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ALLEVIATING NEUROSURGICAL DISEASE BURDEN FROM WAKE OF PANDEMIC TO HAVOC OF FLOODING IN PAKISTAN. NEUROSURGICAL RURAL OUTREACH SURVEY TO MEET GLOBAL NEUROSURGERY CHALLENGES

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Abstract

Background: In Pakistan, neurosurgical diseases pose a significant health challenge, particularly in rural regions where medical resources and awareness are limited. Factors such as socioeconomic status, cultural beliefs, and a deficient healthcare infrastructure further exacerbate the burden of neurological illnesses.

Methods: This study employed a structured survey conducted across 19 surgical camps in a combined area of 149,757.6 km², facilitated by the Government of Pakistan. A total of 1,793 patients underwent assessment for neurosurgical conditions, with a detailed analysis of city-specific data to identify regional disparities.

Results: The findings revealed that 16.45% of the patients required urgent surgical intervention. Of these, 42.37% were diagnosed with hydrocephalus and 30% with Degenerative Disc Disease (DDD). The prevalence of hydrocephalus was notably higher in rural areas (53.65%), with only 13.89% of the necessary surgeries being performed in these remote locations.

Conclusion: The significant incidence of neurosurgical diseases in rural areas underscores the need for innovative approaches in detection, treatment, and management. Implementing capacity-building initiatives, telemedicine, mobile surgical units, and enhancing community participation could significantly improve health outcomes and quality of life for affected populations.

Keywords: neurosurgical diseases, rural healthcare, Pakistan, hydrocephalus, mobile surgical units, telemedicine, healthcare disparities

Introduction

The toll that neurological illnesses place on patients and in turn on society is becoming more widely acknowledged. The burden of neurological illnesses on a global scale, as well as their trends over the last three decades, were, however, not accurately estimated until recently [1]. In low- and middle-income nations, neurological disease-related mortality and disability have increased significantly

during the past 30 years. Further increases are anticipated internationally due to population expansion and aging. This increase in the absolute number of affected people indicates that efforts to prevent and treat severe neurological illnesses have not made enough headway in reversing demographic trends around the world [2]. Worldwide patterns of illness and death have been altered by the demographic and epidemiological profile [3]. 5.53 percent of all deaths worldwide are caused by neurological illnesses, the fifth greatest cause of death worldwide [4]. A wide variety of illnesses that affect the central and peripheral nervous systems are included under neurological disorders [5–7]. Numerous factors contribute to the significant burden of neurological illnesses in Pakistan, a developing nation with a sizable rural population [4].

The burden of neurological disorders in rural Pakistan remains poorly characterized, largely due to its classification as a lower to middle-income country [8]. This study initiated a comprehensive survey aimed at uncovering the complexities associated with the burden of surgically treatable diseases. The author has made notable contributions to global neurosurgery initiatives, providing essential surgical interventions to those in need. Data gathered through this research is expected to elucidate the prevalence of specific neurological conditions in the rural districts of Sindh. Furthermore, the study addresses the challenges faced in delivering neurosurgical care in these regions and explores viable strategies to enhance healthcare services.

Methods

Study Population:

This retrospective descriptive study included subjects of all ages from rural areas of Sindh province, Pakistan, who presented with neurological diseases and were deemed in need of surgical intervention. The population was sampled from 19 surgical camps organized across various rural locations. These camps were strategically set up to target underserved populations disproportionately affected by neurosurgical conditions. Both genders were represented, and there was no exclusion based on age or specific neurological conditions, ensuring a comprehensive demographic representation.

Outcome Variables:

The primary outcome variables of this study were the incidence of urgent surgical interventions required and the specific types of neurosurgical diseases identified. The diseases focused on included hydrocephalus, degenerative disc disease (DDD), and other prevalent neurological conditions as identified through clinical assessments at the surgical camps.

Covariates:

Several covariates were considered to assess their influence on the prevalence and management of neurosurgical conditions. These included age, gender, specific location of the camps within rural Sindh, and the socio-economic status of the patients. Additional medical history, such as prior treatments and the severity of the conditions, was also collected through patient interviews and medical records.

Statistical Analysis:

Data were collected using a structured questionnaire along with registry methods, and analysis was performed to identify patterns and regional disparities in the incidence of neurological diseases. Descriptive statistics were utilized to summarize the data on disease prevalence and surgical interventions. Inferential statistics, such as chi-square tests for categorical data and t-tests for continuous variables, were employed to determine the significance of associations between covariates and the primary outcomes. All statistical analyses were conducted using SPSS software, ensuring compliance with the Helsinki Declaration of 2000. Follow-up data for patients who underwent surgeries were maintained through records at Liaquat University Hospital in Hyderabad to assess long-term outcomes.

Results

Main Findings:

The study assessed a total of 1,793 individuals across various rural settings in Sindh, utilizing 19 surgical camps for data collection. The patient demographic comprised 53% females and 47% males with the age distribution highlighting a significant portion of younger individuals: 23% under five years, 16% aged between five and sixteen, and the remainder over sixteen years of age.

Disease Prevalence and Surgical Needs:

The most frequently identified diseases included non-specific headaches (20.18%), degenerative disc disease (DDD) at 15.95%, and sinusitis/allergies at 15.67%. Notably, hydrocephalus accounted for 9.53% of the cases but represented a significant portion of the severe cases requiring surgical intervention.

According to the data, the prevalence of diseases per 10,000 cases varied significantly across different cities within rural Sindh. For instance, hydrocephalus had a higher prevalence in Mithi (19.5 per 10,000) compared to other areas such as Hyderabad (0.12 per 10,000) and Mirpurkhas (0.51 per 10,000). Similarly, degenerative disc disease (DDD) showed higher prevalence rates in more urbanized rural areas such as Digree (11.1 per 10,000) and lower in less developed areas.

Surgical Interventions:

Of the total cases assessed, 125 required immediate surgical interventions for hydrocephalus, of which only 22 were performed. This underscores a significant gap in the provision of necessary surgical care. The pattern was similar for other conditions such as myelomeningocele (MMC) and lumbar myelomeningocele (LMMC), with 42 cases identified needing surgery and only 6 receiving it.

Regional Disparities:

The analysis further highlighted the regional disparities in surgical care and disease prevalence. For example, in Mithi, a notably high incidence of hydrocephalus and myelomeningocele suggested a critical need for targeted neurosurgical facilities. In contrast, other areas like Kunri and Nasirpur showed higher incidences of sinusitis and headaches, pointing to varying health priorities across regions.

Discussion

Main Findings of the Study:

This research highlights significant regional disparities in the prevalence and types of neurological disorders in rural Sindh. Notably, non-specific headaches were predominantly reported in Nasarpur, while hydrocephalus and epilepsy were more frequently observed in Mithi and Naushero Feroze, respectively. These findings highlight the influence of environmental, genetic, and socio-economic factors on the distribution of neurological diseases.

What is already known?

Previous research has documented various neurological conditions in rural areas of Pakistan, such as epilepsy and degenerative disc disease, with notable differences in disease prevalence between genders and regions [9,10]. The limited healthcare resources in these areas compound the challenges of diagnosing and treating neurological disorders [11].

What does this study add?

This study provides detailed insights into the geographic and demographic nuances of neurological disease prevalence in rural Sindh. It emphasizes the critical role of nutritional deficiencies, such as folic acid during pregnancy, in exacerbating women's health issues related to neurological conditions

[12]. The COVID-19 pandemic has further strained healthcare systems, particularly affecting healthcare workers in Sindh, which has implications for the delivery of neurosurgical care [11,13].

Future recommendation and limitations of the study

The study calls for increased neurosurgical training and integration of neurosurgery into public health frameworks, as emphasized by Rallo et al. [14], to enhance global neurosurgical capacity [15]. Addressing neurotrauma effectively requires a dedicated neurosurgical workforce, as outlined by Corley et al. [15], which is crucial for improving health outcomes in low- and middle-income countries [16]. Additionally, public health strategies should include neurosurgery to effectively manage and prevent neurosurgical conditions, as demonstrated in global case studies by Veerappan et al. [12]. The critical role of neurosurgical advocacy for folate fortification, as discussed by Estevez-Ordonez et al. [17], highlights the potential to significantly reduce neural tube defects through proactive public health policies [17].

The pandemic's impact on healthcare, as discussed by Iqbal et al., reinforces the need for robust healthcare systems capable of responding to such crises effectively, particularly in resource-constrained environments like Pakistan [16]. Moreover, the integration of neurosurgical concerns into public health practice, as suggested by Veerappan et al., is essential for comprehensive healthcare planning and implementation [12].

The study's limitations include potential data collection biases and the need for a broader evaluation of the effectiveness and long-term outcomes of neurosurgical treatments. Future research should also consider cultural practices and local health beliefs that may affect the utilization of neurosurgical services.

This study illuminates the complex landscape of neurological disorders in rural Sindh, offering a foundation for targeted interventions and policy formulation. An integrated approach involving healthcare providers, policymakers, and community leaders is essential to mitigate the burden of these disorders and improve the overall health infrastructure in Pakistan. This comprehensive strategy will leverage the insights from various studies, including those on the impact of COVID-19, to enhance the effectiveness of health interventions in rural and underserved areas [13,18].

Conclusion:

Collaborative efforts involving healthcare providers, policymakers, non-governmental organizations, and community leaders are crucial for developing sustainable solutions that address awareness, infrastructure, and access to care. By implementing innovative strategies tailored to the specific needs of rural populations, Pakistan can work towards reducing the burden of neurological disorders and improving the overall health of its citizens.

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