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ORIGINAL RESEARCH

Prevalence of hypertension and determinants of poor blood pressure control in patients with Type 2 diabetes mellitus attending a Tertiary Clinic in Jammu north India

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Abstract

Aim: Prevalence of hypertension and determinants of poor blood pressure control in patients with Type 2 diabetes mellitus attending a Tertiary Clinic in Jammu North India

Material and Methods: A cross-sectional research was done at a hospital among diabetes co-morbid hypertension patients who met the inclusion criteria. This research covered 100 diabetic hypertensive individuals. Researchers drew on relevant literature to create a structured data gathering questionnaire. The different factors were determined by patient record review and self-report.

Results: The mean SBP was 150.58±11.85, and the mean DBP was 90.25±7.58. Approximately 25% of research participants had a controlled SBP, and approximately 27% had a controlled DBP.

Conclusions: Blood pressure management to target goal was unsatisfactory, with almost two-fifths of pharmacologically treated hypertensive diabetes individuals achieving it. Diabetic patients who were older, female, and had had hypertension for a long time were more likely to have uncontrolled blood pressure.

Keywords: Hypertension, Diabetes mellitus, Poor blood pressure control

Introduction

In terms of both the global burden of illness and worldwide mortality, hypertension is the primary culprit.[1] Hypertension is described as having arterial blood pressure (BP) that is consistently high, with a systolic reading of 140 mmHg or higher and/or a diastolic reading of 90 mmHg or higher.[2,3] Although for patients aged 60 years or older, an SBP up to 150 mmHg and a DBP of less than 90 mmHg is now regarded as accept- able these numbers apply to all adults older than 18 years and indicate the level of BP at which the institution of therapy reduces hypertension-related morbidity and mortality.[4] In 2014, high blood pressure (BP) affected around 22 percent of persons worldwide who were 18 or older[5] and that number is expected to climb to more than 29 percent by 2025.[6] In 2014, Africa had the world's highest rate of hypertension prevalence, at 30 percent among adult males and females.[7] Sub-Saharan Africa is seeing a dramatic rise in the incidence of hypertension.[8] Sub-Saharan Africa has a frequency of between 25.4% and 41.1% in males and 27.2% and 38.7% in females.[9-11] It is believed that between 20% and 30% of the population has it.[12] Other cardio-metabolic

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disorders, such as diabetes, dyslipidemia, insulin resistance, glucose intolerance, and obesity tend to cluster with hypertension increasing the risk of cardiovascular disease.[10-12]
Atherosclerotic vascular problems in people with diabetes are complex, with several overlapping causes and accelerators.
Among those with diabetes, hypertension is the leading independent risk factor for cardiovascular disease.[4] Having both diabetes and hypertension substantially quadruples the chance of developing cardiovascular disease. The development of hypertension in diabetics has been linked to a number of variables, including renal failure, hyperinsulinemia, extracellular fluid volume expansion, and arterial stiffness.[3] Clinical investigations have shown that people with cardiovascular disease or a comparable condition benefit from having their blood pressure lowered to less than 140/90 mmHg (diabetics also benefit from this goal).[7] Additionally, it is suggested that LDL-C levels be lowered to below 100 mg/dL (2.5 mmol/L). The therapeutic aims are not always achieved.[7]
Treatment of hypertension might include both drug therapy and changes in lifestyle.[2] Multiple lifestyle changes have been demonstrated to lower blood pressure. These methods not only aid in hypertension management, but also in the control of a wide variety of other risk factors for cardiovascular disease.[3] All patients, regardless of hypertension stage, should be encouraged to make positive lifestyle changes, such as quitting smoking, controlling their weight, lowering their salt intake, increasing their exercise levels, and decreasing their alcohol use.[13] Changes in lifestyle are best seen as a supplement to pharmacological treatment rather than a replacement.[7] The severity of hypertension and the existence of convincing indicators are key factors in determining whether or not drug therapy is warranted.[2] Treatment of individuals with stage 1 hypertension should often begin with a first-line antihypertensive medication or a combination of two medicines. Patients with stage 2 hypertension are encouraged to use a combination of at least two first-line antihypertensive medications.[4] According to the Joint National Committee's eighth report, a thiazide-type diuretic, calcium channel blockers (CCBs), angiotensin-converting enzyme inhibitors (ACEIs), or angiotensin receptor blockers (ARBs) should be used for initial antihypertensive treatment in the general non-black population, including those with diabetes; in contrast, in the general black population, including those with diabetes, a thiazide-type diuretic Antihypertensive therapy with an angiotensin-converting enzyme inhibitor (ACEI) or an angiotensin receptor blocker (ARB) should be used as primary (or adjunctive) treatment for patients with CKD to enhance renal outcomes.[4] The advantages from using any of the first-line medication groups are similar.[14-17]

Material and Methods

Sample size: 100
Study Design: A cross sectional study
Study duration: 6 months (1st February 2022 to 1st August 2022)

A cross-sectional research was done at a hospital among diabetes co-morbid hypertension patients who met the inclusion criteria from 1st February 2022 to 1st August 2022. This research covered 100 diabetic hypertensive individuals.
Exclusion criteria: T1 DM, diabetes secondary to known medical condition, pregnant women.

Operational definitions:
Hypertension was defined as SBP ≥140 mmHg and/or DBP ≥90 mmHg, or lower in individuals who were already on antihypertensive medication

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Target BP control was defined as BP <130/80 mmHg
Obesity was defined as BMI ≥30.0
Poor glycemic control was defined as a serum glycated hemoglobin (HbA1c) level ≥7%

Researchers drew on relevant literature to create a structured data gathering questionnaire. The different factors were determined by patient record review and self-report.
Data was input into a computer using the Epi Data version before being exported to the Statistical Package for Social Science (SPSS) version 25.0 for analysis. The Student's t test was used to compare mean values, whereas the Pearson's Chi-square test was used to compare proportions. The crude and adjusted effects of potentially significant predictors of the target outcome were assessed using multivariable logistic regression analysis. Continuous and categorical data were reported as percentages and mean standard deviations, respectively. The chi-square test was used to examine categorical data and descriptive statistics were used to assess patient characteristics such as means, medians, and percentiles. A statistically significant p-value of 0.05 was considered.

Results

Behavioral and socio-demographic factors This research had 100 individuals in total. Males made up the majority of research participants (51%). The respondents' average weight was 66.96±10.36. The average age of the respondents was 51.25±6.39, with 51 (51%) under the age of 50 and 83 (83%) married. Among the individuals, 16 (16%) were current smokers, 18 (18%) indicated current alcohol usage, 27 (27%) had no formal education, and 30 (30%) were jobless. According to a self-reported assessment of adherence using the eight item MMMAS, about one-third of the study participants were found to be adherent to their medicine (Table 1).

Participants' clinical characteristics

According to the clinical features of the patients, 18(18%) had a family history of hypertension and 14(14%) had a family history of diabetes. For more than five years, 47% and 48% of patients, respectively, had hypertension and diabetes. More over half of the patients were followed up on a monthly basis. 16(16%) of the 33(33%) individuals with co-morbid diseases had an eye issue. The average time since hypertension was diagnosed was 7.58± 2.69 years. In terms of physical activity, 43 (43%) of individuals reported engaging in physical activity, with 63 (63%) being physically active. 89 (89%) of research participants decrease salt in their diet (Table 2).

Medication for hypertension and diabetes

The total use of antihypertensive medications revealed that the majority of patients (68%), were on dual antihypertensive drugs. About one-third of the patients were taking enalapril and amlodipine, with the rest taking hydrochlorothiazide and enalapril (18%). Approximately 8% of patients were on triple antihypertensive medicines. Approximately two-thirds of the patients were on insulin.

Blood pressure regulation in diabetics with hypertension

The mean SBP was 150.58±11.85, and the mean DBP was 90.25±7.58. Approximately 25% of research participants had a controlled SBP, and approximately 27% had a controlled DBP.

The factors that contribute to uncontrolled blood pressure in diabetes individuals

Both univariate and multivariate logistic regression approaches were used to study the relationship between independent factors and the dependent variable. Age, gender, marital

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status, education level, alcohol intake, smoking, duration with hypertension (HTN), frequency of follow up, blood sugar (glycemic control), comorbidities, and medication adherence all showed an association with BP control in univariate logistic regression analysis and were thus used in multivariate analysis. The multivariate analysis revealed that age was substantially linked with uncontrolled BP, with patients aged 50 years being twice as likely (AOR = 2.16; 95% CI: 2.75-7.89; P = 0.003) as those aged <50 years. Patients with tertiary level education were 75% less likely to have uncontrolled BP than those with no formal education (AOR = 0.27; 95% CI: 0.14-0.64; P = 0.04). Gender was also linked to uncontrolled blood pressure, with female patients 1.42 times more probable (AOR = 1.52; 95% CI: 1.29-2.24; P = 0.033). Patients with a diagnosis of hypertension for more than 5 years were almost three times (AOR = 2.98; 95% CI: 1.37-8.41; P = 0.01) more likely to have uncontrolled BP than those with a diagnostic of 5 years. Patients who had their blood pressure measured monthly were 25% less likely to have uncontrolled BP than those who had their blood pressure measured every three months (AOR 0.75; 95% CI: 0. 73-0.88; P = 0.03), and non-adherent patients were two times more likely to have uncontrolled BP than adherents (AOR 2.15; 95% CI: 2.71-9.43; P = 0.01). Patients with uncontrolled blood sugar (poor glycemic control) were almost twice as likely as those with managed blood sugar (AOR = 1.75; 95% CI: 2.24-3.42; P = 0.03). (Table 4)

Table 1 demographic profile of the patients

Age(years)	Below 35	14	14
	35-50	35	35
	Above 50	51	51
Weight	66.96±10.36		
Gender	Male	51	51
	Female	49	49
Educational status	Illiterate	27	27
	Up to10^{th}	25	25
	Up to 12^{th}	21	21
	Graduate	27	27
Monthly Income	Low	45	45
	Average	35	35
	High	20	20
Area	Rural	30	30
	Urban	70	70
Job	Private	25	25
	Semi government	20	20
	Government	25	25
	No Job	30	30
Living status	Living with immediate family	86	86
	Living with Extended family	8	8
	Living alone	4	4
	Other	2	2
Smoker		16	16
Alcoholic		18	18
Adherence level	Adherent	74	74
	Non-adherent	26	26

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Table 2 Baseline clinical characteristics of study participants

Parameter		Frequency	Percentage
Family history of hypertension	Yes	18	18
	No	82	82
Family history of Diabetes	Yes	14	14
	No	86	86
Time since hypertension diagnosis (years)	≤ 1	19	19
	2–5	34	34
	≥ 5	47	47
Time since diabetes diagnosis(years)	≤ 1	16	16
	2–5	36	36
	≥ 5	48	48
Frequency of follow-up(refill)	Monthly	54	54
	Every 3 months	31	31
	Every 4 months	15	15
Do physical activities	Yes	43	43
	No	57	57
Physical active	Yes	63	63
	No	37	37
Reduce salt intake	Yes	89	89
	No	11	11
Blood glucose	Controlled	66	66
	Uncontrolled	34	34
Co morbidity	Heart failure	5	5
	HIV/AIDS	4	4
	CKD	4	4
	Asthma	3	3
	Retinopathy	16	16
	Other	1	1

Table 3 Poor blood pressure control among hypertensive diabetics

	Mean	Controlled	Uncontrolled
SBP	150.58 ± 11.85	25	75
DBP	90.25 ± 7.58	27	73
Both		25	75

Table 4 Determinants of uncontrolled blood pressure among study participants

Parameter		Blood Pressure		COR (95 %CI)
		Controlled=25	Uncontrolled=75	
Age	Below 50	5	44	1.00
	≥ 50 years	20	31	2.65 (1.82, 4.85)*
Gender	Male	15	36	1.00
	Female	10	39	1. 73 (0. 88, 2. 80)*
Education level	illiterate	5	22	1.00
	10^{th}	10	15	2.32 (1.90, 2.94)
	12^{th}	5	16	1. 25 (0. 88, 2. 45)
	Graduate	5	22	0. 37 (0. 44, 1. 22)*
Area	Rural	10	20	1.00

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	Urban	15	55	0. 38 (1. 44, 11. 85)
Monthly income	Low	10	35	2.27 (4.52, 6.25)
	Average	5	30	1.16 (1.34, 3.25)
	High	10	10	0.79 (1.89, 3.45)
Job	Private	10	15	1.00
	Semi Government	7	13	0. 38 (0. 44, 1. 85)
	Government	4	21	0.77 (0.37, 1.76)
	Unemployed	4	26	1.16 (0.70, 1.95)
Smoking	Yes	6	10	1.41 (0.85, 2.38)*
Alcohol intake	Yes	4	14	1.76 (0.56, 5.85)*
Adherence	Adherent	20	54	1.00
	Non-adherent	5	21	2. 47 (2.81, 8.75)*

Discussion

Diabetes-related hypertension is a well-known risk factor for cardiovascular disease.[18] The Joint National Committee's 8th Report on the prevention, detection, assessment, and management of excessive blood pressure has recommended that BP measurement in diabetes patients should be 140/90 mmHg or below.[4] Diabetes patients have double the rate of hypertension as the general population. Hype7.58rtension has been linked to diabetic micro- and macrovascular problems.[19] To lessen the risk, hypertension must be correctly and immediately identified, and the patient must get proper therapy. New recommendations, however, have been released to emphasise the significance of rigorous blood pressure management in diabetics.[2]

The research found that only 44% of 100 hypertensive diabetics reached the officially recommended blood pressure for diabetes of 140/90 mmHg.[4] This research revealed a lower degree of BP control than studies from Chile (59.7%) [20], Greece (55.6%) , the United States (49.8%) , and South Africa (57%).[20-24] It was also lower than in studies conducted by Greenberg et al.14 and Berlowitz et al.[25] However, it is similar to earlier studies from Adama (43.6%)[26] and Nigeria (42%).[26] This difference in blood pressure management may be attributed to the diabetes comorbidity of our research cohort, indicating the necessity for additional effort to regulate blood pressure among diabetics.

This research found that 25 (25%) and 27 (27%), respectively, of the study participants had a controlled SBP and DBP, which is lower than reports from Saudi Arabia (40.4% and 51.6%) and the United States (55.7% and 77.1%).[28,29] This disparity in SBP and DBP control may be attributable to an age-related rise in SBP, since more than half of research participants were over the age of 50.

According to this study, age was substantially linked with uncontrolled BP, with patients over the age of 50 being two times more likely to have uncontrolled BP than those under the age of 50 (AOR = 2.16, 95% CI: 2.75, 7.89). It is comparable to research conducted in the United States[29] and Kenya.[30] Similarly to a research from Brazil[31] , this study identified older age as a risk factor for uncontrolled BP. Indeed, an interplay between biological and behavioural components might explain our findings. In terms of biological considerations, natural processes associated with ageing, such as autonomous imbalance and vascular stiffness, might provide an explanation. In terms of behavioural characteristics, past research has shown that elderly persons engage in less physical exercise.[32]

Patients with higher education were shown to be less likely to have uncontrolled BP (AOR = 0.36, 95% CI: 0.23, 0.64, P = 0.02) as compared to those with no formal education (AOR = 0.36, 95% CI: 0.23, 0.64, P = 0.02). This finding is congruent with the findings of a Chilean HC research, which found a negative relationship between low education level and blood

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pressure management.[20] This might be due to greater knowledge of hypertension therapy, adherence to lifestyle changes to lower blood pressure, or adherence to antihypertensive medicine treatment. The study's findings revealed a relationship between frequent BP measurement and improved probabilities of BP management, with patients with a monthly BP measurement 35% less likely to have uncontrolled BP than those with a monthly BP measurement. This might be due to a health-seeking habit, frequent changes in lifestyle variables, and a proclivity to use antihypertensive medication among people who assess their blood pressure often.

Treatment adherence is a major factor of treatment success. Poor adherence affects the overall efficacy of treatment outcomes by attenuating optimal therapeutic effects. According to this research, nonadherent individuals were twice as likely as adherents to have uncontrolled blood pressure. This finding is consistent with findings from research in South Africa[24] Zimbabwe[33] , the United States[34] and Nigeria.[35] In light of this finding, patients should be counselled and encouraged to take their antihypertensive medications, as adherence to antihypertensive medications is critical to achieving optimal blood pressure control, particularly in patients who require intensive BP control, such as comorbid diabetics. Positive behavioural indicators (smoking, alcohol use, and chat chewing) were associated with an increased risk of uncontrolled blood pressure, which is comparable with research from Saudi Arabia (8.3%)[28] Oman (8%)[36] and Zimbabwe (16.1%).[33] This might be due to the oxidative stress they cause the cell as well as the influence they have on adherence.[37] To obtain an ideal BP in people with hypertension, particularly those who are diabetic, it is suggested that they quit smoking and reduce/stop drinking alcohol. Because these people have an increased cardiovascular risk This research also shown that not just diabetes comorbidity, but also poor glycemic management, is an independent predictor of uncontrolled BP. Patients with poor glycemic control were about twice as likely to have uncontrolled blood pressure. Greenberg et al.[14] Berlowitz et al.[25] Adler et al[38]. and Jansson et al.[17] conducted similar research in Brazil.[31] This might be explained by the pathophysiologic process associated with the existence of diabetes, which may entail an excess of circulating insulin. Excess circulating insulin from diabetes-related insulin resistance may raise blood pressure by activating the sympathetic nervous system, serving as a growth factor, and/or enhancing salt reabsorption in the kidneys.[39] Simply put, insulin release after a meal induces vasodilation (the widening of blood vessels) in skeletal muscle while simultaneously activating the sympathetic nervous system, resulting in vasoconstriction.[40]

Conclusions

Blood pressure management to target goal was unsatisfactory, with almost two-fifths of pharmacologically treated hypertensive diabetes individuals achieving it. Diabetic patients who were older, female, and had had hypertension for a long time were more likely to have uncontrolled blood pressure. These individuals can be readily recognised, thus preventative actions should focus on this group of patients. In hypertensive diabetic patients, older age, female gender, duration of hypertension, non-adherence, and uncontrolled blood sugar are independent predictors of uncontrolled blood pressure. Blood pressure regulation is aided by monthly monitoring and increased knowledge.

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