

Treatment-Resistant Hypertension in Individuals of High BMI

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ABSTRACT

Objective: To determine the frequency of treatment-resistant hypertension in individuals of high BMI and factors associated with resistant hypertension.

Study Design: Comparative cross-sectional study

Place and Duration of Study: Pak Emirates Military hospital, Rawalpindi Pakistan, from Nov 2020 to Oct 2021.

Methodology: Patients being managed for essential hypertension at the medical outpatient department were included in the study. Body mass index was calculated at the time of routine evaluation during the outpatient visit, and a detailed evaluation regarding the number of anti-hypertensive medications used was carried out on patients with a body mass index >25. Resistant hypertension was diagnosed if the blood pressure of the patient was not controlled on three or more anti-hypertensive medications.

Results: A total of 600 patients with hypertension and a body mass index of more than 25 were included in the final analysis. Out of 600 patients, 489 (81.5%) had essential hypertension, which was not treatment resistant, while 111 (18.5%) had resistant hypertension. Statistical analysis showed that type 2 diabetes mellitus and cigarette smoking had a statistically significant relationship (p -value < 0.05) with resistant hypertension among patients with high body mass index.

Conclusion: Resistant hypertension was a fairly common diagnosis among patients suffering from hypertension and having a body mass index of more than 25. Patients who had comorbid diabetes mellitus or who were cigarette smokers were more at risk of having resistant hypertension in our data set.

Keywords: Body mass Index, Hypertension, Treatment-resistant hypertension.

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INTRODUCTION

Hypertension ranks high among non-communicable diseases in all age groups across the globe.¹ Pakistani population is no different, and the number of patients with this multi-system illness has been increasing.^{2,3} Not only hypertension but complications related to uncontrolled or long-standing hypertension also pose a major burden on the health care system and the quality of life of patients suffering from hypertension.^{4,5} Multiple treatment modalities, including various pharmacological agents, have been used to manage hypertension.⁶

Weight and body mass index of the individual impact his quality of life in several ways. High BMI has been related to multiple physical health problems.⁷ Obesity itself is also classified as an illness and also acts as a gateway to multiple illnesses.⁸ Problem arises when a high BMI hinders the routine management of diseases like diabetes, hypertension, ischemic heart disease, arthritis, hyperlipidemia and other endocrine diseases and makes routine treatment-resistant.^{9,10}

Pakistan is evolving regarding healthcare infrastructure, and basic healthcare information needs to be included in various parts of our country. Patients do not consider illnesses like diabetes and long-standing hypertension illnesses and remain non-compliant or partially compliant in the long run. Limited local data has been available regarding treatment-resistant hypertension and high BMI. Therefore, we planned this study to determine the frequency of treatment-resistant hypertension in individuals with high BMI and the factors associated with resistant hypertension.

METHODOLOGY

The comparative cross-sectional study was conducted at Pak Emirates Military Hospital Rawalpindi from November 2020 to October 2021. The Institutional Review Board Committee granted the ethical approval. The sample size was calculated using the WHO sample size calculation using the population prevalence of raised BMI in hypertensive patients as 72.6%.¹¹ Non probability consecutive sampling was used to gather the sample.

Inclusion criteria: All patients aged 18 and 65 who managed hypertension with BMI > 25 were included in the study.

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Exclusion criteria: All the patients with any cancerous disease were excluded. Patients who were pregnant or those with any comorbid immunological disorders or using any anti-inflammatory or cytotoxic medications were excluded from the study. Patients who had uncontrolled type 2 diabetes mellitus or type 1 diabetes mellitus, or secondary hypertension were excluded as well. Those patients in which non-compliance was established were also not included in the study.

Patients managed for hypertension and having a body mass index of more than 25 were included in the study. BMI was calculated at the time of assessment as per protocol. It was interpreted as Normal weight - BMI greater than or equal to 18.5 to 24.9 kg/m², Overweight-BMI greater than or equal to 25 to 29.9 kg/m² and Obesity-BMI greater than or equal to 30 kg/m².^{12,13} All these patients with BMI>25 were inquired in detailed and underwent assessment of charts to look for the number of anti-hypertensive used and state of control of illness. Treatment-resistant hypertension was defined as a lack of response to therapy with three or more medications.¹⁴

Statistical analysis was done by (SPSS) version 24.00. Frequency and percentage were calculated for the qualitative variables. In contrast, the mean and standard deviation was calculated for the quantitative variables. The chi-square test was used to look for the relationship between age, gender, presence of diabetes and smoking status with treatment-resistant hypertension among the target population. The *p*-value less than or equal to 0.05 was considered significant.

RESULTS

A total of 600 patients with hypertension and a body mass index of more than 25 were included in the final analysis. The mean age of the study participants was 44.79±8.73 years. 369(61.5%) were male, while 231(38.5%) were female (Table-I). Out of 600 patients, 489(81.5%) had essential hypertension, which was not treatment resistant, while 111(18.5%) had resistant hypertension. In addition, 419(69.8%) patients were overweight, while 181(30.2%) were obese. Out of the patients, 505(84.2%) were non-smokers, while 95 (15.8%) were considered smokers. Statistical analysis showed that type 2 diabetes mellitus (*p*-value-0.005) and cigarette smoking (*p*-value-0.001) had a statistically significant relationship with resistant hypertension among patients with high body mass index. In contrast, age (*p*-value-0.451) & gender (*p*-value-0.625) had no such relationship in patients with high BMI recruited in our analysis (Table-II) .

Table-I: Characteristics of Study Participants (n=600)

Parameters	n(%)
Age(years)	
Mean±SD	44.79±8.73 years
Range (min-max)	19 years-65 years
Gender	
Male	369(61.5%)
Female	231(38.5%)
Body Mass Index	
Overweight	419(69.8%)
Obese	181(30.2%)
Smoking	
No	505(84.2%)
Yes	95(15.8%)
Mean Duration of Hypertensive Illness	5.83±4.67 years
Treatment Resistant Hypertension	
No	489(81.5%)
Yes	111(18.5%)
Classes of Medications Used	
Diuretics	351(58.5%)
Angiotensin receptor blockers	126(21%)
ACE inhibitors	129(21.5%)
Beta blockers	37(6.1%)
Calcium channel blockers	119(19.8%)
Others	21(3.5%)

Table-II: Comparison of various variables with Resistant Hypertension among Study Participants (n=600)

Factors Studied	Non-Resistant Hypertension (n=489)	Resistant Hypertension (n=111)	<i>p</i> -value
Age			
<50 years	321(65.6%)	77(69.3%)	0.451
50-65 years	168(34.4%)	34(30.7%)	
Gender			
Male	303(61.9%)	66(59.4%)	0.625
Female	186(38.1%)	45(40.6%)	
Presence of Type 2 Diabetes Mellitus			
No	359(73.4%)	64(57.6%)	0.005
Yes	130(26.6%)	47(42.4%)	
Smoking			
No	425(86.9%)	80(72.1%)	0.001
Yes	64(13.1%)	31(27.9%)	

DISCUSSION

Treatment-resistant hypertension was common in obese patients managed at our hospital, and type 2 DM and smoking were associated with a resistant form of hypertension in our study participants. Hypertension is not merely a disease of the vascular system, but it affects almost all the organ systems of the body, especially if not treated promptly. Patients in our part of the world usually lack information about the control of hypertension and compliance with lifestyle modifications and medications. The situation becomes more difficult when hypertension is resistant to usual treatment and different groups of medications are

combined to achieve optimal blood pressure. We conducted this study intending to determine the frequency of treatment-resistant hypertension in individuals of high BMI and factors associated with resistant hypertension in Pak Emirates Military Hospital Rawalpindi.

Jordana B Cohen 2017 conducted a study regarding the impact of obesity on blood pressure control and weight loss on hypertension.¹⁵ They suggested that hypertension has been closely related to obesity, and the more the person is obese, the more difficult it is to treat hypertension. However, as the patient works on lifestyle modifications, in addition to medications to reduce weight, hypertension responds to treatment and does not become treatment resistant. Mahapatra et al. concluded that resistant hypertension was found in 11% of their hypertensive patients. In addition, longer duration of hypertension, obesity and higher fasting blood glucose were associated with the presence of resistant hypertension in their data set.¹⁶ Our design was slightly different as we only included patients with high BMI; therefore, resistant hypertension was found in 18.5% of patients, which was slightly higher than found in patients included in a study by Mahapatra *et al.*

Naseem *et al.* concluded that nearly one in ten hypertensive patients had true resistant hypertension, and twenty-five percent had pseudo-resistance. Resistance to hypertension is significantly associated with female gender, older age, obesity, dietary non-compliance, and increased use of NSAIDs.¹⁷ Our study results supported their findings as we found out that resistant hypertension was found among 18.5% of patients suffering from hypertension and having body mass index more than 25. Patients who had comorbid diabetes mellitus or who were cigarette smokers were more at risk of having resistant hypertension in our data set. Bhagavathula *et al.*¹⁸ in 2021, studied medication adherence and the prevalence of treatment-resistant hypertension among newly treated hypertensive patients in the United Arab Emirates. They concluded that resistant hypertension was common in patients newly diagnosed with hypertension, and smoking and diabetes were associated with the presence of resistant hypertension in their study.

Cigarette smoking and type 2 diabetes were associated with resistant hypertension in obese patients in our data set. Treatment-resistant hypertension emerged as a common problem in our patients and should be in the mind of the treating physician.

STUDY LIMITATIONS

Study design could be better for establishing the association. For example, cohort studies with long-term follow-up may generate better results to establish the exact association between the variables under consideration.

CONCLUSION

Resistant hypertension was a fairly common diagnosis among patients suffering from hypertension and having a body mass index of more than 25. In addition, patients who had comorbid diabetes mellitus or who were cigarette smokers were more at risk of having resistant hypertension in our data set.

Conflict of Interest: None.

Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MZA & KM: Study design, data interpretation, critical review, approval of the final version to be published.

KR & GRM: Data acquisition, data analysis, critical review, approval of the final version to be published.

MF & MM: Conception, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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