

REVIEW ARTICLE

Dr. Denis Parsons Burkitt: The Flamboyant Fibreman who changed the “Landscape” of Oncology

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Received Date: 17 September, 2024

Accepted Date: 19 October, 2024

ABSTRACT

Denis Parsons Burkitt is an important person in oncology as he made significant contributions to medical research. Born in 1911 in Enniskillen, Ireland, he had to overcome his personal challenges including loss of right eye to become a famous surgeon and researcher. In his early career he was immersed in religious convictions and has a deep sense of purpose. This made him join the Royal Army Medical Corps during World War II. After that he started his career in medicine in Uganda. Here he made a groundbreaking discovery about Burkitt lymphoma. This is a cancer that is fat growing and mainly affects African children. By connecting the malaria endemic areas, Burkitt has identified the relationship between cancer and geographical locations. He has researched epidemiological studies and created geographical maps for proving his findings. His findings have helped in the identification of new cancer and also provided a foundation for cancer epidemiology. His contribution to oncology is well known and it has helped him to get many accolades including knighthood in 1978. Burkitt lymphoma and its relation to viral oncogenesis are researched continuously till today. Burkitt's life has been marked by perseverance, curiosity and compassion. This can serve as an inspiration for future generations mainly in the field of medicine.

Keyword: Burkitt Lymphoma, Denis Parsons Burkitt, Epidemiology, Oncology, Geographical Mapping.

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INTRODUCTION AND BACKGROUND

Denis Parsons Burkitt's life provides many unforgettable moments that mainly reflects on his influence on medicine as well as society. One incident that took place during his journey to deliver a lecture in America. As Burkitt has recalled that he was sitting beside a woman who is preoccupied. And she has shared that her husband is fighting a rare condition. For that Burkitt has answered as “I am a doctor, and if it will help, you can tell me about your husband's

illness”. For that, the woman responded, “Oh, I doubt if you can help, he has a very rare disease known as Burkitt's Lymphoma”. Burkitt's philosophy was, “Societies that eat unrefined foods produce large stools and build small hospitals; societies that eat fiber-depleted foods produce small stools and build large hospitals” [1]. This quote states the essence of his lifelong work and the impact of his scientific contributions that blend humor with insight.

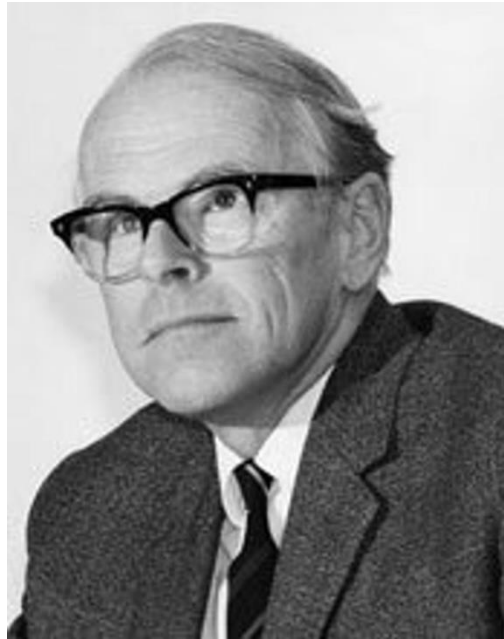


Figure 1. Denis Parsons Burkitt[Image Credit-[2]]

Denis Burkitt was born in 1911 in Enniskillen, Ireland. His father is James Burkitt, an accomplished engineer with a passion for ornithology. James was the first to use ringing to identify individual birds and map their territories [3]. Denis would later employ a similar geographic approach in mapping the spread of African lymphoma. His mother, Gwendolyn Hill, came from a privileged background with a strong sense of tradition and deep religious devotion. Burkitt and his brother attended Portora Royal School, renowned for producing extraordinary talents like Oscar Wilde and Samuel Beckett [3]. At the age of 11, Burkitt lost his right eye during a clash between two groups of boys, leaving him with impaired vision. After this occurrence, he was transferred to a school in Holyhead, Wales. Later, he continued his education at a secondary school in Cheltenham. Despite his academic struggles, he excelled in extracurricular activities such as photography and rowing, which he enjoyed with his brother [3].

In 1929, Denis initially pursued engineering at Trinity College, inspired by his father's career. However, he soon realized that engineering was not his true interest [3]. During his time at Trinity, he became actively involved in a religious group that held monthly evangelical meetings at Number 40 in New Square. These gatherings greatly influenced him and Burkitt later credited them as pivotal moments in shaping his sense of purpose. He later credited his career success to these meetings, stating "It was through their influence that I made a halting commitment of my life to Jesus Christ. This gave me a sense of motivation, identity and direction" [3]. A significant turning point in Denis Burkitt's life occurred when he lived with a medical student whose textbooks sparked his interest in medicine. This unexpected exposure fueled a strong curiosity, leading him to reconsider his career path.

With newfound determination, Burkitt prepared for the medical school entrance examination, achieving success on his first attempt. He interpreted this achievement as a divine sign that solidified his conviction to pursue a career in medicine, reinforcing his belief that he was destined for this path [3,4]. As Burkitt embarked on this journey, his academic performance experienced a marked improvement. His diligence and commitment paid off as he steadily ranked among the top students in his cohort. The rigorous demands of medical training did not deter him; instead, they ignited a passion for learning and a relentless pursuit of excellence that would define his career. Beyond his academic prowess, Burkitt possessed unique skills that distinguished him from his peers. His experience speaking at evangelistic rallies not only honed his public speaking abilities but also prepared him for communicating complex medical ideas effectively. This skill later became instrumental in both his research presentations and public health advocacy [4]. Burkitt's ability to combine clear communication with medical expertise allowed him to engage with diverse audiences, from academic peers to communities in need of health education. This blending of scientific insight and powerful rhetoric laid the foundation for his impactful contributions to medicine, particularly in recognizing and addressing global health challenges, such as the identification of Burkitt's lymphoma.

Denis Parsons Burkitt's early career was marked by resilience and determination. His outstanding academic prowess earned him significant accolades, including the prestigious Hudson Prize and a silver medal for his exceptional performance in medical school. In 1935, Burkitt stood out by placing second in the final medical examinations, an impressive feat that underscored his commitment and intellectual

capability. However, despite his high ranking and clear potential, Burkitt's ambitions met an obstacle when he was overlooked for a sought-after horsemanship at Adelaide Hospital, a position awarded to a peer with notable athletic achievements in rugby. This decision, rooted more in extracurricular prominence than academic excellence, was a setback for Burkitt but did not deter him [4,5]. Determined to advance his medical career, Burkitt relocated to England to pursue a horsemanship, where his interest in surgery began to take root. His time in England proved transformative, as he embraced the rigors of surgical training and developed skills that would later define his legacy. This journey was not without its challenges; Burkitt's limited binocular vision posed a significant difficulty in a field that demanded precision and acute depth perception. Yet, he persevered, adapting to these challenges with ingenuity and unwavering dedication. This period laid the foundation for his future breakthroughs, including his monumental work in discovering and characterizing Burkitt lymphoma, contributing to global medical advancements. Burkitt's early setbacks and subsequent achievements exemplify the resilience that would come to define his career, showcasing how determination can overcome obstacles to create a lasting impact in medical science [5].

REVIEW

Early Career and Military Involvement

In 1938, Denis Burkitt was awarded the distinguished fellowship of the Royal College of Surgeons, an achievement that marked a pivotal moment in his medical career. While undertaking his residency at the Prince of Wales Hospital in Plymouth, he encountered Olivia Rogers, a compassionate nurse whose dedication to her work and shared religious beliefs struck a chord with him. Their shared values fostered a strong connection, culminating in their marriage in 1943 [5]. With the outbreak of the Second World War, Burkitt's profound religious convictions and unwavering sense of duty propelled him to serve in the military. He initially volunteered for the Royal Army Medical Corps (RAMC) in 1940 during the perilous days of the Dunkirk evacuation, but his application was declined. Not one to be easily deterred, Burkitt also sought opportunities through the Colonial Office, only to face rejection—likely due to partial vision loss in one eye, a factor that posed limitations on his candidacy. Undeterred by these setbacks, Burkitt reapplied to the RAMC in late 1941 and this time was accepted after passing the medical examination. His initial training took place in Hampshire, where he demonstrated both resilience and skill, leading to his assignment to the 219 Field Ambulance Unit near Norwich. Here, Burkitt served as a surgeon, gaining invaluable experience under the demanding conditions of wartime medicine. These formative years not only solidified his medical acumen but also reinforced his reputation as a

dedicated and skilled surgeon who would later contribute significantly to medical research and global health [6-8].

Denis Burkitt's experiences as an army surgeon during his service in East Africa profoundly influenced his future contributions to medical research. His initial 18-month tenure in the region allowed him to immerse himself in the vibrant culture and natural beauty of Uganda, leaving an indelible mark that drove him to pursue further work in the region [9-12]. Post-war, Burkitt's passion for tropical medicine and the potential for discovery led him to reapply to the Colonial Office, seeking a permanent position as a medical officer. His application was successful, and he began his new assignment in Lira, Uganda [12-15]. It was during this period that Burkitt embarked on meticulous field research, delving into the distribution of diseases and their underlying causes. One of Burkitt's notable early contributions came from his study of primary hydrocele in the Lango District, published in *The Lancet* in 1951 under the title "Primary hydrocele and its treatment. Review of 200 cases" [15]. This work was groundbreaking, showcasing his methodical approach to epidemiological research. He documented a stark variation in the prevalence of primary hydrocele between the eastern (30%) and western (1%) parts of the district. Importantly, he linked these findings to the presence of *Wuchereria bancrofti*, a filarial parasite, indicating how environmental and parasitic factors influenced disease patterns [15]. This correlation underscored Burkitt's pioneering ability to connect clinical observations with broader public health insights, laying the groundwork for his later landmark work in epidemiology and oncology.

Discovery of Burkitt Lymphoma

In 1957, while working at Mulago Hospital in Kampala, Burkitt encountered children presenting with rapidly progressing jaw swellings, an anomaly that intrigued him due to its aggressive nature and unique demographic pattern. This pivotal observation marked the genesis of his investigation into what would later be known as Burkitt lymphoma. By meticulously analyzing hospital records and conducting autopsies, Burkitt noted a consistent presentation in children, predominantly aged six to eight, who exhibited these alarming symptoms [16]. Out of 41 affected children, histological data were retrieved for 29 cases, which uniformly indicated the presence of malignant cells within the tumorous growths, affirming the malignancy of this condition [17]. Further examination of autopsy findings highlighted a repeated pattern: the swelling often originated in the upper jaw and was accompanied by significant pain, pointing to a localized onset that rapidly metastasized to other organs [18].

This detailed documentation by Burkitt revealed that these tumors were not only lethal but also had a high mortality rate due to the speed of progression and lack

of effective treatment options at that time. The findings were pivotal, as they outlined a pattern of clinical presentation and age-specific incidence that provided the foundation for deeper research into the disease's epidemiology. Subsequent studies linked the endemic occurrence of the condition to regions where malaria was prevalent, suggesting an association between environmental factors and the development of the disease [16]. This connection has since been vital in understanding the interaction between infections and cancer development, influencing modern approaches in cancer research and epidemiology. In 1958, Denis Burkitt published his groundbreaking research in the *British Journal of Surgery*, titled "A Sarcoma involving the jaws in African children," marking the first formal documentation of what later became known as Burkitt's lymphoma [18]. This initial observation was instrumental in identifying jaw tumors as manifestations of a broader, complex pathology. The study highlighted that these tumors could present in various forms, thus broadening the understanding of cancer's heterogeneity [18]. Driven by the intrigue of these early findings, Burkitt launched an ambitious epidemiological investigation encompassing the African continent. This extensive study is celebrated for setting a new precedent in cancer epidemiology. To collect widespread data, Burkitt and his team distributed 1200 leaflets to government hospitals, featuring a photograph of a child with jaw tumors alongside a comprehensive questionnaire. The aim was to gather detailed information about incidence rates and other clinical aspects of the disease. Remarkably, this expansive research effort was supported by a modest grant of £25 from the Ugandan government [18,19]. Despite limited resources,

Burkitt's meticulous approach yielded significant insights. He plotted the distribution of tumor cases onto a detailed map, visually capturing the geographical spread and patterns. This map not only underscored the regional prevalence of the disease but also laid the foundation for future studies linking environmental and infectious factors to cancer epidemiology [19]. Burkitt's dedication and strategic data collection methods ultimately transformed global understanding of cancer distribution and influenced future research on lymphomas and their associations with viral infections.

The identification of high prevalence areas for Burkitt lymphoma, particularly highlighted in equatorial Africa from Sierra Leone to Kenya, marked a pivotal advancement in understanding the disease's epidemiology [19]. This geographic distribution, often referred to as the "lymphoma belt," correlates strongly with regions where malaria is endemic. The discovery provided substantial evidence supporting the hypothesis that malaria acts as a cofactor in the pathogenesis of Burkitt lymphoma. Figure 2 visually underscores this correlation, emphasizing the high incidence regions within the mapped African continent. The implications of this finding extend beyond mere observation; they catalyzed early diagnostic measures and targeted health interventions aimed at these vulnerable populations. Furthermore, these data underscored the need for cross-disciplinary research that combines epidemiology, virology, and public health strategies. Establishing this linkage has paved the way for ongoing research that seeks to better understand how endemic diseases such as malaria can influence cancer development and progression.

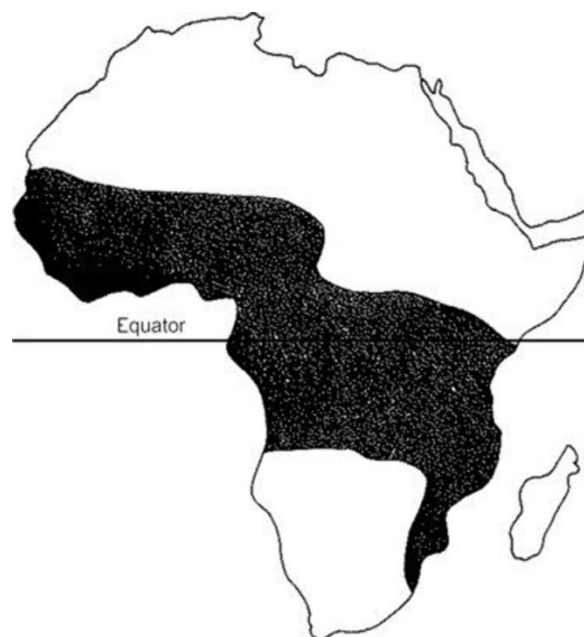


Figure 2. Map of Africa showing the 'lymphoma belt' in which Burkitt lymphoma occurs at high incidence. Lower incidence areas like highlands within this zone are not shown[20].

Burkitt's pioneering work in the identification and study of Burkitt lymphoma marked a major milestone in the field of oncology. This rare form of non-Hodgkin lymphoma was first observed in equatorial Africa, and its unique characteristics were meticulously documented, leading to groundbreaking insights. Burkitt's investigations unveiled the relationship between endemic regions and the Epstein-Barr virus (EBV), establishing a pivotal link between viral infections and cancer [19]. His findings not only advanced knowledge in cancer epidemiology but also spurred subsequent research into the genetic and environmental factors influencing lymphoid malignancies [20]. The clinical implications of his work extend beyond oncology, shaping diagnostic and therapeutic approaches that emphasize targeted, virus-associated cancer treatments [21]. Burkitt's legacy thus underpins both historical and contemporary cancer research, making his contributions a cornerstone for innovations in tumor biology and immunotherapy studies aimed at combatting similar lymphoproliferative disorders.

Later Years and Legacy

After spending 15 transformative years in Uganda, where he first identified and studied the now well-known Burkitt lymphoma, Denis Burkitt returned to London in 1965. Upon his return, Burkitt embarked on a new phase of his career, establishing a dedicated research program to continue his pioneering work on the disease. This initiative significantly advanced the understanding of Burkitt lymphoma, focusing on its underlying causes and exploring potential treatment options. Burkitt's efforts contributed substantially to cancer research, positioning him as a venerated figure in oncology and epidemiology [21].

The impact of Burkitt's work extended far beyond his tenure in Africa. His research into Burkitt lymphoma not only provided insight into a specific cancer type but also underscored the importance of studying cancer in the context of epidemiology and environmental. This approach paved the way for examining the interplay between infectious diseases and malignancies, which would later be foundational for the discovery of other virus-associated cancers, such as the link between human papillomavirus (HPV) and cervical cancer. In recognition of his groundbreaking work and contributions to the field of oncology, Burkitt was honored with a knighthood in 1978. This accolade was a testament to the profound impact his research had on both the scientific community and public health practices worldwide. Even after his formal retirement in 1979, Burkitt's passion for advancing cancer research and public health education did not wane. He actively participated in giving lectures and raising awareness about the significance of early cancer diagnosis. His lectures, renowned for their clarity and inspirational quality, emphasized prevention and the potential for

early detection to reduce cancer-related mortality [20,21].

Until his death in 1993, Burkitt continued to influence the field of oncology and public health, leaving a legacy that transcended his immediate research findings. His work laid the groundwork for future generations of researchers to explore the complex relationships between viruses and cancers, fostering advancements that continue to shape contemporary. His pioneering spirit and innovative approach have earned him a place as one of the most influential figures in cancer research history [21].

CONCLUSION

Dr. Denis Burkitt's life and career serve as a testament to the transformative power of perseverance, curiosity, and compassion in medical research. Born in 1911 in England, Burkitt initially trained as a surgeon and worked in various hospitals before moving to Africa, where his enduring curiosity about disease patterns led to groundbreaking discoveries. In the late 1950s, while working in Uganda, Burkitt observed a unique form of cancer, which would later bear his name Burkitt lymphoma. His meticulous clinical observations and research into this aggressive cancer among African children sparked significant advancements in oncology and provided crucial insights into the relationship between viral infections and cancer development. Burkitt's discovery of the link between the Epstein-Barr virus and the development of lymphoma reshaped the understanding of oncogenesis, making it one of the first examples of a virus-induced cancer in humans. His work fundamentally altered cancer research and treatment strategies, particularly in the context of infectious diseases, and laid the groundwork for future discoveries in cancer immunology and virology. His contributions extend far beyond this discovery; Dr. Burkitt's dedication to improving the lives of his patients and his commitment to advancing medical science were profound. His legacy continues to resonate in the fields of oncology and infectious diseases, influencing both researchers and clinicians today. Dr. Burkitt's unwavering passion and his commitment to making a difference exemplify how the work of one individual can shape global health outcomes for generations to come.

Conflict of Interest: Nil

Funding: Nil

Acknowledgments: Nil

Authorship Contributions: All the three authors equally contributed to this review article drafting, literature review, editing, proof reading, plagiarism correction and submission to the journal.

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