

Epidemiology and Temporal Dynamics of Heck's Disease Among Kano Children, Northern Nigeria

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ABSTRACT

Background: Heck's disease (multifocal epithelial hyperplasia) is a benign oral condition caused by human papillomavirus types 13 and 32, primarily affecting children in resource-limited settings. Epidemiological data on Heck's disease in northern Nigeria are scarce. This study aimed to describe the sociodemographic patterns and temporal trends of Heck's disease among paediatric patients in Kano, northern Nigeria.

Methods: A retrospective hospital-based descriptive analysis was conducted using records from Aminu Kano Teaching Hospital, Kano, Nigeria, over a span of nine years (2015–2023). Data on age, sex, ethnicity, geographical location, and date of diagnosis were collected from patients with clinically confirmed Heck's disease. Descriptive statistics were used to analyze demographic characteristics, while temporal and spatial patterns were examined to identify disease trends and geographical clustering.

Results: Data from 43 paediatric patients aged between 3 and 14 years were retrieved and analyzed. The 6–8 years age group represented the largest proportion (60.5%). Cases predominantly originated from urban local government areas, with Kumbotso and Gwale each accounting for 20.9% of cases. Ethnic distribution showed a marked predominance of Hausa ethnicity. Temporally, the data showed a fluctuating pattern in annual case numbers, with a clear rise observed in the most recent years, reaching the highest level in 2023. On a monthly scale, November exhibited the highest incidence (14.0%). No statistically significant associations were found between sex and geographical distribution ($p = 0.999$) or age distribution across sexes ($p = 0.942$).

Conclusion: This study describes distinct age-specific vulnerability, urban geographical clustering, and a steady increase in case numbers over time. It calls for seasonally timed, culturally appropriate preventive strategies and enhanced surveillance in Kano.

Keywords: Heck's disease, multifocal epithelial hyperplasia, oral papillomavirus, Nigeria, epidemiology, temporal trends

INTRODUCTION

Heck's disease, also known as multifocal epithelial hyperplasia (MEH) or focal epithelial hyperplasia, is a benign proliferative condition of the oral mucosa first described by Heck et al. in 1965.¹ The condition is caused by specific human papillomavirus (HPV) types, predominantly HPV-13 and HPV-32, with occasional involvement of HPV-1, HPV-6, HPV-11, and HPV-16.^{2,3} The condition demonstrates distinct epidemiological patterns, predominantly affecting children and adolescents in developing regions, particularly indigenous populations and communities with limited access to healthcare.⁴ Several risk factors have been identified, including poor oral hygiene, overcrowded living conditions, malnutrition, immunocompromised states, and genetic predisposition, particularly among certain ethnic groups.^{4,5} The condition also shows familial clustering, suggesting both genetic susceptibility and horizontal transmission within households.⁵

The disease typically manifests as multiple asymptomatic, soft, painless, sessile or pedunculated papules on the oral mucosa. Lesions commonly affect the labial and buccal mucosa, tongue (particularly the dorsal and lateral surfaces), and occasionally the gingiva and hard palate.^{1,2} While generally benign and self-limiting, the condition can cause functional impairment, aesthetic concerns, and psychological distress, particularly in adolescents, significantly impacting oral health-related quality of life.⁶

Given the clinical appearance and demographic profile, differential diagnosis must include other viral-induced oral lesions, particularly *Condyloma acuminatum* in cases involving genital HPV types.⁷ In paediatric patients, a careful history and examination are essential to exclude non-accidental injury, as the clinical presentation may raise concerns about sexual abuse, making this a critical component of the diagnostic workup.⁷

Primary prevention focuses on improving oral hygiene practices and reducing transmission through avoiding sharing of eating utensils and personal items.⁷ HPV vaccination, while primarily targeting high-risk oncogenic types, is believed to also provide cross-protection against HPV-13 and HPV-32 in children and young adults, though specific efficacy data for Heck's disease prevention remain limited.^{8,9} According to existing data, recurrence is rare; however, patients are typically advised against sharing utensils due to the risk of cross-transmission.^{10,11} MEH lesions may either progress and increase in size, remain unchanged and persist for several years, or undergo spontaneous regression and resolution.¹¹ Where treatment is indicated for cosmetic or functional concerns, management options include topical immunomodulators (imiquimod 5% cream), cryotherapy with liquid nitrogen, electrocauterization, surgical excision, ablative laser treatment, and chemical cauterization with 80–90% trichloroacetic acid.^{9,10} Treatment is usually based on the patient's age, lesion characteristics, and available healthcare resources.⁹

Currently, there are limited epidemiological data on Heck's disease in Nigeria, with available literature consisting primarily of sporadic case reports.⁹⁻¹³ The majority of documented cases originate from southern Nigeria, with only one study conducted among northern Nigerian populations.¹³ This disparity in research attention is particularly concerning given the distinct demographic, cultural, and healthcare contexts between Nigeria's northern and southern regions, especially in terms of geography, culture, language, religion, healthcare infrastructure, and other determinants of disease. Unlike the south, northern Nigeria is predominantly Muslim, with Hausa as the most widely spoken language, and features an arid, desert-proximate climate due to its location near the Sahara Desert.¹⁴

The region maintains more traditional and conservative cultural and health practices compared to the south. The healthcare landscape in northern Nigeria has its unique challenges, including a comparatively less developed health system and historical vaccine hesitancy. This hesitancy stems from tragic events during a vaccine trial in Kano in the early 2000s, which resulted in mortalities and has subsequently influenced public health interventions and vaccine acceptance in the region.^{15,16} These factors may significantly impact both the epidemiological patterns and management approaches for conditions like Heck's disease.

Kano State, located in northwestern Nigeria, comprises 44 Local Government Areas, with eight situated in urban centers: Dala, Fagge, Gwale, Kano Municipal, Nassarawa, Tarauni, Kumbotso, and Ungogo. According to the most recent official national census, Kano is Nigeria's most populous state, making it an ideal location for epidemiological research.¹⁷

Aminu Kano Teaching Hospital (AKTH) serves as a major medical and dental referral center for northern Nigeria and neighboring countries. Importantly, AKTH houses one of only two specialist paediatric dentistry clinics in northern Nigeria, positioning it as a crucial healthcare facility for diagnosing and managing paediatric oral conditions, including Heck's disease.¹⁸ Understanding the epidemiological patterns and temporal trends of Heck's disease in northern Nigeria is essential for several reasons: developing targeted interventions, improving disease control measures, shaping oral health policies, and addressing healthcare disparities between Nigeria's regions. The unique cultural, geographical, and healthcare context of northern Nigeria necessitates region-specific research to inform evidence-based public health strategies.

This study aims to describe the sociodemographic patterns and temporal trends of Heck's disease as diagnosed at AKTH, Kano, over a span of nine years. By analyzing demographic characteristics, geographical distribution, and temporal dynamics, this research will contribute to filling the critical knowledge gap regarding Heck's disease epidemiology in northern Nigeria and provide baseline data for future interventional studies.

METHODS

This retrospective, hospital-based descriptive study analyzed medical records from AKTH, Kano, over a span of nine years (January 2015 to December 2023). A specially designed data collection form, adapted from previous epidemiological studies, was utilized to ensure systematic data extraction.¹² The sample included all paediatric patients with clinically confirmed Heck's disease who presented at Aminu Kano Teaching Hospital from 2015 to 2023, resulting in a total of 43 cases.

Data source and bias mitigation: Clinical diagnosis confirmation was verified through review of documented assessments by qualified healthcare professionals. All cases included in the study were diagnosed clinically based on characteristic multifocal papular lesions consistent with Heck's disease, as documented in patient records. No histopathology reports were included in the available records. Selection bias was mitigated by including all consecutive confirmed cases meeting eligibility criteria during the study period. The following variables were systematically collected from patient records: age, sex, ethnicity, date of diagnosis, and geographical information (geopolitical zone, state, and local government area of domicile).

Inclusion criteria: Children aged 0–16 years with a clinically confirmed diagnosis of Heck's disease made by a dermatologist, paediatric dentist, oral pathologist, or physician.

Exclusion criteria: Patients with incomplete or missing clinical or demographic data.

Variables assessed

- **Case incidence:** The number of newly diagnosed cases of Heck's disease recorded at Aminu Kano Teaching Hospital within the study period.
- **Age:** Age at diagnosis recorded in years and categorized into groups (3–5, 6–8, and 9–14 years).
- **Sex:** Biological sex as recorded in patient medical records.
- **Temporal dynamics:** The distribution and trend of cases over time, analyzed monthly and annually.
- **Geographical location:** Patient's residential local government area and state, as recorded in medical records.

Statistical analysis: Data were analyzed using descriptive statistics with SPSS software version 25.0. Categorical variables (age groups, sex, ethnicity, geographical location) were described using frequencies and percentages, while continuous variables (age)

were reported as medians and interquartile ranges. Temporal trends in disease incidence were plotted annually to identify patterns over the study period. Residential addresses by state and/or local government area were used as the primary spatial unit of analysis to identify potential disease hotspots. Results were presented using both tables and figures for clear data visualization. Bivariate analysis (chi-square tests) was used to test associations between sex and age groups with Heck's disease.

Ethical considerations: Ethical approval was obtained from the Research Ethics Committee of Aminu Kano Teaching Hospital, vide NHREC/28/01/2020/AKTH/EC/3843. All patient data were de-identified to ensure confidentiality, and the study was conducted in accordance with the principles outlined in the Declaration of Helsinki.

RESULTS

All identified cases presenting within the study period were included in the analysis with no exclusions.

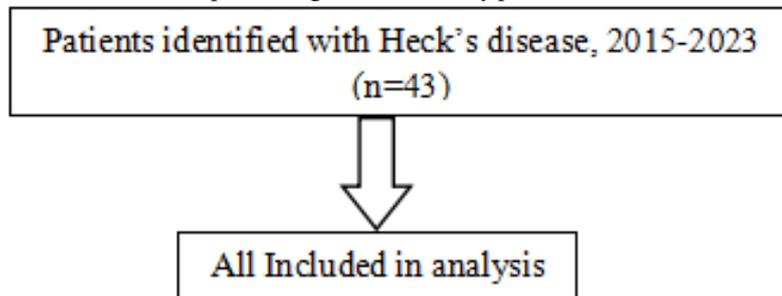


Figure 1: Flow diagram

Demographic characteristics: A total of 43 paediatric cases of Heck's disease were identified within the nine-year period. The age of affected children ranged from 3 to 14 years, with the majority aged 6 to 8 years ($n = 26, 60.5\%$). The median age was 7 years (IQR 5–8). Slightly more males ($n = 22, 51.2\%$) were affected.

Table 1: Demographic distribution of Heck's disease in the study population

Variables	Categories	n (%)	p-value
Sex		43 (100)	
	Male	22 (51.2)	0.78
	Female	21 (48.8)	
Age	3–5 years	9 (20.9)	<0.001
	6–8 years	26 (60.5)	
	9–14 years	8 (18.6)	
Median age (IQR) years		7 (5–8)	
	Male	6 (5–9)	
	Female	7 (5–7)	
Ethnicity	Hausa	41 (95.3)	
	Kanuri	1 (2.3)	
	Unspecified	1 (2.3)	
Location in Nigeria	Kano State (Northwest)	33 (76.7)	
	Jigawa State (Northeast)	3 (7.0)	
	Borno State (Northeast)	1 (2.3)	
	Katsina State (Northwest)	1 (2.3)	
	Unspecified	5 (11.6)	
Kano Local Governments (n = 33)	Gwale	6 (18.2)	
	Tarauni	5 (15.2)	
	Kumbotso	5 (15.2)	
	Dala	2 (6.1)	
	Others*	15 (45.5)	

*Others refers to Local Government Areas in Kano with only one case of Heck's disease each reported.

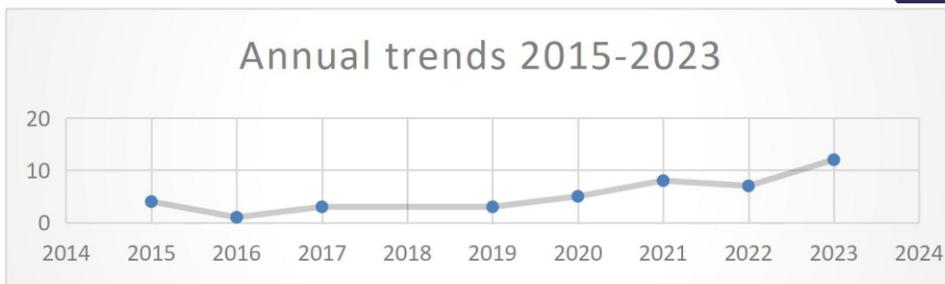


Figure 2: Annual incidence of Heck's disease

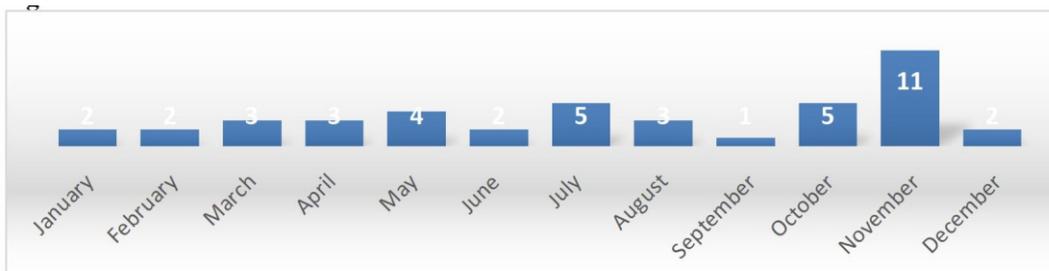


Figure 3: Incidence of Heck's disease by month of the year

DISCUSSION

Findings: This first comprehensive epidemiological investigation of Heck's disease in Nigeria provides important insights into the temporal and demographic patterns of this condition in a previously understudied population. The study's findings have significant implications for public health planning, clinical practice, and future research. One of the most notable findings is the fluctuating number of cases annually, ranging from 0 to 8 cases between 2015 and 2022, with a noticeable rise in the later years and the highest number recorded in 2023 (12 cases). While this upward trend may reflect a true increase in disease incidence, it could also be indicative of improved healthcare access, enhanced diagnostic capabilities, or greater disease awareness among healthcare providers and the public over time. However, this pattern warrants careful consideration, as it diverges from the sporadic pattern typically described in literature from other regions.^{1,4,5}

The near-equivalent sex distribution observed in this study aligns with several previous studies suggesting that biological sex does not significantly influence susceptibility to Heck's disease.^{6,10-13} This finding, however, differs from the observations of Ledesma-Montes et al., who reported a female preponderance.¹⁹ The predominance of cases among 6- to 8-year-olds in this study corresponds with the established understanding that Heck's disease disproportionately affects school-aged children.¹ This age-specific vulnerability likely stems from developmental immune characteristics, behavioral patterns facilitating viral transmission, and exposure risks in educational settings. Similar age distributions have been reported in studies from Latin America and other regions with comparable socioeconomic profiles.^{1,4,7,10}

The geographical clustering of cases in urban local government areas (Kumbotso, Gwale, and Tarauni) in this study suggests important environmental or social determinants. These areas, like typical urban areas, are characterized by higher population density, which may facilitate viral transmission through closer interpersonal contacts.²⁰ Additionally, urban areas have distinctive socioeconomic challenges that could influence disease patterns through multiple pathways, including housing conditions, sanitation infrastructure, and healthcare access.²⁰ The predominance of urban cases contrasts with some previous studies reporting higher rural prevalence among populations often regarded as living with adverse socioeconomic conditions.^{1,6,7}

The predominance of Hausa ethnicity observed in this study is corroborated by the findings of Kaura et al.¹⁰ and Agho et al.¹³ These findings appear to support the theory of potential genetic susceptibility, cultural practices, or environmental exposures in the etiopathogenesis of Heck's disease. Previous studies have also documented ethnicity-associated variations in HPV-related conditions, potentially linked to both genetic and social determinants.^{1,3,5,9} However, Hausa being the predominant ethnicity in this region may also account for this observation.

A seasonal pattern as observed in this study has not been previously reported. The November peak is noteworthy; however, there is currently no established biological mechanism linking Heck's disease (HPV-13/32) with climatic changes, environmental exposures, or vector-related factors. Therefore, the observed pattern should be interpreted cautiously. Possible explanations include diagnostic opportunity, healthcare-seeking behavior, clinic attendance trends, or random variation, rather than true seasonality. Further multi-year, multi-center studies are needed before any seasonal pattern can be confirmed.

In this study, the consistently low incidence from December through February aligns strongly with the Harmattan period, whose dry, dusty conditions are inimical to the survival of many pathogens and their vectors. The low incidence in June, during the peak of the rainy season, may be explained by the flushing of vector breeding sites or reduced outdoor activity during heavy rainfall. Given the agricultural context of many regions in Nigeria, a hypothesis involving zoonotic or soil-borne exposure during the harvest period (September–November) is equally plausible and should be further investigated.^{21,22}

Implications: These findings suggest important epidemiological and social implications, highlighting the influence of urbanization, population density, and regional cultural factors on disease transmission. The age distribution aligns with known vulnerabilities in school-aged children, underscoring the need for focused health interventions.

Trade-Offs (Limitations): The limitations of this study include its retrospective, single-center design and the geographical scope centered on patients presenting to AKTH, which limits both causal inference and generalizability.

Take-Home (Conclusion): This study provides the first comprehensive epidemiological characterization of Heck's disease among the paediatric population in northern Nigeria, revealing distinct patterns of age, geographical, and temporal distribution. The findings establish a foundation for developing targeted public health interventions in understudied populations like Nigeria. The progressive increase in case numbers in recent years emphasizes the growing importance of this condition as a paediatric oral health concern requiring systematic attention from healthcare systems and policymakers.

Expectations for future research: Future research should focus on multi-center prospective studies to validate these findings across diverse population groups, utilize molecular techniques to characterize the HPV serotypes in the population, and explore the use of modern prevention strategies (including vaccines) for high-risk groups.

Recommendations: The findings of this study suggest several targeted approaches for addressing Heck's disease in northern Nigeria, including:

- Enhanced paediatric surveillance, particularly among those aged 6–8 years in high-incidence urban areas, to facilitate early detection and intervention.
- Focused community-based prevention initiatives targeting Hausa communities.
- Prioritization of healthcare resources to urban areas with demonstrated disease burden, which in this instance includes Kumbotso, Gwale, and Tarauni local government areas.
- Implementation of preventive measures and public health campaigns during pre-peak periods (September–October) to mitigate the November disease spike.

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Conflicts of interest: The authors declare no conflicts of interest.

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