



CORRELATION BETWEEN PRE-STROKE SYMPTOMS AND RISK FACTORS OF STROKE: A CROSS-SECTIONAL STUDY

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ABSTRACT

OBJECTIVE: The purpose of our study is to gain knowledge of the relationship between pre-stroke symptoms and risk factors among stroke patients as well as defining the symptoms of stroke in stroke patients.

METHODOLOGY: The data used in this cross sectional study was gathered using a population of 100 patients admitted in Liaquat University Hospital, Hyderabad. The information gathered using a questionnaire within a period of 3 months. The information was then processed by use of SPSS version 27.

RESULTS: The percentage of male and female participants among the study participants was 66.7 and 33.3, respectively. The mean age was determined as 54.7, with the range: 28-75 years. Headache (45.8%), numbness or unilateral weakness (41.7%), and slurred speech (33.3%), were identified as the most common, second and third, respectively, pre-stroke symptoms. Some of the risk factors that were common included hypertension (72.9%), smoking (27.1%), and positive family history (21.4%). The data were analyzed to relate weakness, headache, fatigue and slurred speech to hypertension, smoking and positive family history. We discovered that there exists a strong relationship between pre-stroke symptoms and underlying risk factors (p value<0.05).

CONCLUSION: This paper has determined that pre stroke symptoms have a strong relationship with risk factors and therefore the need to be aware of the warning signs of high risk individuals. In addition, it also means that there must be special public awareness on pre-stroke symptoms, which specially focuses on high risk patients to encourage early visit to the hospital and timely treatment.

KEYWORDS: Stroke, Pre-stroke symptoms, Risk factors, Correlation, Cross sectional, Hypertension

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INTRODUCTION: Stroke is the result of failure to feed the brain with blood, which leads to death of the brain cells within minutes [1]. Approximately every 25 years of age, 12 million incidents of stroke are met in the world with one out of four individuals having suffered a stroke at some point in their lives [2]. Ischemic stroke may result because of thrombosis or embolism whereas hemorrhagic stroke is because a vessel ruptures. A TIA (transient ischemic attack) is a short-term focal neurological deficit which is not accompanied by a permanent impairment of the brain [3]. Hemorrhagic stroke, which is 10-20 percent of all strokes, and is almost 40 percent of stroke mortality [4]. It comes with itself a high level of disability as well as high mortality level [5].

Overall, stroke is one of the greatest morbidity and mortality causes worldwide [6] and irrespective of prevention and treatment improvements, the total amount is still high, especially in low- and middle-income countries [7]. The condition is an important health problem in the world today and the majority of the cases are associated with hypertension, diabetes mellitus, obesity, and atrial fibrillation each of which are associated with modifiable risk factors [8,9].

Age is also the most dangerous in regards to risk of stroke; hypertension is the most prevalent risk factor and about 80% of patients having a first-stroke are hypertensive [10,11].

The high-resolution computed tomography (CT) and magnetic resonance imaging (MRI) have given the world new innovations in diagnostic imaging, which have dramatically accelerated and enhanced the accuracy of detecting ischemic strokes [12]. Immediate administration of acute reperfusion interventions such as thrombolysis and thrombectomy is essential in minimizing disability effect of stroke [13]. Moreover, it has been demonstrated that early revascularization and prompt admission in the stroke units improve the outcome and reduce healthcare expenses [14].

Stroke incidence and outcome are also influenced by social and demographic factors, where variation is noted on the awareness, education, lifestyle, and socioeconomic status [15]. Women are disproportionately affected, dying more, becoming more disabled, and having unique risk factors [16]. Over the past thirty years, stroke cases have grown over 86 percent and almost 12.2 million new cases are observed every year [17]. Stroke is also affecting the younger populations more often, with cognitive, mental health, and overall quality of life effects [18]. The most prevalent psychological symptoms are impaired memory, reduced attention, depression, and

fatigue, which affect recovery and independent living [19].

Timely rehabilitation and better detection of recurrence risk of the stroke will help in better and improved outcome. Effective and evidence-based steps should still be implemented to reduce the global burden of stroke and enhance the quality of life of patients [20].

It is necessary to understand the correlation between pre-stroke and stroke symptoms since it gives a chance of early medical response, which reduces the risk of stroke and enhances the results. The public awareness and empowering of people to recognize the symptoms of stroke will allow a quick medical intervention to be taken, thereby enhancing the outcome and minimizing the long term consequences of stroke on the person and society.

Early detection and management of pre stroke signs and risk factors is essential in stroke prevention. By creating a correlation between these symptoms and those of a full-fledged stroke we can help to early identify the condition, intervene, and achieve a better patient outcome.

METHODOLOGY: Before the start of the study, local ethical authorization was obtained with Liaquat University of medical and health sciences Jamshoro Pakistan. The cross-sectional study design was adopted to present correlation between pre stroke symptoms and underlying risk factors. Data was collected by using a simple random sampling technique on the participants.

OpenEpi (Open Source Epidemiologic Statistics for Public Health) software was used to determine the sample size of this study. It was founded on the probable prevalence of the pre-stroke symptoms in individuals who were at risk concerning a stroke with a margin of error of 5% and a 95% confidence level. Once these factors had been put into consideration, approximately 100 participants were chosen, and it was established that the research findings would be statistically valid, scientifically sound, as well as representative of the target population.

The inclusion criteria used in the study included the following; the participants needed to be patients aged at least eighteen years and have a confirmed diagnosis. To maintain the integrity and focus of the study results, patients who had other medical or psychiatric conditions that could have been of influence to the outcome of interest were excluded. To minimize the confounding factors, and to ensure that the results of the study was as a result of the parameters being tested, patients that had participated in clinical trials were also not eligible to join the study.

The data to be used in this research was obtained on about 100 patients within a time span of 6 months, at Liaquat University Hospital, Jamshoro. The complete data collection was ensured through several procedures, which include direct interviews with patients and their attendants, reviewing the medical records of the patients, and administration of structured surveys. The questionnaire also used was specially designed and ready in three languages, Sindhi, Urdu and English in order to make sure that all the participants regardless of the linguistic and social backgrounds could understand the questionnaire and respond appropriately, the questionnaire was also divided into several sections, which were designed to collect the information about the demographics of the participants, their potential risk factors, their perception and awareness about stroke. It was later revised and evaluated so as to make sure that everything was responsive to the targeted goals of the study.

The data obtained were put into statistical package of the social sciences (SPSS), Version [27] whereby all the data were entered and analyzed. Frequencies, percentages, and central measures of tendency were also computed as descriptive statistics to summarize demographic and clinical variables of the participants. The Chi-square test was conducted to determine the relationship between the pre-stroke symptoms and the different underlying risk factors. In order to improve the data interpretation process, graphical data tools like pie charts and clustered bar charts were made use of to show the distribution and comparison of vital variables in a format that could be easily understood. The p-value of under 0.05 was taken to be statistically significant. All analyses were carefully checked to be accurate, reliable and valid interpretations of results before a final interpretation

RESULTS: This cross-sectional was a study of 100 stroke patients altogether. The participants were more male dominated as 66.7 percent of them were men and 33.3 percent were women. The age of the patients was between 28 and 75 years with the mean age of 54.7

years which means that this stroke can attack people in their middle-adolescence. The standard deviation is 11.75.

Sixty-eight percent of the patients indicated the presence of pre-stroke symptoms. The most prevalent symptom in the pre-stroke was headache, which was reported in 45.8% of patients. Next in 41.7 percent were numbness or unilateral weakness, and slurred speech (33.3). Less frequently reported symptoms included blurred vision (10.4%), dizziness (18.8%) and fatigue (22.9%). It is interesting to note that headache and weakness were often reported as co-morbid conditions and they often preceded the onset of a major neurological event by several hours to days. It was found that a positive family history of stroke existed in 21.4% of participants, smoking among victims was 27.1% and the most prevalent stroke risk factor was hypertension and 72.9% of the stroke participants were affected. Though this was not included in the main association study, diabetes mellitus (18%), obesity (15%), and ischemic heart disease (12%) were other less prevalent variables. The investigation of the data with the help of the Chi-square test was conducted to determine the data correlations between key risk factors (smoking, hypertension, and family history) and key pre-stroke symptoms (weakness, headache, exhaustion, and slurred speech). It was observed that hypertension is statistically significantly correlated with each of the four major pre-stroke symptoms ($p < 0.05$) with unilateral weakness and headache.

Patients with hypertension had a 1.8 and 2.1 times higher likelihood of headache and unilateral weakness respectively than non-hypertensive patients. A positive family history was a little related to headache and weariness whereas smoking was closely related with numbness or weakness ($p < 0.05$). Figure 1 depicts that individuals with one or more of the modifiable risks of the vascular system were at an increased risk of exhibiting early warning signs preceding the development of a full-blown stroke. All in all, these results prove that there is a strong relationship between pre-stroke symptoms and underlying risk factors (p value less than 0.05).

TABLE 01: STATISTICAL ANALYSIS

Chi-Square Tests

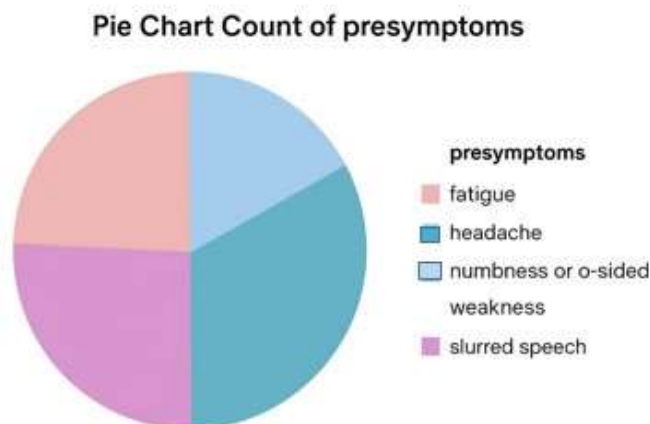
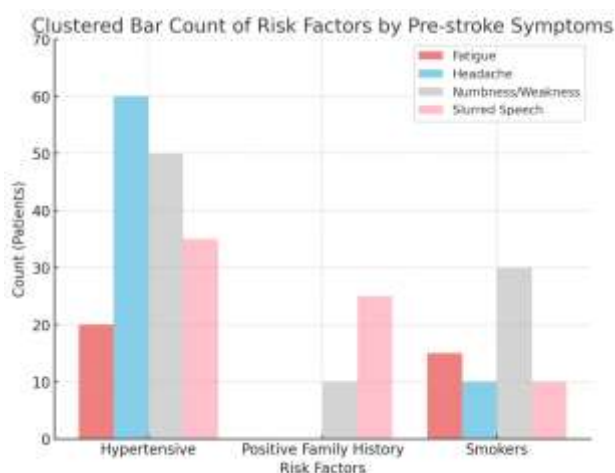
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	72.083 ^a	18	<.001
Likelihood Ratio	40.522	18	.002
Linear-by-Linear Association	1.471	1	.225
N of Valid Cases	50		

a. 26 cells (92.9%) have expected count less than 5. The minimum expected count is .08.

The correlation and association between the key stroke risk factors and the pre-stroke symptoms are depicted in a cluster bar chart like figure 2. The study findings showed that the total symptom burden was highest among hypertensive patients with the most frequent manifestations of the phenomenon being headache (≈ 60 cases) and weakness (≈ 50 cases), indicating that there is a strong vascular-neurological relationship. The most common symptom in people with a favorable family history (25 cases) was slurred speech, which revealed a possible genetic vulnerability in influence on speech and cognitive pathways. Smokers on the other hand were predominantly affected by motor weakness (approximately 30 cases) which is a manifestation of the adverse vascular impact of nicotine and hypoxia on cerebral perfusion. In general, the trend indicates that the smoking behavior

correlates more with motor dysfunction, family history is more likely to manifest itself through slurred speech, and hypertension continues to be the most effective indicator of pre-stroke symptoms and headache and weakness in particular.

Figure 3 shows the prevalence of a number of pre-stroke symptoms in the pie chart. To enable individuals at high risk of stroke to be provided with the opportunity of early detection, targeted screening, and timely preventive intervention, it is critical to be aware of the symptom-risk relationships. were less frequent. A statistically significant correlation between the type of maxillofacial fracture and the presence of head injury was found using a chi-square test of independence ($\chi^2 = 21.3$, $df = 9$, $p = 0.012$). This implies that the probability of concurrent intracranial injury was influenced by the pattern of facial fractures.



DISCUSSION: The objective of the present investigation was to analyze the correlation between the pre-stroke symptoms and the risk factors among the stroke patients in a tertiary care hospital. These findings indicate that the most common early warning symptoms were headache, dizziness and weakness, which are likely to precede the occurrence of the major stroke, but smoking and hypertension are the most prevalent and well associated risk factors, and pre-stroke symptoms. Such results add to the growing knowledge that prompt diagnosis can greatly improve the results and that mild neurological or vascular symptoms can be used as sentinel events of an imminent stroke of the cerebral vessels.

In line with other prior studies which determined that hypertension is the most common risk factor of stroke globally that is most modifiable, the study established that hypertension was the given factor that most correlated with the pre-stroke symptoms ($p = 0.002$). Hypertension remains the leading cause of stroke morbidity and mortality in the whole of Asia, with the prevalence rate of stroke patients reaching 60 percent, according to Tan et al.2024 [21].

The most frequent prodromal symptom reported was headache (55%), then there was weakness, slurred speech and dizziness. This trend is closely related to the findings of Lebedeva et al. (2020) who have found that they have defined sentinel headache as one of the most frequent early warning signs of an ischemic stroke that often happens days to weeks before the incident. The authors are presuming that transitory occlusions or micro-insults of the arteries may cause short-term headache attacks that are precursor to major stroke occurrences [22].

Although slurred speech is a very common and early symptom of stroke, we did not find it very much in our study; it may be due to a small sample size or recall bias. The under-recognized speech-related pre-stroke symptoms remain one of the central reasons of delayed hospitalization and poor functional outcomes. This conclusion is supported in a study by Farokhfir et al. (2025), which has underlined that the delayed health-seeking behavior and the lack of knowledge about stroke are key challenges to timely treatment in stroke, especially in developing countries [23].

The failure of most people in the world to know the symptoms of stroke and some risk factors has led to delays in the detection of pre-stroke symptoms and accessibility of emergency care. Studies have demonstrated that increased knowledge leads to faster response, increased earlier admissions to hospitals and more effective interventions such as thrombolysis are being used within the critical therapeutic period. Thus, to reduce the morbidity and mortality of stroke,

it is imperative to adopt education to focus on the assessment of symptoms, the management of risk factors, and emergency services [6].

The pre-stroke symptoms, which are discussed in this study, and have received minimal coverage in the local literature, are one of the primary strengths of the study. The questionnaire was standardized and multilingual (English, Urdu, and Sindhi), which enhanced comprehension and the inclusiveness of the people who belonged to diverse backgrounds. Nevertheless, due to the use of symptom reporting that depended on the memory of patients or their caregivers, the research is limited by its one-centre setting, which restricts the scope of generalization, and the possibility of recall bias. A more compelling evidence could be collected through a more massive multi-center study which involves objective clinical confirmation of symptoms. The future research must be aimed at studying the preventive therapies of early symptoms, merging genetic, behavioral and environmental factors, and implementing multicenter studies using diversified groups. This method can be used to develop effective preventative and treatment plans.

CONCLUSION: It was found that pre-stroke symptoms and the key risk factors, including smoking, high blood pressure and family history, had a significant correlation. The most frequent warning signals were the headache, weakness on the right, and speech dysfluency, and hypertension had the strongest correlation. The findings highlight the acuteness of early detection methods of individuals with identified risk factors. Medical experts should educate patients. In order to reduce the burden of stroke in Pakistan, the future research needs to explore the behavioral and genetic predictors, preventative strategies, and community-based screening methods.

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ETHICAL PERMISSION: The Institutional Review Board (IRB) of Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro approved the study ethically. Each participant signed an informed consent before data collection following full explanation of the objective of the study.

The anonymity and confidentiality of the participants was maintained.

CONFLICT OF INTERESTS: With respect to publication of this paper, the authors testify that they have no competing interest. None of the financial, personal, and professional relationships had any influence on the conduct and the results of this study.

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Authors Contribution

Sania Rizwan	<i>Concept and design</i>
Samreen	<i>Acquisition of data</i>
Sana Gul	<i>Acquisition of data</i>
Rahul	<i>Data analysis</i>
Pashmina Shaikh,	<i>Study design</i>
Abdul Hafeez Bughio,	<i>Acquisition of data</i>