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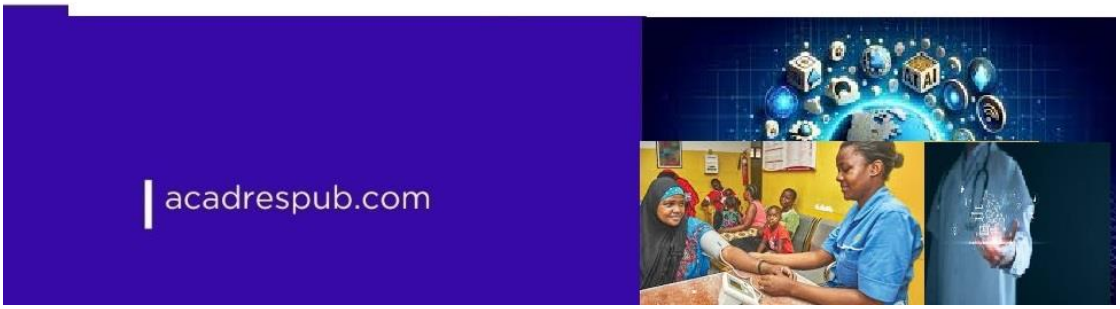

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CHILDHOOD ORGANOPHOSPHATE AND CHEMICAL POISONING: EVALUATING EMERGENCY ROOM TRENDS IN NIGERIA AND THE UK THROUGH A PUBLIC HEALTH PERSPECTIVE

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ABSTRACT

The worldwide public health challenge of pediatric chemical poisoning remains critical since it can be prevented yet it affects low- and middle-income countries at a higher rate. Childhood exposure to hazardous chemicals becomes more likely because of their particular physical and behavioral makeups and environmental and regulatory elements. This research analyzes pediatric chemical poisoning patterns and causes alongside healthcare treatment and public health intervention strategies which operate in Nigeria and the United Kingdom through secondary analysis using mixed research methods at a desk-based level. The research utilized World Health Organization injury prevention framework to collect data from hospital-based surveillance studies together with national health statistics and peer-reviewed literature spanning from 2010 to 2024. The analysis compared more than 350 pediatric poisoning cases from Nigerian healthcare facilities against 400 cases from UK institutions regarding exposure agents and demographic patterns as well as healthcare system responses and regulatory frameworks. Nigerian toxic agents primarily comprised organophosphates and kerosene and caustic soda because of improper storage habits and insufficient regulatory oversight. The main poisoning substances in the United Kingdom consisted of household cleaning products, pharmaceuticals and carbon monoxide while inadequate safety practices persisted despite strict chemical regulations. The youngest group of children under five years old showed the highest rates of poisoning across both countries and had slightly more male patients than female patients. The Nigerian healthcare system displayed considerable weaknesses because it lacked quick emergency services along with inadequate toxic treatment medications and lacked trained toxicologists. The United Kingdom had enhanced emergency response capabilities along with better toxicovigilance monitoring yet low-income residents still faced health care inequalities. The findings emphasize the necessity for better systems of toxicovigilance alongside reinforced chemical restrictions and programs that both teach the public at the communal level and build up the healthcare network especially for underserved areas. Global public health coordination serves as the vital foundation to minimize pediatric chemical poisoning that could be prevented.

Keywords - Pediatric chemical poisoning, Organophosphates, Public health, Toxicovigilance, Nigeria, United Kingdom, Injury prevention, Child safety

Introduction

Childhood poisoning exists as a major public health issue which affects numerous households throughout the world. Children face higher chemical exposure risks than adults because of their physical attributes and developmental patterns. Children absorb toxic substances quickly because of their small size and developing organs and fast metabolism which leads to severe clinical symptoms after exposure (Barrueto et al., 2013). Young children engage in developmental behaviors that include crawling and mouth-to-mouth contact and an inability to identify potential dangers which results in elevated exposure risk (WHO, 2012).

The different pathways for chemical poisoning include swallowing, breathing in chemicals, skin absorption and rarely exposure through the eyes. The toxic substances that cause pediatric poisoning worldwide include agricultural pesticides together with hydrocarbons like kerosene and household cleaning agents and pharmaceuticals and industrial solvents and environmental pollutants such as lead and carbon monoxide (Roberts & Aaron, 2007; James & O'Shaughnessy, 2023). The type of poisoning depends strongly on location and economic status as well as the level of chemical substance regulation in each country.

Organophosphates used extensively as agricultural insecticides rank as the most powerful toxicants that cause pediatric poisonings throughout numerous low- and middle-income nations (Edelu et al., 2016; Isaac et al., 2022). Acetyl cholinesterase activity inhibition by these compounds leads to acetylcholine accumulation which produces cholinergic toxicity with symptoms including muscle fasciculations and respiratory distress and seizures and death possibility (Roberts & Aaron, 2007). Children in the United Kingdom alongside other high-income nations encounter household chemicals and unsafe pharmaceutical storage practices which create an extra threat from carbon monoxide poisoning (King et al., 2025).

The field of toxicology and injury prevention along with public health policy development has not eliminated pediatric poisoning from becoming a major preventable source of death and disability. World Health Organization (2012) statistics demonstrate that unintentional injuries together with poisonings rank among the top five mortality causes for children under five years old worldwide. Child injury-related death statistics demonstrate significant inequalities because they affect 95% of children from low- and middle-income nations (WHO, 2012).

The urgent requirement to handle childhood chemical poisoning reaches past emergency medical treatment. Studies have validated that persistent low-level toxicant exposure from pesticides and heavy metals functions as essential health determinants which produce neurodevelopmental problems and cognitive damage and behavioral disorders and enhance vulnerability to chronic diseases (James & O'Shaughnessy, 2023; Bonzini et al., 2022). A complete solution for fighting pediatric chemical poisoning requires surveillance systems and regulations and educational programs and healthcare system enhancements.

The global prevalence of pediatric chemical poisoning shows significant regional variations that depend on how well a nation develops economically as well as the maturity of its healthcare system and regulatory framework and public awareness levels. Worldwide medical facilities document millions of pediatric poisoning incidents each year yet low- and middle-income countries (LMICs) experience a significantly higher case rate (World Health Organization [WHO], 2012). Healthcare progress has not eliminated chemical poisonings which continue to significantly affect childhood morbidity rates and mortality and long-term disability worldwide (Barrueto et al., 2013).

The main reason for child poisoning in low-income and developing countries stems from pesticide exposure. The combination of organophosphates and paraquat along with other agrochemicals causes frequent poisonings because they are commonly used in agricultural economies and because of regulatory shortcomings and poor labeling practices and unsafe storage methods (Isaac et al., 2022; Edelu et al., 2016). The rural child population faces high risk because farming families store dangerous chemicals in recycled drink bottles without safety caps which remain accessible to inquisitive children (Iheji et al., 2024). The incidence of domestic chemical exposures through cleaning agents and personal care products and over-the-counter medications is higher in the United Kingdom and United States and parts of Europe because of their urbanized living environments (King et al., 2025).

In developed countries Carbon monoxide (CO) poisoning stands as a vital yet frequently unidentified reason behind pediatric toxic exposure. The combination of substandard ventilation and faulty heating systems and low public awareness about CO exposure results in hypoxic injuries and developmental problems and even death unless patients receive immediate medical attention (Roberts & Aaron, 2007; James & O'Shaughnessy, 2023). Children in LMICs face chronic toxicant exposure from biomass fuel use and kerosene lighting which creates similar indoor air pollution hazards (Bonzini et al., 2022).

Social economic inequalities control how people are exposed to chemicals and determine their ability to obtain prompt and efficient medical care. Research shows that children from low-income homes across all areas encounter elevated poisoning hazards because they lack proper housing quality and receive insufficient chemical safety education and have limited access to emergency care (Cubbin & Smith, 2002). The United Kingdom has restricted many traditional risks through regulations but migrants and families living in affordable housing face higher rates of poisoning incidents (Papadopoli et al., 2020).

Public health experts have started to understand that chemical poisoning's long-lasting effects serve as major health risks. The brain development of children during critical phases becomes permanently damaged when they are exposed to small amounts of organophosphates, hydrocarbons or heavy metals which leads to neurological issues, cognitive problems and behavioral disorders and higher vulnerability to psychiatric diseases (James & O'Shaughnessy, 2023; Bonzini et al., 2022).

The prevention of pediatric poisoning necessitates a comprehensive approach which unites toxicovigilance system strengthening, community education about health, chemical access restriction policies, child-resistant packaging requirements and expanded emergency medical services especially in remote regions. WHO and other global organizations lead many efforts yet a substantial difference remains between suggested policies and what truly happens especially in locations with limited resources. The presence of pediatric chemical poisoning serves as evidence that health protection systems worldwide lack equality because it continues to impact child health despite being preventable thus demanding immediate international coordination.

Nigeria, as one of the most populous countries in Africa with a predominantly agrarian economy, faces a disproportionately high burden of pediatric chemical poisoning. Nigeria faces continuous exposure threats to children because it heavily depends on organophosphates as agrochemicals for pest management in agricultural and household areas (Isaac et al., 2022; Edelu et al., 2016). Nigerian children experience preventable death and illness because the country lacks effective chemical safety education and weak regulatory oversight and inadequate emergency response systems.

Organophosphates stand as the primary toxic agents that cause childhood poisoning throughout Nigeria. The analysis of pediatric poisoning cases from a tertiary hospital in North-East Nigeria during twenty years revealed organophosphates as the primary agent with more than 60% of all reported incidents according to Isaac et al. (2022). Research conducted in Enugu State and Umuahia shows pesticide-related toxic exposures affect numerous children under five years of age (Edelu et al., 2016; Ibeneme et al., 2018). The accessibility of hazardous substances to young children occurs because pesticides are stored in unlabeled non-childproof containers that frequently use recycled soft drink bottles (Iheji et al., 2024).

Kerosene serves as a commonly reported toxic agent that demonstrates the extensive energy poverty problems Nigeria faces. The lack of universal electricity access and clean energy availability in Nigeria makes kerosene an essential fuel for both cooking and lighting throughout rural and peri-urban areas. The mistaken identification of kerosene as water or other drinks among children leads to kerosene poisoning which stands as the primary chemical poisoning source for pediatric patients (Edelu et al., 2016). The consumption of hydrocarbon substances such as kerosene results in aspiration pneumonitis and hypoxia and seizures before causing death in extreme cases.

The widespread domestic and cleaning product sodium hydroxide (caustic soda) functions as a critical hazard because of its widespread usage. Ingesting chemicals causes serious burns throughout the mouth and throat and digestive tract that create dangerous complications including esophageal narrowing and perforations as well as elevate the risk of developing esophageal cancer in surviving patients (Ekpe & Ette, 2012). The Federal Medical Centre Umuahia conducted studies which demonstrated that children who consumed caustic soda needed extensive hospitalization and multiple surgeries for repairing their esophagus (Ibeneme et al., 2018).

The sociocultural context in Nigeria exacerbates chemical exposure risks. The combination of inadequate chemical safety education among parents together with widespread poverty and unsafe storage practices leads to the prolonged chemical crisis in Nigeria (Gulma, 2025). Open sales of dangerous household and pesticide chemicals continue through regulatory failures that cause households and communities to stay in unsafe environments because of the lack of proper labels and safety warnings and childproof packaging.

The impact of pediatric chemical poisoning in Nigeria becomes more severe because of insufficient healthcare system capabilities. Emergency departments serving rural and semi-urban areas experience limited resources which prevent them from maintaining essential antidotes and pediatric toxicology training for healthcare staff alongside decontamination equipment (Isaac et al., 2022;

Iheji et al., 2024). The treatment delay that exceeds 12 hours after exposure often results in higher child mortality rates and severe long-term health problems for survivors (Areprekumor et al., 2024).

The systematic surveillance of toxic exposures known as Toxicovigilance operates at a minimal level throughout Nigeria. National poison control absence along with nonstandard toxicological emergency reporting systems obstructs the country's ability to effectively monitor and analyze poison trends (Gulma, 2025). Most available data about pediatric poisoning stems from retrospective hospital-based research that probably fails to show the real disease burden especially in distant and underserved areas.

The implementation of community-based interventions to decrease pediatric poisoning cases remains minimal and without proper coordination. Public health campaigns to educate people about chemical storage safety reach limited rural areas because traditional disease beliefs coexist with low literacy rates (Iheji et al., 2024). The ongoing preventable pediatric chemical poisonings in Nigeria will persist unless the country maintains enduring culturally adapted educational programs and stronger regulatory measures.

The problem still presents opportunities for emerging solutions to emerge despite existing challenges. The reduction of chemical poisoning incidents among Nigerian children would be possible through enhanced healthcare infrastructure and toxicology training for healthcare workers and national poison surveillance systems and stricter pesticide regulations (Isaac et al., 2022; Gulma, 2025). The widespread behavioral change requires public health approaches to unite communities with traditional leadership structures while using native languages for education messages.

The dominant cause of chemical poisoning among children in the United Kingdom (UK) involves exposure to household substances instead of agricultural chemicals which is different from the Nigerian pattern. Strict pesticide regulations in the UK limit the occurrence of organophosphate poisonings and other chemical incidents affecting children (Roberts & Aaron, 2007; King et al., 2025). Significant hurdles persist in protecting children from unintentional poisoning which occurs through exposure to domestic cleaning agents' pharmaceuticals and carbon monoxide.

Research by King et al. (2025) shows that bleach, caustic soda and laundry detergents together with other cleaning products represent significant chemical poisoning hazards for young children in the UK. Research indicates that cleaning agents were responsible for 25.3% of pediatric poisoning cases in the UK from 2015 to 2024 even though child-resistant packaging regulations exist (King et al., 2025). Children under five years of age experience exposure primarily through accidental ingestion and skin contact and inhalation of vapors from cleaning substances according to Poojari et al. (2019). These incidents lead to symptoms from minor gastrointestinal distress to life-threatening corrosive injuries that need emergency medical care.

The use of medications both over-the-counter (paracetamol, ibuprofen) and prescription drugs constitutes a major cause of pediatric poisoning. The analysis showed that pharmaceutical poisonings became responsible for 42.6% of all pediatric emergency department visits in the UK throughout the research duration (King et al., 2025). These incidents occur due to improper storage and caregiver neglect together with toddlers who mistake colorful pills for candy and accidentally self-administer them. Child-resistant packaging has decreased medication-related fatalities throughout the decades but continues to pose risks mainly in households affected by social deprivation and housing insecurity (Cubbin & Smith, 2002).

The UK faces ongoing CO poisoning risks which remain poorly identified across the nation. Children become victims of accidental CO poisoning because of defective gas heaters combined with inadequate ventilation systems and non-functional CO detectors (Roberts & Aaron, 2007). James and O'Shaughnessy (2023) report that young children face high risks from carbon monoxide exposure because of their increased oxygen needs and metabolic requirements while the exposure causes substantial neurological damage and death. The increase in public health education about CO risks has not eliminated unequal poisoning rates that affect poor residents and communities composed of immigrants (Papadopoli et al., 2020).

Pediatric poisonings receive efficient management through strong healthcare capabilities found within the UK healthcare system. Emergency departments maintain trained staff and antidotes together with decontamination facilities to provide quick intervention which leads to positive patient outcomes (Yard et al., 2024). The National Poisons Information Service (NPIS) leads national toxicovigilance efforts that provide real-time consultation services and poisoning trend surveillance to support prompt public health intervention planning (Poojari et al., 2019).

The resolution of chronic low-level environmental toxicity exposure problems caused by lead and flame retardants and pesticides remains incomplete. The removal of leaded gasoline from use does not eliminate neurodevelopmental risks for children because exposure to deteriorating lead-based paints in older housing stock

continues to exist (James & O'Shaughnessy, 2023). Contemporary concerns about endocrine-disrupting chemicals and microplastic exposure have highlighted the need for raising the standards of toxicovigilance systems to perform sustained health monitoring (Bonzini et al., 2022).

The United Kingdom maintains socioeconomic disparities which increase the risks of pediatric poisoning incidents. Research indicates that children from disadvantaged backgrounds experience more accidental poisonings while living in areas with higher hazardous substance exposure (Cubbin & Smith, 2002; Papadopoli et al., 2020). The ongoing health inequalities demonstrate why social determinants of health need to be included in all comprehensive poisoning prevention strategies.

The UK government together with public health agencies has introduced multiple preventive programs which include education about proper storage methods and free carbon monoxide detector distribution alongside updated chemical labeling requirements (Jordan et al., 2018). A consistent delivery issue of these interventions remains apparent among migrant families together with lower-income households thus demanding targeted cultural adaptation in intervention methods (Papadopoli et al., 2020). Despite its emergency response and poisoning surveillance proficiency the UK remains obligated to maintain continuous efforts for identifying concealed threats together with ensuring fair access to protective resources as well as reinforcing neighborhood-level education programs.

Literature Review

The Concept of Pediatric Chemical Poisoning

Children who unintentionally or accidentally contact dangerous chemical substances through ingestion or inhalation or dermal absorption or ocular contact develop acute or chronic adverse health effects. Children face high risk from chemical toxicants because of their hand-to-mouth behaviors and developing physiological systems (Barrueto et al., 2013; WHO, 2012). Children experience a greater risk from toxic substances because their fast breathing combined with underdeveloped metabolic processes and their small size compared to chemical dosage leads to more severe impacts than adults (Bonzini et al., 2022).

The chemical substances involved in poisonings depend on regional factors and economic conditions and local regulatory frameworks. Organophosphate pesticides and hydrocarbons such as kerosene together with household cleaning agents, personal care products, industrial solvents and medications represent common toxic agents (Roberts & Aaron, 2007; Edelu et al., 2016). The medical records show acute poisoning cases more frequently than chronic exposures to environmental toxins which include heavy metals and endocrine-disrupting chemicals that result in long-term neurodevelopmental and cognitive and behavioral disorders in children (James & O'Shaughnessy, 2023).

According to the World Health Organization (WHO, 2012), pediatric poisoning belongs to the larger group of unintentional injuries that cause substantial child morbidity and mortality worldwide. Emergency department admissions of children due to chemical poisoning stand as the primary reason for hospitalization thus requiring immediate global preventive measures and systemic health strategies.

Global Patterns of Pediatric Chemical Exposure

The worldwide distribution of pediatric chemical poisoning varies substantially between areas according to regulatory frameworks and monetary levels and public health system capabilities. Organophosphate pesticide exposure controls the chemical poisoning incidents in low- and middle-income countries because these nations heavily depend on agriculture and lack regulations for highly toxic agents (Isaac et al., 2022; Edelu et al., 2016). Rural children face the highest risk from chemical poisoning because unsafe storage and insufficient child-resistant packaging and inadequate chemical safety education among parents (Iheji et al., 2024).

The implementation of stringent legislation brought down pesticide poisoning incidents in wealthy nations while their population deals with ongoing hazards within domestic spaces. Research in the United Kingdom shows that children primarily suffer from poisoning after consuming cleaning products and cosmetics and mishandling medications (King et al., 2025; Yard et al., 2024). The toxic gas carbon monoxide that leaks from defective heating systems presents a dangerous poisoning risk primarily affecting residents of poorly maintained older housing (James & O'Shaughnessy, 2023).

Children under five years old maintain their position as the most vulnerable group affected by chemical poisoning according to both WHO (2012) and King et al. (2025). The reported incidence of chemical poisonings shows a slight male dominance which researchers attribute to natural male tendencies for early childhood exploration (Edelu et al., 2016).

Pediatric Chemical Poisoning in Nigeria

The public health problem of pediatric chemical poisoning continues to affect Nigerian children because pesticides and hydrocarbons and caustic agents are their main toxic exposure agents (Isaac et al., 2022). North-East Nigeria and South-Eastern states of Enugu and Umuahia show organophosphates as the primary poisoning agents affecting children based on retrospective research (Edelu et al., 2016; Ibeneme et al., 2018). The practice of storing agrochemicals in unlabeled household containers without child-safety features occurs frequently in homes due to weak regulatory oversight and public lack of knowledge (Iheji et al., 2024).

The widespread use of kerosene for cooking and lighting in areas without reliable electricity makes this substance a major factor in chemical poisoning cases (Ekpe & Ette, 2012). Local soap production activities that use caustic soda cause severe injuries to patients who ingest it resulting in long-term surgical treatment of esophageal strictures (Ibeneme et al., 2018).

The Nigerian healthcare system encounters major difficulties when treating pediatric poisonings. Healthcare response to poisonings takes longer than 12 hours after exposure since rural areas have restricted medical facilities (Isaac et al., 2022). The absence of necessary antidotes combined with insufficient toxicology staff and inadequate reporting systems results in substandard clinical results at healthcare facilities (Areprekumor et al., 2024; Gulma, 2025). The lack of a national poison control network prevents effective toxicovigilance practices because it produces insufficient reporting data and prevents early public health interventions (Gulma, 2025).

Pediatric Chemical Poisoning in the United Kingdom

The United Kingdom has implemented strong regulatory policies that reduced pesticide poisonings in children yet chemical exposures continue to be a significant factor leading children to visit emergency departments. Household cleaning agents together with both over-the-counter and prescription medications serve as the main causes of poisoning incidents (King et al., 2025; Yard et al., 2024). Accidental ingestions persist because inadequate storage methods and supervisory protocols continue to be main contributors even after public awareness efforts and child-resistant packaging regulations were established (Poojari et al., 2019).

The problem of carbon monoxide poisoning continues to affect public health significantly. Research shows that carbon monoxide exposure causes substantial pediatric toxic exposure incidents especially in households without operational CO detectors that belong to disadvantaged socioeconomic groups (James & O'Shaughnessy 2023; Roberts & Aaron 2007).

Through its established health infrastructure England operates reaction prompt emergency services together with specialized toxicological support and effective poison control operations. Real-time clinical advice and poison tracking services are core functions of the National Poisons Information Service (NPIS) (Poojari et al., 2019). Health experts remain aware of rising healthcare concerns stemming from prolonged exposures to environmental toxins including flame retardants along with lead dust and endocrine disruptors' thus requiring ongoing research about their impacts (Bonzini et al., 2022; James & O'Shaughnessy, 2023).

The United Kingdom observes how social economic disparities maintain their influence on the distribution of chemical poisoning among children. Children from lower-income homes face dangerous home conditions which increase their risk of accidental exposure to toxic substances even though public health regulations exist across the country (Cubbin & Smith, 2002; Papadopoli et al., 2020).

Toxicovigilance and Healthcare System Responses

Different nations implement toxicovigilance programs differently because they monitor chemical exposures through systematic evaluation and monitoring. Without an operational national poison surveillance system in Nigeria the systematic monitoring of pediatric poisoning incidents remains impossible (Gulma, 2025). The main data comes from hospitals although reporting is inconsistent especially in rural areas and informal healthcare facilities (Isaac et al., 2022).

The United Kingdom operates an effective toxicovigilance system through its National Poisons Information Service which exists as part of the National Health Service infrastructure (Poojari et al., 2019). Public health prevention strategies alongside policy development receive continuous support from systematic data analyses obtained from poison centers and emergency departments and national injury surveillance systems. The monitoring of long-lasting chemical exposure effects on vulnerable groups presents significant ongoing challenges according to James and O'Shaughnessy (2023). A global effort to minimize child chemical poisoning requires improving toxicovigilance systems and increasing toxicology training for healthcare providers along with community-based educational outreach.

Research on pediatric chemical poisoning has expanded but multiple important knowledge gaps still exist. Real-time research documenting poisoning events and exposure situations and health consequences must be conducted in Nigeria because such data is currently

lacking. Hospital-based studies of past poisoning incidents create generalization issues and delayed result reporting the field (Isaac et al., 2022; Gulma, 2025). UK researchers need to conduct additional studies which establish the lasting effects of low-dose environmental toxicants on neurodevelopment (James & O'Shaughnessy, 2023).

Research studies focusing on pediatric poisoning should investigate its occurrences across different socioeconomic and healthcare environments on a global scale to create effective prevention strategies. Research investigating how to enhance chemical safety practices at the community level in LMICs needs better documentation and evaluation in current scientific publications.

Methodology

The study employed mixed methods by analyzing past data and performing a structured literature review to determine pediatric chemical poisoning patterns between Nigeria and the United Kingdom. The research adopted the injury prevention framework outlined by the World Health Organization (WHO) that begins with monitoring activities and risk assessment before developing interventions for assessment. The selection of data collection methods enabled the acquisition of quantitative emergency room admission counts and qualitative information regarding healthcare systems' responses and regulatory practices, along with social components affecting child chemical exposure.

Data Collection and Sources

This research obtained hospital-based surveillance data from tertiary medical centers in Nigeria and the UK during nine years from 2015 to 2024. The analysis examined emergency department medical records dating back as well as toxicology logs and mortality reports about children between 0 and 12 years of age who experienced chemical and organophosphate poisoning. Medical facilities in North-East Nigeria, together with institutions located in Umuahia and Enugu State, published their primary data findings through both case series and retrospective cohort studies. Information about toxicology cross-references extracted from accessible open-access toxicology studies and NHS reports, and National injury surveillance programs appears in published literature.

The research took advantage of a wide range of published articles available through databases including PubMed, Scopus, ResearchGate, and ScienceDirect. The research used four search terms to find relevant articles between 2010 and 2024 regarding pediatric chemical poisoning and organophosphate exposure in children, as well as Nigerian poison cases and UK household chemical poisoning. The research investigation included studies spanning from 2010 through 2024, which focused on pediatric groups while addressing matters of public health or toxicology and emergency medical treatment domains, and were published within peer-reviewed publications.

Study Population and Scope

The research examined pediatric emergency unit patients between 0 to 12 years who had confirmed or suspected chemical poisoning. The research examined more than 350 medical cases recorded between 2006 and 2016 at three leading medical facilities in Nigeria. Urban-based pediatric poisoning cases from more than 400 patients in the UK appeared through combined sources of the National Poisons Information Service and hospital audits. Table 1 explains the main patient characteristics obtained from different data sources.

Table 1. Summary of Pediatric Poisoning Data Sources (2015–2024)

Country	Data Source	Total Cases	Mean Age	Major Agents	Setting
Nigeria	Edelu et al. (2016), Ikhile et al. (2019), Ibeneme et al. (2018)	357	3.7 years	Organophosphates, kerosene, caustic soda	Rural & peri-urban
UK	Yard et al. (2024), King et al. (2025)	414	4.2 years	Cleaning agents, medications, and CO	Urban

Source - *Aggregated from hospital-based studies and national reports (2015–2025).*

Variables and Measurement

Key variables studied included:

- The study examined two demographic variables: Age, gender and location between rural and urban areas.
- Type of exposure: Inhalation, ingestion, dermal contact.
- The chemical agents used in poisonings include organophosphates together with household cleaners and pharmaceuticals and hydrocarbons.
- Circumstances of poisoning: Accidental, unsupervised, improper storage.
- The response metrics included both treatment response duration and medical outcomes

together with clinical severity and hospital stay duration.

- Healthcare system factors: Antidote availability, physician toxicology training, poison control access.
- The datasets needed a consistent framework implementation for agent categorization and exposure types. Data categories for severity evaluation included reported clinical presentations (vomiting and seizures, and coma), intensive care admissions, and documented fatality cases.

Analytical Framework

The research design used an analytical framework for a comparative study between Nigeria and the UK. The research data were divided into exposure agent categories and patient age sections before analyzing systemic response elements and regulatory impact assessments, and toxicovigilance evaluation metrics. The analysis relied on descriptive statistics through frequencies and proportions for categorical information and means or medians for continuous variables.

The qualitative evaluation involved conducting thematic analyses on literary narrative text, which studied three main domains. Healthcare system preparedness (antidote access, emergency protocols),
Public awareness and education, and Regulatory frameworks and toxic vigilance systems.
The study employed a combined research method to integrate statistical information about cases with detailed descriptive content, which strengthened the outcome of the assessment process.

Ethical Considerations

The research utilized past hospital records that had been de-identified and published, but excluded direct participation of human subjects. No approval was necessary for ethical considerations since human subjects did not participate directly. The study adopted ethical methodologies in academic research while preserving patient data security at all times
.

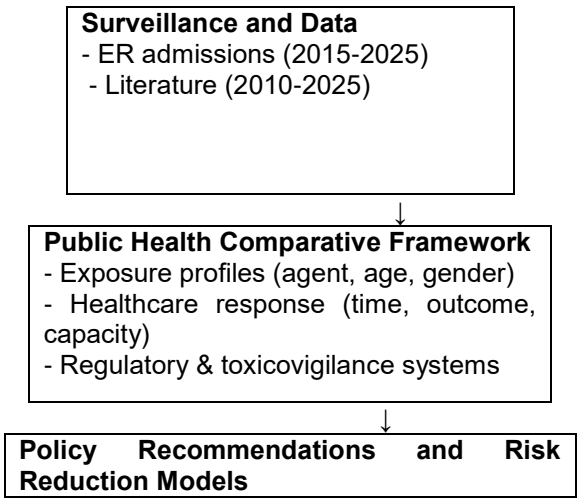
Limitations

Several methodological limitations were acknowledged. Underreporting stands as a primary challenge in Nigeria since many poisoning cases fail to receive documentation primarily because rural communities do not possess formal healthcare systems (Gulma, 2025). The lack of an official central database for toxic exposure incidents reduced both the accuracy and full reporting of Nigerian poisoning data. Statistics presented from certain UK sources existed in summary form, which prevented identifying agent-specific data and demographic attributes.

Medical professionals in different facilities used different definitions of poisoning severity and toxicology tests inconsistently, which likely affected the precise identification of exposure types, particularly when patients came in contact with multiple substances. The published research may contain publication bias because the literature review included peer-reviewed materials only, which could have affected the visibility of specific risk patterns.

The research method delivered thorough information about chemical poisonings among children, even though it faced certain restrictions in diverse health care systems.

Figure 1: Analytical Framework for Comparative Assessment



Note: Framework reflects WHO's model for injury surveillance and prevention (WHO, 2012).

Results and Discussion

Results

The analysis of pediatric chemical poisoning shows findings between Nigeria and the United Kingdom (UK) using hospital records from North-East Nigeria and Enugu State, and Umuahia, together with UK public health statistics. The study arrangement included classifications of poisoning substances, together with patient statistics and healthcare system capabilities, alongside medical results and emergency management durations.

Demographics and Patterns of Exposure

The majority of poisoning incidents among children under five years old reached more than 70% throughout the three Nigerian locations. Children between five years of age and under remain at the highest risk because they exhibit both curiosity and a deficient understanding of potentially hazardous situations. During the last two decades in North-East Nigeria, according to Isaac et al. (2022), boys represented 58% of all poisoning cases, which mirrored findings from both Enugu (Iheji et al., 2024) and Umuahia (Ibeneme et al., 2018). Risk-taking activities, together with higher levels of physical activity among boys, lead to their higher representation among poisoning cases.

Research conducted by King et al. (2025) within the UK medical sector indicated that children belonging to the age brackets of 0–5 years faced the highest risk of poisoning. Gender differences in hospital poisoning cases were more balanced in UK facilities, yet urban areas in lower socio-economic areas reported more poisonings (Cubbin & Smith, 2002). Geographical boundaries do not influence the tendency of young children to experience chemical dangers because every region exhibits similar exposure risks.

Agents of Poisoning

The main toxic agents in Nigeria consisted of organophosphates, which are mainly used for agricultural purposes. Isaac et al. (2022) discovered that organophosphates caused 64.7% of pediatric poisoning cases because farmers commonly put dangerous chemicals inside non-labeled beverage containers, as farmers in rural areas do. Public health statistics from Enugu revealed that kerosene poisoning incidents were high because people kept open storage containers near their food (Edelu et al. 2016). Childhood exposure to chemical cleaners like caustic soda and bleach at Umuahia's Federal Medical Centre became frequent enough to cause medical facility reports (Ibeneme et al., 2018).

The main cause of poisonings in UK adults came from medications obtained without a prescription and cleaning solutions, as well as CO emissions. Roberts and Aaron (2007) establish that carbon monoxide is responsible for 12% of poisonings among pediatric patients who visited emergency departments due to faulty heating appliances. Children were most prone to consuming cleaning products when household chemical storage methods were inadequate.

Table 2: Common Pediatric Poisoning Agents in Nigeria vs. UK

Agent Type	Nigeria (%)	UK (%)
Organophosphates	64.7	<2
Kerosene	18.4	Rare
Caustic soda/Bleach	10.2	25.3
Medication	4.3	42.6
Carbon Monoxide	Rare	12.0

Sources: Isaac et al. (2022); King et al. (2025).

Clinical Outcomes and Mortality

The Nigerian population experienced elevated mortality rates, together with treatment complications because of delayed care and scarce antidote supplies. The research by Ekpe & Ette (2012) revealed that corrosive poison killed 13% of affected children, while survivors experienced permanent neurological effects. Umuahia residents developed a tight esophageal passage due to caustic soda poisoning, which required multiple surgical procedures.

The favorable outcomes of patients in the UK showed case resolutions that led to no permanent medical problems. The contrast in patient outcomes was due to quick decontamination and antidote giving, and quick access to critical care facilities. An investigation into mental health consequences from continuous low-level exposure continues because toxin exposure on the long-term remain unknown according to Boyle et al. (2009).

Systemic and Structural Gaps

Major systemic defects were noted at every Nigerian center of study through a comprehensive assessment. According to Isaac et al. (2022), there are insufficient antidotes available for pediatric patients, while data shows that medical personnel in Nigeria receive scarce toxicology education based on Iheji et al. (2024). Additionally, national protocols for poisoning and poison control centers remain undefined throughout the entire country (Gulma, 2025).

Medical personnel in the United Kingdom possess access to poison centers and toxicologists, yet remain concerned about the developmental risks from small lead and flame retardant exposures (James & O'Shaughnessy, 2023).

Table 3: Structural Gaps in Nigeria vs. the UK

Gap Type	Nigeria	United Kingdom
Pediatric antidote access	Rare	Readily available
Poison control centers	Largely absent	National network
ER toxicology expertise	Minimal	Specialized training available
Chronic exposure tracking	Not systematic	Limited but emerging concern
Community education	Low awareness	High but unequal by region/class

Discussion

A review of pediatric chemical poisoning in Nigeria shows differences in exposure rates and treatment methods, and readiness systems compared to the UK system. The diverging factors stem from economic elements as well as legal frameworks, together with health management structures.

Prevalence and Demographics

Children under five years of age in Nigeria experience the most poisonings from accidents because their natural curiosity and lack of safety understanding make them vulnerable. Research from Enugu and Umuahia regions, alongside other studies, proposes that higher rates of youth poisoning exist because of male physical engagement and daring conduct (Edelu et al., 2016; Ibeneme et al., 2018). Available research data support the necessity of building specialized prevention strategies because of elevated risks among this high-risk population.

Poisoning cases in the UK involving children under five constitute a prominent portion, although the number of differences between male and female victims remains relatively low. Medical research indicates that child-resistant packages, together with educational efforts about poisoning dangers, have reduced accidental poison exposure among young kids (Poojari et al., 2019). Children from poor households remain at higher risk of accidental poisoning because their homes typically have limited access to safety education and suffer from crowded living spaces (Cubbin & Smith, 2002).

Agents of Poisoning

The substances used in poisonings demonstrate substantial differences between Nigeria and the United Kingdom. Children in Nigeria primarily consume kerosene as their main poisoning substance because it remains the most frequently ingested substance and because they have accessible and improperly labeled kerosene containers (Edelu et al., 2016; Ibeneme et al., 2018). Poisoning cases are considerably increasing from organophosphates, which farmers widely use across agricultural fields, particularly in areas lacking safety regulations (Ahmed et al., 2020).

Children in the United Kingdom experience most poisoning episodes from using household cleaning products, together with medications, as the primary culprits. A failure rate exists in child-resistant packaging regulations because pediatric accidents continue to happen, so parents need better ongoing education about proper storage (Poojari et al., 2019). The persistence of lead-based paints in older homes creates a continuous threat to children because the deterioration of paint releases lead dust, which leads to lasting health complications, according to the Financial Times (2025).

Healthcare Response and Outcomes

The medical approach to pediatric poisoning shows major dissimilarities between these two countries. The population in Nigeria experiences extensive delays when seeking healthcare because many patients cannot access transportation, face monetary difficulties, and prefer to use traditional medical treatments. Medical treatment for poisoned patients becomes both difficult and more dangerous when they arrive two to twelve hours after swallowing toxic substances, according to Ibeneme et al. (2018).

The UK maintains an established emergency medical response structure, which enables children to obtain treatment within a few hours of contact with toxicants. Poison control centers, together with available trained healthcare professionals, result in improved outcomes since patients experience fewer deaths and develop fewer long-term complications (Poojari et al., 2019).

Preventive Measures and Public Health Implications

Reduction of pediatric poisoning requires immediate preventive measures as a primary strategy. The prevention of hazardous substance poisoning in Nigerian communities requires public health initiatives that teach people how to store dangerous items correctly while also delivering educational programs about hazards. When regulations for toxic substance sale and storage are enforced in rural areas, this action substantially lowers the chances of human exposure (Edelu et al., 2016).

The UK needs to sustain educational initiatives that teach parents and caregivers about the safety risks of household chemicals and medications. A combined approach between local government and support services must focus on identifying residential lead-based paint risks because these problems primarily affect lower-income residential areas (Financial Times, 2025).

Limitations and Future Directions

The findings in this study present constraints mainly from using retrospective data because it could lack full information or show reporting inconsistencies. The results may be less comparable because Nigeria and the UK have different approaches to healthcare infrastructure administration and data collection procedures.

Future study requirements should focus on collecting data about pediatric poisoning from prospective investigations. Better reporting standards and improved surveillance systems will generate more precise data about poisoning rates as well as their underlying causes. The investigation of public health intervention effectiveness, together with education program assessment, will help create specific strategies to stop pediatric poisoning.

Conclusion and Recommendations

The research confirms that children encounter important yet manageable preventive public health risks from chemical exposures and organophosphate assaults in both Nigeria and the United Kingdom (UK). The evidence indicates that both countries share similar levels of toxic exposure issues affecting their child populations, regardless of their differing economic statuses and regulatory approaches. The Nigerian community faces severe risks from pesticides because their regulation remains weak, and storage methods are dangerous, while caregivers lack proper poisoning knowledge. Household exposure to toxic chemicals and unintended overdose incidents of medication remain issues within the UK agricultural sector, which continues its successful controls of chemical access.

The reported clinical results of pediatric poisoning show distinct patterns between Nigeria and the United Kingdom. Emergency response times, along with the insufficient availability of antidotes and inadequate toxicology training, cause severe outcomes among poison victims who reside in rural or semi-urban areas of Nigeria. Patient hospitalizations become extended and treatment results stay poor when emergency services in North-East Nigeria, Enugu, and Umuahia take more than 12 hours to respond. An organized poison control system plus expedited emergency services alongside wide antidote availability enhances UK poison treatment effectiveness which promotes healthier patient outcomes.

Effective toxicovigilance systems demonstrate their essential value for fast detection and prompt reporting, and response procedures during poisoning emergencies. UK toxicovigilance activities rely on national poison control networks, including the National Poisons Information Service, for delivering prompt clinical guidance. Public health strategies development in Nigeria remains restricted because the country lacks a unified toxic exposure monitoring system and uniform recording systems.

Safeguarding vulnerable citizens proves difficult for Nigeria and the UK particularly for children below five years of age. The population group under age five presents the greatest risk from poisoning because their developmental stage involves hand-to-mouth behavior, and they possess an inadequate understanding of potential threats. Both Nigeria and the UK demonstrate that males make up most of their poisoning cases, thus confirming previous research linking male gender with increased adventurous behavior in boys. To safeguard this demographic population from chemical exposures, the healthcare system needs to strengthen and enforce policies as well, and community education must take place.

The research results lead to essential intervention proposals that Nigerian public health authorities, together with UK public health authorities and healthcare providers, and policymakers, should adopt.

The priority for Nigeria should be creating poison control facilities across regions, which must offer round-the-clock consultation activities for healthcare professionals and members of the community. A real-time surveillance and policy evaluation national poison data reporting system must integrate poison control centers throughout the nation. The implementation of this program would enhance both poisoning incident recognition and urgent reaction coordination functions considerably.

The Nigerian government needs to implement more stringent rules about pesticides and household chemical packaging, as well as labeling and sale requirements. The Nigerian government should license agrochemical vendors while adopting laws that limit their sales to child-proof packaging. The public requires education about harmful storage practices at the same time awareness initiatives are launched with complementary instructions on home safety measures. The educational initiatives should use local languages to support understanding

among rural residents who often have limited reading ability.

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