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Frequency of Hypertension in Patients with Intracranial Hemorrhage Presenting to Emergency Department

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ABSTRACT

Intracranial haemorrhage is a serious neurological emergency with high morbidity and mortality. Hypertension is a known major risk factor; however, local data regarding its frequency in intracranial haemorrhage patients remain limited. **Objectives:** To determine the frequency of hypertension among patients with intracranial haemorrhage presenting to the Emergency Department (ED) of Lady Reading Hospital, Peshawar. **Methods:** This cross-sectional study was conducted at the ED of Lady Reading Hospital from April to September 2023. A total of 182 patients aged 30–70 years, diagnosed with intracranial haemorrhage via CT scan, were enrolled using consecutive sampling. Blood pressure, BMI, demographic data, and socioeconomic status were recorded. Hypertension was defined as SBP ≥140 mmHg, DBP ≥90 mmHg, or self-reported antihypertensive medication use. Data were analyzed using SPSS version 26.0, with the chi-square test ($p<0.05$ considered significant). **Results:** Patients had a mean age of 50.24 ± 12.24 years and a mean BMI of 25.74 ± 4.41 kg/m^2. Hypertension was found in 155 patients (85.2%). There were no significant associations between hypertension and gender ($p=0.364$), age groups ($p=0.817$), or socioeconomic status ($p=0.613$). **Conclusions:** Hypertension prevalence was high among intracranial haemorrhage patients. This emphasizes the need for improved hypertension management and preventive strategies in the community.

INTRODUCTION

Intracranial haemorrhage constitutes a severe clinical condition that threatens one's life due to bleeding from the inside of the skull. It encompasses epidural hematoma, subdural haemorrhage, and both subarachnoid and intra-parenchymal haemorrhage [1]. While each type differs in its pathophysiology, presentation, and prognosis, each form poses a serious threat to health and can lead to severe outcomes if not identified and managed promptly. These types of bleeding are diagnosed with neuroimaging, and most commonly, non-contrast CT scans [2, 3]. Epidural hematoma usually arises following trauma and is frequently arterial in origin, often due to injury to the middle meningeal artery [4]. Subdural haemorrhage involves venous bleeding into the space between the dura mater and arachnoid mater, often after blunt head trauma. Subarachnoid haemorrhage occurs when blood accumulates in the subarachnoid space, either from trauma or rupture of an aneurysm. Among these, intraparenchymal haemorrhage bleeding directly into the brain tissue is commonly associated with longstanding hypertension and forms the focus of this study [5, 6]. Hypertension has been recognized as one of the most important modifiable risk factors for both ischemic and haemorrhagic strokes [7]. Elevated systolic and diastolic blood pressures have been consistently associated with an increased risk of cerebral haemorrhage. Studies have shown that poorly controlled blood pressure not only increases the risk of primary intracerebral haemorrhage

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but also raises the likelihood of recurrent events. Furthermore, undiagnosed or untreated hypertension often contributes silently to vessel fragility, predisposing individuals to spontaneous haemorrhage even in the absence of trauma [8]. Several studies across different populations have reported a high prevalence of hypertension among patients presenting with intracranial haemorrhage. Dong and colleagues reported a hypertension rate of 88% in such patients, while Lioutas et al. found the frequency to be 86.3%. These figures highlight a strong correlation between elevated blood pressure and spontaneous cerebral bleeding events [9, 10]. However, there is a distinct lack of local epidemiological data in Pakistan, particularly from tertiary care emergency departments, quantifying the frequency of hypertension among patients with intracranial haemorrhage. Most available studies are international, and their findings may not fully reflect the regional burden or healthcare context. This absence of region-specific evidence limits the development of targeted prevention and screening strategies in our population. Given the burden of stroke-related emergencies in tertiary hospitals and the limited local data on risk factor prevalence, this study was designed to determine the frequency of hypertension among patients with intracranial haemorrhage presenting to the Emergency Department at Lady Reading Hospital, Peshawar.

This study aims to inform clinicians about the magnitude of this preventable risk factor in our setting and to support more effective strategies for early detection, prevention, and patient education regarding blood pressure control.

METHODS

This was a cross-sectional descriptive study conducted to determine the frequency of hypertension among patients presenting with intracranial haemorrhage to the Emergency Department. The research was carried out in the Department of Emergency Medicine at Lady Reading Hospital (LRH), Peshawar, a major tertiary care hospital providing emergency services to a large population across Khyber Pakhtunkhwa. The duration of the study was six months, from April 2023 to September 2023, following formal approval of the research synopsis by the College of Physicians and Surgeons Pakistan (CPSP) and ethical clearance by the Institutional Review Board (IRB) of LRH. Formal ethical approval was granted by the IRB of Lady Reading Hospital under Reference No. 682/LRH/MTI, and the research protocol was also approved by CPSP under Reference No. CPSP/REU/EMD-2020-022-224 These approvals ensured compliance with ethical research standards, data confidentiality, and patient safety. All participants or their legally authorized representatives were provided with detailed information about the study, including objectives, procedures, and potential risks and benefits. Written informed consent was obtained before participation. Participants were assured that their data would be kept confidential and their care would not be affected by refusal or withdrawal from the study. The sample size was calculated using the WHO sample size calculator, assuming a 95% confidence level, 5% margin of error, and an expected hypertension prevalence of 86.3% based on prior studies [10]. The final sample included 182 patients. A consecutive non-probability sampling technique was employed, enrolling all eligible patients who presented during the study period and fulfilled the inclusion criteria. Inclusion criteria were male and female aged 30 to 70 years with a diagnosis of intracranial haemorrhage confirmed by neuroimaging. Exclusion criteria included known cases of hyperaldosteronism, subarachnoid haemorrhage, or structural brain lesions such as tumours. Intracranial haemorrhage was diagnosed using non-contrast computed tomography (CT) scans of the brain, interpreted by qualified radiologists following standard emergency protocols. Hyper-dense regions indicative of acute haemorrhage was used to confirm the diagnosis. Hypertension was defined as any of the following: systolic blood pressure (SBP) ≥140 mmHg, diastolic blood pressure (DBP) ≥90 mmHg, or self-reported use of antihypertensive medication within the last two weeks. Blood pressure was measured using a digital, calibrated sphygmomanometer after the patient was seated calmly for at least five minutes. Three readings were taken at two-minute intervals, and the average of the three was recorded as the final blood pressure value. Height and weight were measured using standardized instruments to calculate BMI. Data collection was done using a pre-tested structured proforma. Variables collected included age, gender, BMI, socioeconomic status, and clinical data. No additional laboratory or imaging tests were conducted beyond standard emergency care. To minimize observer bias, all CT scans were interpreted by radiologists who were blinded to the patient's blood pressure status. Data collectors were trained on standardized measurement protocols to further ensure objectivity and consistency. Data were analyzed using IBM SPSS Statistics version 26.0. Continuous variables (e.g., age, BMI, SBP, DBP) were expressed as means ± standard deviations, while categorical variables (gender, hypertension status, socioeconomic group) were summarized using frequencies and percentages. Associations between hypertension and independent variables (gender, age group, socioeconomic status) were assessed using the Chi-square test. A p-value <0.05 was considered statistically significant.

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RESULTS

Out of 182 patients presenting with intracranial haemorrhage, the mean age was 50.24 ± 12.24 years, reflecting a predominance of middle-aged individuals. The mean BMI was 25.74 ± 4.41 kg/m^2, placing most patients in the overweight category. Systolic and diastolic blood pressures averaged 143.59 ± 21.36 mmHg and 90.49 ± 11.76 mmHg, respectively, indicating elevated blood pressure in this cohort and suggesting a significant burden of hypertension in these patients (Table 1).

Table 1: Demographic and Clinical Characteristics (n=182)

Variables	Mean ± SD
Age (Years)	50.24 ± 12.24
BMI (kg/m^2)	25.74 ± 4.41
SBP (mmHg)	143.59 ± 21.36
DBP (mmHg)	90.49 ± 11.76

Among the 182 patients, 155 (85.2%) had hypertension, while 27 (14.8%) were normotensive. Females comprised 100 (54.9%) of the study population, and males 82 (45.1%). This shows a high overall prevalence of hypertension in both genders (Table 2).

Table 2: Frequency of Hypertension and Gender Distribution (n=182)

Variables	Frequency (%)
Hypertension	
Yes	155 (85.2%)
No	27 (14.8%)
Gender	
Female	100 (54.9%)
Male	82 (45.1%)
Total	182 (100%)

When comparing gender and hypertension status, 83/100 female (83%) and 72/82 male (87.8%) were hypertensive. The Chi-square test revealed no significant association between gender and hypertension: χ^2 (1, N=182) = 0.823, p=0.364. Although the proportion of hypertensive males was slightly higher, the difference was not statistically meaningful (Table 3).

Table 3: Gender and Hypertension Association (n=182)

Gender	Hypertension Yes (%)	Hypertension No (%)	Total	χ^2(df)	p-value
Female	83 (83%)	17 (17%)	100	0.823 (1)	0.364
Male	72 (87.8%)	10 (12.2%)	82		
Total	155	27	182		

Age-wise, participants were divided into four categories. The highest number of hypertensive cases occurred in the 50–59 age group (44 cases). However, no significant association was found between age group and hypertension: χ^2 (3, N = 182) = 0.935, p=0.817 (Table 4).

Table 4: Association between Age Group and Hypertension (n=182)

Age Group (Years)	Hypertension Yes (%)	Hypertension No (%)	Total	χ^2(df)	p-value
30–39	40 (87%)	6 (13%)	46	0.935 (3)	0.817
40–49	31 (88.6%)	4 (11.4%)	35		
50–59	44 (84.6%)	8 (15.4%)	52		
60–70	40 (81.6%)	9 (18.4%)	49		
Total	155	27	182		

The study presents the association between socioeconomic status and hypertension among patients with intracranial haemorrhage. The highest proportion of hypertensive individuals was observed in the low socioeconomic group, with 58 out of 66 patients (87.9%) affected, followed closely by the high-income group at 85.7%, and the middle-income group at 81.7%. Despite these numerical differences, the Chi-square test did not demonstrate a statistically significant association between socioeconomic status and hypertension, with χ^2 (2, N = 182) = 0.979, p=0.613. This indicates that hypertension was prevalent across all economic strata without a significant trend favouring one group over another. The overall prevalence of hypertension was 85.2%, with a 95% confidence interval of 80.1% to 90.3%, reflecting a consistently high burden in this population regardless of socioeconomic background (Table 5).

Table 5: Socioeconomic Status and Hypertension Association (n=182)

Socio-economic Groups	Hyper-tension Yes (%)	Hyper-tension No (%)	Total	χ^2 (df)	p-value	95% CI for Hyper-tension Prevalence
High	48 (85.7%)	8 (14.3%)	56	0.979 (2)	0.613	80.1% – 90.3%
Middle	49 (81.7%)	11 (18.3%)	60			
Low	58 (87.9%)	8 (12.1%)	66			
Total	155 (85.2%)	27 (14.8%)	182			

DISCUSSION

In the current study, hypertension was notably prevalent (85.2%) among patients presenting with intracranial haemorrhage at Lady Reading Hospital's Emergency Department. These findings align closely with previously published studies, reinforcing the critical role that hypertension plays in the pathogenesis of haemorrhagic stroke [11-13]. Our study's findings correspond well with the frequency reported by Dong *et al.* who found an 88% prevalence of hypertension in patients suffering from intracranial haemorrhage [9]. Similarly, Tran *et al.* documented a hypertension prevalence rate of 86.3% among patients experiencing intracerebral haemorrhage [14]. Such consistency across diverse populations and healthcare settings underscores hypertension as a universal, primary, and preventable risk factor for cerebral haemorrhage [15]. Interestingly, despite hypertension's

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high overall prevalence in our study, statistical analyses revealed no notable relation between hypertension and variables like gender or age groups. A slightly higher proportion of male patients (87.8%) compared to female (83%) were hypertensive, but the difference was not statistically significant (p=0.364). Goswami and Nanda, reported this absence of significant gender difference aligns with global stroke data, suggesting hypertension's widespread prevalence across genders without notable disparities [16]. Similarly, the distribution of hypertension across different age categories did not demonstrate significant variation (p=0.817), though numerically higher cases were found within the 50–59 years' age bracket. This was consistent with global stroke epidemiological data like Nazeer *et al.* and Patel *et al.* suggesting that hypertension prevalence increases with advancing age but does not significantly differ between middle-aged and older age groups in intracerebral haemorrhage patients [17, 18]. The socioeconomic analysis revealed a slightly higher hypertension rate within low socioeconomic groups (87.9%), though statistical significance was not reached (p=0.613). This finding echoes other studies like Ullah *et al.* and Prabhu *et al.* indicating that individuals from lower socioeconomic strata typically face barriers to accessing routine healthcare, contributing to poorer chronic disease management and subsequently higher rates of uncontrolled hypertension [19, 20]. The substantial prevalence of hypertension identified underscores the importance of rigorous public health initiatives [21]. Effective preventive strategies must prioritize early diagnosis, routine blood pressure screening, community education, and accessible hypertension management programs. Current international guidelines highlight effective antihypertensive management as pivotal in reducing stroke risk. Therefore, integrating such protocols in routine emergency department practices, along with public health measures, might substantially mitigate stroke incidence and related complications.

CONCLUSIONS

Hypertension was found to be highly prevalent among patients presenting with intracranial haemorrhage at the emergency department of Lady Reading Hospital, Peshawar. This observed frequency aligns closely with international data, reinforcing hypertension as a significant and modifiable risk factor for haemorrhagic stroke. No statistically significant associations were found between hypertension and demographic variables such as age, gender, or socioeconomic status, indicating that elevated blood pressure affects a broad cross-section of the population. These findings underscore the need for comprehensive public health initiatives focused on community awareness, routine blood pressure screening, and lifestyle modification programs. In addition, integrating standardized hypertension screening protocols into emergency department triage workflows, along with establishing referral pathways for long-term follow-up in primary care, may enhance early detection and long-term control.

Authors Contribution

Conceptualization: HM
Methodology: HM, SA
Formal analysis: HM, SA
Writing review and editing: HM, SA

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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