RESEARCH ARTICLE

Conducting the Pakistan brain tumour epidemiology study — a report on the methodology

Erum Baig,[1] Mashal Murad Shah,[2] Mohammad Hamza Bajwa,[3] Muhammad Usman Khalid,[4] Saad Akhtar Khan,[5] Ummey Hani,[6] Saad bin Anis,[7] Altaf Ali Laghari,[8] Naveed Zaman Akhunzada,[9] Jaleed Ahmed Gilani,[10] Noyan Jawed,[11] Muhammad Faraz Raghib,[12] Pakistan Brain Tumour Consortium, Sameen Siddiqi,[13] Syed Ather Enam[14]

Abstract

Objective: To combat the lack of brain tumour registries, the Pakistan Brain Tumour Epidemiology Study (PBTES) was conducted without any funding from an external source.

Methods: A retrospective analysis of patient data, including patients of all age groups diagnosed with all histopathological types of brain tumours from all over Pakistan, was performed. For this, Pakistan Brain Tumour Consortium (PBTC) was established, including 32 neurosurgical centres from around the country. Data was collected online through a proforma that included variables such as patient demographics, clinical characteristics, operative details, postoperative complications, survival indices, and current functional status. The data collection and analysis team included principal investigators, core leads, regional leads, regional associates, and student facilitators. Despite logistical concerns and lack of resources, the PBTES was conducted successfully, and a formal brain tumour surveillance database was formed without any external funding, which remains unheard of.

Conclusion: The methods applied in this study are reproducible and can be employed not just to develop more robust brain tumour and other cancer registries but also to study the epidemiology of communicable and non-communicable diseases in resource-limited settings, both locally and globally.

Keywords: brain neoplasms, retrospective study, epidemiology, noncommunicable diseases.

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Introduction

The incidence of brain tumours is conjectured to be greater in high-income countries (HICs) than in low-middle-income countries (LMICs).[1] However, this difference can be due to multiple reasons, including the paucity of population-based studies carried out in LMICs and the lack of tumour registries. Therefore, the actual burden of disease for brain tumours in LMICs is underreported. This highlights the importance of conducting population-based epidemiological studies in LMICs to expedite outcomes-based research, serves as a foundation to formulate effective strategies that address the challenges faced by the healthcare system, and ultimately improve patient care in LMICs.[2]

A population-based registry keeps track of all reported cases in a selected population, focusing particularly on epidemiological data and assessment of health systems for disease prevention, detection, and treatment.[3] Conducting population-based epidemiological studies in LMICs like Pakistan can be particularly challenging due to limited resources and poor clinical and research infrastructure. This paper describes our experience in designing and conducting the Pakistan Brain Tumour Epidemiology Study (PBTES) — a nationwide study carried out to assess the distribution of brain tumours in Pakistan. Our experience could be useful to other researchers conducting epidemiological research in challenging and constrained settings.

At present, no national database maintaining information on brain tumour distribution throughout the country exists. While various studies exist on their incidence and prevalence, the provided regional data on brain tumours are often inconsistent due to marked ethnic heterogeneity in the Pakistani population. Moreover, conducting a multi-centre study without any funding is unheard of. The purpose of this study was to propose and establish a comprehensive brain tumour surveillance network that would allow for making national and global estimates of brain tumour burden, as well as facilitate

Affiliation at the time of study

[1-4,6,8,10-14] The Aga Khan University Hospital, Karachi, [5] Liaquat National Hospital, Karachi, [7] Shaukat Khanum Cancer Memorial Hospital, Lahore, [9] Rehman Medical Institute, Hayatabad, Peshawar. PBTC Group Names: End of the supplement

Current affiliation

[1] University of Pennsylvania, USA.

Correspondence: Syed Ather Enam email: ather.enam@aku.edu

decision-making on prevention, diagnosis, treatment, and rehabilitation in brain tumour patients.[1] The purpose of this paper, specifically, was to propose a reproducible methodology to allow for the formation of more brain tumour and cancer registries around the world in resource-limited settings.

Materials and Methods

PBTES is a retrospective cross-sectional study designed by the Pakistan Society of Neuro-oncology (PASNO) to provide information about the various types of brain tumours in Pakistan. This was created to streamline the needs assessment for surgeries, treatments, and other brain cancer care facilities in the country. Patients of all age groups diagnosed with brain tumours between January 1, 2019- December 31, 2019, were included in this study. All types of primary brain tumour cases, as well as metastatic tumours, were included. As data collection had a national scope, approval from the National Bioethics Committee was also requested and provided (Ref: No.4-87/NBC-487/20/749).

Establishing a Pakistan Brain Tumour Consortium,In Pakistan, there is currently no centralised record system for registering brain tumour patients that visit both neurosurgical centres and radiology centres. Therefore, to ensure no patient records were repeated, data were collected only from neurosurgical centres. A consortium of 45 neurosurgical centres from all over Pakistan, from both public and private sectors, was initially selected via the provided list of hospitals enrolled under PASNO. Thirteen centres regretted involvement. The remaining 32 centres were included in the study. Each hospital's neurosurgery head was contacted by the principal investigator and was invited to be a part of the study. This was a non-funded study, and hence the participation of so many centres without any financial incentives was made possible due to existing relationships and rigorous networking with investigators at various centres. The incentive provided for the neurosurgeons and residents involved in data collection was extensive research experience and inclusion in a national initiative.

These centres were then divided into three groups based on their region (Table-1):

Group A (green): centres from Sindh and Baluchistan

Group B (yellow): centres from Punjab

Group C (pink): centres from Khyber Pakhtunkhwa (KP) and Islamabad capital territory (ICT).

The PBTES team: The PBTES team was established to streamline the process of data collection and coordination with the participating centres. It consisted of two principal investigators, three core leads, regional leads, regional associates, and student facilitators. These subgroups were responsible for managing the data from centres in their respective regions. Team members included neurosurgery residents, faculty and research associates. The Neuroscience Interest Group (NSIG), a medical-student interest group at the Aga Khan University, also participated in the study.

Data collection and analysis: A comprehensive online proforma was designed to collect data in collaboration with neurosurgeons involved in the study. A pilot study was conducted at a tertiary care hospital in Karachi to validate our data collection tool. It was finally divided into four sections - section 1 comprised patient demographics, including age, gender, co-morbidities and clinical characteristics; section 2 included peri-operative details, including the date of surgery, the extent of tumour resection, and postoperative complications; section 3 included the patients' discharge dispositions, tumour

Table-1: Pakistan Brain Tumour Consortium.

	Centre Names	City		Center Names	City		Center Names	Names
1	Aga Khan University Hospital	Karachi	11	Mayo Hospital	Lahore	24	Lady Reading Hospital	Peshawar
2	Liaquat National Hospital	Karachi	12	Children Hospital	Lahore	25	North West Hospital	Peshawar
3	Civil Hospital	Karachi	13	National Hospital	Lahore	26	Rehman Medical Centre	Peshawar
4	Jinnah Hospital	Karachi	14	CMH Lahore	Lahore	27	Prime Hospital	Peshawar
5	National Medical Centre	Karachi	15	Shaukat Khanum Cancer Memorial Hospital	Lahore	28	Hayatabad Medical Complex	Peshawar
6	Neuro-Medical Institute	Karachi	16	Hameed Latif Hospital	Lahore	29	DHQ Rawalpindi	Rawalpindi
7	Ziauddin Hospital Nazimabad	Karachi	17	Pakistan Institute of Neuroscience/LGH	Lahore	30	PIMS	Islamabad
8	Liaquat University of Medical Health Sciences	Jamshoro	18	Ganga Ram Hospital	Lahore	31	Shifa International Hospital	Islamabad
9	Bolan Medical Center	Quetta	19	Sheikh Zayed Hospital Lahore	Lahore	32	Ayub Medical College	Abbottabad
10	Peoples Medical College	Hyderabad	20	Allied Hospital	Faisalabad			
			21	Bahawalpur Victoria Hospital	Bahawalpur			
			22	Nishtar Hospital	Multan			
			23	Jinnah Hospital Lahore	Lahore			

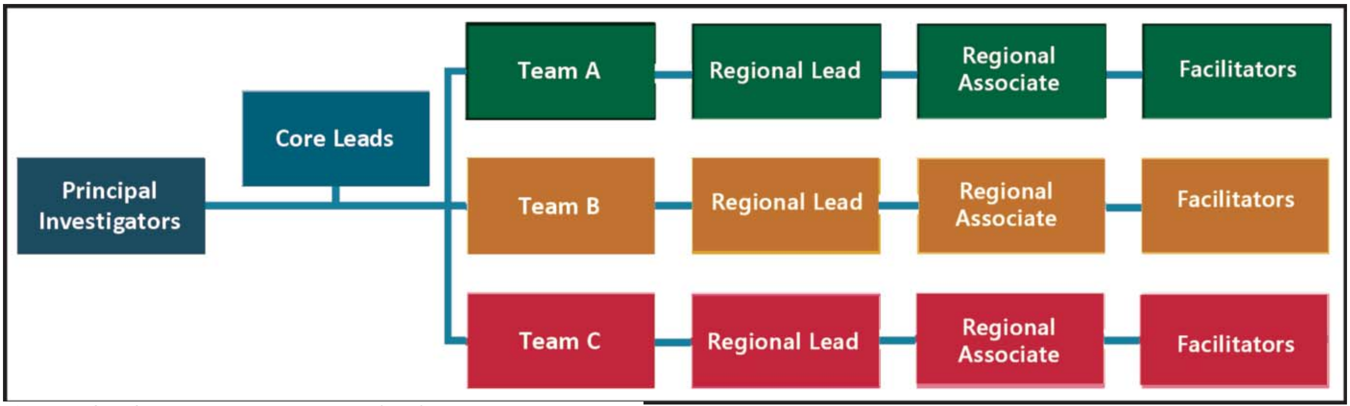

Figure-1: The Pakistan Brain Tumour Consortium (PBTC) Team.

histopathology based on the World Health Organization's 2016 Classification of Central Nervous System Tumours, and information on adjuvant radio- and chemotherapy if any; and section 4 included data on survival indices.

A maximum of two centre associates were designated by centre heads for data collection and entry. Online training sessions were held for centre associates explaining the online proforma and the process of data collection. Regional associates and facilitators were also assigned to centre associates to assist with data collection and to answer general queries. Given the lack of electronic patient records in most centres across Pakistan, individual patient files were reviewed, which was an arduous and time-consuming process.

The data collection was completed over a span of five months, from September 2020 to January 2021. The final data was rigorously reviewed and cleaned by research associates and neurosurgeons. Data were analysed using SPSS Version 25.0 and STATA Version 16.0.

Discussion

Logistical Considerations and Lessons Learnt: A large-scale, nationwide study such as PBTES is bound to encounter many logistical concerns. Our experience can be categorized into health system infrastructure limitations and study-centric limitations.

Health System Infrastructure: One of the biggest obstacles in conducting a nationwide study and establishing a cancer registry in an LMIC is the scarcity of health information systems and the limited capacity of those that are present. Collection of even the basic data for computing cancer incidence can be a difficult process as patients may not reach the system, or the data recorded are incomplete or unreliable.[4] Significant follow-up attrition in LMICs is one of the reasons for incomplete data, with post-surgical treatment and survival often missing.

The time that data was collected for this study was amid the COVID-19 pandemic, which led to changes in the way we could interact, visit institutional health management systems and recordkeeping facilities, and the availability of residents and faculty to collect data. However, we were able to adjust and adapt to these changes — all meetings and communication were carried out through online platforms; our data collection tool was online from the get-go; residents and faculty would often collect data when their respective hospitals had a low influx of patients, and it was possible for them to visit their recordkeeping departments.

Project-centric Challenges

Difficulties in Collecting Epidemiological Data: The foremost challenge in conducting this study was convincing neurosurgeons and residents from centres around Pakistan to participate, and that too without a financial incentive. This demonstrates the lack of inclination towards academia in doctors that exists nationally, something that needs to be investigated and worked upon later and is beyond the scope of this study. Hence, incentivizing our initial list of hospitals also proved to be difficult. However, we were still able to include 32 hospitals across all four provinces and the federal capital and captured patients from the provinces, Islamabad Capital Territory, Gilgit-Baltistan and Azad Jammu and Kashmir, as well as several patients that crossed borders for treatment from countries such as Afghanistan, Syria and Sudan.

To date, no single registry has consolidated brain tumour data for Pakistan. Loss to follow-up was declared if medical records at the primary surgical care centre did not reflect follow-up at the same centre with the same surgeon. Due to the inability to track patients between centres, data comparisons should be made with caution, as patients overlapping between hospitals due to post-surgical treatment has not been accounted for. Similar challenges have been faced while creating other epidemiological registries: in Belgium, the lack of coordination between data sources for epidemiological data on pulmonary disease has resulted in skewed demographic and clinical data.[5] Epidemiologists in Belgium have stressed the importance of a centralized database for disease and disability, which also applies to Pakistan.

Selection bias in our study was also a significant challenge and has been a documented pitfall of the registry process.[6] Obtaining data for every surgically treated intracranial tumour is a time-consuming and demanding process, and it is impossible for one singular registry to cover a country with a population as large and diverse as Pakistan's.

Strengths: Our study, despite challenges and limitations, has covered the largest population catchment for brain tumours when compared with other epidemiological studies and registries for brain tumours in Pakistan. Moreso, this study is like a case report due to the rarity of multicentre studies being conducted without any external funding. Indeed, lack of funding and resources is one of the major reasons for the scarcity of such registries in LMICs. This report sets an example that the same methodology could be used for studying both communicable and non-communicable diseases in countries with limited means. Gathering at least some preliminary data, no matter how crude, can serve as a base to launch more studies — a protocol that is successfully being followed by the Cancer Genetics Studies Consortium (CGSC) to study the epidemiology of colorectal cancer.[7]

Conclusion

The PBTES was conducted to compensate for the lack of a brain tumour registry in Pakistan. This would allow for assessment of the national brain tumour burden, early detection, treatment, and prevention through the implementation of evidence-based strategies and facilitate comparison of data within national and with international populations. In particular, this first paper in the series lays out a reproducible methodology for forming population-based registries in resource-limited settings that would allow the national and international formation of more such databases.

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Conflict of Interest: None to declare

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