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Evaluation of Causes of Hemiplegia/Paraplegia and Effects of Rehabilitative Services in Patients Admitted in Paraplegic Centers

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ABSTRACT

Background: Hemiplegia and paraplegia are severe neurological disorders that significantly impact patients' quality of life and pose substantial challenges for healthcare systems.

Objective: This study aimed to identify the most common causes of hemiplegia and paraplegia, evaluate the influence of demographic and risk factors, and assess the effectiveness of rehabilitative services in improving motor and sensory recovery.

Methodology: A cross-sectional descriptive study was conducted at three paraplegic centers in Peshawar from December 2019 to March 2020. The sample comprised 200 patients with hemiplegia or paraplegia, selected through non-probability convenience sampling. Data were collected using structured interviews and analyzed using SPSS version 21. Statistical tests, including Chi-square, were employed to examine associations between variables.

Results: Of the 200 patients, 151 (75.50%) had paraplegia and 49 (24.50%) had hemiplegia. Trauma caused 106 paraplegia cases (52.50%), while stroke caused 40 hemiplegia cases (20.00%). Comorbidities were more common in hemiplegia patients, with diabetes affecting 20 (40.82%) and hypertension affecting 33 (67.35%). For muscle power recovery, 16 paraplegia patients (10.60%) had no improvement, 95 (62.91%) had partial improvement, and 40 (26.49%) achieved complete recovery. Among hemiplegia patients, 11 (22.45%) had no improvement, 26 (53.06%) had partial improvement, and 12 (24.49%) achieved complete recovery. A significant association was found between the onset of treatment and sensation recovery (p=0.01). Daily physical therapy led to complete muscle power recovery in 51 patients (27.60%), compared to 1 patient (10.00%) with therapy thrice a week, with a p-value of 0.07.

Conclusion: The study highlights the importance of timely and frequent rehabilitation in improving recovery outcomes for hemiplegia and paraplegia patients. Tailored rehabilitation strategies are essential for optimizing patient care.

Keywords: Hemiplegia, Paraplegia, Rehabilitation, Stroke, Trauma, Comorbidities, Physical Therapy

Introduction

Hemiplegia and paraplegia are severe neurological conditions characterized by paralysis on one side of the body or both lower limbs, respectively [1]. These debilitating disorders can arise from a myriad of underlying causes, including stroke, traumatic injury, spinal cord diseases, and congenital conditions [2]. The prevalence and impact of these conditions have significant implications for patients' quality of life, as well as for the healthcare system's burden of care [3].

Understanding the diverse etiologies of hemiplegia and paraplegia is crucial for developing targeted prevention strategies and improving patient outcomes [4]. Research indicates that stroke is the leading cause of hemiplegia, while spinal cord injury is a predominant cause of paraplegia [5]. However, the exact prevalence of these conditions relative to other causes and the influence of demographic and lifestyle factors remain areas requiring further investigation [6,7].

The variability in the causes of hemiplegia and paraplegia highlights the need for a comprehensive analysis of risk factors such as gender, age, comorbidities, and occupational hazards [8]. By examining these variables, researchers can better understand the distribution and frequency of these conditions across different populations, potentially informing more tailored and effective interventions [9].

Rehabilitation services play a critical role in managing hemiplegia and paraplegia [10]. These services often focus on improving motor and sensory functions through a range of therapeutic approaches, including physical therapy, occupational therapy, and psychological support [11]. Evaluating the efficacy of these rehabilitative interventions is essential to optimizing treatment strategies and enhancing patient recovery [12].

Objective

The objective of study was to determine the most common causes of hemiplegia and paraplegia, assess the frequency of these conditions based on risk factors such as gender and comorbid conditions, and evaluate the effectiveness of rehabilitative services in improving motor and sensory recovery in affected patients.

Material and Methods

Study Design and Setting

This research employed a cross-sectional descriptive design to analyze the causes of hemiplegia and paraplegia and assess the effectiveness of rehabilitative services. The study was conducted across three paraplegic centers in Peshawar: Hayatabad Paraplegic Center, the Rehabilitation Centre for the Physically Disabled, and Khyber Teaching Hospital. These centers were selected based on their relevance and accessibility for the study population.

Study Duration

The study was conducted in 4 months from December 2019 to March 2020 after approval of synopsis.

Inclusion and Exclusion Criteria

The study included patients diagnosed with paraplegia or hemiplegia aged 20 years and above who were currently undergoing active treatment at the selected rehabilitation centers and provided informed consent to participate. Excluded from the study were patients with quadriplegia or other severe forms of paralysis beyond the study's scope, those unable to give coherent responses due to severe speech or cognitive impairments, and individuals who did not consent to participate.

Sample Size

A non-probability convenience sampling technique was used to select participants. The sample consisted of 200 individuals, chosen based on the available time and resources for the study.

Data Collection

Data collection was carried out over a four-month period from December 2019 to March 2020. After obtaining ethical approval from the Institutional Research and Ethical Board (IREB), trained team members visited the selected centers to conduct interviews. A structured questionnaire, translated into Urdu or Pashto as needed, was used to gather information. Informed consent was obtained from participants or their guardians before the interviews.

Statistical Analysis

Data was analyzed using SPSS version 21 for Windows. Quantitative variables, such as age, were summarized using mean and standard deviation. Qualitative variables, including gender, occupation, nutrition, stress, history of trauma, and genetic factors, were presented as frequencies and percentages. Chi-square tests were employed to examine associations between categorical variables.

Work Plan

Our batch visited selected rehabilitative centers in Peshawar from December 2019 for data collection. The batch was divided in 2 groups of male and females. Female members took interviews from female subjects in female wards and male members took interviews from male subjects. The collected data was analyzed and results and conclusions were drawn on the basis of data collected.

Ethical Approval

Ethical approval was granted by the Institutional Research and Ethical Board (IREB) of the Medical Education Department, Khyber Medical College. Confidentiality was strictly maintained, personal questions were avoided, and all ethical guidelines were followed to ensure the integrity of the research.

Results

In a sample of 200 patients, 151 (75.50%) were diagnosed with paraplegia, while 49 (24.50%) had hemiplegia (figure 1).

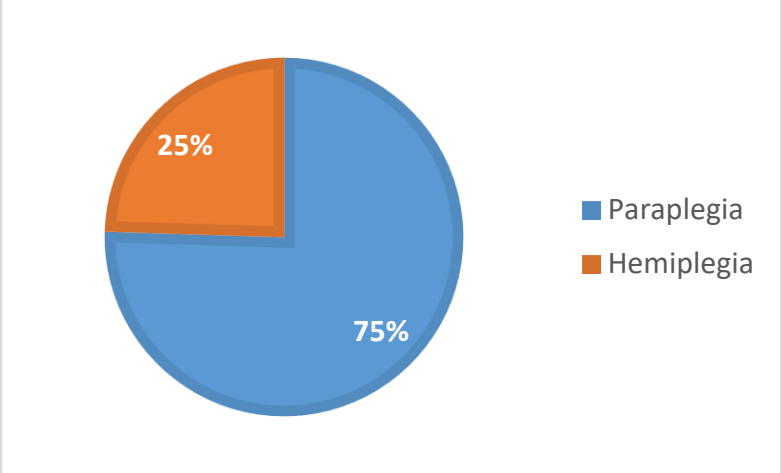

Figure 1: Frequency of Hemiplegia and Paraplegia

Table 1 provides a detailed breakdown of paraplegia and hemiplegia by various demographic and clinical factors. Among the 151 paraplegia cases, 123 (61.50%) are male, and 28 (14.00%) are female. In contrast, of the 49 hemiplegia cases, 30 (15.00%) are male, and 19 (9.50%) are female. The majority of paraplegia cases are in the 20-30 years age group (58, 29.00%), while hemiplegia is more common in the 61-70 years age group (15, 7.50%). Occupationally, 46 (22.50%) paraplegic patients are laborers, whereas only 1 (0.50%) hemiplegic patient is a laborer. Trauma is the primary cause for 106 (52.50%) paraplegia cases, while stroke is the leading cause for 40 (20.00%) hemiplegia cases. For types of trauma, 42 (21.00%) paraplegia cases are due to falls from height, and 40 (20.00%) are due to road traffic accidents. Notably, 11 (7.28%) of paraplegia cases and 45 (91.83%) of hemiplegia cases report no specific trauma.

Table 1: Frequency and Percentage of Paraplegia and Hemiplegia by Demographic and Clinical Factors

Category		**Paraplegia (n=151)**	**Hemiplegia (n=49)**
Gender	Male	123 (61.50%)	30 (15.00%)
	Female	28 (14.00%)	19 (9.50%)
Age Group	20-30 years	58 (29.00%)	5 (2.50%)
	31-40 years	53 (26.50%)	7 (3.50%)
	41-50 years	26 (13.00%)	7 (3.50%)
	51-60 years	10 (5.00%)	9 (4.50%)
	61-70 years	3 (1.50%)	15 (7.50%)
	More than 70	1 (0.50%)	6 (3.00%)
Occupation	Laborer	46 (22.50%)	1 (0.50%)
	Student	25 (12.50%)	2 (1.00%)
	Housewife	22 (11.00%)	16 (8.00%)
	Business Owner	18 (9.00%)	4 (2.00%)
	Driver	14 (7.00%)	4 (2.00%)
	Armed Forces	9 (4.50%)	2 (1.00%)

	Farmer	7 (3.50%)	8 (4.00%)
	Teacher	4 (2.00%)	4 (2.00%)
	Jobless	2 (1.00%)	3 (1.50%)
	Doctor	2 (1.00%)	1 (0.50%)
	Engineer	1 (0.50%)	0 (0.00%)
	Athlete	1 (0.50%)	0 (0.00%)
	Retired	0 (0.00%)	4 (2.00%)
Causes	Trauma	106 (52.50%)	2 (1.00%)
	Stroke	2 (1.00%)	40 (20.00%)
	Spinal Cord Injury	32 (16.00%)	6 (3.00%)
	Neuronal Degeneration	3 (1.50%)	1 (0.50%)
	Other Causes	8 (4.00%)	0 (0.00%)
Types of Trauma	Fall from Height	42 (21.00%)	1 (0.50%)
	Road Traffic Accidents	40 (20.00%)	1 (0.50%)
	Acts of Violence	31 (15.50%)	1 (0.50%)
	Sports Injuries	8 (4.00%)	0 (0.00%)
	Others	19 (9.50%)	1 (0.50%)
	None	11 (7.28%)	45 (91.83%)

Table 2 outlines the prevalence of comorbid conditions among paraplegia and hemiplegia patients. In paraplegia, 12 (7.95%) have diabetes, 7 (4.64%) have hypertension, 4 (2.65%) have cardiovascular diseases (CVDs), and 6 (3.97%) have a family history of these conditions. In hemiplegia, the rates are higher, with 20 (40.82%) having diabetes, 33 (67.35%) having hypertension, 18 (36.73%) having CVDs, and 13 (26.53%) having a family history. Overall, 50 (25.00%) of patients with either condition have comorbidities, while 150 (75.00%) do not.

Table 2: Prevalence of Comorbid Conditions and Relationships with Diabetes, Hypertension, Cardiovascular Diseases, and Family History in Paraplegia and Hemiplegia Patients

Condition		**With Comorbidity (n; %)**	**Without Comorbidity (n; %)**
Paraplegia	Diabetes	12 (7.95%)	139 (92.05%)
	Hypertension	7 (4.64%)	144 (95.36%)
	Cardiovascular Diseases (CVDs)	4 (2.65%)	147 (97.35%)
	Family History	6 (3.97%)	145 (96.03%)
Hemiplegia	Diabetes	20 (40.82%)	29 (59.18%)
	Hypertension	33 (67.35%)	16 (32.65%)
	Cardiovascular Diseases (CVDs)	18 (36.73%)	31 (63.27%)
	Family History	13 (26.53%)	36 (73.47%)
Paraplegia & Hemiplegia		50 (25.00%)	150 (75.00%)

Table 3 provides insights into the effectiveness of rehabilitative therapy for muscle power and sensation recovery. For muscle power recovery, among paraplegia patients, 10.60% showed no improvement, 62.91% had partial improvement, and 26.49% achieved complete recovery. In contrast, 22.45% of hemiplegia patients had no improvement, 53.06% experienced partial improvement, and 24.49% fully recovered. Sensation recovery outcomes mirrored these patterns. When considering the onset of treatment for muscle power recovery, those starting within less than 1 week had 8.33% no improvement, 63.89% partial, and 27.78% complete recovery, while those starting after more than 2 months had 50.00% no improvement, with only 8.33% achieving complete recovery. For sensation recovery, those starting treatment within less than 1 week had 31.94% no improvement and 43.06% partial improvement, with 25.00% recovering completely, whereas those starting after more than 2 months saw 91.67% with no improvement and no complete recoveries. Finally, daily physical therapy yielded 11.70% no improvement, 61.70% partial improvement, and 27.60% complete recovery, whereas therapy thrice a week had 30.00% with no improvement and only 10.00% achieving complete recovery.

Table 3: Recovery and Onset of Treatment for Muscle Power and Sensations Due to Rehabilitative Therapy

Category		**No Improvement (n; %)**	**Partial Improvement (n; %)**	**Complete Recovery (n; %)**
Recovery of Muscle Power	Paraplegia	16 (10.60%)	95 (62.91%)	40 (26.49%)
	Hemiplegia	11 (22.45%)	26 (53.06%)	12 (24.49%)
Recovery of Sensations	Paraplegia	16 (10.60%)	95 (62.91%)	40 (26.49%)
	Hemiplegia	11 (22.45%)	26 (53.06%)	12 (24.49%)
Onset of Treatment and Muscle Power Recovery	Less than 1 week	6 (8.33%)	46 (63.89%)	20 (27.78%)
	1-2 weeks	5 (8.06%)	37 (59.68%)	20 (32.26%)
	2-4 weeks	8 (19.05%)	26 (61.90%)	8 (19.05%)
	1-2 months	2 (16.67%)	7 (58.33%)	3 (25.00%)
	More than 2 months	6 (50.00%)	5 (41.67%)	1 (8.33%)
Onset of Treatment and Sensations Recovery	Less than 1 week	23 (31.94%)	31 (43.06%)	18 (25.00%)
	1-2 weeks	21 (33.87%)	34 (54.84%)	7 (11.29%)
	2-4 weeks	9 (21.43%)	31 (73.81%)	2 (4.76%)
	1-2 months	5 (41.67%)	5 (41.67%)	2 (16.67%)
	More than 2 months	11 (91.67%)	1 (8.33%)	0 (0.00%)
Frequency of Physical Therapy and Muscle Power Recovery	Everyday	22 (11.70%)	115 (61.70%)	51 (27.60%)
	Thrice a week	3 (30.00%)	6 (60.00%)	1 (10.00%)
	Once a week	2 (100.00%)	0 (0.00%)	0 (0.00%)

Table 4 presents the Chi-square test results for various associations related to recovery. The analysis of muscle power recovery between Paraplegia and Hemiplegia showed a Chi-square value of 1.63 with 2 degrees of freedom and a p-value of 0.44, indicating no significant difference. Similarly, the

recovery of sensations also had a Chi-square value of 1.63, 2 degrees of freedom, and a p-value of 0.44, suggesting no significant association. For the onset of treatment and muscle power recovery, the Chi-square value was 10.56 with 8 degrees of freedom and a p-value of 0.23, showing no significant difference. However, the onset of treatment and sensations recovery had a Chi-square value of 19.83 with 8 degrees of freedom and a significant p-value of 0.01, indicating a significant association. Finally, the frequency of physical therapy and muscle power recovery had a Chi-square value of 5.29 with 2 degrees of freedom and a p-value of 0.07, which is close to significance.

Table 4: Chi-Square Tests for Associations Between Recovery and Variables

Category	Variable	Chi-Square Value (χ^2)	Degrees of Freedom (df)	p-Value
Recovery of Muscle Power	Paraplegia vs. Hemiplegia	1.63	2	0.44
Recovery of Sensations	Paraplegia vs. Hemiplegia	1.63	2	0.44
Onset of Treatment and Muscle Power Recovery	Less than 1 week vs. Other Onsets	10.56	8	0.23
Onset of Treatment and Sensations Recovery	Less than 1 week vs. Other Onsets	19.83	8	0.01*
Frequency of Physical Therapy and Muscle Power Recovery	Everyday vs. Thrice a week, Once a week	5.29	2	0.07

Discussion

This study explores the prevalence, causes, and rehabilitation outcomes of hemiplegia and paraplegia, providing significant insights into the demographic and clinical factors associated with these conditions. Among the 200 patients analyzed, paraplegia was more common (75.50%) compared to hemiplegia (24.50%). This distribution aligns with previous research, which highlights spinal cord injuries as a predominant cause of paraplegia [13,14]. In contrast, hemiplegia is often linked to cerebrovascular accidents, as observed in our study where stroke was the leading cause for 20.00% of hemiplegia cases. This finding is consistent with previous study, which emphasize stroke as a primary etiology for hemiplegia [15].

The demographic profile of patients revealed that paraplegia predominantly affects males (61.50%), with trauma being the leading cause (52.50%). This is supported by previous literature indicating a higher prevalence of traumatic spinal cord injuries among males, particularly in younger age groups [16]. The age distribution in our study showed that paraplegia primarily affects individuals aged 20-30 years, whereas hemiplegia is more common in older adults, specifically those aged 61-70 years. This age-related disparity aligns with the previous findings, who reported that traumatic causes are more prevalent among younger individuals, while stroke-related hemiplegia is more common in the elderly [17].

Our study's data on comorbid conditions revealed a striking contrast between paraplegia and hemiplegia patients. While only 25.00% of paraplegia patients had comorbid conditions, a significantly higher proportion of hemiplegia patients (75.00%) had comorbidities such as diabetes, hypertension, and cardiovascular diseases. This finding is consistent with previous research studies, who found a higher prevalence of comorbid conditions among stroke patients [18,19]. The increased

burden of these comorbidities may contribute to the higher incidence and severity of hemiplegia in our sample.

Regarding rehabilitative outcomes, the effectiveness of therapy showed notable differences between paraplegia and hemiplegia patients. Approximately 26.49% of paraplegic patients achieved complete recovery of muscle power, compared to 24.49% of hemiplegic patients. Although these results are similar, the onset of treatment had a significant impact on recovery. Patients starting treatment within less than 1 week had better outcomes for muscle power recovery compared to those who started later. This finding corroborates previous studies, who found early intervention to be crucial for improving recovery outcomes [20]. The frequency of physical therapy also influenced recovery, with daily therapy yielding better results compared to less frequent sessions, which is consistent with recommendations from rehabilitation guidelines [21].

In summary, while our findings align with existing research on the prevalence and causes of hemiplegia and paraplegia, they also underscore the importance of timely and frequent rehabilitation. These insights could inform targeted interventions and improve the quality of care for individuals affected by these debilitating conditions.

Study Limitations

This study has several limitations. The use of non-probability convenience sampling limits the generalizability of the findings, as the sample may not fully represent the broader population of patients with hemiplegia and paraplegia. Additionally, the cross-sectional design restricts the ability to draw conclusions about causality or long-term outcomes. The reliance on self-reported data may introduce response bias, and the study's short duration of four months may not capture the full spectrum of recovery or long-term effects of rehabilitation. Future research with larger, randomized samples and longitudinal follow-up is needed to address these limitations and provide a more comprehensive understanding of these conditions.

Conclusion

This study highlights the varying prevalence, causes, and rehabilitative outcomes for hemiplegia and paraplegia, demonstrating that trauma is a predominant cause of paraplegia, while stroke is a leading cause of hemiplegia. The findings underscore the critical role of early intervention and consistent physical therapy in optimizing recovery outcomes. The significant differences in comorbid conditions between the two groups further emphasize the need for tailored rehabilitation strategies. These insights can guide more effective management approaches and improve the overall quality of care for patients with these debilitating conditions.

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