

PREVALENCE OF DIABETES MELLITUS AND HYPERTENSION AMONG INDIAN ADULT FEMALES AGED 20-49 YEARS: A STUDY USING NATIONAL FAMILY HEALTH SURVEY DATA

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Abstract - *Hypertension (HTN) and type-2 diabetes mellitus (DM) are now consider as major public health issues. These two multifactorial disorders are the gateway to the cardiovascular diseases. The coexistence of DM and HTN worsens clinical outcomes. Most of the hypertensive and diabetic patients are living in India. The current study was undertaken to find out current scenario of DM, HTN and their coexistence among Indian females and its variation by rural versus urban location. The data of the National Family Health Survey -4 (NFHS-4) were used for this study. Minimum age was 20 and maximum was 49 years. On the basis of age subjects were divided into three cohort: cohort-1(age limit 20-29 years, cohort-2 (age limit 30-39 years) and cohort- 3 (age limit 40-49 years). In this study we used random blood glucose level and blood pressure data for calculating prevalence of DM and HTN. The people with systole blood pressure (SBP) ≥ 140 mmHg and/or diastolic blood pressure (DBP) ≥ 90 mm Hg were considered as hypertensive. People with random blood glucose level ≥ 200 mg / dl were selected as diabetic. Prevalence of HTN varied from 6.68% to 25.43% for rural females and 17.22% to 42.48% for urban females depending on age cohort. Prevalence of HTN increased with advancing age. Maximum percentage of DM (5.23%) was noted in age cohort-3. Coexistence of HTN and DM also observed among Indian adults females. Prevalence of coexistence increased with ageing. Prevalence of DM, HTN and coexistence of both was more among urban than rural female. 20.1% to 47.4% urban female and 8.2% to 26.9% rural Indian females were either hypertensive and or diabetic. High prevalence rates of HTN and its coexistence with DM were observed among adult Indian females. Advancing age and living in urban areas were found to be important risk factors for these public health issues.*

Keywords: *Diabetes Mellitus, Hypertension, India, NFHS*

INTRODUCTION

Diabetes mellitus (DM) and hypertension (HTN) are the, most common public health issues throughout the world. These two are the gateway of cardiovascular diseases including coronary artery disease, heart disease and strokes. DM is increasing rapidly in epidemic pattern throughout the world. In the year 1995 the global prevalence of DM was 4% and predicted to rise 5.4% by the year 2025(1). According to the International Diabetes Federation (IDF) the total number of diabetic population predicted to be 552 million by the year 2030 from 360 million in the year 2011 (2). DM increases the risk of coronary artery disease (CAD), cerebrovascular disease, neuropathy, nephropathy and retinopathy. It creates huge economic burden to submit treatment cost and loss of man hours.

The prevalence of HTN is rising at an alarming rate. The worldwide total number of hypertensive population predicted to be 1.5 billion by the year 2025 (4) from 1.0 billion in the year 2011 (3). Hypertensive people have seven time's higher risk of cerebrovascular disease and stroke and twofold higher risk of developing coronary artery disease. HTN is associated with hyperinsulinmia in obese diabetic and obese nondiabetic subjects and produces insulin resistance (5).

The coexistence of DM and HTN have been reported in previous studies (6). The prevalence such coexistent varies from 40% to 60% among patients with type2 DM (7, 8) depending on ethnic, racial and social group. In most of the cases HTN may precede the onset of DM. In some cases HTN and DM may be present at the time of initial diagnosis (9). 39% of the patients were hypertensive at the time of diagnosis of DM (10) was reported from Hypertensive Diabetes Study (HDS)-1. In a large prospective cohort study among adults reported that the development of type2 DM was almost 2.5 times more in hypertensive patients than normotensive counterpart (11). People with coexistence of DM and HTN are more prone to develop atherosclerosis, retinopathy and nephropathy (12). Coronary artery disease and left ventricular hypertrophy are more common in diabetic hypertensive patients than the patients suffering from either DM or HTN (13). Previous studies have been reported that that tight HTN control is more effective than glycaemic control in reducing micro vascular complications (14).

India is now considered as diabetic's capital of the world as every fifth person in India is diabetic (15). 50% of Indian diabetic individuals are hypertensive (16). Most of the study was conducted with adults having age above 40 years. The present study was undertaken to assess the burden of HTN and its coexistence with DM in Indian adult females having age limit starting from 20 to 49 using large sample from NFHS-4 data.

SUBJECTS AND METHODS

The data of the National Family Health Survey -4 (NFHS-4) were used for this study. This survey was organized by the Ministry of Health and Family Welfare of the Government of India. One of the dataset of NFHS-4 provides health related information including blood pressure and blood glucose level of 572812 adult females having age limit 20-49 years.

Operational definition: Minimum age was 20 and maximum was 49 years. HTN is defined in adults as a systolic blood pressure of 140 mmHg or higher or a diastolic blood pressure of 90 mm Hg or higher (17). Random blood glucose level of 200 mg/dl or higher was considered as diabetes mellitus (18).

Statistical analysis: All analysis were conducted using STATA. Results are summarized as count and percentage for qualitative variables. Quantitative variables are represented as mean and standard error. $P < 0.05$ was considered statistically significant. Subjects of each age cohort were categorized into following four group:

- Group 1: Subjects without diabetes and hypertension
- Group-2: Subjects with diabetes but no hypertension
- Group-3: Subjects with hypertension but no diabetes
- Group-4: Subjects with hypertension as well as diabetes.

Age wise prevalence of HTN and DM and coexistence of DM and HTN were calculated.

RESULTS

In NFHS data there are 572915 adult females having age limit 20-49 years. Age cohort wise distribution of subjects are given in table-1.

Table 1: Age wise distribution of population

Age cohort	Number of subjects		
	Rural	Urban	Total
1 (20-29 years)	169971	68526	238497
2 (30-39 years)	130663	56145	186808
3 (40-49 years)	103501	44220	147721
Total (20-49 years)	404135	168891	573026

Source: National Family Health Survey

Age group wise blood pressure blood glucose level was represented in table-2. Both SBP and DBP increase with advancing age. Like blood pressure similar trends was noted for blood glucose level.

Table 2: Age group wise blood pressure and blood glucose level of adult Indian females

Age cohort	number	Age (years)	SBP (mm Hg)	DBP (mm Hg)	Blood glucose (mg/dl)
1	238497	26.26 ± 0.01	114.18 ± 0.03	76.81 ± 0.02	114.34 ± 0.13
2	186808	34.07 ± 0.01	119.12 ± 0.04	80.77 ± 0.03	109.37 ± 0.15
3	147721	44.04 ± 0.01	125.88 ± 0.05	83.44 ± 0.04	117.22 ± 0.18
Total	573026	32.56 ± 0.01	118.68 ± 0.03	79.76 ± 0.16	105.55 ± 0.43

Source: National Family Health Survey

Table-3 shows the comparison of blood pressure and blood glucose level between rural and urban Indian females. There is insignificant difference of both SBP and DBP between rural and urban residential females. Blood glucose level differ significantly between rural and urban residence

Table-3: Comparison of blood pressure and blood glucose level between rural and urban residential females

Age cohort	Parameters	Rural	Urban	P value
1	Age (years)	24.23 ± 0.01	24.35 ± 0.01	>0.05
	SBP (mm Hg)	114.70 ± 0.04	113.71 ± 0.06	>0.05
	DBP (mm Hg)	76.91 ± 0.03	76.58 ± 0.04	>0.05
	Blood glucose (mg/dl)	103.17 ± 0.14	107.22 ± 0.30	<0.05
2	Age (years)	34.04 ± 0.01	34.15 ± 0.11	>0.05
	SBP (mm Hg)	119.14 ± 0.05	118.52 ± 0.04	>0.05
	DBP (mm Hg)	80.61 ± 0.03	81.00 ± 0.05	>0.05
	Blood glucose (mg/dl)	107.15 ± 0.15	113.36 ± 0.33	<0.05
3	Age (years)	44.03 ± 0.01	44.05 ± 0.14	>0.05
	SBP (mm Hg)	125.14 ± 0.06	125.62 ± 0.10	>0.05
	DBP (mm Hg)	83.14 ± 0.04	84.13 ± 0.06	>0.05
	Blood glucose (mg/dl)	114.42 ± 0.20	123.60 ± 0.40	<0.05

Source: National Family Health Survey

Fig.1 represents the prevalence of hypertension among young and middle aged women and its variation by rural versus urban location. Hypertension prevalence is high in middle aged women than young aged counterpart. In all age cohort prevalence is high in women live in urban area than those live in rural areas.

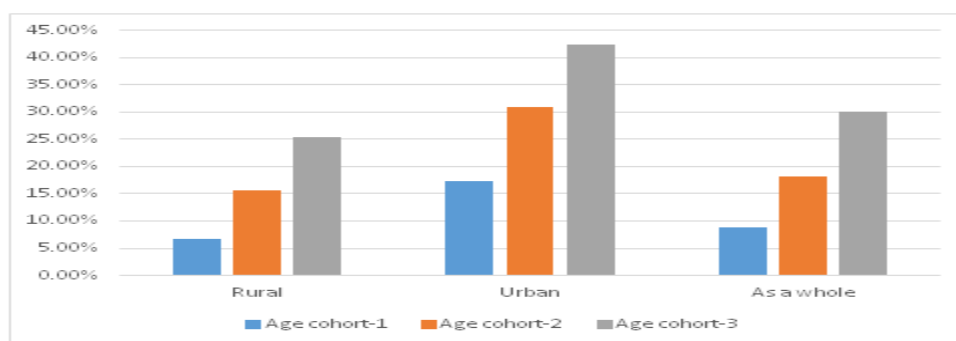


Fig.1: Prevalence of hypertension among Indian adult females

Prevalence of diabetes among adult women represented in fig.2. Prevalence is more among urban than rural counterpart. Prevalence increases with advancing age of both rural and urban population.

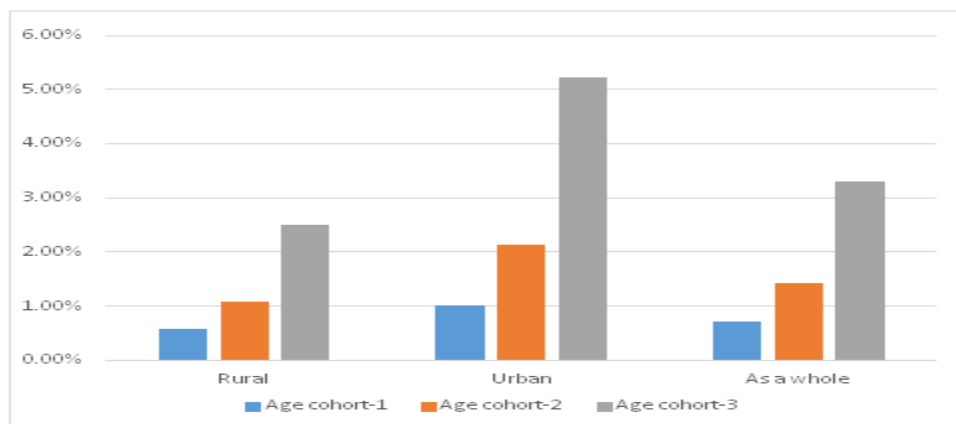


Fig.2: Prevalence of diabetes among Indian adult females

DM and HTN coexist in 0.08% to 2.29% adult female population. Such coexistence increases with advancing age. Prevalence was more among urban than rural counterpart in all age cohorts.

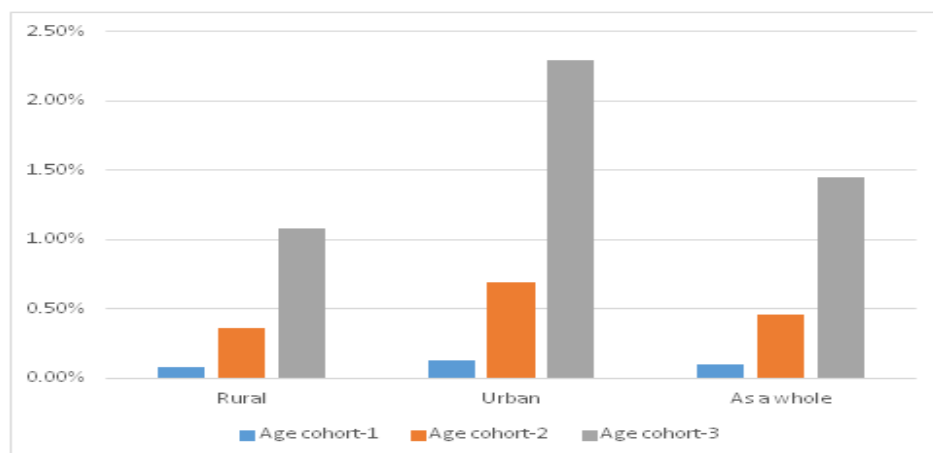


Fig.3: Prevalence of co-existence of hypertension and diabetes among Indian adult females

Blood pressure status among diabetes women were estimated and represented in table-4. ON the basis of age group prevalence of HTN among diabetes women increases with advancing age from 12.64% (age group 20-29 years) to 43.7% (age group 40-49 years). Similar pattern was noted rural and urban population.

Table 4: hypertension status of diabetic adult females of urban and rural India using NFHS- 4 data

Age cohort	% of hypertension among rural diabetic women				% of hypertension among urban diabetic women			
	Only systolic	Only diastolic	Both	Total	Only systolic	Only diastolic	Both	Total
1	1.60	7.20	4.70	13.50	0.86	8.48	3.30	12.64
2	3.51	16.43	12.85	32.79	2.42	17.04	13.04	32.50
3	7.81	10.77	23.89	42.47	8.08	12.19	23.43	43.70

Source: National Family Health Survey

18.1% to 45.4% of urban Indian females were either hypertensive and or type-2 diabetes. Among rural residence 7.2% to 26.9% adult females were suffer in either hypertension or type-2 diabetes (table-5).

Table 5: Compares prevalence of hypertension and diabetes among adult females of urban and rural India using NFHS- 4 data

Age group	Urban				Rural			
	Only diabetes	Only hypertension	Diabetes and hypertension	Total	Only diabetes	Only hypertension	Diabetes and hypertension	Total
20-29	0.89	17.09	0.13	18.11	0.51	6.60	0.08	7.19
30-39	1.44	29.58	0.69	31.71	0.73	15.29	0.36	16.38
40-49	2.94	40.19	2.29	45.42	1.44	24.36	1.07	26.87

Source: National Family Health Survey

DISCUSSION

DM and HTN are two important risk factors for cardiovascular disease including coronary artery disease and strokes. DM is strongly related to life style and economic status (19). Among Indian females having age limit 20-49 years 0.7% to 5.2% are diabetics. Prevalence is more among urban females than their rural counterparts. Prevalence increases with advancement of age of both rural and urban population. Prevalence of hypertension among young and middle aged Indian females are significant. Hypertension prevalence is high in middle aged women (25.4% to 42.5%) than their young aged counterparts (6.7% to 30.3%). In all age cohort prevalence is high in women live in urban area (17.2% to 42.5%) than those live in rural areas (6.7% to 25.4%). Hypertensive people have seven time's higher risk of cerebrovascular disease and stroke and twofold higher risk of developing coronary artery disease (14). Thus prevalence of mortality and morbidity may be high from HTN among Indian females.

Among Indian adult diabetes females prevalence of HTN increases with advancing age from 12.64% (age group 20-29 years) to 43.7% (age group 40-49 years). Thus the patient with DM have a greater chance of having HTN (20). DM and HTN coexist in 0.08% to 2.29% adult female population having age limit 20-49 years. People with coexisting DM and HTN are at increased risk of developing atherosclerosis, nephropathy and neuropathy (21). It was reported that lowering blood pressure in the high risk patients with DM can reduce rate of death from stroke, can slow the progression of nephropathy and reduce overall mortality (22).

CONCLUSION

Prevalence levels of HTN and DM is significantly high in young and middle aged females in spite of variation between rural and urban location. Rapid urbanization, Improve health care expenditure and increase life expectancy may consider as risk factors for high prevalence of DM and HTN. Both DM and HTN often comes hand in hand with each other. HTN may precede the onset of DM. The patient with DM have a greater chance of having affected with HTN. For public health coexistence of DM and HTN is a very adverse combination than either DM or HTN alone. Preventing HTN, DM and their coexistence is a great challenges in developing country like India. Two most crucial approaches to tackle DM and HTN are early detection and reduction of risk factors.

REFERENCES

1. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. *Diabetes Care*. 1998; 21(9): 1414-1431.
2. Unwin N, Whiting D, Guariguata L, Ghyoot G, Gan D. Editors. *Diabetes Atlas*. Brussels, Belgium: International Diabetes Federation. 2011.
3. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. *Lancet*. 2005; 365 (9455): 217-223.
4. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL, et al. The seventh report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure: the JNC 7 report. *The J Am Med Asso*. 2003; 289(19): 2560-2572.

5. Modan M, Halkin H, Almog S, Lusky A, Eshkol A, Shefi M, et al. Hyperinsulinemia: a link between hypertension, obesity and glucose intolerance. *J Clin Invest.* 1985; 75: 809.
6. Lago RM, Sing PP, Nesto RW. Diabetes and hypertension. *Nature Clinical Practice Endocrinol Metab.* 2007; 3(10): p. 667.
7. Sowers JR, Epstein M, Frohlich ED. Hypertension and cardiovascular disease an update. *Hypertension.* 2001; 37(4): 1053-1059.
8. Arauz-Pacheeco C, Parrott MA, Raskin P. The treatment of hypertension in adults patients with diabetes. *Diabetes Care.* 2002; 25(1): 134-147.
9. Klein R, Klein BEK, Lee KE, Cruickshanks KJ, Moss SE. The incidence of hypertension in insulin dependent diabetes. *Arch Internal Med.* 1996; 156(6): 622-627.
10. Turner R, Stratton I, Fright V, Holman R, Manley S, Cull C. Hypertension in diabetes study (HDS)-1. Prevalence of hypertension in newly presenting type 2 diabetes patients and the association with risk factors for cardiovascular and diabetic complications. *J Hypertension.* 1993; 11(3): 309-317.
11. Berraho M, El Achhab y, Benslimane A, El Rhazi K, Chikri M, Nejjari C. Hypertension and type-2 diabetes: a cross sectional study in Morocco (EPIDIAM study)> *Pan African Med J.* 2012; 11: 52.
12. Stamler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors and 12-yr cardiovascular mortality for men screened in the multiple risk factor intervention trial. *Diabetes Care.* 1993; 16(2): 434-444.
13. Grossman E, Messerli F. Hypertension and diabetes. *Advance in Cardiology.* 2008; 45: 82-106.
14. Mohan V, Seedat YK, Pradeepa R. The rising burden of diabetes and hypertension in Southeast Asian and African regions: need for effective strategies for prevention and control in primary health care setting. *Int J hypertension.* 2013; 2013: 409083.
15. Shashank R Joshi, Rakesh M Parikh. India-Diabetes Capital of the world: now heading towards hypertension. *JAPI, Editorial.* May 2007, 55: 323-324.
16. Singh RB, Beegom R, Rastogi V, Rastagi SS, Madhu V. Clinical characteristic and hypertension among known patients of non-insulin dependent diabetes mellitus in North and South Indians. *Diabetic Association of India.* 1996; 36: 45-50.
17. Weber MA, Schiffrin EL, White WB, Mann S, Lindholm LH, Kenerson JH, et al. Clinical practice guidelines for the management of hypertension in the community a statement by the American Society of Hypertension and the International Society of Hypertension. *J Hypertens.* 2014; 32(1): 115-132.
18. International Diabetes Federation. *IDF Clinical Practice Recommendations for Managing Type-2 Diabetes in Primary Care.* Brussels, Belgium: International Diabetes Federation; 2017.
19. King H, Rewers M. Diabetes in adults is now a third world problem. World Health Organization ad hoc diabetes reporting group. *Ethnicity & Disease.* 1993;3 (supplement) S67-S74.
20. Cappuccio FP, Barbato A, Kerry SM. Hypertension, diabetes and cardiovascular risk in ethnic minorities in the UK. *British J Diabetes Vascular Dis.* 2003; 3(4): 286-293.
21. Stmler J, Vaccaro O, Neaton JD, Wentworth D. Diabetes, other risk factors and 12 year cardiovascular mortality for men screened in the multiple risk factor intervention trial. *Diabetes Care.* 1993; 16(2): 434-444.
22. Curb JD, Pressel SL, Cutler JA, Savage PJ, Applegate WB, Black H, et al. Effect of diuretic-based antihypertensive treatment on cardiovascular disease risk in older diabetic patients with isolated systolic hypertension. *J American Med Asso.* 1996; 276(23): 1886-1892.