Original Research Article

A COMMUNITY BASED STUDY ON HYPERTENSION AND DIABETES AMONG ADULTS IN A RURAL AREA OF WEST BENGAL

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Abstract:
Introduction: Prevalence of hypertension and diabetes is increasing rapidly world-wide. Frequently these two conditions coexist. They have serious health impact with an increased risk of premature death due to cardiovascular disease, stroke and renal disease. The present study aimed to find out the prevalence and associated risk-factors of hypertension and diabetes among adults in a rural area of West Bengal.

Methodology: Community based cross-sectional study was conducted in rural field practice area of AIIH&PH, Kolkata located in Singur block, Hooghly district of West Bengal, among 124 adults population aged $\geq$ 18 years. Each participant was examined for Blood Pressure along with height, weight and waist circumference following SOP. Fasting blood sugar was checked by one touch ultra-glucometer. Information related to the relevant covariates was obtained through a pretested predesigned structured schedule.

Results: Prevalence of hypertension and diabetes among participants were 21.8% and 11.3% respectively. Use of non smoking tobacco presently and BMI had significant effect on occurrence of hypertension in bivariate [OR: 3.66, 4.98 and 10.2 respectively] and multivariate [AOR: 29.7, 4.8, 47.9 respectively] analysis. Age, education level of participants and current smoking had significant effect on occurrence of diabetes [OR: 11.8, 4.7 and 13.4 respectively]. Current smoking significantly affected occurrence of diabetes even after adjusting for other covariates [AOR: 8.7].

Conclusion: High prevalence of hypertension, diabetes and their risk factors in rural areas of West Bengal indicates requirement of special emphasis on primary and primordial prevention in these areas.

Key Words: Hypertension, Diabetes, Prevalence, Risk factors,

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Introduction:

Type 2 diabetes is estimated to affect over 150 million people world-wide [1] and associated with an increased risk of premature death due to cardiovascular disease (CVD), stroke, and renal disease [2]. Hypertension is a major risk factor for cardiovascular disease, stroke and ischemic heart disease. Therefore, these factors represent two of the most preventable causes of morbidity and premature mortality in developed as well as developing countries [3]. Hypertension and diabetes frequently coexist. The frequency of hypertension in diabetic population is almost twice as compared to non-diabetic general population [4]. There is a considerable evidence for an increased prevalence of hypertension in diabetic persons [5]. The prevalence rate of hypertension among type 2 diabetics is higher than that of age and sex-matched patients without diabetes, ranging between 32% and 82% [6-11]. The coexistence of hypertension and type 2 diabetes is a major contributor to the development and progression of macro vascular and micro vascular complications compared to the general population. Both hypertension and diabetes predispose to the development of CVD and renal disease. The presence of hypertension in diabetic patients substantially increases the risks of coronary heart disease, stroke, nephropathy and retinopathy. Indeed, when hypertension coexists with diabetes, the risk of CVD is increased by 75%, which further contributes to the overall morbidity and mortality of an already high risk population [12, 13].

The prevalence of both hypertension and diabetes is increasing rapidly both in developed and developing countries mainly due to lifestyle changes. Till recent past, control & prevention of communicable disease were emphasized. Recently, attention has shifted to control and prevention of non-communicable diseases including stroke, hypertension and coronary artery disease at the national level in view of the rising trends.

Rural areas in India are in transitional phase. Rapid change in lifestyle increases the risk of conditions like hypertension, diabetes in rural areas. Even today there is scarcity of the studies in rural areas of India showing prevalence and risk factor of both hypertension and diabetes.

With this backdrop the present study was being undertaken to find out the prevalence and associated risk-factors of hypertension and diabetes among adults in a rural area of West Bengal.

Objective:

- To find out the prevalence of hypertension and diabetes among adults in a rural area of West Bengal.
- To study the socio-demographic, economic and behavioural characteristics of the study population.
- To elicit association (if any) of hypertension and diabetes with socio-demographic, economic and behavioural characteristics of study population.

Methodology:

Study settings:

The study was conducted in a rural community of Singur block, Hooghly district of West Bengal which is the rural field practice area of All India Institute of Hygiene & Public Health, Kolkata.

Time line:

The study was conducted for 2 months starting from December 2014 to January 2015.

Study population:

People aged 18 years and more, residing at the study area.

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Inclusion criteria:

-All the inhabitants aged 18 years and more.

Exclusion criteria:

 -unwilling individuals.

 -moribund patients.

Study variables:

A. Dependent variables:

- Prevalence of hypertension (Known hypertensive or found to be hypertensive during study as per JNC 7 criteria.)

- Prevalence of Diabetes [Known Diabetic or found to be diabetic by fasting blood sugar estimate on spot ($\geq$126mg/dl was considered as diabetic and between 110-125 mg/dl was considered as impaired fasting glucose) during study]

B. Independent variables:

- Demographic factors (Age, gender, religion, marital status & type of the family-nuclear/joint.)

- Socio-economic factors (Education, occupation, income).

- Behavioural factors (smoking, alcoholism, physical activity, dietary habit including salt intake)

- BMI and Waist Circumference

Study Tools:

o   Pre-designed pre-tested schedule.

o   Stethoscope.

o   Portable Weighing machine.

o   A non-stretchable measuring tape.

o   Sphygmomanometer.

o   One touch ultra glucometer with stripe for on spot checking of FBS.

Sample Size:

In a recent study (Prevalence of hypertension in a rural community of central India Kokiwar Prashant R, Gupta Sunil S)[14] it's found that prevalence of hypertension among adults is 19.04% in rural population in India. Now considering this prevalence with 10% absolute allowable error sample size was 62 after applying the formula-

Sample size= $4pq/L^2$

(p=prevalence, q=1-p & L=allowable error, 10%)

Since multistage random sampling was done, design effect of 2 was considered. Therefore the final sample size was 124.

Sampling Design:

There are 4 sub centers under the supervision of Rural Health Unit & Training Centre (RHUTC), Singur. One out of the four sub centers was selected by SRS and in the selected sub centre four villages were selected again by SRS out of 11 villages. From each village, number of adult individuals chosen was proportional to the population (PPS) of that village to obtain desired sample size of 124 adults.

Method of data collection:

All the participants were explained about the purpose of the study that this was an academic research in nature and all data provided by the participants would be kept confidential. After obtaining their approval regarding participation in this study the consent paper was duly signed by them. Then information was obtained about their socio-demographic character, dietary pattern, salt intake, alcohol consumption smoking habit and physical activity. Each participant was examined for Blood Pressure (using JNC VIII Guidelines) along with height, weight and waist circumference following WHO standard techniques. Fasting blood sugar was checked on spot by one touch ultra glucometer with stripe. History regarding preexisting hypertension and diabetes was obtained and previous records like prescription or OPD tickets, if any was also analyzed. Information was recorded in a predesigned and pretested schedule for data collection.

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Results:

Table 1: Distribution of participants according to Socio-demographic, Behavioral characteristics and anthropometry: (n=124)

Variable		Number (%) / Mean (SD)		
Age		**40.6 (±15.6)**		
Age Group	**18-24**	**26 (21%)**		
	25-34	**20 (16.1%)**		
	35-44	**32 (25.8%)**		
	45-54	**22 (17.7%)**		
	55-64	**18 (14.5%)**		
	≥ 65	**6 (4.8%)**		
Sex	**Male**	**69 (55.6%)**		
	Female	**55 (44.4%)**		
Marital Status	**Married**	**90 (72.6%)**		
	Unmarried	**24 (19.3%)**		
	Widow	**10 (8.1%)**		
Family Type	**Nuclear**	**48 (38.7%)**		
	Joint	**76 (61.3%)**		
Per capita Income		**1531.6 (±686.8)**		
B.G.Psasad scale	**Social class II (PCI 2808-5614)**	**14 (11.3%)**		
	Social class III (PCI 1685-2807)	**16 (12.9%)**		
	Social class IV (PCI 842-1684))	**94 (75.8%)**		
Education		**Male (n=69)**	**Female (n=55)**	**Total**
	Illiterate	**0**	**10 (18.2%)**	**10 (8.1%)**
	Can read only	**4 (5.8%)**	**2 (3.6%)**	**6 (4.8%)**
	Can read and write	**9 (13%)**	**7 (12.7%)**	**16 (12.9%)**
	Primary (I-IV)	**18 (26.1%)**	**6 (10.9%)**	**24 (19.4%)**
	Middle (V-VIII)	**16 (23.2%)**	**18 (32.7%)**	**34 (27.4%)**
	High School (IX-XII)	**20 (29%)**	**6 (10.9%)**	**26 (21%)**
	Graduate and above	**2 (2.9%)**	**6 (10.9%)**	**8 (6.5%)**
Occupation		**Male (n=69)**	**Female (n=55)**	**Total**
	Unemployed/Student	**8 (11.6%)**	**4 (7.3%)**	**12**

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				(9.7%)
	Home Maker	0	51 (92.7%)	51 (41.1%)
	Laborer	11 (15.9%)	0	11 (8.9%)
	Business	10 (14.5%)	0	10 (8.1%)
	Independent occupation	4 (5.8%)	0	4 (3.2%)
	Cultivator	32 (46.4%)	0	32 (25.8%)
	Service	4 (5.8%)	0	4 (3.2%)
Smoking status	Current smoker	25 (20.2%)		
	Former smoker	2 (1.6%)		
	Non smoker	97 (78.2%)		
Age of initiation of smoking		22 (±3.5)		
Non smoking tobacco use	Current user	18 (14.5%)		
	Former user	0		
	Non user	106 (85.5%)		
Age of initiation non smoking tobacco		21.4 (±3.7)		
Alcohol intake	Present	10 (8.1%)		
	Absent	114 (91.9%)		
Age of initiation of alcohol		26.4 (±3.9)		
Extra salt in diet		8 (6.5%)		
Fruit intake per week		2.71 (±0.8)		
Vegetable intake per week		6.7 (±0.45)		
Physical Exercise	Any physical Exercise (Moderate+ Heavy)	11 (8.9%)		
	Moderate Physical Exercise	7 (5.6%)		
	Heavy Physical Exercise	4 (3.3%)		
Number of days performing physical exercise per week		5.3 (±1.4)		
BMI	<18.5	12 (9.7%)		
	18.5-22.9	63 (50.8%)		
	23-27.4	33 (26.6%)		
	≥ 27.5	16 (12.8%0		
Waist circumference in male (n=69)	<90 cm	49 (71%)		
	≥90 cm	20 (29%)		
Waist circumference in female (n=55)	<80 cm	25 (45.5%)		
	≥80 cm	30 (54.5%)		

Mean age of participants was 40.6 (±15.6). Maximum participants belonged to 35-44 year age group (25.8%) followed by 45-54 year age group (17.7%). 55.6% participants were male. 72.6% participants were currently married where as 19.3% were

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unmarried and 8.1% were widow. 61.3% belonged to joint family, rest belonged to nuclear family. Mean PCI was 1531.6 (±686.8). 75.8% participants' fell under Prasad socio-economic class IV followed by 12.9% under class III and 11.3% under class II. 8.1% participants were illiterate and maximum participants belonged to middle education group (class V-VIII) (27.4%). Among females 18.2% participants were illiterate and 32.7% fell under middle education group. But in males there were no illiterates and maximum participants belonged to high school education group (class IX-XII) (29%). In males maximum participants were cultivators (46.4%) where as among females 92.7% participants were house wives. (Table 1)

Among the participants 20.2% were current smokers, 1.6% was former smokers; 14.5% were current non smoking tobacco users and 8.1% were consuming alcohol. Mean (SD) age of initiation of smoking, non smoking tobacco and alcohol were 22 (±3.5), 21.4 (±3.7), 26.4 (±3.9). (Table 1)

6.5% of the participants had history of having extra salt in diet. They gave history of fruit intake on an average 2.71 (±0.8) days/ week and vegetable intake on an average 6.7 (±0.45) days/ week. Only 8.9% participants had history of physical exercise. Among them 5.6% performed moderate intensity physical exercise and 3.3% performed heavy physical exercise. Those who performed physical exercise did it for mean (SD) 5.3 (±1.4) days/ week. (Table 1)

As for as BMI of the participants were concerned 26.6% participants had increased risk (BMI between 23-27.4) and 12.8% participants had very high risk (BMI ≥ 27.5) according to WHO additional cut off value for Asian population. 29% male had waist circumference ≥90 cm and 54.5% female had waist circumference ≥80 cm which are cut-off value respectively for Asian male and female population. (Table 1)

Table 2: Prevalence of hypertension and diabetes: (n=124)

Variable			
Hypertension	**Found hypertensive during survey [Number (%)]**	**Not found hypertensive but previously diagnosed and on antihypertensive drug [Number (%)]**	**Total [Number (%)]**
	21(16.9)	**6 (4.9)**	**27 (21.8%)**
Diabetes	**Found diabetic during survey [Number (%)]**	**Not found diabetic but previously diagnosed and on antidiabetic drug [Number (%)]**	**Total [Number (%)]**
	9 (7.3)	**5 (4%)**	**14 (11.3%)**

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Prevalence of hypertension was: 21.8%. Among them 4.9% were previously diagnosed and had taken antihypertensive medicine regularly but were not found hypertensive during survey. Rest 16.9% was detected as hypertensive during time of data collection. (Table 2)

Prevalence of diabetes was: 11.3%. Among them 4% were previously diagnosed as diabetic and had history of taking anti diabetic medicine regularly but were not found diabetic during time of data collection. Rest 7.3% was found as diabetic during survey. (Table 2)

Table 3: Effect of different covariates on occurrence of Hypertension and Diabetes: (n=124)

Covariates		Effect on Hypertension			Effect on Diabetes		
		Hyper tension (%)	OR (95% CI)	AOR (95% CI)	Diabetes (%)	OR (95% CI)	AOR (95% CI)
Age	≥60 yr (n=17)	35.3	2.2 (0.7-6.7)		47.1	11.8 (3.3-41.9)*	4.5 (0.9-22.9)
	<60 yr (n=107)	19.6	1		5.6	1	1
Sex	Male (n=69)	20.3	0.8 (0.4-1.9)		13	1.9 (0.6-6.6)	
	Female (n=55)	23.6	1		9.1	1	
Family type	Nuclear (n=48)	12.5	0.4 (0.1-1.1)		12.5	1.4 (0.4-4.5)	
	Joint (n=76)	27.6	1		10.5	1	
Education	Primary or less (n=56)	26.8	1.7 (0.7-4)		19.6	4.7 (1.2-18)*	1.76 (0.34-8.4)
	Above primary (n=68)	17.6	1		4.4	1	1
Current smoking	Present (n=25)	24	1.2 (0.4-3.3)		36	13.4 (3.7-48.6)*	8.7 (2-37.3)*
	Absent (n=99)	21.2	1		5.1	1	1
Current non-smoking tobacco use	Present (n=18)	44.4	3.7 (1.3-10.5)*	29.7 (4-217.5)*			
	Absent (n=106)	17.9	1	1			
Alcoholism	Present (n=10)	20	0.9 (0.2-4.5)		20	2.34 (0.4-12.4)	
	Absent (n=114)	21.9	1		10.5	1	
Extra salt intake in food	Present (n=8)	25	1.2 (0.2-6.4)				
	Absent (n=116)	21.6	1				
Physical Exercise	No (n=113)	22.1	2.2 (0.6-8.3)		11.5	1.16 (0.3-6.9)	
	Yes (n=11)	18.2	1		9.1	1	
BMI	≥ 23 (n=77)	29.9	4.9 (1.6-15.5)*	4.8 (1.4-16)*	13	1.4 (0.4-4.9)	
	< 23 (n=47)	8.5	1	1	8.5	1	
Waist Circumference	≥ 90 cm in male & ≥ 80 cm in female (n=58)	39.7	10.2 (3.3-31.8)*	47.9 (5.5-420.6)*	12.1	2.2 (0.5-9.2)	
	< 90 cm in male & < 80 cm in female (n=66)	6.1	1	1	10.6	1	

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Diabetes	Present (n=14)	42.9	3.2 (0.9-10.1)				
	Absent (n=110)	19.1	1				
Hypertension	Present (n=27)				22.2	2.5 (0.8-8.5)	
	Absent (n=97)				8.2	1	

(* P value <0.05)

Two separate logistic regression model were built in (Table 3) to examine the effect of different covariates on occurrence of hypertension and diabetes. In first model effect of different covariates on occurrence of hypertension was assessed (bivariate analysis) and the covariates which had significant effect were adjusted with all other covariates (multivariate analysis). Use of non smoking tobacco presently, BMI and waist circumference had significant effect on occurrence of hypertension in both bivariate and multivariate analysis (Table 3). In same way in the 2nd model the effect of different covariates on occurrence of diabetes was examined (bivariate analysis) and the variables having significant effect were adjusted with all other covariates (multivariate analysis). Age and education level of participants had significant effect on occurrence of Diabetes only in bivariate analysis but Current smoking status had significant effect in both bivariate and multivariate analysis (Table 3).

Discussion:
Hypertension and diabetes are non-communicable diseases with different side effects which lead to an exponential increasing in mortality. The prevalence and incidence of both diseases are growing dramatically.

In the present study prevalence hypertension and diabetes were 21.8% and 11.3% respectively. In a community based study in Manipur by Ahsana Shah and Mohammad Afzal these prevalence were 18.16 and 16.63 respectively[15]. A study conducted in Pondicherry, South India by Bharati & Pal et.al showed prevalence of diabetes was

8.47% [16]. Another community based study in north India by Midha T. et.al. showed prevalence of hypertension among rural population was 14.5% [17].

When effect of different modifiable risk factor on hypertension is considered in present study it was found that prevalence of hypertension was significantly affected by current non smoking tobacco use, BMI, and waist circumference. The community based study in north India by Midha T. Et.al. showed in the rural population, physical activity (OR = 0.483) and waist circumference (OR = l.094) of the rural population were significantly associated [17]. Increased body mass index, waist hip ratio, social class, physical activity, tobacco use and diabetes were significantly associated with hypertension in the study by Kokiwar Prashant R, Gupta and Sunil S [14]. In the study in Manipur by Ahsana Shah and Mohammad Afzal physical activity was found to be significant determinant of hypertension [15].

Similarly education level and current smoking status were found to be significant modifiable risk factors for diabetes in current study. Study conducted in Pondicherry, South India by Bharati & Pal et.al showed that family history of diabetes and blood cholesterol level was significant determinants of diabetes [16]. The association of Diabetes Mellitus with consumption of alcohol and difference in physical activities was statistically significant in the study in Manipur by Ahsana Shah and Mohammad Afzal [15].

Conclusion:

This study reveals high prevalence of both hypertension and diabetes in a rural area of West Bengal which is definitely a danger sign. It reflects that modern epidemic of NCDs not only affects the urban people but also endangers the health of rural population which constitutes maximum proportion of total Indian population. Rapid change of lifestyle of rural people is the most probable cause. But fortunately most of the risk factors of diabetes and hypertension are modifiable and can be prevented effectively by primordial and primary preventive measure. So there is urgent need for appropriate and effective govt. strategy for promotion and restoration of healthy lifestyle even in rural part of the country.

References:

1. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care.1998 Sep; 21(9):1414-31.
2. Genuth S. A case for blood glucose control. Advances in internal medicine. 1995; 40:573-623.
3. Libby P, Nathan DM, Abraham K, Brunzell JD. Report of the National Heart, Lung and Blood Institute: National Institute of Diabetes and Digestive and Kidney Diseases Working Group on Cardiovascular Complications of DM. Circulation. 2005; 111:3489-93.
4. Paul B, Sapra B, Maheswari S, Goyal RK. Role of Losartan therapy in the management of diabetic hypertension. The Journal of the Association of Physicians of India. 2000; 48: 514-7.
5. National High Blood Pressure Education Program Working Group report on hypertension in diabetes. Hypertension. 1994 Feb; 23(2):145-58.
6. Satman I, Yilmaz T. Population-based study of diabetes and risk characteristics in Turkey. Diabetes Care. 2002; 25:1551-6.
7. Tseng CH. Higher risk of hypertension in indigenous type 2 diabetic patients in Taiwan. Journal of Hypertension. 2006; 24(9):1817-21.
8. Baskar V, Kamalakannan D, Holland MR, Singh BM. The prevalence of hypertension and utilization of antihypertensive therapy in a district Diabettes Population. Diabetes Care. 2002; 25:2107-8.
9. Comaschi M, Coscelli C, Cucinotta D, Malini P, Manzato E, Nicolucci A; SFIDA Study Group--Italian Association of Diabetologists (AMD).Cardiovascular risk factors and metabolic control in type 2 diabetic subjects attending outpatient clinics in Italy: the SFIDA (survey of risk factors in Italian diabetic subjects by AMD) study. Nutr Metab Cardiovasc Dis. 2005 Jun;15(3):204-11.
10. Del Cañizo-Gómez FJ, Moreira-Andrés MN. Cardiovascular risk factors in patients with type 2 diabetes. Do we follow the guidelines? Diabetes Res Clin Pract. 2004 Aug;65(2):125-33. This article on PubMed
11. Baskar V, Kamalakannan D, Holland MR, Singh BM. Does ethnic origin have an independent impact on hypertension and diabeticcomplications? Diabetes Obes Metab. 2006 Mar;8(2):214-9. This article on PubMed
12. Sowers JR, Epstein M, Frohlich ED. Diabetes, hypertension, and cardiovascular disease: an update. Hypertension. 2001; 37(4): 1053-9.
13. Adler AI, Stratton IM, Neil HA, Yudkin JS, Matthews DR, Cull CA Wright AD, Turner RC, Holman RR. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): prospective observational study. British medical journal. 2000; 321(7258): 412-9.

14. Kokiwar Prashant R, Gupta Sunil S. Prevalence of hypertension in a rural community of central India. Int J Biol Med Res. 2011; 2(4): 950 – 953

15. Shah Ahsana, Afzal Mohammad. Prevalence of diabetes and hypertension and association with various risk factors among different Muslim populations of Manipur, India. Journal of Diabetes & Metabolic Disorders 2013, 12:52 doi:10.1186/2251-6581-12-52

16. Bharati Dharamvir Ranjan, Pal Ranabir, Kar Sumit, Rekha R., Yamuna T. V., and Basu Mausumi. Prevalence and determinants of diabetes mellitus in Puducherry, South India. J Pharm Bioallied Sci. 2011 Oct-Dec; 3(4): 513–518.

17. Midha T , Idris MZ, Saran RK, Srivastav AK, Singh SK. Prevalence and determinants of hypertension in the urban and rural population of a north Indian district. East Afr J Public Health. 2009 Dec; 6(3):268-73.