Co-existence of Diabetes Mellitus and Hypertension in Rural-Urban Areas of Aligarh

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Abstract: Co-existence of Diabetes with hypertension in patients is usually well-known phenomenon nowadays. The burden of hypertension is 1.5-2.0 times greater among diabetics in comparison to non-diabetics, while nearly one-third of the hypertensive patients develop diabetes later in their life. Several findings showed that diabetes and hypertension are increasing enormously in India. Thus the present study aimed to determine the prevalence of hypertension among type 2 diabetic patients. The present descriptive cross-sectional study conducted on 160 patients aged 20 years and above from Jawaharlal Nehru Medical College and Hospital (JNMCH) Aligarh with minimum six-months of duration from August 2017 to January 2018. Stratified random sampling technique was used to select study subjects. A self-prepared questionnaire cum interview schedule was used to collect the information regarding demographic condition, anthropometric data, and medical history. Blood pressure was measured by using sphygmomanometer. Diagnostic criteria were based on Joint National Committee (JNC) 7 guideline for hypertension and world Health Organization International Diabetes Federation (WHO/IDF) 2006 for diabetes. Data analysis for Chi-square and proportion test was done using SPSS version 16. Out of total 160 patients, 100(62.5%) were only diabetic and co-prevalence of diabetes and hypertension were found among 60 (37.5%) diabetic patients. Mean age was 50.21±10.53 years. The mean HbA1c % level was 8.51±1.98% among all diabetes patients. 43 (26.9%) cases were found in the rural area while 117 (73.1%) cases in urban areas and coexistence of diabetes hypertension were higher in urban 47 (29.4%) than rural 13 (8.1%) among all diabetes patients. Chi-square test statistics of 5.372 (sig value>0.05) indicates that there is no significant association between rural-urban area and control of HbA1c% level of diabetes and hypertension patients. There is urgent need to overcome the rising burden of these intertwined diseases among both areas.

Keywords: prevalence, Diabetes mellitus, hypertension, type 2 diabetes, coexistence, urban rural areas

I. Introduction:
Diabetes mellitus (DM) and hypertension (HTN) both are emerging risk factors for coronary artery disease (CAD), heart failure, and cerebrovascular disease and also play a role in major clinical and public health issues around the world ¹. Despite the fact DM and HTN are not like cancer and stroke that are top leading cause of death but due to increasing trends, these two chronic diseases draw attention from the general population ². The prevalence of diabetes was 171 million in 2000 and it was predicted to increase 366 million by 2030 similarly the quantity of adult hypertension is anticipated to increase by 60% to a sum of 1.56 billion individuals by 2025 ³. Coexistence of diabetes and hypertension in patients is usually a well-known phenomenon now a days and burden of hypertension is 1.5-2.0 times greater among diabetics in comparison to non-diabetics while nearly one-third of the hypertensive patients develop diabetes later ⁴. Prevalence of HTN in diabetic persons is continuously increasing in different population ⁵. In American Indian and Alaska Native communities the prevalence of clinical HTN and its coexistence with DM showed 37% diabetic with HTN ⁶. Coexistence of DM and HTN among type 2 DM was also investigated by International Diabetic Federation South-East Asia (SEA) region. The study showed that about 50% of diabetic people have hypertension ⁷. In 2012 Screening India’s Twin Epidemic (SITE) Study conducted in 10 Indian state showed coexistence of DM and HTN to be 20.6% and cautioned that the significant dual burden of DM and HTN is on the rise in India ⁸. Worldwide epidemic proportion of diabetes mellitus is continuously increasing. WHO defines Diabetes as a chronic metabolic disorder result from an inadequate production of insulin from pancreas or if the body is not able to use insulin properly, insulin is the hormone which regulates blood glucose ⁹. If hyperglycemia is noted dummy for a long duration, it can destroy various body organs resulting in disability and life threaten disease complications such as cardiovascular, neuropathy, renal disorder and eye complications which cause diabetic
retinopathy and visual impairment\textsuperscript{14}. Over the past few years, number of cases with diabetes is increasing enormously. The age-standardized prevalence of adult’s diabetes was 422 million in 2014 as compared 108 million in 1980. It indicates that the worldwide burden of diabetes from 1980 has nearly doubled and the prevalence in adult population rises from 4.7% to 8.5%\textsuperscript{16}. According to diabetes atlas 2017, 425 million people about 8.8% adult were diabetes. Due to increasing tendency it is predicted that there will be 629 million people with diabetes by 2045. In 2017, the prevalence of diabetes is highest in China (114.4 million) followed by India (72.9 million) and united state (30.2 million) due to ageing, urbanization, increased prevalence of obesity and sedentary lifestyles. The number of cases may increase in coming years and it is predicted that the burden of diabetes will be up to 134.3 million people in India with the maximum increase by 2045 and unpleasantly India will become a diabetes capital of the world\textsuperscript{11}. According to Indian council of Medical Research (ICMR) prevalence of diabetes was 62.4 and pre-diabetes was 77.2 million in 2011\textsuperscript{12}. In 2017, urban prevalence is much greater than rural (10.2% vs. 6.9%). About two third of people with diabetes found in urban areas are due to global urbanization. It is predicted that prevalence will increase three fourth (472, 6) million by 2045\textsuperscript{11}. Due to cardiovascular diseases death rate continuously on rise, 2-4 times more in people with diabetes rather than those without diabetes\textsuperscript{13}. DM exerts a significant burden resulting in increased morbidity and mortality, decreased life expectancy, and reduced quality of life, as well as individual and national income losses\textsuperscript{14}.

Additionally, hypertension is a major health problem in both economically developed and developing countries\textsuperscript{14}. Hypertension has already affected one billion people globally. It is estimated that about 9 million people dies due to raised blood pressure every year. A silent and invisible killer hypertension is one of the risk factors for cardiovascular disease\textsuperscript{15}. A report from WHO (2008)attributed causes of death worldwide to be approximately 17 million or nearly one third of total death due to cardiovascular diseases and among these 9.4 million deaths each year due to complication of raised blood pressure\textsuperscript{16,17}. Among all part of WHO region, prevalence of hypertension is highest in Africa and lowest in America at 30% and 18% respectively. Higher prevalence found among men (21%) in comparison to women 16 %\textsuperscript{16}. HTN is an important risk factor for attributable burden of diseases. The study reported that among all the regain the condition is very critical in Southeast Asian region\textsuperscript{16,18}. The increased proportion of hypertension makes it a significant cause of mortality and morbidity. Hypertensive individual generally develop cardiovascular disease with two times, congestive heart failure with 4 times and cerebrovascular disease and stroke with 7 times higher risk in comparison to normotensive people\textsuperscript{14}.

Evidences shows that more than 75% diabetic individuals also have raised blood pressure and evidence of insulin resistance are found among the patients with hypertension. Significant overlap are seen in these intertwined situations of diabetes and hypertension that contributes a common risk factors of ethnicity, familial, high lipid level and lifestyle factors, and complications\textsuperscript{22}. In 2007, according to centers for disease control and prevention, nearly 74.5 million worldwide and 23.6 million adults in the united states are affected by hypertension and diabetes respectively, and around 75% of patients with diabetes have coexistent hypertension\textsuperscript{22}. Coexistence also increased the risk of CVD up to 75% which additionally contributes to the overall morbidity and mortality of an already high-risk population. India contributes a lion’s share of the diabetic and hypertensive population\textsuperscript{5}. Thus the objective of the present study is to estimate the coexistence of diabetes mellitus and hypertension among the rural-urban area of Aligarh.

II. Material and Methods:

The hospital-based cross-sectional descriptive study was carried out on among 160 patients of diabetes age 20 years and above visiting outpatients’ clinic in endocrinology section of Jawaharlal Nehru Medical College and Hospital, Aligarh over a period of 6 months. Aligarh city is a part of the northern India and district of Uttar Pradesh. Uttar Pradesh is the most populous state in India with the population of 199,812,341. Aligarh constitute of 3,650 sq.km area with the population of 3,673,889 among these 1,951,996 are males while 1,721,893 are females. Aligarh urban population comprised of 12, 16,581 (33.11%) of total and 24, 57,268 (66.89%) cover by rural population\textsuperscript{23}. Aligarh population is of mixed nature with people of different religion, occupation, and socioeconomic level.

Prevalence of diabetes among adults from previous data was found to be 11.3%\textsuperscript{24}. A sample size of 160 was calculated for the diabetic by using the formula 4pq/l\textsuperscript{25}with 5 % relative error. The population of the study was heterogeneous because its elements are not similar to each other in all aspect, like gender, age, socioeconomic status, rural-urban area, diabetes, and hypertension. Thus stratified random sampling technique was used to select study subjects by dividing a heterogeneous universe into more and more homogenous one within each stratum. Stratification was based on their condition of disease (diabetes and hypertension). After that random selection were made from each stratum\textsuperscript{22}.

Ethical clearance for conducting the study was approved by the institutional ethics committee, Jawaharlal Nehru Medical College and Hospital, Aligarh Muslim University, Aligarh. A signed informed verbal consent was collected from all the patients. A valid and reliable (Cronbach’s alpha=0.896) self-prepared questionnaire cum interview schedule was used to collect data regarding demographic condition, anthropometry, medical history, and detailed dietary pattern which includes dietary intake and frequency of food consumption of participants. Both
quantitative and qualitative data were obtained for the study. Blood sugar level including FBS, PP, and HbA1c was recorded from their previous records. DM was defined according to the WHO recommendations as FBS ≥126 mg/dl or oral glucose tolerance test OGTT2 ≥200 mg/dl. Blood pressure was measured by using standardized sphygmomanometer by auscultation method in which subject was in a sitting position and inflatable cuff was placed on the upper arm at the level of the heart. Blood Pressure (BP) readings were recorded after 15 minutes of the gap. Two readings were recorded and average calculated values of both readings were used for final analysis. Hypertension was also diagnosed on the basis of the use of antihypertensive drugs or prescribed antihypertensive drugs from clinic regardless of their recent blood pressure or if the blood pressure (systolic/diastolic) was more than 140/90 mm of Hg as per JNC VII criteria. Data analysis was done using SPSS version 16. Proportion test was used to find out the prevalence and chi-square test was used to find the association between categorical variables.

III. Result and discussion:

Table 1 shows that among 160 patients of diabetes, 100 (62.5%) patients were diabetic only and co-prevalence of diabetes mellitus and hypertension noted in 60 (37.5%) with the mean age of 50.21±10.53 years. The Mean HbA1c % level was 8.51±1.98 % among all diabetics. Mean systolic and diastolic blood pressure of diabetics hypertensive was 136.58±27.0 SD and 92±23.3 SD respectively. The result revealed that 43 (26.9%) cases were found in rural area while 117 (73.1%) cases in urban areas and coexistence of diabetes hypertension were higher in urban 47 (29.4%) than rural 13 (8.1%) among all diabetic patients. A significant association was found among diabetes and hypertension in the patients.

Table 1: Prevalence of diabetes hypertension among diabetes patients

<table>
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<tr>
<th>Area of Subjects</th>
<th>Count</th>
<th>% within Area of Subjects</th>
<th>Count</th>
<th>% within Area of Subjects</th>
<th>Count</th>
<th>% within Area of Subjects</th>
<th>% of Total</th>
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<tbody>
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<td>% within Area of Subjects</td>
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<tr>
<td>Urban</td>
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<td>% within Area of Subjects</td>
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HBA1c % is used as an indicator of glycemic controls among overall all patients of diabetes mellitus. The Glycosylated hemoglobin (HbA1c %) level was categorized according to ICMR guideline. Table 2 revealed that among overall patients of diabetes, majority of patients were having unsatisfactory control of (HbA1c>8%) i.e. 84 (52.5%).Diabetes control (HbA1c<7.0%) was achieved by only one forth 40 (25%) of patients and 36 (22.5%) of patients showed satisfactory control of (HbA1c 7-8%) level.

Table 2: Association of control of HbA1c% with rural urban area of patients

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<th>Area of Subjects</th>
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<th>Urban</th>
<th>Total</th>
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<tbody>
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<td>72.6%</td>
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<tr>
<td>Count</td>
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<td>67.4%</td>
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<tr>
<td>% within Area of Subjects</td>
<td>100.0%</td>
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Similarly, in rural areas majority of patients showed unsatisfactory control of (HbA1c <8%) 29 (67.4%) and satisfactory (HbA1c 7-8%) and ideal control of (HbA1c<7%) were found be 6(14.0%) and 8(18.6%) respectively. In urban area, 55 (47%) were noted for unsatisfactory control of (HbA1c <8%) and around one forth 30 (25.6%) were found to be satisfactory (HbA1c 7-8%) and only 32 (27.4%) patients showed ideal range of (HbA1c<7%).Chi square test statistics of 5.372 (sig value>0.05) indicates that there is no significant association between rural urban area and control of HbA1c% level of diabetes and hypertension patients.
According to table 3, the degree of hypertension among 60 diabetic hypertensive patients, 25 (41.7%) patients were in Prehypertension stage and number of patients with stage I and stage II hypertension were recorded 19 (31.7%) and 16 (26.7%) respectively.

IV. Discussion:
The present study was conducted first time in Aligarh city regarding co-occurrence of diabetes mellitus and hypertension. Very little information is available regarding co-prevalence of these two giant disorders in the northern part of our nation. Hypertension in diabetes mellitus is a very common incident and a significant association was found among diabetes and hypertension in the patients of Aligarh city. The present study revealed co-existence of diabetes mellitus and hypertension to be 60 (37.5%) among overall diabetes participants compared to 13.8% in Manipuri diabetics and 25.6% in Karnataka. Another study conducted in Madhya Pradesh reported prevalence of hypertension in type 2 diabetes patients to be 49% Similarly a higher rate of prevalence (64.4%) was found by Mysore study which reflect higher degree in comparison to Aligarh progression. The present study is agreement with the southwest China study conducted in 2017 and the study conducted in American Indian and Alaska Native communities which noted coexistence 32.0% and 37% respectively. Several international studies also revealed co-prevalence of DM And HTN at peak level 75% in united states, 70.4% in Morocco and slightly lower in Nigeria 54.2%. The proportion of hypertension relatively lower in the present study may possibly be due to more number of hypertensive patients in middle adulthood than late or due to lower prevalence of hypertension (7.3%) reported in Aligarh city as per NFHS 4 findings. The difference in the frequency of hypertension among different nations could be because of various approaches for inspection, people attributes, and cultural imbalance.

Findings of the present study indicate that prevalence of diabetes was higher in urban area 117 (73.1%) than rural area 43 (26.9%). In 2017 International diabetes federation reported emerging differences in the prevalence of diabetes have been found among different communities globally. About two third of people with diabetes found in urban areas are mainly due to global urbanization and the number will increase to three fourth (472, 6) million by 2045. Urban prevalence is much greater than rural (10.2% vs. 6.9%) Similar results are also reported by researcher in India regarding rural-urban prevalence of diabetes in 2016. Most recent national family health survey 4 data showed that overall prevalence of diabetes in India was 10.3% in which prevalence of urban area is greater than rural area i.e.11.9% and 9.2% respectively. High frequency of prevalence in urban area than rural area was also observed among most of the states of India as per NFHS 4. Similar results in sub-Saharan Africa and in the Astana region, Kazakhstan (2016) revealed that diabetes was highly prevalent, more in urban residents than in rural.

The result of the present study that unsatisfactory control of (HbA1c>8%) was higher among rural people than urban people is consistent with findings reported in a study by Unadiket al (2017). The findings of this study that there is no significant association between rural and urban areas in control of HbA1c% level of diabetes and hypertension patients is found to be consistent with the findings reported by Majety et al (2014), but is in contrary to findings reported by Du, G et al (2016).

V. Conclusion:
Change in lifestyle components and rising burden of diabetes mellitus and hypertension both are significantly correlated. More than 1.3 billion people are affected by these two “major killer” diabetes mellitus and hypertension prevalence is also high in middle-aged and elderly around all geographic and socio-economic groups in India. Prevalence-based studies are not surveyed adequately among many states in India. Furthermore multi-dimensional and multi-sectoral in depth studies are required to accumulate more knowledge for supporting the facts as a reason for techniques and projects to handle the diabetes epidemic. There is urgent need to overcome the rising burden of these intertwined diseases.

References:


