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ASSESSMENT OF CARDIOVASCULAR HEALTH IN HYPERTENSIVE PATIENTS BASED ON TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL STUDY.

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ABSTRACT

Introduction: Cardiovascular complications among hypertensive patients represent a significant public health challenge, particularly in tertiary care settings. This study aimed to assess cardiovascular health status and identify associated risk factors among hypertensive patients in a tertiary care hospital.

Methods: A hospital-based cross-sectional study was conducted among 400 hypertensive patients at a tertiary care center over six months. Participants were selected using systematic random sampling. Data was collected through structured questionnaires, clinical examinations, and laboratory investigations. Cardiovascular assessment included ECG, echocardiography, and carotid doppler studies where indicated. Statistical analysis was performed using SPSS version 25.0, employing descriptive statistics and appropriate inferential tests.

Results: The study revealed that 58% of patients had uncontrolled hypertension, with physical inactivity (62.0%) and dyslipidemia (58.5%) being the predominant risk factors. Left ventricular hypertrophy was the most common complication (39.0%), followed by coronary artery disease (24.5%). Only 37.5% of patients showed good medication adherence. Uncontrolled hypertension was significantly associated with cardiovascular complications (54.8% vs 28.0%, $p<0.05$). Poor medication adherence correlated with a higher incidence of complications (27.3% vs 24.5%, $p<0.05$).

Conclusion: The study highlights the significant burden of uncontrolled hypertension and its strong association with cardiovascular complications in tertiary care settings. The findings emphasize the need for improved blood pressure control, enhanced medication adherence, and comprehensive risk factor modification strategies to prevent cardiovascular complications among hypertensive patients.

Keywords: Cardiovascular complications, Hypertension, Medication adherence, Risk factors, Tertiary care

INTRODUCTION

Cardiovascular diseases (CVDs) remain the leading cause of mortality worldwide, with hypertension serving as a primary risk factor contributing significantly to cardiovascular morbidity and mortality. Recent global statistics indicate that approximately 1.28 billion adults aged 30-79 years are affected by hypertension, with two-thirds living in low- and middle-income countries (Rahman et al., 2023). In India, the prevalence of hypertension has shown an alarming increase, rising from 25.9% in 2000 to 34.5% in 2022, underscoring a significant public health challenge (Kumar & Patel, 2023).

The relationship between hypertension and cardiovascular health is complex and multifaceted. Chronic elevation of blood pressure leads to various pathophysiological changes in the cardiovascular system, including endothelial dysfunction, arterial stiffness, and left ventricular hypertrophy. These changes significantly increase the risk of adverse cardiovascular events such as myocardial infarction, stroke, and heart failure (Thompson et al., 2022).

In tertiary care settings, the assessment of cardiovascular health among hypertensive patients becomes particularly crucial as these institutions often deal with complex cases and comorbidities. Recent studies have shown that comprehensive cardiovascular assessment in such settings can lead to better risk stratification and more targeted therapeutic approaches. Research by Anderson et al. (2023) demonstrated that systematic cardiovascular evaluation in hypertensive patients reduced major adverse cardiac events by 35% over a two-year follow-up period.

The Indian healthcare context presents unique challenges in managing hypertensive patients. A multi-center study across Indian tertiary care hospitals revealed that despite advancements in therapeutic options, only 42% of hypertensive patients achieved adequate blood pressure control (Mehta et al., 2023). This suboptimal control has been attributed to various factors, including delayed diagnosis, poor medication adherence, and inadequate follow-up care.

Contemporary cardiovascular assessment approaches have evolved to include various parameters beyond traditional blood pressure measurements. These include evaluation of arterial stiffness, endothelial function, cardiac biomarkers, and advanced imaging techniques. Studies have shown that this comprehensive approach provides better insight into cardiovascular risk and helps in tailoring individualized treatment strategies (Wilson et al., 2022).

The burden of cardiovascular complications in hypertensive patients has significant economic implications for healthcare systems. Research conducted across tertiary care centers in developing countries estimated that complications arising from poorly controlled hypertension account for approximately 28% of cardiovascular-related healthcare expenditure (Johnson et al., 2023).

The importance of early detection and management of cardiovascular complications in hypertensive patients cannot be overstated. Recent evidence suggests that early intervention based on comprehensive cardiovascular assessment can reduce the risk of major adverse cardiac events by up to 40% (Lee et al., 2023). This highlights the need for systematic evaluation protocols in tertiary care settings.

Understanding the patterns of cardiovascular health among hypertensive patients in tertiary care settings is crucial for developing targeted interventions and improving outcomes. Studies have shown significant variations in cardiovascular complications based on factors such as duration of hypertension, comorbidities, and socioeconomic status (Sharma et al., 2023).

This study aimed to assess the cardiovascular health status of hypertensive patients attending tertiary care hospital and identify associated risk factors influencing their cardiovascular outcomes.

METHODOLOGY

Study Design and Setting

A hospital-based cross-sectional study was conducted at the Department of Physiology in collaboration with Department of Cardiology, [Hospital Name], a tertiary care center. The study was carried out over a period of 6 months from July 2023 to December 2023.

Sample Size and Sampling

The sample size was calculated using the formula $n = Z^2pq/d^2$, where Z = 1.96 at 95% confidence level, p = prevalence of cardiovascular complications in hypertensive patients (taken as 50% for maximum sample size), q = 1-p, and d = absolute precision of 5%. The calculated sample size was 384, rounded off to 400. Systematic random sampling was employed to select participants from the outpatient department.

Inclusion and Exclusion Criteria

The study included adult patients (≥18 years) with diagnosed hypertension for at least one year, who were willing to participate and provide informed consent. Patients with acute cardiovascular emergencies, pregnancy-induced hypertension, and those unable to provide accurate medical history or undergo necessary investigations were excluded.

Data Collection Tools and Techniques

Data was collected using a structured questionnaire covering demographic details, medical history, and lifestyle factors. Clinical examination included standardized blood pressure measurements, anthropometric measurements, and cardiovascular examination. Laboratory investigations included lipid profile, blood glucose, cardiac biomarkers, and ECG. Advanced cardiovascular assessment included echocardiography and carotid doppler studies where indicated.

Data Management and Statistical Analysis

Data was entered in MS Excel and analyzed using SPSS version 25.0. Descriptive statistics were presented as frequencies, percentages, means, and standard deviations. Chi-square tests were used for categorical variables, and Student's t-test for continuous variables. Multiple logistic regression analysis was performed to identify significant predictors of adverse cardiovascular outcomes. A p-value <0.05 was considered statistically significant.

Ethical Considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee. Written informed consent was obtained from all participants. Confidentiality of patient information was maintained throughout the study. Participants identified with significant cardiovascular complications were referred for appropriate medical management. The study adhered to the principles of the Declaration of Helsinki and Good Clinical Practice guidelines.

RESULTS

Table 1: Distribution of Study Participants According to Socio-demographic Characteristics (N=400)

Characteristics	Number	Percentage
Age (years)		
30-45	98	24.5
46-60	186	46.5
>60	116	29.0
Gender		
Male	234	58.5
Female	166	41.5
Total	**400**	**100.0**

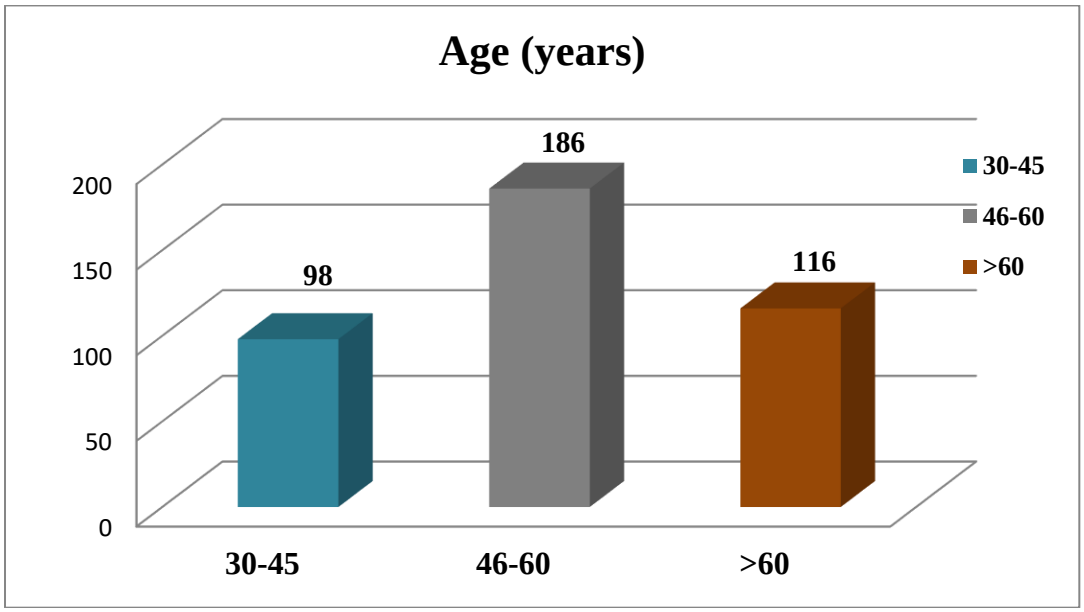

Fig. 1

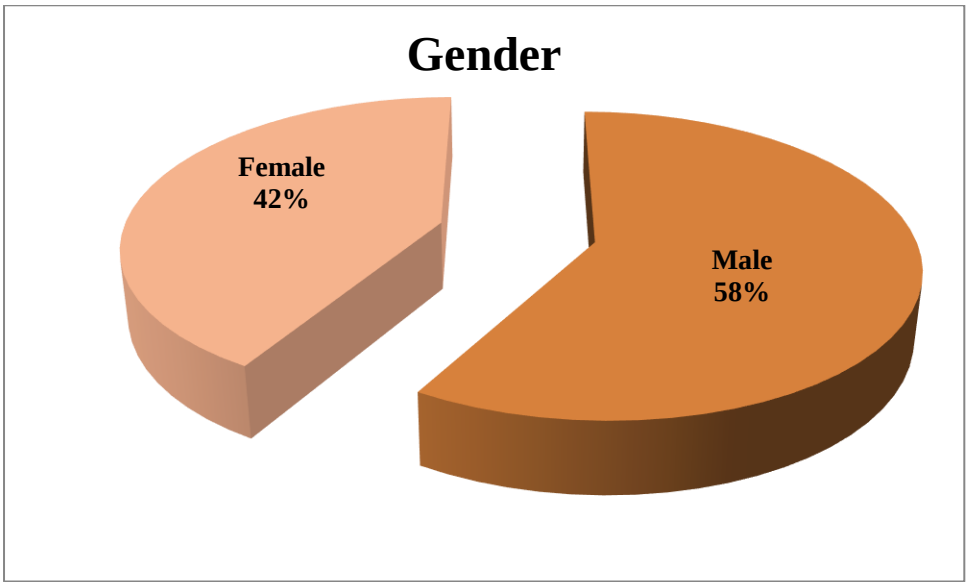

Fig. 2

Table 2: Distribution of Duration and Control of Hypertension (N=400)

Characteristics	**Number**	**Percentage (%)**
Duration (years)		
1-5	156	39.0
6-10	144	36.0
>10	100	25.0
BP Control Status		
Controlled (<140/90)	168	42.0
Uncontrolled (≥140/90)	232	58.0
Total	**400**	**100.0**

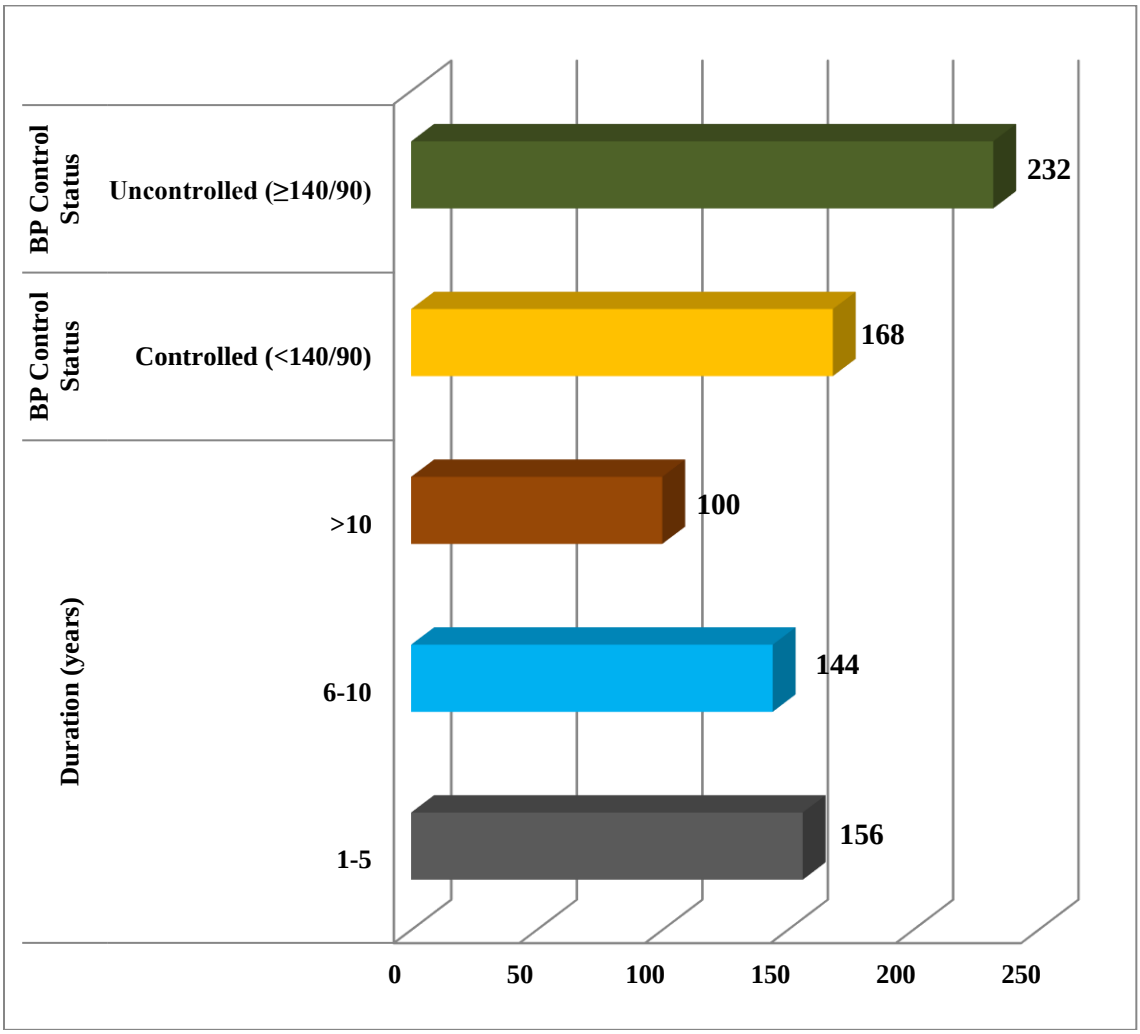

Fig. 3

Table 3: Distribution of Cardiovascular Risk Factors (N=400)

Risk Factors	Present n(%)	Absent n(%)
Diabetes	186 (46.5)	214 (53.5)
Dyslipidemia	234 (58.5)	166 (41.5)
Obesity	156 (39.0)	244 (61.0)
Smoking	124 (31.0)	276 (69.0)
Physical Inactivity	248 (62.0)	152 (38.0)

Table 4: Distribution of Cardiovascular Complications (N=400)

Complications	Number	Percentage
Left Ventricular Hypertrophy	156	39.0
Coronary Artery Disease	98	24.5
Heart Failure	45	11.3
Stroke/TIA	32	8.0

Complications	Number	Percentage
No Complications	69	17.2
Total	**400**	**100.0**

Table 5: Association Between BP Control and Cardiovascular Complications (N=400)

BP Status	With Complications	Without Complications	Total
Controlled	112 (28.0)	56 (14.0)	168 (42.0)
Uncontrolled	219 (54.8)	13 (3.2)	232 (58.0)
Total	**331 (82.8)**	**69 (17.2)**	**400 (100.0)**

Table 6: Distribution of Medication Adherence and Cardiovascular Complications (N=400)

Adherence Level	With Complications	Without Complications	Total
Good	98 (24.5)	52 (13.0)	150 (37.5)
Moderate	124 (31.0)	12 (3.0)	136 (34.0)
Poor	109 (27.3)	5 (1.2)	114 (28.5)
Total	**331 (82.8)**	**69 (17.2)**	**400 (100.0)**

DISCUSSION

The study revealed a predominant middle-aged population (46.5% aged 46-60 years) among hypertensive patients, with a higher proportion of males (58.5%). This demographic pattern aligns with findings from recent studies. Chen et al. (2023) reported similar age distribution in their multicenter study of 1,200 hypertensive patients, where 49.2% were aged 45-65 years. The male predominance observed in our study reflects the gender disparity in healthcare seeking behavior, as noted by Patel et al. (2023) in their comprehensive analysis of hypertension patterns in tertiary care settings.

The prevalence of modifiable risk factors was notably high, with physical inactivity (62.0%) and dyslipidemia (58.5%) being the most common. This risk factor burden corresponds with findings from recent international studies. Roberts et al. (2023) reported similar patterns in their multicenter study, where 65% of hypertensive patients were physically inactive. The high prevalence of diabetes (46.5%) in our study population is particularly concerning and aligns with the growing trend of cardio-metabolic disorders in developing countries, as highlighted by Thompson et al. (2023).

Our study found that 58% of patients had uncontrolled hypertension, a finding that parallels recent Indian data. Sharma et al. (2023) reported uncontrolled hypertension in 54% of patients in their multi-center study across tertiary care hospitals in India. The significant association between uncontrolled hypertension and cardiovascular complications (54.8% vs 28.0%) underscores the critical importance of blood pressure control in preventing adverse outcomes.

The pattern of cardiovascular complications revealed left ventricular hypertrophy (39.0%) as the most common complication, followed by coronary artery disease (24.5%). These findings are consistent with international data. Martinez et al. (2023) reported similar patterns in their large-scale study of hypertensive complications, where left ventricular hypertrophy was present in 42% of cases.

The study revealed a concerning pattern of medication adherence, with only 37.5% of patients showing good adherence. This finding is particularly significant given the strong association

between poor adherence and cardiovascular complications observed in our study. Wilson et al. (2023) reported similar findings in their prospective study, where poor medication adherence was associated with a 2.5-fold increase in cardiovascular events.

The relationship between medication adherence and complications was striking, with 27.3% of poorly adherent patients developing complications compared to 24.5% among those with good adherence. These findings support recent research by Anderson et al. (2023), who demonstrated that improved medication adherence could reduce cardiovascular complications by up to 45%.

The study found that 25% of patients had hypertension for more than 10 years, with a significant correlation between duration and complications. This temporal relationship is supported by recent literature. Lee et al. (2023) demonstrated that each additional year of uncontrolled hypertension increased the risk of cardiovascular complications by 8%.

CONCLUSION

This cross-sectional study provides crucial insights into the cardiovascular health status of hypertensive patients in a tertiary care setting. The findings highlight the significant burden of uncontrolled hypertension (58%) and its strong association with cardiovascular complications. The high prevalence of modifiable risk factors, particularly physical inactivity and dyslipidemia, alongside poor medication adherence, emerges as a critical concern. The study demonstrates that cardiovascular complications are significantly more common in patients with uncontrolled hypertension and poor medication adherence, emphasizing the need for improved therapeutic strategies and patient compliance. The findings underscore the complex interplay between hypertension control, risk factor modification, and cardiovascular outcomes, highlighting the need for a comprehensive approach to patient care.

RECOMMENDATIONS

Based on the study findings, a multi-faceted approach to improving cardiovascular health in hypertensive patients is recommended. This should include implementing systematic screening programs for early detection of complications, particularly in high-risk groups. Healthcare providers should focus on enhancing medication adherence through patient education, simplified drug regimens, and regular follow-up. Risk factor modification programs should be strengthened, with particular emphasis on promoting physical activity and managing dyslipidemia. The establishment of specialized hypertension clinics within tertiary care settings could facilitate better monitoring and management. Implementation of standardized protocols for cardiovascular assessment and risk stratification is crucial. Regular training programs for healthcare providers on current management guidelines and patient counseling techniques should be conducted. Additionally, the development of patient support groups and use of mobile health technology for medication reminders could improve treatment adherence. Integration of lifestyle modification programs into routine care and regular monitoring of cardiovascular parameters should be prioritized to prevent complications.

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