intake and smoking counted for more number of hypertension cases compared to diabetic

cases. Mean weight and waist Circumference was found on the higher side among the Diabetic cases compared to Hypertension cases. Higher preponderance of Hypertension was seen amongst subject who were indulged in farming.

Table 2. Baseline characteristics of the study population based on Blood Glucose level and Blood Pressure

Category	Diabetic		Hypertensive		Diabetes and Hypertension		p
	Mean	SD	Mean	SD	Mean	SD	
Male (%)	21.60	1.60	29.72	2.10	48.60	3.40	0.267
Family History of NCD	12	1.40	21.27	1.80	16.32	1.20	0.821
Alcohol Intake (%)	48	2.70	74	2.80	83.67	2.10	0.039
Smoker (%)	8	0.60	10.20	0.90	12.76	1.10	0.562
Height (cm)	158.5	4.28	156.50	5.29	159.50	5.54	0.781
Weight (kg)	66.8	1.30	60.60	1.00	62.60	0.90	0.665
Waist Circumference (cm)	87.13	13.71	80.13	15.56	85.46	14.12	0.547
Uneducated (%)	79.16	6.28	91.83	8.93	85.71	8.37	0.082
Farmers (%)	10	0.8	14.21	1.24	18.36	1.78	0.067

*- Family history of DM, HTN, Obesity, Cancer was asked.

†- Included all kind of alcohol country and other brand's

‡-Who worked atleast 4 hours in the farm daily

As per Table 3. Study subjects having dual Co-morbidities had comparatively higher BMI, RBG level and HbA1C values compared to the Diabetic and hypertensive subjects individually. Among the Hypertensive study subjects the mean level of SBP,

DBP and Lipid profile values were comparatively higher compared to the diabetic subjects compared to hypertensive study subjects. Thus both Clinical and Laboratory parameters were found to be

high among study subjects having both diabetes and hypertension.

Table3. Examination Finding of Study population

Parameters	Diabetis		HTN		DM and HTN		p
	Mean	SD	Mean	SD	Mean	SD	
BMI	26.15	1.95	23.15	2.46	30.24	3.02	0.893
SBP (mm of Hg)	134.79	22.66	147.79	13.69	152.41	12.42	0.076
DBP (mm of Hg)	84.39	13.02	91.39	11.42	92.14	10.28	0.145
Waist Circumference (cm)	88.70	14.77	83.70	12.58	89.56	11.18	0.256
Random Blood Glucose (mg/dl)	157.16	79.39	142.76	47.22	155.28	42.14	0.334
HbA1C (%)	7.10	1.20	5.91	3.20	6.41	2.90	0.075
Total cholesterol (mg/dl)	179.25	6.24	192.11	18.11	198.21	16.12	0.176
Triglyceride (mg/dl)	135.21	10.20	121.45	9.54	142.28	11.24	0.065
LDL-C (mg/dl)	71.46	18.79	82.24	6.93	84.29	6.24	0.048
HDL-C (mg/dl)	49.17	10.62	54.72	14.25	54.72	14.25	0.165

Diabetic control-among study subjects with diabetes RBS 70-130 and HBAIC <7,

#Hypertension control-SBP <140 and DBP <90 among hypertensives and

@Lipid control-LDL <100, TC <200 and TG <150

BP - Blood pressure, SBP - Systolic BP, DBP - Diastolic BP, FBS – Fasting blood sugar, TC -

Total Cholesterol, TG-Triglyceride, LDL - Low-density Lipoprotein, HDL- High Density

Lipoprotein, HbA1C – Hemoglobin A1c.

DISCUSSION

In our study majority of the subjects were females (70%) and almost sixty percent of the cases were between 40 to 60 yrs. Majority of the study subjects were Illiterate and having sedentary mode of life (50%). About 15% of the study subjects had family history of Non communicable Disease. As per some studies showed same age group and mean age of the study participants were 40-42 yrs. Also about 55% of the study subject were illiterate and 50% of them where some kind of Job which included skilled as well as unskilled work. As per other studies about 50 percent of NCD subject were involved in some kind of manual work (Kinra et al., 2010; Sharma et al.,2020)

The current study shows high level of addiction among the study subjects. Speaking about alcoholism there are 48% of the diabetic patients who are consuming alcohol and the percentage is much high

among the hypertensive subject with about 3/4th of the patients consuming alcohol. Alcohol consumption history was on an average since 10 yrs and most of the study subjects were drinking toddy which is available locally. As per one of the national level study the alcohol consumption among the population is actually increasing significantly- from “2.4 litres of pure alcohol per 15+ aged person in a calendar year in 2005, to 4.3 litres in 2010, and 5.7 litres in 2016.” It is predicted that India is projected to increase its APC (alcohol per capita consumption) by another 2.2 litres by 2025 (Kumar et al., 2019) In contrast to alcoholism tobacco consumption was found to be very low among the study subjects. As per the Global Adult Tobacco Survey (GATS -2) India factsheet shows a decline in current tobacco usage from 2010 to 2017 of almost 6% in India (from a prevalence of 34.6% to 28.6%) (India Global Adult Tobac-

co Survey, 2016-2017) About 15% of the farmer's had history of only hypertension and 10 percent of the Farmers had Diabetes. Overall prevalence of NCD among farmers was high than other occupation. As per one of the study study high prevalence of cardiovascular disease was associated among the Farmers as exposers to Organophosphorus pesticides causes increased risk cardiovascular diseases (Lind et al., 2013).

Body mass index of the hypertensive patients was seen higher depicting the presence of underlying obesity which is one of the risk factor for hypertension. It was identified that about 2/3rd of the diabetic patients with BMI above 25 were found in 50-70 yrs age group. With 1SD increase in the BMI the proportion of Diabetic patient was found to be 50-60 % higher and the p value among was statistically significant ($p=0.002$). Among diabetic subject BMI was just above the higher range of normal ($p=0.082$). Similar results were shown in study done by (Patel et al., 2016) and (Giridhara et al., 2018) were positive co-relation was seen between BMI and Diabetes, Hypertension.

Glycosylated haemoglobin is one of the important parameters for assessing the longterm control diabetes among the subjects. In our study the mean HbA1C among the diabetic subjects was found to be 7.1 which was higher than the normal range, thus illustrating that diabetic patient under treatment didn't had complete control over the morbidity. As per ICMR INDIAB study depicted levels of HbA1C as 8.1 in Tamilnadu 7.9 in Maharashtra and 9.4 in Chandigarh. So compared to different states from south to North the glyce-mic control seems to be better in our field practice area in Telangana (Unikrishnan et al., 2014)

Lipid profile of the subjects was done which showed high TG levels (i.e 135

mg/dl) among Diabetic study subject and 122 mg/dl among the hypertensive study subjects which is above the accepted level of 100 mg/dl. A pan India study depicted level of TG as 130mg/dl,118mg/dl and 142 mg/dl in states like Tamilnadu, Maharashtra and Chandigarh etc. Total Cholesterol and LDL was also at the higher range of normal. The state like Tamilnadu, Maharashtra and Chandigard were had higher LDL level but lower level of Total Cholesterol as compared to our study. Lower level of LDL just gives a comparatively good prognosis with respect to any CVD complication. Some dietary modification to reduced fat intake will help in managing the deranged lipid profile level (Thakur et al., 2016; Joshi et al., 2014)

The present study helped us to evaluate to ongoing NCD services delivered during the pandemic. The analysis evaluated not only the Sociodemographic parameters but also the clinical and laboratory parameters thus giving a comprehensive evidence based situational analysis of ongoing NCD services provided. Entire rural field practice area of RHTC was covered under the study thus covering a large population.

As per us following flaws can be noted. Lack of resources like better transport restricted mobilization of very old age people to camp site. Also COVID-19 added difficulties as we faced resistance from study subject to come to the camp site due to fear of getting COVID-19 thus creating a need for strictly practicing COVID preventive guidelines by health care workers and also to increase health awareness among people.

Diabetes and Hypertension can be linked to large number of Sociodemographic, Clinical risk factor which contribute to its significantly high prevalence. Also in this study we found that current

treatment strategies followed for the patients were unable to control the Laboratory parameters, thus requiring an extended research upon understanding the confounding factors contributing to the disease condition.

AUTHOR CONTRIBUTION

Mavatkar Munnaji is the main researcher who selected the topic did final write up, Data Analysis and worked on Correspondence. Dr. Kiran Prakash Kanaparty and Dr. Aruna Devi Sadamala worked as supporting researcher for making writeup of the study article. Intern Arif Mahboob Syed and Yamini Anjaneya Rao Vala of 2016 batch did for data collection and Data Entry.

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Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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